



# EUR AMHS Manual

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## Scope of the Document

This document has been developed by the ICAO EUR Aeronautical Fixed Service Group (AFSG), which was replaced in 2019 by ICAO EUR AFS to SWIM Transition Task Force (AST TF) according to COG/74&RCOG/11 Decision /4, in order to present a comprehensive collection of information pertaining to the implementation of ATSMHS in the ICAO EUR Region.

It is intended that the document will evolve into an EUR ICAO Document containing guidance material on EUR AMHS implementation.

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  - APPENDIX G-C: EDS TESTING GUIDELINES
- APPENDIX H: APPLICATION/SERVICE ORIENTED AMHS PROFILES

## References

### ICAO Documentation

- [1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II and Volume III
- [2] ICAO Annex 11 – Air Traffic Services
- [3] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS), Second Edition – 2016
- [4] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part III – Upper Layer Communications Service (ULCS) and Internet Communications Service (ICS) , Second Edition – 2016
- [5] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part IV – Directory Services, Security and Identifier Registration, Second Edition – 2016
- [6] ICAO Doc 9896: Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols, Second Edition – 2015
- [7] ICAO Doc 7910, Location Indicators,
- [8] ICAO Doc 8585, Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services
- [9] ICAO Doc 8259-AN/936: Manual on the Planning and Engineering of the Aeronautical Fixed Telecommunication Network, Fifth Edition – 1991
- [10] ICAO Doc 7754, European (EUR) Air Navigation Plan, Volume I
- [11] ICAO Doc 7754, European (EUR) Air Navigation Plan, Volume II, Working Copy
- [12] EUR Doc 021, ATS Messaging Management Manual

### SPACE Documentation

- [13] WP201 – Location of AMHS message servers and AFTN/AMHS gateways, SPACE/NATS/201/WPR/034, Version 2.0, 30/06/2002
- [14] WP202 – Specification of European AMHS performance objectives, SPACE/EURO/202/WPR/045, Version 2.0, 30/06/2002
- [15] WP211 – Topology between servers and gateways, SPACE/DFS/211/WPR/059, 2.0, 08/11/2002
- [16] WP223 – Study of routing strategy in SPSOs, SPACE/STNA/223/WPR/120, Version 2.0, 11/11/2002

- [17] WP232 – AMHS security issues in SPACE participating States/ Organisations, SPACE/Eurocontrol/232/WPR/047, Version 1.0, 13/09/2001
- [18] WP233 – AMHS institutional and financial issues in SPACE participating States/ Organisations, SPACE/STNA/233/WPR/192, Version 1.0, 11/09/2002
- [19] WP234 – Analyse requirements for System Management at AMHS level, SPACE/NATS/234/WPR/051, Version 2.0, 30/06/2002
- [20] WP411 – SPACE Final Report, SPACE/STNA/411/WPR/224, Version 1.0, 02/12/2002

#### **General technical literature**

- [21] ISO/IEC 10021-2: Information Technology – Message Handling Systems (MHS): Overall architecture
- [22] ISO/IEC 10021-10 International Standard, Information technology – Message Handling Systems (MHS): MHS routing (1998)

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# **1 Structure of the EUR AMHS Manual**

1.1 The EUR AMHS Manual consists of the “Main Part” and the Appendices.

1.2 In the main part, the following Chapters have been introduced, with the view to provide general guidance and detailed information on requirements concerning AMHS implementation in the EUR Region.

1. Introduction
2. EUR AMHS Requirements
3. European ATS Messaging Service Profile
4. System implementation - Guidelines for system requirements
5. AMHS management
6. Tests and validation of systems
7. Operational procedures and Recommendations
8. Miscellaneous

1.3 Then, for easy reference, the Change Control Mechanism of the EUR AMHS Manual has been included as Attachment A.

1.4 Finally, for better presentation and management, detailed documents, which have been produced on particular subjects initially addressed in the main body of the Manual, have been included as Appendices to the Manual.

1.5 The following Appendices to the EUR AMHS Manual have been produced:

- Appendix A: Abbreviations, Glossary and Definitions
- Appendix B: European ATS Messaging Service Profile
- Appendix C: AMHS Testing Requirements
- Appendix D: AMHS Conformance Tests and Appendix D-UA: AMHS UA Conformance Tests
- Appendix E: AMHS Interoperability Tests
- Appendix F: AMHS Pre-operational Tests
- Appendix G: European Directory Service (EDS), Appendix G-A: EDS User Interface Control Document, Appendix G-B: EDS Data Description and Appendix G-C: EDS Testing Guidelines
- Appendix H: Application/Service oriented AMHS Profiles



1.6 *Note.– The EUR AMHS Manual is a “living” document. The Planning Group of the AST TF, as the editor, has collected necessary and relevant information to be used for the Regional deployment of AMHS. All interested partners are invited to contribute. Do not hesitate to contact the Planning Group; each comment, remark or correction is welcome.*

## **2 Introduction**

### **2.1 Background Information**

#### **2.1.1 AFS**

2.1.1.1 The Aeronautical Fixed Service provides, among other things, for the exchange of messages pertaining to the safety of air navigation and the regular, efficient and economical operation of air services.

2.1.1.2 The following categories of message are handled by the AFS:

- distress and urgency messages
- flight safety messages
- meteorological messages
- flight regularity messages
- aeronautical information services messages
- administrative messages
- AFTN SVC messages

2.1.1.3 The principal users of messages in the above categories are ATS and the AIS, ATFM, MET and SAR Services which support and complement the ATS.

#### **2.1.2 AFTN/CIDIN**

2.1.2.1 Initially, the operational requirements for such an information exchange were met by the development of the Aeronautical Fixed Telecommunications Network.

The AFTN provides a store-and-forward messaging service for the conveyance of text messages in ITA-2 or IA-5 format, using character-oriented procedures.

Although AFTN served its purpose well for many years, AFTN technology has become outdated due to the fact that it remains bound to its telex/telegraphic origins.

2.1.2.2 One major step towards overcoming the limitations of the AFTN was taken with the introduction of the Common ICAO Data Interchange Network, which is based on packet switching techniques.

The CIDIN provides a common transport service for the conveyance of binary or text application messages in an expeditious and reliable manner.

In the EUR Region, the CIDIN provides the enhanced backbone data communications infrastructure for the AFTN and a general data communications service to non-AFTN applications such as OPMET.

#### **2.1.3 AMHS**

2.1.3.1 The most recent development with regard to messaging in the ATS environment is the AMHS. The AMHS is a natural evolution from AFTN/CIDIN, replacing the telegraphic style of working with a modern Message Handling System based on international Standards.

2.1.3.2 It is presumed that the ATSMHS, being an ATN application, utilises the infrastructure of the ATN internetwork. However this is not a prerequisite for the initial deployment of the ATSMHS.

2.1.3.3 There are several advantages of AMHS over AFTN/CIDIN including:

- increased speed, capacity and throughput
- enhanced reliability
- extended functionality
- interoperability with other global messaging services
- security capabilities
- use of COTS equipment and services

Furthermore, AMHS offers services meeting non-AFTN communication requirements.

2.1.3.4 The provisions pertaining to ATSMHS, such as SARPs, technical specifications and general guidance material, are contained in the following ICAO documents, which constitute the main references for this Manual.

- Annex 10, Volume II, Chapter 4 [1]
- Annex 10, Volume III, Part I, Chapter 3 [1]
- Doc 9880 Part II [3]
- ICAO EUR ANP, Volume I [10]
- ICAO EUR ANP, Volume II [11]

## **2.1.4 ACCESS and SPACE**

### **2.1.4.1 ACCESS Project**

2.1.4.1.1 The “ATN Compliant Communications - European Strategy Study” (ACCESS) project was undertaken between January 1997 and March 1999 by National Air Traffic Services Ltd (NATS), the Service Technique de la Navigation Aérienne (STNA) and the Deutsche Flugsicherung (DFS) and part-funded from the European Commission’s programme for financial aid in the field of Trans-European Networks - Transport (TEN-T).

2.1.4.1.2 As TEN-T ATM Project 1996-GB-94-S, “Aeronautical Telecommunications Network -Implementation Feasibility Studies”, the main objectives of the study were:

- a) Development of an ATN Architecture;
- b) Development of an Implementation Plan in the European core area in conjunction with EUROCONTROL;
- c) Interoperability and validation trials between States using ATN-compliant ATS Message Handling Services.

2.1.4.1.3 The geographical area considered in the ACCESS study comprised the following countries: Belgium, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain and the United Kingdom. These States were chosen for the following reasons:

- a) They had a direct connection to the European Central Flow Management Unit and/or were involved in the control of North Atlantic traffic;
- b) The study was representative of both Oceanic and Continental ATC.

However, the architectural principles proposed in this Study are also applicable to the whole European area.

2.1.4.1.4 Similarly, whilst the ATN is designed to accommodate all aeronautical communications, the ACCESS Study concentrated on those directly related to the provision of Air Traffic Services (ATS). The other users of the ATN were not ignored, but the resulting network architecture does not consider those user requirements. However, this does not invalidate the design of the ATN in this study.

### **2.1.4.2 SPACE Project**

2.1.4.2.1 The SPACE (Study and Planning of AMHS Communications in Europe) Project is a European Commission Project co-funded by the Commission of the European Union in the framework of the TEN-T ATM Programme. This project is run by a consortium of the following European States and Organisations: France (DGAC/STNA), Germany (DFS GmbH), Spain (Aena), United Kingdom (NATS Ltd) and the EUROCONTROL Agency.

2.1.4.2.2 The overall objective of SPACE is to develop plans to upgrade the current European-wide AFTN messaging system and to replace it using X.400 compliant systems based on the AMHS technical specifications developed by the ICAO ATN Panel and contained in Doc 9880, Part II (old Sub-Volume 3 of ICAO Doc 9705).

2.1.4.2.3 The SPACE Project comprises the following main phases:

- Phase 1: Definition of a European AMHS addressing plan;
- Phase 2: Technical design for the European AMHS; and
- Phase 3: Overall implementation plan.

2.1.4.2.4 The deliverables of the project complement the SARPs and technical specifications by addressing technical issues that are generally of an implementation nature such as:

- the location of servers and gateways;
- the definition of performance objectives;
- the definition of address conversion and routing strategy;
- etc.

2.1.4.2.5 One of the major deliverables of the SPACE Project is the definition of a common unique world-wide addressing scheme. This scheme - the Common AMHS Addressing Scheme (CAAS) - has subsequently been endorsed by the AFSG and the ATN Panel working groups and included in old Edition 3 of ICAO Doc 9705 which was replaced by Doc 9880, Part II.

2.1.4.2.6 The overall implementation plan is developed primarily for the benefit of the partners of the SPACE Consortium but is complemented by a set of extensibility principles in order to help other States and Organisations in planning the deployment of their own AMHS system.

## **2.2 ATSMHS Overview**

### **2.2.1 General**

2.2.1.1 The ATN technical specifications for the Air Traffic Services Message-Handling Service (ATSMHS) define the ICAO store and forward messaging service used to exchange ATS messages between users over the ATN internet.

2.2.1.2 The set of computing and communication resources implemented by Air Navigation Service Providers (ANSP) to provide the ATS Message Handling Service is commonly referred to as AMHS (ATS Message Handling System).

The ATS Message Handling System technical specifications are compliant with mature message handling systems standards such as ISO/IEC 10021 [22] and ITU-T X.400.

### **2.2.2 Functional Components**

In terms of functionality, the ATSMHS comprises the following components:

- (a) the Message Transfer Agent (MTA) which performs the function of the message switch,
- (b) the User Agent (UA) which performs the user access to the MTA and provides an appropriate user interface,
- (c) the Message Store (MS) which provides the intermediary storage between MTA and UA and is usually co-located with the MTA, and
- (d) the Access Unit (AU) which provides for intercommunication with other Messaging Systems.

### **2.2.3 End systems**

2.2.3.1 Three categories of ATN end systems are defined for the support of the ATS Message Handling Service:

- the ATS message server
- the ATS message user agent
- the AFTN/AMHS Gateway

2.2.3.2 Together, these systems provide connectivity between users at ATN end systems and users at AFTN Stations in three different end-to-end configurations:

- a) from an AFTN/CIDIN Station to another AFTN Station over the ATN;
- b) from an AFTN/CIDIN Station to an ATN End System, and vice versa;
- c) from an ATN End System to another ATN End System.

### **2.2.4 Levels of service**

2.2.4.1 Two levels of service are defined within the ATS Message Handling Service:

1. The Basic ATS Message Handling Service;
2. The Extended ATS Message Handling Service.

2.2.4.2 The Basic ATS Message Handling Service meets the basic requirements of the MHS Profiles published by ISO as International Standardized Profiles (ISPs), and it incorporates additional features to support the service offered by the AFTN.

2.2.4.3 Compared to the service of the AFTN, the Basic ATS Message Handling Service offers some significant improvements such as:

- practically unlimited message length;
- virtually no limit on the number of addressees of a message;
- provision of non-delivery reports;
- indication of the subject of a message.

2.2.4.4 The Extended ATS Message Handling Service provides functionality in addition to those of the Basic ATS Message Handling Service such as the introduction of directory services and security mechanisms. Furthermore, in addition to IA-5 text, the extended service allows for the transfer of binary coded data, files etc.

2.2.4.5 The Extended ATS Message Handling Service is backwards compatible with the Basic ATS Message Handling Service.

## **2.2.5 Inter-operability**

2.2.5.1 During the transition phase from the AFTN or the CIDIN to the AMHS the interoperability between systems is achieved by the use of the AFTN/AMHS Gateway.

2.2.5.2 The technical specifications for the AFTN/AMHS Gateway have been defined by ICAO.

## **3 EUR AMHS Requirements**

### **3.1 Quality of Service Requirements**

#### **3.1.1 Scope**

3.1.1.1 The purpose of this section is to define quality of service (QoS) requirements and set target performance objectives for the European AMHS. To this end, the properties of the AMHS are considered from the outside of the network, i.e. at its boundary, without taking into account the way in which the service, as defined on its boundary, is provided from within the network.

3.1.1.2 The performance requirements dealt with in this section are the common understanding on what the applications will get in terms of performance and what level of performance the network has to provide. The performance parameters are therefore necessary for designing applications as well as the network itself.

3.1.1.3 This section is organised as follows:

3.1.1.3.1 First, a collection of terms and concepts is set up for discussing quantitative properties of the service delivered by the AMHS.

3.1.1.3.2 Second, numerical values for performance parameters are defined using the following input:

- anticipated location of message servers and gateways;
- analysis of existing and projected message flows in the EUR area based on presently available information;
- general design principles;
- user expertise.

3.1.1.4 As in most cases, in order to arrive at concrete values for the performance parameters, a number of assumptions and restrictions are made:

- QoS is not dependent on traffic volumes;
- QoS is measured between originator-recipient pairs;
- QoS is not geographically dependent;
- QoS is not dependent on time;
- QoS represents worst case performance;
- the underlying network should be sized to accommodate QoS;
- degree of corruption is not relevant to the Corruption QoS parameter;
- corruption is not dependent on message size;
- non reachability due to network causes is typically of the order of a few minutes (60 per year);
- the bit error rate of an HDLC link is of the order  $10^{-11}$ .

### **3.1.2 Quantitative approach**

3.1.2.1 The formal analysis and formulation of network performance requirements is a difficult task and the pragmatic solution often adopted is to over-dimension the network, resulting in sufficient capacity and service assurance but also significantly higher costs. At a time when ANSPs are becoming increasingly cost conscious, this solution is not acceptable.

This sub-section gives an overview of the problems of quantitative analysis of message handling with special reference to the AMHS.

Existing networks are studied and existing literature and study results (EATCHIP, ACCESS, SPACE) are used.

#### **3.1.2.1.1 Comparison with the development of CIDIN**

The introduction of CIDIN in Europe was done with new technology over a period of 15 years, with no overall CIDIN capacity planning. The CIDIN development is characterised by continual upgrading.

In the case of the AMHS, the technology is not new, but is well tried. For this reason it makes sense to establish quantitative performance requirements for it from the beginning. Unfortunately, there is very little experience available and techniques for the specification of performance requirements for message handling systems do not exist.

#### **3.1.2.1.2 The process of continual upgrading**

Since the task of specifying numerical requirements is so difficult, most networks experience a process of continual upgrading in order to correct errors in the initial numerical requirements estimates but also to cope with increasing demands on performance. A typical approach of network operators is to keep utilisation of individual network components below a certain level, e.g. 50%. As soon as this level is reached in a component, it is upgraded. This is based on the experience that when components reach high utilisation levels, highly non-linear effects occur and the performance of the network as a whole is no longer predictable.

#### **3.1.2.1.3 EATCHIP – Application requirements for data communications services**

In the framework of EATCHIP<sup>1</sup> a study of requirements which ATC applications place on data communications services was conducted. The results of this study, collated in a report titled “Application Requirements for Data Communication Services” have been used as an initial source of information. It must be pointed out that this study was performed with little regard to the actual networks which provide or should provide data communications services.

#### **3.1.2.1.4 ACCESS - ATN Compliant Communications European Strategy Study<sup>2</sup>**

This study investigated the ways in which user requirements placed on data transmission through the ATN Internet could be modelled. Although there are significant differences between the behaviour of packets in a connectionless network infrastructure and the behaviour of messages, the modelling approach defined in this study provides valuable insight into the problem of determining QoS parameters.

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<sup>1</sup> EATCHIP : European ATC Harmonisation and Implementation Programme

<sup>2</sup> Project run under the Trans-European Networks for Transport (TEN-T), ATM Task 1996-GB-94-S



### 3.1.2.1.5 SPACE – Study and Planning of AMHS Communications in Europe<sup>3</sup>

As part of the SPACE project, a specific work package defined performance parameters and set corresponding numerical values in order to capture all performance aspects that are relevant to the European AMHS. Results of this work package are extensively used in this section.

### 3.1.2.2 Quantitative aspects of the AMHS

#### 3.1.2.2.1 Messages as the basis of the analysis

In dimensioning the AMHS only complete messages should be considered for the following reasons:

- the message is the basic unit of data at the user interface;
- whole messages are stored and forwarded by MTAs in the network;
- in formulating performance requirements, transport or sub-network performance is not taken into account.

Of course, in dimensioning the network, it will be necessary to consider performance aspects of lower level infrastructure as well, but as a result of the user requirements formulated in this document and their impact on MTA performance.

Further, it is important to note that the specification of performance requirements is based on individual messages, independently of all other messages.

When considering message size, only the volume of user information is relevant since the user has no control (or only very limited control) over the data overhead involved in message handling.

Formulating performance requirements of a given user, taking into account the simultaneous use of the network by other users, does not appear to be feasible. However, it has to be recognised that, in a real world situation, the performance of the network for a given message certainly does depend on the presence of other messages currently being processed. The performance requirements specified here represent minimum or worst-case performance under the load conditions (Traffic Volume Requirements) identified in the framework of the SPACE project.

#### 3.1.2.2.2 Types of performance parameters

There are two distinct groups of performance parameters to be considered in connection with the AMHS.

Parameters not dependent on message volumes: These parameters describe the quality of service (QoS), which is available to each individual message considered by itself, e.g. transit time. They can be measured, i.e. they are the quantitative results of the way in which messages are handled by the network.

Message volumes: These parameters describe the volumes of messages, message sizes and their distribution geographically, as they could be generated by users of the network. The

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<sup>3</sup> Project run under the Trans-European Networks for Transport (TEN-T), ATM Task FR/98/228

parameters could be measured in the user end systems but it is not realistic to measure them in the network.

#### 3.1.2.2.3 QoS per individual message

QoS requirements have to be satisfied under worst possible/allowable traffic volumes and most unfavourable originator/recipient pairs within a specific network configuration. Consequently, QoS is formulated for each individual message, independently of other messages being handled by the network.

This choice has been made for the following reasons:

- it is difficult to imagine that users would accept a QoS which is dependent on the demands which other users place on the network at the same time;
- the network has to be dimensioned to handle the maximum message volumes, while performing sufficiently well;
- the QoS requirements represent "worst case" performance when maximum degradation through interaction with other traffic occurs.

It must be pointed out, that AMHS provides the facilities to send messages many orders of magnitude greater than AFTN, with attachments measured in Mb. Clearly transfer times for such messages will be considerably longer than for the short text messages exchanged in AFTN. It is, thus, necessary to qualify the statement that QoS is independent of message size by adding 'for messages containing similar information to that carried over the AFTN'. If a quantitative limit is required, this will be between 4Kb and 6Kb, being the equivalent size of an AFTN message including the AMHS header.

#### 3.1.2.2.4 Independence of QoS on location and time

QoS for an originator/recipient pair is most likely dependent on the relative locations of the two end systems, i.e. whether messages are transmitted with more or less hops through MHS systems (MTAs etc.). However, for simplicity reasons and since QoS requirements are "worst case" requirements, they are stated independently of the location of a message server.

Furthermore, QoS requirements remain constant at all times and are not dependent on date and time of day.

The AMHS performance requirements for the AFTN/AMHS Gateways, could, by agreement, be deemed to apply to interfaces between AMHS functions and AFTN functions in Gateways, e.g. a boundary point consisting of an interface between an internal Message Store and an AFTN handler within a Gateway.

#### 3.1.2.2.5 Dependence of QoS on the AMHS service used

It may be necessary to specify different QoS levels for the AMHS corresponding to different sets of services used, i.e. there may be different classes of messages with respect to QoS. The number of QoS levels should be kept small for simplicity and the way in which service parameters map a message to a QoS level must be simple.

The values of QoS provided by the AMHS are useful to the application designer in deciding which services to use and how they are used. For example, the degree of certainty that a message will reach its destination will determine whether AMHS acknowledgement services are used and in what way. Furthermore, the values of QoS are useful in designing higher-level protocols.

### **3.1.3 Specification of performance requirements**

3.1.3.1 The specification and meaningful application of performance requirements is not a simple task. This sub-section outlines some of the difficulties involved and principles to be adopted.

#### 3.1.3.1.1 Statistical significance

The way in which performance parameters are formulated is necessarily statistical in nature. This is due to the large number of factors, which affect the performance of the network, such as:

- the current network configuration;
- the current overall load of the network, i.e. the behaviour of all users considered as a whole; and
- the dynamic properties of network nodes and transmission systems.

#### 3.1.3.1.2 The need for measurement

For the specification and application of performance requirements to be meaningful, there has to be a framework for measuring performance with respect to the performance parameters. Aspects of a measurement framework which have to be considered are:

- because of the non-deterministic nature of network performance, measurements need to involve large samples of messages, as described in the previous section;
- measurements must be made at different locations simultaneously;
- consistent decisions have to be made as to where measurements are performed, e.g. at service interfaces in MTAs, UAs etc.

#### 3.1.3.1.3 Network aspects relevant to performance

The following list contains factors which can affect message handling performance:

- processing speed, limits the capacity due to the store and forward nature of message handling;
- the finite transmission capacity (line speed) of links between nodes, limits the network throughput;
- the transmission times across links, affects the message transit time since complete messages are stored and forwarded a number of times between originator and recipient;
- the efficiency of message queues;
- transmission line failures and errors are obvious sources of degraded performance;
- table configuration errors can have major negative effects on network performance;
- software failures, which are difficult to treat quantitatively.

In designing the network, the performance requirements (amongst other things) have to be translated into properties of individual network components such that overall requirements are satisfied. Of course other considerations such as policy, expandability, ease of maintenance etc. enter into the network design as well.

### 3.1.3.2 AMHS Quality of Service Requirements

3.1.3.2.1 For reasons of completeness, simplicity and relevance, a minimal set of parameters was selected out of the large range of possibilities for expressing performance properties, to form a suitable "frame of reference" for discussing the dynamic properties of the European AMHS:

These parameters defined and described in the following sub-sections in more detail, are:

- **Destination Non-Reachability;**
- **Maximum Transit Time;**
- **Message Corruption.**

The selection of these three parameters has been made for the sake of:

- Completeness: all relevant performance aspects of AMHS are covered;
- Simplicity: the formulation of requirements is intentionally kept simple; and
- Relevance: no aspects are included which are not considered to be relevant.

If the performance of the AMHS is such that these parameters are exceeded, then the service is deemed to be of poor quality.

#### 3.1.3.2.2 Destination Non-Reachability

Destination Non-Reachability is expressed with respect to pairs of addresses (originator / recipient). It is the probability that a message sent by the originator will not reach the recipient within the Maximum Transit Delay (as defined below).

The above definition shows that the parameters Destination Non-Reachability and Maximum Transit Time (see below) are not independent of each other: their definitions are coupled. This is intentional. The philosophy behind this definition is that the value of a message to a person or an application receiving it is dependent on its timely receipt. It is assumed, for a given flow type, that all messages belonging to it have the same value of this parameter.

The definition of Destination Non-Reachability is independent of whether the long (or infinite) transit time for a message is reported to its originator or not. It is also independent of whether acknowledgement procedures within the AMHS or on an application level detect the long (or infinite) transit time or not.

Destination Non-Reachability includes the cases in which messages are "lost", i.e. do not reach their destination in finite time. The probability of message loss must be negligible and this probability is included in the total probability of Destination Non-Reachability. However, there remains a need (for procurement purposes) to place a separate figure on this probability. In keeping with the above rationale, it is required that the probability of message loss is, at most, one tenth of the probability of Destination Non-Reachability.

#### 3.1.3.2.3 Maximum Transit Delay

The Maximum Transit Delay is the time within which a single message has to be transmitted through the network end-to-end so that its transmission is of value to the applications (users). Time critical services, such as CCAMS, impose very stringent requirements for the timely delivery of messages to end users.

If this time is exceeded, the receipt of the message is, in principle, of no value to the application. If the non-receipt within this time is known to the application, then, presumably, error procedures, such as message retransmission, will be initiated.

The transit delay is the time taken by the network to make the message available to the Message Store associated with the message recipient (UA). Therefore the boundary points of the network may, in this context, be considered to be the MTAs connected to the UAs serving the originators/recipients. The boundary points can also be the MTA functionality within AFTN/AMHS Gateways.

It must be borne in mind, that the parameters Maximum Transit Delay and Destination Non-Reachability only have significance when they are taken together.

#### 3.1.3.2.4 Message Corruption

The third Quality of Service Parameter concerns message integrity and is called "Message Corruption". It is the probability that each 1,000 octet content block of a message which arrives at its destination, has been corrupted in any way. The definition of Message Corruption applies only to messages which reach their recipients within the Maximum Transit Delay.

"Corruption" means a deviation, end-to-end, of the content of the received message from the content of the original message. The "content" is also deemed to include parameters, such as originator address, which are delivered together with the message. Corruption can also result from unauthorised changes to a message.

Since the volume unit for defining Message Corruption is large (1,000 octets), the requirement is almost independent of the size of (current) messages. This simplification is based on the assumption that corruption is due to unforeseen system malfunctioning, e.g. faulty software. The corruption of messages due to such causes is not likely to be dependent on the size of messages. (This may need to be reconsidered with the potential forthcoming applications that interchange messages with binary body parts).

The probability of corruption due to other parameters such as system load, queue sizes, transmission errors etc. is almost negligible.

It is estimated, that the volume dependent non-detected bit error probability for a 1000 octet message traversing the AMHS and involving 5 links and 5 different systems (MTAs, UAs, MSs) is of the order of one bit in  $10^5$  or less. This justifies the (almost) volume-independent character of the Message Corruption parameter.

#### 3.1.3.3 QoS Flow Type Classes

3.1.3.3.1 Different types of information exchange, called Flow Types here, place different QoS requirements on the AMHS.

In principle, each Flow Type might need to be associated with its own specific values of the three QoS parameters. However, taking into account the large number of possible Flow Types, this would result in a very complex analysis. A suitable approach to reducing this complexity is the introduction of "QoS Flow Type Classes" as follows:

Define a number of "QoS Flow Type Classes" and associate a set of fixed values of the three QoS parameters with each class. Depending on the properties and needs of applications using specific Flow Types, assign these to the QoS Flow Type Classes.

When engineering the network, message traffic volumes of each class need to be taken into account rather than individual Message Flow Types.

#### 3.1.3.3.2 Three QoS Flow Type Classes

The approach outlined above is simple and practical provided the number of classes is small. In addition, there is a requirement that the QoS Flow Type Class, to which a message belongs, can be coded in some way in the message itself. This requirement comes from the fact that all AMHS components, e.g. MTAs, must be able, at least in principle, to adapt their processing to the QoS Flow Type Class. The means for this coding must come from standard MHS protocol elements, since development specific to AMHS has to be avoided and the possibility of using third-party-service must be kept open. This rules out, for example, the representation of QoS Flow Type Classes by specific User Parts.

The use of the MHS message priority parameter with three values, "urgent", "normal" and "non urgent", belonging to the P1 protocol handled by MTAs, is currently also not suitable for this purpose. The association of values to messages originating from and destined for the AFTN is fixed by technical specifications, since such messages traverse an AFTN/AMHS Gateway. This means that values of the MHS priority parameter cannot be freely assigned to message types which are currently handled by the AFTN.

There is no short-term solution to this problem. However, in the long-term, when the majority of messages handled by the AMHS are originated by and destined for native users, the priority parameter may become available for this purpose, keeping in mind, nevertheless, that various practical issues may need to be resolved.

3.1.3.3.3 In keeping with the three possible values of the MHS message priority parameter, three corresponding QoS Flow Type Classes are defined:

##### a) The "High QoS" Flow Type Class

Properties of this QoS Flow Type Class are:

- message transmissions are part of procedures, i.e. the sending and receipt of messages necessarily lead to actions or processing. Without receipt of the message, these actions or processing would not take place, or
- any corrupt information in messages could have serious consequences. This possibility has to be negligible.

##### b) The "Medium QoS" Flow Type Class

This class has similar properties to the High QoS Flow Type Class; however the Maximum Transit Time requirement can be somewhat less stringent. This distinction is important, because it can be expected that the Maximum Transit Time requirement will have a sensitive effect on network dimensioning.

Properties of this QoS Flow Type Class are:

- message transmissions tend to be of the nature of "information distribution" or "broadcast", possibly based on distribution lists rather than being parts of operational procedures. They are normally not acknowledged. Transit time and reachability constraints are not critical. In the case of non-delivery of messages, this may be noticed by users, in which case backup activities could be initiated, or

- message corruption could have serious consequences and needs to be as low as for the previous class.

#### c) The "Low QoS" Flow Type Class

This class has similar properties to the Medium QoS Flow Type Class; however the Destination Non-Reachability and Message Corruption requirements can be somewhat less stringent. This is due to a certain amount of redundancy in the message contents and/or the regular updating and transmission of messages with similar content.

### **3.1.4 Numerical requirements**

#### 3.1.4.1 QoS values

3.1.4.1.1 Resulting from the SPACE project, numerical values are assigned to the Performance Parameters defined for the European AMHS. These values, contained in Table 1, are based on the quantitative analysis of the Communications Service Attributes defined in the framework of EATCHIP as well as performance parameters of typical message switching equipment (see - Guidelines for system requirements).

	High QoS Flow Type Class	Medium QoS Flow Type Class	Low QoS Flow Type Class
Destination Non-Reachability (probability)	$< 10^{-4}$	$< 10^{-4}$	$< 10^{-3}$
Maximum Transit Delay	$< 10$ seconds	$< 5$ minutes	$< 5$ minutes
Message Corruption (probability)	$< 10^{-6}$	$< 10^{-6}$	$< 10^{-5}$

***Table 1: Numerical values of SPACE QoS performance requirements***

3.1.4.2 It must be noted that the above numerical values:

- have been defined as initial requirements for the AMHS network of the States having participated in the SPACE project;
- could be adopted as possible quantitative and qualitative characteristics for setting up the EUR AMHS network;
- will be reviewed on the basis of compiled AMHS operational experience.

### **3.1.5 Application of performance requirements**

3.1.5.1 The QoS parameters are obviously of importance to the network operators, users and application designers.

3.1.5.2 The QoS requirements along with the volume requirements for each of the Flow Type Classes at the boundary of the network (servers and gateways) are used, in conjunction with a set of well defined design principles (see 3.3 AMHS topology), in order to:

- determine the local performance of servers and gateways, thus dimensioning their configuration,
- determine the throughput of MTAs and capacity of links,
- draft possible network configurations and select the “optimum” network design, and measure actual network performance.

### **3.1.6 Measurement**

3.1.6.1 The specification of numerical values for Performance Requirements is meaningless unless provision is foreseen for measurement of network performance. Such measurement is needed:

- when implementing and enforcing Service Level Agreements between AMHS service providers and users;
- for acceptance testing of network components;
- to determine network capacity;
- to gain experience in network operation (e.g. testing of various routing strategies, etc.).
- to manage the network efficiently.

3.1.6.2 Technically, network performance measurement involves, among other things:

- generation of large message/data volumes;
- automation of measurement;
- time-stamping of messages;
- use of statistical analysis.

*Note.— The content of this section is basing on material developed in the framework of the SPACE project. Input reference: [14] WP202 – Specification of European AMHS performance objectives, SPACE/EURO/202/WPR/045, Version 2.0, 30/06/2002*

## **3.2 AMHS Addressing**

### **3.2.1 Introduction**

3.2.1.1 This section aims at the production of the AMHS Addressing Plan for all the potential AMHS users in the EUR Region. This Plan should define the AMHS users addressing in an intuitive way and it should be comprehensible and meaningful to the human user and independent of the use (or not) of any type of Directory service such as X.500.

3.2.1.2 The Addressing Plan should also provide the rules to extend the addressing defined to other ANSPs (or not yet identified users).

### **3.2.2 Requirements**

3.2.2.1 The AMHS addressing scheme should meet all of the following requirements:

- The addressing scheme should be as uniform as possible across all AMHS implementations in different Regions (as it is currently the case for AFTN addresses);



- The same addressing scheme should be maintained when indirect AMHS users (i.e. AFTN users or CIDIN users) migrate to AMHS. This implies that the AMHS addressing scheme is pre-defined and published before actual operation of the newly implemented AMHS;
- The addressing scheme should be independent of any constraints that may be imposed by Management Domains (MDs) in the Global MHS (i.e. the non-AMHS services operating globally as commercial services) or by national regulations that may vary from Region to Region; and
- The addressing scheme should allow for the interchange messages with MDs in the Global MHS.

### **3.2.3 MHS Addressing structure**

Each MHS address consists of a set of MHS standard components referred to as address attributes.

#### **3.2.3.1 High level MHS address attributes**

3.2.3.1.1 The high level MHS attributes identify an MHS Management Domain as specified in ISO/IEC 10021-2, Section 18.3 [21]. They are determined by the structuring of Management Domains of the MHS Region/organisation to which the address belongs. Each attribute must be registered with an appropriate registration authority to ensure that all addresses remain unambiguous. They are as follows:

- **country-name (C):** this is mandatory, and the possible range of values of the attribute is drawn from the ISO 3166 register of country names. The register contains a special value 'XX', allocated for the purposes of international organisations (i.e. those that are established by international treaty) which do not 'reside' within any particular country;
- **administration-domain-name (A):** administration-domain-name (ADMD-name) is mandatory, and its value is the name of an MHS Service provider in the context of a particular country. ADMD-name s must be registered by a national registration authority. ADMDs registered under the 'XX' country must obtain that registration from the Telecommunication Standardisation Sector of the International Telecommunication Union (ITU-T);
- **private-domain-name (P):** private-domain-name (PRMD-name) is optional, and its value is the name of an MHS service usually operated by a private organisation. PRMD-names must be registered either with their respective ADMDs, or with a national register of PRMDs.

3.2.3.1.2 For example, the high level address of a PRMD in the United Kingdom might be:

C = GB; A = BT; P = British Gas;

#### **3.2.3.2 Low level MHS address attributes**

3.2.3.2.1 They are as follows:

- **organization-name (O):** the organization-name is the most significant naming attribute of the O/R address. Many organisations will operate as sub-naming authorities, allocating name space below their organization-name attribute. The function of the domain names,

both Administrative and Private, is to provide a relaying mechanism for delivery of the message to the intended destination. Relaying to the intended destination is made easier by the combination of a unique organization-name within a unique PRMD-name, thus ensuring that all MHS organisations are uniquely identified.

- **organizational-unit-name (OU):** the organizational-unit-names are used within the context of a hierarchical addressing structure as identified by the organization-name attribute, and should be used to identify meaningful subdivisions of that namespace. The X.400 O/R address allows for up to 4 occurrences of the OU attribute to be specified, each up to 32 characters in length, in descending order of significance within the organisational hierarchy.

The other *OU* (*OU2-4*) attributes can be used to further subdivide the namespace represented by the *OUI* attribute if necessary. Subordinate OU attributes should only be used if all superior OU attributes are in use.

- **common-name (CN):** The common-name attribute is the preferred way of identifying distribution lists and computer applications, avoiding the (mis)use of the personal-name attribute. The common-name attribute can be up to 64 characters in length.

3.2.3.2.2 A complete list of attributes with different information concerning on the maximum length and type of allowed characters for each attribute type is provided in the following Table:

MNEMONIC FORM ADDRESS ATTRIBUTE	CHARACTERISTICS
country-name	2 alpha or 3 numeric
ADMD-name	16 PrintableString
PRMD-name	16 PrintableString
organization-name	64 PrintableString
organizational-unit-names	32 PrintableString
common-name	64 PrintableString

*Table 2: Mnemonic O/R address attributes maximum length and types*

## **3.2.4 AMHS Addressing Schemes**

### **3.2.4.1 XF-Addressing Scheme**

3.2.4.1.1 The AMHS technical specifications describe a potential AMHS addressing scheme, the XF-Address (translated), composed of the following:

- a) an AMHS Management Domain identifier;
- b) an organization-name attribute:
  - 1) as specified in ISO/IEC 10021-2, Section 18.3,

- 2) taking the 4-character value “AFTN”, and
  - 3) encoded as a Printable String; and
- c) an organizational-unit-names attribute:
- 1) as specified in ISO/IEC 10021-2, Section 18.3,
  - 2) comprising a sequence of one single element, which takes the 8-character alphabetical value of the AF-Address (AFTN-form address) of the user, and
  - 3) encoded as a Printable String.

*Note 1.– An XF-Address is a particular MF-Address whose attributes identifying the user within an AMHS Management Domain (i.e. those attributes other than country-name, administration-domain-name and private-domain-name) may be converted by an algorithmic method to and from an AF-Address. The algorithmic method requires the additional use of look-up tables which are limited, i.e. which include only a list of AMHS Management Domains rather than a list of individual users, to determine the full MF-Address of the user.*

*Note 2.– An MF-Address (MHS-form address) is the address of an AMHS user.*

3.2.4.1.2 A summary of XF-Addressing Scheme can be found in the following table:

Attribute	Attribute value	Remark
<b>country-name (C)</b>	C = “XX”, as already obtained by ICAO from ITU-T	
<b>ADMD-name (A)</b>	A = “ICAO”, as already registered by ICAO at ITU-T	
<b>PRMD-name (P)</b>	P = a name to be defined by a State, ANSP or body responsible for an AMHS Management Domain and registered with ICAO.	In the absence of such a name being registered with ICAO, a default value will be used to ensure that the attribute value is always defined. This default value is the ICAO two letter State/territory identifier, as may be found in Doc 7910.
<b>organization-name (O)</b>	O = “AFTN”, taking the 4-character value “AFTN” encoded as a Printable String.	
<b>organizational-unit-names (OU1)</b>	OU1 = the 8-letter AF-address (or AFTN indicator) of the considered user.	

**Table 3: XF-Addressing Scheme**

*Note 3.- PRMD Names may be assigned to bodies such as ANSPs, groups of ANSPs, organizations hosting Regional services and applications or third parties connected to the AFS. Relevant requests need to be validated prior to registration, in line with Regional procedures.*

*Note 4.- The combination of address attributes defined in Table 3 may also be used by bodies managing an AMHS management domain but which are not registered as a State/territory in ICAO Doc 7910. Such a body can be, for example, an aeronautical communication service provider. However, an AMHS address obeying to that scheme cannot be converted by an algorithmic method to and from an AF-address, and it consequently cannot be considered as an XF-address. In such cases the address is considered as an 'XF-like form' address.*

Example: XF AMHS Address for the Southampton Tower

/C=XX/A=ICAO/P=EG/O=AFTN/OU1=EGHIZTZX/

Example: 'XF-like form' AMHS Address for SITA user

/C=XX/A=ICAO/P=SITA/O=AFTN/OU1=LSTTSITA

### 3.2.4.2 CAAS Addressing Scheme

The Common AMHS Addressing Scheme (CAAS) adopted by ATNP and collected in old Doc 9705 (3<sup>rd</sup> Edition) (replaced by Doc 9880, Part II) is aligned with the addressing scheme developed in Europe by the SPACE Project Team and endorsed by the third meeting of the Aeronautical Fixed Services Group (AFSG) of the European Air Navigation Planning group (EANPG).

#### 3.2.4.2.1 *High-level attributes*

3.2.4.2.1.1 The following preferred high-level MD and address structure that meets all of the requirements outlined in paragraph 3.2.1 above:

- country-name = 'XX';
- ADMD-name = 'ICAO';
- PRMD-name = preferred operating name assigned by the State, ANSP or other body concerned.

In this way, ICAO creates an international ADMD without addressing constraints imposed from outside ICAO and its members.

3.2.4.2.1.2 This scheme has placed two requirements on ICAO:

- To obtain from the ITU-T the registration of the name 'ICAO' (or some other suitable acronym agreed between ICAO/ANC and ITU-T); and
- To establish and maintain a register of PRMDs established by States, ANSPs and bodies managing an AMHS Management Domain that operate using the 'XX' + 'ICAO' address structure, in a way similar to Doc 7910 [7] and Doc 8585 [8].

*Note.- This scheme does **not** require ICAO itself to operate the ADMD systems since this is normally delegated to the participating ANSPs and other bodies concerned.*

3.2.4.2.1.3 This registration will enable the establishment of regional AMHS services and their later interconnection, and it will provide States, ANSPs and other bodies concerned with a good deal of stability within which they can develop their AMHS plans.

#### 3.2.4.2.2 *Low level attributes*

3.2.4.2.2.1 The CAAS addressing scheme includes the following attributes:

- organization-name (O) = Region,
- organizational-unit-names (OU1) = Location,
- common-name (CN) = User

#### 3.2.4.2.2.2 Consequences:

- Each State, ANSP or other body concerned will define the values for the organization-name attribute (O) in its Management Domain. The character set to be used for this attribute will be the set of characters allowed by the ASN.1 type "PrintableString".
- organizational-unit-names (OU1) will be the 4-character ICAO Location Indicator (as specified in ICAO Doc 7910 [7]) of the user.
- common-name (CN) will include the 8-character AFTN address for AFTN users.

### **3.2.5 EUR AMHS Addressing Plan**

#### **3.2.5.1 EUR AMHS Addressing Scheme**

3.2.5.1.1 EUR AMHS Addressing Scheme was endorsed by the third meeting of the Aeronautical Fixed Services Group (AFSG) of the European Air Navigation Planning group (EANPG) and is fully compliant with the CAAS Addressing Scheme described above.

3.2.5.1.2 This scheme has been adopted for potential EUR AMHS users, both already identified and users not currently defined.

3.2.5.1.3 It is recognised that the Addressing Plan to be used by EUR States, ANSPs and bodies implementing AMHS will be a combination of AMHS addresses following the Addressing Plan described in this section, for some AMHS EUR Management Domains, and of AMHS addresses following the XF Addressing Scheme, for other EUR AMHS Management Domains.

3.2.5.1.4 Major concepts of this EUR AMHS Addressing Plan are shown as follows:

<b>Attribute</b>	<b>Attribute value</b>	<b>Remark</b>
<b>country-name (C)</b>	C = "XX", as already obtained by ICAO from ITU-T	
<b>ADMD-name (A)</b>	A = "ICAO", as already registered by ICAO at ITU-T	

Attribute	Attribute value	Remark
<b>PRMD-name (P)</b>	P = a name to be defined by a State, ANSP or body responsible for an AMHS Management Domain and registered with ICAO.  Such a name will identify a State, an Organisation, or an organisation within a State.	In the absence of such a name being registered with ICAO, a default value will be used to ensure that the attribute value is always defined. This default value is the ICAO two letter State/territory identifier, as may be found in Doc 7910.
<b>organization-name (O)</b>	O = a value corresponding to local/national geographical information, e.g. a region or a geographical area within a State where the user is located.	The syntax and value are to be defined by the considered State, ANSP or body concerned. The table associating such an organization-name to each ICAO Location Indicator (4 characters) needs to be registered and published by ICAO.
<b>organizational-unit-names (OU1)</b>	OU1 = the ICAO Location Indicator (4 characters) of the considered user;	
<b>common-name (CN)</b>	CN = the 8-letter AF-address (or AFTN indicator) of the considered user, irrespective of whether it is a direct or indirect user.	

**Table 4: EUR AMHS Addressing Plan**

*Note 1.- PRMD Names may be assigned to bodies such as ANSPs, groups of ANSPs, organizations hosting Regional services and applications or third parties connected to the AFS. Relevant requests need to be validated prior to registration, in line with Regional procedures.*

*Note 2.- The combination of address attributes defined in Table 4 may also be used by bodies managing an AMHS management domain but which are not registered as a State/territory in ICAO Doc 7910. Such a body can be, for example, an aeronautical communication service provider. However, an AMHS address obeying to that scheme cannot be converted to and from an AF-address using the rules usually applied to CAAS-addresses. Such addresses need to be fully specified and registered with ICAO for use in the User Address Look-up Table defined in Doc 9880, Part II, section 4.3.2.4. They consequently cannot be considered as CAAS-addresses. In such cases the address is considered as a 'CAAS-like form' address.*

Example: MF AMHS Address of Lanzarote's ARO:

/C=XX/A=ICAO/P= SPAIN /O= LEEE /OU1= GCRR /CN= GCRRZPZX

### 3.2.5.2 Distribution lists.

3.2.5.2.1 The scheme to be used for the identification of AMHS Distribution Lists is the same as for potential AMHS users.

3.2.5.2.2 The O and OU attributes would then represent the expansion point of the distribution list.

### 3.2.5.3 Indirect AMHS users

3.2.5.3.1 EUR AMHS Addressing Scheme shall be applicable to both direct and indirect users in the EUR Region as soon as the scheme is published. This scheme should be published through ICAO and other appropriate bodies (e.g. the ECAC community or EUROCONTROL Member States). EUR users should use the XF-address of users outside the EUR Region until another addressing scheme (CAAS) is published by the organisations responsible for those users.

### 3.2.5.4 European Services and Applications

3.2.5.4.1 A special case of the EUR AMHS Addressing Plan is the allocation of a discrete PRMD-name (P=EUROPE) dedicated for use by European Services and Applications for which Location Indicators have been allocated in ICAO Doc 7910, Section: EU – Europe (ICAORD).

3.2.5.4.2 The respective organization-name (O) consists of a value corresponding to the specific European Service or Application.

3.2.5.4.3 When assigning a new value to the organization-name attribute, the following rules should be considered:

1. It should be as short as possible;
2. It should only comprise standard characters, i.e. no accented letters or letters only used in specific geographical areas;
3. The use of figures is not advisable.

3.2.5.4.4 The assignment of the value to the organization-name attribute should be coordinated with the ATS Messaging Management Centre (AMC) Operator to ensure unique naming under the PRMD-name P=EUROPE (detailed information on the AMC is provided in section 6.5).

3.2.5.4.5 With the assignment and publication of the organization-name attribute the ATS Messaging Management Centre (AMC) Operator ensures convertibility (update of the respective CAAS Table) and routing of the complete address of the new European Service or Application via the AFTN/CIDIN/AMHS within EUR, by following the defined procedure.

3.2.5.4.6 This particular PRMD is a virtual PRMD, defined for ICAO Europe in a way similar to the “ICAO” ADMD at a global level. It is formed by the organisations in charge of the centralised European Services and Applications. Two cases may occur for such organisations being part of PRMD “EUROPE”:

1. Organisations hosting European Services and Applications, which have already implemented AMHS, and which manage their respective MTAs. Some specific requirements apply to them. They are listed in sections 9.1.3 and 9.2;
2. Organisations hosting European Services and Applications, which are still using AFTN to connect their applications, by means of connections to AFTN/AMHS Gateways of other PRMDs. The present section 3.2.5.4 is defined to also cover this special case for addressing, without any additional requirements.

3.2.5.4.7 Within this PRMD, clauses of ICAO Doc 9880 which refer to a “matter local to an AMHS Management Domain” or to a “matter of policy local to an AMHS Management Domain” therefore may be interpreted as referring to a “matter local to each organisation managing a European Service or Application part of the “EUROPE” AMHS Management Domain”.

### **3.2.6 Guidelines on PRMD-name assignment**

#### **3.2.6.1 Purpose**

3.2.6.1.1 A PRMD-name attribute shall be formulated and assigned by each State, ANSP or other body concerned in order to uniquely identify the AMHS Management Domain of which they are in charge. Practically, the PRMD-name attribute identifies that part of the AMHS for which an ANSP or other body concerned is responsible.

#### **3.2.6.2 Assignment rules**

3.2.6.2.1 When assigning a value to the PRMD-name attribute the following rules should be considered:

1. It should be representative of the whole AMHS Management Domain for which the State, ANSP or other body concerned is responsible;
2. It should be as short as possible, an acronym would be sufficient;

*Note.— The use of the two-letter ISO 3166 country codes (e.g. FR for France, AU for Australia, US for the United States, etc.) is not advisable, as these codes are used as values of the country-name attribute and not the PRMD-name attribute. This may confuse the operators.*

3. It should be stable and not subject to changes unless there are duly justified technical and/or operational reasons;
4. It should be unique and unambiguous;

*Note.— Care should be taken not to use a name or an acronym such as "civil aviation", "ANSP", "DGAC".*

5. A default value has been reserved in order to ensure that this attribute value is always defined. This default value is the ICAO two letter State/territory identifier, as may be found in Doc 7910 [7].
6. It should only comprise standard characters, e.g. no accented letters or letters only used in specific geographical areas;
7. The use of figures is not advisable.

#### **3.2.6.3 Registration**

3.2.6.3.1 Once assigned by the concerned State, ANSP or other body, the PRMD-name value(s) shall be registered and published by ICAO after checking its uniqueness, as described in paragraph 3.2.6.2.



*Note.— ICAO being the naming authority for AMHS addresses, there is no requirement to register the PRMD-name value(s) with a national authority.*

### **3.2.7 Guidelines on organization-name assignment**

#### **3.2.7.1 Purpose**

3.2.7.1.1 The purpose of the organization-name attribute is to allow each State, ANSP or other body concerned to split, if needed, the AMHS Management Domain (MD) for which it is responsible in distinct geographical areas.

3.2.7.1.2 Within a given AMHS Management Domain (identified by the "C", "A" and "P" attributes) two potential AMHS network architectures are possible:

1. centralised architecture, with one single ATS message server; and
2. geographically distributed architecture, with several regional ATS message servers.

3.2.7.1.3 It is to be noted that architectural aspects and addressing aspects are not completely linked together, in effect the agreed addressing scheme does not place any constraints on the AMHS network deployment plan.

Both types of architecture have advantages and drawbacks, as summarised in the following Table 5.

	<b>Centralised architecture</b>	<b>Distributed architecture</b>
Applicability	Relatively small MD; Relatively small number of users.	Large MD; Large number of users.
Advantages	Easy management (one server).	A high quality of service can be offered to the users; Each server is dimensioned to match the requirements of the users attached to it; Allows a better load sharing on the network.
Drawbacks	Require a high grade of service from the network (e.g. in terms of availability, end-to-end throughput, etc.)	A highly distributed architecture may increase the complexity of the management of addresses by operational staff.

***Table 5: Centralised AMHS architecture versus distributed AMHS architecture***

#### **3.2.7.2 Assignment rules**

3.2.7.2.1 Before assigning a value to the organization-name attribute, each State, ANSP or other body concerned should follow the following 3-step process:

1. Develop the general architecture of the AMHS to be implemented;
2. Define the location and the number of sites at which ATS Message Server could be installed within a foreseeable time frame (e.g. 5, 10 or 15 years); and
3. Chose and assign a name to each one of these sites.

3.2.7.2.2 A specific case is the situation where a single ATS Message Server is implemented in an AMHS MD, providing services to AMHS users that are all directly attached to this server (centralised architecture). For simplification, it is suggested that a single organization-name (O) value be allocated to all Location Indicators in the AMHS MD.

3.2.7.2.3 Potential criteria for the selection of sites include:

- Geographic divisions, such as: North, South, East, West, etc.;
- Administrative divisions of the concerned ANSP, such as ATS, Meteorological, etc.;
- Operational divisions centred around the ACCs (if more than one ACCs exist);
- Operational divisions centred around the main airports;
- Mapping of the AMHS architecture on the existing AFTN/CIDIN architecture;
- A mixture of the above criteria; and
- Other.

*Note.— Care should be taken not to define too many geographical areas within a given AMHS MD as this may lead to less efficient message routing.*

3.2.7.2.4 When assigning a value to the organization-name attribute, the following rules should be considered:

1. It should be as short as possible;
2. It should only comprise standard characters, i.e. no accented letters or letters only used in specific geographical areas;
3. The use of figures is not advisable.

*Note.— Typically, a State, ANSP or other body concerned defines different values for the organization-name attribute only if it plans to implement a distributed AMHS architecture in the short, medium or long term future. States, ANSPs or bodies not planning to implement a distributed AMHS architecture allocate a single value for this attribute.*

### 3.2.7.3 Registration

3.2.7.3.1 Once assigned by the concerned State, ANSP or other body, the organization-name values shall be registered and published by ICAO, as described in paragraph 3.2.8.3.

*Note.— ICAO being the registration authority for AMHS addresses, there is no requirement to register the organization-name value(s) with a national authority.*

### **3.2.8 Address conversion**

#### **3.2.8.1 Addressing Plans requirements**

3.2.8.1.1 The selected address conversion strategy must take into account the following principles:

- The selected address conversion solution shall be able to support any X.400 addressing plan making use of any address form.
- The AFTN address of an AFTN or AMHS user is unambiguous, internationally recognised and shall not be replaced by another value.

3.2.8.1.2 The addresses to be considered are: AFTN, XF, CAAS and MF. It can be concluded that:

- All EUR AFTN/AMHS Gateways shall implement the conversion AFTN<=>XF;
- All EUR AFTN/AMHS Gateways shall implement the conversion AFTN<=>CAAS;
- All EUR AFTN/AMHS Gateways shall implement the conversion AFTN<=>MF for individual user addresses which are officially published for integration in the User Address Look-up Table. This is particularly required for AMHS communication with non-ICAO entities using AFTN addresses;

*Note.— The ability to convert these three types of AMHS addresses is required for compliance with Doc 9880.*

- To deal with the risk of arrival of spurious XF addresses at EUR ANSPs MDs from the global AMHS, and avoid rejection of messages directed to such erroneous addresses, an ANSP having selected CAAS may implement the X.400 redirection of XF-addresses to CAAS-addresses for its own MD, on a local basis;

#### **3.2.8.2 Address Conversion Scenarios and Criteria**

3.2.8.2.1 Several address conversion scenarios may be envisaged (single conversion, AMHS transit conversion, AFTN transit conversion and multiple transit conversion) and were assessed, at the time when an address conversion strategy for Europe was established.

3.2.8.2.2 Once the scenarios were established, the need was identified to take into account the following considerations for address conversion:

- The result of the address conversion performed in an AFTN/AMHS Gateway shall depend only on the pre-defined pair of unambiguously associated AFTN and AMHS addresses, and not on the gateway itself, according to the form published by ICAO and defined by the delivering MD.
- It is required that each gateway performing address conversion has access to the minimal necessary information to perform mappings between AFTN addresses and AMHS addresses and vice-versa. The complete mappings between AFTN addresses and their AMHS equivalents should be published (in electronic form) and made available to all gateways that support address translations.
- The conversion process shall be easy to use and manage, and efficient.

3.2.8.2.3 As a conclusion, a compromise solution combining the use of algorithmic tables and X.500 directory is preferred for the address conversion.

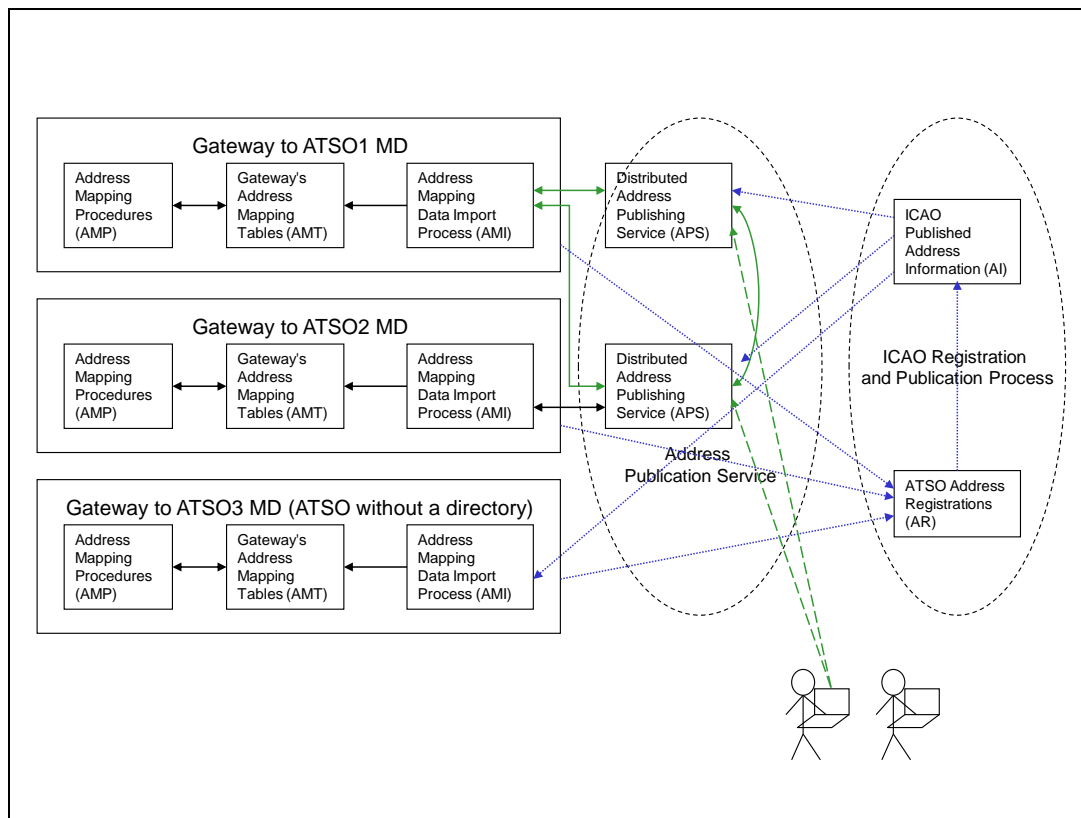
### 3.2.8.3 General model for address distribution and gateway address conversion

3.2.8.3.1 A model of address distribution and gateway address conversion is depicted in Figure 1 below. The figure represents information exchanges between ICAO and three ANSPs implementing AMHS Gateways, concerning address conversion. ANSP1 and ANSP2 implement a distributed address publishing service (APS), e.g. by means of ATN X.500 Directory Services. This allows electronic distribution. ANSP3 provides this information to ICAO for manual collation and distribution (e.g. on paper, electronic database), and does not support a directory.

The dotted arrows represent exchanges that are performed in an off-line way, e.g. through "paper" or off-line management procedural exchanges. The full arrows represent exchanges that are performed electronically using appropriate communication protocols.

3.2.8.3.2 The model identifies a number of components that are necessary for address conversion:

- 1) Collection and distribution of the basic addressing information that establishes equivalence between the different addresses identifying each AMHS and AFTN/CIDIN user; the content of this information **must** be standardised and made available to all AFTN/AMHS Gateways;
- 2) Access to, and/or import of the basic addressing information into AFTN/AMHS Gateways. This depends on the particular gateway implementation;
- 3) Re-structuring the basic addressing information into a format suitable for use by each gateway's internal address conversion procedures (AMI). This is again gateway implementation specific;
- 4) The internal procedures and data structures of the gateway (AMP and AMT) that make use of the re-structured addressing information. This is gateway implementation specific.



**Figure 1: General model for gateway address conversion**

3.2.8.3.3 The address mapping information content held in AMT and distributed through APS is identical in nature.

3.2.8.3.4 The structure of APS must be compatible with many different systems (e.g. different ANSP's Gateways), and must therefore be standardised. There are a number of possibilities for structuring APS:

- As an X.500 Directory Information Tree, thereby enabling implementation of a Distributed APS;
- By some other electronic means (e.g. CSV files);
- On paper.

### 3.2.8.4 The impact of different paths through the AFTN and AMHS

3.2.8.4.1 There is also a potential need for messages to undergo multiple address conversions. In order to minimise message rejection and to regulate the responsibilities for conversions, the following rules should apply:

- Originating MDs (for originator's addresses) shall generate addresses according to the form published by ICAO and defined by the delivering MD (for recipient addresses);
- Delivering MDs are authorised to reject messages received with recipient addresses which do not comply with the address form published by ICAO and defined by the delivering MD;
- Delivering MDs should have the capability of redirecting potential internal XF addresses to the corresponding MF(S) form addresses for use within their delivering

MD, for a transition period of at least 6 months after publication of the appropriate ICAO documentation;

- Transit domains should not attempt to perform any AMHS <-> AMHS mapping unless a specific bilateral agreement has been established with the delivering MD (for recipient's addresses) or the originating MD (for originator addresses). Transit MD should only use the attributes C, A, P (which are invariant and predetermined for all AMHS address forms in the ATS) in selecting a message route.

### 3.2.8.5 Recommended AMHS Address Conversion Strategy

3.2.8.5.1 The recommended AMHS address conversion strategy is the means by which the general model represented in Figure 2 should be realised by States in the EUR Region. It is also applicable on a worldwide basis and has been presented and adopted by the ICAO ATNP as the general AMHS address conversion strategy. This strategy is made of the following elements:

- 1) the establishment, by an appropriate ICAO body or entity, of an ICAO Registration and Publication process as a set of procedures for collecting and publishing AMHS address conversion information on a periodic basis (e.g. twice yearly). This will include:
  - a) the MD information included in the ICAO Registry of AMHS Management Domains, i.e. the MD identifier and the corresponding ICAO two letter State/territory identifier, together with the specification of the type of implemented addressing scheme (XF or CAAS);
  - b) for those MDs having implemented the CAAS, the mapping information providing the organization-name address attribute for each ICAO Location Indicator;
  - c) for MDs which have selected addressing schemes which are neither XF nor CAAS (this may be 'XF-like' or 'CAAS-like' addresses, for example), the full list of individual AMHS user addresses managed by these MDs, together with the equivalent AFTN addressee indicator.

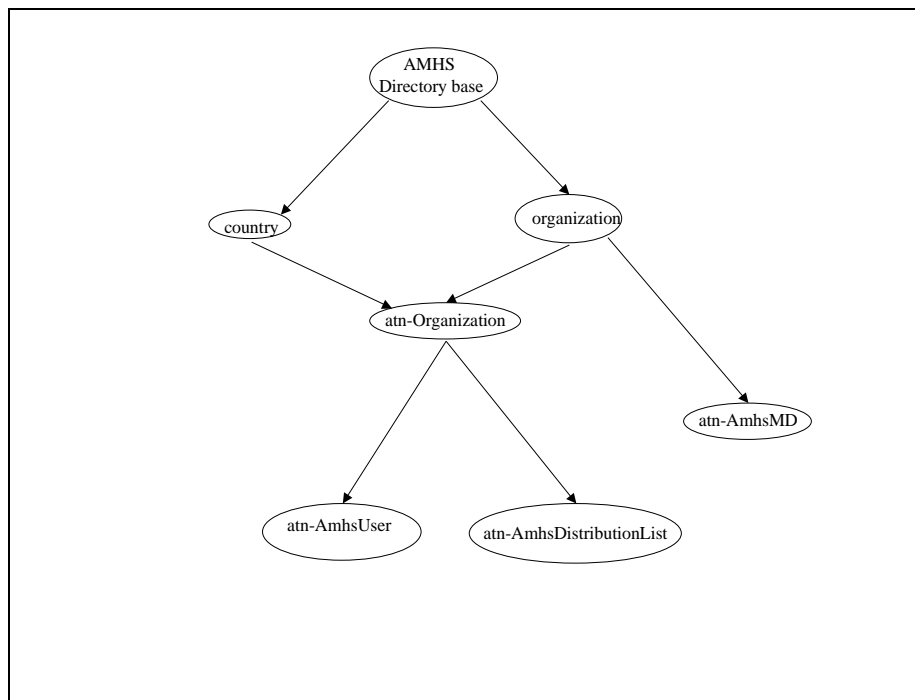
*Note: this element is currently implemented by means of the ATS Messaging Management Centre (AMC), which collects and publishes AMHS address information on an AIRAC-cycle periodic basis.*

- 2) a Distributed Address Publishing Service (APS), based on ATN Directory Services, that allows publication of real-time AMHS address conversion information. This is to be implemented at the earliest opportunity upon ANSPs initiative, with the following principles:
  - a) use of the directory scheme;
  - b) initial population of the Directory Information Base with the information distributed through the ICAO Registration and Publication process;
  - c) implementation of a single Directory System Agent (DSA) per ANSP to hold the MD Registry sub-tree, the world-wide ANSP information distributed through the ICAO Registration and Publication process, and the local AMHS MD address conversion information sub-tree; and

*Note: this element is being implemented with the support of the European Directory Service (EDS) as a Central information repository enabling synchronisation with national DSAs implemented by ANSPs.*

- 3) in co-existence with the use of Address Mapping Tables (AMT) directly derived from the information published through the ICAO Registration and Publication process, for ANSPs that choose to defer the implementation of ATN Directory Services.

3.2.8.5.2 As a local implementation matter, ANSPs that envisage implementation of Directory Services for the purpose of the Distributed address publication service (APS) at the same time as they implement AMHS, should also consider the use of directory solutions as a technical option for the gateway's address mapping tables (AMT).



**Figure 2: DIT structure for AMHS address conversion**

### 3.2.8.6 Regional provisions

3.2.8.6.1 The strategy above is complemented by the following transitional provisions which may apply regionally.

3.2.8.6.2 In case the first element in the above strategy is not implemented by ICAO in a timeframe compatible with early AMHS implementations, an equivalent process may be set up on an ad-hoc basis among ANSPs forming an AMHS island. This is particularly applicable to any European ANSPs being early AMHS implementers.

3.2.8.6.3 In case of ANSPs implementing the second element in the above strategy that initially prefer to group together for the implementation of a single ICAO Regional DSA, the following should apply:

- the MD Registry sub-tree;
- a local AMHS MD ANSPs information sub-tree for each of the ANSPs in the group;

- and the world-wide ANSPs information distributed through the ICAO Registration and Publication process.

3.2.8.6.4 The Regional DSA thereby becomes an aggregation of the local DSAs envisaged in the principle strategy.

3.2.8.6.5 In the EUR Region, the creation of an Offline Management Centre is recommended to consolidate, co-ordinate and distribute AMHS user address changes across the Region. This Offline Management Centre should implement such a Regional DSA in support of its address management activities.

### 3.3 AMHS topology

#### **3.3.1 General potential AMHS topologies**

3.3.1.1 As for any other network topology, an AMHS topology describes the connectivity among the nodes - which are in this case AMHS COM Centres – and links – which are AMHS logical connections at the ISO/OSI application layer.

3.3.1.2 From a theoretical viewpoint, there are many possible solutions for a network topology. Each of the chosen designs has distinct properties in terms of cost, transit time (number of hops to be passed), routing complexity, reliability (survivability). Furthermore, from a more practical perspective, a network topology is also often related to the organisation and relationships between its users, and possibly network managers. In a situation where traffic flows are not equally distributed between nodes (from a statistical perspective), the traffic patterns have also a great influence on designed topologies.

3.3.1.3 General network topologies include:

- Tree-shaped topologies, including
- Star,
- String,
- Partially meshed topologies, including
- Double star (two interconnected stars centred on two distinct “hubs”),
- Ring,
- Hyper-ring (two rings with several links interconnecting them),
- Hybrid topologies, e.g. using a partial mesh backbone between some nodes and star from the backbone nodes to other nodes,
- Full meshed topology.

3.3.1.4 A general analysis of such topologies, based on the properties listed above, is provided in the following.

3.3.1.5 Reliability, transit time, cost and operational complexity are all factors affected by the topology of a network. Table 6 summarises the characteristics of the topological structures addressed above in order to indicate the advantages of certain topologies over others.



3.3.1.6 In Table 6 measures are used to evaluate the technical merit of a topological structure: Number of links, maximum number of hops, complexity and reliability. Each of these measures is described below.

3.3.1.7 A low *number of links* per node for a design will often be associated with low cost. Vice versa, a higher link-per-node ratio indicates a more expensive network topology. The tree shaped topologies (star, string) have the lowest number of links per node. Ring and hyper-ring architectures have a small number of links per node. At the opposite end from the tree structures, the full mesh network marks the upper limit of the link-per-node ratio.

3.3.1.8 Clearly, a smaller number of *hops* from a source node to a destination node will result in shorter transit times. Here, a full meshed topology is the most desirable. The star topologies, with their very small number of hops, are also very desirable. On the other hand, string and simple ring architectures can have a significantly greater numbers of hops. – A large number of hops is associated with a large number of intermediate nodes and links which have to be dimensioned for conveyance of transit traffic. The related capacity enhancements also constitute a cost factor.

3.3.1.9 *Complexity* provides here a measure for the effort to be spent on network design, establishment of appropriate (re-)routing mechanisms and network operations. The number of potential paths between nodes, as well as the need to sum up multi-hop traffic (in order to get capacity figures for nodes and links), increase the complexity of the network design task. The complexity for re-routing of traffic increases also with the number of candidate links providing alternative paths between each pair of nodes. Finally, the effort for network management and maintenance grows with the number of links providing connectivity between a given set of nodes. Centralised (star) topologies are easier to maintain than those that are highly distributed (as meshed structures).

3.3.1.10 The *reliability* of a network increases with the number of established links allowing alternative paths in case of link failures (provision of adaptive routing assumed). More precisely, if  $n$  represents the minimum number of nodes to which any node is connected ( $n$ -connectivity) then we can expect that the probability that a given node has access to at least one of its neighbours increases with the quantity of  $n$ . A partial mesh topology has 2-connectivity or greater, a full mesh offers as upper limit a  $(N-1)$  connectivity (where  $N$  represents the number of nodes).

Topology	Number of Links	Relative Number of Links	Max Hop Count	Complexity	Reliability
Star (tree)	$N-1$	Lowest	2	Lowest	Lowest
Double Star	$2(N-2)+1$	Low	2	Low	High at core, low at remote locations
String (tree)	$N-1$	Lowest	$N-2$		
Ring	$N$	Low	$(N-1)/2$	Low	Moderate
Hyper-Ring	$2N$	Low	2	Low	Moderate

Topology	Number of Links	Relative Number of Links	Max Hop Count	Complexity	Reliability
Partial mesh	Moderate	Moderate		High	Good
Full mesh	$[N*(N-1)]/2$	Highest	1	High	Highest

*Table 6: Comparison of alternative network topologies*

### **3.3.2 Design elements for the European AMHS**

3.3.2.1 In application of the principles above, the following elements have been taken into account for the definition of the European AMHS topology:

1. Quality of service (Transit delays),
2. Quality of service (Availability / Reliability),
3. Cost effectiveness,
4. Complexity of operation,
5. Responsibility for transit traffic.

3.3.2.2 Most of these criteria were already defined as the main considerations for AFTN topology design (ref. ICAO Doc 8259-AN/936/1991 [9]).

### **3.3.3 Possible approaches for the European AMHS topology**

#### **3.3.3.1 SPACE recommendation for a fully-meshed topology**

3.3.3.1.1 The objective of ensuring transit delays compatible with the QoS performance requirements specified in section 3.1.4 led to the SPACE recommendation of a **fully-meshed topology for the AMHS network deployed in the EUR Region**, thereby minimising the number of hops between any pair of International MTAs / ATS Message Servers in this area (ref. [15] and SPACE WP321 Report “AMHS Extensibility Principles”).

3.3.3.1.2 The end-to-end transit delay in networks is mainly caused by the processing time in the nodes passed by a message and the transmission times on the links between these nodes. With given processing times, link speed, average message length and protocol overhead a first estimation of the number of allowable hops for a given maximum end-to-end transit delay is possible. – For a link speed of 256 kbps five hops are allowed in the international network to meet the maximum end-to-end transit delay for the high QoS class. With 64 kbps only two hops are allowed (ref. [15] and [20]).

3.3.3.1.3 To be realistic, such a recommendation implies that an underlying network forming a common lower layer infrastructure would be available across the considered geographical area. The requirements placed upon such an underlying network are described in section 3.5.

3.3.3.1.4 This approach favours criteria 1 (QoS – transit delays) and 2 (QoS – availability) among those listed in section 3.3.2. No other topology could rate better than a fully-meshed network regarding these objectives.

3.3.3.1.5 As far as criteria 3 (cost effectiveness) and 4 (complexity of operation), it may be considered that the need to establish and maintain AMHS connections with any other International ATS Message Server in the EUR network represents a non-optimised cost (in network capacity and required staff). However, although parallel operations have to be performed with all communication partners in such a network topology, the similarity between these operations reduces complexity and increases efficiency, thereby reducing the negative impact on costs.

3.3.3.1.6 Complexity of operation, although obviously higher than in a tree-shaped network, is probably lower than in some partially-meshed topologies where network behaviour, required tasks and diagnostics vary depending on the existence or not of a direct link between both MTAs.

3.3.3.1.7 The factor of responsibility of transit traffic (criterion 5) should also be considered. In the fully meshed topology each MTA is managing its own traffic with no transit traffic coming from other international MTAs (except re-routing), representing a clear advantage in comparison with other topologies.

3.3.3.1.8 It must be noted that an AMHS fully-meshed topology could lead to approximately 50 AMHS connections to/from each COM centre, when AMHS is fully deployed in the EUR Region, based on the current number of international COM Centres. This is significantly different from the current AFTN/CIDIN topology in Europe, which is a partially-meshed network with a maximum of 12 connections (AFTN and/or CIDIN) from a COM Centre to its adjacent Centres. Appendix A to the ATS Messaging Management Manual [12] specifies how transition may take place from the current CIDIN connectivity and topology to a fully meshed AMHS network.

### **3.3.3.2 EUROCONTROL/NM approach for a hybrid topology**

3.3.3.2.1 The EUROCONTROL/NM (former CFMU) is in a specific situation as a European Facility, which is an end-user of communication flows, rather than a COM Centre like other parties in the international AFTN/ CIDIN/ AMHS network. The organisation of the EUROCONTROL/NM in two Centres also creates specific requirements.

3.3.3.2.2 Because of the significant change between the current CIDIN topology and a fully-meshed network, and due to specific operational requirements related to EUROCONTROL/NM contingency (see AFSG/PG31 WP08, “Considerations in the integration of EUROCONTROL/NM in the AMHS network”, Roma, March 2008), EUROCONTROL/NM favours for AMHS a hybrid topology similar to the current CIDIN connectivity:

- A double-star to six adjacent COM Centres, through which EUROCONTROL/NM traffic is relayed to other communication partners;
- The existing AFTN/CIDIN topology between these six COM Centres and other COM Centres in Europe when the traffic flow is originated/directed to a State “beyond” those of the six COM Centres.

3.3.3.2.3 Such a topology could be revisited when more experience is gained in AMHS operation, and depending upon the availability of some automatic re-routing capabilities. Based on such conditions a more complete level of meshing could be envisaged. Such an

approach clearly favours criteria 2 (availability) and 4, in order to reduce complexity of operation.

### 3.3.3.3 Approach favouring cost effectiveness

3.3.3.3.1 Based on the estimation that cost reductions could be obtained if only a partially-meshed topology is implemented, some States have expressed their intention to limit the establishment of direct links from their international MTA to the international MTAs in other States with which they have a given volume of traffic, or specific connectivity requirements.

3.3.3.3.2 In this approach favouring criterion 3 (cost effectiveness), the goal is to reduce the workload and cost of operation, including configuration, testing and in service support.

- Initial system configuration,
- Interoperability testing,
- Transition activity,
- In service support, including fault management,
- Re-testing when MTAs are changed and/or upgraded.

3.3.3.3.3 Whilst the intent to minimise operation costs is obviously a valid objective, this should not be detrimental to the overall quality of service and to the (partly contradictory) objective to minimise the number of hops in the network. Furthermore it may also be considered that when a certain number of AMHS connections is established from a COM Centre, and a high AMHS operational experience is available in that COM Centre, then the establishment of an additional connection to another COM Centre increases only marginally the cost of operation.

### 3.3.3.4 Influence of the current AFTN/CIDIN topology

3.3.3.4.1 This subject has been partly and/or indirectly addressed in the sections above.

3.3.3.4.2 With the assumption that approximately 50 States are part of the EUR Region, a fully-meshed AMHS network when AMHS is available is all of these States will also represent approximately 50 direct AMHS connections (international MTA to MTA associations) to/from each COM Centre. This number is to be compared to the current number of (intra-Europe) international connections to/from an international COM centre, which is between three and twelve links before migration to AMHS.

3.3.3.4.3 If transition was to take place quickly (e.g. between a few months and one or two years) from the pre-AMHS situation to such a fully-meshed topology, the effort would indeed be considerable and the target would be difficult to achieve. However, it is recognised that the transition to AMHS at the European scale will be progressive and may take a number of years.

## 3.3.4 Recommended European AMHS topology

3.3.4.1 The objective of this section is to specify a European AMHS topology which meets the various objectives expressed in section 3.3.3, taking into account the fact that they are sometimes contradictory.

3.3.4.2 The general principle adopted is that the expected quality of service, in terms of transit times and availability (criteria 1 and 2) should be maintained to define the target topology.

3.3.4.3 This leads to confirm that **the AMHS topology in Europe should be fully-meshed, as a long-term objective**. However, it should also be recognised that:

- there is a pre-requisite to the implementation of such a topology, which is the availability of a seamless underlying network across the considered geographical area;
- during the transition to this target topology, a partially-meshed network following the constraints of the various ANSPs and participants to the EUR AMHS network.

3.3.4.4 Principles need to be established for the transition phase, so that a clear direction is provided to ANSPs implementing AMHS in their COM Centres.

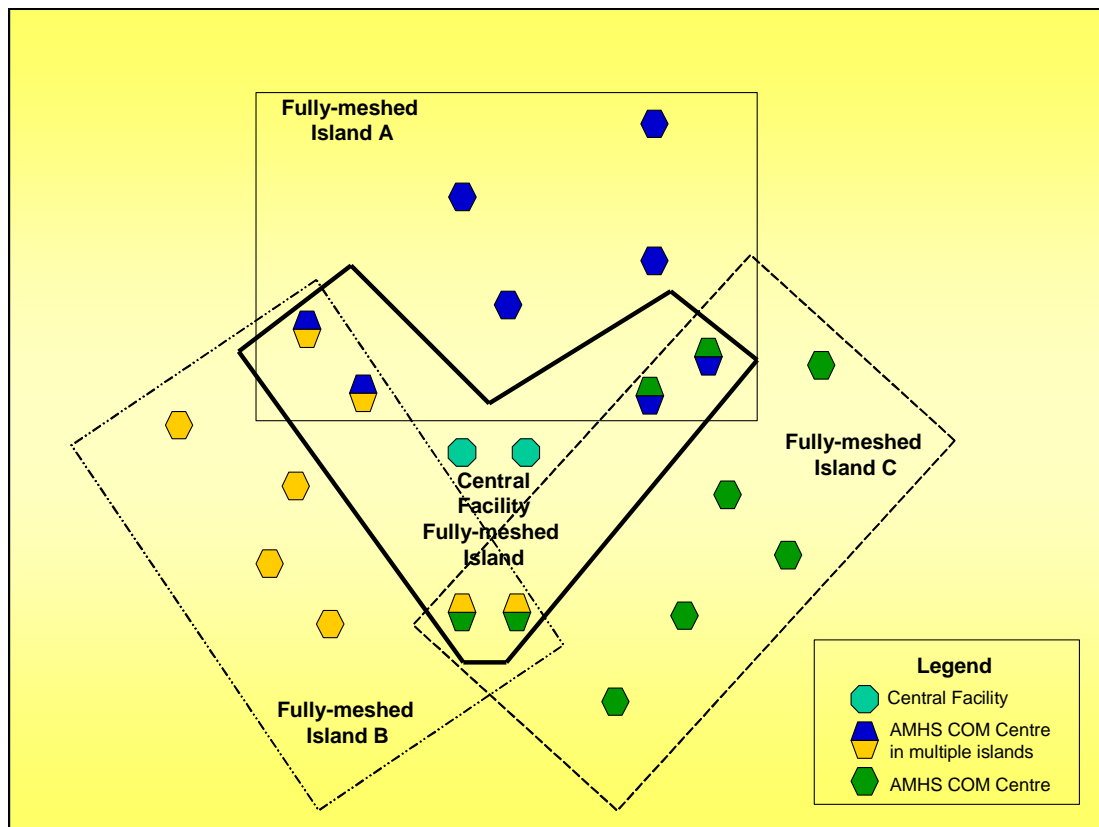
3.3.4.5 These principles are the following:

1. until a common underlying network at a European scale is available, the implemented AMHS topology should:
  - a. **at least replicate the former AFTN/CIDIN topology;**
  - b. in areas where a common underlying network is already available but for a smaller area than Europe (e.g. multi-States, or “sub-Regional”), **implement a fully-meshed AMHS island, with at least two entry points** into the island;
2. when a common underlying network at a European scale is available, and while transition to the fully-meshed target is in progress, the topology should be such that:
  - a. **no more than two hops are needed for communication between any two International MTAs** in the considered area;
  - b. **Two distinct paths are available at AMHS level** for communication between any two International MTAs.

3.3.4.6 The transitional partially-meshed topology specified in item 2 above can be achieved, for example, by the establishment of several partly overlapping fully-meshed AMHS islands:

- each pair of AMHS islands must have a non-empty intersection, with at least two “multi-island” AMHS COM Centres;
- the central facilities (e.g. EUROCONTROL/NM (former CFMU), EAD, etc.) must form a fully meshed island with the “multi-island” AMHS COM Centres.

3.3.4.7 This example is depicted in Figure 3.



**Figure 3: Example of partially-meshed AMHS topology before transition to fully-meshed**

3.3.4.8 In line with the numerical requirements for QoS adopted in section 3.1.4, the strategy for AMHS topology may be reviewed on the basis of compiled AMHS operational experience, when a common underlying network at a European scale is available and a significant number of AMHS COM Centres are in operation.

## 3.4 Routing mechanisms

### 3.4.1 Available routing mechanisms

3.4.1.1 AMHS uses the routing mechanisms of its X.400 base standards. X.400 routing is static by nature, it uses the address attributes forming O/R addresses to determine the next hop towards which the message must be routed:

- local delivery,
- AFTN/AMHS Gateway (MTCU), or
- adjacent MTA inside the AMHS Management Domain of the current MTA,
- adjacent MTA in a different AMHS Management Domain.

3.4.1.2 Conceptually, X.400 routing tables are made of records associating a potential combination of address attribute values to a next hop. For each message, the route record with the best match for each AMHS recipient's address attributes is looked for in the routing table, to determine where the message is to be routed. In case of a message with multiple recipients and different routes, the message is "expanded" or "split" into several messages, according to the various destinations.

3.4.1.3 This section focuses on international AMHS routing, i.e. inter-domain routing.

3.4.1.4 Unlike in AFTN, where any substring from 1 to 7 characters may be used to determine a route, X.400 address attribute values are generally considered “as a whole” when looking for a best match. Some X.400 implementations may implement substring matching but this is not a standard feature.

3.4.1.5 Inter-domain routing, from an international MTA in an AMHS MD to an international MTA in another AMHS MD, should therefore use only entire address attribute values. The attributes country-name, ADMD-name, PRMD-name and potentially organization-name, usually represented by their initials C, A, P and O are sufficient for Inter-domain routing. The attribute organization-name must be used only in specific cases, when destinations are located in AMHS MDs with multiple International MTAs, and having implemented the CAAS Addressing Scheme.

3.4.1.6 It may be noted that ISO/IEC 10021-10 (2003) [22], which is aligned on ITU-T Recommendation X.412 (1999), “INFORMATION TECHNOLOGY – MESSAGE HANDLING SYSTEMS (MHS) – MHS ROUTING” describes an X.400/MHS Routing functionality based on Directory Services. There is no requirement to implement this feature in AMHS, including when the Extended ATS Message Handling Service is deployed.

### **3.4.2 X.400 re-routing mechanisms**

3.4.2.1 Based on the general routing principles described above, re-routing consists in the definition of an alternative route to the intended destination, if for any reason there is a transfer-failure or delivery-failure to the initially determined next hop.

3.4.2.2 Re-routing may be either manual or automatic. In the first case, the MTA operator, in view of the transfer-failures, modifies temporarily (or definitively) the routing tables to specify an alternative next hop. The main requirements placed on the software by manual re-routing are related to:

- the ease of reconfiguration;
- the immediate applicability of the modification: it is preferable that the routing be modifiable on line, or require only a fast restart or parameter load.

3.4.2.3 Regarding automatic re-routing, although not prevented by the X.400 base standards, nor by the way they are designed, this feature was initially not a standard practice in X.400 products. The main reasons were the following:

1. MHS/X.400 was initially designed for messaging traffic with relatively low transfer time requirements, clearly non-real time, where it was possible to “wait” for the availability of a connection to the intended MTA, in case such a connection was not immediately available;
2. In this context, the usual practice in the store-and-forward MHS/X.400 is to store a message, and, in case of transfer failure to the next MTA, to perform a pre-defined number of “retry” towards this same MTA (based on timers), before a non-delivery-report is sent back to the message-originator (or to the originating-MTA).

3.4.2.4 However, due to the adoption of X.400 by communities with more stringent transfer time and availability requirements (Defence, Air Traffic Services), it should be possible to obtain from X.400 software manufacturers automatic re-routing mechanisms.

3.4.2.5 The principle of such re-routing would be that, after the number of retries to the main route to the next MTA, an alternative route already specified in the routing table would be used. It is important that those responsible for system operation be aware that this re-routing facility is activated.

3.4.2.6 Care should be taken about a possible interaction with X.400 timers when such a mechanism is used. For example, if no alternative route is specified, a MTA will retry to transfer until the expiry the MTA and MTS timers, before a NDR is generated. If an alternative route is defined, then a time allocation should be kept to use the alternative route before the timers expire. This should be considered in conjunction with the re-routing mechanisms at the underlying network level: timers and re-routing mechanisms at the underlying network level have to be shorter than timers and re-routing mechanisms at the AMHS level. The reason for this is that most of the time the unavailability of a P1 association is going to be caused by a transitional problem in the underlying network.

### **3.4.3 Routing in the recommended EUR AMHS topology**

3.4.3.1 In the fully-meshed target topology, routing is trivial as there is a direct route from any International MTA to any other International MTA in the EUR AMHS network.

3.4.3.2 Transfer failures could be caused by unavailability of underlying network (that have their own resources to recover the failure, out of AMHS procedures) or by the failure of the destination MTA itself. In such a situation re-routing does not improve quality of service, but simply overloads the AMHS network by moving the problem from place to place. Depending on the underlying network and on the operator capability (e.g. depending upon the management tools and information available to him/her) to determine the reason of a failure, manual re-routing may however have benefit in some cases.

3.4.3.3 Automatic or manual re-routing is required, however, for efficient handling of AMHS traffic to other ICAO Regions (see next section).

3.4.3.4 In the temporary partially-meshed topology, the next hop for each destination MTA is either of the following:

1. the destination MTA itself, if a direct connection/route exists, or
2. an intermediate MTA which has a direct connection to the destination MTA.

3.4.3.5 The first case is identical to the situation of a fully-meshed AMHS network, where automatic re-routing is not really useful but manual re-routing may have some value, if an accurate fault diagnosis can be established.

3.4.3.6 In the second case, the availability of two distinct paths established as a design principle enables to use manual or automatic re-routing at AMHS level. Use of re-routing is essential in this situation, and automatic re-routing should be preferred whenever as it is available. This allows to make sure that the failure of an international MTA (e.g. in one of the multi-island AMHS COM Centres, in the depicted example) does not cause loss of communication between two islands.



3.4.3.7 Therefore, in the partially meshed network, it is recommended that:

1. one single route be specified in the AMHS routing tables if a direct connection exists,
2. a main route and an alternate route be specified in the AMHS routing tables if no direct connection exists and a two hops path is required between the considered MTA and the destination MTA.

### **3.4.4 Routing to/from other ICAO Regions**

3.4.4.1 For message flows incoming to or outgoing from the EUR Region, the routing strategy is to route messages from/to one of the Regional boundary ATS Message Servers to/from the international MTA of the destination/source EUR AMHS MD, using either a single direct route if existing, or one of the main/alternate routes in case a two hops path is available between these MTAs.

3.4.4.2 The assumption is that, in the target environment, these Regional boundary ATS Message Servers would be implemented by States or ANSPs that already provide Regional boundary AFTN/CIDIN COM centres towards other ICAO Regions.

3.4.4.3 For resilience purposes, a minimal number of two inter-Regional boundary MTAs needs to be implemented to connect to each other ICAO Region. To gain full benefit of this duplication, automatic or manual re-routing is required, so that alternate routing via the “alternative” MTA can be activated in case of loss of connectivity with the “main” boundary MTA to be used.

3.4.4.4 The “alternative” MTA can be connected with the same MTA in the other ICAO Region, as the “main” MTA, or preferably it can also be connected with an alternative MTA in the other ICAO Region.

## **3.5 Underlying network**

### **3.5.1 Background**

3.5.1.1 In terms of the ISO/OSI seven layer model, AMHS resides in the application layer. The design of such an application is dictated by both the end users, who best know their particular needs, and by the state of the art technological environment, which determines the way in which these needs are transformed to concrete technical specifications. The current situation, the way of migrating from this situation to the targeted future, the process flow, the safety requirements, the security requirements, the quality of service requirements and the expected results are all translated into the application specification. These requirements not only affect the design of the application but their influence permeates to the lower layers.

3.5.1.2 Therefore, the creation of an appropriate underlying network is seen as essential for the smooth deployment of AMHS.

### **3.5.2 General principles**

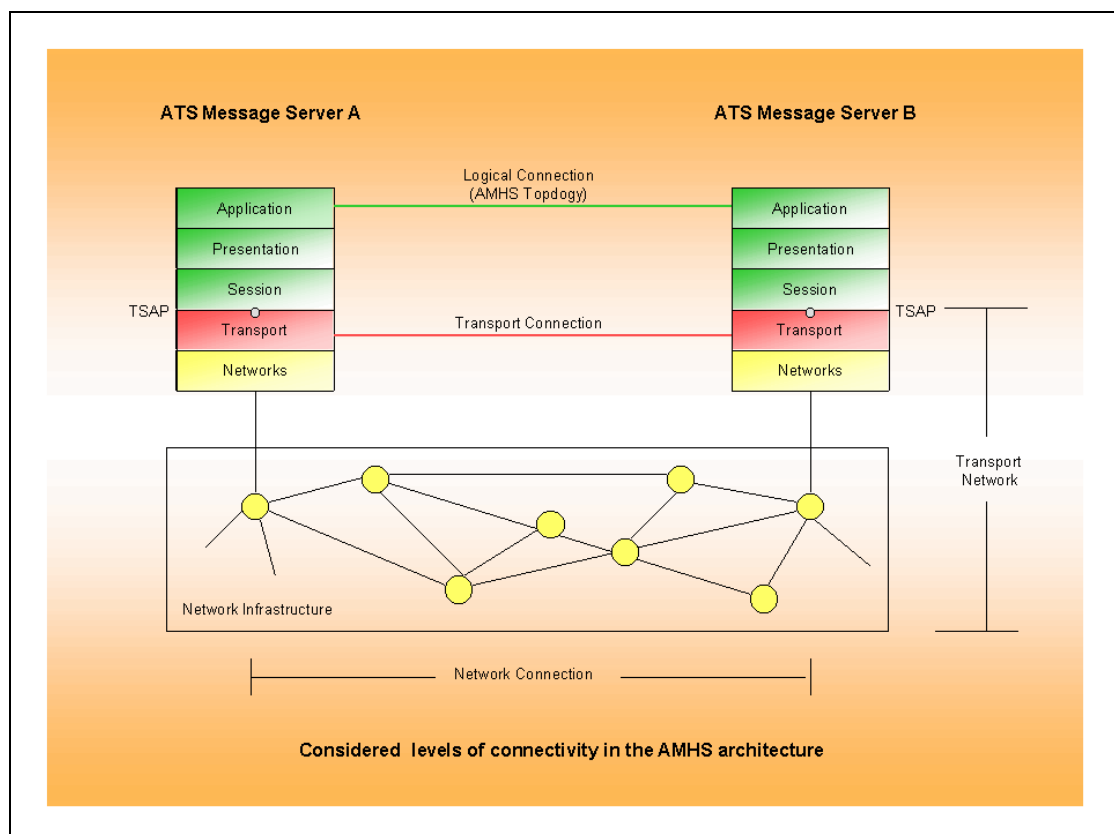
3.5.2.1 In current communications practices, the independency between application and network levels is highly desirable.

### 3.5.2.2 The separation of application and network brings several benefits:

- the provision, development and management of the network and AMHS can proceed largely independently (provided sufficient capacity is available within the network), leaving each discipline free to concentrate on its particular sphere of competence,
- there are economies of scale to be gained by the sharing of the network between multiple applications, resulting in better utilisation of resources,
- the increased size of the network (over a purely AMHS network) should deliver a better quality of service and in particular a more robust infrastructure,
- routing, at the AMHS level, is independent of the lower level network and in particular any European International ATS Message Server is directly accessible by any other.

3.5.2.3 The logical connection (links) of the AMHS topology implemented by means of a transport service could make use of the physical connectivity provided by a layer-3 network infrastructure.

3.5.2.4 The following Figure 4 illustrates the relationship between logical and physical connectivity for the international AMHS. Each international COM centre will access the underlying network over the local network node through a network access line.



**Figure 4: Logical and physical AMHS connectivity**

### **3.5.3 Considerations**

3.5.3.1 In the European area, a European wide TCP/IP based communications service dedicated to Air Traffic Management Communications is envisaged for supporting current and forthcoming applications.

3.5.3.2 This approach is supported by ANSPs' large experience in defining general principles (addressing, routing, ...) and providing TCP/IP services for supporting ATC operational applications.

3.5.3.3 Furthermore, concerning international communications, ANSPs are acquiring expert knowledge about underlying network interoperability.

3.5.3.4 The European AMHS will be implemented on top of a TCP/IP stack, as stipulated by EANPG Conclusion 44/45:

“That, States in the EUR Region use the TCP/IP communication protocol for the initial implementation of ATS Message Handling Systems, as a transition mechanism to enable AMHS operations to commence ahead of eventual full SARPs compliant data transmission systems.”

3.5.3.5 At the time of the EANPG conclusion, the reasons for using TCP/IP communication in support of AMHS operation were:

1. There was no European ATN/OSI internet communication service available, nor were there any real plans for implementation of such a service for other ATN applications in a timeframe compatible with the short-term implementation planned for AMHS. In the longer term, i.e. for the target profile, there was no sufficient reason identified that could justify the substitution of the initial TCP/IP underlying network with a fully ATN-compliant infrastructure.
2. Following successful testing results, there was a straightforward activity supported by EUROCONTROL and Member States, aiming at the establishment of an international TCP/IP infrastructure for aeronautical purposes in the ECAC area.
3. There were already national AMHS implementations in place based on the TCP/IP protocol suite. In addition, ANSPs have the necessary TCP/IP expertise on hand from various national applications.
4. The broad market of TCP/IP products would facilitate rapid implementation with reasonable costs.

3.5.3.6 Through Amendment 83 to ICAO Annex 10 (November 2008), the possibility to implement ATN/IPS was introduced into the SARPs, thus rendering the deployment of AMHS over TCP/IP fully SARPs compliant.

3.5.3.7 The de-coupling that exists in an AMHS system between upper layers and lower layers (transport and network services) allows implementing AMHS systems with multiple lower layer protocol stacks (ATN/OSI, TCP/IP, TP0/X.25).

3.5.3.8 The ability to implement AMHS over multiple lower layer stacks may be used to ensure global AMHS interoperability. In particular, as other Regions may deploy AMHS based on ATN/OSI, there could be a need for a limited number of Regional boundary ATS Message Servers (inter-Regional entry-exit points) to implement dual stacks. However, as

most AMHS products support TCP/IP, the relevance of such a requirement can only be determined when inter-Regional communication discussions are initiated between peer inter-Regional entry-exit points.

### **3.5.4 Conclusion**

3.5.4.1 An underlying network infrastructure that can provide physical connectivity between AMHS systems needs to be implemented as a Common Facility, in a timeframe compatible with the short-term AMHS deployment plan. It is foreseen that the Pan-European IP network resulting from the ongoing PENS programme, launched under the aegis of EUROCONTROL, will form an appropriate basis for this network infrastructure.

3.5.4.2 Bilateral or multilateral connectivity arrangements should be made to accommodate initial AMHS operations, until such a common facility becomes available.

3.5.4.3 In any case, the AMHS Quality of Service requirements, as they are prescribed for the various flow class types, should be supported by any type of underlying network infrastructure used. In this direction, the recommended availability is in the order of 99.99% with a mean time to restore outages in the order of 5 minutes.

## **3.6 Interregional communication aspects**

### **3.6.1 Guidance provided by ATNP on "AMHS over TCP/IP"**

3.6.1.1 As a consequence of EANPG Conclusion 44/45, the ATNP provided guidance for implementation of "AMHS over TCP/IP" in 2002. Following the introduction of ATN/IPS SARPs through Amendment 83 to Annex 10 in 2008, these guidelines have been superseded by events, but they are **presented** hereunder **for historical purposes**.

"1. It has been observed that some States or even Regions are implementing or planning to implement AMHS systems making use of lower communication layers that are not conformant to the ATN Internet Communication Services (ICS). Such AMHS systems conform to Doc 9705, Sub-Volume III, Chapter 1 (replaced with Amendment 83 by Doc 9880, Part II), with the exception of the clauses related to interfacing with ATN ICS. The most frequent occurrence of such non-compliant systems is related to AMHS systems making use of TCP/IP lower layers through a RFC1006 interface ("AMHS over TCP/IP").

2. Due to the store-and-forward nature of the AMHS, this can be done without compromising the end-to-end interoperability at the AMHS application layer with SARPs-compliant AMHS implementations, but at the cost of some dual-stack systems<sup>4</sup> for lower layers. Strict conformance to Doc 9705, Sub-Volume III, Chapter 1 is required, with the only exception of clause 3.1.2.2.1.2 ("Use of Transport Service"), to ensure such end-to-end interoperability.

3. The reasons invoked by States adopting such local policies include the following:

- The need for an immediate or short-term transition from existing ground networks, and in particular from X.25 networks that are reaching obsolescence;
- The use of a common ground network infrastructure shared with other ground

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<sup>4</sup> Such dual-stack systems are beyond the baseline ATN architecture which is specified by ICAO.

applications, such as radar data distribution or inter-centre communications (such as OLDI in Europe), such infrastructure being sometimes already in operation.

4. It should be noted that in all known cases, the IP network used or planned to be used is a network infrastructure in which switching equipment and links are dedicated to ATS communications, building a so-called "private" IP network.

5. It is recognized that other transition strategies can also be developed, that make use of the proposed IP SND CF to enable IP sub-networks to be used as ATN sub-networks, in a fully SARPs-compliant ATN ICS architecture. However such an architecture is not discussed in the present document.

6. Despite the fact that the implementation of "AMHS over TCP/IP" can meet, as described above, the specific objectives of a State on a local or regional basis, the attention of implementers should be drawn to the fact that the implementation of two different architectures has the following drawbacks:

- It limits "any-to-any" communication between AMHS systems on a global basis that could be needed in specific cases, e.g. for performance requirements;
- it requires the implementation by some States of "dual-stack" AMHS systems, to gateway between AMHS systems using the ATN ICS and AMHS systems using TCP/IP. This may reduce performance and availability;
- The cost of such gateway facilities is expected to be borne by States implementing non SARPs-compliant AMHS systems.

7. In view of the elements above, the following guidance is offered by the ATN Panel on the use of "AMHS over TCP/IP":

- a) "AMHS over TCP/IP" implementations should not be presented as fully SARPs-compliant ATN implementations.
- b) Non-SARPs-compliant "AMHS over TCP/IP" implementations are seen as a "local solution" within a State or Region. Inter-State or inter-Regional connections between such systems using TCP/IP should be subject to bilateral/regional agreements.
- c) States or Regions that implement "AMHS over TCP/IP" systems within their domains are responsible for taking those necessary measures to ensure interoperability with SARPs-compliant implementations in other States or Regions.
- d) Appropriate security measures should be taken when using an IP network, irrespective of whether AMHS uses TCP/IP directly or via the IP SND CF.

8. The ATNP will continue to monitor related developments and will provide further guidance as appropriate."

3.6.1.2 With introduction of the Internet Communications Service (see Doc 9880 – Part III [4]) the "European" solution "AMHS over TCP/IP" is now fully SARPs compliant.

## 3.7 European Directory Service

3.7.1 This section provides general information on the European Directory Service (EDS) Operational Concept. Appendix G of the EUR AMHS Manual provides the details of the concept.

3.7.2 Directory services are seen as a global function. However they are expected to be implemented at a regional and international level rather than on a global basis. The EDS is specified as a common European facility but is also open to support, to coordinate with and to integrate with States and Organisations outside Europe. The EDS Operational Concept considers distribution and use of information at the national level a local implementation matter.

3.7.3 The EDS Operational Concept adopted and refined the approach of the ATN Directory as specified by ICAO Doc 9880 Part IV. The EDS is specified in support of ATN applications such as the AFTN/AMHS Gateway. In addition the EDS supports human users interfacing the EDS through their Directory User Agent (DUA).

3.7.4 The architecture of the EDS allows for centralised management of information, versioning of information as well as periodic and automated distribution of information using X.500 Directory protocols. In parallel the EDS Operational Concept reduces the individual effort of States and Organisations for management and coordination.

3.7.5 The EDS Operational Concept takes into account the existing infrastructure for management and distribution of AMHS address information by the ATS Messaging Management Centre (AMC) and deploys the EDS in three steps. In the first, initial step, the information is maintained and managed by AMC and distributed by AMC and EDS. In the second, intermediate step, the information is maintained by EDS and managed and distributed by AMC and EDS. In the third, final step, the information is maintained, managed and distributed by EDS. The stepwise introduction of EDS for AMHS address information ensures a smooth introduction of European directory services and seamless operation of the AMHS.

3.7.6 In support of the AMHS, the EDS provides and distributes in the initial step information to support the messaging functions name resolution, user capabilities and AFTN/AMHS address conversion. The EDS is prepared to support further ATN applications and functions such as AMHS security.

## **4 European ATS Messaging Service Profile**

### **4.1 Introduction**

4.1.1 The detailed specifications for ATSMHS are currently spread over a number of different documents such as the ISO/IEC ISPs, ICAO SARPs and technical specifications (Annex 10 and Doc 9880) and the SPACE Final Report.

4.1.2 The EUR-ATSMHS Profile is intended to provide one single document that brings together these specifications by referencing the basic documents and by providing any additional specifications necessary for ATSMHS implementation in the EUR Region.

4.1.3 The scope of the Profile is limited to the specification of those aspects of systems that are involved in exchange ATS messages between international COM Centres. Other aspects, that involve gateways e.g. to the AFTN and CIDIN or communications that remain entirely within a State, are not dealt with in this Profile.

4.1.4 The first version of the EUR-ATSMHS profile was developed by EUROCONTROL. Following a thorough review procedure which was supported by various stakeholders (suppliers, SPACE, COMT, AFSG), the Profile has been approved for use in the specification and procurement of AMHS systems in the EUR Region and it has been included as Appendix B to the EUR AMHS Manual.

### **4.2 EUR ATSMHS Profile Objectives**

4.2.1 The purpose of the Profile is to provide a single, relatively short specification containing interoperability requirements between international Message Transfer Agents (MTA).

4.2.2 Furthermore, the Profile contains the following requirements applicable within the EUR Region:

- Use of TCP/IP for the underlying Data Communications Service;
- Message Legal Recording;
- Distribution Lists;
- Use of IPM File Transfer Body Parts for the transfer of binary data (e.g. to support WMO BUFR coded messages);
- Specifications of message maximum and minimum lengths (e.g. to support ADEXP messages).

### **4.3 Scope of Profile**

4.3.1 The EUR-ATSMHS Profile specifies a number of AMHS protocols and systems capabilities for the exchange of ATS messages between direct and indirect AMHS users through international MTAs. In other words, the Profile is intended to ensure end-to-end message transfer between International COM Centres over AMHS.

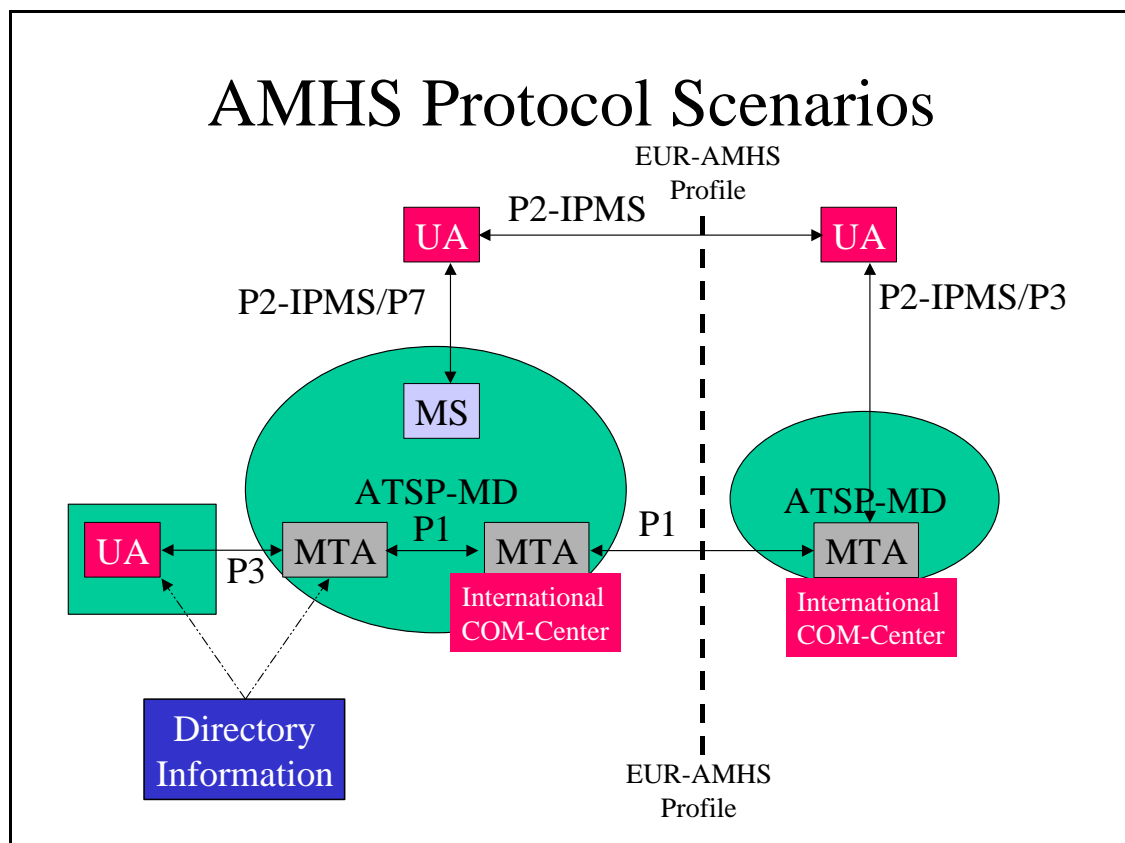
4.3.2 The Profile is applicable to the following aspects of message interchange:

- Transfer of messages between the AMHS systems at International COM Centres operated by different ANSPs;
- Submission, Delivery and Retrieval of messages that are to be transferred between AMHS systems operated by different ANSPs;
- The content of Message Envelopes, IPM Headings, Body Part Types and AMHS Addressing used for the protocols identified above.

4.3.3 The Profile does not specify any of the purely local requirements within an ANSPs individual systems – e.g. MTS Access, MS Access, and interconnections between MTAs within an ANSP's Private Management Domain, other than to ensure adequate interchange of ATS messages internationally. Nor does it specify aspects of interconnections between Regional AFTN/AMHS Gateways where additional requirements may apply, such as support of an ATN lower layer protocol stack as specified in ICAO Document 9880, Part III [4].

4.3.4 Access to the Directory Information used to support Directory Name Resolution and address mapping between AFTN and AMHS address forms is indicated for information only.

4.3.5 The following diagram illustrates the scope of the protocols and system types specified in the EUR-ATSMHS Profile:



**Figure 5: AMHS Systems and interconnecting Protocols**

4.3.6 The Profile applies to the following AMHS system components:

- User Agents UA
- Message Transfer Agents MTA



- Message Stores MS

4.3.7 The Profile applies to the following AMHS protocols:

- IPM Content P2
- Message Transfer P1
- Message Submission/Delivery P3
- Message Retrieval P7

4.3.8 The Profile specifies a Profile of ATS Message Handling Service conformance called the EUR-AMHS Profile. It is based on the requirements of following:

- The Basic ATS Message Handling Service (Bas), introduced in the Doc 9880, Part II, para. 1.1.3-1.1.8;
- A number of further Functional Groups and options selected from the Extended ATS Message Handling Service (Ext), introduced in the Doc 9880, Part II, para. 1.1.3-1.1.8;
- Further requirements specified by the SPACE Final Report for use in Europe.

4.3.9 The resulting scope is sufficient to ensure inter-State message interchange using AMHS according to the Basic AMHS requirements stated in Doc 9880, which covers Basic Message Transfer Capabilities, Distribution Lists, appropriate message size capability and Legal Recording.

4.3.10 In addition, the following requirements are included:

- Use of TCP/IP as the underlying Data Communications Service;

It must be pointed out that specification of an AMHS based on TCP/IP necessarily references a wide range of standards from different sources. This is complicated by the fact that procurement of a complete AMHS/TCP solution involves the specification of three different system component types (Message Transfer Agents, Message Stores and User Agents), each of which has a number of implementation options. The Profile therefore also provides guidance on the correct use of the referenced ISO/IEC ISPs, ICAO Documents and Internet RFCs for each type of system.

- Provision for the transfer of binary data using the File Transfer Body Part

It must be pointed out that the originally planned mechanism for this requirement was to use the Bilaterally Defined Body Part. However, this was found to be deficient in two ways:

- a) its use is now discouraged by the base standards;
- b) it provides no way for recipients to determine the nature of the binary encoding actually contained in a received Bilaterally Defined Body Part.

For these reasons, the use of the Bilaterally Defined Body Part was removed from old Doc 9705 during 2003 now Doc 9880, Part II, and was replaced by the File Transfer Body Part, which is known to overcome the previously mentioned drawbacks.

4.3.11 Security requirements are not a mandatory part of the EUR-ATSMHS Profile. However, the Profile mandates IP address validation and the protocol includes system identification following transport connection establishment. It must be pointed out that certain Messaging Application Security functions are also mandated in the MHS S0 optional

Functional Group for the Extended ATS Message Handling Service but these are not mandated by this Profile.

## **4.4 Use of the Directory**

Under development

## **4.5 Application/Service oriented AMHS Profiles**

4.5.1 The EUR ATS Messaging Profile, as described in Appendix B to the EUR AMHS Manual, defines the specifications necessary for ATSMHS implementation in the EUR Region. Nevertheless, the support of the complete set of features defined by the EUR ATS Messaging Service Profile from user agent implementations developed for given applications/services, acting in limited environments, may not be necessary.

4.5.2 In order to facilitate the adoption of the ATS Message Handling Service by end users dedicated for specific applications/services, the support of a subset of requirements can be accepted. The requirements that need to be supported should be specified per case depending on the specific application/service. Appendix H to the EUR AMHS Manual defines such ‘Application/Service oriented AMHS Profiles’.

## **5 System implementation - Guidelines for system requirements**

### **5.1 Introduction**

5.1.1 This section is intended to deal with technical and operational requirements for a COM system replacing the AFTN/CIDIN system by an AMHS or adding the ATSMHS capability. As indicated by its title, this section covers guidelines for requirements not specified in the AMHS technical specifications, but considered by the Group important enough for being included in a Call for Tender for the procurement of an AMHS system.

5.1.2 The main input of this section was a subset of the specifications of an actual Call For Tender issued by one of the Group members, adapted and modified in order to have a 'template' able to be used by any ANSP who intends to procure an AMHS system.

5.1.3 The section covers technical and operational requirements like:

- General facilities
- Addressing - mapping table facilities
- Queue management facilities
- Message repetition facilities
- Tracing facilities
- Sizing
- Availability and reliability

5.1.4 For such a COM system in the following paragraphs the term "**AMHS System**" will be used.

5.1.5 Due to the character of this section (as guidelines for system requirements) the term "**should**" is used. In a specific Call for Tender this term can be replaced by shall.

### **5.2 General requirements**

5.2.1 The AMHS System should implement the ATSMHS and AFTN/AMHS Gateway facilities in accordance to the specifications defined in the latest approved ATN technical specifications for Basic Services, but supporting AFTN messages with a message length up to 64 Kbytes.

*Note.— This requirement is not covered by the technical specifications, which mandate support of standard AFTN message length only.*

5.2.2 The AMHS System should support the monologue dialogue-mode and one or several incoming and outgoing P1 associations with an MTA partner simultaneously .

*Note.— An MTA may establish permanent or dynamic (i.e. on-demand) P1 associations. The type and specific number of associations to be set up for operations depends on different factors and has to be agreed between the MTA partners, after consideration of their traffic exchange requirements.*

5.2.3 The AMHS System should support simultaneous associations with several MTA partners (one or several associations with each MTA partner) with the same or different “transport” protocols (e.g. TCP/IP to be used within EUR, ATN/OSI).

5.2.4 The AMHS System should support the total number of simultaneous associations (sum of all associations) without any restrictions caused by inherent limitations of the system (memory, interfaces, etc).

5.2.5 The AMHS System should allow control of establishment of associations with MTA partners via on-line operator commands; i.e., it should be able to:

- Prevent/allow the establishment of associations with a given MTA partner by AMHS System (local MTA), by MTA partner only or by both partners.
- Prevent/allow the establishment of associations with all configured MTA partners by AMHS System (local MTA), by all MTA partners only or by all partners.
- Force the termination of associations already established with a given MTA partner.
- Force the termination of associations already established with all configured MTA partners.

*Note.– The number of actual simultaneous associations to be supported will depend on:*

- *the target 'logical' AMHS network topology: for example each centre establishes direct associations with all the other centres or each centre establishes associations with adjacent centres only (as in AFTN);*
- *whether permanent or dynamic connections will be established. Such distinction is only applicable in case there is no requirement for continuous traffic exchange.*

5.2.6 The AMHS System should implement MTA queues. These queues will keep the AMHS messages that:

- a) either are pending to be sent;
- b) or have been transmitted but for which a delivery report is expected.

*Note 1.– The queue referred to in a) is typically implemented in the MTA.*

*Note 2.– The queue of messages for which a DR is expected is normally implemented in the User Agents and MTCUs of the AFTN/AMHS Gateways.*

*The reaction of an AMHS System in case of loss of a DR is fixed (implementation matter): E.g., would it have to resend the message after timeout? How many attempts to resend the message should be made? A DR or NDR is addressed to the originator of the message; therefore it should be left to the originator to react upon non-arrival of a DR as it is his task to react upon reception of a NDR. If the originator is an indirect (AFTN) user, the AFTN/AMHS Gateway has to perform this task on his behalf. Furthermore, a report may take another route than the message it refers to, that means it does not necessarily pass through the same MTAs as the original message.*

5.2.7 There should be a logical MTA queue per configured MTA partner. Management of these queues is specified in section 5.4).

5.2.8 The configuration of an MTA partner (via on-line commands) should provide flexibility for each of its parameters. For example:

- a) It should be possible to configure the “transport” protocol (e.g. ATN, TCP/IP, TP0/X.25) to be used per each MTA partner.
- b) In case of selection of TP0/X.25, it should be allowed to configure at least two local X.25 attachments to be used for the connections, several calling – called addresses to be used for initiating a call or acceptance of an incoming call, etc.
- c) It should be possible to configure the maximum number of simultaneous associations with each MTA partner.
- d) It should be possible to configure whether the associations have to be left permanently established or whether they have to be established and closed depending on traffic.

5.2.9 The AMHS System should allow configuration of all profile items if possible.

5.2.10 The AMHS System should allow configuration of the following profile items, at least:

- a) Mapping between AFTN priorities and AMHS Message Transfer Envelope priorities.
- b) Values of “rn” and “rnr” in the notification-requests element in the recipient fields in the IPM heading. These values should depend on the value of the AFTN priority.

*Note 1.– Both functions are implemented in the UAs and MTCUs of the AFTN/AMHS Gateway as the MTA does not deal with the ATS Message Priority (or AFTN priority) which is contained in the ATS Message Header as part of the IPM body.*

*Note 2.– The technical specifications specify the values of these profile items. It is good practice that the implementation allows the possibility to change them just by configuration in case operational experience recommended other settings. The processing is an implementation matter.*

## 5.3 Addressing – mapping tables requirements

5.3.1 The AMHS System should support the CAAS (see section 3.2).

5.3.2 The AMHS System should process and manage AMHS messages received with the O/R name in the XF Addressing Scheme also, even if the ANSP has chosen the CAAS for its internal users.

5.3.3 The AMHS System should provide mechanisms to import mapping tables needed in the AFTN/AMHS Gateway. The tables to be imported will be downloadable from the AMC system.

5.3.4 The implemented facilities in the AFTN/AMHS Gateway which map an AFTN address to an O/R name should be flexible enough to accommodate different O/R structures (Addressing Schemes) and use the minimum number of configuration / lookup tables with the minimum number of entries. As an example for the implementation of the mapping of an AFTN address to an O/R name, the following information should be entered in configuration tables:

- a) Attributes and associated values that are fixed for each State. E.g. in the case of States using the address scheme described in section 3.2 the attributes and associated values to be entered should be country-name, ADMD-name and PRMD-name. Each entry will be indexed by the ICAO routing area or State/territory identifying letters (first characters of the AFTN address).

- b) Attributes whose values can be determined directly from the AFTN address. E.g., in the case of States using the CAAS described in section 3.2, the organizational-unit-names attribute (first to fourth characters in the AFTN address) and the common-name (all characters in the AFTN address) should be declared here for them.
- c) Attributes whose values depend on a mapping table. For each such attribute for each State, the following should be specified: the name of the mapping table and the subset of the AFTN address (e.g. one to four first characters, the complete AFTN address, wild characters could be used to define the subset ...) that gives the index to the mapping table. The mapping table itself should also be provided. E.g., in the case of countries using the CAAS address scheme described in section 3.2, the value for the organization-name attribute should be defined this way.

5.3.5 The possibility to use a directory should also be contemplated, even if this is not part of the Basic Services.

## 5.4 Queue management requirements

5.4.1 The AMHS System should provide, in addition to a pure diversion facility of outgoing queues, a reprocessing of messages in X.400 (outgoing) queues in case of longer outages of adjacent MTAs (non-reachability).

*Note.— Such reprocessing facilities will be very important during the time period when both AMHS and AFTN/CIDIN centres coexist in the EUR Region.*

5.4.2 Two types of reprocessing should be envisaged:

- at the pure X.400 level;
- at the AFTN level (in the case of AFTN/AMHS Gateways).

### Reprocessing at the pure X.400 level

5.4.3 The reprocessing at pure X.400 level should allow:

- to extract messages waiting in an X.400 queue from this queue;
- to process these messages again by the X.400 routing software; and
- to route according to possible new or temporarily modified X.400 routing tables.

Such a mechanism would allow to extract the messages from the queue associated to a non-reachable MTA. The messages could be routed through another centre (MTA) and forwarded through the alternate route only for those recipient addresses for which alternate routes have been activated. For all other recipients addresses the messages remain in the queue. This kind of reprocessing prevents a general forwarding of messages to other centres (MTAs) containing recipient addresses for which rerouting is not intended.

5.4.4 The reprocessing at the pure X.400 level should be present in the ATS Message Servers, in AFTN/AMHS Gateways.

### Reprocessing at the AFTN level

5.4.5 The reprocessing at AFTN level should allow:

- to extract messages waiting in an X.400 queue;

- to re-process them by the AFTN layer; and
- to route them according to the current AFTN, CIDIN and X.400 routing tables respecting the updated route availability information (predefined alternate routing).

This reprocessing would solve the problem of non-reachability due to outages, in a heterogeneous AFTN/CIDIN/AMHS environment.

5.4.6 An X.400 queue can contain messages, reports and probes. The AFTN reprocessing function should only concern the messages.

These messages can be of different 'types': messages from AFTN/AMHS Gateways, 'pure' UA to UA exchanges, etc. All these messages will be IPM messages, so there is no way to distinguish them at the X.400 (envelope) protocol level.

5.4.7 The reprocessing should be restricted to messages generated by an AFTN/AMHS Gateway.

## 5.5 Message repetition requirements

5.5.1 The AMHS System should provide powerful message repetition facilities in the AFTN, CIDIN and AMHS subsystems implementation.

5.5.2 The repetition facilities should be able to repeat messages as they were originally transmitted i.e. sent to all recipients following the same transmission paths.

5.5.3 Additionally, the repetition facilities should be able to specify (with the use of wildcards) 'detailed' or 'generic' destinations. Such destinations can be an AFTN address, an O/R name, all AFTN addresses mapped to a given Ax, all O/R names of a given PRMD, etc.

5.5.4 The AMHS System should find all the messages that were transmitted to such specified 'generic' destinations within a specified time interval and retransmit them only to pending destinations and following the current routing. To avoid a transmission to other destinations originally contained in the message the addresses not matched by the 'generic' destination should be suppressed (address stripping).

## 5.6 Tracing facilities requirements

5.6.1 The AMHS System should provide a facility to allow generation of X.400 probes.

5.6.2 The user interface of the facility should allow entering of the priority, the O/R name of the originator / destinations and the message length.

5.6.3 The AMHS System should send the reports regarding the probes (delivery, non-delivery) to a configurable instance (e.g. the rejection queue).

*Note.— This requirement relates to a user interface requirement. The user needs some notification when the delivery report related to the probe has been received. It is an implementation matter to decide whether this is performed just by allocating a fixed originator O/R name to one of the queues of the system or by another way.*

The contents of such reports should be decoded and presented in a 'human' readable and understandable format.

5.6.4 The AMHS System should provide association-tracing facilities to monitor in real time the establishment, interruption and finalisation of associations related to adjacent MTAs.

## 5.7 Sizing requirements

5.7.1 The sizing of the AMHS System operational platform should support the traffic in peak hour situations with:

- a) Average peak hour total CPU usage at 30% maximum.
- b) Communication adapters loaded at a maximum 30% of their real bandwidth capacity (not the theoretical one) and excluding the redundancy needs.

*Note.— The previous values have to be reconsidered by each ANSP depending on the expected lifetime of the AMHS System. As e.g., if the lifetime is expected to be 10 years and the traffic estimates for the peak hour relate to the end of the lifetime, the usage requirements for the CPU and the communication adapters are typically greater than 30% (if not, the purchased system will be oversized during quite a number of years).*

- c) Processing time of a message (High QoS flow type class, see section 3.1) at least less than 1.5 seconds. The processing time is defined as the difference between the moment the latest character of the message enters into the AMHS System and the moment the first character of the message is sent out. This applies for all implemented in / out protocol combinations. For messages of other flow types, the processing time should be less than 3 seconds.

*Note.— This value, especially for AMHS, has significant implications in the platform sizing and total network transit time (this also depends on the network topology, see section 3.3 AMHS topology). If the value is too low, a very powerful platform is required; If the value is too high, it could introduce a significant delay in the overall message transmission (especially if the other centres also have high values).*

- d) Response time to configuration / management on-line commands less than 3 seconds. This response time is related to requests from a management position for actions which do not require a query / browsing of a log (e.g. close a PVC, create an Ax, etc).
- e) At least 50% of the disk space remaining available after:
  - i) all the standard and specific developed software versions (including the possibility of more than one software versions and two configurations per version) are present on disk,
  - ii) all logs and archive folders corresponding to the number of days to be kept on-line in the system are present on disk.

*Note.— The precise number of days depend on the particular policy of each ANSP to comply with the ICAO Legal Requirements (see section 9.1 Legal Recording in AMHS).*

*If its policy indicates that all the data has to be kept on the AMHS System, the system is dimensioned to support at least 30 days. If the policy indicates that the data are saved for such purpose somewhere else (e.g. in another system, in an external media like CD-ROM, DAT, cartridge, etc.), data concerning fewer days need to be kept on-line (e.g. three days, one week...).*



*Note.— As for the CPU and communication adapter usage, the value for disk space is reconsidered by each ANSP depending on the expected lifetime of the AMHS System and the traffic estimates related to this lifetime.*

## 5.8 Availability and reliability requirements

5.8.1 The AMHS System should operate 24 hours per day and 365 days per year.

*Note.— The values provided below represent 'minimum' requirements. Each ANSP may reconsider them according to its own policy and internal SLAs with its internal users.*

5.8.2 Interruptions for system maintenance and installation should be limited to the strict minimum and should be less than 60 minutes.

5.8.3 After power is switched on, the AMHS System should be fully operational after a maximum of 15 minutes.

5.8.4 The AMHS System should auto monitor:

- the state of its application processes;
- the state of its system processes;
- the state of its system components (hardware).

5.8.5 The AMHS System should generate an SNMP MIB of the states monitored (see above).

5.8.6 The AMHS System should automatically try to recover from failure conditions in its application processes. If it is not possible to recover without impacting the service, the AMHS System should terminate all its application processes in an orderly manner and restart them afterwards automatically.

5.8.7 The AMHS System should allow an operator to:

- a) Stop the AMHS application gracefully (with automatic restart).
- b) Stop the AMHS application gracefully (with no automatic restart).
- c) Force the AMHS application to stop (with no automatic restart).
- d) Start the AMHS application with message recovery (messages that were in queue when the system was stopped are processed and forwarded).
- e) Start the AMHS application without message recovery (messages that were in queue when the system was stopped are discarded).

5.8.8 The AMHS System should lose no message that has been acknowledged by it (according to the respective messaging protocol), unless an operator explicitly requests to drop the messages.

5.8.9 The AMHS System should lose no message because of its load.

5.8.10 In case of a switchover (cluster, master/standby) configuration the following requirements apply:

- a) After detection of failure of the primary system unit or after an operator command, the switchover process should last less than five minutes. The duration of the switchover is counted as the time from the failure detection (or operator command)

until the time the AMHS restarts forwarding messages again (assuming there are messages in queue or there are new incoming messages).

- b) The time needed for the standby unit to detect failure of the primary one should be less than three minutes.
- c) The switchover process should be completely automatically without requiring any plugging/unplugging of any type of cables (communications, disks ...). A matrix switch action (if a matrix switch is proposed) is not considered as a cable plug / unplug.

5.8.11 Any period of time longer than one minute, during which the AMHS System does not perform message switching (in a total or partial manner) due to software or hardware problems, should be considered as an interruption of service.

5.8.12 An interruption of service of an AMHS System should be less than 10 minutes when the recovery is automatic. The duration of an interruption is calculated as the time from the moment the last received message was forwarded until the moment the AMHS System starts forwarding messages again (assuming there are messages in queue or there are new incoming messages).

5.8.13 There should be no more than one interruption of service without automatic recovery in a sliding window of six months.

5.8.14 There should be no more than one interruption of service with automatic recovery per day.

5.8.15 There should be no more than two interruptions of service with automatic recovery per month.

5.8.16 There should be no more than three interruptions of service with automatic recovery in a sliding window of three months.

5.8.17 The MTBF of the AMHS System hardware should be higher than 52 weeks.

## 5.9 Requirements for statistics

5.9.1 The AMHS System should monitor and produce statistics per direct MTA partner as follows, where the term “data message” includes all X.400 P1 information objects, i.e. messages, probes and reports:

- a) Number of data messages transmitted
- b) Average size of the data messages transmitted
- c) Maximum size of the data messages transmitted
- d) Average number of destination addresses per message transmitted
- e) Number of data messages received
- f) Average size of the data messages received
- g) Maximum size of the data messages received
- h) Average transfer time
- i) Number of delivery reports transmitted (a subset of item a)
- j) Number of non-delivery reports transmitted (a subset of item a)
- k) Number of delivery reports received (a subset of item e)
- l) Number of non-delivery reports received (a subset of item e)
- m) Minimum size of data messages received
- n) Minimum size of data messages transmitted
- o) Maximum, mean and minimum response time

- p) Number of recipients processed
- q) Number of messages deferred (the criterion for a deferred message should be specified by a configurable system parameter)
- r) Number of messages redirected
- s) Number of messages rejected
- t) Number of loops detected

5.9.2 The AMHS System and its management tools should enable to monitor and produce statistics per direct MTA partner, related to traffic volume and quality of service at an overall system level, as follows:

- a) Overall traffic volume at the level of IP packets;
- b) Maximum outage duration of association between MTAs (if any);
- c) Cumulated outage duration of association between MTAs (if any).

*Note.— The use of IP network measurement tools distinct from the message switch, and/or manual intervention may be required to produce these elements.*

5.9.3 Additionally the AMHS System should produce the information specified in 5.9.1 and 5.9.2 for all partner MTAs as a total.

5.9.4 The AMHS System should be able to generate the above statistics in at least the following intervals: 1 day interval, 1 hour interval, 30 minutes interval or better.

5.9.5 The AMHS System should be flexible in configuring other intervals for application statistics generation.

5.9.6 The AMHS System should be flexible in generating statistics at a more detailed level, as e.g., MTA route entries, particular O/R attributes, individual O/R names (to be discussed).

*Note.— Each ANSP may consider what requirements on statistics are put on the AMHS System in accordance with its requirements (national and international) and its policy for statistics production. E.g., there can be ANSPs which transfer the traffic logs to another system which will produce all required statistics; in such a case, the AMHS System may be relieved of too many statistics requirements. If an ANSP does not have such other system, it is the responsibility of the AMHS System itself to produce all statistics needed.*

5.9.7 The AMHS System should be able to export specific statistic files on a monthly basis. Such a statistic file should contain daily as well as peak hour statistical data in a standard format, covering certain items in 5.9.1 and all items in 5.9.2, because of their specific international relevance. Detailed specifications of the file formats and statistical indicators are provided in the ATS Messaging Management Manual.

## **6 AMHS management**

### **6.1 Introduction**

6.1.1 In general, network management is essential for reliable and efficient operation of a network like the EUR AMHS Network.

6.1.2 This chapter contains a general introduction on the management aspects for an EUR AMHS network. It contains a list of required functions that are to be fulfilled by a management system.

6.1.3 The breakdown of the management areas is according to the ISO FCAPS scheme.

6.1.4 At the end in section 6.5 the European approach of AMHS Network management by implementing the ATS Messaging Management Centre is described.

### **6.2 Requirements for AMHS Management**

6.2.1 The following AMHS Management activities can be distinguished:

<b>Timeframe Activity</b>	<b>Online 24 hr*7 day</b>	<b>Off line - short term</b>	<b>Offline – long term</b>
Fault Management	Helpdesk, fault reporting. 1st line support. Service availability monitoring	Fault resolution, fault management	High level changes to increase reliability, reduce user queries
Configuration Management	These are not a regular feature of online systems management. System and user changes recorded online but usually applied to offline system.	Activation/turn-up of changes. Regular published changes	High level planning, for international connectivity and national service upgrades
Accounting management	N/A	Production of regular statistics	Policy and planning activities relating to budgeting, charging, capacity planning
Performance management	Monitoring utilisation, processors, queues, connections, discs etc.	Performance tuning activities	Long term and international planning for capacity management

Timeframe Activity	Online 24 hr*7 day	Off line - short term	Offline – long term
Security	Monitoring for attacks, taking countermeasures	Regular health checks, reviewing warnings from industry and other ANSPs, security training	Security policy, significant architecture/topology changes to increase security

*Table 7: Breakdown of activities by timeframe*

## 6.3 System Management data flows

6.3.1 How system management will be implemented and operated at local level can be freely chosen by a State. The ATN technical specifications define requirements to make information available to other States through XMIBs, with as a primary goal the support of boundary management.

6.3.2 The ATN technical specifications define the XMIB sets, and the information is used to serve the following purposes:

- Enable other participating organisations to query the current operational status of the ATN system (ES or IS);
- The cross domain MIB should support the capability to allow a SM Manager to be warned by notification as soon as an error occurs in an adjacent domain.

6.3.3 This “public” management information is to be made freely available by the State to the international community.

6.3.4 Alarms raised in one management domain that affect the provision of AMHS service should be made available to other management domains.

*Note.– The exact standard distribution of reports and alarms is for further study.*

## 6.4 Realisation options

### 6.4.1 Information database

6.4.1.1 For the exchange of information with the management database the ISO XMIB solution is foreseen in the technical specifications. In this context, States have been requested to implement XMIBs from the onset of AMHS for international co-ordination. Eventually a conversion mechanism should be implemented.

6.4.1.2 Such an implementation should cover both the AMHS application (entry and exit MTAs, Gateways, MTCUs and routes through a State carrying traffic) and the underlying ATN network XMIBs.

6.4.1.3 A capability to broadcast alarms to other States should be foreseen.

*Note.– The use of XMIB is under discussion. Especially in the light of TCP/IP in the EUR Region other options (MIB) may be studied.*

## **6.4.2 Fault management**

6.4.2.1 Fault management can be subdivided in 3 distinct areas:

- Fault rectification – the process of providing a long term solution to a fault. This is highly implementation dependent and thus very much a national issue.
- Fault management – the process of ensuring that faults are correctly recorded, assigned for rectification and the entire process managed. Also this is a national function.
- Fault reporting – covers the area of helpdesks and first line support and spans both local and international systems.

6.4.2.2 Helpdesks can be organised either nationally or internationally. In the international model a centralised regional or global helpdesk operates on behalf of member States which maintain the operational responsibility for their own domains.

6.4.2.3 The international approach has a better overview of the network as a whole, offers economies of scale and relieves national operations centres. The national approach deals more efficiently with local users in the local situation.

6.4.2.4 Weighing advantages and disadvantages a regional helpdesk has been chosen for the EUR AMHS.

*Note.– The Terms of Reference of the Helpdesk are to be defined. For the time being the helpdesk is of passive nature and is intended to operate off-line.*

## **6.4.3 Configuration Management**

6.4.3.1 Although Configuration Management is a local responsibility there is a significant requirement for co-ordination of addressing and routing information.

6.4.3.2 An AMHS Offline Management Centre is created to consolidate, co-ordinate and distribute AMHS address and routing information across the EUR Region. The configuration changes follow the 4-week AIRAC cycle.

6.4.3.3 The following information will be co-ordinated and maintained:

- Declaration and changes to PRMD;
- Declaration and changes to mapping of “4 character Location Indicator” to “Geographical Unit”, i.e. relationship between OU1 and O attributes;
- Declaration and changes to mappings of “8 character AFTN address” and Geographical unit i.e. CN to OU1;
- Declaration and changes of network addresses for primary and backup boundary MTAs and AFTN/AMHS Gateways;
- General awareness of deployment and transition activities;
- Routing and alternate routing.

6.4.3.4 ICAO will hold a registry of PRMDs.

#### **6.4.4 Accounting management**

6.4.4.1 In the initial phase of AMHS operation accounting will not be performed.

6.4.4.2 Cost assignment will eventually be locally introduced.

*Note.– The requirements for eventual later implementation of the facility are under study.*

#### **6.4.5 Performance management**

##### **6.4.5.1 Performance**

6.4.5.1.1 Online performance monitoring includes monitoring of metrics like queue size, transit times utilisation factors and status, where manual and/or automatic procedures are being invoked when thresholds are passed.

6.4.5.1.2 Offline performance management is aimed at the ability of the service to meet future needs. This requires accurate statistics on traffic patterns and system performance.

6.4.5.1.3 Both management aspects are local to an ANSP and no matter for international harmonisation.

##### **6.4.5.2 Statistics**

6.4.5.2.1 It is recommended that statistics should be collected using the internationally agreed objects (MTA). (For detailed requirements for statistics see 5.9)

6.4.5.2.2 Implementers should use a flexible design and should be able to obtain the information down to the level of individual operators or recipients with a granularity of 30 minutes or better.

6.4.5.2.3 A minimum set of monthly statistic should be exportable. Such a file should contain daily as well as peak hour statistical data in a standard format. Detailed specifications are provided in the ATS Messaging Management Manual.

##### **6.4.5.3 Reporting of statistics**

6.4.5.3.1 The statistic file containing daily as well as peak hour statistical data should be provided to the ATS Messaging Management Centre monthly.

6.4.5.3.2 There are no specific recommendations for statistics that are to be reported for national use.

#### **6.4.6 Security Management**

6.4.6.1 The management of security within a State is considered to be a local issue. However, when a breach of security or a threat is detected, it is recommended that the helpdesk is informed, and that the helpdesk subsequently passes on security warnings to other States and Regions and co-ordinates exchanges.

## 6.5 Implementation of AMHS Management in the EUR Region

### 6.5.1 Introduction

6.5.1.1 This section is intended to give the reader information necessary for an understanding of AMHS Management as currently planned, and has been written for those implementing, operating, using and planning the procurement of management systems.

6.5.1.2 Section 6.5.3 defines a group of functions known as "off-line" management functions. To a certain extent, these functions represent updated CIDIN Management Functions already being carried out. They are not highly demanding in an implementation and operational sense and they are typically introduced first.

6.5.1.3 The other functions in the context of AMHS Management are termed "on-line" functions. They are defined in section 6.5.4.

### 6.5.2 On-line and off-line management

#### 6.5.2.1 The Terms “Off-line” and “On-line”

6.5.2.1.1 A basic principle underlying the structure of AMHS management is the distinction between the two groups of functions designated as "off-line" and "on-line" management functions.

6.5.2.1.2 **Off-line** functions do not need to be executed in a short time period. These relate to medium and long-term requirements and include, e.g., collection and processing of information from COM Centres (inventory, planning, addressing, statistics, etc.) and preparation of configuration proposals (routing, addressing). Provision of technical support (help desk, consultancy, etc.) is also included in off-line management, even though these functions do not belong to one of the OSI Functional Areas.

6.5.2.1.3 **On-line** management refers to functions that need to be executed in a short time period in order to maintain the level of service required from AMHS. This necessitates the rapid exchange of management information between the COM centres and possibly between the COM centres and AMHS Management Unit (on-line Regional Help Desk).

#### 6.5.2.2 The Distinction

6.5.2.2.1 The terms “off-line” and “on-line” are used to classify two separate groups of functions. The following table summarises the distinction with respect to a number of characteristics.

Characteristic	off-line	on-line
on-line connections between the systems?	not essential	essential
human intervention in the “management loop”	yes	in transition phase and in exceptional circumstances



Characteristic	off-line	on-line
new application software to be implemented in AMHS centres?	not essential	essential
operational time constraint	a few time-critical functions	more time-critical functions
degree of technical sophistication	relatively simple	more complex
period of operation	office hours	7 days / 24 hours
order of implementation	it is being implemented	to be studied

**Table 8: Characteristics of “off-line” and “on-line” functions**

### 6.5.2.3 Implementation Aspects

6.5.2.3.1 The off-line group of functions is less demanding than the on-line functions to implement. They can be introduced within a relatively short timescale.

6.5.2.3.2 The on-line functions are more ambitious and not yet defined as the off-line functions. The timescale for their implementation is longer and network management experience in the AMHS context needs to be built up before they can be introduced. The introduction of an on-line mode of operation supplementing the off-line mode is expected to be a major design issue.

### 6.5.3 AMHS off-line Management

6.5.3.1 AMHS off-line Management is described in the ATS Messaging Management Manual. ATS Messaging refers to the integrated, heterogeneous messaging environment comprising AFTN, CIDIN and AMHS.

6.5.3.2 The ATS Messaging Management Manual provides the information necessary for understanding and operating within the environment of the integrated AFTN/CIDIN/AMHS off-line Management.

6.5.3.3 The ATS Messaging Management Manual describes the framework in which the services of the ATS Messaging Management Centre (AMC) are provided to States/ANSPs in the EUR/NAT Regions, and, in a more limited manner, to States/ANSPs in other Regions.

6.5.3.4 Two categories of AMHS off-line Management Functions are defined, i.e.: Implementation Support Functions primarily for States in the process of implementing AMHS, and Operational Functions in support of States with AMHS in operational service:

6.5.3.5 Implementation Support Functions:

- Download support information
- AMHS PDR monitoring
- Inter-working test support
- View operational data

- Implementation planning
- Helpdesk function

#### 6.5.3.6 Operational Functions:

- Network inventory
- Network planning
- Routing management
- Address management
- AMHS user capabilities management
- Security management (for future development)
- Statistics
- Support

6.5.3.7 The AMC procedures associated with the performance of the AMHS off-line management functions by Co-operating COM Centres (CCCs) are described in detail in the ATS Messaging Management Manual.

#### 6.5.3.8 The goal of the AMC is twofold:

- the AMC facilitates the transition from AFTN/CIDIN to AMHS, particularly with routing management and address management functions;
- the AMC provides new tools in support of AMHS operations.

6.5.3.9 When States in the EUR/NAT Regions implement AMHS, the transition is complex to manage. Considering that ill-coordinated actions may create risks for the overall ATS Messaging quality of service, it is therefore recommended that every State implementing AMHS in the EUR/NAT Regions participates in AMC activities.

6.5.3.10 Detailed information on the AMC organisation, features, functions, procedures and implementation issues can be obtained from the AMC.  
(<https://www.eurocontrol.int/amc/>).

### **6.5.4 AMHS on-line Management**

- to be studied if needed -

## **7 Tests and validation of AMHS systems**

### **7.1 Objective**

7.1.1 Experience has shown that, although it is claimed that systems have been implemented according to the one set of protocol specifications, they are often not capable of inter-working. This is due to errors in implementation or to different interpretations of the specifications (SARPs and Doc 9880). Testing and validation of systems according to the same set of principles aims at the detection of such errors and the prevention of incompatibility instances.

7.1.2 The primary objective of this chapter is to formulate recommendations for testing the ability of a given AMHS implementation to function as required at the level of an International Communication Centre within the AFTN/CIDIN/AMHS network environment.

7.1.3 This chapter provides general information on the AMHS testing concept. The actual testing methodologies, configurations and procedures are defined in Appendix C, Appendix D and D-UA, Appendix E and Appendix F. In these Appendices, tests are described in sufficient detail to give an appreciation of the variety of functions that are covered, the facilities required and the expected results.

### **7.2 General Principles**

7.2.1 The creation of standards for testing is subject to consideration by a number of standardization bodies concerned with open systems (e.g. ISO, ITU-T).

7.2.2 In these standards, *conformance testing* is prescribed for testing a protocol implementation (IUT) with respect to its specification.

7.2.3 If conformance testing could be done in a complete and correct manner then two different implementations that passed the conformance test would be interoperable. In practice, conformance testing does not necessarily reach the intended point of completeness and correctness. Consequently, conformance testing may be followed by *interoperability testing* to determine whether two or more implementations will produce the expected behaviour under actual operating conditions.

7.2.4 In a more detailed analysis of the objectives of conformance and interoperability testing the following distinctions can be made:

- The primary objective of interoperability testing is to confirm the end-to-end interoperability of two systems, which have both been developed to a common specification. Performance and load testing are possible, at least in principle.
- Conformance testing can be defined as the exhaustive testing of an IUT against the functions and procedures defined in an agreed standard. Performance and load testing are not usually part of conformance testing which is restricted to the “logic” of the protocol implementation.

7.2.5 Furthermore, two essential practical differences between conformance and interoperability testing should be pointed out:

- Incorrect protocol behaviour. – Conformance testing allows “provoking” of the IUT, through incorrect protocol behaviour, in order to study its stability. Interoperability testing provides only limited possibilities due to (normally) correct protocol implementations in real systems.
- Distribution of test locations. – Conformance testing can be performed locally between IUT and a conformance testing equipment. Interoperability testing is normally distributed over at least two remote locations, therefore requiring more co-ordination effort.

7.2.6 Figure 6 depicts the principal differences in test arrangements for interoperability and conformance testing.

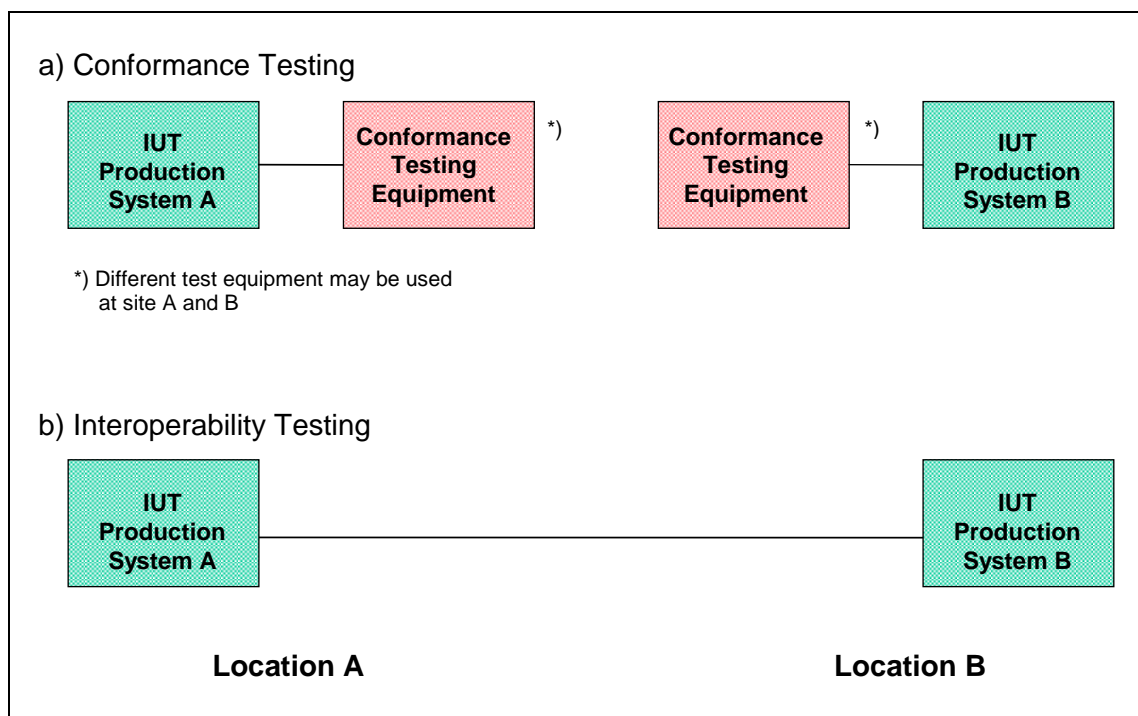


Figure 6: Principal test arrangements for conformance and interoperability testing

## 7.3 AMHS testing concept

### 7.3.1 Testing strategy

7.3.1.1 AMHS system implementations consist of protocol layers according to the principles of the Reference Model for Open Systems Interconnection. The AMHS functions to be tested reside in the application layer of the ISO/OSI reference model. The underlying layers provide supporting communication services, however they are not primarily subject to testing.

7.3.1.2 Figure 7 provides a generic functional presentation of an AMHS implementation under test.

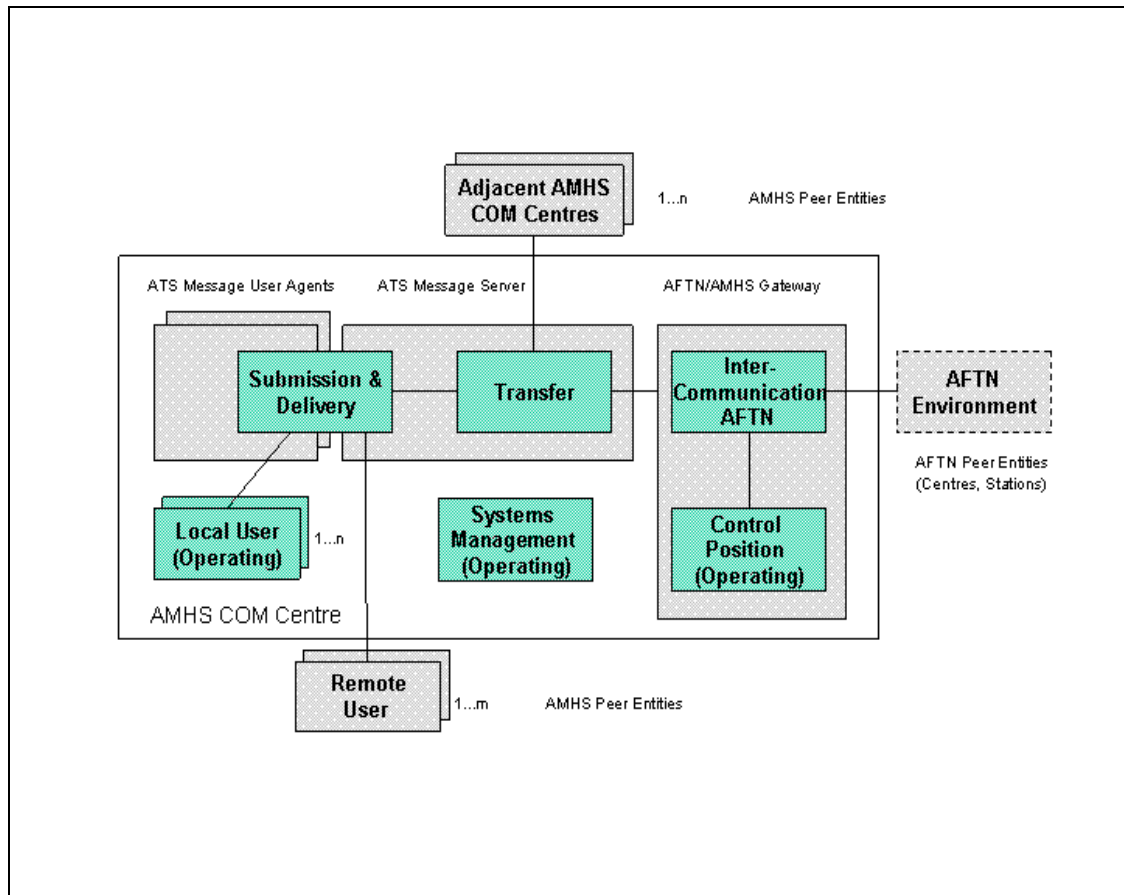


Figure 7: Functional view of an AMHS IUT

## 7.3.2 AMHS testing phases

### 7.3.2.1 AMHS Conformance testing

7.3.2.1.1 For the purposes of AMHS, *conformance testing* is considered mandatory and shall be performed in parallel with or after the acceptance testing of a new system.

7.3.2.1.2 The new system is tested as a *black box*, meaning that that required features are verified by observation of the external *behaviour* of the IUT upon stimulation with well-defined input events.

7.3.2.1.3 A *conformance testing equipment*, called the *AMHS test tool*, is used typically for the production of such input events and the monitoring of the resulting outputs from the IUT. In case such an AMHS test tool or reference implementation is *not* available, a test environment could be configured by using functional components of the IUT itself. Testing in such an environment may be seen as consistency testing rather than conformance testing.

7.3.2.1.4 The main AMHS functional areas covered by conformance testing are:

- Transfer of messages probes and reports;
- Submission of messages and probes / delivery of messages and reports;
- Intercommunication with AFTN;

- Naming and addressing;
- Parameters;
- System management functions.

### 7.3.2.2 AMHS Interoperability testing

7.3.2.2.1 After successful completion of conformance testing, *interoperability testing* is recommended, particularly in the following cases:

- one of the involved parties is establishing a first AMHS connection;
- one of the involved parties is joining an AMHS island;
- the connection is being established between AMHS implementations of manufacturers which have not performed IOT before;
- one of the involved parties requests to perform interoperability tests.

7.3.2.2.2 With due consideration given to paragraph 7.3.2.2.1, and by mutual agreement, interoperability testing may be omitted between two Com Centres that are in the same AMHS island and already have operational AMHS connections.

7.3.2.2.3 As a first step to interoperability testing the interconnection between pairs of systems should be established and checked.

7.3.2.2.4 Then, at the bilateral level, the following functional areas should be covered:

- Submission, Transfer and Delivery operations (AMHS to AMHS)
- Gateway operations (AFTN to AMHS)
- Gateway operations (AMHS to AFTN)
- Gateway operations (AFTN to AMHS to AFTN)
- Gateway operations– special case scenarios
- Stress traffic situations
- Submission/Transfer/Delivery and Relay operations
- Test of special situations

7.3.2.2.5 At the multilateral level, interoperability testing involves more than two organizations, interchanging normal messages and generating specific reactions of their systems.

### 7.3.2.3 AMHS Pre-operational testing

7.3.2.3.1 Before going into operation, *pre-operational testing* should be carried out between the AMHS systems concerned, within the operational network environment and using duplicated operational traffic.

7.3.2.3.2 The configuration details and the actual sub-sets of traffic to be used, have to be co-ordinated between the test partners. In any case, the operational traffic selected for this purpose should be traffic under the responsibility of the Communication Centres under test.

7.3.2.3.3 The AMHS relation between the two systems is considered operational, if the exchange of the total of operational traffic between them (or a subset of that), is performed by means of AMHS only. For this operational traffic no other transmission means (AFTN or CIDIN) is used.

## **7.4 Integration to the operational network**

7.4.1 A common stepwise transition plan for migrating a successfully tested system into the operational AFTN/CIDIN/AMHS network should be applied.

## **8 Operational procedures and Recommendations**

### **8.1 Introduction of a new AMHS COM Centre in the AMHS network**

#### **8.1.1 Scope of the procedure**

8.1.1.1 This procedure specifies the actions necessary to perform the introduction of a new AMHS COM Centre in the International AMHS network. The term "new AMHS COM Centre" may refer to three distinct cases:

- the COM Centre already exists. It provides CIDIN and possibly conventional AFTN connectivity, and it supports the AFTN application of the CIDIN for national users. AMHS is introduced as an additional functionality and service in the existing COM Centre. This case corresponds to the majority of COM Centres in the EUR/NAT Regions;
- the COM Centre already exists. It provides conventional AFTN connectivity. AMHS is introduced as an additional functionality and service in the existing COM Centre. This case corresponds to a smaller number of COM Centres in the EUR/NAT Regions;
- the COM Centre does not exist yet and it will start operational service directly with AMHS. Although theoretically possible, there is no such case foreseen in practice in the EUR/NAT Regions. This case will consequently not be further discussed in the present version of the procedure<sup>5</sup>.

8.1.1.2 From the above, it results that, strictly speaking, the procedure is related to the introduction of the AMHS operational service in a COM Centre of the international AFTN/CIDIN/AMHS network.

#### **8.1.2 Target AMHS network**

8.1.2.1 The target AMHS network which this procedure aims at reaching, when applied to all COM Centres in the EUR/NAT Region, has the following characteristics:

- it is an integrated AMHS network, composed of one single AMHS island in which all COM Centres are interconnected;
- it is a fully-meshed network, which means that there is an any-to-any connectivity at the level of AMHS connections (associations between MTAs) between COM Centres.

#### **8.1.3 Assumptions**

8.1.3.1 The principles of [1] are used for the definition of procedure.

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<sup>5</sup> It might be subject for further study if a future major reorganisation of European COM Centres were envisaged in the future.



8.1.3.2 The procedure relies heavily upon the use of the ATS Messaging Management Centre, implementing off-line management of AFTN, CIDIN and AMHS.

#### **8.1.4 Qualitative objectives**

8.1.4.1 The proposed approach aims at three main goals:

1. to migrate all the flows conveyed over the CIDIN link to the AMHS connection. CIDIN connectivity is not maintained at the end of the transition;
2. to migrate operational flows progressively to the AMHS connection, so as to:
  - facilitate operational validation (reduce the number/extent of changes at each step, to facilitate the analysis of behaviour/results),
  - enable easy rollback, in case it would be absolutely needed;
3. to limit impact on COM Centres other than those to which the procedure is applied, to reduce as much as possible inter-Regional co-ordination tasks during transition. Co-ordination will still be needed anyway, making use of the AMC.

#### **8.1.5 General procedure**

8.1.5.1 The introduction of a new AMHS COM Centre to the operational AFTN/CIDIN/AMHS network shall be performed in a stepwise manner. Initially, the activation of an operational AMHS connection takes place, after appropriate lower layer connectivity has been implemented and bilateral interoperability testing has been successfully completed. Then progressive migration of AMHS, AFTN and CIDIN traffic to the new connection is performed.

8.1.5.2 The detailed description of this procedure is provided in the ATS Messaging Management Manual (see [12]).

### **8.2 Recommended default values for international MTA names and passwords**

#### **8.2.1 Introduction**

8.2.1.1 AMHS implementation requires the setting of the MTA names and passwords for each communication partner (MTA) connected. In a future fully meshed AMHS Network, unique identification of the MTAs would be required. Additionally, the naming should respect the knowledge and experiences of the operator staff, in order to avoid any unnecessary complications in the transition to AMHS.

8.2.1.2 One way to achieve this is to use a scheme, in which MTA names and passwords contain keywords which uniquely identify the MTA and facilitate recognition.

#### **8.2.2 Default values for international MTA names**

8.2.2.1 The recommended scheme of MTA names consists of:

- the term “MTA”;

- the Location Indicator of the MTA location; and
- a number (for future extensions if required).

8.2.2.2 All items are separated by a hyphen (hexadecimal 2D). The result is a printable string which can be exchanged in a message without difficulties.

*Example:* In accordance with this scheme the name of the MTA in Frankfurt, Germany should be: MTA-EDDD-1.

8.2.2.3 This scheme could be used for the national MTA naming as well.

### **8.2.3 Default values for international MTA passwords**

8.2.3.1 Password complications arise because manufacturers deviate in the interpretation of an “empty” password. Some implementations await “nothing”, some hexadecimal 00, others a single “space” character. To avoid misinterpretations during establishment of association(s) all tests could be performed with a common (known) password or with default passwords that follow the scheme recommended in the next section. Individual secure passwords should be established for operational systems, in order to ensure the necessary security of operational AMHS facilities.

8.2.3.2 The recommended scheme of the default password consists of:

- the term “ICAO”;
- the Location Indicator of the MTA location; and
- the specific number of the MTA.

8.2.3.3 All items are separated by a hyphen (hexadecimal 2D). The result is a printable string which can be exchanged in a message without difficulties.

*Example:* In accordance with this scheme the default password of the MTA in Frankfurt, Germany should be: ICAO-EDDD-1.

8.2.3.4 By following this scheme, the default passwords of future MTAs can be determined at any time and the integration of new MTAs in a fully meshed AMHS Network topology could be simplified. Nevertheless in order to increase the level of systems protection, the use of secure passwords by operational MTAs is highly recommended. The creation of quality passwords and their proficient management in general would improve security.

## **8.3 Recommended setting of timers**

### **8.3.1 Message related timers**

#### **8.3.1.1 MTS Timer related to Message lifetime**

8.3.1.1.1 If the MTS (Message Transfer System) cannot deliver a message within a determined period of time, a NDR will be returned to the originator.

8.3.1.1.2 If this MTS timer is different per message priority and potentially different at each MTA, an AMHS user will receive NDRs depending on the different settings, which could create confusion and result in inaccurate NDR handling.

8.3.1.1.3 In order to ensure that the behaviour of the MTS is predictable it is recommended that every MTA in the AMHS network should use the same timer values related to message lifetime and that these values should be the same for messages of any priority.

8.3.1.1.4 Furthermore, the recommended value for the MTS timer related to message lifetime should ensure that:

- temporary communication failure / maintenance actions do not cause timer expiry;
- Direct Users do not receive unnecessary NDRs (if values are too low);
- message lifetime does not conflict with ‘latest delivery’ (optional Element of Service);

8.3.1.1.5 Based on the above analysis, the following values of the message lifetime MTS timer are recommended:

Message priority	Message lifetime
Urgent	168 hours (7 days)
Normal	168 hours (7 days)
Non-urgent	168 hours (7 days)
Report	168 hours (7 days)

**Table 9: Recommended Message Lifetime per priority**

8.3.1.1.6 This recommended timer setting ensures that in normal situations no NDR is generated with diagnostic code ‘maximum-time-expired’. AMHS COM Centre operators can act in accordance with established procedures, when a message queue is detected.

### **8.3.1.2 Usage of the Latest Delivery Time**

8.3.1.2.1 As outlined in Doc 9880 the Element of Service “latest delivery time” should never be set in an MTCU.

8.3.1.2.2 Furthermore, it is recommended not to set this parameter in an UA by default.

### **8.3.2 Network related timers**

Tbd.

## 8.4 Processing of AFTN SVC messages in the Gateway

### 8.4.1 Introduction

8.4.1.1 This section is retained for reasons of reference. In previous versions of this document this paragraph contained recommendations deviating from ICAO Doc 9880 – 1<sup>st</sup> Edition requirements for specific processing of AFTN SVC messages in the MTCU. The rationale of the deviating recommendation is preserved in the following paragraph. ICAO Doc 9880 – 2<sup>nd</sup> Edition, published in 2016, is in line with the EUR AMHS Manual recommendations. Therefore, this section has been reworked.

8.4.1.2 The AMHS COM Centre implementations in the EUR Region as well as in other Regions are expected to be adapted to the EUR AMHS Manual or the ICAO Doc 9880 – 2<sup>nd</sup> Edition at different speeds. As a result, in the operational environment some COM Centres may still conform to now obsolete SARPs. Hence, the observed processing of AFTN SVC messages in an MTCU might correspond to the scenario described in the following section. This section is kept with the intention to explain potential issues related to AFTN SVC messages.

8.4.1.3 It is recommended to implement the processing of AFTN SVC messages in MTCU according to ICAO Doc 9880 – latest edition.

### 8.4.2 Rationale of the previously deviating recommendation

#### 8.4.2.1 AFTN Service message “ADS ... UNKNOWN ...”

8.4.2.1.1 In a specific operational scenario in a mixed AFTN/AMHS environment it was observed that the original originator information of AFTN SVC messages “ADS ... UNKNOWN ...” was lost due to double conversion from AFTN (SVC message) to AMHS (NDR) and back to AFTN (SVC message).

8.4.2.1.2 Such a scenario was relevant during the migration to AMHS when traffic was relayed by AMHS “bridging” two AFTN areas by an AMHS connection as shown in Figure 8.

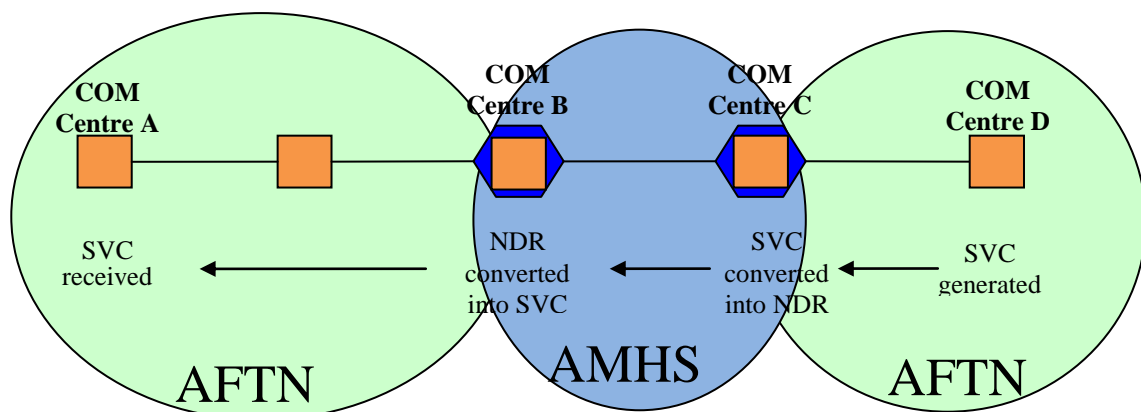


Figure 8: Mixed AFTN/AMHS environment

8.4.2.1.3 If COM Centre A sends an AFTN message to COM Centre D containing an unknown address, then COM Centre D generates an AFTN SVC message “ADS ... UNKNOWN ...”, addressed to the originator of the AFTN message.

8.4.2.1.4 Due to the fact that between A and D an AMHS network existed, the AFTN SVC message originated from COM Centre D was converted into an NDR in COM Centre C, if the subject AMHS message had passed through COM Centre C.

8.4.2.1.5 The NDR generated in COM Centre C was converted back to an AFTN SVC message “ADS ... UNKNOWN ...” in COM Centre B, but with the originator of COM Centre B.

8.4.2.1.6 Consequently, COM Centre A received an AFTN SVC message “ADS ... UNKNOWN ...” with the originator of COM Centre B. The originator of the original AFTN SVC message (“ADS ... UNKNOWN ...” generated by COM Centre D) was lost, as a report has no originator.

#### **8.4.2.2 Other AFTN Service messages**

8.4.2.2.1 Due to the strict implementation of the SVC processing according to obsolete ICAO Doc 9880, Part II – Edition 1, paragraph 4.2.1.4, it might not have been possible in some cases to convert and/or forward AFTN SVC messages through the AFTN/AMHS Gateway. In particular, an AFTN SVC message could have been prevented from passing through an AMHS link interconnecting two AFTN islands. Such behaviour did not meet the operational expectations. In order to avoid the potential loss of any AFTN SVC message paragraphs 4.2.1.4 and 4.2.1.12 have been modified in ICAO Doc 9880, Part II – Edition 2.

8.4.2.2.2 Any AFTN SVC message “QTA RPT” requesting from an originator repetition of an incorrectly received message should be processed according to Annex 10 Vol. II, 4.4.11.1 and 4.4.16.2.2. If the message(s) requested for repetition cannot be repeated for any reason, ICAO Doc 9880, Part II – Edition 2, 4.2.1.12 requests the AFTN component to forward the AFTN SVC message to the MTCU for further processing, i.e. conversion into an IPM conveying the AFTN SVC message towards its destination.

8.4.2.2.3 ICAO Doc 9880, Part II – Edition 2, 4.2.1.4 e) requests the AFTN component to forward any other AFTN SVC message which is not addressed to the AFTN/AMHS Gateway to the MTCU for further processing in the same manner.

8.4.2.2.4 Any SVC message addressed to the AFTN/AMHS Gateway should be processed as specified in Annex 10, Vol. II. Depending on the position where the AFTN SVC message is to be displayed (control position, local AFTN terminal or local AMHS User Agent) the AFTN SVC message may or may not pass through the MTCU; this is considered a local implementation matter.

#### **8.4.3 Recommended processing related to AFTN Acknowledgment messages**

8.4.3.1 Guidance concerning this special case may be found in the section that follows.

## **8.5 Recommended practices for processing of AFTN acknowledgement messages (SS ACK) / Receipt Notification (RN)**

### **8.5.1 Introduction**

8.5.1.1 In ICAO Annex 10, Vol. II, it is foreseen that AFTN distress messages (SS priority) are acknowledged directly by their actual recipients, to ensure that they are aware of the distress situation and have undertaken appropriate actions.

8.5.1.2 In the same spirit, it has been foreseen in ENRD, Section 6.9, that a User Agent (UA) shall be able to generate a Receipt Notification (RN) only after manual user/operator interaction as a reaction to the reception of an AMHS message with priority “urgent” (distress message).

8.5.1.3 In ICAO Doc 9880, Part II, section 4.5.3, it is foreseen that an AFTN/AMHS Gateway converts an incoming RN to an AFTN acknowledgement message, assuming that the subject AFTN distress message has traversed this Gateway. If it has not, an NDR is generated, an error report is provided to the Gateway control position and manual investigation is required.

8.5.1.4 As a consequence of the above, in a mixed AFTN/AMHS environment there is a potential risk that an AFTN acknowledgement message will not reach its intended recipient in a timely manner, if the corresponding RN is addressed to an AMHS Indirect User and it has to follow a different route than the original AFTN distress message (asymmetric routing). In such cases, the concerned MTCU is not able to convert the RN into the corresponding AFTN acknowledgement message due to the absence of the related subject message.

### **8.5.2 Recommended practices**

In order to minimise such operational situations during the transition phase towards AMHS the following practices are recommended:

#### **8.5.2.1 Manual processing of the acknowledgement by a UA**

8.5.2.1.1 The AMHS user at the UA should have the choice to acknowledge an ATS message with priority SS in the ATS-message-header either by an RN or by an ATS message in the format of the Acknowledgement message.

8.5.2.1.2 The decision is taken by the AMHS user at the UA knowing that the originator of this AFTN distress message is an AMHS Direct User (generate an RN) or an AMHS Indirect User (send an ATS message in the format of the Acknowledgement message).

8.5.2.1.3 In the current AFTN/AMHS transition phase the default assumption is “AMHS Indirect User”.

#### **8.5.2.2 Automated processing of the acknowledgement by a UA**

8.5.2.2.1 If an AMHS user at the UA intends to acknowledge an ATS message with priority SS in the ATS-message-header, he initiates a function of the UA which generates either an RN or an ATS message in the format of the Acknowledgement message.

8.5.2.2.2 The decision which kind of message (RN or ATS message) needs to be generated should be taken by the UA based on the user capability information made available via the Directory Service (EDS).

8.5.2.2.3 If the originator of the distress message is an AMHS Direct User, an RN is generated, otherwise (originator is an AMHS Indirect User) an ATS message in the format of the Acknowledgement message is generated.

8.5.2.2.4 If the originator of the distress message cannot be identified by directory means, the default value is “AMHS Indirect User”.

### **8.5.2.3 Processing of AFTN Acknowledgement by an AFTN/AMHS Gateway**

8.5.2.3.1 The occurrences of unconvertible RNs can be further reduced by the application of temporary conversion alternatives at the level of the AFTN/AMHS Gateway.

8.5.2.3.2 Specifically, the possibility for the AFTN/AMHS Gateway to convey incoming AFTN Acknowledgement messages into IPMs, instead of converting them to RNs, should be made available, preferably as a configuration parameter, and used during the transition phase.

## **8.6 Recommended processing of characters not authorized by ICAO Annex 10, Volume II**

### **8.6.1 Introduction**

8.6.1.1 This section presents recommended processing of characters or character sequences not authorized by ICAO Annex 10, Volume II and contained in the text part of a message or the optional heading information (OHI). Guidance for implementation is provided for the AFTN component and the MTCU of an AFTN/AMHS Gateway, as well as for User Agents.

### **8.6.2 Recommended processing by an AFTN component**

8.6.2.1 ICAO Doc 9880, Part II, section 4.2.1.7 requires the AFTN component to pass to the MTCU only messages which are constructed in strict accordance with the provisions of ICAO Annex 10, Volume II, 4.4.15.1 through 4.4.15.3.12 and 4.4.15.6. This requirement includes that the message text may only contain characters allowed by ICAO Annex 10, Vol. II, 4.1.2.

8.6.2.2 How this requirement is achieved, should be considered as a local implementation matter. It is the objective of section 8.6.2.3 to provide guidance for appropriate implementation in the AFTN component of the AFTN/AMHS gateway.

#### *8.6.2.3 Guidance for implementation*

8.6.2.3.1 Each of the two implementations described in the following paragraphs 8.6.2.3.2 and 8.6.2.3.3 ensures that the AFTN component of an AFTN/AMHS gateway passes to the MTCU only messages of which the text and the OHI only contain characters and character sequences as authorized by ICAO Annex 10, Vol. II, 4.1.2.

8.6.2.3.2 The AFTN component of an AFTN/AMHS gateway can check the text and the OHI, if any, of each message received from the AFTN for characters and character sequences not authorized by ICAO Annex 10, Vol. II, 4.1.2. If such characters or character sequences are

identified, the message can be forwarded to the Control Position for manual correction and retransmission by an operator. When no error is detected, the AFTN component passes the message to the MTCU for further processing.

8.6.2.3.3 Alternatively, the AFTN component of an AFTN/AMHS gateway can apply local conversion to the text and the OHI, if any, of each message received from the AFTN. Any character or character sequence not authorized by ICAO Annex 10, Vol. II, 4.1.2 is replaced by an allowed character or character sequence. Principles for local conversion are proposed below.

#### 8.6.2.3.3.1 *Local conversion*

Local conversion may be based on the following rules:

- conversion of each IA5IRV alphabetical character in the text or in the OHI, if it is in lower case, into the equivalent upper case character;
- replacement by a question-mark (“?”, 0x3F) of each character in the text or the OHI, of which the use is not authorized by Annex 10, Volume II, 4.1.2;
- replacement by a question mark (“?”, 0x3F) of each character within a character sequence in the text or the OHI of which the use is not authorized in Annex 10, Volume II, 4.1.2.

#### 8.6.2.3.3.2 *Event at the Control Position*

The Control Position of the AFTN/AMHS gateway should display an event for each message which was subject to character conversion. The operator should identify the originating station of the message and take action in order to avoid further submission of non-standard messages.

### **8.6.3 Recommended processing by an MTCU**

#### **8.6.3.1 Initial processing of AMHS messages**

8.6.3.1.1 ICAO Doc 9880, Part II, section 4.5.2.1 defines initial processing of AMHS messages upon reception by the MTCU. More specifically, section 4.5.2.1.6 specifies how the MTCU shall process IPMs depending on the abstract-value of the *conversion-with-loss-prohibited* element. The conditions listed in sub-clauses 4.5.2.1.6 c) and d) do not cover all possible cases of characters or character sequences in the text that are not authorized by Annex 10. Furthermore, sub-clauses 4.5.2.1.6 c) and d) do not foresee any reaction by the MTCU in case the abstract-value of the element *conversion-with-loss-prohibited* is ‘prohibited’ and at least one character or character sequence in the optional-heading-information or the originators-reference is not authorized by Annex 10.

#### 8.6.3.1.2 *Guidance for implementation*

8.6.3.1.2.1 The MTCU shall process an IPM according to ICAO Doc 9880, Part II, section 4.5.2.1. Especially for the processes described in 4.5.2.1.6 c) and d) it is recommended to consider all possible cases of not authorized characters or character sequences in the text or the optional-heading-information or the originators-reference in compliance with the procedure described below.



8.6.3.1.2.2 Referring to ICAO Doc 9880, Part II, section 4.5.2.1.6 c), in case the MTCU receives an IPM, at which the abstract-value of the element *conversion-with-loss-prohibited* is “prohibited” and at least one punctuation symbol in the text or the optional-heading-information or the originators-reference is not authorized in Annex 10, Volume II, 4.1.2, then:

- 1) the message should be rejected for all the message recipients; and
- 2) a non-delivery report should be generated as specified in ICAO Doc 9880, Part II, section 4.5.6 with the following elements taking the following abstract-values in all the *per-recipient-fields* of the report:
  - i) “conversion-not-performed” for the *non-delivery-reason-code*; and
  - ii) “punctuation-symbol-loss” for the *non-delivery-diagnostic-code*.

8.6.3.1.2.3 Referring to ICAO Doc 9880, Part II, section 4.5.2.1.6 d), in case the MTCU receives an IPM, at which the abstract-value of the element *conversion-with-loss-prohibited* is “prohibited” and at least one alphabetical character in the text or the optional-heading-information or the originators-reference is not authorized by Annex 10, Volume II, 4.1.2, then:

- 1) the message should be rejected for all the message recipients; and
- 2) a non-delivery report should be generated as specified in ICAO Doc 9880, Part II, 4.5.6 with the following elements taking the following abstract-values in all the *per-recipient-fields* of the report:
  - i) “conversion-not-performed” for the *non-delivery-reason-code*; and
  - ii) “alphabetic-character-loss” for the *non-delivery-diagnostic-code*.

8.6.3.1.2.4 In case the MTCU receives an IPM, at which the abstract-value of the element *conversion-with-loss-prohibited* is “prohibited” and the text or the optional-heading-information or the originators-reference contains at least one IA5IRV character sequence not authorized by Annex 10, Volume II, 4.1.2, taking into account sequences of lower case characters, upper case characters and combinations thereof then:

- 1) the message should be rejected for all the message recipients; and
- 2) a non-delivery report should be generated as specified in ICAO Doc 9880, Part II 4.5.6 with the following elements taking the following abstract-values in all the *per-recipient-fields* of the report:
  - i) “conversion-not-performed” for the *non-delivery-reason-code*; and
  - ii) “conversion-with-loss-prohibited” for the *non-delivery-diagnostic-code*;

8.6.3.1.2.5 In case the MTCU receives an IPM, at which the abstract-value of the element *conversion-with-loss-prohibited* is “prohibited” and the text or the optional-heading-information or the originators-reference contains at least one character which is not in the IA5IRV character repertoire (non-IA5IRV), then:

- 1) the message should be rejected for all the message recipients; and
- 2) a non-delivery report should be generated as specified in ICAO Doc 9880, Part II 4.5.6 with the following elements taking the following abstract-values in all the *per-recipient-fields* of the report:
  - i) “conversion-not-performed” for the *non-delivery-reason-code*; and
  - ii) “conversion-with-loss-prohibited” for the *non-delivery-diagnostic-code*.

*Note.— Occurrence of non-IA5IRV characters is limited to the body part type “general-text-body-part” with repertoire identifiers {1, 6, 100} (Basic-1).*

8.6.3.1.2.6 In case the MTCU receives an IPM, at which the abstract-value of the element *conversion-with-loss-prohibited* is “prohibited” and the text or the optional-heading-information or the originators-reference contains at least one control character other than <CR> or <LF> and not part of an escape sequence indicating which character set following characters belong to, then:

- 1) the message should be rejected for all the message recipients; and
- 2) a non-delivery report should be generated as specified in ICAO Doc 9880, Part II 4.5.6 with the following elements taking the following abstract-values in all the *per-recipient-fields* of the report:
  - i) “conversion-not-performed” for the *non-delivery-reason-code*; and
  - ii) “conversion-with-loss-prohibited” for the *non-delivery-diagnostic-code*.

8.6.3.1.2.7 In case the MTCU receives an IPM, at which the abstract value of the element *conversion-with-loss-prohibited* is “prohibited” and

- the text contains at least one line which is longer than 69 characters (ICAO Doc 9880, 2<sup>nd</sup> Edition, Part II, 4.5.2.1.6 b)) and the text or the optional-heading-information or the originators-reference meet any condition as described in 8.6.3.1.2.2 – 8.6.3.1.2.6, or

- the text or the optional-heading-information or the originators-reference meet at least two of the conditions as described in 8.6.3.1.2.2 – 8.6.3.1.2.6, including the case that one of these conditions is met by the text and another one is met by the optional-heading-information or the originators-reference, then:

- 1) the message should be rejected for all the message recipients; and
- 2) a non-delivery-report should be generated as specified in ICAO Doc 9880, Part II, 4.5.6 with the following elements taking the following abstract-values in all the *per-recipient-fields* of the report:

- i) “conversion-not-performed” for the *non-delivery-reason-code*; and
- ii) “multiple-information-loss” for the *non-delivery-diagnostic-code*.

This recommendation is in line with ICAO Doc 9880, 2<sup>nd</sup> Edition, Part II, 4.5.2.1.6 e) considering text with several types of information loss (“line-too-long”, “punctuation-symbol-loss” and “alphabetic-character-loss”).

### **8.6.3.2 IPM conversion**

8.6.3.2.1 ICAO Doc 9880, Part II, section 4.5.2.2 defines the generation of an AFTN message by the MTCU, depending on the results of the initial processing of a received IPM. ICAO Doc 9880, Part II, section 4.5.2.2.11 specifies rules for the conversion of the IPM text of an AMHS message with a valid body part type into the text part of an AFTN message.

8.6.3.2.2 ICAO Doc 9880, Part II, section 4.5.2.2.10 specifies how the OHI of an AFTN message derived from an IPM received by the MTCU, is generated. Nevertheless, ICAO Doc 9880, Part II does not specify any conversion rules for the OHI similar to those mentioned for the IPM text in 8.6.3.2.1 above. In order to ensure that the OHI of an AFTN message, derived from an IPM, does not contain any characters or character sequences not authorized by Annex 10, Vol. II, 4.1.2, the optional-heading-information or the originators-reference of the subject IPM should be converted as recommended in the following paragraph.

8.6.3.2.3 *Guidance for implementation*

8.6.3.2.3.1 For the conversion of an IPM message by the MTCU, the content of the OHI of an AFTN message derived from an IPM is according to ICAO Doc 9880, Part II, section 4.5.2.2.10, in compliance with the following procedure:

- conversion of each character which is not in the IA5IRV character repertoire into an IA5IRV character according to the locally defined conversion rules;
- conversion of each IA5IRV character, if it is in lower case, into the equivalent upper case character;
- replacement by a question-mark (“?”, 0x3F) of each character of which the use is not authorized in Annex 10, Vol. II, 4.1.2;
- replacement by a question-mark (“?”, 0x3F) of each character within a character sequence of which the use is not authorized in Annex 10, Vol. II, 4.1.2.

*Note.— If the capability of the AFTN connected to the AFTN/AMHS Gateway is extended in terms of character set then the procedures described above may be adapted in accordance with the extended AFTN capabilities.*

#### **8.6.4 Recommended processing by a UA**

8.6.4.1 ICAO Doc 9880, Part II, does not explicitly define the characters allowed in the optional-heading-information element (section 3.3.3.7.5 and 3.3.4.4) in contradiction to section 3.3.3.8 that specifies that ‘the ATS-message-text element shall be composed of IA-5 characters with no further restriction’.

##### *8.6.4.2 Guidance for implementation*

8.6.4.2.1 Upon generation of an IPM by an originator supporting the basic ATSMHS service the optional-heading-information element of the ATS-message-header is composed of IA-5 characters with a maximum length of either:

- a) 53 characters if the message priority differs from “SS”; or
- b) 48 characters if the message priority is “SS”.

8.6.4.2.2 When an IPM is generated by an originating extended ATSMHS user and all intended recipients of the message support the extended ATSMHS service, the optional heading information is contained in the originators-reference IPM heading field. The value of the optional heading information is composed of IA-5 characters with a maximum length of either:

- a) 53 characters if the message priority differs from “SS”; or
- b) 48 characters if the message priority is “SS”.

## **9 Miscellaneous**

### **9.1 Legal Recording in AMHS**

#### **9.1.1 Annexes to the Convention on Civil Aviation**

9.1.1.1 In an AMHS environment the rules for recording of communication are valid as expressed in Annexes 10 [1] and 11 [2] to the Convention on Civil Aviation, in sections 3.5 and 6 respectively. For easy reference, the pertinent paragraphs are quoted below.

9.1.1.2. A telecommunication log, written or automatic, shall be maintained in each station of the Aeronautical telecommunication service except that in an aircraft station, when using radiotelephony in direct communication with an aeronautical station, need not maintain a telecommunication log. [Annex 10, 3.5.1.1]

9.1.1.3 Telecommunication log, written or automatic, shall be retained for a period of at least thirty days. When logs are pertinent to inquiries or investigations they shall be retained for longer periods until it is evident that they will be no longer required. [Annex 10, 3.5.1.5]

9.1.1.4 Recommendation.— In all cases where automatic transfer of data to and/or from air traffic services computers is required, suitable facilities for automatic recording should be provided. [Annex 11, 6.2.2.3.3]

9.1.1.5 All facilities for direct-speech or data link communications between air traffic services units and between air traffic services units and appropriate military units shall be provided with automatic recording. [Annex 11, 6.2.2.3.7]

9.1.1.6 Recommendation.— All facilities for direct speech or data link communications required under 6.2.2.2.1 [Annex 11] and 6.2.2.2.2 [Annex 11] and not otherwise covered by 6.2.2.3.7 [Annex 11] should be provided with automatic recording. [Annex 11, 6.2.2.3.8]

9.1.1.7 Recommendation.— In all cases where automatic exchange of data between air traffic services computers is required, suitable facilities for automatic recording should be provided. [Annex 11, 6.2.3.5]

#### **9.1.2 Manual on detailed technical specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols**

9.1.2.1 In the Manual on detailed technical specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols [Doc 9880] the logging provisions for the Basic and Extended ATS Message Handling Service are defined. The AMHS management shall include logging provisions which are defined for the ATS Message User Agent, for the ATS Message Server and for the AFTN/AMHS Gateway. Pertinent extracts from this Manual are presented below for easier reference.

9.1.2.2 AMHS Traffic logging upon origination [Doc 9880 , Part II, 2.7]

9.1.2.2.1 An AMHS Management Domain shall be responsible for long-term logging of all messages in their entirety, which are originated by its direct AMHS users, for a period of at least thirty days.

### 9.1.2.3 Traffic logging requirements at an ATS Message User Agent [Doc 9880, Part II, 3.1.3]

9.1.2.3.1 *Note.— The requirement expressed in 9.1.2.2.1 may be implemented in the ATS Message User Agent.*

### 9.1.2.4 Traffic logging requirements at an ATS Message Server [Doc 9880, Part II, 3.2.3]

9.1.2.4.1 The ATS Message Server shall perform a long-term logging, for a period of at least thirty days, of the actions taken with respect to every message received at the ATS Message Server, whether from an ATS Message User Agent or from another ATS Message Server, and to every report received or generated at the ATS Message Server.

9.1.2.4.2 For the long-term logging of information related to a message submitted to or received by an ATS Message Server, the following parameters related to the message shall be logged:

- a) *message-identifier*;
- b) *priority*;
- c) *content-type*;
- d) *originator-name*;
- e) *recipient-name* elements on responsibility list;
- f) *message-content-size*;
- g) last element of the *trace-information* (if any);
- h) *arrival-time* or *submission-time*;
- i) *transfer destination* (if any);
- j) *transfer time* (if any);
- k) *this-recipient-name* (if message delivery is performed by the ATS Message Server);
- l) *delivery-time* (if any);
- m) *delivery and/or non-delivery reports generated* (if any); and
- n) *event date/time*.

*Note.— The responsibility list identifies recipients whose perRecipientIndicator responsibility bit has the abstract-value “responsible”.*

9.1.2.4.3 For the long-term logging of information related to a report generated or received by an ATS Message Server, the following parameters related to the report shall be logged:

- a) *report-identifier*;
- b) *subject-identifier*;
- c) *actual-recipient-name* elements;
- d) *report-type* elements;
- e) *report-destination-name*;
- f) last element of the *trace-information* (if any);
- g) *arrival-time* in the ATS Message Server or generation time;
- h) *transfer destination* (if any);
- i) *transfer time* (if any);
- j) *OR-name* of the report recipient (if report delivery is performed by the ATS Message Server);
- k) *delivery-time* (if any); and
- l) *event date/time*.

### 9.1.2.5 Traffic logging requirements at an AFTN/AMHS Gateway [Doc 9880, Part II, 4.3.1]

9.1.2.5.1 The Message Transfer and Control Unit shall perform long-term logging, as specified in 9.1.2.5.2 to 9.1.2.5.5, for a period of at least thirty days, of information related to the following exchanges of information objects with the ATN Component and with the AFTN Component:

- a) AMHS message transfer out (to the ATN Component);
- b) AMHS report transfer out (to the ATN Component);
- c) AMHS message transfer in (from the ATN Component);
- d) AMHS report transfer in (from the ATN Component);
- e) AFTN message conveyance out (to the AFTN Component);
- f) AFTN message conveyance in (from the AFTN Component);
- g) AFTN SVC message indicating an unknown addressee indicator conveyance in (from the AFTN Component); and
- h) AFTN SVC message indicating an unknown addressee indicator conveyance out (to the AFTN Component).

9.1.2.5.2 For the long-term logging of information related to an AMHS Message Transfer In and AFTN message conveyance out, the following parameters, relating to the messages, shall be logged by the Message Transfer and Control Unit:

- a) *input message-identifier*;
- b) *IPM-identifier*, if any;
- c) *common-fields* and either *receipt-fields* or *non-receipt-fields* of IPN (Inter-Personal Notification), if any;
- d) action taken thereon (reject with *non-delivery-reason-code* and *non-delivery-diagnostic-code*, convert as AFTN message, convert as AFTN acknowledgement message, splitting due to number of recipients or message length, delivery report generation);
- e) event date/time;
- f) Origin line of converted AFTN message or AFTN SVC message, if any; and
- g) transmission identification of AFTN message(s) or AFTN SVC message(s), if returned by the AFTN Component.

9.1.2.5.3 For the long-term logging of information related to AFTN message conveyance in and AMHS Message Transfer Out, the following parameters, relating to the messages, shall be logged by the Message Transfer and Control Unit:

- a) Origin line of AFTN message (or AFTN acknowledgement message);
- b) transmission identification of AFTN message or AFTN SVC message, if any;
- c) action taken thereon (reject with rejection cause, convert as IPM, convert as RN, AFTN SVC message indicating an unknown addressee indicator generation);
- d) event date/time;
- e) *MTS-identifier*, if any; and
- f) *IPM-identifier*, if any.

9.1.2.5.4 For the long-term logging of information related to an AMHS Message Report In and/or AFTN Service Message indicating an unknown addressee indicator conveyance out, the following parameters, relating to the report and/or AFTN SVC message, shall be logged by the Message Transfer and Control Unit:

- a) *report-identifier* (if report in);
- b) *subject-identifier* (if report in);
- c) action taken thereon if report in (discard, convert into AFTN SVC message);
- d) event date/time;

- e) Origin line of converted AFTN SVC message (if AFTN SVC message out);
- f) Origin line of subject AFTN message (if AFTN SVC message out and no report in); and
- g) transmission identification of AFTN message or AFTN SVC message, if any.

9.1.2.5.5 For the long-term logging of information related to an AFTN SVC message indicating an unknown addressee indicator conveyance in and/or to an AMHS Message Report Out, the following parameters, relating to the AFTN SVC message and/or report, shall be logged by the Message Transfer and Control Unit:

- a) Origin line of converted AFTN SVC message (if AFTN SVC message in);
- b) Origin line of subject AFTN message (if AFTN SVC message in);
- c) transmission identification of AFTN message or AFTN SVC message, if any;
- d) action taken thereon if AFTN SVC message in (discard, convert into AMHS report);
- e) *report-identifier* (if report out);
- f) *subject-identifier* (if report out);
- g) MTS-identifier of resulting message, if the AFTN service message was converted into an IPM; and
- h) event date/time

9.1.2.5.6 If, for any reason, the processing of the AMHS component cannot be properly achieved, the procedure shall unsuccessfully terminate and:

- 1) logging of the error situation and reporting to a control position, and
- 2) storage of the concerned message for appropriate action at the control position,

shall be performed.

*Note.— ICAO Doc 9880, Part II [3] specifies all cases for the AFTN/AMHS Gateway in more detail.*

### **9.1.3 Additional logging requirements for PRMD “EUROPE” and AMHS MDs adjacent to this MD**

#### **9.1.3.1 AMHS Traffic logging upon origination**

9.1.3.1.1 In addition to 9.1.2.2.1 above, in the specific case of PRMD “EUROPE”, the referred Doc 9880 requirement applies to each European Service or Application part of the “EUROPE” AMHS Management Domain.

#### **9.1.3.2 Traffic logging requirements at an ATS Message Server**

9.1.3.2.1 In addition to 9.1.2.4.2 above, in the specific case of PRMD “EUROPE” and of PRMDs adjacent to PRMD “EUROPE”, for the long-term logging of information related to a message submitted to or received by an ATS Message Server, the following parameters related to the message shall also be logged:

- a) the last element of the *internal-trace-information* (if any).

9.1.3.2.2 In addition to 9.1.2.4.3 above, in the specific case of PRMD “EUROPE” and of PRMDs adjacent to PRMD “EUROPE”, for the long-term logging of information related to a

report generated or received by an ATS Message Server, the following parameters related to the report shall also be logged:

- a) the last element of the *internal-trace-information* (if any).

## 9.2 Specific requirements applying to PRMD “EUROPE”

### 9.2.1 Local identifier values in MTS-Identifiers

9.2.1.1 There is no base standard requirement ensuring that MTS-Identifiers generated by different MTAs managed by different organisations within PRMD “EUROPE” would be different. From a theoretical viewpoint, there is a possible risk of duplicate use of MTS-Id. An additional requirement applying only to MTAs belonging to PRMD “EUROPE” is therefore needed to remove this risk. The requirement is specified in the clause which follows.

9.2.1.2 Organisations coordinating under the aegis of ICAO-Europe to form PRMD “EUROPE” shall agree upon, and implement a technical means ensuring uniqueness of the *local-identifier* sub-part values of the *MTS-identifier* and *report-identifier* elements generated by MTAs belonging to PRMD “EUROPE”.

9.2.1.3 It may be noted that one such technical means could be the insertion of the *MTA-name* as a prefix to the *local-identifier* element.

### 9.2.2 Trace-information and internal-trace-information

9.2.2.1 *Trace-information* is used in MHS/X.400 systems to provide information about the path followed by a message, probe or report. However, *trace-information* includes only MD-related records. In the context of PRMD “EUROPE” where MTAs are managed by independent organisations, *trace-information* is more difficult to use and may be seen as ambiguous. Additional requirements applying only to MTAs belonging to PRMD “EUROPE” are therefore needed to enable accurate identification of the source MTA and related organisation. These requirements are specified in the clause which follows. They are based on the use of *internal-trace-information* which, conversely to *trace-information*, includes the *MTA-name* and thus provides an accurate reference. The base X.400 standards allow a MTA to remove internal-trace-information before sending a message, probe or report to an adjacent MD. This has to be avoided for MTAs belonging to PRMD “EUROPE”, to make sure that:

- a) the accurate tracing information is maintained when exiting PRMD “EUROPE”, and
- b) loop detection algorithms counting the number of trace-information-elements and internal-trace-information-elements will be effective for messages exchanged within PRMD “EUROPE”.

9.2.2.2 MTAs belonging to PRMD “EUROPE” shall insert *internal-trace-information*, if not yet present, in the messages, probes and reports which they transfer. If internal trace is present, these MTAs shall append an *InternalTraceInformationElement* to *internal-trace-information*. MTAs belonging to PRMD “EUROPE” shall be prevented from removing *internal-trace-information* from messages, probes and reports transferred to MTAs outside PRMD “EUROPE”.

9.2.2.3 Due to the use of *internal-trace-information* for tracing purposes when exiting PRMD “EUROPE”, it becomes necessary that this information become subject to long-term logging for all MTAs adjacent to PRMD “EUROPE”, and by extension, for all ATS Message Servers.



### **9.2.3 Use of PerDomainBilateralInformation**

9.2.3.1 *PerDomainBilateralInformation* is an optional element which may be used in MHS/X.400 systems to exchange (at P1 level) information related to a message, probe or report and intended for a given MD. There is no known example of ANSPs using this information element in the European AMHS, however, this is not precluded by any of the applicable standards and documents. A *PerDomainBilateralInformation* information element includes the Global Domain Identifier (GDI) of the MD for which the information is intended. In the context of PRMD “EUROPE” where MTAs are managed by independent organisations, bilateral information, if used, would be between a PRMD other than “EUROPE” and an organisation part of PRMD “EUROPE”. In such a case, the GDI for PRMD “EUROPE” may be seen as ambiguous to specify the intended recipient of bilateral information. Additional requirements applying to MTAs belonging to PRMD “EUROPE”, and to their partners for this type of exchanges, are therefore needed to enable accurate identification of the destination MTA and related organisation. These requirements are specified in the clause which follows.

9.2.3.2 If *PerDomainBilateralInformation* is used in reception by one of the organisations coordinating under the aegis of ICAO-Europe to form PRMD “EUROPE”, the sub-element *bilateral-information* shall be structured in a way such that the relevant organisation and/or its MTA can be identified unambiguously among the organisations forming PRMD “EUROPE” and/or their MTAs.

## **9.3 Institutional / financial issues**

- to be developed -

## **Attachment A: Change Control Mechanism of the EUR AMHS Manual and its Appendices.**

*Note.— Changes, problems or defects detected concerning the Standards and Recommended Practices (SAPS) summarised in the ICAO Documentation (Doc 9880 as well as Doc 9537) are not affected by this mechanism. For these documents the change control process set up by ACP and its Working groups, by using PDR (Preliminary Defect Reports) applies.*

Proposals to introduce changes to the EUR AMHS Manual and its Appendices may arise from users, implementers or manufacturers. The procedure for submission and processing of a Defect Report (DR) or a Change Proposal (CP) involves the following steps:

### **A.1 Procedure for DR**

- a) A problem is detected concerning the operation of the AMHS network, which is reflected in the EUR AMHS Manual and may be attributed to implemented AMHS procedures and/or inconsistencies in the documentation.
- b) The problem is reported to the Rapporteur of the Planning Group of the AST TF, by submission a defect report (DR). A standard reporting format is used (see attached template).
- c) The Rapporteur assigns a number and priority to the defect report and introduces it to the agenda of an upcoming meeting of the PG.
- d) The PG evaluates the report and either adopts it as a working item or rejects it. The party, which submitted the defect report, is notified accordingly.
- e) Experts of the PG are assigned to the problem and milestone dates are set. Outside expertise may be invited to participate, as appropriate.
- f) The PG develops proposals for resolving the problem and submits them to the AST TF for approval.
- g) The AST TF approves or rejects the presented proposals. In case of the latter, the subject is referred back to the PG (step e) or discarded.
- h) The PG drafts appropriate text for amendment of the EUR AMHS Manual and submits it to the AST TF for approval.
- i) The AST TF approves or rejects the proposed material. In case of the latter, the subject is referred back to the PG (step h).
- j) The proposed amendments to the EUR AMHS Manual are presented to the EASPG for approval.
- k) Solutions are implemented.

Steps (f) and (h) may run in parallel.

## A.2 Procedure for CP

The same structured procedure, with the exception of steps (f) and (g) applies in case of proposed enhancements to the EUR AMHS Manual or inconsistencies in existing EUR AMHS documentation.

In this case, a change proposal (CP) should be submitted to the PG. The format of the CP is similar to that of the DR.

(If Doc 9880 documentation is concerned the change control process set up by ACP and its Working groups has to be followed (see Attachment B).)

## A.3 Template for Defect Reports / Change Proposals

TEMPLATE FOR DEFECT REPORTS / CHANGE PROPOSALS	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px 10px; text-align: center;"><b>DR</b></div> <div style="border: 1px solid black; padding: 2px 10px; text-align: center;"><b>CP</b></div> </div>	
<b>Title:</b>	Short, indicative textual name
<b>Reference:</b>	Number assigned by the PG Rapporteur
<b>Originator reference:</b>	Provided by the originator
<b>Submission date:</b>	
<b>Submitting State/Organization:</b>	
<b>Author:</b>	
<b>Contact Information:</b>	e-mail, fax, telephone and postal address
<b>Experts involved:</b>	
<b>Status:</b>	Assigned by the PG Rapporteur
<b>Priority:</b>	Assigned by the PG Rapporteur
<b>Document reference:</b>	Affected section(s) of the EUR AMHS Manual or its Appendices
<b>Description of defect:</b>	Nature of the problem in detail Reason(s) for requesting changes
<b>Assigned expert(s):</b>	
<b>Task history:</b>	Working Papers and Information Papers Produced on the subject
<b>Proposed solution:</b>	Including amendments to the text, if feasible

<b>DR/CP STATUS control sheet</b>				
<b>Event</b>	<b>Date</b>	<b>Status</b>		<b>Remark</b>
DR or CP received submission date		Set to submitted		
discussion at PG/ ...		Set to accepted	Set to rejected	
Date for development of proposals/ solutions				Responsible:
discussion at PG/ ...		Set to resolved		
presentation to AST TF/ ...		Set to adopted	Set to rejected	
Date for development of amendment to the Manual				Responsible:
discussion at PG/		Set to approved		
presentation to AST TF/ ...		Set to approved for application		
Additional DATES and comments				

## **Attachment B: Amendment Procedure for the detailed Technical Specifications for Air/Ground and Ground/Ground Data Links**

(updated 2008-06-12)

Published in the Report of the twelfth meeting of the Aeronautical Communications Panel (ACP),  
Working Group M (WG M) -(Reconstituted), Montreal, 16-19 June 2008

### **B.1 Introduction**

B.1.1 Detailed technical specifications for air/ground and ground/ground data link systems are contained in the following ICAO documents:

ATN/OSI	Doc 9880, Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols
ATN/OSI	Doc 9705, Manual on technical provisions of the aeronautical telecommunication network (to be withdrawn)
ATN/OSI	Doc 9739, Comprehensive Aeronautical Telecommunication Network (ATN) Manual (to be withdrawn)
AMS(R)S	Doc AMSRS, Manual for Aeronautical Mobile Satellite (Route)_Service
VDL Mode 2	Doc 9776, Manual on VHF Digital Link (VDL) Mode 2
VDL Mode 3	Doc 9805, Manual on VHF Digital Link (VDL) Mode 3 (currently not being maintained)
VDL Mode 4	Doc 9816, Manual on VHF Digital Link (VDL) Mode 4
HF data link	Doc 9741, Manual on HF Data Link

### **B.2 Amendment Procedure**

B.2.1 ACP Working Group M (WG M) will continue to maintain the material identified in section B.1.1 as indicated in the terms of reference agreed in ACP. In this task, the working group will consider proposals for amending this material as a result of ongoing validation of the detailed technical specifications and experience gained during the implementation of these systems. Amendments are necessary when a statement of information in the manuals or their supporting material, if not corrected, will prevent the system from meeting its stated operational requirements.

B.2.2 Amendment Proposals will be submitted to ACP Working Group M, preferably in the format of Table B-2. ACP Working Group M will review each amendment proposal and agree on the changes, to be made to the relevant detailed technical specifications. The amendment proposals will be distributed to the members of WG M by the secretariat through placing the

information on the ACP website. This would also enable all panel members to also consider the proposals.

**B.2.3 Amendment Proposals may be required when:**

- i. implementation hardships occur, resulting from schedule and/or costs;
- ii the detailed technical specifications over-specify the actual requirements for achieving interoperability or may unnecessarily constrain implementation or further development;
- iii the detailed technical specifications inadequately specify the actual requirements for achieving the intended operational capabilities;
- iv ambiguities in the detailed technical specifications result in different implementations that are not interoperable;
- v interoperability discrepancies are discovered.

*Note.— Should a State [or a relevant international organization] identify a safety critical problem, which might e.g. necessitate grounding of aircraft, an ICAO fast track procedure should be established. Such a procedure would enable an amendment of the SARPs at very short notice (e.g. 1 - 2 months). A fast track procedure is not expected to be required for detailed technical specifications.*

## **B.3 Maintenance procedures**

**B.3.1 The following maintenance procedures apply:**

- i interested parties submit an amendment proposal, preferably using the form in Table B-2. The proposal will address aspects relating to the backwards compatibility of the amendment proposal. The proposal will also indicate a category from Table B-1 and identify a coordinator.
- ii the amendment proposals will be placed on the ACP website as soon as practicable;
- iii WG M will consider amendment proposals will be submitted not later than four weeks prior to a WG M meeting;
- iv the amendment proposal will be reviewed during meetings of WG M. If necessary, a special group will be formed to study detailed aspects of the proposal. If the working group cannot complete its review, the amendment proposal will be added to the list of action items.
- v the Working Group M will recommend to ICAO on the amendments necessary;
- vi ICAO will publish regularly the necessary amendments to the manuals on detailed technical specifications and implementation aspects.

**Table B-1 Category of an Amendment Proposal (AP)**

Category	Description
Critical	The AP addresses a serious flaw in the manuals text which either: a) if implemented in an operational system could jeopardize safety in the air, and/or b) would result in non-interoperability between operational systems which have implemented the amendment proposal and those which have not.
Bug	The AP addresses bugs in the manuals, which affect SARPs, and/or operational implementations to be fully compliant with the technical provisions in the manuals.
Clarification	The AP clarifies an ambiguity or omission in the manuals. APs in this category are useful but not essential to ensure interoperability and proper functioning of the system.
Minor	The AP clarifies or improves the internal consistency of the manuals, but has no effect on implementations.
Editorial	The AP corrects one or more editorial or typographical errors in the manuals, or adds detail, which has no effect on implementations.
Registration	The AP proposes placeholders for activities other than those identified in the manuals.

**Table B-2 Format of an Amendment Proposal (AP)**

<b>Title:</b>	
<b>AP working paper number and date:</b>	
<b>Document(s) affected:</b>	<p>Doc 9880, Manual on detailed technical specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols</p> <p>Doc AMSRS, Manual for Aeronautical Mobile Satellite (Route) Service</p> <p>Doc 9776, Manual on VHF Digital Link (VDL) Mode 2,</p> <p>Doc 9816, Manual on VHF Digital Link (VDL) Mode 4</p> <p>Doc 9741, Manual on HF Data Link</p>
<b>Sections of Documents affected:</b>	
<b>Coordinator:</b>	
<b>Coordinators address:</b>	
<b>Coordinators Phone:</b>	
<b>Coordinators Fax:</b>	
<b>Coordinators e-mail address:</b>	
<b>Category:</b>	CRITICAL   BUG   CLARIFICATION   MINOR   EDITORIAL   REGISTRATION
<b>Problem description:</b>	
<b>Background:</b>	
<b>Backwards compatibility:</b>	
<b>Amendment Proposal:</b>	
<b>WG-M status:</b>	PROPOSED   APPROVED   PENDING   REJECTED

**-END-**





# EUR AMHS Manual

## Appendix A

Abbreviations, Glossary and Definitions	
Document Reference:	EUR AMHS Manual, Appendix A
Author:	Planning Group
Revision Number:	Version 16.0
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0.2	15/08/2005	Updated by abbreviations used in the EUR AMHS Profile and Conformance Test documents	Chapter 1
0.3	28/09/2005	Insert of additional abbreviations	Chapter 1
0.4	28/01/2006	Insert of additional abbreviations and definitions	Chapter 1 and 2
0.5	08/03/2006	Reformatting ( <i>Notes</i> )	all
0.6	19/03/2006	Insert of additional abbreviations	Chapter 1
1.0	27/04/2006	Adopted version (AFSG/9)	
1.1	11/01/2007	Insert of abbreviations from Manual update of Main Part and Appendices	Chapter 1
2.0	26/04/2007	Adopted version (AFSG/10)	
3.0	24/04/2008	Adopted version (AFSG/11) – without changes	
3.1	17/11/2008	Change of references from ICAO Doc 9705 to ICAO Doc 9880 (CP-AMHSM-08-006), editorial improvements	References, Chapter 2 Note
3.2	13/02/2009	Incorporation of CP-AMHSM-08-007	Chapter 2 - <i>Indirect AMHS user</i>
3.3	11/03/2009	Update of the referenced documents	References
4.0	02/04/2009	Adopted version (AFSG/12)	
5.0	17/06/2010	Adopted version (AFSG/14) – without changes	
5.1	24/09/2010	Incorporation of CP-AMHSM-10-001, minor editorial updates	References
5.2	30/11/2010	Remark concerning Doc 9739 (CAMAL) added	References
6.0	14/04/2011	Adopted version (AFSG/15)	

6.1	19/03/2012	Incorporation of abbreviations used in CP-AMHSM-11-001, CP-AMHSM-12-001 and CP-AMHSM-12-002	Chapter 1
7.0	26/04/2012	Adopted version (AFSG/16)	
7.1	25/03/2013	Incorporation of CP-AMHSM-12-006	References, Chapter 1, Chapter 2
8.0	25/04/2013	Adopted version (AFSG/17)	
8.1	12/03/2014	Incorporation of CP-AMHSM-12-014	Chapter 1
9.0	10/04/2014	Adopted version (AFSG/18)	
9.1	19/03/2015	Incorporation of CP-AMHSM-14-004,	Chapter 1 and 2
9.2	23/03/2015	Incorporation of CP-AMHSM-15-001	Chapter 1 and 2
10.0	23/04/2015	Adopted version (AFSG/19)	
10.1	04/04/2016	Incorporation of CP-AMHSM-15-007	Chapter 1
11.0	26/04/2016	Adopted version (AFSG/20)	
11.1	31/03/2017	Incorporation of CP-AMHSM-17-001	Chapter 1
12.0	28/04/2017	Adopted version (AFSG/21)	
12.1	23/04/2018	Incorporation of CP-AMHSM-17-003, Incorporation of CP-AMHSM-17-004	Chapter 1, References
13.0	27/04/2018	Adopted version (AFSG/22)	
14.0	05/03/2019	Adopted version (AFSG/23) – without changes	
14.1	26/11/2019	Incorporation of CP-AMHS-19-002  Adaption: According to COG/74&RCOG/11 Decision /4, Approval of AFS to SWIM Transition Task Force (AST TF) Terms of Reference (ToR) and coherent Work Programme, the Author of EUR Doc 020 changed from “AFSG PG” to “AST PG”.	all
14.2	30/09/2020	Incorporation of DR-AMHSM-19-003	Chapter 1 and 2
15.0	12/11/2020	Adopted version (AST TF/01)	
16.0	20/10/2021	Adopted version (AST TF/02)	



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<b>3. DEFINITIONS OF ELEMENTS OF SERVICE.....</b>	<b>24</b>

## References

### ICAO Documentation

- [1] Aeronautical Telecommunications, Annex 10, Volume III, Part I, Chapter 3
- [2] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS), Second Edition – 2016
- [3] ICAO Doc 9739, Comprehensive ATN Manual (CAMAL), Part 1, Section 5.1 Abbreviations (not further maintained by ICAO)
- [4] ICAO Doc 9739, Comprehensive ATN Manual (CAMAL), Part 1, Section 5.2 Definitions (not further maintained by ICAO)
- [5] ICAO Doc 9739, Comprehensive ATN Manual (CAMAL), Part 1, Section 5.3 ATNP Lexicon (not further maintained by ICAO)

### General technical literature

- [6] ISO/IEC 10021-2: Information Technology – Message Handling Systems (MHS): Overall architecture
- [7] ITU-T Recommendations X.400-X.499: Message Handling Systems
- [8] ITU-T Recommendations X.500-X.599: Directory
- [9] ITU-T Recommendations X.800-X.849: Security
- [10] ITU-T Recommendations X.850-X.899: OSI applications

## 1. Abbreviations

(The list has been composed by the abbreviations included in the EUR AMHS Manual and its Appendices. It is noticed that the list also contains terms, not directly derived from the said manual, but taken from the ICAO Doc 9739, Comprehensive ATN Manual (CAMAL), Part 1, Section 5.1 Abbreviation, which was not further maintained by ICAO)

A			
A	administration-domain-name	AIRAC	Aeronautical information regulation and control
AAC	Aeronautical administrative communications	AIRMET	Information concerning en-route weather phenomena which may affect the safety of low-level aircraft operations
ACARS	Aircraft communication addressing and reporting system	AIS	Aeronautical information services
ACC	Area control centre	AIXM	Aeronautical Information Exchange Model
ACCESS	ATN Compliant Communications European Strategy Study	AMC	ATS Messaging Management Centre
ACI	Access Control Information	AMH	Application (profile) Message Handling
ACK	Acknowledgement	AMHS	ATS message handling system
ACP	Aeronautical Communications Panel (ICAO)	AMI	Address Mapping Data Import Process
ACSE	Application control service element	AMP	Address Mapping Procedure
Ad	Destination Address (CIDIN)	AMS	Aeronautical mobile service
AD	Administrative domain	AMSS	Aeronautical mobile satellite service
ADEXP	Aeronautical Data Exchange Protocol	AMS(R)S	Aeronautical Mobile Satellite (Route) Service
ADI	Administrative domain identifier	AMT	Address Mapping Table
ADM	Administrative identifier	ANC	Air Navigation Commission
ADMD	Administration management domain	ANM	ATFM notification messages
ADS	Address (AFTN procedure signal)	ANP	Air Navigation Plan
ADS	Automatic dependent surveillance	ANSP	Air Navigation Service Provider
ADSL	Asymmetric Digital Subscriber Line	AOC	Aeronautical operational control
Ae	Entry address (CIDIN)	AOP	ATN OSI profile
AE	Application Entity	AP	Amendment Proposal
AES	Aircraft earth station	AP	Application process
AFI	Authority and format identifier	APC	Aeronautical passenger communications
AFS	Aeronautical fixed service	API	Application Programming Interface
AFSG	Aeronautical Fixed Services Group (ICAO EANPG)	APRL	ATN protocol requirements list
AFTN	Aeronautical fixed telecommunication network	APS	Address Publishing Service
AI	Aircraft identifier	ARO	ATS/Aerodrome Reporting Office
AIDC	ATS inter-facility data communication	ARS	Administrative region selector
AINSC	Aeronautical industry services communication	ASCII	American Standard Code for Information Interchange
		ASN.1	Abstract syntax notation one
		ASO	Application service object

AST OG	Operations Group of AST TF	CLNP	Connectionless-mode network protocol
AST PG	Planning Group of AST TF	CM	Context management
AST TF	AFS to SWIM Transition Task Force (EASPG)	CMA	Context management application
ATC	Air traffic control	CMC	CIDIN Management Centre
ATCC	Air traffic control centre	CN	common-name
ATFM	Air traffic flow management	CNS	Communications, navigation and surveillance
ATIS	Automatic terminal information service	CO	Connection oriented
ATM	Air traffic management	COM	Communication
ATN	Aeronautical telecommunication network	COMT	Communications Team (EUROCONTROL)
ATNP	Aeronautical telecommunication network panel	COP	Character oriented protocol
ATS	Air traffic services	COTS	Commercial Off The Shelf
ATSC	Air traffic services communication	CP	Change Proposal
ATSMHS	ATS message handling services	CPDLC	Controller-pilot data link communications
ATSO	Air Traffic Services Operator	CPU	Central Processing Unit
ATSP	Air Traffic Service Provider	CS	Community Specification
ATSU	Air traffic service unit	CSV	Comma Separated Values
AU	Access unit	CT	Conformance Test
Ax	Exit Address (CIDIN)	CTD	CIDIN Test Driver
		CTUA	User Agent Conformance Test
B			
Bas	Basic ATS Message Handling Service (as used in Appendix B)	D	
BC	Business class	DAP	Directory access protocol
BCD	Binary coded decimal	DCE	Data communications equipment
BIS	Boundary intermediate system	DIB	Directory information base
BER	Basic encoding rules	DIR	Use of directory (functional group)
BUFR	Binary Universal Form for the Representation of meteorological data	DISP	Directory information shadowing protocol
C			
C	country-name	DIT	Directory information tree
CA	Certification authority	DL	Distribution list
CAA	Civil aviation authority	DLAC	Data link application coding
CAAS	Common AMHS addressing scheme	DMD	Directory management domain
CAMAL	Comprehensive ATN Manual	DNIC	Data network identification code
CCAMS	Centralised Code Assignment & Management System	Doc	Document (ICAO)
CCC	Co-operating COM Centre	DOP	Directory operational binding protocol
CCITT	International telegraph and telephone consultative committee (now ITU-T)	DR	Delivery Report
CFMU	Central Flow Management Unit	DR	Defect Report
CIDIN	Common ICAO data interchange network	DR	Disconnect request
CL	Connectionless	DSA	Directory system agent
		DSP	Directory system protocol
		DSP	Domain specific part
		DTE	Data terminal equipment
		DUA	Directory user agent
E			
		EAD	European AIS Database

EANPG	European Air Navigation Planning Group (ICAO)
EASPG	European Aviation System Planning Group
EATCHIP	European ATC Harmonisation and Integration Programme
ECAC	European Civil Aviation Conference
ECDSA	Elliptic curves digital signature algorithm
ECG	EATMP Communication Gateway
EDS	European Directory Service
EIT	Encoded Information Type
EMA	Electronic Messaging Association
ES	End system
EUR	ICAO Region Europe
Ext	Extended ATS Message Handling Service (as used in Appendix B)

## F

FANS	Future air navigation system
FASID	Facilities and Services Implementation Document (Part of ANP)
FCAPS	Fault, configuration, accounting, performance, security (ISO Telecommunications Management Network model and framework for network management)
FDDI	Fibre distributed data interface
FG	Functional group
FIB	Forwarding information base
FIR	Flight information region
FIRST	First multipartite International Realisation of ICAO SARPs AMHS Trials
FIS	Flight information services
FIXM	Flight Information Exchange Model
FMS	Flight management system
FMTF	Flight Message Transfer Protocol
FP	Flight plan
FPG	Future Planning Group (now PG – Planning Group)
FPL	Flight plan
FT	Filling time
FTBP	File transfer body part

## G

GA	General aviation
GDI	Global Domain Identifier
GES	Ground earth station

## H

HDLC	High-level data link control
HF	High frequency
HMI	Human machine interface

## I

IA-5	International Alphabet No. 5
IACSP	International aeronautical communication service provider
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
ICAORD	ICAO Regional Director
ICC	Inter-centre co-ordination
ICD	International code designator
ICS	Internet communications service
ID	Identification
IDI	Initial domain identifier
IDP	Initial domain part
IDRP	Inter-domain routing protocol
IEC	International electro technical commission
IETF	Internet Engineer Task Force
IFR	Instrument flight rules
IHE	IPM heading extension(s)
IP	Internet protocol
iPAX	Internet protocol for ATS data exchange
IPM	Interpersonal messaging
IPMS	Interpersonal Messaging System
IPN	Interpersonal notification
IPS	Internet protocol suite
IPsec	Security Architecture for the Internet Protocol
IPv4	Internet protocol version 4
IPv6	Internet protocol version 6
IROG	Interregional OPMET Gateway
IT	Interoperability Test (as used in appendix E)
ITA-2	International Telegraph Alphabet No. 2
ITOT	ISO Transport Service on top of TCP
IS	Intermediate system
ISDN	Integrated services digital network
ISO	International organisation for standardisation
ISOPA	ISO protocol architecture
ISP	International standardised profile



ITU-T	International Telecommunication Union — Telecommunication Standardisation Sector
IUT	Implementation Under Test
IWXXM	ICAO Meteorological Information Exchange Model

## L

LAN	Local area network
LDAP	Lightweight Directory Access Protocol
LDIF	LDAP Data Interchange Format
LLC	Logical Link Control
LOC	Location identifier

## M

MAC	Medium Access Control
MD	Management domain
MET	Meteorological service
METAR	Aerodrome routine meteorological report (in meteorological code)
MF	MHS-form (address)
MH	Message Handling
MHE	Message Handling Environment
MHS	Message handling services
MHS	Message handling system
MIB	Management Information Base
MODE S	Mode select
MORTs	Managed objects requirement templates
MOTIS	Message-oriented text interchange system
MS	Message store
MS (94)	Message Store '94
MT	Message transfer
MTBF	Mean Time between Failures
MTCU	Message transfer and control unit
MTA	Message transfer agent
MTD	MTA Test Driver
MTE	Message Transfer Envelope
MTP	Manual teletypewriter procedures
MTS	Message transfer system

## N

NAT	ICAO Region North Atlantic
NAT-PT	Network Address Translation-Protocol Translation
NDR	Non-Delivery Report
NET	Network entity title
NM	Network Manager

NOC	National OPMET Centre
NOTAM	Notice to airmen
NPDU	Network protocol data unit
NRN	No-Receipt Notification
NSAP	Network service access point
NTN	Network terminal number
N-SEL	Network selector

## O

O	organization-name
OG	Operations Group (see AST OG)
OHI	Optional heading information
OID	Object identifier
OLDI	On-line Data Interchange
OPMET	Operational meteorological traffic
O/R	Originator/recipient
OSI	Open system interconnection
OSPF	Open Shortest Path First
OU	organizational-unit-names

## P

P	private-domain-name
P1	Message Transfer Protocol
P2	Inter-Personal Messaging Content Type
P3	Message Submission and Delivery Protocol
P7	Message Retrieval Protocol
PANS-RAC	Procedures for Air Navigation Services — Rules of the Air and Air Traffic Services
PCI	Protocol control information
PDAI	Predetermined distribution addressee indicator
PDR	Potential Defect Report
PDU	Protocol data unit
PENS	Pan-European Network Services
PER	Packed encoding rules
PG	Planning Group (see AST PG)
PIB	Policy information base
PICS	Protocol implementation conformance statement
PIREP	Pilot reports
PKI	Public Key Infrastructure
PN	personal-name
PRI	Priority
PRL	Profile requirement list
PRMD	Private management domain
PSAP	Presentation service access point
PSDN	Packet switched data network

PSEL	Presentation selector	SPSO	SPACE Participating States/ Organisations
PTT	Post, telephone and telegraph		
PVC	Permanent virtual circuit	S-SEL	Session selector
Q		SSAP	Session service access protocol
QoS	Quality of service	SSR	Secondary surveillance radar
QTA	AFTN procedure signal	SUT	System under test
R		SVC	Service message
		SVC	Switched Virtual Connection
		SWIM	System Wide Information Management
RAPNET	Regional ATS Packet Switched Network	SYS	System identifier
RD	Routing domain	T	
RDC	Routing domain confederation	TAF	Aerodrome forecast
RDF	Routing domain format	TBD	To be defined
RDI	Routing domain identifier	TC	Test Case (as used in appendix E)
RDN	Relative distinguished name	TCA	Tropical cyclone advisory
RFC	Request For Comment	TCP/IP	Transmission control protocol/internet protocol
RIB	Routing information base	TEN-T	Trans-European Transport Network
RN	Receipt notification	TP	Transport Protocol
ROC	Regional OPMET Centre	TSAP	Transport service access point
RODB	Regional OPMET Databank	TSEL	Transport selector
ROSE	Remote operations service element	TSMS	Test Suite and Monitoring System
RPT	Repeat (AFTN procedure signal)	U	
RQX	Meteorological databank request in IWXXM format	UA	User agent
RTE	Report Transfer Envelope	UHF	Ultra high frequency
RTSE	Reliable transfer service element	ULCS	Upper layer communications service
S		UTC	Universal Time Coordinated
SAR	Search and rescue	V	
SARPs	Standards and recommended practices	VAA	Volcanic ash advisory
SEC	Security (functional group)	VDL	Very high frequency digital link
SEL	Selector	VER	Version identifier
SICASP	SSR Improvements and Collision Avoidance Systems Panel	VHF	Very high frequency
SIGMET	Information concerning en-route weather phenomena which may affect the safety of aircraft operations	W	
SLA	Service level agreement	WAN	Wide area network
SN	Subnetwork	WG	Working Group
SND CF	Subnetwork Dependent Convergence Function	WG M	Working Group for Maintenance
SNMP	Simple Network Management Protocol	WMO	World Meteorological Organisation
SNPA	Subnetwork point of attachment	WPR	Work Package Report
SPACE	Study and Planning of AMHS Communications in Europe	X	
SPECI	Aerodrome special meteorological report (in meteorological code)	XF	Translated-form (address)
		XMIB	Cross-domain management information base
		XML	Extensible Markup Language

## 2. Glossary and Definitions

*Note. – This glossary of terms has been compiled using ITU-T X.400 [7], X.500 [8], X.800 [9], X.850 [10] series recommendations, ISO/IEC 10021-2 [6], ICAO AMHS technical specifications [2] and the Comprehensive ATN Manual (Definitions [4] and ATNP Lexicon [5]). In case of notable differences in definitions from various sources, all are presented, with the indication of the relevant source.*

**Access unit (AU)** In the context of a message handling system, the functional object, a component of MHS, that links another communication system (e.g. a physical delivery system or the telex network) to the MTS and via which its patrons engage in message handling as indirect users.

In the context of message handling services, the unit which enables users of one service to intercommunicate with message handling services, such as the IPM service. [7]

**Actual recipient** In the context of message handling, a potential recipient for which delivery or affirmation takes place. [7]

**Address domain** A set of address formats and values administered by a single address authority. Under the ISO plan, any address authority may define subdomains within its own domain and delegate authority within those subdomains. [4]

**Addressing authority** Defines formats and/or values of NSAP addresses within its jurisdiction. [4]

**Addressing (logical)** Logical addressing means that the address defined in the addressing plan and used to locate the addressed object is a virtual address which is a substitute of the actual (physical) address of an object. Address mapping functions have to fulfil this substitution, carefully maintaining unambiguity of identification of objects. [5]

**Addressing (physical)** Physical addressing means that the address defined in the addressing plan and used to locate the addressed object is the physical, i.e. hardwired, hard-coded or configured address of the object. An example of a physical address is the ICAO 24-bit aircraft address used for the SSR Mode S transponder. [5]

**Administration** In the context of ITU-T, an Administration (member of ITU) or a Recognised Operating Agency (ROA). [7]

**Administrative domain** A collection of end systems, intermediate systems and subnetworks operated by a single organisation or administrative authority. An administrative domain may be internally divided into one or more routing domains. [4]

**Administration domain name (A)** In the context of message handling, a standard attribute of a name form that identifies an ADMD relative to the country denoted by a country name. [7]

An administration-domain-name is a standard attribute that identifies an ADMD relative to the country denoted by a country-name. The value of an administration-domain-name is a Printable String chosen from a set of such strings that is administered for this purpose by the country alluded to above.

*Note. – In the context of ATSMHS, the administration-domain-name assigned to ICAO by ITU-T is A = "ICAO". [6]*

**Administration management domain (ADMD)** A management domain that comprises messaging systems managed (operated) by a service provider. [7]

A management domain that comprises systems managed (operated) by a service provider. [6]

**Aeronautical administrative communications (AAC)** Communications used by aeronautical operating agencies related to the business aspects of operating their flights and transport services. These communications are used for a variety of purposes, such as flight and ground transportation bookings, deployment of crew and aircraft, or any other logistic purposes that maintains or enhances the efficiency of overall flight operation. [4]

**Aeronautical mobile satellite service (AMSS)**

Provides packet-mode data and circuit-mode data and voice service to aircraft and ground users provided by a satellite subnetwork which comprises satellites, Aircraft Earth Stations (AESs), Ground Earth Stations (GESs) and associated ground facilities such as a network co-ordination centre. [4]

**Aeronautical operational control (AOC)**

Communication required for the exercise of authority over the initiation, continuation, diversion or termination of flight for safety, regularity and efficiency reasons. [4]

**Aeronautical passenger communications (APC)**

Communications relating to the non-safety voice and data services to passengers and crew members for personal communications. [4]

**Aeronautical telecommunication network (ATN)**

An internetwork architecture which allows ground, air-to-ground and avionics data subnetworks to interoperate by adopting common interface services and protocols based on the International Organisation for Standardisation (ISO) Open Systems Interconnection (OSI) reference model. [4]

**AF-address** The AF-address (AFTN-form address) is either an AFTN addressee indicator as specified in Annex 10, Volume II, paragraph 4.4, which is used to locate AMHS users, either direct or indirect, in the AFTN address space or a predetermined distribution addressee indicator (PDAI) as specified in Annex 10, Volume II, paragraph 4.4.14. [1]

**AFTN/AMHS Gateway:** An end system which provides bi-directional interworking between users of the ATS message service and users connected to the AFTN.

**Air traffic control (ATC)** A service operated by an appropriate authority to promote the safe, orderly and expeditious flow of air traffic. [4]

**Air traffic services communications (ATSC)** Communications related to air traffic services including air traffic control, aeronautical and meteorological information, position reporting and services related to safety and regularity of flight. This communication must involve one or more air traffic service administrations. This term is used for purposes of address administration. [4]

**Alternate recipient** In the context of message handling, a user or a distribution list to which a message or probe may be conveyed if, and only if, it cannot be conveyed to a particular preferred recipient. The Alternate Recipient may be specified by the originator, by the recipient, or by the recipient MD. [7]

**Application** Software providing services to its users as a consistent set of functionality; e.g. the ATC related functions implemented in the server(s) and/or controller work position host computers. [4]

**Application entity (AE)** Part of an application process that is concerned with communications within the OSI environment. The aspects of an application process that need to be taken into account for the purposes of OSI are represented by one or more AEs. [4]

**Application process (AP)** A set of resources, including processing resources, within a real open system which may be used to perform a particular information processing activity. [4]

**Application service** The abstract interface between the (N)-service and the (N)-service user, where N refers to the application layer; thus it is the boundary between the ATN-App-AE and the application-user. [4]

**ATN applications** Refers to applications that support ATM or aeronautical industry functions and that are designed to operate across an OSI communications system. ATN applications are always distributed applications, i.e. peer processes are hosted by different end systems which are interconnected. [4]

**ATN communication services** The ATN communication services are provided to ATN users that require ground-ground or air-ground data communication. The ATN accommodates different grades of services which can be expressed by quality of service parameters and by communication priorities. [5]

**ATN environment** The term relates to functional and operational aspects around the ATN as a complete end-to-end communication system. [4]

**ATN internet (ATNI)** An implementation of the ISO OSI network layer services and protocols for support of interprocess data communication between aeronautical host computers. It is defined to be the collection of the connected internetwork routers and subnetworks that conform to ATN internetwork requirements. [4]

**ATN network operating concept** An ATN network operating concept will address the administrative, operational, institutional and policy issues and additional (non-SARPs) technical aspects to enable the efficient and correct operation of the ATN. [4]

**ATN router** The communication element that manages the relaying and routing of data while in transit from an originating ATN host computer to a destination ATN host computer. In ISO terms, an ATN router comprises an OSI intermediate system and an end system supporting a systems management agent. [4]

**ATN routing domain confederation (RDC)** The ATN RDC is the set of interconnected routing domains that together form the ATN internetwork. [4]

**ATN services** The ATN services are provided to ATN users that require ground-ground or air-ground data communication. The ATN internet service is provided at the transport layer (service access point). The ATN accommodates different grades of services which can be expressed by Quality of Service parameters. [4]

**ATN system applications** System applications support the operation of the ATN communication services and are either not directly or not at all used by ATN users but rather by the service providers, operators or other ATN applications. Typical examples of ATN system applications are the ATN directory service, ATN context management or ATN systems management. [5]

**ATN systems management** The ATN Systems Management provides mechanisms for monitoring, control and co-ordination of resources necessary to provide ATN services. ATN systems management is based on OSI system management principles and may be distributed, centralised or local. [4]

**ATS message handling services (ATSMHS)** Procedures used to exchange ATS messages over the ATN such that the conveyance of an ATS message is in general not correlated with the conveyance of another ATS message by the service provider. There are two ATS message handling services. They are the ATS message service and the ATN pass-through service. [4]

**ATS Message Handling Services (ATSMHS) or ATS message service** Both terms apply to the application or functional service delivered to service users in compliance with the technical provisions for the ATN (i.e. ref. [1], sub-volume III).

Two levels of service are defined within the ATS Message Service:

- i) the Basic ATS Message Service; and
- ii) the Extended ATS Message Service.

Both levels of service are compatible with one another. The Extended ATS Message Service is functionally a superset of the Basic ATS Message Service, and it is backward compatible with the Basic ATS Message Service. [2]

**ATS message-handling system (AMHS)** Term used to technically identify the set of systems providing the ATS message service. [1]

**Attribute** In the context of message handling, an information item, a component of an attribute list that describes a user or distribution list and that can also locate it in relation to the physical or organisational structure of MHS (or the network underlying it). [7]

It describes a user or DL and may also locate it in relation to the physical or organisational structure of the MHS (or the network underlying it).

An attribute has the following parts:

- a) attribute type (or type) that denotes a class of information;
- b) attribute value (or value) that is an instance of the class of information the attribute type denotes.

Attributes are of the following two kinds:

- a) standard attribute: an attribute whose type is bound to a class of information by the ISO/IEC 10021-2 specification;
- b) domain-defined attribute: an attribute whose type is bound to a class of information by a Management Domain (MD). [6]

**Attribute list** In the context of message handling, a data structure, an ordered set of attributes, that constitutes an O/R address. [7]

**Attribute type** An identifier that denotes a class of information (e.g. personal names). It is a part of an attribute. [7]

**Attribute value** An instance of the class of information an attribute type denotes (e.g. a particular personal name). It is a part of an attribute. [7]

**Automatic dependent surveillance (ADS)** A technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems, including aircraft identification, four-dimensional position and additional data as appropriate. ADS is a data link application. [4]

**Basic service** In the context of message handling, the sum of features inherent in a service. [7]

**Basic ATS message service** The Basic ATS Message Service is based on the first version of the ISO/IEC ISPs, published in 1994 and based on the ISO/IEC 10021:1990 set of standards. [2]

**Bilaterally-defined** The body part type bilaterally-defined is a basic X.400 body part type. A body part of type bilaterally-defined represents an information object whose semantics and abstract syntax are bilaterally agreed by the IPM's originator and all of its potential recipients. [7]

*Note 1. – According to the ISO/IEC 10021-7, the use of this body part type is discouraged [7]*

*Note 2. – In ATSMHS, its use has meanwhile been deprecated. See also bilaterally-defined-body-part*

**Bilaterally-defined-body-part** The body part type bilaterally-defined-body-part is a standard extended X.400 body part type. A body part of type bilaterally-defined-body-part represents an information object whose semantics and abstract syntax are bilaterally agreed by the IPM's originator and all of its potential recipients. [7]

*Note 1. – According to the ISO/IEC 10021-7, the use of this body part type is discouraged [7]*

*Note 2. – In ATSMHS, its use has meanwhile been deprecated. See also bilaterally-defined*

**Bind operation** A Directory Bind operation is used at the beginning of a period of accessing the Directory. [8]

**Body** Component of the content of a message. Another component is the heading. [7]

**Body part** Component of the body of a message. [7]

**Boundary intermediate system (BIS)** An intermediate system that is able to relay data between two separate routing or administrative domains. [4]

**Character set** Standard attribute values and domain-defined attribute types and values are constructed from Printable Strings. [1]

**Common name (CN)** In the context of message handling, a standard attribute of an O/R address form that identifies a user or distribution list relative to the entity denoted by another attribute (e.g. an organisational name). [7]

A common-name is a standard attribute that identifies a user or DL relative to the entity denoted by another attribute (e.g. an organization-name). The value of a common-name is a Printable String. The string is chosen from a set of such strings that is administered for this purpose (and perhaps others) by the entity alluded to above. [6]

**Congestion** In the ATN internet sense, congestion describes the state where the network is overloaded. Typical effects of congestion are extended transit delays, drastically reduced throughput and the loss of data packets. [5]

**Congestion avoidance** Techniques that regulate the data flow into the network in order to prevent the network from getting overloaded. These encompass both open-loop techniques, which ensure that a traffic contract specified by the source is respected, and closed-loop techniques, which monitor signals generated by the network and adapt the traffic generated by the sources accordingly. [5]

**Congestion management** This term refers to a set of rules and techniques which prevent congestion, e.g. by monitoring actual network load. Co-operative interaction of *all* end systems is required in order to prevent individual end-systems taking up the throughput saved by well behaving systems. [5]

**Congestion recovery/congestion control** This term refers to a mechanism which reacts to congestion after it has occurred in order to remove the overload condition. Congestion recovery can be initiated only after congestion has been experienced and is not able to safely prevent congestion in the network. [5]

**Conformance test** A test of a protocol implementation with respect to its specifications.

**Consistency** A property of a set of related operations such that the effects of the operations are performed accurately, correctly, and with validity, with respect to application semantics. [10]

**Content** In the context of message handling, an information object, part of a message, that the MTS neither examines nor modifies, except for conversion, during its conveyance of the message. [7]

**Content type** In the context of message handling, an identifier, on a message envelope, that identifies the type (i.e. syntax and semantics) of the message content. [7]

**Context management (CM)** Refers to an ATN application. This application implements an ATN logon service allowing initial aircraft introduction into the ATN. The logon service also allows indication of all other data link applications on the aircraft. CM also includes functionality to forward addresses between ATC centres. Thus, CM is a logon and simple directory service. [4]

*Note.* – “Context management” is a recognised OSI presentation layer term. The OSI use and the ATN use have nothing in common.

**Conversion** In the context of message handling, a transmittal event in which an MTA transforms parts of a message’s content from one encoded information type to another, or alters a probe so it appears that the described messages were so modified. [7]

**Country name (C)** In the context of message handling, a standard attribute of a name form that identifies a country. A country name is a unique designation of a country for the purpose of sending and receiving messages. [7]

A country-name is a standard attribute that identifies a country. The value of a country-name is a Printable String that gives the character pair assigned to the country by ISO 3166.

*Note.* – In the context of ATSMHS, the country-name assigned to ICAO by ITU-T is C = “XX” [6]

**Data Integrity** The property that data has not been altered or destroyed in an unauthorized manner. [9]

**Delivery** In the context of message handling, a transmittal step in which an MTA conveys a message or report to the MS, UA or AU of a potential recipient of the message or of the originator of the report’s subject message or probe. [7]

**Delivery report** In the context of message handling, a report that acknowledges delivery, non-delivery, export, or affirmation of the subject message or probe, or distribution list expansion. [7]

**Direct AMHS user** An ATS Message Service user who engages in the ATS Message Service at an ATS Message User Agent. A direct AMHS user may belong to two subgroups as follows:

- 1) human users who interact with the ATS Message Service by means of an ATS Message User Agent connected to an ATS Message Server; and
- 2) host users which are computer applications running on ATN end systems and interacting with the ATS Message Service by means of application programme interfaces. [2]

**Direct submission** In the context of message handling, a transmittal step in which the originator’s UA or MS conveys a message or probe to an MTA. [7]

**Directory** A collection of open systems co-operating to provide directory services. [7]

**Directory Access Protocol (DAP)** Before a DUA and a DSA from different open systems can interact, a Bind operation has to be invoked between them to establish an application-association supporting a Directory protocol called the Directory Access Protocol (DAP). [8]

**Directory Information Base (DIB)** The information held by the Directory is collectively known as the Directory Information Base (DIB). The DIB is composed of Directory entries, each of which consists of a collection of information on one object. [8]

**Directory Information Shadowing Protocol (DISP)** Before a pair of DSAs from different open systems can interact for the purpose of exchanging shadowing information, a Bind operation has to be invoked between them to establish an application-association supporting a Directory protocol called the Directory Information Shadowing Protocol (DISP). [8]

**Directory Information Tree (DIT)** The entries of the Directory Information Base (DIB) are arranged in the form of a tree, the Directory Information Tree (DIT). Starting at the root, the DIT gives a hierarchical structure to the DIB whereas the vertices represent the entries. [8]

**Directory Management Domain (DMD)** A DMD is a management domain in Directory services implementing a set of one or more DSAs and zero or more DUAs managed by a single organisation. [8]

**Directory name** Name of an entry in a directory.

*Note.* – In the context of message handling, the entry in the directory will enable the O/R address to be retrieved for submission of a message. [7]

When locally supported, a Directory name identifies an object to the Directory. By presenting such a name to the Directory, the MHS can access a user's or DL's Directory entry and from that entry the Message Transfer System (MTS) can obtain the user's or DL's OR-address. [6]

**Directory Operational Bindings Management Protocol (DOP)** Before a pair of DSAs from different open systems can interact for the purpose of maintaining operational bindings, a Bind operation has to be invoked to establish an application-association supporting a Directory protocol called the Directory Operational Binding Management Protocol (DOP). [8]

**Directory service** The ATN directory service provides the ATN user with the addressing information which is associated with the application process title or application entity title used as input to the directory. The addressing information provided by the directory service includes the network address as well as further technical addresses on the layers above, as required or applicable. Furthermore, the ATN directory service resolves generic application process titles or application entity titles, i.e. names which may be incomplete or contain “don't care” elements, into the corresponding (list of) non-generic application process titles or application entity titles. [5]

**Directory system agent (DSA)** An OSI application process which is part of the directory, and whose role is to provide access to the directory information base to DUAs and/or other DSAs. [7]

**Directory System Protocol (DSP)** Before a pair of DSAs from different open systems can interact, a Bind operation has to be invoked between them to establish an application-association supporting a Directory protocol called the Directory System Protocol (DSP). [8]

**Directory user agent (DUA)** An OSI application process which represents a user in accessing the directory. Each DUA serves a single user so that the directory can control access to directory information on the basis of the DUA names. DUAs can also provide a range of local facilities to assist users to compose requests (queries) and interpret the responses. [7]

**Direct user** In the context of message handling, a user that engages in message handling by direct use of the MTS. [7]

**Distribution list (DL)** In the context of message handling, the functional object, a component of the message handling environment, that represents a pre-specified group of users and other distribution lists and that is a potential destination for the information objects an MHS conveys. Membership can contain O/R names identifying either users or other distribution lists. [7]

**Distribution list expansion** In the context of message handling, a transmittal event in which an MTA resolves a distribution list, among a message's immediate recipients, to its members. [7]

**Distribution list name** An O/R name allocated to represent a collection of O/R addresses and directory names. [7]

**Domain** See management domain. [7]

**Domain** A set of end systems and intermediate systems that operate according to the same routing procedures and that is wholly contained within a single administrative domain. [4]

**Domain-defined attributes** Optional attributes of an O/R address allocated to names in the responsibility of a management domain. [7]

**Element of service** A functional unit for the purpose of segmenting and describing message handling features. [7]



**Encoded information type (EIT)** In the context of message handling, an identifier, on a message envelope, that identifies one type of encoded information represented in the message content. It identifies the medium and format (e.g. T.51 text, group 3 facsimile) on an individual portion of the content. [7]

**End system (ES)** A system that contains the seven OSI layers and contains one or more end user application processes. [4]

**Engineering trials** In contrast to operational trials, engineering trials may be based on pre-operational, prototype or experimental equipment. Aim is to demonstrate the technical feasibility and correctness of applied techniques, concepts and specifications. [5]

**Envelope** In the context of message handling, an information object, part of a message, whose composition varies from one transmittal step to another and that variously identifies the message originator and potential recipients, documents its past and directs its subsequent conveyance by the MTS, and characterises its content. [7]

**European Directory Service (EDS)** The European Directory Service (EDS) is a centralised Directory service in the European area in support of ATN applications and implemented as a common facility.

**Explicit conversion** In the context of message handling, a conversion in which the originator selects both the initial and final encoded information types. [7]

**Extended ATS message service** The Extended ATS Message Service is based on the third version of the ISO/IEC ISPs, published in 1999 and based on the ISO/IEC 10021:1999 set of standards. [2]

**File transfer body part** A body part for conveying the contents of a stored file, and other information associated with the file, from originator to recipient. The other information includes attributes, which are typically stored along with the file content, information on the environment from which the transfer originated, and references to existing stored files or previous messages. [7]

**File-transfer-body-part** The body part type file-transfer-body-part is a standard extended X.400 body part type. A body part of type file-transfer-body-part represents an information object used to convey the contents, and optionally the attributes, of a stored file. [7]

**Functional requirements** Operational requirements that determine what function a system should perform. They can usually be expressed by a verb applying to a type of data, e.g. display aircraft position. [4]

**Gateway** A system used to interconnect dissimilar networks. A gateway may contain all seven layers of the OSI reference model. [4]

**General text body part** A body part that represents character text of a general nature, using 8-bit-encoding. It has parameters and data components. The parameter component identifies the character sets that are present in the data component. The data component comprises a single general string. [7]

**General-text-body-part** The body part type general-text-body-part is a standard extended X.400 body part type. A body part of type general-text-body-part represents a text of general nature. [7]

In ATSMHS, use of the general-text-body-part is limited to repertoire group A identified by repertoire identifiers {1, 6} and repertoire group B identified by repertoire identifiers {1, 6, 100}.

**Heading** A component of an IP-message. Other components are the envelope and the body. [7]

**Ia5-text** The body part type ia5-text is a basic X.400 body part type. A body part of type ia5-text. [7]

*Note.* – See also ia5-text-body-part

**Ia5-text-body-part** The body part type ia5-text-body-part is a standard extended X.400 body part type. A body part of type ia5-text-body-part represents an IA5 text. [7]

*Note.* – See also ia5-text

**Immediate recipient** In the context of message handling, one of the potential recipients assigned to a particular instance of a message or probe (e.g. an instance created by splitting). [7]

**Implementation under test** Implementation of one or more protocols, which are to be studied by testing

**Implicit conversion** In the context of message handling, a conversion in which the MTA selects both the initial and final encoded information types. [7]

**Indirect AMHS user** An ATS Message Handling Service user at an AFTN station, using an AFTN/AMHS Gateway to communicate with other ATS Message Handling Service users. [2]

**Indirect submission** In the context of message handling, a transmittal step in which an originator's UA conveys a message or probe to an MTA via an MS. [7]

**Indirect user** In the context of message handling, a user that engages in message handling by indirect use of MHS, i.e. through another communication system (e.g. a physical delivery system or the telex network) to which MHS is linked.

*Note. – Indirect users communicate via access units with direct users of MHS. [7]*

**Institutional issues** Issues related to ownership, control and responsibility for correct implementation and operation of systems which involve more than one state or organisation. [5]

**Integrated services digital network (ISDN)** A public telecommunications network that supports the transmission of digitised voice and data traffic on the same transmission links. [4]

**Intercommunication** In the context of message handling, a relationship between services, where one of the services is a message handling service, enabling the user of the message handling service to communicate with users of other services

*Note. Examples are the intercommunication between the IPM service and the telex service, and the intercommunication between message handling services and physical delivery services. [7]*

**Intermediate system (IS)** A system comprising the lower three layers of the OSI reference model and performing relaying and routing functions. [4]

**International Alphabet No. 5** 7-bit coded character set providing a repertoire of 128 characters. [11]

*Note. – Abbreviation IA-5 is used in ICAO documentation whereas abbreviation IA5 is also used (e.g. ITU-T Rec. T.50)*

**International Telegraph Alphabet No. 2** 5-bit coded character set. [12]

*Note. – Abbreviation ITA-2 is used in ICAO documentation whereas abbreviation ITA2 is also used (e.g. ITU-T Rec. S.1)*

**Internetwork** A set of interconnected, logically independent heterogeneous subnetworks. The constituent subnetworks are usually administrated separately and may employ different transmission media. [4]

**Interoperability test** A test of a protocol implementation in a model of a communication network where fault-free interaction with peer implementations can be verified.

**Interpersonal messaging service** Messaging service between users belonging to the same management domain or to different management domains by means of message handling, based on the message transfer service. [7]

**Interrogation operations** These are operations which allow querying the directory: read, compare, list, search and abandon. [8]

**IP-message** The content of a message in the IPM Service. [7]

**Management domain** Resources that for systems management purposes are represented by managed objects. A management domain possesses at least the following quantities: a name that uniquely identifies that management domain, identification of a collection of managed objects that are members of the domain, and identification of any inter-domain relationships between this domain and other domains. [4]

**Management domain (MD)** In the context of message handling, a set of messaging systems – at least one of which contains, or realises, an MTA – that is managed by a single organisation. It is a primary building block used in the organisational construction of MHS. It refers to an organisational area for the provision of services.

*Note. – A management domain may or may not necessarily be identical with a geographical area. [7]*

**Management domain name** A unique designation of a management domain for the purpose of sending and receiving messages. [7]

**Members** In the context of message handling, the set of users and distribution lists implied by a distribution list name. [7]

**Message** An instance of the primary class of information object conveyed by means of message transfer, and comprising an envelope and content. [7]

**Message handling (MH)** A distributed information processing task that integrates the intrinsically related subtasks of message transfer and message storage. [7]

**Message handling environment (MHE)** The environment in which message handling takes place, comprising MHS, users, and distribution lists.

The sum of all components of message handling systems.

*Note.* – Examples of components are:

- message transfer agents;
- user agents;
- message stores;
- users.

[7]

**Message handling service** Service provided by the means of message handling systems.

*Note 1:* Service may be provided through administration management domains or private management domains.

*Note 2:* Examples of message handling services are:

- Interpersonal Messaging service (IPM service);
- Message Transfer service (MT service).

[7]

**Message handling system (MHS)** The functional object, a component of the message handling environment, that conveys information objects from one party to another. [7]

**Message storage** The automatic storage for later retrieval of information objects conveyed by means of message transfer. It is one aspect of message handling. [7]

**Message store (MS)** The functional object, a component of MHS, that provides a single direct user with capabilities for message storage. [7]

**Message transfer (MT)** The non-real-time carriage of information objects between parties using computers as intermediaries. It is one aspect of message handling. [7]

**Message transfer agent (MTA)** A functional object, a component of the MTS, that actually conveys information objects to users and distribution lists. [7]

**Message transfer service** A service that deals with the submission, transfer and delivery of messages for other messaging services. [7]

**Message transfer system (MTS)** The functional object consisting of one or more message transfer agents which provides store-and-forward message transfer between user agents, message stores and access units. [7]

**MF-address** An MF-address is the OR-address of an AMHS user. [7]

**Messaging system** A computer system (possibly but not necessarily an open system) that contains, or realises, one or more functional objects. It is a building block used in the physical construction of MHS. [7]

**Mnemonic O/R address** An O/R address that mnemonically identifies a user or distribution list relative to the ADMD through which the user is accessed or the distribution list is expanded. It identifies an ADMD, and a user or distribution list relative to that ADMD. [7]

A mnemonic OR-address is one that provides a memorable identification for a user or DL. It identifies an ADMD and a user or DL relative to that ADMD. [6]

**Mobile subnetwork** A subnetwork connecting a mobile system with another system not resident in the same mobile platform. These subnetworks tend to use free-radiating media (e.g. radio) rather than “contained” media (e.g. wire); thus they exhibit broadcast capabilities in the truest sense. [4]

**Modification operations** These are operations to alter the contents of the directory: add entry, remove entry, modify entry and modify distinguished name. [8]

**Naming authority** An authority responsible for the allocation of names.

*Note.* – In the context of ATSMHS, ICAO is the naming authority, responsible for the allocation of private-domain-name and organization-name. [7]

**Network address** In the context of message handling, a standard attribute of an O/R address form that gives the network address of a terminal. It comprises the numbering digits for network access points from an international numbering plan. [7]

**Network management** The set of functions related to the management of various OSI resources and their status across the network layer of the OSI architecture. [4]

**Non-delivery** In the context of message handling, a transmittal event in which an MTA determines that the MTS cannot deliver a message to one or more of its immediate recipients, or cannot deliver a report to the originator of its subject message or probe. [7]

**Non-registered access** In the context of message handling services, access to the service through publicly available telecommunications means by users who have neither been explicitly registered by the service provider, nor been allocated an O/R address. [7]

**Object class** An identified family of objects (or conceivable objects) which share certain characteristics. [8]

**Operating concept** The technical functionality of a system and its inherent capabilities regarded from the system operator's point of view. This includes the interaction between user and system, the services provided by the system as well as the internal operation of the system. [4]

**Operational concept** Describes, from the user's point of view, the operational requirements, constraints and prerequisites within which a technical system is supposed to work as well as the inherent capabilities of the system. It describes the interaction between the user and the system as well as the services the user may expect from the system. Broad outline of an operational structure able to meet a given set of high level user requirements. It comprises a consistent airspace organisation, general operational procedures and associated operational requirements for system support. [4]

**Operational trials** Operational trials are based on operational environment. This includes operational systems and operational equipment, e.g. routinely scheduled flights in an operational ATS environment. Aim is to demonstrate the operational acceptance and correctness of applied mechanisms, applications and concepts. [5]

**O/R address** In the context of message handling, an attribute list that distinguishes one user or DL from another and identifies the user's point of access to MHS or the distribution list's expansion point. [7]

To convey a message, probe or report to a user, or to expand a DL specified as a potential recipient of a message or probe, the MTS must locate the user or DL relative to its own physical and organisational structures. OR-addresses are the data structures by means of which all such location is accomplished. OR-addresses are constructed from attribute lists. [6]

**O/R address form** An OR-address shall only take the mnemonic form. [7]

**Organizational unit name (OU)** Standard attribute of an O/R address as a unique designation of an organizational unit of an organization for the purpose of sending and receiving of messages. [7]

**Organization name (O)** Standard attribute of an O/R address as a unique designation of an organization for the purpose of sending and receiving of messages. [7]

**O/R name** In the context of message handling, an information object by means of which a user can be designated as the originator, or a user or distribution list designated as a potential recipient of a message or probe. An O/R name distinguishes one user or distribution list from another and can also identify its point of access to MHS. [7]

An identifier by means of which a user can be designated as the originator, or a user or DL designated as a potential recipient of a message or probe. An OR-name comprises a Directory name, an OR-address, or both. [6]

**Originator** In the context of message handling, the user (but not distribution list) that is the ultimate source of a message or probe. [7]

**Performance requirements** Requirements with respect to the performance of a system (e.g. reliability, availability, response time, processing delay, etc.) and are derived from operational requirements. In general, they describe the minimum performance figures that a system must provide in order to fulfil the operationally required functions. [4]

**Personal name (PN)** In the context of message handling, a standard attribute of an O/R address form that identifies a person relative to the entity denoted by another attribute (e.g. an organization name).

*Note.*— In the context of ATSMHS, the personal-name attribute is not used at present. [7]

**Private domain name (P)** In the context of message handling, a standard attribute of an O/R address form that identifies a PRMD relative to the ADMD denoted by an administration domain name. [7]

A private-domain-name is a standard attribute that identifies a PRMD. As a national matter, this identification may be either relative to the country denoted by a country-name (so that PRMD names are unique within the country), or relative to the ADMD identified by an administration-domain-name. The value of a private-domain-name is a Printable String chosen from a set of such strings that is administered for this purpose by the country or ADMD alluded to above. [6]

**Private management domain (PRMD)** In the context of message handling, a management domain that comprises messaging system(s) managed (operated) by an organisation other than a service provider.

*Note. – This does not preclude a service provider from managing (operating) a PRMD. [7]*

**Probe** In the context of message handling, an instance of a secondary class of information objects conveyed by means of message transfer that describes a class of messages and that is used to determine the deliverability of such messages. [7]

**Pull mode** A content delivery mode which provides delivery of content at the request of the end-user.

**Push mode** A content delivery mode which provides delivery of content at the request of the service provider.

**Quality of service (QoS)** Information relating to data transfer characteristics (for example, requested throughput and priority) used by a router to perform relaying and routing operations across the subnetworks which make up a network. [4]

**Receipt** In the context of message handling, a transmittal step in which either a UA conveys a message or report to its direct user, or the communication system that serves an indirect user conveys such an information object to that user. [7]

**Recipient** See actual recipient. [7]

**Recursion** In the context of message handling, the situation that a message gets back to the same distribution list of origin and potentially circulates infinitely. [7]

**Redirection** In the context of message handling, a transmittal event in which an MTA replaces a user among a message's immediate recipients with a user preselected for that message. [7]

**Registered access** In the context of message handling services, access to the service performed by subscribers who have been registered by the service provider to use the service, and been allocated an O/R address. [7]

**Replication** The process by which copies of entry and operational information are held by DSAs other than the master DSA. [8]

**Report** In the context of message handling, an instance of a secondary class of information object conveyed by means of message transfer. It is generated by the MTS; it reports the outcome or progress of a message's or probe's transmittal to one or more potential recipients. [7]

**Retrieval** In the context of message handling, a transmittal step in which a user's message store conveys a message or report to the user's UA. The user is an actual recipient of the message or the originator of the subject message or probe. [7]

**Router** The communication element that manages the relaying and routing of data while in transit from an originating end system to a destination end system. An ATN router comprises an OSI intermediate system and end system supporting a systems management agent. [4]

**Routing** A function within a layer that uses the address to which an entity is attached in order to define a path by which that entity can be reached. [4]

**Routing domain** A set of end systems and intermediate systems that operate the same routing protocols and procedures and that are wholly contained within a single administrative domain. A routing domain may be divided into multiple routing subdomains. [4]

**Routing policy** A set of rules that control the selection of routes and the distribution of routing information by ATN boundary intermediate systems (BISs). These rules are based on policy criteria rather than on performance metrics such as hop count, capacity, transit delay, cost, etc. which are usually applied for routing. There are two groups of routing policy in the ATN:

- (1) general routing policy specified in the ATN Internet SARPs in order to ensure necessary connectivity in the ATN at a reasonable routing information update rate; and
- (2) user-specified routing policy, i.e. individual policy rules which may be additionally implemented in ATN BISs by administrations and organisations to meet their specific operational and policy needs.

The set of rules in a BIS that determines the advertisement and use of routes is known as a routing policy. Each organisational user of the ATN must determine and apply their own routing policy. [4]

**Safety case** An analysis presenting an overall justification for the declaration that a particular systems satisfies its safety requirements. [4]

**Security capabilities** In the context of message handling, the mechanisms that protect against various security threats. [7]

**Security management** To support the application of security policies by means of functions which include the creation, deletion and control of security services and mechanisms, the distribution of security-relevant information and the reporting of security-related events. [4]

**Specialised access** In the context of message handling, the involvement of specialised access units providing intercommunication between message handling services and other telecommunication services. [7]

**Standard attribute** An attribute whose type is bound to a certain class of information. [7]

**Subject** In the context of message handling, the information, part of the header that summarises the content of the message as the originator has specified it. [7]

**Subject message** The message that is the subject of a report. [7]

**Subject probe** The probe that is the subject of a report. [7]

**Submission** Direct submission or indirect submission. [7]

**Subnetwork** An actual implementation of a data network that employs a homogeneous protocol and addressing plan, and is under control of a single authority. [4]

**Substitute recipient** In the context of message handling, the user or distribution list to which a preferred, alternate, or member (but not another substitute) recipient can have elected to redirect messages (but not probes). [7]

**Systems management** The set of functions related to the management of various OSI resources and their status across all layers of the OSI architecture. [4]

**Transfer** In the context of message handling, a transmittal step in which one MTA conveys a message, probe, or report to another. [7]

**Transfer system** A messaging system that contains one MTA; optionally one or more access units, and neither a UA nor a message store. [7]

**Transmittal** The conveyance or attempted conveyance of a message from its originator to its potential recipients, or of a probe from its originator to MTAs able to affirm any described message's deliverability to its potential recipients. It also encompasses the conveyance or attempted conveyance, to the originator of the message or probe, of any reports it provokes. It is a sequence of transmittal steps and events. [7]

**Unbind operation** A Directory Unbind operation is used at the end of a particular period of accessing the Directory. [8]

**User** In the context of message handling, a functional object (e.g. a person), a component of the message handling environment, that engages in (rather than provides) message handling and that is a potential source or destination for the information objects an MHS conveys. [7]

**User agent (UA)** In the context of message handling, the functional object, a component of MHS, by means of which a single direct user engages in message handling. [7]

**User requirements** A description of what users expect to obtain from the system (not how the system should do it). They are usually expressed on a high level and do not include technical details. The direct user of the ATN is an application within an end system supporting air traffic management or aeronautical industry functions. The air traffic controller, other ground staff or the pilot are the human beings using directly, or indirectly, the ATN. The user may also be seen more on the abstract level as an organisation, e.g. airline or air navigation service provider. [4]

**Validation** In the ICAO context, a process that ensures that systems meet user requirements to an agreed level of confidence and can be produced from written SARPs and guidance material. One has to distinguish between performance based and functional validation. Single subsystems of the ATN, like routers, may be validated on a functional basis; validation of the ATN's suitability with respect to network performance etc. requires definition of performance requirements. [4]

**XF-address** An XF-address (translated address) is a particular MF-address of which the user within an AMHS Management Domain may be converted by an algorithmic method to and from an AF-address. [2]

### 3. Definitions of elements of service

Note. – The abbreviations used in the title line have the following meanings:

MT	Message Transfer
IPM	Interpersonal Messaging
PD	Physical Delivery
MS	Message Store
PR	Per recipient (available on a per-recipient basis)

**Access management** This element of service enables a UA and MTA to establish access to one another and to manage information associated with access establishment.

The element of service permits the UA and MTA to identify and validate the identity of the other. It provides a capability for the UA to specify its O/R address and to maintain access security. When access security is achieved through passwords, these passwords can be periodically updated.

*Note. – A more secure form of access management is provided by the element of service secure access management.*

**Additional physical rendition** This element of service allows an originating user to request the PDAU to provide the additional rendition facilities (e.g. kind of paper, colour printing, etc.). Bilateral agreement is required to use this element of service.

**Alternate recipient allowed** This element of service enables an originating UA to specify that the message being submitted can be delivered to an alternate recipient as described below.

A destination MD will interpret all of the user attributes in order to select a recipient UA. Three cases can be distinguished:

- 1) all the attributes match precisely those of a subscriber UA. Delivery is attempted to that UA;
- 2) either insufficient attributes are supplied or those supplied match those of more than one subscriber UA. The message cannot be delivered;
- 3) at least the minimum set of attributes required by the destination MD is supplied. Nevertheless, taking all of the other attributes into account, the attributes match those of no UA.

In case 3) an MD that supports the alternate recipient assignment element of service can deliver the message to a UA that has been assigned to receive such messages. This UA will be notified of the O/R address of the intended recipient as specified by the originator. Delivery to this UA will be reported in a delivery notification if requested by the originator.

**Alternate recipient assignment** This element of service enables a UA to be given the capability to have certain messages delivered to it for which there is not an exact match between the recipient attributes specified and the name of the user. Such a UA is specified in terms of one or more attributes for which an exact match is required, and one or more attributes for which any value is acceptable. For example, an organisation can establish a UA to receive all messages for which country name, administration management domain name and organisation name (for example, company name) are an exact match but the personal name of the recipient does not correspond to an individual known by an MHS in that organisation. This permits the organisation to manually handle the messages to these individuals.

In order for a message to be reassigned to an alternate recipient, the originator must have requested the alternate recipient allowed element of service.



**Authorising users indication** This element of service allows the originator to indicate to the recipient the names of the one or more persons who authorised the sending of the message. For example, an individual can authorise a particular action which is subsequently communicated to those concerned by another person such as a secretary. The former person is said to authorise its sending while the latter person is the one who sent the message (originator). This does not imply signature-level authorisation.

**Auto-acknowledgement of IP-messages** This element of service enables an MS-user to instruct the MS to generate a receipt notification automatically for each IP-message containing a receipt notification request which is delivered to the MS. The receipt notification is sent when the complete IP-message has been retrieved by the user or when the user indicates to the MS that he regards the message as having been retrieved.

**Auto-action log** This element of service enables an MS-user to access a log that records details of selected auto-action executions performed by the MS. The MS-user is able to retrieve information from the Auto-action Log by means of the Stored Message Listing and Stored Message Fetching elements of service. The ability to delete Auto-action Log entries is subject to subscription. This log of information is available if and only if this element of service is subscribed to by the user of the MS. Support for an element of service which comprises an auto-action does not require support for the Auto-action Log element of service. For each type of auto-action that may generate log entries, it is a subscription option whether all auto-action executions are logged, or only those executions that result in an error, or no executions are logged for that auto-action.

**Auto-assignment of annotations** This element of service enables an MS-user to instruct the MS to attach annotations to a selected message automatically, when the message is stored in the MS and satisfies specified criteria.

The MS-user may specify, through registration, several sets of selection criteria each of which may indicate the attachment of a different value of annotation. Subscription to this element of service requires subscription to the Stored Message Annotation element of service.

**Auto-assignment of group names** This element of service enables an MS-user to instruct the MS to assign group-names to a selected message automatically, when the message is stored in the MS and satisfies specified criteria. The MS-user may specify, through registration, several sets of selection criteria each of which may indicate the assignment of a different group-name. The MS will verify that only registered group-names are assigned to messages. Subscription to this element of service requires subscription to the Stored Message Grouping element of service.

**Auto-assignment of storage period** This element of service enables an MS-user to instruct the MS to assign a storage period to a selected message automatically, when the message is stored in the MS and satisfies specified criteria. The MS-user may specify, through registration, several sets of selection criteria each of which may indicate the attachment of a different value of storage period. Subscription to this element of service requires subscription to the Storage Period Assignment element of service.

**Auto-correlation of IP-messages** This element of service enables an MS-user to retrieve information, automatically generated by the MS, concerning the correlation between various related IP-messages. The following types of messages may be correlated:

- 1) IP-messages received in reply to, or sent in reply to an IP-message;
- 2) the IP-messages which forwarded (or auto-forwarded) one or more messages;
- 3) the received or submitted IP-messages that obsolete an IP-message;
- 4) the received or submitted IP-messages that indicate that they are related to an IP-message.

Besides identifying each IP-message related to a given message in the ways indicated, the MS provides a summary of all such responding IP-messages.

**Auto-correlation of IP-notifications** This element of service enables an MS-user to retrieve information, automatically generated by the MS, concerning the IP-notifications that have been received in response to a previously submitted IP-message. Information may also be retrieved concerning IP-notifications sent by the MS-user or the MS in response to delivered IP-messages. The MS identifies each IP-notification related to a given submitted or delivered message, and for submitted messages it also provides a summary of received IP-notifications. This enables the MS-user to access this information directly rather than perform an exhaustive search of all entries that could hold the information. This element of service is effective only if the submitted or delivered message that an IP-notification refers to is stored in the MS, or is recorded in the Submission Log or Delivery Log. Provision for the storage of submitted messages, and maintenance of the Submission Log and the Delivery Log are supported by separate elements of service.

**Auto-correlation of reports** This element of service enables an MS-user to retrieve information, automatically generated by the MS, concerning the delivery and non-delivery reports that have been received in response to a previously submitted message. Successful cancellations of deferred delivery for submitted messages are also recorded. In addition to identifying each report related to a given submitted message, the MS provides a summary of these reports. This enables the MS-user to access this information directly rather than perform an exhaustive search of all entries that could hold the information. This element of service requires that at least one of the Submission Log or Storage on Submission elements of service has also been subscribed to.

**Auto-deletion after storage period** This element of service enables an MS-user to instruct the MS to delete automatically any stored message whose storage period has elapsed. This registration remains in force until disabled by a subsequent registration. Messages that have not been listed or processed are not subject to auto-deletion.

Equally, entries of the Submission Log, Delivery Log, and Auto-action-log are not subject to auto-deletion. Other content-specific message handling Specifications may lay down additional rules for the performance of this element of service. Subscription to this element of service requires subscription to the Storage Period Assignment element of service.

**Auto-discarding of IP-messages** This element of service enables an MS-user to instruct the MS to discard stored IP-messages automatically, if they satisfy criteria registered by the MS-user. An IP-message becomes a candidate for auto-discarding if a subsequently delivered IP-message renders it obsolete, or if it contains an Expiry Time that has been reached. The MS-user may control whether auto-discarding occurs for such IP-messages by specifying additional conditions which the IP-message must satisfy, e.g. that the message has been fetched by the MS-user, or that the obsoleting IP-message has the same originator as the obsoleted IP-message. Where the message has not been fetched by the MS-user before being auto-discarded, a non-receipt notification is generated if requested in the discarded IP-message.

**Auto-forwarded indication** This element of service allows a recipient to determine that a body of an incoming IP-message contains an IP-message that has been auto-forwarded. Thus the recipient can distinguish from that where an incoming IP-message contains a forwarded message (as described in B.31) in the body. As with a forwarded IP-message, an auto-forwarded IP-message can be accompanied by information (for example, time stamps, indication of conversion) associated with its original delivery.

*Note. – The indication that auto-forwarding of an IP-message has occurred enables a recipient IPM-UA, should it so choose, to prevent further auto-forwarding and thus the possibility of loops. In addition, a recipient IPM-UA can choose whether or not to auto-forward based on other criteria (for example, sensitivity classification).*

When an IPM-UA auto-forwards an IP-message, it designates it as auto-forwarded. If receipt/non-receipt notification has been requested for the IP-message being auto-forwarded, the IPM-UA generates a non-receipt notification informing the originator of the auto-forwarding of the IP-message. The notification optionally includes a comment supplied by the originally intended recipient. No further notification applying to the auto-forwarded IP-message is generated by any IPM-UA.

**Basic physical rendition** This element of service enables the PDAU to provide the basic rendition facilities for converting the MHS message into a physical message. This is the default action to be taken by the PDAU.

**Auto-forwarding of IP-messages** This element of service enables an MS-user to instruct the MS to auto-forward selected IP-messages that are delivered to it. The MS-user may specify through registration several sets of criteria chosen from the attributes available in the MS, and IP-messages meeting each set of criteria will be auto-forwarded to one or more users or DLs. If requested by the message originator, a non-receipt notification is generated indicating that the IP-message was auto-forwarded, even if the MS retains a copy of the forwarded message. For each set of selection criteria, a body part may be specified, to be included as a “cover-note” with each auto-forwarded IP-message.

*Note. – In versions of this part of ISO/IEC 10021 published prior to 1994, this element of service was named Stored Message Auto-forward, and classified as a general MS optional user facility; it has since been classified as IPM-specific.*

**Auto-submitted indication** This element of service allows the originator, or enables the UA/MS, to indicate to the recipient whether the message was or was not submitted automatically by a machine without either the direct or indirect control by a human of the submission, and to determine the nature of the submission, thus:

- not auto-submitted;
- auto-generated;
- auto-replied;
- auto-forwarded.

The absence of this indication yields no information as to whether the message submission involved human control or not.

**Blind copy recipient indication** This element of service allows the originator to provide the O/R name of one or more additional users, or DLs, who are intended recipients of the IP-message being sent. These names are not disclosed to either the primary or copy recipients. Whether or not these additional recipients are disclosed to one another is a local matter.

**Body part encryption indication** This element of service allows the originator to indicate to the recipient that a particular body part of the IP-message being sent has been encrypted. Encryption can be used to prevent unauthorised inspection or modification of the body part. This element of service can be used by the recipient to determine that some body part(s) of the IP-message must be decrypted. This element of service, however, does not itself encrypt or decrypt any body part.

**B.61** This element of service enables an originating UA to instruct the MTS not to return a non-delivery notification to the originating UA in the event that the message being submitted is judged undeliverable. In the case of a multi-destination message, the originating UA can request this element of service on a per-recipient basis.

**B.86 stored message listing** This element of service provides a recipient UA with a list of information about certain of its messages stored in the MS. The information comprises selected attributes from a message’s envelope and content and others added by the MS. The UA can limit the number of messages that will be listed.

**Content confidentiality** This element of service allows the originator of a message to protect the content of the message from disclosure to recipients other than the intended recipient(s). Content confidentiality is on a per-message basis, and can use either an asymmetric or a symmetric encryption technique.

**Content integrity** This element of service allows the originator of the message to provide to the recipient of the message a means by which the recipient can verify that the content of the message has not been modified. Content integrity is on a per-recipient basis, and can use either an asymmetric or a symmetric encryption technique.

**Content type indication** This element of service enables an originating UA to indicate the content type for each submitted message. A recipient UA can have one or more content types delivered to it. An example of a content type is the contents generated by the IPM class of co-operating UAs.

**Conversion prohibition** This element of service enables an originating UA to instruct the MTS that implicit encoded information type conversion(s) shall not be performed for a particular submitted message.

**Conversion prohibition in case of loss of information**

This element of service enables an originating UA to instruct the MTS that encoded information type conversion(s) shall not be performed for a particular submitted message if such conversion(s) would result in loss of information. Loss of information is discussed in detail in Recommendation X.408.

Should this and the conversion prohibition element of service both be selected, the latter shall take precedence.

*Note.* – This element of service will not protect against possible loss of information in certain cases where the recipient is using an I/O device whose capabilities are unknown to the MTA.

**Converted indication** This element of service enables the MTS to indicate to a recipient UA that the MTS performed encoded information type conversion on a delivered message. The recipient UA is informed of the resulting types.

**Copy precedence** This element of service enables an originating UA to convey the precedence level (i.e. supplemental importance information) of a message as it applies to the copy recipients. Six levels of precedence are defined for this field (please see Table B.1 defined in B.131 below for specific values and their semantics).

The value of the copy precedence field must always be equal to, or of a lesser priority than the value of the primary precedence field.

Additional levels of precedence may be defined for national use. Upon receipt, the handling of unknown precedence levels will be dictated by the local “precedence handling policy”.

**Counter collection** This element of service allows an originating user to instruct the PDS to keep the physical message ready for counter collection at the post office specified by the originator, or at the post office which offers counter collection service closest to the given recipient’s address.

**Counter collection with advice** This element of service allows an originating user to instruct the PDS to keep the physical message ready for counter collection at the post office specified by the originator, or at the post office which offers counter collection service closest to the given recipient’s address, and to inform the recipient via telephone, or telex, using the number provided by the originator.

**Cross-referencing indication** This element of service allows the originator to associate with the IP-message being sent, the globally unique identifiers of one or more other IP-messages. This enables the recipient’s IPM-UA, for example, to retrieve from storage a copy of the referenced IP-messages.

**Deferred delivery** This element of service enables an originating UA to instruct the MTS that a message being submitted shall be delivered no sooner than a specified date and time. Delivery will take place as close to the date and time specified as possible, but not before. The date and time specified for deferred delivery is subject to a limit which is defined by the originator’s management domain.

*Note.* – Storage of the message shall be handled in the originating country.

**Deferred delivery cancellation** This element of service enables an originating UA to instruct the MTS to cancel a previously submitted deferred delivery message. The cancellation attempt may or may not always succeed. Possible reasons for failure are: deferred delivery time has passed, or the message has already been forwarded within the MTS.

**Delivery log** This element of service enables an MS-user to access a log that records details of the messages and reports delivered to the MS; these records persist even after the messages and reports have been deleted. A Delivery Log entry contains a subset of the information that may be stored for a delivered message. The quantity of information stored in the Delivery Log for each message is specified at subscription time. The MS-user is able to determine whether the delivered message corresponding to a Delivery Log entry has been deleted. The MS-user is able to retrieve information from the Delivery Log by means of the Stored Message Listing, Stored Message Fetching and Stored Message Summary elements of service. The ability to delete Delivery Log entries is subject to subscription, and may be restricted to messages meeting certain criteria, e.g. messages stored longer than an agreed period of time.

**Delivery notification** This element of service enables an originating UA to request that the originating UA be explicitly notified when a submitted message has been successfully delivered to a recipient UA or in use of access units, may indicate that the message has been successfully received by the destination terminal. The notification is related to the submitted message by means of the message identifier and includes the date and time of delivery. In the case of a multidestination message, the originating UA can request this element of service on a per-recipient basis.

When a message is delivered after distribution list expansion, then, depending on the policy of the distribution list, the notification can be sent to either the list owner, the message originator, or both.

Delivery notification carries no implication that any UA or user action, such as examination of the message content, has taken place.

**Delivery time stamp indication** This element of service enables the MTS to indicate to a recipient UA the date and time at which the MTS delivered a message. In the case of physical delivery, this element of service indicates the date and time at which the PDAU has taken responsibility for printing and further delivery of the physical message.

**Delivery via bureaufax service** This element of service allows an originating user to instruct the PDAU and associated PDS to use the bureaufax service for transport and delivery.

**Designation of recipient by directory name** This element of service enables an originating UA to use a directory name in place of an individual recipient's O/R address.

**Disclosure of other recipients** This element of service enables the originating UA to instruct the MTS when submitting a multi-recipient message, to disclose the O/R names of all other recipients to each recipient UA, upon delivery of the message. The O/R names disclosed are as supplied by the originating UA. If distribution list expansion has been performed, then only the originator specified DL name will be disclosed, and not the names of its members.

**Distribution code** This element of service enables the originating UA to give distribution information to a recipient UA. The recipient UA can use this information to perform local distribution of a message to one or more persons or staff cells. This service contains two components, the Subject Indicator Code (SIC) and a distribution code, each of which is optional.

The SICs are bilaterally agreed codes that define the subject matter of a message to support onward distribution after delivery to a recipient organisation. Each SIC can consist of between three and eight characters. It is possible to attach up to eight SICs to a message.

The distribution code service the same function, but allows future use of object identifiers as the local distribution criteria. Any number of distribution codes may be specified. The assignment of the distribution code can be privately defined or may be subject to future standardisation.

**Exempted address** This element of service is used to convey the names of members of a DL that the originator has specified are to be excluded from receiving the message. Exclusion is performed at the point of DL expansion.

The names or addresses of exempted list members are also conveyed to the remaining recipient UAs. There is no guarantee that the exempted addresses will not receive the message as the result of redirection.

**Extended authorisation information** This element of service enables the originating UA to indicate to a recipient UA the date and time of some important event associated with the message, such as when the release of the message was formally approved. Depending upon local requirements, this date and time stamp may vary from the date and time when the message was submitted to the MTS. This element of service may be used in conjunction with B.5 to provide supplementary information.

**Express mail service (EMS)** This element of service allows an originating user to instruct the PDS to transport and deliver the physical message produced from the MHS message through accelerated letter circulation and delivery service (such as EMS or the equivalent domestic service) in the destination country.

**Expiry date indication** This element of service allows the originator to indicate to the recipient the date and time after which he considers the IP-message to be invalid. The intent of this element of service is to state the originator's assessment of the current applicability of an IP-message.

The particular action on behalf of a recipient by his IPM-UA, or by the recipient himself, is unspecified. Possible actions might be to file or delete the IP-message after the expiry date has passed.

**Explicit conversion** This element of service enables an originating UA to request the MTS to perform a specified conversion, such as required when interworking between different telematic services. When a message is delivered after conversion has been performed, the recipient UA is informed of the original encoded information types as well as the current encoded information types in the message.

*Note 1: This element of service is intended to support interworking with telematic terminals/services.*

*Note 2: When DL names are used in conjunction with this element of service, conversion will apply to all members of the DL.*

**Forwarded IP-message indication** This element of service allows a forwarded IP-message, or a forwarded IP-message plus its “delivery information” to be sent as the body (or as one of the body parts) of an IP-message. An indication that the body part is forwarded is conveyed along with the body part. In a multipart body, forwarded body parts can be included along with body parts of other types. “Delivery information” is information which is conveyed from the MTS when an IP-message is delivered (for example, time stamps and indication of conversion). However, inclusion of this delivery information along with a forwarded IP-message in no way guarantees that this delivery information is validated by the MTS.

The receipt notification request indication and the non-receipt notification request elements of service are not affected by the forwarding of a IP-message.

**Grade of delivery selection** This element of service enables an originating UA to request that transfer through the MTS be urgent or non-urgent, rather than normal. The time periods defined for non-urgent and urgent transfer are longer and shorter, respectively, than that defined for normal transfer. This indication is also sent to the recipient with the message.

**Hold for delivery** This element of service enables a recipient UA to request that the MTS hold its messages and returning notifications for delivery until a later time. The UA can indicate to the MTS when it is unavailable to take delivery of messages and notifications, and also, when it is again ready to accept delivery of messages and notifications from the MTS. The MTS can indicate to the UA that messages are waiting due to the criteria the UA established for holding messages. Responsibility for the management of this element of service lies with the recipient MTA.

Criteria for requesting a message to be held for delivery are: encoded information type, content type, maximum content length, and priority. The message will be held until the maximum delivery time for that message expires, unless the recipient releases the hold prior to its expiry.

*Note. – The hold for delivery element of service is distinct from the message store facility. The hold for delivery element of service provides temporary storage to facilitate delivery and, only after a message has been transferred to the recipient's UA is delivery notification returned. The message store facility augments the storage of a UA and can be used to store messages for an extended period of time. Unlike the hold for delivery element of service, delivery notifications are returned as soon as the message is placed in (that is, delivered to) the message store.*

**Implicit conversion** This element of service enables a recipient UA to have the MTS perform for a period of time any necessary conversion on messages prior to delivery. Neither the originating nor recipient UA explicitly requests this element of service on a per-message basis. If the encoded information type capabilities of the recipient UA are such that more than one type of conversion can be performed, the most appropriate conversion is performed.

When a message is delivered after conversion has been performed, the recipient UA is informed of the original encoded information types as well as the current encoded information types in the message.

**Importance indication** This element of service allows the originator to indicate to the recipients his assessment of the importance of the IP-message being sent. Three levels of importance are defined: low, normal and high.

This element of service is not related to the grade of delivery selection element of service provided by the MTS. The particular action taken by the recipient or his IPM-UA based on the importance categorisation is unspecified. It is the intent to allow the recipient IPM-UA, for example, to present IP-messages in order of their importance or to alert the recipient of the arrival of IP-messages of high importance.

**Incomplete copy indication** This element of service allows an originator to indicate that this IP-message is an incomplete copy of an IP-message with the same IP-message identification in that one or more body parts, and/or heading fields of the original IP-message are absent.

**IP-message action status** This element of service enables an MS-user to determine whether a reply or a receipt notification has been requested of the user in an IP-message which the user has received. It allows the user to record in the MS (and subsequently retrieve the information) that the reply (or IP-notification) has been sent. In addition, the user may set a reminder that a reply is intended even if no reply was explicitly requested.

**IP-message identification** This element of service enables co-operating IMP-UAs to convey a globally unique identifier for each IP-message sent or received. The IP-message identifier is composed of an O/R name of the originator and an identifier that is unique with respect to that name. IPM-UAs and users use this identifier to refer to a previously sent or received IP-message (for example, in receipt notifications).

**IPM-UA** This element of service provides to a recipient, at delivery, information about the distribution list(s) through which the message has arrived. It is a local matter as to how much of this information is presented to the recipient.

**IPM-UA** This element of service allows an originating user to specify that if any of the recipients can directly or via reassignment refer to a distribution list, then no expansion shall occur. Instead, a non-delivery notification will be returned to the originating UA, unless prevention of non-delivery notification has been requested.

**Language indication** This element of service enables an originating UA to indicate the language type(s) of a submitted IP-message.

**Latest delivery designation** This element of service enables an originating UA to specify the latest time by which the message is to be delivered. If the MTS cannot deliver by the time specified, the message is not delivered and is cancelled. On multi-recipient messages, the latest delivery time can expire prior to delivery to all recipients, but this will not negate any deliveries which have already occurred.

**Message flow confidentiality** This element of service allows the originator of the message to protect information which might be derived from observation of the message flow.

*Note. – Only a limited form of this is supported.*

**Message identification** This element of service enables the MTS to provide a UA with a unique identifier for each message or probe submitted or delivered by the MTS. UAs and the MTS use this identifier to refer to a previously submitted message in connection with elements of service such as delivery and non-delivery notification.

**Message instructions** This element of service enables the originating UA to indicate to the recipient UA that message instructions (e.g. remarks) accompany the message. Examples of message instructions include special recipient handling requests, special body descriptions and bilateral information.

**Message origin authentication** This element of service allows the originator of a message to provide to the recipient(s) of the message, and any MTA through which the message is transferred, a means by which the origin of the message can be authenticated (i.e. a signature). Message origin authentication can be provided to the recipient(s) of the message, and any MTA through which the message is transferred, on a per-message basis using an asymmetric encryption technique, or can be provided only to the recipient(s) of the message, on a per-recipient basis using either an asymmetric or a symmetric encryption technique.

**Message security labelling** This element of service allows the originator of a message (or probe) to associate with the message (and any reports on the message or probe) an indication of the sensitivity of the message (a security label). The message security label may be used by the MTS and the recipient(s) of the message to determine the handling of the message in line with the security policy in force.

**Message sequence integrity** This element of service allows the originator of the message to provide to a recipient of the message a means by which the recipient can verify that the sequence of messages from the originator to the recipient has been preserved (without message loss, re-ordering, or replay). Message sequence integrity is on a per-recipient basis, and can use either an asymmetric or a symmetric encryption technique.

**Message type** This service element enables receiving UAs to distinguish messages that relate to a specific project, contract, company position, press release, operation, exercise or drill. The service can convey a discrete identifier for each particular type plus optional printable information capable of identifying a particular project, press release, contract, company position, exercise, operation or drill. The value is provided by the originator.

**MS register** This element of service enables an MS-user to register various items of information with the MS in order to modify certain aspects of its behaviour, such as:

- 1) the performance of automatic actions;
- 2) the default set of information retrieved when using the Stored Message Fetching and Stored Message Listing elements of service. One set of information may be registered per UA employed by the user;
- 3) the credentials used by the Message Store to authenticate the MS-user.

If a user employs more than one UA implementation, then as a subscription option the MS may store a separate set of registration information for each UA. The user may retrieve the registered information from the MS.

*Note. – The capability to store separate sets of registration information and to retrieve registered information was not defined in versions of this Recommendation published prior to 1996.*

**Multi-destination delivery** This element of service enables an originating UA to specify that a message being submitted is to be delivered to more than one recipient UA. Simultaneous delivery to all specified UAs is not implied by this element of service.

**Multi-part body** This element of service allows an originator to send to a recipient or recipients an IP-message with a body that is partitioned into several parts. The nature and attributes, or type, of each body part are conveyed along with the body part.

**Non-delivery notification** This element of service enables the MTS to notify an originating UA if a submitted message was not delivered to the specified recipient UA(s) or in the case of access units, may indicate that the message was not received by the destination terminal. The reason the message was not delivered is included as part of the notification. For example, the recipient UA can be unknown to the MTS.

In the case of a multi-destination message, a non-delivery notification can refer to any or all of the recipient to which the message could not be delivered.

When a message is not delivered after distribution list expansion, then, depending on the policy of the distribution list, the notification can be sent to either the list owner, the message originator, or both.

*Note. – Non-delivery notifications are generated automatically, and do not depend on a request by an originator.*

**Non-receipt notification request indication** This element of service allows the originator to ask that he be notified, should the IP-message be deemed unreceivable. In the case of a multi-recipient IP-message, the originator can request this element of service on a per-recipient basis.

The originator's UA conveys his request to the recipient's UA. The recipient's UA automatically issues a non-receipt notification, if either receipt notification or non-receipt notification was requested, when any of the following events occur:

- 1) the recipient's UA auto-forwards the IP-message to another user;
- 2) the recipient's UA discards the IP-message prior to receipt;
- 3) the recipient's subscription is terminated before he receives the IP-message.

Since receipt can occur arbitrarily long after delivery, the recipient's failure to access the IP-message, even for a long period of time (for example, while on an extended business trip), does not constitute non-receipt and thus no notification is issued.

*Note. – No legal significance can be adduced from this element of service.*

**Non-repudiation of content received** This Element of Service enables a recipient of an IP-message to provide an irrevocable proof that the original IP-message content was received by the recipient.



This service provides irrevocable proof of the integrity of the content received and irrevocable proof of the authenticity of the recipient of the IP-message. This service fulfils the same function as the Proof of Content Received Element of Service, but in a manner which cannot be repudiated.

The corresponding irrevocable proof can be supplied in various ways depending on the security policy in force. The originator of the IP-notification always uses the “Non-repudiation of Origin” Element of Service when sending the IP-notification in response to the IP-message:

one way of providing the irrevocable proof is to incorporate the following in the IP-notification:

- A verified copy of the IP-message originator’s “Non-repudiation of Origin” arguments (when present in the IP-message and verified by the recipient of the IP-message).
- A verified copy of the complete IP-message content, if the IP-message originator’s “Non-repudiation of Origin” arguments are not present in the IP-message.

*Note. – As an alternative to invoking this Element of Service, equivalent security may be achieved by the use of a notarisation mechanism, which requires bilateral agreement outside the scope of this Recommendation.*

*The recipient is required to fulfil the request for this Element of Service only when the UA is subject to a security policy which mandates the support of this element of service.*

**Non-repudiation of delivery** This element of service allows the originator of a message to obtain from the recipient(s) of the message irrevocable proof that the message was delivered to the recipient(s). This will protect against any attempt by the recipient(s) to subsequently deny receiving the message or its content. Non-repudiation of delivery is provided to the originator of a message on a per-recipient basis using asymmetric encryption techniques.

**Non-repudiation of IP-notification** This Element of Service provides the recipient of a IP-notification with irrevocable proof of the identity of the originator of the IP-notification and with proof that the corresponding IP-message was received by the recipient.

This protects against any attempt by the recipient to deny subsequently that the IP-message was received or that the IP-notification was returned to the originator of the IP-message. This Element of Service fulfils the same service as Proof of IP-notification but in a manner which cannot be repudiated.

This Element of Service is used only in conjunction with Non-repudiation of Origin Element of Service applied to the IP-notification.

The corresponding irrevocable proof can be supplied in various ways depending on the security policy in force. One way of providing the irrevocable proof is by means of the MTS-user to MTS-user Data Origin Authentication Security Services defined in 10.2.1.1.1/X.402 and in ISO/IEC 10021-2 applied to the IP-notification, when the security service has non-repudiation properties.

The recipient is required to fulfil the request for this Element of Service only when the UA is subject to a security policy which mandates the support of this element of service.

**Non-repudiation of origin** This element of service allows the originator of a message to provide the recipient(s) of the message irrevocable proof of the origin of the message. This will protect against any attempt by the originator to subsequently revoke the message or its content. Non-repudiation of origin is provided to the recipient(s) of a message on a per-message basis using asymmetric encryption techniques.

**Non-repudiation of submission** This element of service allows the originator of a message to obtain irrevocable proof that a message was submitted to the MTS for delivery to the originally specified recipient(s). This will protect against any attempt by the MTS to subsequently deny that the message was submitted for delivery to the originally specified recipient(s). Non-repudiation of submission is provided to the originator of a message on a per-message basis, and uses an asymmetric encryption technique.

**Obsoleting indication** This element of service allows the originator to indicate to the recipient that one or more IP-messages he sent previously are obsolete. The IP-message that carries this indication supersedes the obsolete IP-message.

The action to be taken by the recipient or his IPM-UA is a local matter. The intent, however, is to allow the IPM-UA or the recipient to, for example, remove or file obsolete messages.

**Ordinary mail** This element of service enables the PDS to transport and deliver the letter produced from the MHS message in the mode available through the ordinary letter mail service in the country of destination. This is the default action for the transport and delivery of a physical message.

**Original encoded information types indication** This element of service enables an originating UA to specify to the MTS the encoded information types of a message being submitted. When the message is delivered, it also indicates to the recipient UA the encoded information types of the message specified by the originating UA.

**Originator indication** This element of service allows the identity of the originator to be conveyed to the recipient. The intent of this IPM element of service is to identify the originator in a user-friendly way. In contrast, the MTS provides to the recipient the actual O/R address and directory name, if present, of the originator. DL names should not be used in originator indication.

**originator requested alternate recipient** This element of service enables an originating UA to specify, for each intended recipient, one alternate recipient to which the MTS can deliver the message, if delivery to the intended recipient is not possible. The alternate recipient can be a distribution list. For the purposes of determining success or failure (and hence delivery and non-delivery notifications), delivery to the originator requested alternate recipient is equivalent to delivery to the intended recipient. If the intended recipient has requested redirection of incoming messages, and if the originating UA has requested redirection allowed by the originator, the system first tries to redirect the message. If this fails, the system then attempts to deliver the message to the designated alternate recipient.

**Originator reference** This element of service enables the originating UA to indicate to a recipient UA a reference called the “originator’s number”. The originator’s number may be used by the originating organisational unit as an internal reference. This service element is different from the identifier in that this reference is assigned by the originator, while the identifier is supplied by the UA.

**Other recipients indicator** The intent of this service element is to enable a recipient to determine which recipients are intended to receive the message without the use of MHS, as well as the category in which they are placed. While the primary and copy recipients indication service provides the names of recipients that can be reached through MHS, other recipients can be determined with this service element.

*Note.* – This service element does not allow the originator to convey the reason why the other recipient(s) will not receive the message via the MHS.

**Physical delivery notification by MHS** This element of service allows an originating user to request that an explicit notification, informing the originator of either successful or unsuccessful delivery of the physical message, be generated and returned by MHS. The notification provides information on delivery but no physical record is provided by the PDS.

*Note 1:* The notification includes the date and time of delivery based on the delivery confirmation given by the delivery person, the addressee or another authorised person. This is subject to national regulations in the destination country and is also dependent on the type of delivery requested (e.g. in the case of registered mail to addressee in person, the addressee would be the confirming person).

*Note 2:* This notification carries no implication that any action on the part of the recipient (such as examination of the message content) has taken place.

*Note 3:* When this element of service is requested, and the physical message is undeliverable, it is either returned or destroyed depending on national regulations in the destination country, which means that the default action of the element of service B.91 is overridden.

**Physical delivery notification by PDS** This element of service allows an originating user to request that an explicit notification, informing the originator of either successful or unsuccessful delivery of the physical message, be generated and returned by the PDS. The notification serves as a record of delivery for the originating user to retain for reference.

*Note 1:* The notification includes the date and time, and, in the case of successful delivery, the signature of the person confirming the delivery. The confirming person can be the delivery person, the addressee or another authorised person. This is subject to national

regulations in the destination country and is also dependent on the type of delivery requested (e.g. in the case of registered mail to addressee in person, the addressee would be the confirming person).

*Note 2:* This notification carries no implication that any action on the part of the recipient (such as examination of the message content) has taken place.

*Note 3:* When this element of service is requested, and the physical message is undeliverable, it is either returned or destroyed depending on national regulations in the destination country, which means that the default action of the element of service B.91 is overridden.

**Physical forwarding allowed** This element of service enables the PDS to forward the physical message to a forwarding address if the recipient has changed his address and indicated this to the PDS. This is the default action taken by the PDS.

**Physical forwarding prohibited** This element of service allows an originating user to instruct the PDS not to forward the physical message to a forwarding address.

**Primary and copy recipients indication** This element of service allows the originator to provide the names of zero or more users, or DLs, who are the intended primary recipients of the IP-message, and the names of zero or more users, or DLs, who are the intended copy recipients of the IP-message. It is intended to enable a recipient to determine the category in which each of the specified recipients (including the recipient himself) was placed. The exact distinction between these two categories of recipients is unspecified. However, the primary recipients, for example, might be expected to act upon the IP-message, while the copy recipients might be sent the IP-message for information only.

*Note.* – As an example of this element of service in a typical memorandum, the primary recipients are normally designated by the directive “to:” while “cc:” identifies the copy recipients.

**Primary precedence** This element of service enables an originating UA to convey the precedence level (i.e. supplemental importance) information of a message as it applies to the primary recipients. Six levels of precedence are defined for this element of service (see below for specific values and their semantics).

Additional levels of precedence may be defined for national use. Upon receipt, the handling of unknown precedence levels will be dictated by the local “precedence handling policy”.

This service is provided not only as information from originator to recipient, but also is used to automatically select the MTS grade of delivery. The six levels of precedence are mapped to only three levels of grade of delivery which is conveyed in the MTS envelope. Table B.1 maps primary precedence values onto the MTS priority protocol element. Behaviour upon receipt is determined by local policy.

TABLE B.1/F.400

**Primary precedence value mapping onto the MTS Priority EOS**

Primary Precedence	MTS EOS Priority
Override (5)	Urgent (2)
Flash (4)	Urgent (2)
Immediate (3)	Normal (0)
Priority (2)	Normal (0)
Routine (1)	Non-urgent (1)
Deferred (0)	Non-urgent (1)

*Note.* – Elements of service specific to EDI messaging and voice messaging are defined in Recommendations F.435 and F.440.

**Probe** This element of service enables a UA to establish before submission whether a particular message could be delivered. The MTS provides the submission information and generates delivery and/or non-delivery notifications indicating whether a message with the same submission information could be delivered to the specified recipient UAs.

The probe element of service includes the capability of checking whether the content size, content type, and/or encoded information types would render it undeliverable. The significance of the result of a probe depends upon the recipient UA(s) having registered with the MTS the encoded information types, content type and maximum message size that it can accept.

This element of service is subject to the same delivery time targets as for the urgent class. In the case of DLs, a probe indicates nothing about the likelihood of successful delivery to the DL members, but only whether the originator has the right to submit to the DL.

**Probe origin authentication** This element of service allows the originator of a probe to provide to any MTA through which the probe is transferred a means to authenticate the origin of the probe (i.e. a signature). Probe origin authentication is on a per-probe basis, and uses an asymmetric encryption technique.

**Proof of content received** This Element of Service enables a recipient of an IP-message to provide proof that the original IP-message content was received by the recipient. This service provides proof of the integrity of the content received and proof of the authenticity of the recipient of the IP-message.

This Element of Service is used only in conjunction with “Content Integrity” and/or “Message Origin Authentication” Elements of Service applied to the subject IP-notification.

The corresponding proof can be supplied in various ways depending on the security policy in force. The originator of the IP-notification always uses the “Content Integrity” and/or “Message Origin Authentication” Element of Service when sending the receipt IP-notification in response to the IP-message.

One way of providing the proof is to incorporate the following in the IP-notification:

- A verified copy of the IP-message originator’s “Content Integrity” and/or “Message Origin Authentication” arguments (when present in the IP-message and verified by the recipient of the IP-message).
- A verified copy of the complete original IP-message content, if the IP-message originator’s “Content Integrity” and/or “Message Origin Authentication” arguments are not present in the IP-message.

The recipient is required to fulfil the request for this Element of Service only when the UA is subject to a security policy which mandates the support of this element of service.

*Note 1: The “Message Origin Authentication” Element of Service may be provided on a per message basis using the Message-origin-authentication-check and/or on a per recipient basis using the Message-token as defined in Recommendation X.411 | ISO/IEC 10021-4.*

*Note 2: The “Content Integrity” Element of Service may be conveyed in several places on the message envelope. The Content-integrity-check can be stand-alone security argument in the message envelope and/or attributes of the Message-token as defined in Recommendation X.411 and ISO/IEC 10021-4.*

**Proof of delivery** This element of service allows the originator of a message to obtain from the recipient(s) of the message the means to authenticate the identity of the recipient(s) and the delivered message and content. Message recipient authentication is provided to the originator of a message on a per-recipient basis using either symmetric or asymmetric encryption techniques.

**Proof of IP-notification** This Element of Service provides the originator of an IP-message with proof that the IP-message was received by its recipient, and that the recipient was the originator of the received IP-notification.

This protects against any attempt by the recipient IPM-UA to deny subsequently that the IP-message was received and that the IP-notification was returned to the originator.

This Element of Service is used only in conjunction with “Content Integrity” and /or the “Message Origin Authentication” Element of Service applied to the IP-notification.

The corresponding proof can be supplied in various ways depending on the security policy in force. One way of providing the proof is by means of the MTS-user to MTS-user Data Origin Authentication Security Services, defined in 10.2.1.1.1/X.402 and in ISO/IEC 10021-2, applied to the IP-notification.

The recipient is required to fulfil the request for this Element of Service only when the UA is subject to a security policy which mandates the support of this element of service.

**Proof of submission** This element of service allows the originator of a message to obtain from the MTS the means to authenticate that the message was submitted for delivery to the originally intended recipient. Message submission authentication is provided on a per-message basis, and can use symmetric or asymmetric encryption techniques.

**Receipt notification request indication** This element of service allows the originator to ask that he be notified when the IP-message being sent is received by the recipient’s UA. In the case of a multi-recipient message, the originator can request this element of service on a per-recipient basis. This element of service also implicitly requests non-receipt notification request indication.

The originator's UA conveys his request to the recipient's UA. The recipient can instruct his UA to honour such requests, either automatically (for example, when it first renders the IP-message on the recipient's terminal) or upon his explicit command. The recipient can also instruct his UA, either in blanket fashion or case by case, to ignore such requests.

**Redirection disallowed by originator** This element of service enables an originating UA to instruct the MTS, if the recipient has requested the redirection of incoming messages element of service, that redirection should not be applied to a particular submitted message.

**Redirection of incoming message** This element of service enables a UA, through registration, to instruct the MTS to redirect incoming messages addressed to it, to another UA or to a DL, for a specified period of time, or until revoked.

*Note 1: This is an MT element of service that does not require delivery to the intended recipient before redirection can take place. It is therefore distinct from the Auto-forwarding of IP-messages element of service.*

*Note 2: Different incoming messages, on the basis of their content-types, security labels, and other criteria, may be redirected to separate alternate recipients or not redirected at all.*

**Registered mail** This element of service allows an originating user to instruct the PDS to handle the physical message as registered mail.

**Registered mail to addressee in person** This element of service allows an originating user to instruct the PDS to handle the physical message as registered mail and to deliver it to the addressee only.

**Reply request indication** This element of service allows the originator to request that a recipient send an IP-message in reply to the IP-message that carries the request. The originator can also specify the date by which any reply should be sent, and the one or more users and DLs to whom the originator requests (but does not demand) be among the preferred recipients of any reply. The recipient is informed of the date and names but it is up to the recipient to decide whether or not, and if so, to whom to reply.

*Note. – A blind copy recipient should consider carefully to whom he sends a reply, in order that the meaning of the blind copy recipient indication element of service is preserved.*

**Replying IP-message indication** This element of service allows the originator of an IP-message to indicate to the recipient(s) that this IP-message is being sent in reply to another IP-message. A reply can, depending on the wishes of the originator of the replied-to message, and the final decision of the originator of the reply, be sent to:

- 1) the recipients specified in the reply request indication of the replied-to message;
- 2) the originator of the replied-to message;
- 3) the originator and other recipients;
- 4) a distribution list, in which the originator of the replied-to message can be a receiving member;
- 5) other recipients as chosen by the originator of the reply.

The recipients of the reply receive it as a regular IP-message, together with an indication of which IP-message it is a reply to.

**Report origin authentication** This element of service allows the originator of a message (or probe) to authenticate the origin of a report on the delivery or non-delivery of the subject message (or probe), (a signature). Report origin authentication is on a per-report basis, and uses an asymmetric encryption technique.

**Request for forwarding address** This element of service allows an originating user to instruct the PDS to provide the forwarding address if the recipient has changed his address and indicated this to the PDS.

This element of service can be used with either physical forwarding allowed or prohibited. The provision of the forwarding address by the PDS to an originating user is subject to national regulations in the destination country. The default action is no provision of the forwarding address.

**Requested preferred delivery method** This element of service allows a user to request, on a per-recipient basis, the preference of method or methods of message delivery (such as through an access unit).

*Note. – This assumes availability of a directory and specification of a directory name by the originator together with this element of service. It may not be possible to match the request with the O/R address available in the directory. Non-delivery may occur if no feasible match can be found.*

**Request for non-repudiation of content received** This Element of Service enables the originator of an IP-message to request the recipient of the IP-message to provide an irrevocable proof of the received IP-message content by means of an IP-notification.

This Element of Service may be subscribed to only if the Receipt Notification Request Indication Element of Service is subscribed to.

If this Element of Service is requested, the Request for Proof of Content Received Element of Service shall not be requested.

This Element of Service provides only an indication of the originator's request. Fulfilment of the request requires support of the Non-repudiation of Content Received Element of Service.

**Request for non-repudiation of IP-notification** This Element of Service enables the originator of an IP-message to request the recipient of the IP-message to provide irrevocable proof of the origin of an IP-notification generated in response to the IP-message.

This Element of Service may be subscribed to only if the Receipt Notification Request Indication Element of Service is subscribed to.

If this Element of Service is requested, the Request for Proof of IP-notification Element of Service shall not be requested.

This Element of Service provides only an indication of the originator's request. Fulfilment of the request requires support of the Non-repudiation of IP-notification Element of Service.

**Request for proof of content received** This Element of Service enables the originator of the IP-message to request the recipient of the IP-message to provide proof of the received IP-message content by means of an IP-notification.

This Element of Service may be subscribed to only if the Receipt Notification Request Indication Element of Service is subscribed to.

This Element of Service provides only an indication of the originator's request. Fulfilment of the request requires support of the Proof of Content Received Element of Service.

**Request for proof of IP-notification** This Element of Service enables the originator of the IP-message to request the recipient of the IP-message to provide proof of the origin of an IP-notification generated in response to the IP-message.

This Element of Service may be subscribed to only if the Receipt Notification Request Indication Element of Service is subscribed to.

This Element of Service provides only an indication of the originator's request. Fulfilment of the request requires support of the Proof of IP-notification Element of Service.

**Restricted delivery** This element of service enables a recipient UA to indicate to the MTS, through registration, that it is not prepared to accept delivery of messages which originate from, or are redirected by, or are DL-expanded by certain MTS-users.

*Note 1: This element of service can be requested in either of two ways:*

a) *specification by the recipient UA of unauthorised originators, all other originators are considered as authorised;*

b) *specification by the recipient UA of authorised originators, all other originators are considered to be unauthorised.*

*Note 2: The MTS abstract service specified in Recommendation X.411 and ISO/IEC 10021-4 does not provide a technical realisation of this element of service. Its provision is for further study.*

**Return of content** This element of service enables an originating UA to request that the content of a submitted message be returned with any non-delivery notification. This will not be done, however, if any encoded information type conversion has been performed on the message's content.

**Sensitivity indication** This element of service allows the originator of an IP-message to specify guidelines for the relative sensitivity of the message upon its receipt. It is the intent that the sensitivity indication should control such items as:

- 1) whether the recipient should have to prove his identity to receive the IP-message;
- 2) whether the IP-message should be allowed to be printed on a shared printer;
- 3) whether an IPM-UA should allow the recipient to forward the received IP-message;
- 4) whether the IP-message should be allowed to be auto-forwarded.

The sensitivity indication can be indicated to the recipient or interpreted directly by the recipient's IPM-UA.

If no sensitivity level is indicated, it should be assumed that the IP-message originator has advised no restriction on the recipient's further disposition of the IP-message. The recipient is free to forward, print, or otherwise do as he chooses with the IP-message.

Three specific levels of sensitivity above the default are defined:

- Personal: The IP-message is sent to the recipient as an individual, rather than to him in his role. There is no implication that the IP-message is private, however.
- Private: The IP-message contains information that should be seen (or heard) only by the recipient, and not by anyone else. The recipient's IPM-UA can provide services to enforce this intent on behalf of the IP-message's originator.
- Company-confidential: The IP-message contains information that should be treated according to company-specific procedures.

**Special deliver** This element of service allows an originating user to instruct the PDS to transport the letter produced from the MHS message through the ordinary letter mail circulation system and to deliver it by special messenger delivery.

**Stored message alert** This element of service allows a user of an MS to register relevant sets of criteria that can cause an alert to be generated to the user when a message arrives at the MS satisfying the selected criteria. The generation of the alert can occur as follows:

- 1) If the UA is connected and on-line to the MS, the alert message will be sent to the UA as soon as a message arrives at the MS that satisfies the registered criteria for generating alerts. If the UA is off line then the next time the UA connects to his MS after a message arrives at the MS satisfying the registered criteria, the user will be informed that one or more alert cases have occurred, the details of which can be determined by performing a stored message summary.
- 2) In addition to, or as an alternative to 1) above, the MS can use other mechanisms to inform the user.

**Stored message annotation** This element of service enables an MS-user to attach one or more textual annotations to a stored message. Annotations apply to the complete message and may not be applied selectively to different parts of the message. Annotations are local to the MS and MS-user and are not transmitted through the MTS in any message. The "cover note" described in B.83 is not related to message annotations.

**Stored message deletion** This element of service enables a recipient UA to delete certain of its messages from the MS. Subject to subscription, deletion may be restricted to messages meeting certain criteria, e.g. messages stored for longer than an agreed period of time. Messages cannot be deleted if they have not been previously listed.

**Stored message fetching** This element of service enables a recipient UA to fetch from the MS a message, or portions of a message. The UA can fetch a message (or message portion) based on the same search criteria that can be used for stored message listing.

**Stored message grouping** This element of service enables an MS-user to attach group-names to messages stored in the MS. A message can have zero, one, or more group-names associated with it that can subsequently be used for selection purposes. Each message group-name comprises a sequence of components which may be regarded as modelling a storage hierarchy. The setting, changing, or deletion of the group-names attached to a message can be performed by the MS-user.

The UA indicates to the MS, through registration, the name of each distinct group which the UA will employ to label each group of related messages. Each group-name may be assigned a descriptive text registered together with the group-name. The MS will verify that the group-names subsequently employed by the user belong to the registered set of group-names, and will prevent the user from deregistering group-names which are currently attached to stored messages, or which are registered for use by the Auto-assignment of Group Names element of service. A group-name remains valid until it is deregistered. The MS will prohibit an attempt to register the same group-name twice.

**Stored message summary** This element of service provides a recipient UA with a count of the number of messages satisfying a specified criteria based on one or more attributes of the message stored in the MS.

**Storage of draft messages** This element of service enables an MS-user to store draft messages in the MS. The user may obtain summaries of draft messages and may access a draft message by means of the Stored Message Listing and Stored Message Fetching elements of service.

**Storage on submission** This element of service enables an MS-user to instruct the MS to store a copy of a message upon its submission, either by the MS-user or as a result of the performance of an auto-action. Storage of a submitted message is conditional upon the success of the submission. The user may instruct the MS to store all submitted messages, or may control storage on a per message basis.

**Storage period assignment** This element of service enables an MS-user to assign a storage period to a stored message. The storage period indicates the period of time for which the user anticipates the message should be retained in the MS; this may be expressed as a period of time (from the start of storage), or as an absolute date and time. This element of service must be subscribed to if the Auto-deletion after Storage Period or Auto-assignment of Storage Period elements of service are subscribed to.

**Subject indication** This element of service allows the originator to indicate to the recipient(s) the subject of an IP-message being sent. The subject information is to be made available to the recipient.

**Submission log** This element of service enables an MS-user to access a log that records details of the messages submitted from the MS to the MTS. These records are generated regardless of whether a copy of the submitted message is stored by means of the Storage on Submission element of service. Even where a copy is stored, the corresponding Submission Log entry may persist after the message has been deleted. Both successful and unsuccessful submissions are recorded. A Submission Log entry contains a subset of the information that may be stored for a submitted message.

The quantity of information stored in the Submission Log for each message is specified at subscription time. The MS-user is able to determine whether the submitted message corresponding to a Submission Log entry has been deleted. The MS-user is able to retrieve information from the Submission Log by means of the Stored Message Listing, Stored Message Fetching and Stored Message Summary elements of service. The ability to delete Submission Log entries is subject to subscription, and may be restricted to messages meeting certain criteria, e.g. messages stored longer than an agreed period of time.

**Submission of IP-messages incorporating stored messages** This element of service enables an MS-user to instruct the MS to incorporate parts of one or more stored messages as body parts of a submitted IP-message. The submitted IP-message may also contain body parts supplied in the submission from the MS-user.

The stored message which is the source of a body part may be a delivered, submitted or draft message. Individual body parts or the whole content of a stored IP-message may be incorporated. When the content is incorporated it will form a Forwarded IP-message. Delivery-information may also be incorporated from delivered messages when the content is incorporated.

The MS may optionally support the forwarding of body parts from messages which are not IP-messages. In this case, only body parts whose definition is compatible with IPM (or for which rules of conversion into IPM body parts are defined) may be forwarded. The complete content of a message cannot be forwarded if the message is not an IP-message.

The message submitted to the MTS, incorporating the stored messages or body parts may be stored in the MS if the user subscribes to the Storage on Submission element of service. An extract of the message will also be stored in the Submission Log if this element of service is subscribed to.

**Submission time stamp indication** This element of service enables the MTS to indicate to the originating UA and each recipient UA the date and time at which a message was submitted to the MTS. In the case of physical delivery, this element of service also enables the PDAU to indicate the date and time of submission on the physical message.



**Typed body** This element of service permits the nature and attributes of the body of the IP-message to be conveyed along with the body. Because the body can undergo conversion, the body type can change over time.

*Note 1:* One example is the use of a file transfer body part. This provides for conveying the contents of a stored file and other information associated with the file from originator to recipient. The other information includes:

- file attributes, which are typically stored along with the file contents;
- information on the environment from which the transfer originated;
- references to existing stored files or earlier messages.

*Note 2:* Another example is the use of a voice body part.

**Undeliverable mail with return of physical message**

This element of service enables the PDS to return the physical message without delay, with reason indicated to the originator, if it cannot be delivered to the addressee. This is the default action to be taken by the PDS.

*Note.* – In the case of “poste restante” the return of the physical message will take place after some period of time.

**Use of distribution list** This element of service enables an originating UA to specify a distribution list in place of all the individual recipients (users or nested DLs) mentioned therein. The MTS will add the members of the list to the recipients of the message and send it to those members.

Distribution lists can be members of distribution lists, in which case the list of recipients can be successively expanded at several places in the MTS.

**User/UA capabilities registration** This element of service enables a UA to indicate to its MTA, through registration, the categories of message it is capable of handling, and which MTA may deliver to it. A message category is defined as a combination of various properties:

- 1) the content type(s) of messages which may be delivered;
- 2) the encoded information type(s) of messages which may or may not be delivered;
- 3) additional properties, including the maximum message length, and the security labels present.

*Note.* – It is possible to register certain encoded information types such that they cause a message to be delivered regardless of the other encoded information types present. A user may declare certain encoded information types undeliverable to cause the MTS to perform implicit conversion.

The UA may specify different sets of registration information to control the delivery of different categories of message.

The MTA will not deliver to a UA a message that does not match, or exceeds, the capabilities registered.

**END of Appendix A**



# EUR AMHS Manual

## Appendix B

<b>European ATS Messaging Service Profile</b>	
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<sup>1</sup> Appendix H of AFSG/8 report: Profile for ATS Messaging using AMHS and TCP/IP, EUROCONTROL 24/10/2004, Version 2.0

		Revision of ATN specific object classes and ATN specific attribute types	Table K.2.2, K.2.3
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16.0	20/10/2021	Adopted version (AST TF/02)	

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## References

- [1] Internet Engineer Task Force (IETF) STD0007, RFC0793:1981, Transmission Control Protocol
- [2] Internet Engineer Task Force (IETF) STD0005, RFC0791:1981, Internet Protocol
- [3] Internet Engineer Task Force (IETF) STD0003, RFC1122:1989, Requirements for Internet Hosts - Communication Layers
- [4] Internet Engineer Task Force (IETF) RFC4301:2005, Security Architecture for the Internet Protocol (IPsec)
- [5] Internet Engineer Task Force (IETF) RFC2460:1998, Internet Protocol, Version 6 (IPv6) Specification
- [6] Internet Engineer Task Force (IETF) RFC4443:2006, Internet Control Message Protocol (ICMPv6) for the Internet Protocol Version 6 (IPv6) Specification
- [7] Internet Engineer Task Force (IETF) BCP0028, RFC2488:1999, Enhancing TCP over Satellite Channels Using Standard Mechanisms
- [8] ISO/IEC 7498-1:1994 (2nd edition), Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model
- [9] ICAO Annex 10 – Aeronautical Telecommunications, Volume II and Volume III
- [10] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS), Second Edition – 2016
- [11] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part III – Upper Layer Communications Service (ULCS) and Internet Communications Service (ICS) , Second Edition – 2016
- [12] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part IV – Directory Services, Security and Identifier Registration, Second Edition – 2016
- [13] CCITT Rec X.400 (1993). Message handling system and service overview
- [14] CCITT Rec X.402 (1992). Message handling systems: overall architecture
- [15] CCITT Rec X.411 (1992). Message handling systems: Message transfer system: Abstract service definition and procedures
- [16] CCITT Rec X.419 (1992). Message handling systems: Protocol specifications
- [17] CCITT Rec X.420 (1992). Message handling systems: Interpersonal messaging system



- [18] ISO/IEC 646:1991. Information technology — ISO 7-bit coded character set for information interchange
- [19] ISO 3166:1993. Codes for the representation of names and countries
- [20] ISO/IEC 8859-1: 1987. Information processing — 8-bit single-byte coded graphics character sets — Part 1: Latin alphabet No. 1
- [21] ISO/IEC TR 10000-1: 1995. Information technology — Framework and taxonomy of International Standardized Profiles — Part 1: General principles and documentation framework
- [22] ISO/IEC TR 10000-2: 1995. Information technology — Framework and taxonomy of International Standardized Profiles — Part 2: Principles and taxonomy for OSI profiles
- [23] ISO/IEC 10021-1:1990. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 1: System and Service Overview
- [24] ISO/IEC 10021-1:1990/Amd.1:1994. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 1: System and Service Overview
- [25] ISO/IEC 10021-2:1990. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 2: Overall Architecture
- [26] ISO/IEC 10021-2:1990/Amd.1:1994. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 2: Overall Architecture
- [27] ISO/IEC 10021-2:1990/Amd.2:1994. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 2: Overall Architecture
- [28] ISO/IEC 10021-3:1990. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 3: Abstract Service Definition Conventions
- [29] ISO/IEC 10021-4:1990. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 4: Message Transfer System: Abstract Service Definition and Procedures
- [30] ISO/IEC 10021-4:1990/Amd.1:1994. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 4: Message Transfer System: Abstract Service Definition and Procedures
- [31] ISO/IEC 10021-5:1990. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 5: Message Store: Abstract Service Definition
- [32] ISO/IEC 10021-6:1990. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 6: Protocol Specifications

- [33] ISO/IEC 10021-7:1990. Information Technology — Text Communication — Message-Oriented Text Interchange System (MOTIS) — Part 7: Interpersonal Messaging System
- [34] ISO/IEC ISP 10611-1:1994. Information Technology — International Standardized Profiles AMH1n — Message Handling Systems — Common Messaging — Part 1: MHS Service Support
- [35] ISO/IEC ISP 10611-2:1994. Information Technology — International Standardized Profiles AMH1n — Message Handling Systems — Common Messaging — Part 2: Specification of ROSE, RTSE, ACSE, Presentation and Session Protocols for use by MHS
- [36] ISO/IEC ISP 10611-3:1994. Information Technology — International Standardized Profiles AMH1n — Message Handling Systems — Common Messaging — Part 3: AMH11-Message Transfer (P1)
- [37] ISO/IEC ISP 10611-4:1994. Information Technology — International Standardized Profiles AMH1n — Message Handling Systems — Common Messaging — Part 4: AMH12-MTS Access (P3)
- [38] ISO/IEC ISP 10611-5:1994. Information Technology — International Standardized Profiles AMH1n — Message Handling Systems — Common Messaging — Part 5: AMH13-MS Access (P7)
- [39] ISO/IEC ISP 11188-1:1995. Information Technology — International Standardized Profile — Common Upper Layer Requirements — Part 1: Basic connection oriented requirements
- [40] ISO/IEC ISP 11189:1997. Information technology - International Standardized Profile FDI2 - Directory Data Definitions - MHS Use of the Directory
- [41] ISO/IEC ISP 12062-1:1995. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 1: IPM MHS Service Support
- [42] ISO/IEC ISP 12062-2:1995. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 2: AMH21 — IPM Content
- [43] ISO/IEC ISP 12062-3:1995. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 3: AMH22 — IPM Requirements for Message Transfer (P1)
- [44] ISO/IEC ISP 12062-4:1995. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 4: AMH23 — IPM Requirements for MTS Access (P3)
- [45] ISO/IEC ISP 12062-5:1995. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 5: AMH24 — IPM Requirements for MS Access (P7)
- [46] ISO/IEC 10021-1:2003. Information Technology — Text Communication — Message Handling Systems (MHS) — Part 1 : System and Service Overview

- [47] ISO/IEC 10021-2:2003. Information Technology — Text Communication — Message Handling Systems (MHS) — Part 2: Overall Architecture
- [48] ISO/IEC 10021-4:2003. Information Technology — Text Communication — Message Handling Systems (MHS) — Part 4: Message Transfer System: Abstract Service Definition and Procedures
- [49] ISO/IEC 10021-5:1999. Information Technology — Text Communication — Message Handling Systems (MHS) — Part 5: Message Store: Abstract Service Definition
- [50] ISO/IEC 10021-6:2003. Information Technology — Text Communication — Message Handling Systems (MHS) — Part 6: Protocol Specifications
- [51] ISO/IEC 10021-7:2003. Information Technology — Text Communication — Message Handling Systems (MHS) — Part 7: Interpersonal Messaging System
- [52] ISO/IEC ISP 10611-4:2003. Information Technology — International Standardized Profiles AMH1n — Message Handling Systems — Common Messaging — Part 4: AMH12 and AMH14 - MTS Access (P3) and MTS 94 Access (P3). (Edition 3)
- [53] ISO/IEC ISP 10611-5: 2003. Information Technology — International Standardized Profiles AMH1n — Message Handling Systems — Common Messaging — Part 5: AMH13-MS Access (P7). (Edition 3)
- [54] ISO/IEC ISP 10611-6: 2003. Information Technology — International Standardized Profiles AMH1n — Message Handling Systems — Common Messaging — Part 5: AMH15-MS 94 Access (P7). (Edition 2)
- [55] ISO/IEC ISP 12062-1: 2003. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 1: IPM MHS Service Support (Edition 3)
- [56] ISO/IEC ISP 12062-2: 2003. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 2: AMH21 — IPM Content (Edition 3)
- [57] ISO/IEC ISP 12062-3: 2003. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 3: AMH22 — IPM Requirements for Message Transfer (P1). (Edition 3)
- [58] ISO/IEC ISP 12062-4: 2003. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 4: AMH23 and AMH25 — IPM Requirements for MTS Access (P3) and MTS 94 Access (P3). (Edition 3)
- [59] ISO/IEC ISP 12062-5: 2003. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 5: AMH24 — IPM Requirements for Enhanced MS Access (P7). (Edition 3)
- [60] ISO/IEC ISP 12062-6: 2003. Information Technology — International Standardized Profiles AMH2n — Message Handling Systems — Interpersonal Messaging — Part 6: AMH26 — IPM Requirements for Enhanced MS 94 Access (P7). (Edition 2)
- [61] IETF STD0035 RFC 1006:1987 – ISO Transport Service on top of TCP (TP-TCP)
- [62] IETF RFC 2126:1997 – ISO Transport Service on top of TCP (ITOT)

- [63] IETF RFC4511. Lightweight Directory Access Protocol (LDAP): The Protocol, June 2006
- [64] IETF RFC2849. The LDAP Data Interchange Format (LDIF) - Technical Specification, June 2000
- [65] EUR Doc 020, EUR AMHS Manual, Appendix A "Abbreviations, Glossary and Definitions", latest version
- [66] ICAO Doc 9896: Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols, Second Edition – 2015

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# **1. Introduction**

## **1.1 Purpose of the Document**

The following documents and standards contain provisions which, through reference in this text, constitute provisions of this Profile.

At the time of publication of this Profile, the editions indicated for the referenced documents and standards were valid.

Revisions of the referenced documents shall not form part of the provisions of this Profile until they are formally reviewed and incorporated into this Profile.

In case of conflict between the requirements of this Profile and the contents of the referenced documents, this Profile shall take precedence.

## **1.2 Referencing the ISP 1st, 2nd and 3rd Editions**

Doc 9880, Part II [10] refers to Edition 1 of the ISPs to define the Basic ATS Message Handling Service, and it refers to Edition 3 ISPs to define the Extended ATS Message Handling Service. Edition 2 ISPs are not referenced.

This situation complicates the specification of this Profile, because it references both the Basic and Extended ATS Message Handling Services. The Basic Service definitions in Doc 9880, Part II [10] should be updated to refer exclusively to Edition 3 ISPs – thus eliminating all references to Edition 1 ISPs.

In the meantime, this Profile, and the profiling tables in its Annexes all refer to the elements of the 3rd Edition ISPs. Annex R provides a mapping between the elements of Edition 3 to the corresponding elements of Edition 1 ISPs.

## 2. **Definitions**

For the purpose of this Profile, the following definitions shall apply:

**Profile:** A set of one or more base standards, and, where applicable, the identification of chosen classes, subsets, options and parameters of those base standards, necessary for accomplishing a particular function.

**Profile Requirements List (PRL):** The profile requirements are expressed in the form of conformance requirements and are arranged in a tabular list format.

**Protocol Implementation Conformance Statement (PICS):** A statement made by the supplier of a system, stating which capabilities have been implemented for a given protocol.

**Implementation:** a conforming AMHS implementation of this Profile which is uniquely defined by its IP address, TCP port and, if applicable, its associated OSI TSAP, SSAP PSAP and Application Entity Title.

### 3. **Technical Overview**

#### 3.1 **ATS Message Handling Service Support**

The ATS Message Handling System includes several types of system:

**ATS Message User Agents** – ATS Message Servers are accessed remotely using an ATS Message User Agent. Therefore each individual user or group of users at a physical location that require access to AMHS must be provided with an ATS Message User Agent.

The user may be a person or some type of system that automatically generates and/or receives messages.

ATS Message User Agents generate, and must accept the contents of messages and Message Envelopes transmitted between International COM centres. Some of the provisions of this Profile therefore apply to ATS Message User Agents. Some other purely local aspects of the protocols used to connect a UA to an MTA or MS will need to be specified separately by the ANSP to suit their own requirements.

**ATS Message Servers** – these provide the Message Transfer Service and perform the entire common message processing for a number of attached ATS Message User Agents. They support ATS Message User Agents and Message Stores access to the server for message Submission and Delivery, and interchange messages with other ATS Message Servers in other locations.

An ATS Message Server supporting AMHS contains an MTA. Some of the provisions of this Profile therefore apply to the MTA components used in AMHS systems.

An ATS Message server may also contain a Message Store. Message Stores are required to be effectively transparent to international message interchange, and therefore are not subject to the provisions of this Profile. However, they will be the subject of local specifications by the ANSP procuring an MS.

The AMHS may also include a further component such as AFTN/AMHS Gateway, however, this is out of the scope of this Profile.

#### 3.2 **ATS-Message Handling System components**

ATS Message Servers and ATS Message User Agents are supported by the MHS system components outlined in the following sections.

##### 3.2.1 **ATS-Message User Agent components**

Each ATS Message User Agent consists of an MHS User Agent, possibly a Directory User Agent (DUA) and some form of user interface.

- **User Agent (UA)** – The task of a UA is to provide one or more users at a particular location with remote access to Message Handling Services provided by the MTA. In particular, they support the users to create and receive Inter-Personal Messages formatted to ATS requirements.



- **Directory User Agent (DUA)** – The task of a Directory User Agent is to provide one or more users at a particular location with access to a Directory Service Agent to allow them to determine the OR-Addresses and messaging capabilities of other users.

### 3.2.2 ATS Message Servers

ATS Message Servers consist of a Message Transfer Agent and optionally an access point for Message Transfer Service access, a Message Store, and may include a Directory User Agent:

- **Message Transfer Agent (MTA)** – The task of an MTA component is to provide the Message Handling Services to users, and in particular, to transfer messages directly or indirectly to users attached to other Message Transfer Agents using Store and Forward messaging techniques. Each international COM Centre that supports AMHS must communicate with other international COM Centres using an MTA.
- **Message Store (MS)** – The task of a Message Store is to take delivery of messages on behalf of a User Agent and hold them until the user retrieves them through the UA.
- **MTS Access for remote MTS Users** – This provides an access point to the Message Transfer Agent for MTS users (e.g. either Remote UAs and/or Message Stores).
- **Directory User Agent (DUA)** – The task of a DUA is to provide the MTA with access to a Directory Service Agent (which holds directory information) to allow the determination of user OR-Addresses and user's messaging capabilities, to provide AMHS<>AFTN Address mapping information, and to hold AMHS Security and Distribution List details.
- **Co-located MHS User Agents (UA)** – Some Message Server configurations may include a Co-located User Agent that supports remote access for the user's system/terminal using some proprietary protocol (e.g. via a proprietary LAN solution).

## 3.3 **AMHS and other Protocols**

The AMHS system components outlined above communicate with each other using standard protocols specified in the Message Handling Systems Base Standards, the International Standardized Profiles (ISPs), Doc 9880, Part II [10] and some Internet RFCs. The following subsections give an overview:

### 3.3.1 The IPM Content Type

The ATS Message Handling Service is based on the Inter-Personal Messaging Content Type. This is a Profile that specifies the form and fields of an IPM message Heading and Body Parts. The IPM Content Type is used by UAs that generate AMHS IP Messages, and by UAs that receive AMHS IP Messages. The protocol (referred to as P2) is therefore used in communications between IPM-conformant User Agents. The IPM content Type is profiled by Doc 9880, Part II [10] to support the ATS Message Handling Service.

### 3.3.2 AMHS Body Part Types

In the ATS Messaging Service, an IPM may contain either one body part or a combination of two body parts.

In case of one body part only, the IPM contains either:

- a) a single ia5-text in support of textual data exchange, or
- b) a single ia5-text-body-part in support of textual data exchange, or
- c) a single general-text-body-part in support of textual data exchange, or
- d) a single file-transfer-body-part in support of binary data exchange.

In case of a combination of two body parts, the IPM contains either:

- a) a single ia5-text and a file-transfer-body-part, or
- b) a single ia5-text-body-part and a file-transfer-body-part, or
- c) a single general-text-body-part and a file-transfer-body-part.

*Note.— Use of the bilaterally-defined body part (as specified in earlier editions of former Doc 9705) is deprecated.*

### **3.3.3 Message Transfer – P1**

ATS Messages are transferred between MTA components of ATS Message Servers using a Message Store-and-Forward Protocol referred to as P1. There are a number of different specifications of P1, each suited to a particular situation. One of these is mandated in this Profile. Each ATS message will be transferred between MTAs in a Message Envelope that conforms to the P1 Protocol.

### **3.3.4 Message Transfer System Access – P3**

ATS Messages are transferred between MTS-Users (UAs and MSs) and MTAs during message Submission and Delivery using a protocol referred to as P3. The ISPs, together with this Profile mandate facilities for users to be able to construct valid AMHS message IPM-Headings, IPM Body Parts, Message Transfer Envelopes and valid AMHS Addresses (OR-Addresses) by using standard MHS Elements of Service.

This form of MTS access is referred to as ‘forced access’ because messages arriving at the MTA are immediately ‘force’ delivered to the UA (as opposed to being stored in a Message Store). This is an important consideration for users that may receive urgent, high priority messages (e.g. ‘SS’ priority ATS messages).

However, it should be noted that the P3 protocol is not often used in commercial environments because commercial users generally prefer to use Message Store Access (P7) which more adequately suits their needs. This means that P3 based UAs and MTAs might not be quite so readily available in the marketplace.

### **3.3.5 Proprietary MTS Access**

If an ATC application (e.g. Flight Planning System) and its UA are co-located with an MTA on a common hardware platform, then the Application Program Interface between the UA and MTA supports the MT-Access Abstract Service as defined for P3.

### **3.3.6 Proprietary MTS Access (Co-Located UA)**

In some configurations a UA may be co-located with the MTA on the same platform. In these cases, the UA and MTA exchange messages over a system internal Application Programming Interface (using the P3 Abstract Service), and the UA is accessed from the remote user’s site

using a local system (e.g. a non-P3 Personal Computer). The remote system and the UA component communicate using some proprietary protocols (e.g. via a LAN or using a dial-up connection).

In these cases, it is important to ensure that the remote user's system can access all of the necessary facilities and MHS Elements of Service to construct, submit and take delivery of valid ATS message IPM-Headings, IPM Body Parts, Message Transfer Envelopes and valid AMHS Addresses (OR-Addresses).

### **3.3.7 Message Store Access – P7**

Some users may optionally be configured with a Message Store that is attached permanently to the MTA to take message delivery. Users access the Message Store and retrieve delivered messages at their own convenience. The protocol used for communications between the UA and the MS is referred to as P7.

Messages are not 'force-delivered' to users of Message Stores, so, Message Stores should not be configured for users who might receive urgent, high priority messages (e.g. 'SS' priority ATS messages) unless the Message Store is locally configured with an appropriate function called the "Alert Auto-Action".

Message Stores are often co-located with their MTA, and an Application Programming Interface (API) is used for communications between MTA and MS. This API supports the MT-Access Abstract Service (P3).

In other, rare, cases an MS may not be co-located with the MTA. In such cases the P3 protocol is used for Message Submission and Delivery between the MS and MTA.

### **3.3.8 Message Store Access P7 (94)**

In 1994, an upgraded Message Store was defined in the MHS Base Standards (referred to as MS (94) P7). For the purposes of ATS Messaging in the context of this Profile, there is no distinction between the MS and MS(94) systems, since all of the base standards enhancements of the MS(94) systems are of a purely local nature (i.e. effective only between the UA and the MS and not effective on an end-to-end basis). The enhancements allow the user to create and store draft messages in the message store. It also includes more Auto Action types, and enables enhanced message manipulation. Procurers may need to become aware of these distinctions and specify the local options of the MS that are appropriate to the MS user's intended task.

### **3.3.9 Proprietary Message Store Access**

In some configurations, a UA may be partly co-located with the MS. In these cases, the UA and MS exchange messages over a system internal Application Programming Interface, and the UA is accessed from the remote user's site using a local system (e.g. a non-P7 Personal Computer). The remote system and the UA component communicate using some proprietary protocols (e.g. via a LAN or using a dial-up connection). In these cases, it is important to ensure that the remote user's system can access all of the necessary facilities and MHS Elements of Service to construct and retrieve valid AMHS message IPM-Headings, IPM Body Parts, Message Transfer Envelopes and valid AMHS Addresses (OR-Addresses).

### **3.3.10 Upper Layer Support**

The Upper Layers of OSI are used to support communications between MTAs, UAs and MSs. The protocols involved are the ROSE, RTSE, ACSE, Presentation and Session protocols. The

use of OSI upper layers is specified as a common ISP for all of the MHS Applications (MTA, UA and MS). These rely on provision of an OSI Transport Service.

### **3.3.11 Transport**

The Upper Layers use a common set of OSI Transport Services. However, the OSI Transport Layer Protocols are not used in the EUR AMHS Profile. Instead the OSI Transport Service is supported by RFCs 1006 and 2126 as a means of utilising an underlying TCP/IP data communications service.

### **3.3.12 Lower Layers and TCP/IP**

This Profile specifies the use of TCP/IP for interconnections between MTAs of different ANSP International COM Centres within Europe. The same Lower Layer profile may also be used within ANSP's local systems – e.g. to support P1, P3 and P7.

Additional protocol stacks may be required in other situations (e.g. the ATN profile may be additionally required to connect to other inter-Regional gateways, and other profiles may need to be used between the MTAs operating within an ANSP's Management Domain).

## **3.4 Common Facilities**

### **3.4.1 Directory Service**

ICAO Doc 9880 Part IV [12] defines the ATN Directory Services (ATN DIR) with the intention to allow ATN users to obtain directory information about ATN users, applications and services participating in the ATN. The ATN DIR is based on the X.500 Directory model defined by the ISO/IEC 9594 set of standards.

The ATN DIR is refined by the definition of the European Directory Service (EDS) adopting the directory concept proposed by the AMHS Community Specification (AMHS CS). Besides technology considerations, the EDS operational concept addresses further issues such as management, collaboration and transition. The EDS proposes a hierarchical architecture of DSAs connected to a Central European DSA acting as a common facility. The introduction of the Central European DSA reduces not only the overall complexity of communication, but also enables a co-ordinated exchange of information.

The European Directory Service (EDS) is specified in Appendix G to the EUR AMHS Manual.

The EUR AMHS Profile indicates information that may be obtained from the Directory by the ATS Message User Agent, the ATS Message Server as well as the AFTN/AMHS Gateway. In order to access the Directory, these AMHS components need to be complemented by respective Directory User Agents (DUA). The information obtainable from EDS by AMHS components supports, among others, name resolution, AFTN/AMHS address translation and determination of user capabilities. Support of further functions can be added as necessary.

Annex K to this Appendix provides material for conformity assessment for AMHS components that incorporate a DUA for access to EDS.

### **3.4.2 Cryptographic profile**

The Extended ATS Messaging Service requires the support of the S0 Functional Group, which applies to the various forms of User Agent. However, the ISPs do not specify the

cryptographic parameters (e.g. cryptographic algorithms and parameters) to be used. These are specified by Doc 9880, Part IV [12] for AMHS, and furthermore over time, they are liable to change. The cryptographic profile provided by this Profile contains references to those additional specifications of cryptographic algorithms and value settings of individual protocol fields necessary to secure ATS messages.

*Note.*– The S0 functional group is not specified by the EUR AMHS Profile.

*Note.*– The Cryptographic profile has been treated in a separate Annex for simplicity of maintenance, and the fact that it is referenced by a number of different AMHS component types.

### 3.5 Addressing and Address Registration

AMHS Systems use Originator-Recipient Addresses (OR-Addresses) to identify and locate users within the MTS. Doc 9880, Part II [10] specifies a number of OR-Address Forms for use in AMHS.

Doc 9880, Part II [10] also specifies and registers appropriate address values for use with the OSI upper layer addressing.

The RFCs specify ‘well-known’ TCP-port identifiers for use with RFC 1006/2126 applications.

This Profile collects these values in a Register of Address Values in Annex N.

### 3.6 ANSP’s AMHS System local configurations

ANSPs will need to configure their own AMHS systems according to local requirements. Accordingly, the specifications of this Profile constrain only those aspects that are necessary to guarantee Regional (EUR) interchange of ATS messages.

However, this means that ANSPs will need to define their own systems local configurations (such as location of UAs, MTAs, and their interconnectivity etc.) and they may need to provide further specifications for any purely local protocol aspects that remain options in the ISPs on which this Profile is based (e.g. options for Message Retrieval from Message Stores, and the details of UA/MTA and UA MS Bind Operations and Authentication resulting from an ANSP’s local security policy).

### 3.7 Protocol Stacks

The following illustrates the different applications profiled in this Profile together with their underlying protocol stacks.

Ref	Layer	UA	MS	MTA
1	Application	P3 + IPM	P7 or P7 (94) + IPM	P1 + IPM
2	ROSE	Y	Y	-
3	RTSE	O	O	Y
4	ACSE	Y		

Ref	Layer	UA	MS	MTA
5	Presentation	Y		
6	Session	Y		
7	Transport	Y (RFC 1006 or 2126 over TCP)		
8	Network	Y (IPv6 or IPv4)		

**Table 3.7.1: EUR AMHS Protocol Stacks**

Y = Layer protocol implemented  
O = Optionally implemented  
- = Not used

## **4. EUR AMHS Profile Requirements**

### **4.1 Introduction**

The specifications of AMHS components in this Profile are based on the ISO/IEC ISPs and other specifications, which, in turn, are further refined by Annexes A to Q of this Profile. The following sections indicate which ISPs and which Annexes to this Profile shall be used in specifying each of the types of AMHS components identified in section 3 (UAs, MTAs, and MSs).

### **4.2 Conformance Requirements**

An implementation claiming conformance to this specification shall meet the requirements of the Base Standards (ISO/IEC 10021), and the ISPs referenced in sections 4.3 to 4.7 applicable to the corresponding system type. The technical details are provided in Annexes A to P. Within each Annex, the notes in italics are advisory only and used to clarify the intent and development of each Annex.

An implementation claiming conformance to this specification shall additionally meet the requirements specified in sections 4.3 to 4.7 that apply to the particular type of system identified in section 4.3 including all those requirements contained in the referenced Annexes to this profile.

For each AMHS System Type identified in 4.3 below, Annex Q contains a corresponding Implementation Conformance Statement pro forma that is intended to document each implementation's conformance to the Base Standards, the referenced ISPs, Doc 9880, Part II [10] and the corresponding Annexes listed in sections 4.4 to 4.7. A claim of conformance for an implementation shall be supported by completion of the Profile Implementation Conformance Statement pro forma as described in Annex Q.

Support for the Extended ATS Message Handling Service is not mandated for conformance to this profile. However, an implementation for which conformance to this profile is claimed may additionally claim conformance to some or all of the requirements of the extended service. The requirements to be met for such additional conformance are specified by means of conditional 'c' requirements and notes at the bottom of tables in the following sections.

### **4.3 AMHS Systems and System Component Configurations**

The following table specifies the different AMHS components required to construct an ATS Message User Agent System and an ATS Message Server to support the EUR AMHS Profile. Specifications of the corresponding systems components are given in sections 4.4 to 4.7.

Ref	System Component	ATS User System	ATS Message Server	Comments
1	IPM UA Content - See Annex A	m	-	For any UA exchanging ATS messages internationally
2	IPM UA – P3 Access - See section 4.4.1	c <sup>1, 2</sup>	-	“
3	IPM UA – P7 Access - See section 4.4.2	c <sup>1, 2</sup>	-	“
4	IPM UA – P7 (94) Access - See section 4.4.3	c <sup>1, 2</sup>	-	“
5	Co-located UA - See section 4.4.4	c <sup>1, 3</sup>	o <sup>1, 3</sup>	“
6	MTA - See section 4.5	-	m	For all MTAs supporting as International COM Centres
7	MS Support for P7 - See section 4.6	-	c <sup>4</sup>	
8	MS Support for P7 (94) - See section 4.7	-	c <sup>5</sup>	
9	Directory Information - See Annex K	o	o	Directory Information availability is indicated but not mandated.

**Table 4.3.1: AMHS Systems and System Component Configurations**

<sup>1</sup> if the Basic service or the EUR AMHS Profile is to be supported then at least one of the system components marked 1 is mandatory.

<sup>2</sup> if Extended service is to be supported at least one of those marked 2 is mandatory.

<sup>3</sup> Excluded (X) in the Extended Service if Secured Messages are to be generated.

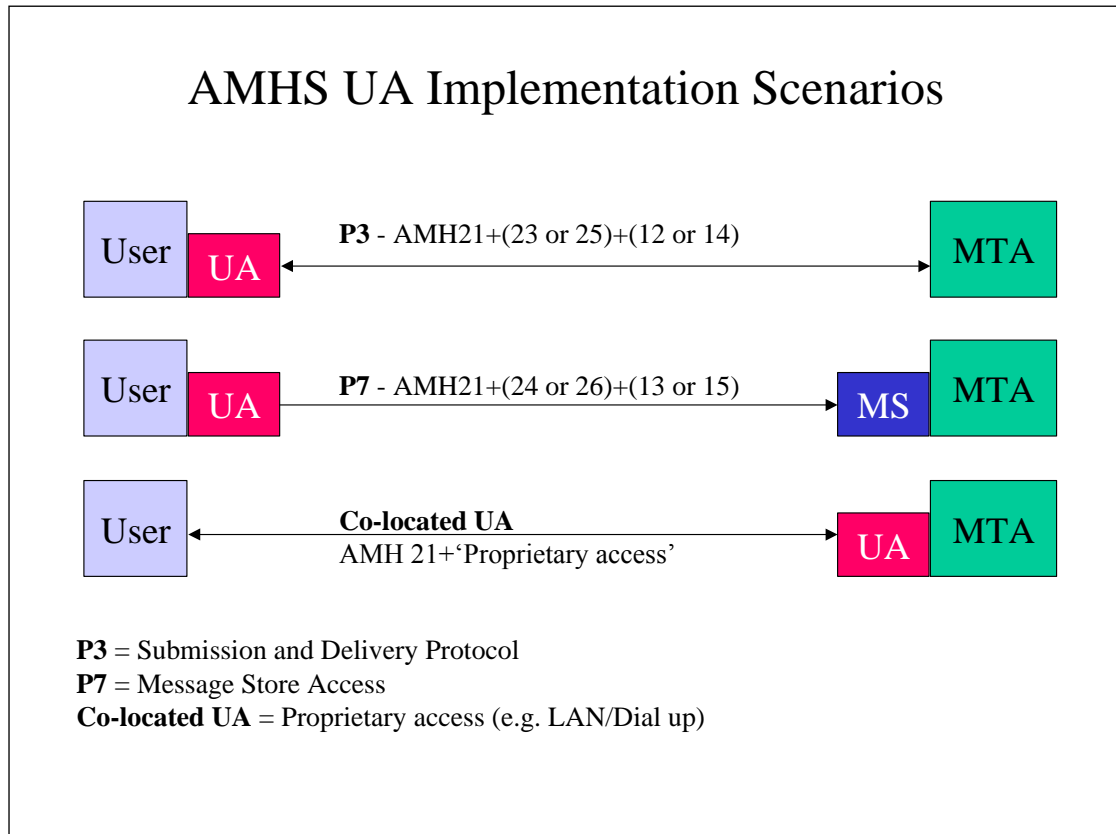
<sup>4</sup> For any MS supporting P7 UAs exchanging ATS messages internationally m, else o.

<sup>5</sup> For any MS supporting P7 (94) UAs exchanging ATS Messages internationally m, else o.



## 4.4 IPM UA Requirements

There are three IPM User Agent scenarios which are illustrated in Figure 1:



**Figure 1: UA Implementation Scenarios**

### 4.4.1 IPM UA using P3

This section applies where a EUR AMHS P3 based User Agent is to be procured.

A P3 User Agent for which conformance to this Profile is claimed shall conform to the following list of specifications:

Ref	Element	EUR AMHS Requirement	Specifications
1	IPM Content	m	<ul style="list-style-type: none"> <li>Profile AMH21 – ISO/IEC ISP 12062-2 – IPM Content</li> <li>Annex A</li> </ul>
2	IPM Use of P3	m <sup>1</sup>	<ul style="list-style-type: none"> <li>Profile AMH23 &amp; 25 – ISO/IEC ISP 12062-4 – IPM Requirements for MTS Access and MTS Access(94) – (P3)</li> <li>Annex C</li> </ul>

Ref	Element	EUR AMHS Requirement	Specifications
3	P3	m <sup>2</sup>	<ul style="list-style-type: none"> <li>Profile AMH12 &amp; 14 – ISO/IEC ISP 10611-4 – Requirements for MTS Access and MTS Access(94) – (P3)</li> <li>Annex G</li> </ul>
4	Upper Layers	m	<ul style="list-style-type: none"> <li>Profile AMH1n – ISO/IEC ISP 10611-2 Common Messaging Specification of ROSE, RTSE, ACSE, Presentation and Session Protocols for use by MHS</li> <li>Annex J</li> <li>Annex N</li> </ul>
5	Transport-RFC 1006/2126 – TCP	o <sup>3</sup>	<ul style="list-style-type: none"> <li>Annex L</li> </ul>
6	IP	o <sup>3</sup>	<ul style="list-style-type: none"> <li>Annex M</li> </ul>
7	IPSec	o <sup>3</sup>	<ul style="list-style-type: none"> <li>Annex O</li> </ul>
8	AMHS Cryptographic Profile	c <sup>4</sup>	<ul style="list-style-type: none"> <li>Annex P</li> </ul>
9	Directory Information	o	<ul style="list-style-type: none"> <li>Annex K</li> </ul>

**Table 4.4.1: IPM UA using P3**

<sup>1</sup> AMH23 is mandated for the Basic Service. Conformance to AMH25 may be additionally claimed for the Extended Service.

<sup>2</sup> AMH12 is mandated for the Basic Service. Conformance to AMH14 may be additionally claimed for the Extended Service.

<sup>3</sup> Locally specified by the ANSP. It must be either as stated in the requirement column, or must use ATN specification or specify another alternative.

<sup>4</sup> If extended Service then m else o.

#### **4.4.2 IPM UA using P7**

This section applies where a EUR AMHS P7 based User Agent is to be procured.

A P7 User Agent for which conformance to this Profile is claimed shall conform to the following list of specifications:

Ref	Element	EUR AMHS Requirement	Specifications
1	IPM Content	m	<ul style="list-style-type: none"> <li>Profile AMH21 – ISO/IEC ISP 12062-2 – IPM Content</li> <li>Annex A</li> </ul>
2	IPM Use of P7	m	<ul style="list-style-type: none"> <li>Profile AMH24 – ISO/IEC ISP 12062-5 – IPM Requirements of Enhanced MS Access (P7)</li> <li>Annex D</li> </ul>
3	P7	m	<ul style="list-style-type: none"> <li>Profile AMH13 – ISO/IEC ISP 10611-5 – MS Access (P7)</li> <li>Annex H</li> </ul>
4	Upper Layers	m	<ul style="list-style-type: none"> <li>Profile AMH1n – ISO/IEC ISP 10611-2 Common Messaging Specification of ROSE, RTSE, ACSE, Presentation and Session Protocols for use by MHS</li> <li>Annex J</li> <li>Annex N</li> </ul>
5	Transport-RFC 1006/2126 - TCP	o <sup>1</sup>	<ul style="list-style-type: none"> <li>Annex L</li> </ul>
6	IP	o <sup>1</sup>	<ul style="list-style-type: none"> <li>Annex M</li> </ul>
7	IPSec	o <sup>1</sup>	<ul style="list-style-type: none"> <li>Annex O</li> </ul>
8	AMHS Cryptographic Profile	c <sup>2</sup>	<ul style="list-style-type: none"> <li>Annex P</li> </ul>
9	Directory Information	o	<ul style="list-style-type: none"> <li>Annex K</li> </ul>

**Table 4.4.2: IPM UA using P7**

<sup>1</sup> Locally specified by the ANSP. It must be either as stated in the EUR AMHS Requirements column, or must use ATN specification or specify another alternative.

<sup>2</sup> If Extended Service then m else o.

#### **4.4.3 IPM UA using P7 (94)**

This section applies where a EUR AMHS P7 (94) based User Agent is to be procured.

A P7 (94) User Agent for which conformance to this Profile is claimed shall conform to the following list of specifications:

Ref	Element	EUR AMHS Requirement	Specifications
1	IPM Content	m	<ul style="list-style-type: none"> <li>Profile AMH21 – ISO/IEC ISP 12062-2 – IPM Content</li> <li>Annex A</li> </ul>
2	IPM Use of P7 (94)	m	<ul style="list-style-type: none"> <li>Profile AMH26 – ISO/IEC ISP 12062-6 – IPM Requirements of Enhanced MS Access (94) (P7)</li> <li>Annex E</li> </ul>
3	P7 (94)	m	<ul style="list-style-type: none"> <li>Profile AMH15 – ISO/IEC ISP 10611-6 – MS Access-94 (P7)</li> <li>Annex I</li> </ul>
4	Upper Layers	m	<ul style="list-style-type: none"> <li>Profile AMH1n – ISO/IEC ISP 10611-2 Common Messaging Specification of ROSE, RTSE, ACSE, Presentation and Session Protocols for use by MHS</li> <li>Annex J</li> <li>Annex N</li> </ul>
5	Transport-RFC 1006/2126 - TCP	o <sup>1</sup>	<ul style="list-style-type: none"> <li>Annex L</li> </ul>
6	IP	o <sup>1</sup>	<ul style="list-style-type: none"> <li>Annex M</li> </ul>
7	IPSec	o <sup>1</sup>	<ul style="list-style-type: none"> <li>Annex O</li> </ul>
8	AMHS Cryptographic Profile	c <sup>2</sup>	<ul style="list-style-type: none"> <li>Annex P</li> </ul>
9	Directory Information	o	<ul style="list-style-type: none"> <li>Annex K</li> </ul>

**Table 4.4.3: IPM UA using P7 (94)**

<sup>1</sup> Locally specified by the ANSP. It must be either as stated in column 1, or must use ATN specification or specify another alternative.

<sup>2</sup> If Extended Service then m else o.

#### **4.4.4 IPM UA Co-located with MTA (with or without MS)**

This section applies where a EUR AMHS Co-located based User Agent is to be procured.

An IPM User Agent integrated with MTA for which conformance to this Profile is claimed shall conform to the following list of specifications:

Ref	Element	EUR AMHS Requirement	Specifications
1	IPM Content	m	<ul style="list-style-type: none"> <li>Profile AMH21 – ISO/IEC ISP 12062-2 – IPM Content</li> <li>Annex A</li> </ul>
2	Underlying Proprietary Network and Protocols used to access the UA	–	Suppliers shall declare the name, version number etc. of the standards or products used

**Table 4.4.4: IPM UA Co-located with MTA**

## 4.5 MTA Requirements

This section applies where a EUR AMHS MTA is to be procured.

An MTA for which conformance to this Profile is claimed shall conform to the following list of specifications:

Ref	Element	EUR AMHS Requirement	Specifications
1	IPM Requirements of Message Transfer P1	m	<ul style="list-style-type: none"> <li>Profile AMH22 – ISO/IEC ISP 12062-3 – IPM Requirements for Message Transfer – (P1)</li> <li>Annex B</li> </ul>
2	Message Transfer Protocol – P1	m	<ul style="list-style-type: none"> <li>ATS Messaging Addendum to Profile AMH11 – ISO/IEC ISP 10611-3 – Message Transfer (P1)</li> <li>Annex F</li> </ul>
3	IPM Requirements of Message Submission and Delivery Service P3	c <sup>1</sup>	<ul style="list-style-type: none"> <li>Profile AMH23 &amp; 25 – ISO/IEC ISP 12062-4 – IPM Requirements for MTS Access and MTS Access(94) – P3</li> <li>Annex C</li> </ul>
4	Message Submission and Delivery Service P3	c <sup>1</sup>	<ul style="list-style-type: none"> <li>Profile AMH12 &amp; 14 – ISO/IEC ISP 10611-4 – Requirements for MTS Access and MTS Access(94) – (P3)</li> <li>Annex G</li> </ul>
5	Upper Layers	m	<ul style="list-style-type: none"> <li>Profile AMH1n – ISO/IEC ISP 10611-2 Common Messaging</li> </ul>

Ref	Element	EUR AMHS Requirement	Specifications
			Specification of ROSE, RTSE, ACSE, Presentation and Session Protocols for use by MHS <ul style="list-style-type: none"> <li>• Annex J</li> <li>• Annex N</li> </ul>
6	Transport-RFC 1006/2126 - TCP	m	<ul style="list-style-type: none"> <li>• Annex L</li> </ul>
7	IP	m	<ul style="list-style-type: none"> <li>• Annex M</li> </ul>
8	IPSec	o	<ul style="list-style-type: none"> <li>• Annex O</li> </ul>
9	Directory Information	o	<ul style="list-style-type: none"> <li>• Annex K</li> </ul>

**Table 4.5.1: MTA Requirements**

<sup>1</sup> If MTA supports P3 UAs or MSs then m, else o.

## 4.6 MS Requirements

This section applies where a EUR AMHS P7 based Message Store is to be procured.

A Message Store for which conformance to this Profile is claimed shall conform to the following list of specifications:

Ref	Element	EUR AMHS Requirement	Specifications
1	IPM Content	m	<ul style="list-style-type: none"> <li>• Profile AMH21 – ISO/IEC ISP 12062-2 – IPM Content</li> <li>• Annex A</li> </ul>
2	IPM Use of P7	m	<ul style="list-style-type: none"> <li>• Profile AMH24 – ISO/IEC ISP 12062-5 – IPM Requirements of Enhanced MS Access (P7)</li> <li>• Annex D</li> </ul>
3	P7	m	<ul style="list-style-type: none"> <li>• Profile AMH13 – ISO/IEC ISP 10611-5 – MS Access (P7)</li> <li>• Annex H</li> </ul>
4	Upper Layers	m	<ul style="list-style-type: none"> <li>• Profile AMH1n – ISO/IEC ISP 10611-2 Common Messaging Specification of ROSE, RTSE, ACSE, Presentation and Session Protocols for</li> </ul>

Ref	Element	EUR AMHS Requirement	Specifications
			use by MHS <ul style="list-style-type: none"> <li>Annex J</li> <li>Annex N</li> </ul>
5	Transport-RFC 1006/2126 - TCP	o <sup>1</sup>	<ul style="list-style-type: none"> <li>Annex L</li> </ul>
6	IP	o <sup>1</sup>	<ul style="list-style-type: none"> <li>Annex M</li> </ul>
7	IPSec	o <sup>1</sup>	<ul style="list-style-type: none"> <li>Annex O</li> </ul>
3	AMHS Cryptographic Profile	c <sup>2</sup>	<ul style="list-style-type: none"> <li>Annex P</li> </ul>

**Table 4.6.1: MS Requirements**

<sup>1</sup> Locally specified by the ANSP. It must be either as stated in the requirements column, or must use ATN specification or specify another alternative

<sup>2</sup> If Extended Service then m else o.

## 4.7 MS (94) Requirements

This section applies where a EUR AMHS Message Store (94) is to be procured.

A P7 (94) Message Store for which conformance to this Profile is claimed shall conform to the following list of specifications:

Ref	Element	EUR AMHS Requirement	Specifications
1	IPM Content	m	<ul style="list-style-type: none"> <li>ATS Messaging Addendum to Profile AMH21 – ISO/IEC ISP 12062-2 – IPM Content</li> <li>Annex A</li> </ul>
2	IPM Use of P7 (94)	m	<ul style="list-style-type: none"> <li>Profile AMH26 – ISO/IEC ISP 12062-6 – IPM Requirements of Enhanced MS Access (94) (P7)</li> <li>Annex E</li> </ul>
3	P7 (94)	m	<ul style="list-style-type: none"> <li>Profile AMH15 – ISO/IEC ISP 10611-6 – MS Access-94 (P7)</li> <li>Annex I</li> </ul>

Ref	Element	EUR AMHS Requirement	Specifications
4	Upper Layers	m	<ul style="list-style-type: none"> <li>• Profile AMH1n – ISO/IEC ISP 10611-2 Common Messaging Specification of ROSE, RTSE, ACSE, Presentation and Session Protocols for use by MHS</li> <li>• Annex J – ISP Addendum</li> <li>• Annex N – Upper Layer Addressing</li> </ul>
5	Transport-RFC 1006/2126 - TCP	o <sup>1</sup>	<ul style="list-style-type: none"> <li>• Annex L</li> </ul>
6	IP	o <sup>1</sup>	<ul style="list-style-type: none"> <li>• Annex M</li> </ul>
7	IPSec	o <sup>1</sup>	<ul style="list-style-type: none"> <li>• Annex O</li> </ul>
3	AMHS Cryptographic Profile	c <sup>2</sup>	<ul style="list-style-type: none"> <li>• Annex P</li> </ul>

**Table 4.7.1: MS (94) Requirements**

<sup>1</sup> Locally specified by the ANSP. It must be either as stated in the requirements column, or must use ATN specification or specify another alternative.

<sup>2</sup> If Extended Service then m else o.



## **A. ANNEX A (NORMATIVE) – IPM CONTENT**

### **AMHS Addendum to Profile AMH21 – ISO/IEC ISP 12062-2 IPM Content**

#### **A.1 Introduction**

This is an addendum to ISO/IEC ISP 12062-Part 2 – AMH21 - IPM Content (the ISP), and should be used in conjunction with that ISP. It contains additional requirements to those specified in the ISP for ATS Message User Agents.

*Note.– Summary:*

- *The IPM content has a high significance for end-to end ATS messaging;*
- *The ISP (12062-2) mandates most of the required heading, OR-Naming, content types and Body Parts used for ATS messaging. However it is necessary to ensure that Business Class messaging, general text, ia5 text and file transfer body parts may also be correctly mandated together with the required optional functional group for DL in the appropriate profiles;*
- *Additional UA requirements concerning ATS Message Header Generation, potentially Message Legal Recording, use of message priorities, interpretation of UTC Time, and use of DL Expansion prohibition are also specified;*
- *Note that the IPM Profile itself makes no mention of the S0 Security functional group since it is purely a message ‘envelope’ based technique which is more related to the P1/P3/P7 profiles and which are specified to include S0 in other Annexes.*

#### **A.2 EUR AMHS Requirement**

##### **A.2.1 ISP Conformance**

An AMHS User Agent shall conform to Profile AMH21 – ISO/IEC ISP 12062-2 – IPM Content.

##### **A.2.2 Additional Requirements to the ISP**

The following tables (A.0.6, A.1.3, A.1.3.1 and A.1.3.3) have been adapted from, and refer to the tables of the same title as those in ISO/IEC ISP 12062-2. They specify additional mandatory requirements that express restrictions on a set of rows of the AMH21 profile, which are referred to using their respective references in ISO/IEC ISP 12062-2. Implementations for which conformance to this Profile is claimed shall implement the additional mandatory elements.

-----Begin of references to ISO/IEC ISP 12062-2-----

#### A.0.6 Statement of profile conformance

Ref	Question	ISP	Doc 9880		EUR AMHS	Comments
			Basic Service	Ext. Service		
2	Are all mandatory requirements of any of the following optional functional groups implemented?					
2.2	IPM Security (SEC)	o	o	m	o	class(es): S0 – Common Messaging
2.5	IPM Business Class (BC)	o	o	m	o	See Doc 9880, Part II - 3.1.4.2.1

#### A.1.3 IPM body

Ref	Element	ISP Origin/Rec	Doc 9880		EUR AMHS origin/rec	Notes/ References
			Basic Service origin /rec	Extended Service origin /rec		
1	ia5-text	o/m	o/m	o/m	o/m	
1.2	data	m/m	m/m	m/m	m/m	See Doc 9880, Part II - 3.3.3
12	extended	m/m	m/m	m/m	m/m	

##### A.1.3.1 Extended body part support

Ref	Extended Body Part Type	ISP Origin/ Rec.	Doc 9880		EUR AMHS	Notes/ References
			Basic Service	Extended Service		
			Orig/Rec	Orig/Rec	Orig/rec	
1	ia5-text-body-part	o/m	o/m	o/m	o/m	see A.1.3/1
11	general-text-body-part	m/m	m/m	m/m	m/m	see Doc 9880, Part II - 3.3.3 and Table 3-1 Part 4
12	File-transfer-body-part	o/m	o/m	m/m	m/m	See Doc 9880, Part II - Table 3-2

**A.1.3.3 General text repertoire support**

Ref	Repertoire set description	Repertoire identifiers	ISP				Doc 9880 Basic & Extended Service		EUR AMHS Requirement	
			Origination		Reception		Origin/Rec		Origin/ Rec	
			A	B	A	B	A	B	A	B
1	Basic (ISO 646)	{1,6}	m	m	m	m	m/m	m/m	m	m
2	Basic-1 (ISO 8859-1)	{1,6,100}	o	m	o	m	-	o/o	o/o	o/o

**A.1.5 Common data types**

Ref	Element	ISP Origin/ Rec	Doc 9880		EUR AMHS	Notes and References
			Basic Service	Extended Service		
			Origin/ Rec	Origin/ Rec	Origin/Rec	
1	RecipientSpecifier					
1.2	notification-requests	o/m	m/m	m/m	m/m	see Doc 9880, Part II - 3.3.6
1.2.1	rn	o/o	m/m	m/m	m/m	see Doc 9880, Part II - 3.3.6
1.2.2	nrn	o/m	m/m	m/m	m/m	
2	ORDescriptor					
2.1	formal-name	m <sup>1</sup> /m <sup>1</sup>	m <sup>1</sup> /m <sup>1</sup>	m <sup>1</sup> /m <sup>1</sup>	m <sup>1</sup> /m <sup>1</sup>	see A.1.7 in ISO/IEC ISP10611-3 see also Doc 9880, Part II - 3.3.2.1

m<sup>1</sup> - the requirements for support of OR-names are specified in clause 8 of ISO/IEC ISP 12062-1 (i.e. a claim of support of the formal-name element means that at least the minimum requirements of ISO/IEC ISP 12062-1 with respect to the component elements of OR-names are met).

-----End of references to ISO/IEC ISP 12062-2-----

**A.2.3 Additional Implementation Capabilities for the EUR AMHS Profile (from Doc 9880, Part II [10])****A.2.3.1 Generation of AMHS Messages**

ATS Message User Agents shall be capable of constructing ATS Messages in an IPM ia5-text or ia5-text-body-part as specified in Doc 9880, Part II [10], section 3.3.

*Note.— Generation of ATS Messages may differ for certain cases where the UA conforms to the Extended Service.*

#### **A.2.3.2 Generation of ATS ‘SS’ priority messages**

User Agents used to create ATS messages shall automatically select the DL-Expansion-Prohibition service when creating ATS messages with an ‘SS’ priority indicator.

#### **A.2.3.3 Use of DL expansion prohibition**

ATS Message User Agents shall prevent users from selecting the DL-Expansion-Prohibition service for all ATS messages with the exception of ATS messages with an ‘SS’ priority indicator.

#### **A.2.3.4 Use of the value ‘urgent’ as the priority element**

ATS Message User Agents shall prevent users from selecting the value ‘urgent’ as the priority element of any AMHS message generated with the exception of messages with an ‘SS’ ATS-message-priority indicator. ATS Message User Agents shall also automatically assign the priority ‘urgent’ to each message carrying an ‘SS’ ATS-message-priority indicator.

#### **A.2.3.5 ATS Message Legal Recording**

ATS Message User Agents may optionally be required to perform Legal Recording of message traffic as specified in the Doc 9880, Part II [10], sections 3.1.3 and 2.7.

#### **A.2.3.6 Interpretation of UTC Time**

An ATS Message User Agent shall interpret the value of UTC time as specified in the Doc 9880, Part II [10], section 3.1.2.4.

#### **A.2.3.7 Requests for Receipt Notification Request**

ATS Message User Agents shall only allow requests for Receipt Notification Request if the ATS Message has an ‘SS’ Priority.

#### **A.2.3.8 Message Size Supported**

The maximum message length that ATS Message User Agents are capable of generating and receiving shall be a configuration parameter that can be adjusted as operational requirements evolve in the future. It is strongly recommended that each UA should have a static capability of generating and receiving messages of at least 64 Kbytes length.

Note that the deliverable maximum content length that an MTA may deliver at any given time may be controlled by use of the P3 DeliveryControl operation (permissible-maximum-content-length) and the P3 Register operation (permissible-maximum-content-length). However, ANSPs will have to specify this capability for their UAs and MTAs as a local matter.

### **A.2.4 Additional Extended Service-specific Implementation Capabilities**

#### **A.2.4.1 Use of the Business Class Heading Fields**

The ATS Messaging User Agent supporting the Extended Service shall be capable of setting the Business Class Heading fields values as specified in Doc 9880, Part II [10], section 3.3.4 if, and only if it can be determined that the originator and all of the intended recipients systems support the Extended Service (i.e. they all support the IPM Heading Extensions).

Use of the Business Class Heading Fields remains optional in the EUR AMHS Profile.

#### A.2.4.2 Use of parameters in the file-transfer body part

When forwarding binary data with file-transfer body parts for the included file transfer parameters “default values” shall apply as indicated in the table below. Other or additional parameter types and/or values may be used by multilateral agreement.

-----Begin of references to ISO/IEC ISP 12062-2-----

##### A.1.3.3 File transfer parameters

Ref	Extended Body Part Type	Origination		Reception		EUR AMHS Orig / Rec	Comment
		Base	Profile	Base	Profile		
1	related-stored-file	o	o	o	o	-	
2	contents-type	o	m	o	m		
2.1	document-type	o	o	o	o		
2.1.1	document-type-name	m	m	m	m	m/m	See A.2.4.2.1
3	environment	o	m	o	m		
3.1	application-reference	o	m	o	m		
3.1.1	registered-identifier	o	m	o	m	o/m	See A.2.4.2.2
3.4	user-visible-string	o	m	o	m	o/m	See A.2.4.2.6
4	compression	o	o	o	o	-	
5	file-attributes	o	m	o	m		
5.1	pathname	o	m	o	m		
5.1.1	incomplete-pathname	o	m	o	m	o/m	See A.2.4.2.3
5.5	date-and-time-of-last-modification	o	m	o	m	o/m	See A.2.4.2.4
5.13	object-size	o	m	o	m		
5.13.2	actual-values	o	m	o	m	o/m	See A.2.4.2.5
6	extensions	o	o	o	o	-	

-----End of references to ISO/IEC ISP 12062-2-----

A.2.4.2.1 The element *document-type-name* in the *document-type* element of the *contents-type* parameter shall take its default value in conformance with ISO/IEC 10021-7:2003 clause 7.4.12, which is the OID value {iso(1) standard(0) 8571(8571) document-type(5) unstructured-binary(3)}.

A.2.4.2.2 The element *registered-identifier* in the *application-reference* element of the *environment* parameter shall:

- a. be optionally generated by the originator; and
- b. when present, take either by default the OID value registered by the Electronic Messaging Association (EMA) to represent the abstract-value “unknown-attachment”, which is the OID value {2.16.840.1.113694.2.2.1.1} or one of the registered OID values listed in A.2.4.2.6.

A.2.4.2.3 The element *pathname* in the *file-attributes* parameter shall:

- a. be optionally generated by the originator using the *incomplete-pathname* element; and
- b. when present, contain a file-name value, without preceding path information to be potentially used for local storage of the included data.

A.2.4.2.4 The element *date-and-time-of-last-modification* in the *file attributes* parameter shall be optionally generated by the originator.

A.2.4.2.5 The element *actual-values* of the *object-size* element in the *file-attributes* parameters shall:

- a. be optionally generated by the originator; and
- b. when present, take the value representing the size of the included data in bytes.

A.2.4.2.6 The element *user-visible-string* of the *environment* parameter shall be present in cases where the element *registered-identifier* is present and set to an OID value other than the default one (see A.2.4.2.2 b). In these cases, the OID value of the element *registered-identifier* and the corresponding value of the element *user-visible-string* shall be assigned according to the following Table of registered sets of values:

OID Value ( <i>registered-identifier</i> )	Application Program ( <i>user-visible-string</i> )	Organisation/ Authority
1.3.27.8.1.0 {icao-atn-amhs application(1) digital-notam(0)}	Digital NOTAM	AST TF
1.3.27.8.1.1 {icao-atn-amhs application(1) digital-fpl(1)}	Digital FPL	AST TF
1.3.27.8.1.2 {icao-atn-amhs application(1) digital-met(2)}	Digital MET	AST TF

<b>OID Value (registered-identifier)</b>	<b>Application Program (user-visible-string)</b>	<b>Organisation/ Authority</b>
1.3.27.8.1.3 {icao-atn-amhs application(1) bufr(3)}	BUFR	AST TF
1.3.27.8.1.4 {icao-atn-amhs application(1) grib2(4)}	GRIB Edition 2	AST TF

**Table A.2.4.2: registered OID values**

A.2.4.2.7 Further OID values and application programs may be allocated on request using the Change Control Procedure of the EUR AMHS Manual (see Attachment A of the EUR AMHS Manual).

## B. ANNEX B (NORMATIVE) – IPM REQUIREMENTS OF P1

### AMHS Addendum to Profile AMH22 – ISO/IEC ISP 12062-3 – IPM Requirements for Message Transfer – (P1)

#### B.1 Introduction

This is an addendum to ISO/IEC ISP 12062-Part 3 – AMH22 - IPM Requirements for Message Transfer (P1) and should be used in conjunction with the ISP. It contains additional requirements to those specified in the ISP for AMHS MTAs used to transfer ATS Messages to each other.

*Note.– Summary:*

- *P1 is largely transparent to IPM, so IPM places minimal requirements on it;*
- *However, it is necessary to ensure that the FG for DL is selected to ensure transparency, and that MTAs can expand DLs.*
- *The P1 profile itself contains a number of requirements that stem directly from ATS messaging that are not directly related to IPM.*

#### B.2 EUR AMHS Requirement

##### B.2.1 ISP Conformance

An AMHS MTA shall conform to Profile AMH22 – ISO/IEC ISP 12062-3 – IPM Requirements of P1.

##### B.2.2 Additional Requirements to ISP

The following table (A.0.6 – a table of ISO/IEC ISP 12062-3) specifies additional requirements that express restrictions on a set of rows of the AMH22 profile, which are referred to using their respective references in ISO/IEC ISP 12062-3.

-----Begin of references to ISO/IEC ISP 12062-3-----

#### A.0.6 Statement of profile conformance

Ref	Question	ISP	Doc 9880		EUR AMHS	Comments
			Bas	Ext		
4	Are all mandatory requirements of any of the following optional functional groups implemented?					
4.2	IPM Distribution List (DL)	o	m	m	m	
4.7	IPM Security (SEC)	o	o	m	o	class(es): S0 – Common Messaging

-----End of references to ISO/IEC ISP 12062-3-----



## C. ANNEX C (NORMATIVE) – IPM REQUIREMENTS OF P3

### AMHS Addendum to Profile AMH23 & 25 – ISO/IEC ISP 12062-4 – IPM Requirements for MTS Access and MTS Access(94) – (P3)

#### C.1 Introduction

This is an addendum to ISO/IEC ISP 12062-Part 4 – AMH23 and 25 - IPM Requirements for MTS Access and MTS Access(94) (P3), and should be used in conjunction with that ISP. It contains additional requirements to those specified in the ISP for AMHS MTS Users (UAs and MSs) and MTAs used for submission and delivery of ATS messages.

*Note.– Summary:*

- *P3 is largely transparent to IPM, so IPM places minimal requirements on it;*
- *However, it is necessary to ensure that the FG for DL is selected;*
- *The P3 profile itself contains a number of further requirements that stem directly from ATS messaging that are not directly related to IPM, and includes requirements for the dynamic generation of Message Tokens for submission of Secure ATS messages for the Extended AMHS service. Message Tokens are not required for the EUR AMHS Profile.*

#### C.2 EUR AMHS Requirement

##### C.2.1 ISP Conformance

The AMHS UA or MTA implementation shall conform to Profile AMH23 and AMH25 – ISO/IEC ISP 12062-4 – IPM Requirements of MTS Access and MTS Access (94). Conformance to the AMH25 profile is not mandated for the Basic AMHS Service.

##### C.2.2 Additional Requirements to ISP

The following table (A.0.7 – a table of ISO/IEC ISP 12062-4) specifies additional requirements that express restrictions on a set of rows of the AMH23 and AMH25 profiles, which are referred to using their respective references in ISO/IEC ISP 12062-4.

-----*Begin of references to ISO/IEC ISP 12062-4*-----

#### A.0.7 Statement of profile conformance

Ref	Question	ISP	Doc 9880		EUR AMHS	Comments
			Bas	Ext		
3	Are all mandatory requirements of any of the following optional functional groups implemented?					
3.2	IPM Distribution List (DL)	o	m	m	m	
3.7	IPM Security (SEC)	o	o	m	o	class(es): S0 – Common Messaging

-----*End of references to ISO/IEC ISP 12062-4*-----

## **D. ANNEX D (NORMATIVE) – IPM REQUIREMENTS OF P7**

### **AMHS Addendum to Profile AMH24 – ISO/IEC ISP 12062-5 – IPM Requirements of Enhanced MS Access (P7)**

#### **D.1 Introduction**

This is an addendum to ISO/IEC ISP 12062-Part 5 – AMH24 - IPM Requirements of Enhanced MS Access (P7) (the ISP), and should be used in conjunction with the ISP. It contains additional requirements to those specified in the ISP for AMHS User Agents used to retrieve messages from a Message Store using the Enhanced MS Access (P7) protocol.

*Note.– Summary:*

- *P7 must implement an appropriate set of MS IPM attributes to support ATS messaging. Most are mandated by the ISPs;*
- *It is necessary to ensure that the FG for DL is selected, and that the MS and MS user can deal with the appropriate Heading Attributes and ATS body part types.*
- *Selection of the IPM BC Functional group automatically selects the appropriate heading field attributes for BC (as used in ATS messaging);*
- *It is necessary to specify the required body part types used to support ATS messaging;*
- *Support for IPM Content Types is mandated in the ISPs;*
- *The P7 profile itself contains a number of further requirements that stem directly from ATS messaging that are not directly related to IPM, and includes requirements for the dynamic generation of Message Tokens for Secure ATS messages and support of the S0 security functional group. S0 is not mandated by the EUR AMHS Profile.*

#### **D.2 EUR AMHS Requirement**

##### **D.2.1 ISP Conformance**

An AMHS UA or MS shall conform to Profile AMH24 – ISO/IEC ISP 12062-5 – IPM Requirements of Enhanced MS Access.

##### **D.2.2 Additional Requirements to ISP**

The following tables (A.0.7 and A.1.12.1 of ISO/IEC ISP 12062-5) specify additional requirements that express restrictions on a set of rows of the AMH24 profile, which are referred to using their respective references in ISO/IEC ISP 12062-5.

-----Begin of references to ISO/IEC ISP 12062-5-----

#### A.0.7 Statement of profile conformance

Ref	Question	ISP	Doc 9880		EUR AMHS	Comments
			Bas	Ext		
3	Are all mandatory requirements of any of the following optional functional groups implemented?					
3.2	IPM Distribution List (DL)	o	m	m	m	
3.7	IPM Security (SEC)	o	o	m	o	class(es): S0 Common Messaging
3.9	IPM Business Class (BC)	o	o	m	o	

#### A.1.12.1 Extended body part attribute support

Ref	Extended Body Part Attribute	UA		MS		UA EUR AMHS	MS EUR AMHS	Notes/References
		ISP	Doc 9880 Bas/Ext	ISP	Doc 9880 Bas/Ext			
1	ia5-text-body-parts	o	o/o	m	m/m	m	m	
11	general-text-body-parts	o	m/m	m	m/m	m	m	
12	file-transfer-body-part	o	o/m	o	o/m	m	m	See Doc 9880, Part II – Table 3-2

-----End of references to ISO/IEC ISP 12062-5-----

## **E. ANNEX E (NORMATIVE) – IPM REQUIREMENTS OF P7 (94)**

### **ATS Messaging Addendum to Profile AMH26 – ISO/IEC ISP 12062-6 – IPM Requirements of Enhanced MS Access (94) (P7)**

#### **E.1 Introduction**

This is an addendum to ISO/IEC ISP 12062-Part 6 – AMH26 - IPM Requirements of Enhanced MS Access (94) (P7) (the ISP), and should be used in conjunction with that ISP. It contains additional requirements to those specified in the ISP for AMHS User Agents used to retrieve messages from a Message Store using the Enhanced MS Access (94) (P7) protocol.

*Note.– Summary:*

- *P7 must implement an appropriate set of MS IPM attributes to support ATS messaging. Most are mandated by the ISPs;*
- *It is necessary to ensure that the FG for DL is selected, and that the MS and MS user can deal with the appropriate Heading Attributes and ATS body part types.*
- *Selection of the Business Class Messaging Functional Group automatically selects the appropriate heading field attributes for Business Class (as used in ATS messaging);*
- *It is necessary to specify the required body part types used to support ATS messaging;*
- *Support for IPM Content Types is mandated in the ISPs;*
- *The P7 profile itself contains a number of further requirements that stem directly from ATS messaging that are not directly related to IPM, and includes requirements for the dynamic generation of Message Tokens for Secure ATS messages and support of the S0 security functional group. S0 is not mandated by the EUR AMHS Profile.*

#### **E.2 EUR AMHS Requirement**

##### **E.2.1 ISP Conformance**

An AMHS UA and MS (94) shall conform to Profile AMH26 – ISO/IEC ISP 12062-6 – IPM Requirements of Enhanced MS Access (94) (P7).

##### **E.2.2 Additional Requirements to ISP**

The following tables (A.0.7, A.1.15.1 and A.1.15.3 of ISO/IEC ISP 12062-6) specify additional requirements that express restrictions on a set of rows of the AMH26 profile, which are referred to using their respective references in ISO/IEC ISP 12062-6.

-----Begin of references to ISO/IEC ISP 12062-6-----

#### A.0.7 Statement of profile conformance

Ref	Question	ISP	Doc 9880		EUR AMHS	Comments
			Bas	Ext		
3	Are all mandatory requirements of any of the following optional functional groups implemented?					
3.2	IPM Distribution List (DL)	o	m	m	m	
3.7	IPM Security (SEC)	o	o	m	o	class(es): S0 Common Messaging
3.31	IPM Business Class (BC)	o	o	m	o	

#### A.1.15.1 Support of IPM-specific attributes in the Stored-message subordinate entry-classes

Ref	Attribute	UA	MS	EUR AMHS		Notes/References
		ISP	ISP	UA	MS	
50	ia5-text-body-parts	o	m	m	m	
51	ia5-text-data	o	o	m	m	
52	ia5-text-parameters	o	o	m	m	

#### A.1.15.3 Extended body part attribute support in Stored-message subordinate entry-classes

Ref	Attribute	UA	MS	EUR AMHS		Notes/References
		ISP	ISP	UA	MS	
1	ia5-text-body-part	o	m	m	m	
11	general-text-body-part	m	m	m	m	
12	file-transfer-body-part	m	m	m	m	See Doc 9880, Part II – Table 3-2

-----End of references to ISO/IEC ISP 12062-6-----

## F. ANNEX F (NORMATIVE) – REQUIREMENTS OF MESSAGE TRANSFER PROTOCOL - P1

### AMHS Addendum to Profile AMH11 – ISO/IEC ISP 10611-3 – Message Transfer (P1)

#### F.1 Introduction

This is an addendum to ISO/IEC ISP 10611-Part 3 – AMH11 – Message Transfer (P1), and should be used in conjunction with the ISP. It contains additional requirements to those specified in the ISP for ATS Message Servers used to transfer ATS Messages.

*Note.– Summary:*

- *Since the ISPICs requires full transparency for message transfer for all possible envelope and content fields, there are no extra requirements for tables A1 and A2 of the PICS that affect the P1 Protocol static requirements. However:*
- *Table A.0.6 has been used to select the required Optional Functional Groups for DL and S0;*
- *Table A3 has been extended to incorporate a number of ATS specific implementation requirements with respect to MTA routing evaluation of the XF and CAAS addressing attributes;*
- *Table A.3.4 and A.3.5 have been extended to accommodate ATS specific implementation requirements of Message Server MTA components.*

#### F.2 EUR AMHS Requirements

##### F.2.1 ISP Conformance

An AMHS MTA shall conform to Profile AMH11 – ISO/IEC ISP 10611-3 – Message Transfer (P1).

##### F.2.2 Additional Requirements to ISP

The following tables (A.0.6 and A.3.1 of ISO/IEC ISP 10611-3) specify additional requirements that express restrictions on a set of rows of the AMH11 profile, which are referred to using their respective references in AMH11 – ISO/IEC ISP 10611-3).

-----Begin of references to ISO/IEC ISP 10611-3-----

##### A.0.6 Statement of profile conformance

Ref	Question	ISPs	Doc 9880 Bas/Ext	EUR AMHS	Comments
3	Are all mandatory requirements of any of the following optional functional groups implemented?				
3.2	Distribution List (DL)	o	m/m	m	class(es):
3.7	Security (SEC)	o	o/m	o	class(es): S0 – Common Messaging

### A.3.1 Routing capability

The following additions to table A.3.1 ensure that conformant MTAs will be able to route messages on all of the XF and CAAS address-form attributes.

Ref	OR-Address Attribute	ISP	EUR AMHS	Comments
1	country-name <sup>1</sup>	o	m	
2	administration-domain-name <sup>2</sup>	o	m	
6	private-domain-name	o	m	
7	organization-name	o	m	
	teletex-organization-name <sup>3</sup> universal-organization-name <sup>3</sup>	o	o	
10	organizational-unit-names	o	m	
	teletex-organizational-unit-names <sup>3</sup> universal-organizational-unit-names <sup>3</sup>	o	o	
11	common-name	o	m	
	teletex-common-name <sup>3</sup> universal-common-name <sup>3</sup>	o	o	

<sup>1</sup> In particular, it shall be ensured that messages can be routed using the country-name value = 'XX'.

<sup>2</sup> In particular, it shall be ensured that messages can be routed using the administration-domain-name = 'ICAO'.

<sup>3</sup> Not required to support the CAAS and XF addressing schemes.

-----End of references to ISO/IEC ISP 10611-3-----

### F.2.3 Implementation capabilities

The following requirements are in addition to those specified in ISO/IEC ISP 10611-3).

#### F.2.3.1 ATS Message Legal Recording

MTAs shall be capable of generating and holding long term message traffic logs for 'legal recording' as specified in the Doc 9880, Part II [10], sections 3.2.3 and 2.7. These requirements are mandatory for conformance to the EUR AMHS Profile.

#### F.2.3.2 Interpretation of UTC Time

An MTA shall interpret the value of UTC time as specified in Doc 9880, Part II [10], 3.1.2.4. These requirements are mandatory for conformance to the EUR AMHS Profile.

### F.2.4 Implementation constraints

The following requirements are in addition to those specified in ISO/ISP 10611-3.

#### F.2.4.1 Number of Simultaneous P1 Associations

An AMHS MTA shall be capable of operating a sufficient number of permanent P1 associations simultaneously.

*Note 1.*– Within EUR, each international MTA may interconnect on a potentially simultaneous basis to each of the international MTAs of all other countries in the Region using P1 (i.e. in the region of 50 other MTAs). In addition, each international MTA may need to simultaneously maintain P1 associations to national MTAs supporting users within that country (the number depends upon the topology and connectivity of these MTAs). Furthermore, any MTA that acts as an inter-Regional Entry/Exit point needs to simultaneously support associations to the corresponding MTA of the other Region.

*Note 2.*– Besides P1 associations, an MTA may also simultaneously operate P3 associations to directly connected User Agents.

*Note 3.*– An association can be permanent or dynamic (i.e. on-demand). When operating dynamic associations, the number of simultaneously open associations is generally less compared to permanently established associations. On the other hand, a permanent association has the advantage that it avoids messages being delayed due to protocol overhead resulting from association establishment. Therefore, in an operational AMHS environment, a general preference is given to operate permanent P1 associations. It may, however, also be agreed on bilateral basis to use dynamic (on-demand) instead of permanent associations, e.g. in testing environments or if the operational traffic is low and the two MTAs exchange AMHS messages occasionally, but not every hour or even not every day.

*Note 4.*– An MTA operating the monologue mode needs at least one incoming and one outgoing association to each adjacent MTA.

*Note 5.*– To make use of priority based associations as described in section 11.4 of ISO/IEC 10021-6 an MTA may, for example, establish 3 outgoing associations to the same adjacent MTA in parallel, each association assigned with a minimum message priority as indicated in Table F.2.4.1 below.

Outgoing P1 association	Minimum Priority assigned	Possible traffic
1	urgent (2)	only urgent messages can be sent over this association
2	normal (0)	urgent and normal messages, reports and probes can be sent over this association
3	non-urgent (1) or none assigned	all messages can be sent over this association

**Table F.2.4.1:** Example for 3 associations, each assigned with minimum message priority

#### **F.2.4.2 MTA Message Transit Time**

Suppliers shall state the maximum transit time per message due to the MTA (from last byte received by the MTA to the last byte being transmitted).

The SPACE Final Report requires a maximum transit time within Europe of 10 seconds to meet the high quality of service. Since a message transiting Europe will need to transit several MTAs and P1 protocol instances connecting them, each MTA will need to process each message in a fraction of the 10 seconds overall target. This fraction will depend solely on the configuration of the ANSP's internal topology and routing strategy. In general, the overall transit time allocated to each ANSP will be 3.3 seconds.

#### **F.2.4.3 Minimum message size support**



The SPACE Final Report requires that MTAs shall be capable of taking submission, transferring and delivering messages of at least 2 Mbytes overall length.

To enable support of messages with multiple body parts, in the EUR AMHS profile this value is increased to at least 4 Mbytes. It is clarified that the definition of the Message Transfer System does not impose a realistic restriction to the overall message size; however implementation might be restricted for practical reasons.

## **G. ANNEX G (NORMATIVE) – REQUIREMENTS OF MESSAGE SUBMISSION AND DELIVERY PROTOCOL – P3**

### **AMHS Addendum to Profiles AMH12 & 14 – ISO/IEC ISP 10611-4 – Requirements for MTS Access and MTS Access(94) – (P3)**

#### **G.1 Introduction**

This is an addendum to ISO/IEC ISP 10611-Part 4 – AMH12 and 14 - Requirements for MTS Access and MTS Access(94) (P3) and should be used in conjunction with the ISP. It contains additional requirements to those specified in the ISP for AMHS MTS Users (UAs and MSs) and MTAs used for submission and delivery of ATS messages.

*Note.– Summary:*

- *There are two parts to P3, an MTA part and an MTS user part;*
- *The MTA part is required to be transparent (as is the MTS as a whole). The MTS user part is also required to be ‘transparent’, but the MTS User part is required to generate certain ATS message specific components such as the Message Token, CAAS + XF Address Attributes, and certain body part types;*
- *Also, many of the specifications (i.e. the operations apart from Submission and Delivery) are purely local, and are not profiled here. Individual ANSPs may have their own preferences (e.g. for BIND credentials and Administration) here;*
- *So, the basic requirements of the ISPs satisfy most of the requirements. However, the P3 profile is enhanced by this addendum in tables A.0.7, A.3.1, A.3.2, A.3.4 and A.3.5 to ensure that the MTS User component and the MTA can transfer, deliver, generate and receive several items that are required for ATS messaging, namely: the Message Token, ia5 text, general text and file transfer body parts, IPM(88), DL and SO functional groups, OR-Address attributes.*

#### **G.2 EUR AMHS Requirements**

##### **G.2.1 ISP Conformance**

An AMHS UA or MS shall conform to Profile AMH12 as specified in ISO/IEC ISP 10611-4 – MTS Access and MTS Access 94.

An AMHS UA or MS may additionally conform to Profile AMH14 as specified in ISO/IEC ISP 10611-4 – MTS Access and MTS Access 94.

##### **G.2.2 Additional Requirements to ISP**

The following tables (A.0.7, A.1.9, A.3.1, A.3.2 and A.3.4 of ISO/IEC ISP 10611 - 4) specify additional ATS messaging requirements of the P3 implementation that express restrictions on a set of rows of the AMH12 & AMH14 profiles, which are referred to using their respective references in ISO/IEC ISP 10611 - 4.

-----Begin of references to ISO/IEC ISP 10611-4-----

### A.0.7 Statement of profile conformance

Ref	Question	ISP	Doc 9880 Bas/Ext	EUR AMHS	Comments
2	Are all mandatory requirements of any of the following optional functional groups implemented?				
2.2	Distribution List (DL)	o	m/m	m	only applicable in the case of an MTA class(es):
2.7	Security (SEC)	o	o/m	o	class(es): S0 – Common Messaging

### A.2.7 Security (SEC) (Optional Functional Group)

#### A.2.7.8 Extension data types

Selection of the S0 Functional Group mandates the ability of MTAs and the MTS user to be able to deal with the Message Token, however, the dynamic capability for the MTS user is mandated in section G.4.1 of this profile.

### A.3.1 Content types supported

Ref	Content Type	ISP	Doc 9880 Bas/Ext	EUR AMHS	Comments
1.2	interpersonal-messaging-1984 (2)	o	-	-	not used
1.3	interpersonal-messaging-1988 (22)	o	m/m	m	

### A.3.2 Encoded information types supported

Ref	Encoded Information Type	ISP Submit Deliv	Doc 9880 Submit Bas/Ext	Doc 9880 Delivery Bas/Ext	EUR AMHS Subm/Del	Comments
1.2	ia5-text (2)	o/m	m/m	m/m	m/m	
2	extended					
2.1						In support for general-text body part as in ISO/IEC 10021-7 B.2
2.1.1	OID {iso(1) standard(0) motis(10021) ipms(7) cs(1) eit-authority(0) 1 }	m/m	m/m	m/m	m/m	m in support for of Basic (ISO 646) repertoire o in support for Basic-1(ISO 8859-1) repertoire

Ref	Encoded Information Type	ISP Submit Deliv	Doc 9880 Submit Bas/Ext Delivery Bas/Ext	EUR AMHS Subm/Del	Comments
2.1.2	OID {iso(1) standard(0) motis(10021) ipms(7) cs(1) eit-authority(0) 6}	m/m	m/m m/m	m/m	m in support for of Basic (ISO 646) repertoire o in support for Basic-1(ISO 8859-1) repertoire
2.1.3	OID {iso(1) standard(0) motis(10021) ipms(7) cs(1) eit-authority(0) 100}	o/o	o/o o/o	o/o	o in support for Basic-1(ISO 8859-1) repertoire
2.1.4	OID {joint-iso-itu-i(2) mhs(6) ipms(1) eit(12) file-transfer(0)}	o/o	o/o m/m	m/m	m in support for the File Transfer Body Part

### A.3.4 Delivery capability

Ref	OR-Address Attribute	ISP	Doc 9880 Bas/Ext	EUR AMHS	Comments
1	country-name	o	m/m	m	
2	administration-domain-name	o	m/m	m	
6	private-domain-name	o	m/m	m	
7	organization-name	o	m/m	m	
	teletex-organization-name <sup>1</sup> universal-organization-name <sup>1</sup>	o	o	o	
10	organizational-unit-names	o	m/m	m	
	teletex-organizational-unit-names <sup>1</sup> universal-organizational-unit-names <sup>1</sup>	o	o	o	
11	common-name	o	m/m	m	
	teletex-common-name <sup>1</sup> universal-common-name <sup>1</sup>	o	o	o	

<sup>1</sup> – Not required to support the CAAS and XF addressing schemes.

### A.3.5 Implementation constraints

#### A.3.5.1 Maximum P3 Associations for MTA

The supplier shall state the maximum number of MTS-Access or MTS Access (94) Associations that can be simultaneously supported by an MTA.

-----End of references to ISO/IEC ISP 10611-4-----

### G.3 Additional requirements to support AMHS

#### G.3.1 Additional MTS User requirement for Generation Secure Messages for the Extended ATS Message Handling Service

AMH12 and AMH14 specify the static requirements for the Message Token in Table A.1.9/4. The following table specifies the corresponding requirement for dynamic generation of Message Token Fields for MTS Users conforming to the S0 Functional Group when generating a secure ATS message. Refer also to the Doc 9880, Part II [10] - Table3-3. Use of Security Elements (Message Token) in the Extended ATS Message Handling Service.

-----Begin of references to ISO/IEC ISP 10611-4-----

##### A.1.9 Extension Data Types:

Ref	Element	MTS-User Static Requirement			Dynamic action for secure message	Notes/References
		ISP	Doc 9880 Bas/Ext	EUR AMHS		
4	MessageToken	o	o/m	o	G	
4.1	token-type-identifier	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.6
4.2	asymmetric-token	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.7
4.2.1	signature-algorithm-identifier	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.8
4.2.2	name	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.9
4.2.3	time	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.10
4.2.4	signed-data	o	m	o	G	
4.2.4.2	content-integrity-check	o	m	o	G	See Doc 9880, Part II - 3.1.4.3.11

M = Mandatory  
O = Optional support or optional dynamic use  
G = Generated

-----End of references to ISO/IEC ISP 10611-4-----

#### G.3.2 ATS Message Legal Recording by MTS user

Optionally, the MTS user (UA or MS) may perform ATS Message Legal Recording. See the requirements of the Doc 9880, Part II [10], clause 3.1.3.

## H. ANNEX H (NORMATIVE) – REQUIREMENTS OF MESSAGE RETRIEVAL PROTOCOL (P7)

### AMHS Addendum to Profile AMH13 – ISO/IEC ISP 10611-5 – MS Access (P7)

#### H.1 Introduction

This is an addendum to ISO/IEC ISP 10611-Part 5 – AMH13 - MS Access (P7) (the ISP), and should be used in conjunction with the ISP. It contains additional requirements to those specified in the ISP for AMHS User Agents used to originate and retrieve ATS Messages from a Message Store.

*Note.– Summary*

- *This profile is very similar to that of the MS Access(94) profile, the difference being that the Base and ISP standards for the MS Access (94) support far more sophisticated manipulation and retrieval of messages. These aspects are of local concern only, and possibly subject to further specification by ANSPs;*
- *There are two parts to P7, an MS part and an MS user part;*
- *The MS part is required to be effectively transparent as far as generation and reception of messages is concerned i.e. the Message Store functions themselves have no impact on the overall operation of ATS Messaging. The MTS user part is also required to be ‘transparent’, but it is required to generate certain ATS message specific components such as the Message Token, CAAS + XF Address Attributes, and certain body part types;*
- *Also, many of the specifications (i.e. the message operations, apart from Submission and Retrieval and Attribute sets supported by MS-User and MS) are purely local, and are not profiled. Individual ANSPs may have their own preferences (e.g. for BIND credentials and Administration) here;*
- *So, the basic requirements of the ISPs satisfy most of the requirements. However, the P7 profile is enhanced by this addendum in tables A.0.7, A.1.9 A.3.1, A.3.2 and A.3.4 to ensure that the MTS User component and the MTA can transfer, deliver, generate and retrieve several items that are required for ATS messaging, namely: the Message Token, ia5 text, general text and file transfer body parts, IPM(88), DL and S0 functional groups and OR-Address attributes;*
- *Section H.3 indicates further requirements that are mandated for support of the P3 protocol used for ATS messaging Extended Service.*

#### H.2 EUR AMHS Requirements

##### H.2.1 ISP Conformance

An AMHS UA or MS shall conform to Profile AMH13 – ISO/IEC ISP 10611-5 – MS Access (P7).

##### H.2.2 Additional Requirements to ISP

The following tables (A.0.7, A.1.9, A.3.1, A.3.2 and A.3.4) specify additional requirements that express restrictions on a set of rows of the AMH13 profile, which are referred to using their respective references in ISO/IEC ISP 10611-5.

-----Begin of references to ISO/IEC ISP 10611-5-----

**A.0.7 Statement of profile conformance**

Ref	Question	ISP	Doc 9880 Bas/Ext	EUR AMHS	Comments
2	Are all mandatory requirements of any of the following optional functional groups implemented?				
2.1	Distribution List (DL)	o	m/m	m	
2.5	Security (SEC)	o	o/m	o	class(es): S0 – Common Messaging

**A.3.1 Content types supported**

Ref	Content Type	ISP		Doc 9880 Bas and Ext		EUR AMHS		Comments
		Subm	Retr	Subm	Retr	Subm	Retr	
1	built-in							
1.2	interpersonal-messaging-1984 (2)	o	o	-	-	-	-	not used
1.3	interpersonal-messaging-1988 (22)	o	o	m	m	m	m	

**A.3.2 Encoded information types supported**

Ref	Encoded Information Type	ISP		Doc 9880		EUR AMHS	Comments
		Submit	Deliv	Submit Bas/Ext	Delivery Bas/Ext		
1.2	ia5-text (2)	o/m		m/m	m/m	m/m	
2	extended						
2.1							In support for general-text body part as in ISO/IEC 10021-7 B.2
2.1.1	OID {iso(1) standard(0) motis(10021) ipms(7) cs(1) eit-authority(0) 1 }	m/m		m/m	m/m	m/m	m in support for of Basic (ISO 646) repertoire o in support for Basic-1 (ISO 8859-1) repertoire
2.1.2	OID {iso(1) standard(0) motis(10021) ipms(7) cs(1) eit-authority(0) 6 }	m/m		m/m	m/m	m/m	m in support for of Basic (ISO 646) repertoire o in support for Basic-1 (ISO 8859-1) repertoire

Ref	Encoded Information Type	ISP		Doc 9880		EUR AMHS	Comments
		Submit	Deliv	Submit Bas/Ext	Delivery Bas/Ext	Subm/Del	
2.1.3	OID {iso(1) standard(0) motis(10021) ipms(7) cs(1) eit-authority(0) 100}	o/o		o/o	o/o	o/o	o in support for Basic-1 (ISO 8859-1) repertoire
2.1.4	OID {joint-iso-itu-i(2) mhs(6) ipms(1) eit(12) file-transfer(0)}	o/o		o/o	m/m	m/m	m in support for the File Transfer Body Part

#### A.3.4 Implementation constraints (a table of ISO/IEC ISP 10611-5)

Suppliers shall state the maximum number of MS users that can be simultaneously supported by an MS implementation.

-----End of references to ISO/IEC ISP 10611-5-----

### H.3 Additional MTS User requirements to support AMHS

#### H.3.1 Dynamic Generation of Message Token by UA for Extended ATS Message Handling Service

AMH13 specifies the static requirements for the Message Token in Table A.1.9/4. The following table specifies the corresponding requirement for dynamic generation of Message Token Fields for MS Users conforming to the S0 Functional Group when generating a secure ATS message. Refer also to Doc 9880, Part II [10] - Table 3-3. Use of Security Elements (Message Token) in the Extended ATS Message Handling Service.

-----Begin of references to ISO/IEC ISP 10611-5-----

#### A.1.9 Extension data types

Ref	Element	MTS-User Static Requirement			Dynamic action for secure message	Notes/References
		ISP	Doc 9880 Bas/Ext	EUR AMHS		
4	MessageToken	o	o/m	o	G	
4.1	token-type-identifier	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.6
4.2	asymmetric-token	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.7
4.2.1	signature-algorithm-identifier	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.8
4.2.2	name	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.9



Ref	Element	MTS-User Static Requirement			Dynamic action for secure message	Notes/References
		ISP	Doc 9880 Bas/Ext	EUR AMHS		
4.2.3	time	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.10
4.2.4	signed-data	o	m	o	G	
4.2.4 .2	content-integrity- check	o	m	o	G	See Doc 9880, Part II - 3.1.4.3.11

-----End of references to ISO/IEC ISP 10611-5-----

# I. ANNEX I (NORMATIVE) – REQUIREMENTS OF MESSAGE RETRIEVAL PROTOCOL (P7) (94)

## AMHS Addendum to Profile AMH15 – ISO/IEC ISP 10611-6 – MS Access-94 (P7)

### I.1 Introduction

This is an addendum to ISO/IEC ISP 10611-Part 6 – AMH15 - MS Access-94 (P7) (the ISP), and should be used in conjunction with the ISP. It contains additional requirements to those specified in the ISP for AMHS User Agents used to originate and retrieve ATS Messages from a '94 Message Store.

*Note.– Summary*

- *This profile is very similar to that of the MS Access profile, the difference being that the Base and ISP standards for the MS Access support far more limited facilities for manipulation and retrieval of messages. These aspects are of local concern only, and possibly subject to further specification by ANSPs. They are of no concern to the overall operation of the international ATS messaging service;*
- *There are two parts to P7: an MS part and an MS user part;*
- *The MS part is required to be effectively transparent as far as generation and reception of messages is concerned i.e. the Message Store functions themselves have no impact on the overall operation of ATS Messaging. The MTS user part is also required to be 'transparent', but it is also required to generate certain ATS message specific components such as the Message Token, CAAS + XF Address Attributes, and certain body part types;*
- *Also, many of the specifications (i.e. the message operations, all of the Auto-Actions, apart from Submission and Retrieval and the particular attribute sets for MS user and MS support) are purely local, and are not profiled. Individual ANSPs may have their own preferences here (e.g. for BIND credentials and Administration);*
- *So, the basic requirements of the ISPs satisfy most of the EUR AMHS Requirements. However, the P7 profile is enhanced by this addendum in tables A.0.7, A.2.7.8, A.3.1, A.3.2, A.3.4 and A.3.5 to ensure that the MTS User component and the MTA can transfer, deliver, generate and retrieve several items that are required for ATS messaging, namely: the Message Token, ia5 text, general text and file transfer body parts, IPM(88), DL and S0 functional groups and OR-Address attributes.*

### I.2 EUR AMHS Requirements

#### I.2.1 ISP Conformance

AMHS MS (94)s and UAs shall conform to Profile AMH15 – ISO/IEC ISP 10611-6 – MS Access (P7).

#### I.2.2 Additional Requirements to ISP

The following tables (A.0.7, A.1.9, A.3.1, A.3.2 and A.3.4) specify additional requirements that express restrictions on a set of rows of the AMH15 profile, which are referred to using their respective references in ISO/IEC ISP 10611-6.

-----Begin of references to ISO/IEC ISP 10611-6-----

**A.0.7 Statement of profile conformance**

Ref	Question	ISP	AMHS Bas/Ext	EUR AMHS	Comments
2	Are all mandatory requirements of any of the following optional functional groups implemented?				
2.1	Distribution List (DL)	o	m/m	m	
2.5	Security (SEC)	o	o/m	o	class(es): S0 Common Messaging

**A.3.1 Content types**

Ref	Content Type	ISP Subm/ Retr	DOC 9880 Bas and Ext		EUR AMHS	Comments
			Submis- sion	Retrieval		
1	built-in					
1.2	interpersonal-messaging-1984 (2)	o/o	-	-	-	not used
1.3	interpersonal-messaging (22)	o/o	m	m	m	

**A.3.2 Encoded information types supported**

Ref	Encoded Information Type	ISP Submit Deliv	Doc 9880 Submit    Delivery Bas/Ext   Bas/Ext		EUR AMHS Subm/Del	Comments
1.2	ia5-text (2)	o/m	m/m	m/m	m/m	
2	extended					
2.1						In support for general-text body part as in ISO/IEC 10021-7 B.2
2.1.1	OID {iso(1) standard(0) motis(10021) ipms(7) cs(1) eit-authority(0) 1}	m/m	m/m	m/m	m/m	m in support for of Basic (ISO 646) repertoire o in support for Basic-1 (ISO 8859-1) repertoire
2.1.2	OID {iso(1) standard(0) motis(10021) ipms(7) cs(1) eit-authority(0) 6}	m/m	m/m	m/m	m/m	m in support for of Basic (ISO 646) repertoire o in support for Basic-1 (ISO 8859-1) repertoire

Ref	Encoded Information Type	ISP Submit Deliv	Doc 9880		EUR AMHS Subm/Del	Comments
			Submit Bas/Ext	Delivery Bas/Ext		
2.1.3	OID {iso(1) standard(0) motis(10021) ipms(7) cs(1) eit-authority(0) 100}	o/o	o/o	o/o	o/o	o in support for Basic-1 (ISO 8859-1) repertoire
2.1.4	OID {joint-iso-itu-i(2) mhs(6) ipms(1) eit(12) file-transfer(0)}	o/o	o/o	m/m	m/m	m in support for the File Transfer Body Part

### A.3.4 Implementation constraints

Suppliers shall state the maximum number of MS Users that can be simultaneously supported by the MS.

-----End of references to ISO/IEC ISP 10611-6-----

## I.3 Additional MTA requirements to support Extended AMHS

### I.3.1 Dynamic Generation of Message Token by UA for Extended ATS Message Handling Service

AMH15 specifies the static requirements for the Message Token in Table A.1.9/4. The following table specifies the corresponding requirement for dynamic generation of Message Token Fields for MS Users conforming to the S0 Functional Group when generating a secure ATS message. Refer also to Doc 9880, Part II [10] - Table 3-3. Use of Security Elements (Message Token) in the Extended ATS Message Handling Service.

-----Begin of references to ISO/IEC ISP 10611-6-----

#### A.1.9 Extension data types

Ref	Element	MTS-User Static Requirement			Dynamic action for secure message	Notes/References
		ISP	Doc 9880 Bas/Ext	EUR AMHS		
4	MessageToken	o	o/m	o	G	
4.1	token-type-identifier	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.6
4.2	asymmetric-token	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.7
4.2.1	signature-algorithm-identifier	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.8
4.2.2	name	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.9

Ref	Element	MTS-User Static Requirement			Dynamic action for secure message	Notes/References
		ISP	Doc 9880 Bas/Ext	EUR AMHS		
4.2.3	time	m	m	o	G	See Doc 9880, Part II - 3.1.4.3.10
4.2.4	signed-data	o	m	o	G	
4.2.4.2	content-integrity-check	o	m	o	G	See Doc 9880, Part II - 3.1.4.3.11

-----End of references to ISO/IEC ISP 10611-6-----

## **J. ANNEX J (NORMATIVE) – REQUIREMENTS OF OSI UPPER LAYERS FOR AMHS**

### **AMHS Addendum to Profile AMH1n – ISO/IEC ISP 10611-2 Common Messaging Specification of ROSE, RTSE, ACSE, Presentation and Session Protocols for use by MHS**

#### **J.1 Introduction**

This is an addendum to ISO/IEC ISP 10611-Part 2 – AMH1n – Specification of ROSE, RTSE, ACSE, Presentation and Session Protocols for use by MHS and should be used in conjunction with that ISP. It contains additional requirements to those specified in the ISP for AMHS MTS Users (UAs and MSs), MS Users (UAs) and MTAs for the use of underlying data communications facilities.

*Note.– Summary:*

- *The options available for ACSE, Presentation, Session, RTSE and ROSE in 10611-2 are all tightly driven by the selection of the Application Contexts that they support – so, there are few changes to make in this profile;*
- *However, in order to meet the stringent message transit time targets set out within the SPACE project, the Monologue Dialogue Mode has been mandated for the P1 application context in table B.3.2.*

#### **J.2 EUR AMHS Requirements**

##### **J.2.1 ISP Conformance**

AMHS UA, MTA and MS implementations shall conform to ISO/IEC ISP 10611-2 – Requirements of OSI Upper Layers for MHS Support.

##### **J.2.2 Additional Requirements to ISP**

The following specify additional AMHS requirements of the implementation that express restrictions on a set of rows of the AMH1n profile, which are referred to using their respective references in ISO/IEC ISP 10611 - 2.

-----*Begin of references to ISO/IEC ISP 10611-2*-----

#### **Annex A ACSE, Presentation and Session Layers**

##### **A.3 Association Control Service Element**

There are no changes to the specifications of Association Control Service Element (ACSE).

##### **A.4 Presentation protocol**

There are no changes to the specifications of the Presentation Protocol.

##### **A.5 Session protocol**

There are no changes to the specifications of the Session Protocol.

**Annex B RTSE****B.1 RTSE Protocol****B.3.2 Dialogue mode**

Ref	Capability	ISP	EUR AMHS
A.6.2.2	Monologue dialogue-mode	c1	m
A.6.2.2	Two-way alternate dialogue-mode	c2	-

c1 if any P1 application-context is supported then m else –  
c2 if any reliable P3 or P7 application-context is supported then m else o

**Annex C Remote Operations Service Element (ROSE)**

There are no changes to the specifications of the Remote Operations Service Element.

-----End of references to ISO/IEC ISP 10611-2-----

## **K. ANNEX K (INFORMATIVE) – DIRECTORY INFORMATION SUPPORTING AMHS**

### **AMHS**

### **Directory Information - Object Classes and Attributes Profile for AMHS**

#### **K.1 Introduction**

This Annex defines a profile in support of the Use of Directory Functional Group (DIR FG) of the Extended ATS Message Handling Service by components of the AMHS.

*Note.– Summary:*

- *This profile indicates the Directory information made available by the European Directory Service (EDS). Support of this profile is required in order to implement name resolution, determination of user capabilities and mapping of AFTN addresses to and from AMHS addresses by Directory means.*
- *The AMHS messaging profile defined in this Appendix does not mandate for implementation of the DIR FG. Consequently, this Annex constitutes an informative part of the profile. Despite this, the Object Classes and Attribute Types listed in this Annex accurately describe the information requirement, and provide an adequate way of expressing that requirement. This profile therefore assumes that some local mechanisms are available to obtain and input the described information into AMHS systems.*

#### **K.2 AMHS Requirements**

##### **K.2.1 General Conformance Requirements**

The AMHS Community Specification (AMHS CS) identifies directory-based functions in support of the AMHS. The EDS provides related information for the following functions of AMHS components:

- Name resolution;
- Determination of user capabilities;
- AFTN/AMHS address conversion;
- Address book; and
- Routing.

*Note.– Routing has not been considered by the AMHS CS.*

A Directory User Agent (DUA) of an AMHS component supporting the EUR AMHS messaging profile specified in this Appendix should support the Directory schema of EDS specified in the Appendix G to the EUR AMHS Manual.

A DUA claiming support of a function shall support the related structure of the Directory Information Tree (DIT), object classes and attribute types of EDS as given in this Appendix.

*Note.– At the level of local access by Directory users, the specification of the EDS in Appendix G to the EUR AMHS Manual establishes no explicit requirements. Use of the Directory Access Protocol (DAP) is recommended, but users with limited needs may make use of the Lightweight Directory Access Protocol (LDAP).*



A DUA of an AMHS component may support the definition of the ATN Directory specified by the ICAO Doc 9880 Part IV [12] which in addition to ATN-specific object classes and attributes types makes references to object classes and attribute types defined ISO/IEC ISP 10616 and ISO/IEC ISP 11189 [40].

### K.2.2 Additional Object Class Requirements

A DUA shall support as a minimum the object classes given in Table K.2.2, depending on the functions of the AMHS component for which support is claimed.

Object Class	Name Resolution	Determination of User Capabilities	AFTN/AMHS Address Conversion	Address Book	Routing
country	yes	yes	yes	yes	yes
organization	yes	yes	yes	yes	yes
organizationalUnit	yes	yes	yes	yes	yes
eds-collective-version	yes	yes	yes	yes	yes
atn-amhsMD			yes		
atn-organization	yes	yes	yes	yes	
atn-organizational-role	yes	yes	yes	yes	
eds-amhs-user	yes	yes	yes	yes	
atn-facility					yes
eds-routing-aftn					yes
eds-routing-cidin					yes
eds-routing-amhs					yes

**Table K.2.2: Support of Object Classes**

*Note.*– ISO/IEC 9594-7 provides the definition of basic object classes. Appendix G-B to the EUR AMHS Manual provides the definition of ATN- and EDS-specific object classes.

In support of the ATN Directory a DUA may support further object classes defined in ICAO Doc 9880 Part IV [12].

### K.2.3 Additional Attribute Type Requirements

A DUA shall support as a minimum the attribute types given in Table K.2.3, depending on the functions of the AMHS component for which support is claimed.

Attribute Type	Name Resolution	Determination of User Capabilities	AFTN/AMHS Address Conversion	Address Book	Routing
countryName	yes	yes	yes	yes	yes
organizationName	yes	yes	yes	yes	yes
organizationalUnitName	yes	yes	yes	yes	yes
eds-airac-version	yes	yes	yes	yes	yes
eds-routing-aftn-version					yes
eds-routing-cidin-version					yes
eds-routing-amhs-version					yes
commonName	yes	yes	yes	yes	
atn-global-domain-identifier			yes		
atn-icao-designator			yes		
atn-amhs-addressing-scheme			yes		
atn-amhsMD-naming-context			yes		
atn-facility-name			yes		yes
mhs-or-addresses	yes		yes	yes	
atn-ipm-heading-extensions		yes			
atn-amhs-direct-access		yes			
mhs-maximum-content-length		yes			
mhs-deliverable-content-types		yes			
mhs-acceptable-eits		yes			
mhs-exclusively-acceptable-eits		yes			
atn-maximum-number-of-body-parts		yes			
atn-maximum-text-size		yes			
atn-maximum-file-size		yes			

Attribute Type	Name Resolution	Determination of User Capabilities	AFTN/AMHS Address Conversion	Address Book	Routing
atn-use-of-amhs-security		yes			
atn-use-of-directory		yes			
atn-group-of-addresses			yes	yes	
atn-AF-address			yes	yes	
eds-type-of-user		yes	yes	yes	
eds-external-user		yes		yes	
eds-routing-existing-main-protocol					yes
eds-routing-existing-main-com					yes
eds-routing-existing-alt-protocol					yes
eds-routing-existing-alt-com					yes
eds-routing-existing-coordination					yes
eds-routing-planned-main-protocol					yes
eds-routing-planned-main-com					yes
eds-routing-planned-alt-protocol					yes
eds-routing-planned-alt-com					yes
eds-routing-planned-coordination					yes
eds-routing-planned-event					yes
eds-routing-planned-date					yes
eds-routing-planned-description					yes
eds-routing-aftn-indicators					yes
eds-routing-cidin-indicators					yes
eds-routing-amhs-addresses					yes
eds-routing-amhs-comment					yes

**Table K.2.3: Support of Attribute Types**

*Note.— ISO/IEC 9594-6 provides the definition of basic attribute types. Appendix G-B to the EUR AMHS Manual provides the definition of ATN- and EDS-specific attribute types.*

In support of the ATN Directory a DUA may support further attribute types defined in ICAO Doc 9880 Part IV [12].

## L. ANNEX L (NORMATIVE) – REQUIREMENTS OF TRANSPORT SERVICES SUPPORTING ATS MESSAGING USE OF RFC 1006/2126 OVER TCP

### L.1 Introduction

All of the AMHS OSI Applications (UAs, MTAs, MSs) require provision of the OSI Transport Service, however this Profile requires that they are supported by TCP/IP. In order to use TCP/IP, the Upper Layers shall use an implementation of RFC 1006 or 2126.

*Note.– Summary:*

- *The two RFCs 1006 and 2126 are self-contained and are complete specifications of how OSI Upper Layers using the OSI Transport Service are to be mapped on to the underlying TCP service. RFC 1006 specifies a TCP mapping to Ipv4; 2126 specifies a mapping of TCP to Ipv6.*

### L.2 RFC 1006 and RFC 2126 Requirements

The OSI implementations that conform to this Profile shall support either one or both of the variants listed in Table L.2.

Ref	RFC	EUR AMHS
1	1006	o <sup>1</sup>
2	2126	o <sup>2</sup>

**Table L.2: RFC 1006 and 2126 Requirements**

<sup>1</sup> if Ipv4 is used then m else –

<sup>2</sup> if Ipv6 is used then m else –

### L.3 TCP Requirements

A conforming TCP implementation shall be IP version independent.

## **M. ANNEX M (NORMATIVE) – REQUIREMENTS OF INTERNET PROTOCOLS IPV4 AND IPV6**

### **M.1 Internet Protocol (IP) requirements**

Implementations for which conformance to this profile is claimed shall implement either the Ipv4 or the Ipv6 protocol stack or shall implement both.

### **M.2 IP Addressing**

#### **M.2.1 Assignment of IP Addresses**

An IP address shall be assigned by the authority implementing this Profile.

##### **M.2.1.1 Traffic Class**

A conforming implementation shall not make use of the Traffic Class field.

##### **M.2.1.2 Flow Label**

A conforming implementation shall not make use of the Flow Label field by setting this field to zero.

#### **M.2.2 Ipv4 Implementations**

**Recommendation:** It is possible that some implementations are limited to IP version 4 support. In such cases, it is recommended to make use of network address translation protocol translation (NAT-PT) to interwork with remote implementations.

### **M.3 Network Security**

#### **M.3.1 IP Address Validation**

The source IP address and TCP port number shall be validated against a local list of valid remote addresses for the system. If an invalid address is detected, the incoming IP packets shall be dropped.

#### **M.3.2 Authentication, Encryption and Integrity**

This Profile does not mandate the use of authentication, encryption and integrity services offered by the IPSec standards – RFC 4301

However, use of such techniques and protocols may be bilaterally agreed

## N. ANNEX N (NORMATIVE) – OSI ADDRESSING PRINCIPLES AND REGISTERED VALUES FOR AMHS

### N.1 Introduction

The following table collects a number of registered name and address values for OSI Upper Layers, Application, TCP ports and IP addresses:

*Note.– Summary:*

- *This table simply collects together a number of naming and addressing conventions that are defined in Doc 9880, Part III [11] and various RFCs to provide easy reference, and to ensure that products are capable of using (or pre-specifying) the registered values.*

Address Type	UA	MS	MTA
AE-Title	Doc 9880, Part III 2.3.2.2 & 2.3.2.3 <sup>1</sup>	Doc 9880, Part III 2.3.2.2 & 2.3.2.3 <sup>1</sup>	Doc 9880, Part III 2.3.2.2 & 2.3.2.3 <sup>1</sup>
AE Qualifier	AUA(9)	Locally selected	AMS(7)
PSAP	Locally selected	Locally selected	Locally selected
SSAP	Locally selected	Locally selected	Locally selected
TSAP	Locally selected	Locally selected	Locally selected
TCP Port (well-known)	102	102	102
IP Address	Locally selected	Locally selected	Locally selected

**Table N.1: Address registrations**

<sup>1</sup> EUR AMHS conformant systems shall be capable of being configured to the address values specified in these sections of Doc 9880, Part III [11].

## **O. ANNEX O (NORMATIVE) – AMHS LOWER-LAYER SECURITY REQUIREMENTS (IPSEC)**

### **O.1 Introduction**

Some ANSPs may have concerns for the confidentiality of messages transferred between COM centres. However, use of message confidentiality at the application layer on a per message basis is difficult to apply without partitioning AMHS. For this reason, if a confidentiality requirement exists, then it should be applied at the IP level to all AMHS traffic between international COM Centres, and will need to be administered as a bilateral agreement between those centres.

*Note.– Summary:*

- *ANSPs can operate confidentiality encryption to protect messages at the 'link layer' during transfer between COM centres as well as internally between ANSP systems.*

**Recommendation:** If a requirement for message confidentiality exists then ANSPs should bilaterally agree to use IPsec (RFC 4301) link-layer encryption together with a bilaterally agreed IPsec cryptographic profile.



## P. ANNEX P (NORMATIVE) – AMHS CRYPTOGRAPHIC PROFILE

### P.1 Introduction

This is a specification of cryptographic profile used to support the generation and reception of secure ATS Messages over AMHS. It specifies particular values and settings of AMHS protocol elements that reflect the current Security Profile that applies to the Extended ATS, and which directly support the S0 Functional Group specified in Profile AMH1n Common Messaging Part 1 – MHS Service Support. The values and settings specified in this document apply to the following ISPs and their EUR AMHS addenda contained in this document:

- ISO/IEC ISP 10611-4 – AMH12 & 14-MS Access (P3)
- ISO/IEC ISP 10611-5 – AMH13-MS Access (P7)
- ISO/IEC ISP 10611-6 – AMH15-MS Access (P7 94)

*Note.– Summary*

- *The S0 FG selects all of the necessary static requirements for S0 – mainly the generation of a Message Token on Origination of a secure ATS Message;*
- *Additionally, the P3 and two P7 Addenda contained in this document specify the Dynamic Requirement for Message Token Generation;*
- *Neither the base standards nor ISPs specify the values (Algorithm types etc.) that should be used to generate and evaluate secured messages. Doc 9880, Part IV does;*
- *Therefore this profile collects together all of the cryptographic specifications that support the S0 Functional Group dynamic generation of the Message Token by UAs in P3 and P7 protocols;*
- *These specifications are gathered here in a single place to allow easy update, and because they form a single reference used by the P3, P7 and P7(94) ISPs.*

### P.2 EUR AMHS Requirements

The EUR AMHS Profile does not mandate Security. However, if the S0 functional group is selected, then the provisions of this Annex shall apply.

#### P.2.1 Secure ATS Message Generation

ATSMHS User Agents that claim conformance to the S0 Functional Group shall generate a Message Token using the following values and settings for generation of a secure message.

Element	Value Setting	References
message token		Doc 9880, Part II - 3.1.4.3.3, 3.1.4.3.4, 3.1.4.3.5
token extension criticality	‘non-critical’	
Token type identifier	Asymmetric	
signature algorithm	ecdsa	Doc 9880, Part IV
hash algorithm	sha1	

Element	Value Setting	References
signature-algorithm-identifier	ecdsa-with-sha1	
name element	MF Address or Directory Name of originator	
time element	Time of message generation	
content-integrity-check		Doc 9880, Part II - 3.1.4.3.11
content-integrity-check criticality	'non-critical'	
content-integrity-check value	signature of the ATN signature scheme's Object Identifier concatenated with the message content	

**Table P.2.1: Secure ATS Message Generation**

### **P.2.2 Secure ATS Message evaluation on Reception**

On reception of a secure ATS message, an AMHS User Agent that conforms to the S0 Functional Group shall decode and evaluate the message security elements as specified in Doc 9880, Part II [10], section 3.1.4.3.12, and in Doc 9880, Part IV [12].

## **Q. ANNEX Q (NORMATIVE) – CONFORMANCE IMPLEMENTATION STATEMENT**

### **Q.1 Conformance Implementation Overview**

This Annex provides the PICS Proforma for the AMHS profiles defined in section 6 of this Profile. The Implementation Conformance Statement for an implementation claiming conformance to this profile shall be generated in accordance with the instructions given below.

A conforming implementation shall satisfy the mandatory conformance requirements of the base standards referenced in this profile as well as the applicable Annexes (A to Q) of this Profile.

### **Q.2 The Role of the PRL and PICS Proformas**

The status of this section is informative: it does not constitute a provision of this Part of this Profile.

- The objective of presenting the conformance requirements in the tabular form of the PRL and PICS proformas is to provide a check-list of the features which must or may be implemented. The underlying concepts are defined and described in ISO/IEC ISP 9646-1.
- A profile combines and selects the options of several base standards in order to fulfil a specific information processing function. In AMHS, each International Standardized Profile (ISP) refers to the Base Standards, and has a PICS proforma, listing the requirements of the standard. Each PRL comprises the subset of the ISPs PICS proforma items that are constrained by the profile, together with the specific profile requirements; it defines answers required on the ISP PICS proformas to conform with the profile. In addition, each PRL will contain PICS-type items which are specific to the profile (at the least, there will be an item testing whether all the required PICS proformas have been correctly completed); these items must be completed together with the referenced ISP's PICS proformas. The completed proformas together constitute a profile Implementation Conformance Statement (ICS).
- A claim of conformance to a profile has to be supported by PICS proformas completed in accordance with the PRL. The use of this material will depend on the procurement approach for an AMHS implementation and the particular type of system (UA, MTA or MS) being procured.
- Several possible approaches to an AMHS implementation can be imagined :
  - In-house implementation by a Member State or Air Navigation Service Provider: the PRL should be used as the basis of the requirements specification and acceptance test specification for the implementation; the completed ICS should be produced as part of the acceptance procedure.
  - Implementation of the profile by a contractor: the material will be used and produced as for an in-house implementation, but the contractor should provide the ICS and the need for this must be a contractual requirement.
  - Implementation of the profile by a contractor as part of a turn-key or system integration contract: the material will be used and produced as for an in-house implementation, but the contractor must be required to do this internally as well as providing the completed ICS. Conformance

to the profile ensures, for instance, that a supplier working for two organisations cannot introduce its proprietary protocols to meet the AMHS requirement and thus helps to give control to the contracting organisations.

- Integration of off-the-shelf products into a profile implementation in any of the previous cases: the supplier of a product should be required to provide those PICS proformas relevant to the product completed in accordance with the PRL given here and to warrant the conformance of the product with the applicable profile requirements; this PICS can then be forwarded as part of the profile ICS.
- Following implementation, the ICS should be maintained as part of the documentation of the implementation; it can be used to predict interoperability with other administrations, and to identify changes that may be needed in moving to different protocols.

### Q.3 Instructions for Completing the PICS Proformas

To provide the profile ICS, the PICS proformas for the referenced ISPs shall be completed, together with the additional profile-related PICS items provided in this Annex.

Where this profile refines the features of the base standards and ISPs, the requirements expressed in this PRL shall be applied (as indicated in PRL items with a 'Profile features' column) to constrain the allowable responses in the ISP PICS proformas.

Where this profile makes additional requirements, the response column for such items shall be completed. In this column, each response shall either be selected from the indicated set of responses, or comprise a parameter value or values or range of values as requested.

If a mandatory requirement is not satisfied, exception information must be supplied, by entering a reference X<i>, where <i> is a unique identifier, to an accompanying rationale for the non-compliance.

A possible reason for such an exception is compliance with a pending defect report on a provision of the profile; if the defect report is accepted, the implementation will then be conformant.

## Q.4 Conformance Statement for IPM User Agent using P3 Implementations

### Q.4.1 Conformance Overview

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	
Date of statement	
Have all the mandatory of the sections indicated below including the listed Annexes and other references been implemented? - Section 4.4.1 (IPM UA using P3)	Yes o
<i>Note.– Failure to respond 'Yes' to all of these questions indicates a failure of conformance to this profile</i>	
State which PDRs have been implemented in this system	

**Table Q.4.1: Identification of IPM UA using P3 System**

### Q.4.2 Dynamic Conformance Requirements

Does the implementation provide ATS Message Legal Recording?	Yes o
State the maximum message size that can be delivered to the UA	
<i>Note.– Failure to respond to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.4.2: Dynamic Conformance Requirements**

### Q.4.3 Transport and Lower Layer Requirements

The Transport and Lower Layer Requirements are to be specified locally by the ANSP.

## Q.5 Conformance Statement for IPM User Agent using P7 Implementations

### Q.5.1 Conformance Overview

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	
Date of statement	
Have all the mandatory of the sections indicated below including the listed Annexes and other references been implemented? - Section 4.4.2 (IPM UA using P7)	Yes o
<i>Note.– Failure to respond 'Yes' to all of these questions indicates a failure of conformance to this profile</i>	
State which PDRs have been implemented in this system	

**Table Q.5.1: Identification of IPM UA using P7 System**

### Q.5.2 Dynamic Conformance Requirements

Does the implementation provide ATS Message Legal Recording?	Yes o
State the maximum message size that can be delivered to the UA	
<i>Note.– Failure to respond 'Yes' to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.5.2: Dynamic Conformance Requirements**

### Q.5.3 Transport and Lower Layer Requirements

The Transport and Lower Layer Requirements are to be specified locally by the ANSP.

## Q.6 Conformance Statement for IPM User Agent using P7 (94) Implementations

### Q6.1 Conformance Overview

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	
Date of statement	
Have all the mandatory of the sections indicated below including the listed Annexes and other references been implemented? - Section 4.4.3 (IPM UA using P7 (94))	Yes o
<i>Note.– Failure to respond 'Yes' to all of these questions indicates a failure of conformance to this profile</i>	
State which PDRs have been implemented in this system	

**Table Q.6.1: Identification of IPM UA using P7 (94)**

### Q.6.2 Dynamic Conformance Requirements

Does the implementation provide ATS Message Legal Recording?	Yes o
State the maximum message size that can be delivered to the UA	
<i>Note.– Failure to respond to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.6.2: Dynamic Conformance Requirements**

### Q.6.3 Transport and Lower Layer Requirements

The Transport and Lower Layer Requirements are to be specified locally by the ANSP.

## Q.7 Conformance Statement for IPM UA Co-located with MTA Implementations

### Q.7.1 Conformance Overview

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	
Date of statement	
Have all the mandatory of the sections indicated below including the listed Annexes and other references been implemented? - Section 4.4.4 (IPM UA co-located with MTA)	Yes o
<i>Note.– Failure to respond ‘Yes’ to all of these questions indicates a failure of conformance to this profile</i>	
State which PDRs have been implemented in this system	

**Table Q.7.1: Identification of Co-located IPM UA System**

### Q.7.2 Dynamic Conformance Requirements

Does the implementation provide ATS Message Legal Recording?	Yes o
State whether any of the Elements of Service for the EUR AMHS IPM cannot be accessed by the user.	
State whether any of the Extended ATS Elements of Service cannot be accessed by the user.	
State the maximum message size that can be delivered to the UA	
<i>Note.– Failure to respond to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.7.2: Dynamic Conformance Requirements**

### Q.7.3 Transport and Lower Layer Requirements

The Transport and Lower Layer Requirements are to be specified locally by the ANSP.

## Q.8 Conformance Statement for Message Transfer Agents

### Q.8.1 Conformance Overview



Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	
Date of statement	
Have all the mandatory of the sections indicated below including the listed Annexes and other references been implemented? - Section 4.5 (MTA Requirements)	Yes o
<i>Note.– Failure to respond 'Yes' to all of these questions indicates a failure of conformance to this profile</i>	
State which PDRs have been implemented in this system	

**Table Q.8.1: Identification of MTA System****Q.8.2 Dynamic Conformance Requirements**

Does the implementation provide ATS Message Legal Recording?	Yes o
State the number of simultaneous P1 Associations that the MTA can maintain	
State the MTA Transit time per message (See Annex F – A.3.5.2)	
State the maximum message size that the MTA can accept, switch and forward in octets	
Are the TCP port values to service incoming connection establishments configurable?	Yes o
Is the implementation IP version independent?	Yes o
Are the IP addresses of local and remote implementations configurable?	Yes o
Does the implementation make use of Network Address Translation - Protocol Translation (NAT-PT)	Yes o No o
<i>Note.– Failure to respond 'Yes' to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.8.2: Dynamic Conformance Requirements****Q.8.3 Upper Layer Requirements**

Does the supplied RTSE support the Monologue Dialogue Mode?	Yes o No o
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**Table Q.8.3: RTSE Mode****Q.8.4 Lower Layer Requirements**

Is the Transport Service provided by either RFC 1006 or RFC 2126?	Yes o
Is RFC 1006 supported?	Yes o
Is RFC 2126 supported	Yes o
Does the TCP implementation comply to RFC1122 section 4?	Yes o
Are at least 100 simultaneous TCP connections supported for the purpose of AMHS P1 Associations?	Yes o
<i>Note.– Failure to respond to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.8.4.1: Transport and TCP Layers**

Does the IP implementation comply to RFC2460?	Yes o
Are remote IP addresses validated during connection establishment ?	Yes o
<i>Note.– Failure to respond to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.8.4.2: Network Layer**

Does the IP implementation comply to RFC1122 section 2?	Yes o
<i>Note.– Failure to respond to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.8.4.3: Data Link Layer**

## Q.9 Conformance Statement for Message Store implementations

### Q.9.1 Conformance Overview

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	
Date of statement	
Have all the mandatory of the sections indicated below including the listed Annexes and other references been implemented? - Section 4.6 (Message Store)	Yes o
<i>Note.– Failure to respond 'Yes' to all of these questions indicates a failure of conformance to this profile</i>	
State which PDRs have been implemented in this system	

**Table Q.9.1: Identification of MS System**

### Q9.2 Dynamic Conformance Requirements

Does the implementation provide ATS Message Legal Recording?	Yes o
State the maximum size of messages that can be delivered to the MS	
<i>Note.– Failure to respond to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.9.2: Dynamic Conformance Requirements**

### Q.9.3 Transport and Lower Layer Requirements

The Transport and Lower Layer Requirements are to be specified locally by the ANSP.

## Q.10 Conformance Statement for MS (94) Implementations

### Q.10.1 Conformance Overview

Supplier	
Contact point for queries about the PICS	
Implementation name/version	
Machine name/version	
Operating system name/version	
Other hardware and operating systems claimed	
System name (if applicable)	
Date of statement	
Have all the mandatory of the sections indicated below including the listed Annexes and other references been implemented? - Section 4.7 (Message Store (94))	Yes o
<i>Note.– Failure to respond 'Yes' to all of these questions indicates a failure of conformance to this profile</i>	
State which PDRs have been implemented in this system	

**Table Q.10.1: Identification of MS (94) System**

### Q.10.2 Dynamic Conformance Requirements

Does the implementation provide ATS Message Legal Recording?	Yes o
State the maximum number of MTS Access (94) Associations that can be simultaneously supported by the Message Store	
<i>Note.– Failure to respond to all of these questions indicates a failure of conformance to this profile</i>	

**Table Q.10.2: Dynamic Conformance Requirements**

### Q.10.3 Transport and Lower Layer Requirements

The Transport and Lower Layer Requirements are to be specified locally by the ANSP.

## R. ANNEX R (INFORMATIVE) – REFERENCES ACROSS EDITIONS OF ISO/IEC ISPS

This document uses references of ISO/IEC ISPs as found in Edition 3 of each of these documents, published in 2003.

These references have evolved since Edition 1 of these documents was published in 1994 or 1995.

The ICAO Doc 9880, Part II [10], makes use of references to Edition 1 of the ISPs as far as the specification of the Basic ATS Message Handling Service is concerned.

The following tables provide the mapping between references of sections and items in Edition 1 (used in Doc 9880, Part II) and in Edition 3 (used in this document).

The mapping is limited to the sections and items used in Doc 9880, Part II [10] and/or in this document, and that have been subject to renumbering through the ISP Edition process. The numbering hierarchy is also provided, even if not renumbered, to enable unambiguous localization of the amended sections and items.

ISO/IEC ISP 10611-6 and of ISO/IEC ISP 12062-6 are both related to MS 94 Access (P7) and their edition dates are different from other parts of the ISPs. Their Edition 1 was published in 1997 only. Therefore the relevant tables below provide the mapping between references of items in Edition 1 and in Edition 2, which was published in 2003 at the same time as Edition 3 of other parts of this multi-part ISO/IEC ISP.

Amended references are identified using bold and italics characters.

### ISO/IEC ISP 10611-3

ISP Edition 1 ref	ISP Edition 3 ref	Name of section/item
A.1	A.1	Basic requirements
A.1.4.2	A.1.4.2	MessageTransfer
1	1	MessageTransferEnvelope
1.1	1.1	(per message fields)
1.1.11	1.1.11	extensions
-	<b><i>1.1.11.13</i></b>	certificate-selectors
-	<b><i>1.1.11.14</i></b>	multiple-originator-certificates
-	<b><i>1.1.11.15</i></b>	dl-exempted-recipients
-	<b><i>1.1.11.16</i></b>	PrivateExtensions
A.1.4.3	A.1.4.3	ReportTransfer
1	1	ReportTransferEnvelope
1.4	1.4	extensions

ISP Edition 1 ref	ISP Edition 3 ref	Name of section/item
<i>1.4.2</i>	<i>1.4.3</i>	originator-and-DL-expansion-history
<i>1.4.3</i>	<i>1.4.4</i>	reporting-DL-name
<i>1.4.4</i>	<i>1.4.5</i>	reporting-MTA-certificate
<i>1.4.5</i>	<i>1.4.6</i>	report-origin-authentication-check
<i>1.4.6</i>	<i>1.4.7</i>	internal-trace-information

**ISO/IEC ISP 10611-4**

ISP Edition 1 ref	ISP Edition 3 ref	Name of section/item
A.2	A.2	Optional functional groups
A.2.7	A.2.7	Security (SEC)
A.2.7.7	A.2.7.8	Extension data types

**ISO/IEC ISP 10611-5**

ISP Edition 1 ref	ISP Edition 3 ref	Name of section/item
A.0	A.0	Identification of the implementation
A.0.7	A.0.7	Statement of profile conformance
2	2	Are all mandatory requirements of any of the following optional functional groups implemented?
-	<i>2.1</i>	Distribution List (DL)
<i>2.4</i>	<i>2.5</i>	Security (SEC)

**ISO/IEC ISP 10611-6**

ISP Edition 1 ref	ISP Edition 2 ref	Name of section/item
(published 1997)	(published 2003)	
A.0	A.0	Identification of the implementation
A.0.7	A.0.7	Statement of profile conformance
2	2	Are all mandatory requirements of any of the following optional functional groups implemented?
-	<i>2.1</i>	Distribution List (DL)
<i>2.4</i>	<i>2.5</i>	Security (SEC)

**ISO/IEC ISP 12062-2**

ISP Edition 1 ref	ISP Edition 3 ref	Name of section/item
A.0	A.0	Identification of the implementation
A.0.6	A.0.6	Statement of profile conformance
2	2	Are all mandatory requirements of any of the following optional functional groups implemented?
<b>2.7</b>	<b>2.2</b>	IPM Security (SEC)
-	<b>2.5</b>	Business Class (BC)
A.1	A.1	Basic requirements
A.1.2	A.1.2	IPM heading fields
17	17	extensions
-	<b>17.4</b>	body-part-signatures
-	<b>17.5</b>	ipm-security-label
-	<b>17.6</b>	authorization-time
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A.1.5	A.1.5	Common Data Types
1	1	RecipientSpecifier
1.4	1.4	recipient-extensions
-	<b>1.4.2</b>	circulation-list-indicator
-	<b>1.4.3</b>	precedence

**ISO/IEC ISP 12062-5**

ISP Edition 1 ref	ISP Edition 3 ref	Name of section/item
A.0	A.0	Identification of the implementation
A.0.7	A.0.7	Statement of profile conformance
3	3	Are all mandatory requirements of any of the following optional functional groups implemented?
-	<b>3.2</b>	IPM Distribution List (DL)
<b>3.6</b>	<b>3.7</b>	IPM Security (SEC)
-	<b>3.9</b>	Business Class (BC)
-	<b>A.1</b>	Basic requirements
A.1.12	A.1.12	IPM-specific attributes
A.1.12.1	A.1.12.1	Extended body part attribute support
1	1	ia5-text-body-parts
-	<b>9</b>	bilaterally-defined-body-parts
<b>3</b>	<b>11</b>	general-text-body-parts
B.2	B.2	Optional functional groups
<b>B.2.6</b>	<b>B.2.7</b>	IPM Security (SEC)
-	<b>B.2.9</b>	Business Class (BC)

**ISO/IEC ISP 12062-6**

ISP Edition 1 ref	ISP Edition 2 ref	Name of section/item
(published 1997)	(published 2003)	
A.0	A.0	Identification of the implementation
A.0.7	A.0.7	Statement of profile conformance
3	3	Are all mandatory requirements of any of the following optional functional groups implemented?
-	<b>3.2</b>	IPM Distribution List (DL)



ISP Edition 1 ref	ISP Edition 2 ref	Name of section/item
<b>3.6</b>	<b>3.7</b>	IPM Security (SEC)
-	<b>3.13</b>	Business Class (BC)
-	<b>A.1</b>	Basic requirements
B.2	B.2	Optional functional groups
<b>B.2.6</b>	<b>B.2.7</b>	IPM Security (SEC)
-	<b>B.2.13</b>	Business Class (BC)

**END of Appendix B**



# EUR AMHS Manual

## Appendix C

AMHS Testing Requirements	
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0.3	29/03/2006	Terminology (ATS Message Handling Service) corrected	all
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1.1	14/01/2007	Editorial updates	References
2.0	26/04/2007	Adopted version (AFSG/10)	
3.0	24/04/2008	Adopted version (AFSG/11) – without changes	
3.1	17/11/2008	Change of references from ICAO Doc 9705 to ICAO Doc 9880, Part IIB, editorial improvements	all
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5.1	25/09/2010	Incorporation of CP-AMHSM-10-001, minor editorial updates	References
5.2	05/11/2010	Incorporation of CP-AMHSM-10-001, Attm2	5.1.2, Table 4
6.0	14/04/2011	Adopted version (AFSG/15)	
7.0	26/04/2012	Adopted version (AFSG/16) – without changes	
7.1	25/03/2013	Incorporation of CP-AMHSM-12-010	4.3.4.1
8.0	25/04/2013	Adopted version (AFSG/17)	

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8.1	12/03/2014	Incorporation of CP-AMHSM-13-005	3.5.2.1, 4.1, 4.2, 4.3.4.1
9.0	10/04/2014	Adopted version (AFSG/18)	
9.1	19/03/2015	Incorporation of CP-AMHSM-14-004	all
9.2	22/03/2015	Incorporation of CP-AMHSM-14-006	4.4 [MHS/AMHS procedural errors (E2)]
10.0	23/04/2015	Adopted version (AFSG/19)	
11.0	26/04/2016	Adopted version (AFSG/20) – without changes	
12.0	28/04/2017	Adopted version (AFSG/21) – without changes	
12.1	23/04/2018	Incorporation of CP-AMHSM-17-004	References, 4.3.5, 4.3.7
13.0	27/04/2018	Adopted version (AFSG/22)	
14.0	05/03/2019	Adopted version (AFSG/23) – without changes	
14.1	26/11/2019	Incorporation of CP-AMHS-19-002  Adaption: According to COG/74&RCOG/11 Decision /4, Approval of AFS to SWIM Transition Task Force (AST TF) Terms of Reference (ToR) and coherent Work Programme, the Author of EUR Doc 020 changed from “AFSG PG” to “AST PG”.	all
14.2	30/06/2020	Incorporation of DR-AMHSM-19-003	4.3.6
15.0	12/11/2020	Adopted version (AST TF/01)	
16.0	20/10/2021	Adopted version (AST TF/02)	

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## References

- [1] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS), Second Edition – 2016, Referred to as AMHS technical specifications
- [2] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part III – Upper Layer Communications Service (ULCS) and Internet Communications Service (ICS), Second Edition – 2016
- [3] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures
- [4] ICAO EUR Doc 005, EUR CIDIN Manual, Fifth Edition (2006)
- [5] ISO/IEC 10021-2 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 2: Overall architecture
- [6] ISO/IEC 10021-4 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 4: Message Transfer System: Abstract service definition and procedures
- [7] ISO/IEC 10021-7 – Information technology, Text communication – Message-oriented Text Interchange Systems – Part 7: Interpersonal Messaging System
- [8] ISO/IEC ISP 10611-3 – International standardized profile AMH1n – Message Handling Systems – Common Messaging –AMH11: Message transfer (P1)
- [9] ISO/IEC ISP 12062-2 – International standardized profile AMH2n – Message Handling Systems – Interpersonal Messaging –AMH21: IPM content
- [10] ISO/IEC ISP 12062-3 – International standardized profile AMH2n – Message Handling Systems – Interpersonal Messaging –AMH22: IPM requirements for message transfer (P1)
- [11] SPACE Final Report, Version 1.0, STNA (02/12/2002)
- [12] ISO/IEC 9646-1 – Conformance testing methodology and framework – Part 1: General concept (1994)
- [13] ACCESS – Interim Deliverable 4: ATSMHS interoperability/conformance testing (16/04/1999)
- [14] FIRST – Part 1a: Bilateral Basic Tests, Test Plan V1.0 (29/01/2004)
- [15] FIRST – Part 1b: Bilateral Extended Tests, Test Plan Rev. 1.7 (29/08/2005)
- [16] FIRST – Part 2: Trilateral Network Tests, Test Plan Rev. 0.14 (28/07/2005)
- [17] EUR Doc 020 – EUR AMHS Manual, Appendix A "Abbreviations, Glossary and Definitions", latest version
- [18] EUR Doc 020 – EUR AMHS Manual, Appendix B, European ATS Messaging Service Profile, latest version

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# 1. Introduction

## 1.1 Purpose of the Document

The purpose of the document is to define the functional requirements for AMHS testing procedures.

## 1.2 Scope of the Document

Based on known principles of testing and general assumptions on an AMHS test scenario, the scope of testing for an "AMHS Conformance Test" is specified. Elements of the specifications are generic test groups and related test configurations. Special attention is given to the "provocation" of an AMHS implementation with incorrect protocol behaviour ("negative testing") to analyse its stability (robustness) in out-of-line situations.

Further requirements are specified in terms of configuration parameters (such as the number of ATS Message Servers and AMHS users represented by test equipment) and components of the AMHS and AFTN information objects to be handled.

In principle, these groups are also valid for interoperability tests. But especially the test groups dealing with "negative testing" cannot be performed by real systems due to the nature of an implementation to avoid such exception situations.

## 1.3 Document Structure

*Chapter 2* is concerned with general aspects of conformance testing and identifies the principal differences to interoperability testing. Key elements of the envisaged test methodology are identified which form high-level requirements for an AMHS conformance testing equipment. References are made to ISO/IEC 9646, which provides a general concept of conformance testing, and to deliverables of the ACCESS study concerning AMHS testing.

*Chapter 3* deals with the scope of AMHS functions to be tested and identifies reference points at AMHS implementations which should be accessible for testing. In addition, the used transport service for AMHS communications is identified and the interface with AFTN at the implemented AFTN/AMHS Gateway is detailed.

*Chapter 4* defines AMHS test groups for comprehensive conformance testing of AMHS native communications and gateway operations with the AFTN. Related test configurations are added with explanations on sequences of exchanged AMHS and AFTN information objects. In addition, principles for definitions of test cases are set up including the consideration of so-called "negative testing".

*Chapter 5* specifies the range of parameters values supported in test configurations which place quantitative requirements on the testing equipment as the number of represented adjacent ATS Message Servers and handled AMHS and AFTN users.

Finally, *chapter 6* identifies the used AMHS and AFTN test data. In particular, the elements of AMHS information objects and their sub-components (such as message and message transfer envelope) to be supported are specified in detail.



## **1.4 Acronyms**

All items are compiled in EUR AMHS Manual, Appendix A "Abbreviations, Glossary and Definitions" [17].

## 2. Conformance Testing

The chapter provides an introduction to general aspects of conformance testing and identifies the principal differences to interoperability testing. Elements of the envisaged test methodology are identified which form high-level requirements for an AMHS conformance testing equipment.

References are made to ISO/IEC 9646 [12] and outcomes of the ACCESS study work [13].

### 2.1 Objectives

Generally, conformance testing attempts to determine whether a given implementation matches a specification. The implementation to be tested is referred to as the *implementation under test (IUT)*. A tester provides the IUT with defined inputs and observes the resulting outputs. – ISO/IEC 9646-1 [12] provides a general concept of OSI conformance testing and definitions of related key terms.

*Note.* – According to ISO 9646-1, the term *Implementation Under Test (IUT)* refers to an implementation of one or more OSI protocols, being part of a real open system which is to be studied. The *System Under Test (SUT)* is the real open system in which the IUT resides. – In the following, the term *IUT* is used when referring to the AMHS implementation to be tested in consideration that only the AMHS aspects within a given (real) ATS communication system are addressed.

ISO/IEC 9646-1 distinguishes three types of standardised conformance testing:

- *Basic interconnection tests*, used to determine whether or not there is sufficient conformance to the relevant protocols for interconnection, without trying to perform thorough testing.
- *Capability tests*, which are used to verify the existence of one or more claimed capabilities of an IUT (*static* conformance requirements).
- *Behaviour tests* deal with *dynamic* conformance requirements, which specify the observable behaviour of an implementation. Behaviour tests include tests for conformant behaviour of the IUT for both valid and invalid inputs by the tester.

The AMHS testing requirements specified in this document focus on *behaviour tests*, i.e. test cases that verify the proper implementation of AMHS functions. *Basic interconnection tests* are an appropriate means to check the correctness of a test configuration before starting detailed test execution.

The discussed AMHS conformance testing relates to that scope of functions which is typically implemented in an *International Communication Centre*, i.e.

- 1) AMHS message transfer,
- 2) AMHS submission and delivery operations with attached AMHS user terminals and
- 3) intercommunication with the AFTN/CIDIN by means of the AFTN/AMHS Gateway.

The interface to the AFTN/CIDIN is only taken into account in the extent specified in the AMHS technical specifications. For example, the AMHS technical specifications do not assume AFTN routing by the gateway. – The Basic ATS Message Handling Service is assumed as the service level supported by the IUT.

The conformance testing equipment acting as peer system of the AMHS IUT is referred to as the *AMHS Test Tool*. The AMHS Test Tool provides the IUT with inputs, records and evaluates responses of the IUT.

The specified testing requirements refer to an initial functionality of the AMHS Test Tool. Potential future extensions are indicated in the context of the specified sub-items of the test tool.

## 2.2 Specific aspects of AMHS testing

The AMHS (MHS) functions to be tested reside in the *application layer* of the ISO/OSI reference model. The underlying layers provide supporting communication services, however, are not primary subject of testing.

In the framework of the ACCESS study [13] two methodologies have been discussed in the context of AMHS conformance testing:

- (a) the testing of complete systems (“black boxes”) and
- (b) the testing of individual protocol layers, in particular the application layer.

In case (a) only external interfaces which are part of the IUT are used for access by the conformance testing equipment. In case (b), on the other hand, the IUT has to be “opened up”, providing access to the layer to be tested. For this purpose special software modules have to be provided within the IUT for control and observation of the lower and upper service boundary at the layer under test (see ISO/IEC 9646-1).

The ACCESS study recommends for AMHS conformance testing that:

- the individual components and protocol layers of the IUT not to be visible to the conformance testing equipment;
- access to the IUT by the test equipment is implemented only via standard interfaces; and
- human readable terminal interfaces (such as the Control Position of an AFTN/AMHS Gateway) are not accessed by the test equipment.

This recommended testing approach forms the baseline for the functional requirements placed on the AMHS Test Tool, as follows:

- The AMHS Test Tool will be interconnected with the IUT's external interfaces as far as they are standardised by the AMHS technical specifications. Such standardised interfaces are the *AMHS transfer ports* and the *AFTN/CIDIN interface*. The IUT is treated as a *black box*.
- Origination and reception at user terminals have to be performed and observed by an operator who is familiar with the implemented HMI. Therefore conformance testing

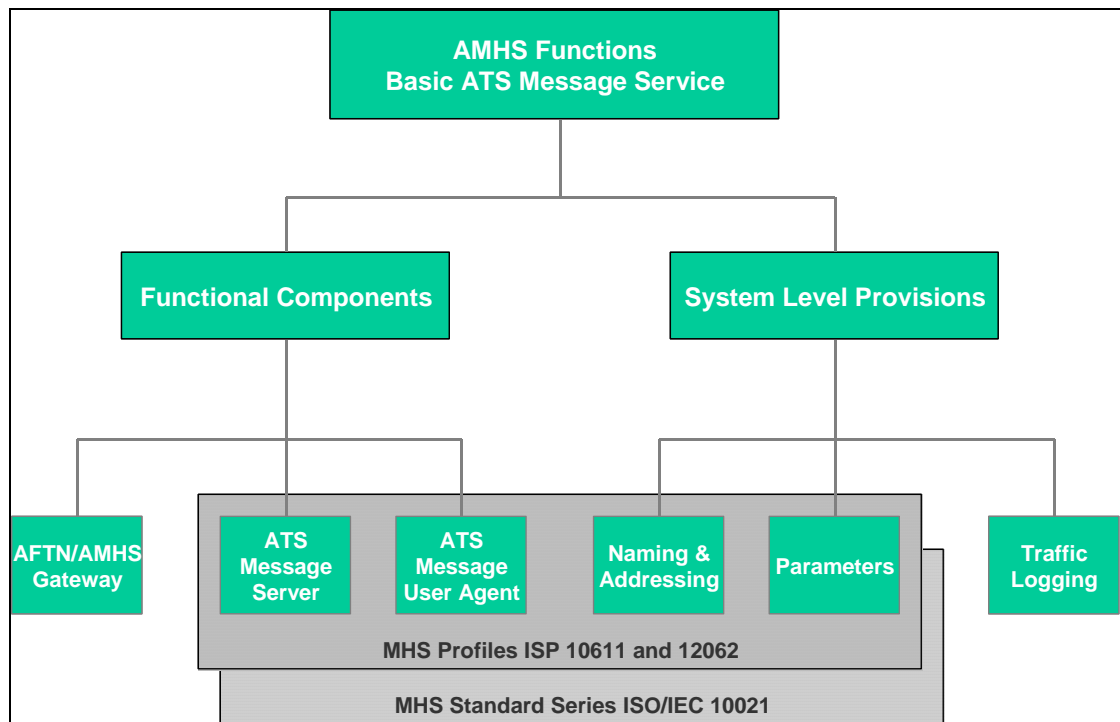
needs certain operator assistance at the IUT. (The assumptions made on interfaces which are available at individual IUTs will be outlined by means of an IUT model.)

### 3. Assumed Test Scenario

#### 3.1 AMHS Functionality of the IUT

##### 3.1.1 AMHS technical specifications provisions

The assumption is made that the IUT to be tested provides completely or partially the AMHS functionality as specified by the Doc 9880, Part II [1] in support of the *Basic* ATS Message Handling Service. Figure 1 identifies the key elements of the AMHS which are addressed by the AMHS technical specifications. The figure also indicates that the majority of the AMHS functionality is specified by references to the MHS standard series ISO/IEC 10021 and the related profile documentation ISO/IEC ISP 10611 (Common Messaging) and ISP 12063 (Interpersonal Messaging).



**Figure 1: AMHS functionality specified by the AMHS technical specifications**

The nucleus of the AMHS is formed by its three functional components:

- *ATS Message Server*, performing *transfer* operations with adjacent ATS Message Servers (and AFTN/AMHS Gateways) by means of its inherent (MHS) Message Transfer Agent (MTA) [5]. In addition, *submission* and *delivery* operations are performed with one or more attached ATS Message User Agents. Optional (MHS) Message Stores (MS) [5] may provide retrieval services for ATS Message User Agents in the context of message delivery. – The MTA functions are specified in [6].
- *ATS Message User Agents*, each including a (MHS) User Agent (UA) [5] as key component. An ATS Message User Agent interacts on the one side with a (local)

AMHS user interface and accesses on the other side the transfer level of the AMHS by performing *submission* and *delivery* operations with the serving ATS Message Server. End-to-end communication between ATS Message User Agents is achieved via ATS Message Servers and has to comply with the IPM content as specified for the (MHS) Interpersonal Messaging System (IPMS) [7].

- *AFTN/AMHS Gateway* supporting interworking between users of the AMHS and AFTN. The gateway includes for operations with the transfer level of the AMHS an MTA. The mapping functions of the gateway reside in the Message Transfer and Control Unit (MTCU). The operations with AFTN [3] are performed with the AFTN components. Exception handling which needs operator assistance is moved to the Control Position.

The above listed functional components are typically implemented in International Communication Centres performing AMHS message transfer, AMHS message submission and delivery operations with attached AMHS user terminals and intercommunication with the AFTN. However, an AFTN/AMHS Gateway may be also implemented as stand-alone facility, allowing existing AFTN based communication facilities access the AMHS environment.

In addition, the AMHS technical specifications address some aspects relating to the system level of an AMHS environment. The key ingredients at the system level of the AMHS are:

- *Naming and addressing*, relating to the unambiguously identification of AMHS users and entities at upper layers protocols as needed for communication between AMHS systems. The specifications are based on MHS O/R addressing and ISO/OSI upper layer conventions. Examples are: the Common AMHS Addressing Scheme, Application Process Titles and Transport/Session/Presentation addresses.
- *Parameters*, defining specific AMHS conventions in the framework of the MHS standards. Examples are: The limitation of Receipt Notification Request for IPMs with the priority value set to 'urgent' and the definition of the ATS-Message-Header in the IPM body part.
- *Traffic logging*, in functional components for the support of message tracking across the AMHS.

The manner of implementation of the above identified AMHS functionality in the IUT is irrelevant in the frame of this testing (*black-box* view). The above functional outline is used just as reference for the scope of conformance testing to be supported by the AMHS Test Tool.

### 3.1.2 Implementation specific AMHS features

Typically, an AMHS implementation includes features which are either beyond the scope of the technical specifications or seen as local issue. Examples are: User interfaces (HMI) for local submission and delivery, proprietary MTS access protocol and provisions for system management (including statistics and diagnostic means).

Such features will not be subject to conformance testing, however they may be used in support of conformance testing. Example: IPM submission at local user terminals for verification of correct generation of the related P1 message.

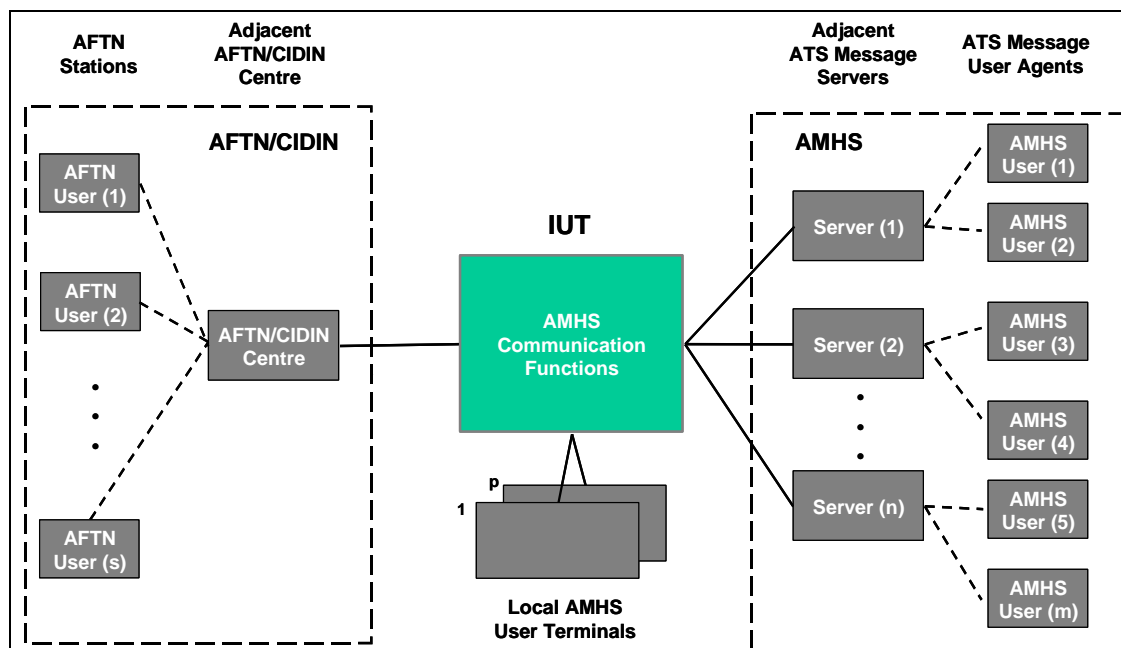
### 3.2 Modelling of the test environment

Figure 2 illustrates the intended operational environment of the IUT at the level of messaging: Via Transfer Ports [6] of the IUT (logical) connections are established to  $n$  adjacent ATS Message Servers which in turn provide connectivity to  $m$  distant ATS Message User Agents. Local access to the AMHS is offered by  $p$  AMHS User Terminals attached to the IUT. Via the AFTN/AMHS Gateway there is a connection to an adjacent AFTN Communication Centre which in turn provides connectivity to  $s$  AFTN stations. – The figures  $m$ ,  $n$ ,  $p$  and  $s$  are seen as configuration parameters of the test configuration (see Section 5).

*Note 1.– The specification of the AFTN/AMHS Gateway assumes an AFTN link to only one adjacent AFTN centre to minimise the AFTN functionality in the gateway [1]. However, in typical implementations, the AFTN/AMHS Gateway is collocated with AFTN centre functions supporting connections to a number of adjacent centres. This aspect of multiple AFTN connections is not considered for conformance testing against the AMHS technical specifications.*

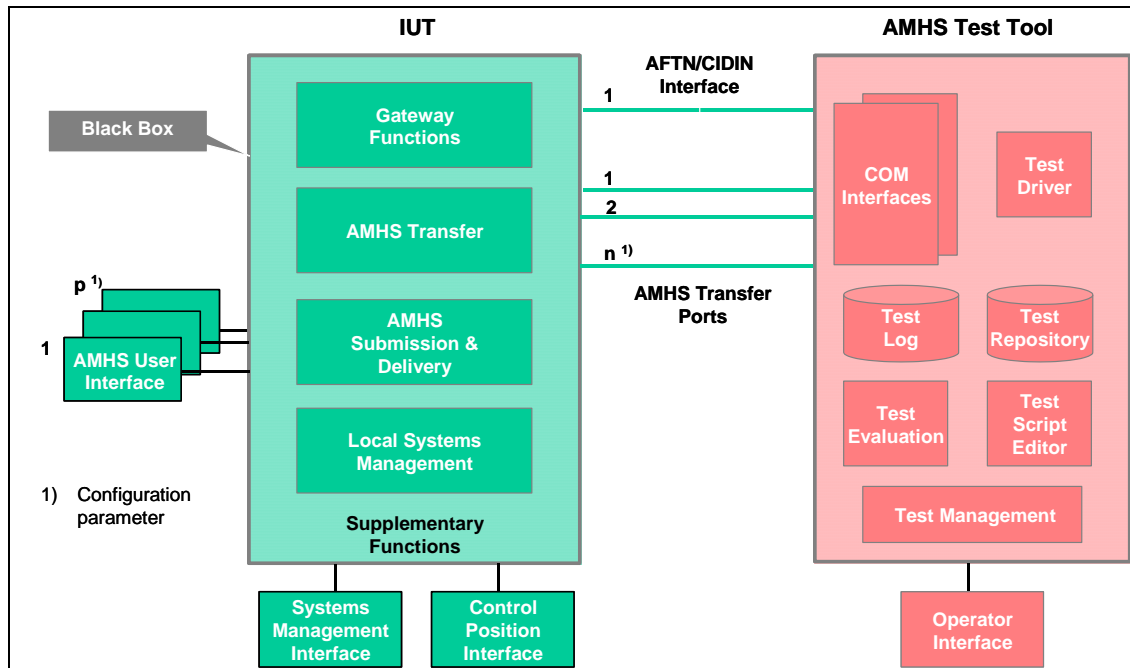
*Note 2.– In the European Region, AFTN communications make use of the CIDIN transport service. This is taken into account for conformance testing, with the limitation, that only one AFTN/CIDIN link is established between the test tool and the IUT (see Figure 2).*

*Note 3.– In-depth testing of AFTN and CIDIN capabilities of the IUT is not seen as subject of AMHS conformance testing.*



**Figure 2: Assumed operational environment of the IUT**

The AMHS Test Tool simulates an operational environment for the IUT as depicted in Figure 2. Figure 3 shows the corresponding model of the test configuration. The *COM Interfaces* of the test tool include  $n$  MTA instances representing the  $n$  adjacent ATS Message Servers of the IUT and an AFTN/CIDIN source/sink representing the AFTN/CIDIN environment. Other major functional components of the test tool are the *Test Repository* (containing predefined test scripts and associated test data), *Test Script Editor* (providing an HMI for specifications of test scripts and test data), *Test Log* (containing all the exchanged information objects) and *Test Evaluation* (performing test evaluations based on the test log against various criteria). The *Test Driver* controls the execution of test scripts and enters exchanged information objects in the test log. Finally, the component *Test Management* is tasked with the overall management and administration of the test tool.



**Figure 3: Model of the test environment**

The IUT is represented in the modelled test configuration (Figure 3) by its functional components which will be subject of testing, i.e. AMHS transfer, AMHS submission/delivery and AMHS gateway functions (cf. Section 3.1). The inclusion of other indicated components of the IUT (as Systems Management Interface) will be addressed in subsequent sections.

The  $n$  MTA names, the addresses of the  $m$  ATS Message User Agents,  $s$  AFTN stations and  $p$  AMHS User Terminals are considered as configuration parameters which are jointly set up in the IUT and AMHS Test Tool.

*Note.*— The above outlined functional model includes an abstract, logical view on the AMHS Test Tool for the purpose of understanding the intended testing approach. The real design of the test tool is subject of separate documentation.

### 3.3 Used Transport Service for AMHS

There is a common understanding in the European Region to implement (at least initially) the AMHS on top of an IP infrastructure. In terms of communications: The ISO Transport Service of the class TP0 will be provided over a TCP/IP stack by using the convergence function defined with RFC 1006. The AMHS communications in the test configuration follow this European approach.

*Note.*— Further extensions of the AMHS Test Tool may also support the ATN Internet Communications Service (aspect of inter-Regional or boundary centres) and TP0 over X.25 (ECG requirement).

### 3.4 Communication with the AFTN

The AMHS technical specifications [1] specify for the AFTN/AMHS Gateway an AFTN interface by referring to Annex 10, Volume II [3], i.e. the (asynchronous) AFTN Teletypewriter Procedures apply. However, in the European Region, typically, AFTN



communications make use of the CIDIN transport service. Therefore, the AMHS Test Tool should support CIDIN communication in connection with the “AFTN application” [4].

*Note.— Extensions of the AMHS Test Tool may also support AFTN asynchronous communications and/or AFTN over X.25.*

### 3.5 Points of Reference for testing

With the black-box view at the IUT, the verification of implemented functionality is limited to test inputs and examination of resulting responses at external (open) interfaces of the IUT. Standardised interfaces of the IUT are directly interfaced by the AMHS Test Tool. At non-standardised (proprietary) user interfaces of the IUT, observation of operator inputs and displayed information is needed. Example: Origination of IPMs to be submitted or presentation of delivered IPMs at local AMHS user interfaces.

Such interfaces of the IUT which are used for conformance testing are referred to as *points of reference*. In the following, these points of reference will be detailed with reference to Figure 3.

#### 3.5.1 Standardised points of reference

### 3.5.1.1 AMHS Communications

The IUT shall offer *Transfer Ports* [6] for P1 communication with  $n$  adjacent ATS Message Servers. The lower protocol layers (layers 1 to 4) shall be configured as indicated below:

Layer 4	Layer 3	Layer 2	Layer 1
ISO TP0 RFC 1006 TCP	IPv4	ISO LLC1	10/100 Base T (Ethernet)

***Table 1: Lower protocol layers (AMHS communications)***

The Transfer Ports of the IUT and AMHS Test Tool shall be physically interconnected via a LAN (Ethernet).

### 3.5.1.2 AFTN/CIDIN Communications

The IUT should offer a AFTN/CIDIN interface. That means, the IUT conveys AFTN-formatted messages by using the CIDIN transport service (cf. Section 3.4). The CIDIN protocol layers are configured as follows:

Layer 4	Layer 3	Layer 2	Layer 1
CIDIN Transport Layer	CIDIN Network Layer (3b), Network Layer (3a): X.25 (PVC)	HDLC	X.21/V.11 or X.21bis/V.28

**Table 2: Lower protocol layers (AFTN/CIDIN communications)**

*Note.— If the IUT supports only AFTN asynchronous communications or AFTN over X.25 the "Extensions" of the AMHS Test Tool has to be used. The conformance testing is independent from the physical connection used.*

### 3.5.2 Proprietary points of reference

The scope of conformance testing includes submission and delivery operations with local *AMHS user interfaces* of the IUT. Notifications for specified out-of-line situations shall be sent to the *Control Position* of the AFTN/AMHS Gateway [1]. Furthermore, traffic logs generated by the IUT during test execution have to be verified against the AMHS technical specifications [1] by means of retrieval services provided at the IUT's *Operator Positions*.

The format of input and presentation of test data at the above identified three working positions is seen as a local implementation matter and is, therefore, out of scope of conformance testing. The inclusion of these working positions in testing is limited to observation and interpretation of test data.

Below, the three types of working positions are handled in more detail.

### 3.5.2.1 AMHS user interface

AMHS user interfaces provided at the IUT allow submission of IPMs and Probes and in the opposite direction reception of delivered IPMs, IPNs and Reports that have to be brought to the attention of AMHS users. The format of input and presentation of the mentioned AMHS information objects is seen as subject of implementation. The inclusion of submission and delivery operations in conformance testing requires operator observation and interaction during test execution.

*Note.— Although the MTS access is seen as an implementation matter when supporting only the Basic ATS Message Handling Service, conformance testing is also used to verify the correct mapping of originated information objects onto P1 information objects; vice versa delivery operations have to map P1 information objects onto displayed objects in a correct manner.*

### **3.5.2.2 Control Position**

There is an AMHS technical specification requirement to notify the Control Position of the AFTN/AMHS Gateway on specified deviations from the gateway's normal operations. Notifications may be issued for the operators information only or may require operator assistance for recovery from an occurred communication problem. How the Control Position is implemented is out of scope of the AMHS technical specifications. However, the correct presentation of notifications at the IUT's Control Position is seen as subject of conformance testing. Appropriate observations have to accompany certain test exercises.

### **3.5.2.3 Access to systems management functions**

Access to IUT's systems management functions by means of a related working position shall be possible for:

- Preparation of the IUT for the test configuration, and
- verification of traffic logs generated by the IUT during test exercises.

## 4. Supported Scope of Conformance Testing

### 4.1 General aspects

The scope of testing covers the (native) AMHS communications and interoperations with the AFTN/CIDIN by means of the AFTN/AMHS Gateway. The AFTN/CIDIN interface is tested for verification of the gateway's capability to intercommunicate with AFTN/CIDIN, however, is not subject of dedicated conformance testing.

Communication services at lower communication layers (as TCP/IP, X.25, LAN) support the interconnection between the AMHS system and the AMHS Test Tool. In this way, lower communication layers will be included in the test tool, however, there is no intention performing lower layer protocol testing.

The following aspects of conformance testing shall be taken into account:

- *Protocol testing*, encompassing intra-AMHS communications (MTS, IPMS) and AMHS to AFTN/CIDIN mappings (and vice versa).
- *Functionality testing*, to ensure the appropriate implementation of AMHS functionality and services (as message submission, transfer, delivery) including the correct mappings between AMHS information objects and user data made visible at users' working positions.
- *Resilience testing*, particularly with regard to the stability of an AMHS implementation against external communication failures.

The reference specification for AMHS testing is the *Basic ATS Message Handling Service* as specified in the AMHS technical specifications [1].

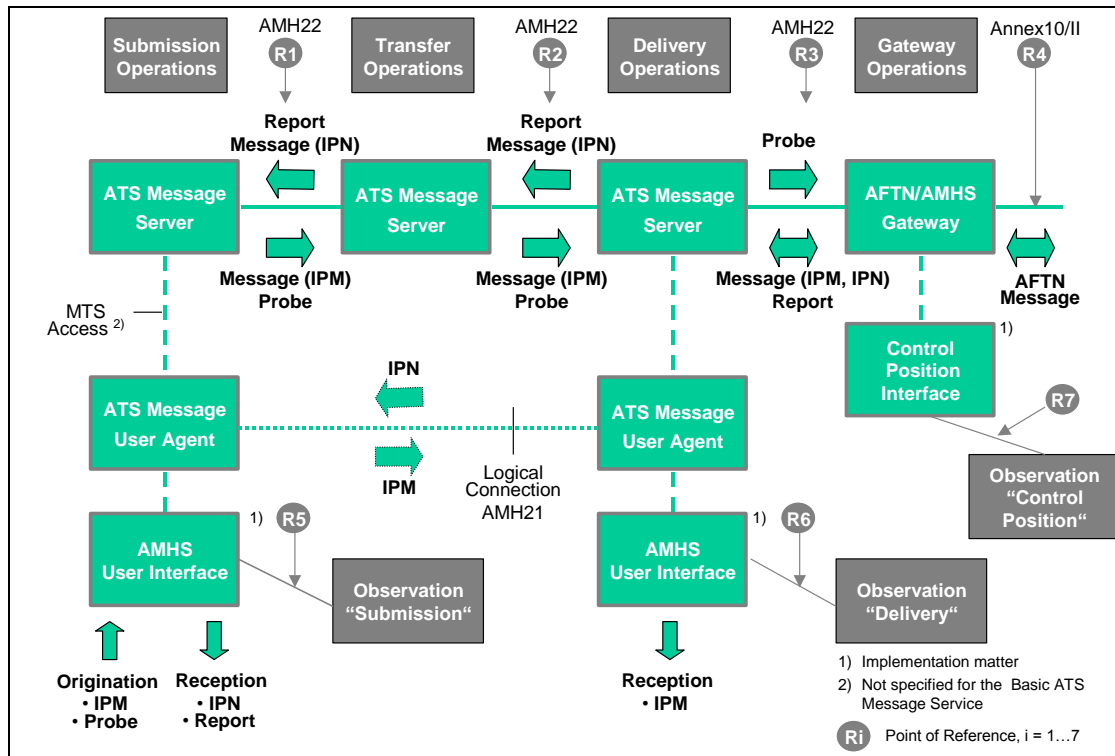
*Note.*— *The incorporation of the Extended ATS Message Handling Service is to be conceptually taken into account in a later extension of the AMHS testing requirements.*

Below, the scope of conformance testing will be specified by definitions of generic *test groups* and related *test cases*. These definitions should be seen as a base (minimum) set which do not exclude testing using other equivalent or extended test arrangements.

### 4.2 Generic test configuration

The scope of AMHS functions expected from the IUT is defined firstly by the implemented AMHS *functional components*, i.e. ATS Message Server, AFTN/AMHS Gateway and ATS Message User Agent and secondly by supplementing *system level provisions* as AMHS naming/addressing, AMHS parameters and AMHS traffic logging (see Section 3.1).

Figure 4 places the above three functional components in a fictitious AMHS communication scenario with flows of AMHS information objects between two (*direct*) AMHS users. In addition, an AFTN/AMHS Gateway supports intercommunication with AFTN users (i.e. *indirect* users of the AMHS). The position of the gateway in Figure 4 should be seen just as an example.



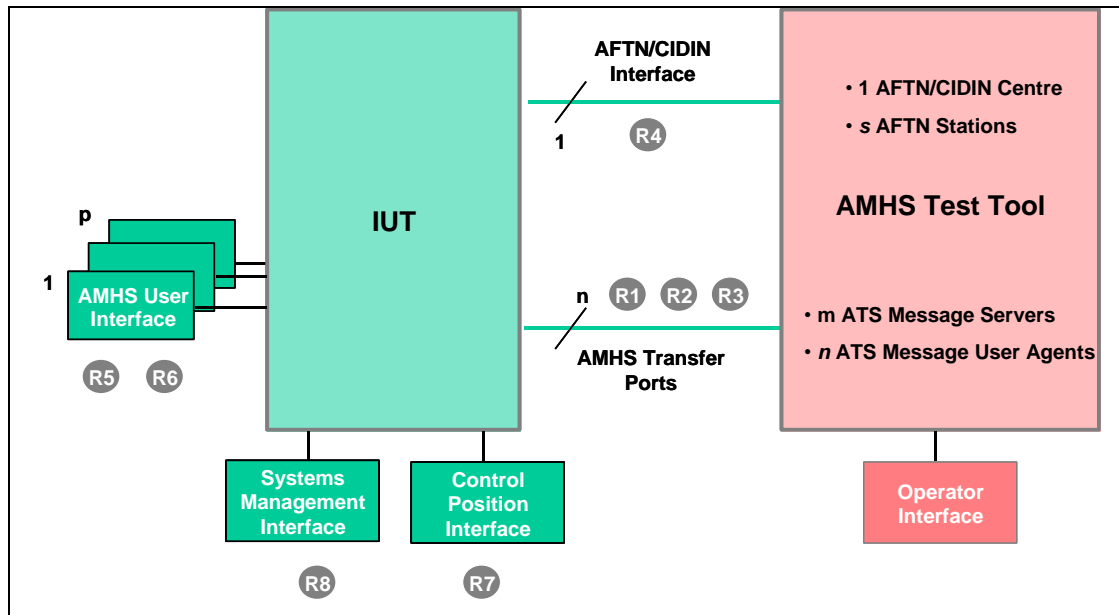
**Figure 4: Generic AMHS communication scenario and used Points of Reference for conformance testing**

The points of references *R1* to *R7* (in Figure 4) are allocated to the communication scenario according to the principles which have been stated in Section 3.5. The points *R1* to *R3* correspond to communication interfaces which are addressed by the MHS profiles AMH11 or AMH22, respectively [8], [10]. The exchange of IPMs and IPNs between the pair of ATS Message User Agents is subject of the MHS profile AMH21 [9]. Communications at the point *R4* follow the procedures laid down in Annex 10, Volume II, as far as applicable for the AFTN/AMHS Gateway.

The IUT is required to provide the communication functions of the ATS Message Server, ATS Message User Agent and AFTN/AMHS Gateway in any of their positions indicated in Figure 4. For related conformance testing the IUT is placed in various positions of the communication scenario (Figure 4) and the AMHS Test Tool performs the functions of the corresponding AMHS peer entity (entities). The resulting generic test configuration is depicted in Figure 5. The allocated points of reference *R1* to *R7* correspond to those of Figure 4. The reference point R8 is added for identification of the IUT's systems management interface (see Section 3.5.2.3).

*Note.— In consideration of testing implementations of the Basic ATS Message Handling Service no point of reference is allocated to the MTS access.*





**Figure 5: Generic test configuration with points of reference**

*Note.*— In Figure 5 no AFTN user interface is forming part of the IUT. Such interfaces are outside of the scope of the specified AMHS functionality and are placed, therefore, in the IUT's test environment surrounding the IUT (see Figure 2). When testing AFTN/AMHS Gateway functions of the IUT the AFTN peer entities are always represented by the AMHS Test Tool. The AFTN related user actions are performed by the AMHS Test Tool itself.

### 4.3 Definition of test groups

Generally, *test groups* provide a logical high-level ordering in test specifications (ISO 9646-2). Typically, a single test group addresses a particular functional area for which an IUT claims conformance. In the following, AMHS test groups are defined for the purpose of specification of high-level requirements placed on an AMHS Test Tool.

Figure 4 identifies four types of AMHS functional areas to be supported by the IUT: *Submission*, *Transfer*, *Delivery* and *Gateway Operations*. These types of AMHS operations will constitute a first set of test groups. A second set of test groups is formed by the provisions at the AMHS system level as referred to in Section 3.1.1, i.e. *Naming & Addressing*, *Parameters* and *Traffic Logging*.

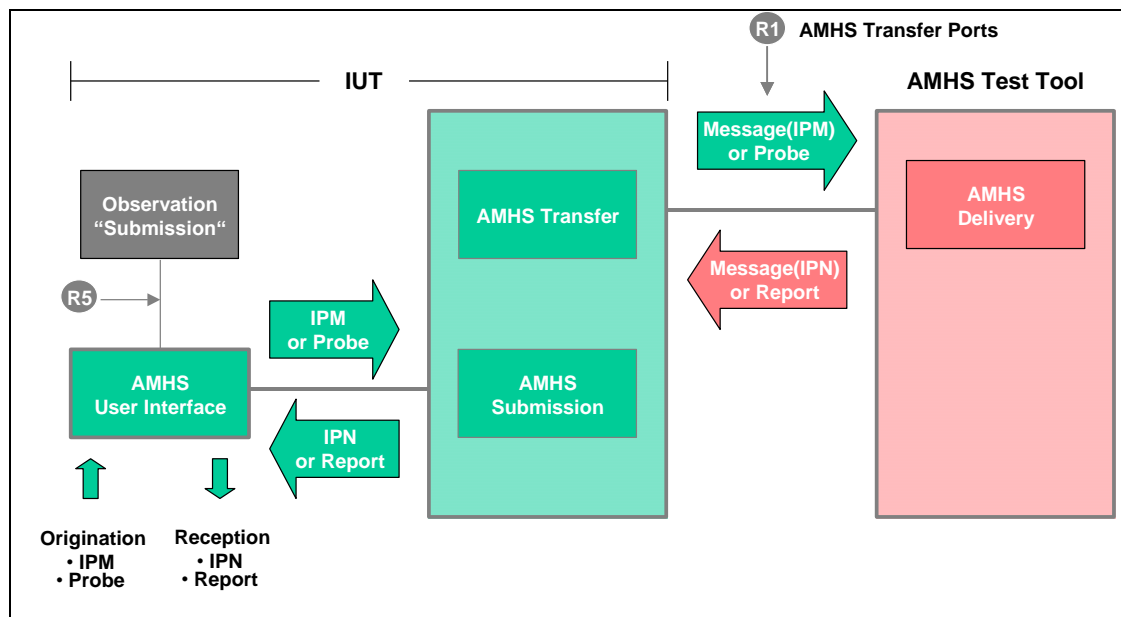
The defined test groups reflect the external view of the IUT's functionality and are independent of the chosen implementation model. Below, the defined test groups are handled in detail.

For each of the handled test groups the correspondent test configuration is indicated. These test configurations are of generic nature. In practice, test configurations may be combined for study of local interworking between functional areas in an IUT. Example: Combined test cases for message submission and local gateway functions.

### 4.3.1 Submission operations

Subject of the test group *Submission* operations is the origination of *IPMs* and *Probes* at the AMHS user interfaces of the IUT and the related generation of *P1 information objects* for transfer to adjacent ATS Message Servers; returned *Reports* and *IPNs* have to be displayed at the IUT in an appropriate manner (see Figure 4).

Figure 6 depicts the test configuration for verification of the *Submission* operations. The test configuration follows from Figure 4 and Figure 5.



**Figure 6: Test configuration “Submission”**

For testing of the *Submission* operations the following actions may be performed:

- At an AMHS user interface of the IUT (reference point *R5* in Figure 6) predefined IPMs and Probes are originated for intended recipients. The AMHS Test Tool at the transfer ports of the IUT (*R1*) verifies the correct generation of the related Messages (IPMs) and Probes.
- In the opposite direction, the AMHS Test Tool responds at the transfer ports of the IUT (*R1*) with valid and invalid Messages containing IPNs (upon IPMs) and Reports (upon IPMs and Probes). The presentation of valid IPNs and Reports is observed at the originator's AMHS user interface (*R5*). Invalid responses may effect error notifications at an operator position of the IUT (fault management).

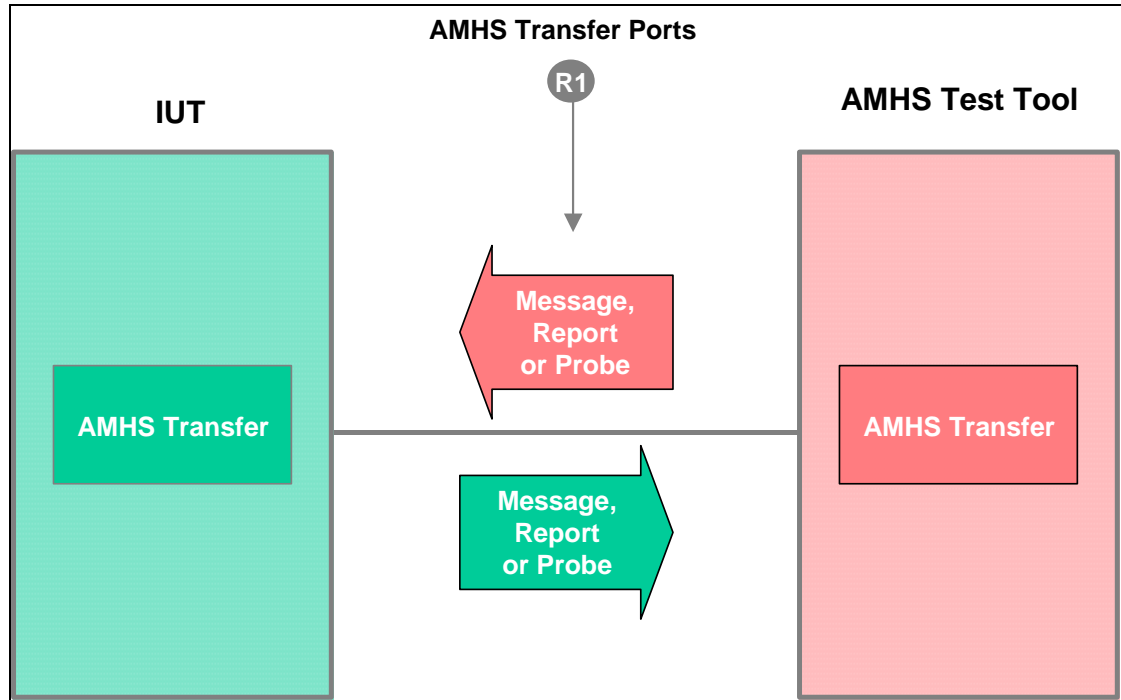
*Note.— The local rejection of erroneous originations of IPMs and Probes at IUT's user interfaces is seen as a local implementation matter and is, therefore, out of the scope of conformance testing.*

### 4.3.2 Transfer operations

Subject of the test group *Transfer* operations is the transfer of P1 information objects (i.e. Message, Report, Probe) by the IUT. Rejected transfers of messages and probes have to be indicated by returning of Non-Delivery Reports (NDR). The test group includes handling of

multiple recipient addresses (multiple dissemination) and the expansion of Distribution Lists (DLs).

Figure 7 depicts the test configuration for verification of the *Transfer* operations. The test configuration follows from Figure 4 and Figure 5.



**Figure 7: Test configuration “Transfer”**

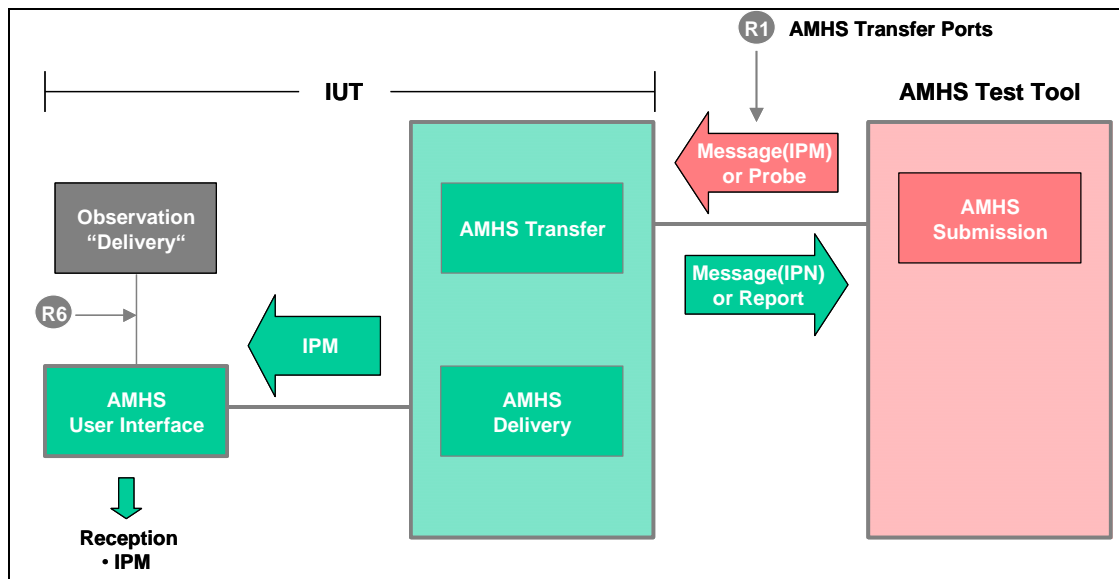
For testing of the *Transfer* operations the following actions may be performed:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 7) with valid and invalid Messages (containing IPMs or IPNs), Reports and Probes with recipient addresses which are *not* local to the IUT.
- The IUT responds at its transfer ports (*R1*) with the output of one or more Messages, (due to multiple dissemination and/or DL resolution), one or more Probes (multiple dissemination) or just the received Reports. The AMHS Test Tool verifies the expected IUT behaviour. Invalid information objects generated by the AMHS Test Tool may effect error notifications at an operator position of the IUT (fault management).

### 4.3.3 Delivery operations

Subject of the test group *Delivery* operations is the display of received Messages (IPMs) at AMHS user interfaces of the IUT. In addition, the IUT shall generate Reports (DR, NDR) and/or IPNs (RN, NRN) according to the requests contained in the received Messages and Probes.

Figure 8 depicts the test configuration for verification of the *delivery* operations. The test configuration follows from Figure 4 and Figure 5.



**Figure 8: Test configuration “Delivery”**

For testing of the *Delivery* operations the following actions may be performed:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 8) with valid and invalid Messages (containing IPMs) and Probes, both with recipient addresses which are local to the IUT.
- The IUT may respond with one or more of the following actions:
  - Display the received IPM at the appropriate AMHS user interface (*R6*),
  - Returning a Message (IPN) at its transfer Port (*R1*) according to the given *receipt notification request* in the subject IPM,
  - Returning a Report (DR or NDR) at its transfer ports (*R1*) according to the given *report request* in the subject Message or Probe.

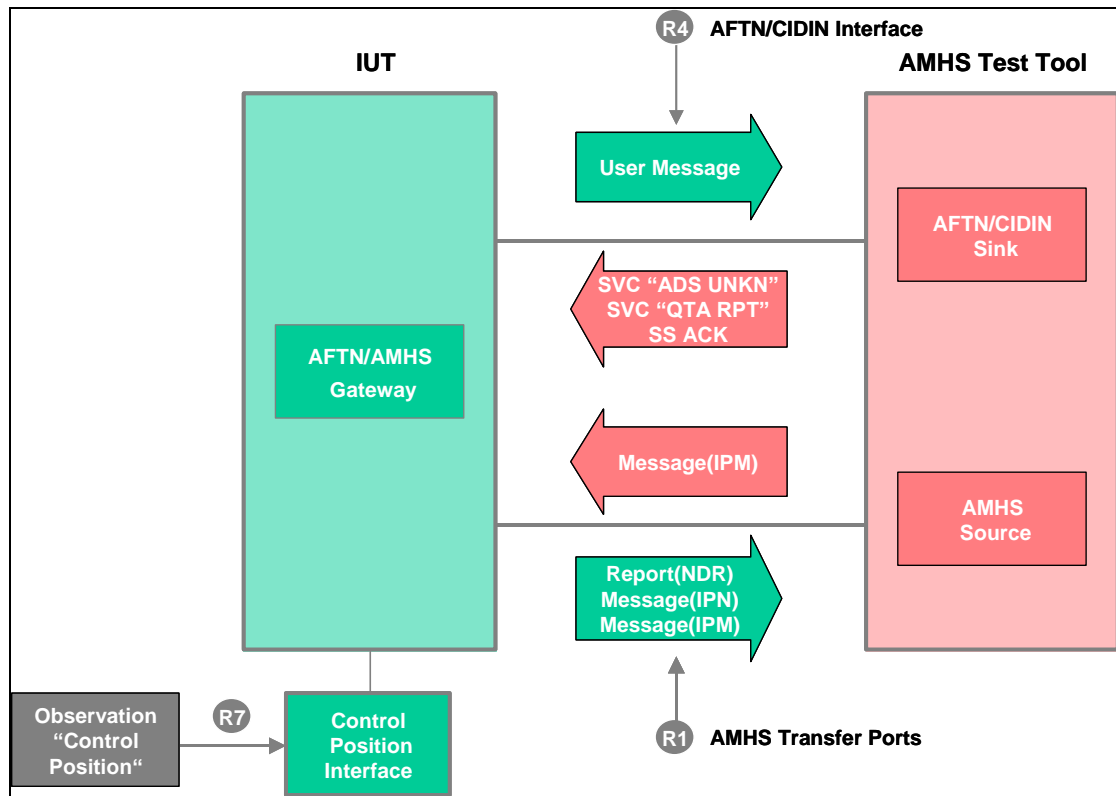
#### 4.3.4 Gateway operations

Subject of the test group *Gateway* operations is the bi-directional conversion between AMHS and AFTN user messages and the handling of accompanying service information, i.e. AFTN SVC messages (SVC), AFTN acknowledgements message (SS ACK), AMHS Reports and AMHS Receipt Notifications. – Cf. AMHS technical specifications [1] para. 4.2.1.4.

Considering the functional complexity of the AFTN/AMHS Gateway, the test group is logically subdivided in three sub-groups: 1) Flow of user message from AMHS to AFTN, 2) Flow of user message from AFTN to AMHS and 3) Handling of Probes. The sub-groups 1) and 2) include the handling of accompanying service information.

#### 4.3.4.1 User Message from AMHS to AFTN

Figure 9 depicts the test configuration for verification of the *Gateway* operations for the flow of a user message from AMHS to AFTN. The test configuration follows from the Figure 4 and Figure 5.



**Figure 9: Test configuration “Gateway” – User message from AMHS to AFTN**

The following actions may be performed with the Gateway test configuration depicted in Figure 9:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 9) with valid and invalid AMHS Messages containing IPMs. The IUT converts valid AMHS Messages to AFTN user messages which leave the IUT at its AFTN/CIDIN interface (*R4*), whereas invalid AMHS Messages are rejected by the IUT with Non-Delivery Reports (NDR) which are returned to the AMHS Test Tool using the IUT's transfer ports (*R1*).
- The AMHS Test Tool provides the IUT at its AFTN/CIDIN interface (*R4*) with an AFTN SVC message “ADS UNKNOWN” simulating the detection of an unknown destination address within the AFTN. The IUT converts the AFTN SVC message “ADS UNKNOWN” in a Non-Delivery Report (NDR). In exceptional situation, the AFTN SVC message “ADS UNKNOWN” is encapsulated by the IUT in an IPM. The NDR or IPM, respectively, is forwarded to the AMHS Test Tool via the IUT's transfer ports (*R1*).

*Note.– In order not to lose the originator indicator of the initial AFTN SVC message “ADS UNKNOWN” message, in Section 8.4 of this Manual, it is recommended*

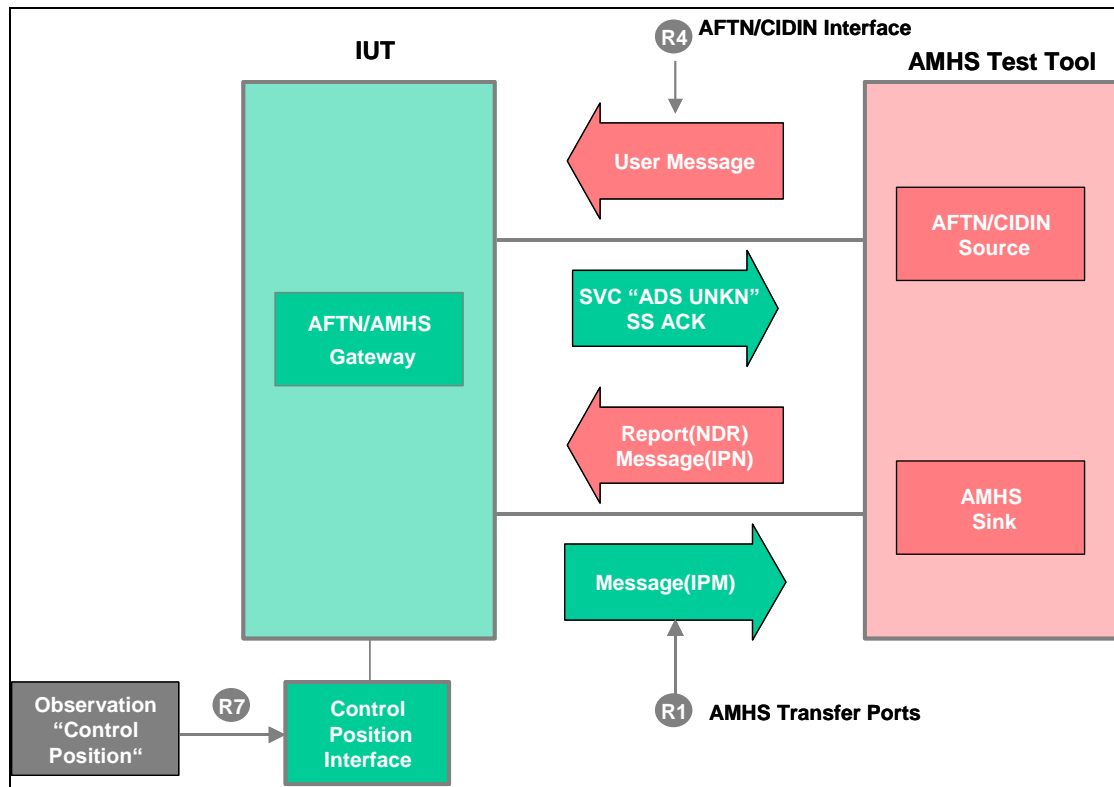
*that the exceptional handling foreseen for such SVC messages in ICAO Doc 9880 be applied as standard, resulting in the encapsulation of each AFTN SVC message “ADS UNKNOWN” in an IPM.*

- The AMHS Test Tool provides the IUT at its AFTN/CIDIN interface (*R4*) with an AFTN acknowledgements message (SS ACK). The IUT converts the SS ACK in an IPN of the type Receipt Notification (RN). In exceptional situation, the SS ACK is encapsulated by the IUT in an IPM. The IPN or IPM, respectively, is forwarded to the AMHS Test Tool via the IUT's transfer ports (*R1*).
- The AMHS Test Tool provides the IUT at its AFTN/CIDIN interface (*R4*) with an AFTN SVC message “QTA RPT” requesting the repetition of an AFTN message sent before to a specified AFTN addressee. The IUT retransmits the respective AFTN message via its AFTN/AMHS interface (*R4*).

For certain out-of-line situations, which may occur during conversions in the AFTN/AMHS Gateway, the AMHS technical specifications [1] specify error notifications to be forwarded to the gateway's Control Position. Such notifications have to be observed during test execution at the reference point *R7* in Figure 9.

#### 4.3.4.2 User message from AFTN to AMHS

Figure 10 depicts the test configuration for verification of the *Gateway* operations for the flow of a user message from AFTN to AMHS. The test configuration follows from the Figure 4 and Figure 5.



**Figure 10: Test configuration “Gateway” – User message from AFTN to AMHS**

The following actions may be performed with the Gateway test configuration depicted in Figure 10:

- The AMHS Test Tool provides the IUT at its AFTN/CIDIN interface (reference point *R4* in Figure 10) with valid and invalid AFTN user messages. The IUT converts valid AFTN user messages in AMHS messages containing IPMs which leave the IUT at its transfer ports (*R1*), whereas invalid AFTN user messages are handled according to locally implemented procedures. When the conversion of AFTN addressee indicators fails, the IUT returns AFTN SVC messages “ADS UNKNOWN” to the AFTN (AMHS Test Tool ) via its AFTN/CIDIN interface (*R4*).
- The AMHS Test Tool provides the IUT at its transfer ports (*R1*) with a Non-Delivery Report (NDR) simulating the detection of an unknown recipient address within the AMHS. The IUT converts the NDR in an AFTN SVC message “ADS UNKNOWN” which leaves the IUT via its AFTN/CIDIN interface (*R4*).
- The AMHS Test Tool provides the IUT at its transfer ports (*R1*) with an AMHS message containing a Receipt Notification (RN) indicating the reception of a SS-priority message at a specified AMHS recipient. The IUT converts the RN in a AFTN

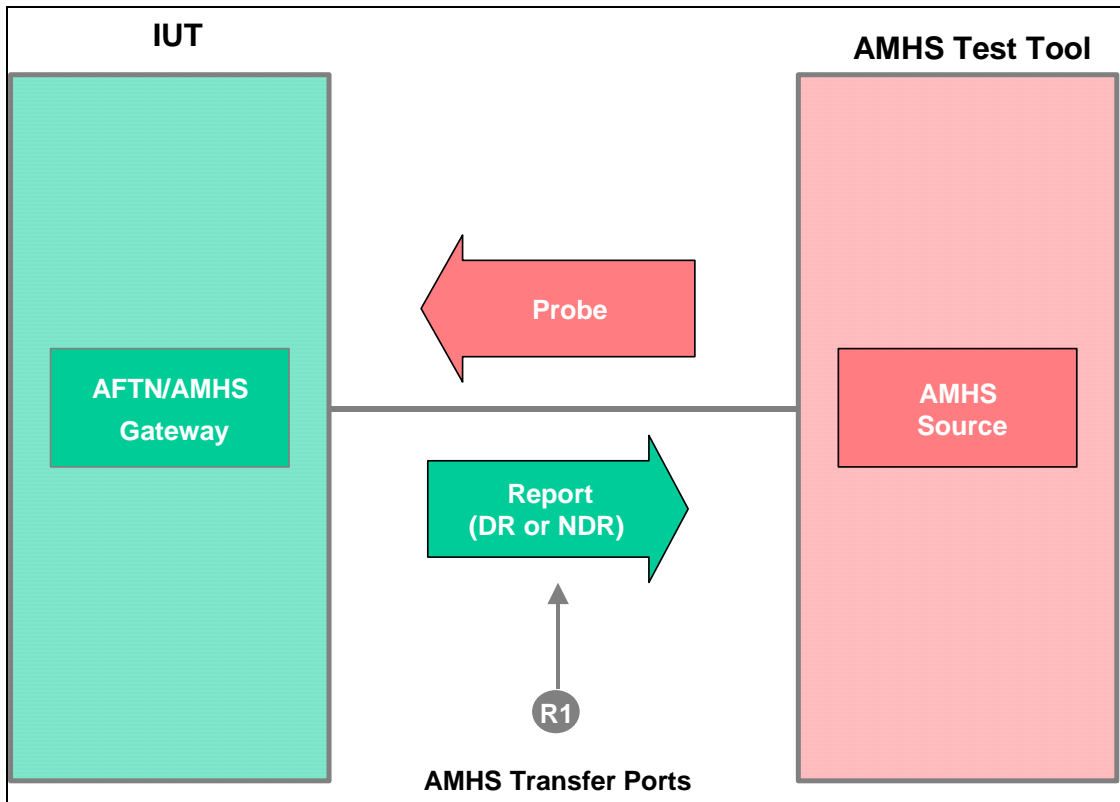
acknowledgement message (SS ACK) which leaves the IUT via its AFTN/CIDIN interface (R4).

For certain out-of-line situations which may occur during conversions in the AFTN/AMHS Gateway, the AMHS technical specifications [1] specify error notifications to be forwarded to the gateway's Control Position. Such notifications have to be observed during test execution at the reference point *R7* in Figure 10.



#### 4.3.4.3 Handling of Probes

Figure 11 depicts the test configuration for verification of the *Gateway* operations when receiving a Probe. The test configuration follows from Figure 4 and Figure 5.



**Figure 11: Test configuration “Gateway” – Handling of Probes**

The following actions may be performed with the Gateway test configuration depicted in Figure 11:

- The AMHS Test Tool provides the IUT at its transfer ports (reference point *R1* in Figure 11) with valid and invalid Probes.
- The IUT verifies whether it can perform translation of the probe to an AFTN user message by comparing certain parameters in the Probe with the capability of its gateway function. The IUT generates, depending on the result of the verification, either a Delivery Report (DR) or a Non-Delivery Report (NDR) which is returned to the AMHS Test Tool via a transfer port (R1).

#### 4.3.5 Naming and addressing

Naming and addressing in the AMHS context relates to the unambiguously identification of 1) users to a global AMHS and 2) communication entities residing in the upper layers of the AMHS communication stack (AMHS technical specifications [1], 2.5). The focus of conformance testing is on the IUT's capability to handle AMHS addressing schemes for

identification of users. The second aspect is covered by setting up of configuration parameters in the test configuration (see Section 5).

The AMHS technical specifications [1] specify two user addressing schemes which are collectively referred to as MF-addressing schemes: the *XF-addressing scheme* and the *Common AMHS Addressing Scheme (CAAS)*. Preference should be given to the latter. In addition, the technical specifications allow to implement within an AMHS Management Domain *locally defined* schemes. The AMHS Test Tool supports the XF-addressing scheme and the CAAS. (Support of other addressing schemes may be subject of further extensions.)

The use of *directory names* is seen as a local matter when supporting the *Basic* ATS Message Handling Service (AMHS technical specifications [1], 2.5.1.1.1). Their support by the AMHS Test Tool may be subject of further extensions meeting the requirements of the *Extended* ATS Message Handling Service.

An IUT's capability to handle MF-addressing schemes is already implicitly verified with the operations related test groups as defined in Sections 4.3.1 to 4.3.4. However, for in-depth testing of implemented addressing features the establishment of a dedicated test group may be a suitable approach. Depending on the test purpose an appropriate test configuration may be selected from those depicted in Figure 6 to Figure 10.

*Note.— The aspect of a dedicated test groups for in-depth testing of system level provisions applies also to the two remaining test groups defined below.*

#### 4.3.6 AMHS parameters

The AMHS technical specifications [1] section 3.3 specify a number of operational conventions which have the nature of parameters from the MHS point of view. These parameters relate to:

- Use of MF-addresses (see Section 4.3.5)
- User data conventions
  - Only single body part in IPMs
  - ia5-text or ia5-text-body-part (Basic ATS Message Handling Service)
- Use of ATS-Message-Header in the body part of IPMs (Basic ATS Message Handling Service)
- Restriction of Notification Requests (IPMS) for SS-priority messages.

Neither the AMHS technical specifications nor the MHS standard with related ISPs include requirements concerning the minimum size of messages to be supported by AMHS implementations. Closing this gap, the SPACE study [11] recommends for the European AMHS: 1) ATS Message Servers (MTAs) shall support at the minimum a P1 message length of 2 Mbytes and 2) ATS Message User Agents (UAs) shall accept initially a message-text length of at least 10 Kbytes (or 64 Kbytes according [18]). To enable the transport of messages with multiple body-parts in MTAs, in the EUR AMHS profile this value is increased to at least 4Mbytes. The AMHS Test Tool should support testing with these values.

In-depth testing of the AMHS parameters may be performed by means of a dedicated test group. Depending on the test purpose an appropriate test configuration may be selected from those depicted in Figure 6 to Figure 10.

### 4.3.7 Traffic logging

The AMHS technical specifications [1] specify long-term (30 days) logging requirements for the various types of functional components of the AMHS. The requirements make it possible to perform message tracing through the AMHS, in particular when an investigation is needed. The query of the logged information is seen as a local implementation detail.

Logging requirements are placed on the following functional components of the AMHS:

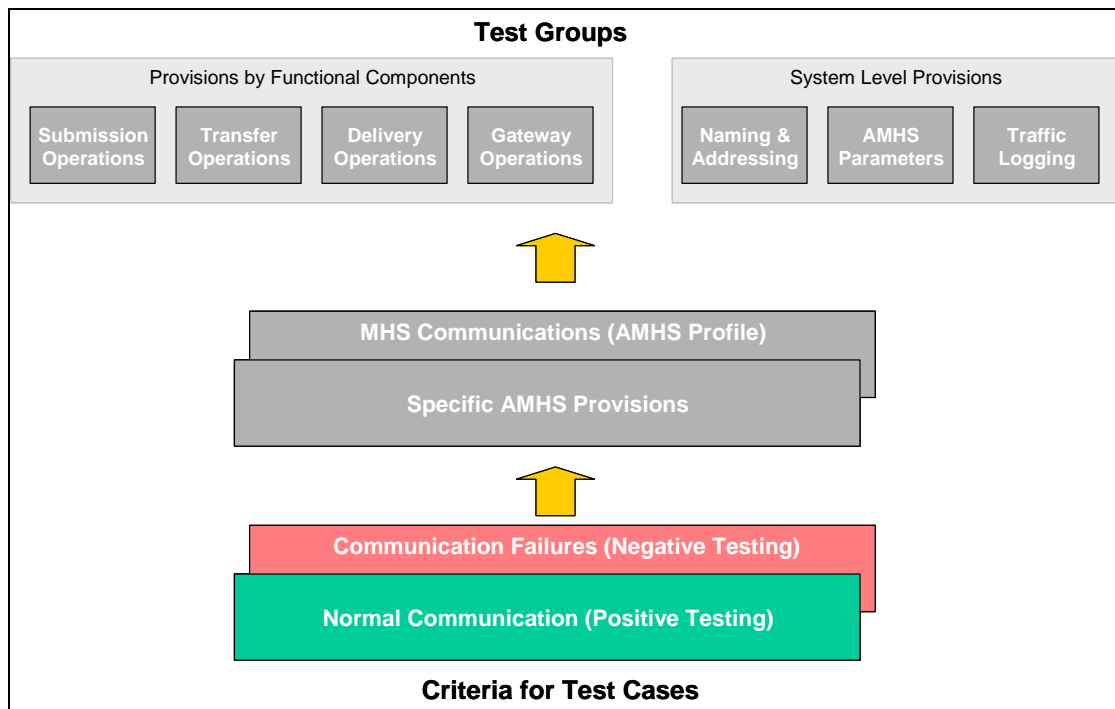
- ATS Message User Agent – [1] Section 3.1.3
- ATS Message Server – [1] Section 3.2.3
- AFTN/AMHS Gateway concerning its sub-components
  - ATN component – [1] Section 4.2.2.6
  - Message Transfer and Control Unit (MTCU) – [1] Section 4.3.1
  - AFTN component – [1] Section 4.2.1.8-11.

In-depth testing of the traffic logging may be performed by means of a dedicated test group. Depending on the test purpose an appropriate test configuration may be selected from those depicted in Figure 6 to Figure 10. Verification of the logged information will make use of the local query and tracing provisions. Access is typically provided at the system management interface of the IUT (cf. reference point *R8* in Figure 5).

## 4.4 Definition of test cases

According to ISO 9646-2 a *test case* comprises the actions to achieve a specific test purpose. Each test case normally has a single test purpose, such as that of verifying that the IUT has a certain required capability (e.g. the capability to support certain message lengths) or exhibits a certain required behaviour when a particular event occurs (e.g. transfer of submitted messages). Typically, a set of test cases aiming at a common functional area of an IUT are arranged to a *test group* (see Section 4.3).

There may be many criteria for methodical definitions of test cases (within a test group) to achieve an envisaged confidence in a particular functional area of the IUT. Figure 12 depicts proposed two levels of high-order criteria for definitions of AMHS related test cases. The AMHS Test Tool should support conformance testing in a scope as outlined in Figure 12.



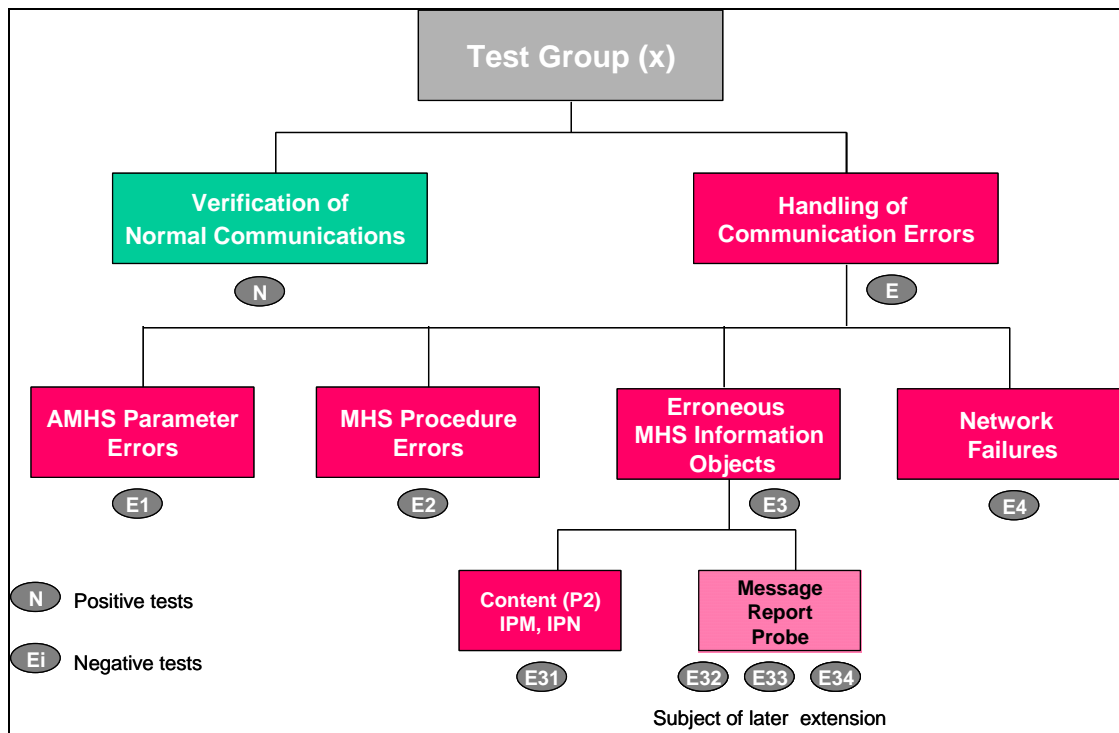
**Figure 12: Approach for definition of Test Cases**

In Figure 12 a distinction is made between communication requirements which are of general nature in MHS environments and requirements which are specific to AMHS. The first category of requirements is addressed in the AMHS technical specifications [1] just by references to the MHS standard (ISO/IEC 10021) and related profile documentation (ISPs). No further details of MHS procedures are provided with the AMHS technical specifications [1].

In addition, the AMHS technical specifications include a number of provisions which are specific for AMHS. Such provisions may relate to supplementary functional components (as AMHS gateways) or specify conventions for which MHS implementations are transparent (e.g. limited use of notification requests). The AMHS technical specifications specify the AMHS specific provisions in a “stand-alone” manner.

*Note.— An example of the above made distinction between specific AMHS requirements and underlying MHS features are the AMHS traffic logging requirements: The traffic logging requirements at an ATS Message Server refer to the last element of the trace-information (AMHS technical specifications [1] 3.2.3). The trace-information itself (forming part of the message-transfer-envelope) is specified in ISO/IEC 10021-4, 12.3.1. – It is up to the organisation which will operate an AMHS system to limit conformance testing to the technical specifications specific elements or to extend testing to the referenced trace-information as defined with the MHS standard.*

Distinction between normal MHS/AMHS communications (*positive* testing) and enforcing fault situations (*negative* testing) is used as a second level criterion in the definition of test cases. Figure 13 details this further logical ordering of testing.



**Figure 13: Classes of “Negative Tests”**

The test categories indicated in Figure 13 are based on the following definitions:

*Normal communications (N).* – The AMHS Test Tool provides the IUT with correct inputs and the related responses (behaviour) of the IUT should be in compliance with the AMHS technical specifications. It should be noted that a correct response of the IUT not always equals to a successful transmission of an AMHS information object. Example: If the service element *DL-expansion-prohibited* has been set then a DL expansion will not occur.

*Erroneous AMHS parameters (E1).* – The AMHS technical specifications, Section 3.3 (Parameters), specify a number of specific AMHS conventions as use of MF-addresses, ATS-Message-Header, notification requests and single body part IPMs. It should be noted that violations of such AMHS conventions are not equal with faults in the MHS communication.

*MHS/AMHS procedural errors (E2).* – The AMHS Test Tool does not act in compliance with the MHS or AMHS procedures or the arrangements made in the test configuration. Examples: 1) The IUT is requested to send a message with a Report request, however, the AMHS Test Tool does not return any Report. 2) The AMHS Test Tool uses a recipient address which is unknown in the test configuration. 3) The AMHS Test Tool sends a RN or NDR to the AFTN/AMHS Gateway, which is not related to any subject message.

*Erroneous MHS information objects (E3).* – That means arguments have not allowed values or information objects are corrupted. A distinction is made between the levels of IPMS and MTS:

- IPMS (E31). – IPMs and IPNs sent to the IUT are not correctly encoded (syntax or semantic errors). Example: Mandatory arguments in the IPM heading are missing or there is no IPM body attached to the IPM heading.
- MTS (E32), (E33), (E34). – Messages, Reports and Probes sent to the IUT are not correctly encoded. Example: In a Report the *Report Transfer Content* is missing.

*Network failures (E4).* – Transient interruptions of network connections during transmission of AMHS information objects.

The AMHS Test Tool supports negative testing of the categories E1, E2 and E31 and E4 (Figure 13).

*Note.*– Negative testing of the categories E32, E33 and E34 may be subject of further extensions of the testing requirements if experience leads to this need.

A given test group may be transparent for one or more classes of “negative tests”. For example, transfer operations are transparent for AMHS parameter errors (E1) and Content (IPMS) failures (E31). Table 3 indicates in a form of a matrix the valid interrelations between defined test groups and classes of negative tests. Such a testing matrix may be helpful to demonstrate the reached coverage of testing for a given set of test cases.

	Submission Ops	Transfer Ops	Delivery Ops	Gateway Ops	Naming & Addressing	AMHS Parameters	Traffic Logging
<b>N</b>	X	X	X	X	X	X	X
<b>E1</b>	X	n/a	X	X	X	X	n/a
<b>E2</b>	X	X	X	X	n/a	n/a	n/a
<b>E31</b>	X	n/a	X	X	n/a	n/a	n/a
<b>E32-E34</b>	X	X	X	X	n/a	n/a	n/a
<b>E4</b>	X	X	X	X	n/a	n/a	n/a

X = valid interrelation; n/a = not applicable

**Table 3: Applicability of negative testing for test groups (testing matrix)**

## 5. Configuration Parameters

The generic test configuration depicted in Figure 5 needs a number of quantitative adjustments before AMHS Test Tool and IUT are in a position to communicate with each other. The subjects of such adjustments are the values of *configuration parameters* which are inherent in the test configuration. Configuration parameters relate to the number of established communication links, number of simulated AMHS and AFTN users as well as to addresses associated with the various layers of communications. Below the configuration parameters are specified in the categories of AMHS and AFTN/CIDIN communications.

### 5.1 AMHS communication

#### 5.1.1 AMHS application

- Number of transfer ports: 3
- Number of AMHS users: 30

Reference: Section 3.2, Figure 2 and Figure 3.

#### 5.1.2 Layer addresses

No.	Address Type	AMHS technical specifications	Value	
			IUT	AMHS Test Tool
1	Application Process Title	2.5.2.1, 2.5.2.2, 2.5.2.3 of Doc 9880, Part II [1]; 2.3.2.2 of Doc 9880, Part III [2]		
2	AE-Qualifier	2.5.2.4, 2.5.2.5, 2.5.2.6 [1]	ATS Message Server: AMS(7)	
			AFTN/AMHS Gateway: GWB(8)	
3	Presentation Selector	2.5.2.7, 2.5.2.8, 2.5.2.9, 2.5.2.10, 2.5.2.11, 2.5.2.12 [1]	tbd	tbd
4	Session Selector	2.5.2.7, 2.5.2.8, 2.5.2.9, 2.5.2.10, 2.5.2.11, 2.5.2.12 [1]	tbd	tbd

No.	Address Type	AMHS technical specifications	Value	
			IUT	AMHS Test Tool
5	TSAP	2.5.2.7, 2.5.2.8, 2.5.2.9, 2.5.2.10, 2.5.2.11, 2.5.2.12 [1]	tbd	tbd
6	TCP Port	n/a	102	
7	IP Address	n/a	tbd	MTA(1): tbd
				MTA(2): tbd
				MTA(3): tbd
8	MAC Address	n/a	tbd	MTA(1): tbd
				MTA(2): tbd
				MTA(3): tbd

Reference: Sections 3.3 and 3.5.1.1.

**Table 4: Layer addresses (AMHS communications)**

## 5.2 AFTN/CIDIN communication

### 5.2.1 AFTN application

- Number of links: 1
- Number of AFTN users: 30

Reference: Section 3.2, Figure 2 and Figure 3.

### 5.2.2 Layer addresses

No.	Address Type	Reference	Value	
			IUT	AMHS Test Tool
1	CIDIN Entry (Ae)	[4] 6.1.2.1.4.5	tbd	tbd
	CIDIN Exit (Ax)	[4] 5.1.2.7	tbd	tbd



No.	Address Type	Reference	Value	
			IUT	AMHS Test Tool
2	X.25 DTE	[4] 4.2.1.7	<i>tbd</i>	<i>tbd</i>

Reference: Sections 3.4 and 3.5.1.2.

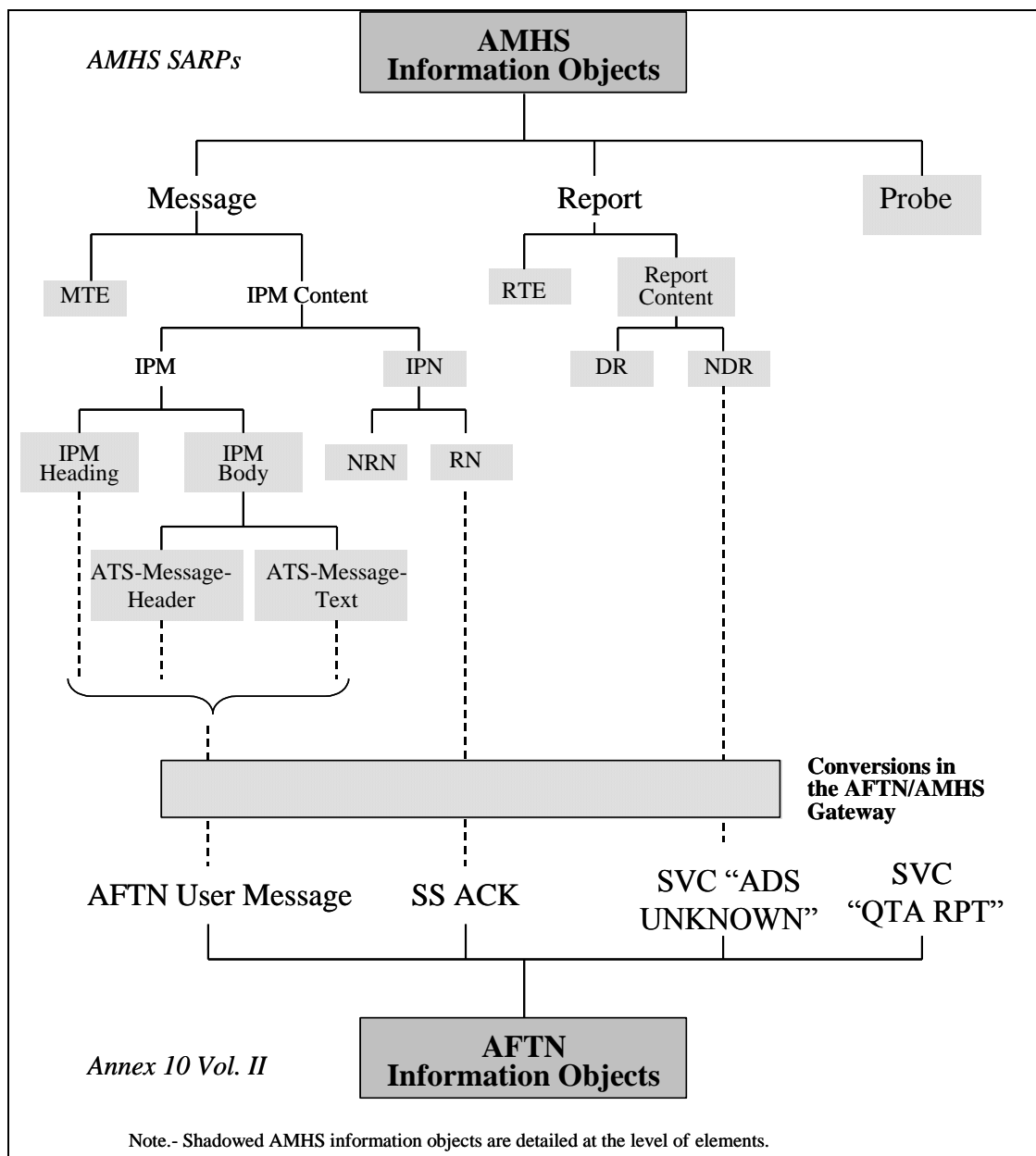
**Table 5: Layer addresses (CIDIN communications)**

## 6. Test Data

The test data generated and evaluated in conformance testing environments with the AMHS Test Tool comprise (cf. Figure 5):

- (1) AMHS and AFTN information objects exchanged between the AMHS Test Tool and IUT. These information objects are well defined by the AMHS technical specifications [1] and Annex 10, Vol. II [3], respectively.
- (2) AMHS information objects entered and presented at AMHS user interfaces of the IUT. Even if these information objects are substantially specified by the AMHS technical specifications [1] their appearance at AMHS user interfaces is specific to a given IUT. In addition, when entering AMHS information objects certain parameters may be handled by the IUT as defaults and do not appear at user interfaces at all.
- (3) The AMHS technical specifications specify events to be reported to the Control Position of an AFTN/AMHS Gateway. However, the style of reporting is an implementation matter.
- (4) Traffic log data to be maintained by the IUT are specified in the AMHS technical specifications [1], however, their handling and presentation is specific for each IUT.

The correct interpretation of test data of the types (2) to (4) needs insight into the IUT's User Manual.



**Figure 14: Information objects supported by the AMHS Test Tool**

**END of Appendix C**



# EUR AMHS Manual

## Appendix D

AMHS Conformance Tests	
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0.2	20/11/2005	Renumbering of test procedures (415-417, 423-426), editorial refinements, completion (422, 425, 426, 601-606) of or deletion (former 423) of test procedures, renaming of the Appendix	all
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1.2	14/03/2007 (16/04/2007)	Incorporation of CP06-001 Typo in reference: 4.4.22 instead of 4.2.2, Typo in CT202, Test scenario: "seven" instead of "six"	<del>4.4.2</del> 4.4.22
2.0	26/04/2007	Adopted version (AFSG/10)	
2.1	19/03/2008	Incorporation of CP-AMHSM-08-001, CP-AMHSM-08-002 and CP-AMHSM-08-003	3.1, 3.2, 4.6.1- 4.6.6, 4.7, all
3.0	24/04/2008	Adopted version (AFSG/11)	
3.1	17/11/2008	Change of references from ICAO Doc 9705 to ICAO Doc 9880 (CP-AMHS-08-006), editorial improvements	all
3.2	09/02/2009	Incorporation of CP-AMHS-08-009, CP-AMHS-08-010, CP-AMHS-08-011	4.4.10, 4.6.1, 4.6.2

3.3	11/03/2009	Update of the referenced documents	References
4.0	02/04/2009	Adopted version (AFSG/12)	
5.0	17/06/2010	Adopted version (AFSG/14) – without changes	
5.1	25/09/2010	Incorporation of CP-AMHSM-10-001, minor editorial updates	References
5.2	05/11/2010	Incorporation of CP-AMHSM-10-001, Attm2;	4.4.5 / CT405
6.0	14/04/2011	Adopted version (AFSG/15)	
7.0	26/04/2012	Adopted version (AFSG/16) – without changes	
7.1	25/03/2013	Incorporation of CP-AMHSM-12-008, CP-AMHSM-12-010, CP-AMHSM-13-001	4.1.1, 4.2.1, 4.3.1 4.4.18, 3.3, 4.6.9, 4.6.10
8.0	25/04/2013	Adopted version (AFSG/17)	
8.1	12/03/2014	Incorporation of CP-AMHSM-13-005, CP-AMHSM-13-009, CP-AMHSM-13-011	4.3.3, 4.4.18 4.3 – CT303 4.4.6 – CT406
9.0	10/04/2014	Adopted version (AFSG/18)	
9.1	20/03/2015	Incorporation of CP-AMHSM-14-003, CP-AMHSM-14-004 (editorials)	all
9.2	22/03/15	Incorporation of CP-AMHSM-14-005, CP-AMHSM-14-006,  CP-AMHSM-14-007, CP-AMHSM-14-008	4.4.6 – CT406 CT306,402,415, CT416, 417, 419, CT504, 506, 507, CT509 4.4.24 – CT424 CT203, 425, 426
9.3	23/03/2015	Incorporation of CP-AMHSM-15-001	Chapt. 3, Table 9, CT601, 602
9.4	02/04/2015	Finalised version for presentation at AFSG/19	
10.0	23/04/2015	Adopted version (AFSG/19)	
10.1	04/04/2016	Incorporation of CP-AMHSM-15-002 CP-AMHSM-15-006 CP-AMHSM-15-008	1.3, 4.7 CT707, CT708 CT414, CT418, CT420 CT603, CT604, CT605, CT606
11.0	26/04/2016	Adopted version (AFSG/20)	
12.0	28/04/2017	Adopted version (AFSG/21) – without changes	

12.1	23/04/2018	Incorporation of CP-AMHSM-17-004, Incorporation of CP-AMHSM-16-009	References CT407, CT418, CT419, CT424, CT408, CT609, CT610, Chapter 3
13.0	27/04/2018	Adopted version (AFSG/22)	
13.1	15/02/2019	Incorporation of DR-AMHSM-18-001 Incorporation of CP-AMHSM-19-001	CT408a, CT408b, Ct408c, CT408d, CT408e
14.0	05/03/2019	Adopted version (AFSG/23)	
14.1	26/11/2019	Incorporation of CP-AMHS-19-002  Adaption: According to COG/74&RCOG/11 Decision /4, Approval of AFS to SWIM Transition Task Force (AST TF) Terms of Reference (ToR) and coherent Work Programme, the Author of EUR Doc 020 changed from “AFSG PG” to “AST PG”.	all
14.2	30/09/2020	Incorporation of DR-AMHSM-19-001 Incorporation of DR-AMHSM-19-003	CT610 CT101, CT201, CT301, CT409, CT424, CT425, CT426, CT601, CT607, CT608, CT707, CT708
15.0	12/11/2020	Adopted version (AST TF/01)	
16.0	20/10/2021	Adopted version (AST TF/02)	

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## References

- [1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures
- [2] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS), Second Edition – 2016
- [3] EUR Doc 020, EUR AMHS Manual, Appendix C, AMHS Testing Requirements
- [4] First Multipartite International Realisation of ICAO SARPs AMHS Trials (FIRST), Test Plans for Interoperability Testing, Part 1a: Bilateral Basic Tests
- [5] First Multipartite International Realisation of ICAO SARPs AMHS Trials (FIRST), Test Plans for Interoperability Testing, Part 1b: Bilateral Extended Tests
- [6] First Multipartite International Realisation of ICAO SARPs AMHS Trials (FIRST), Test Plans for Interoperability Testing, Part 2: Trilateral Network Tests
- [7] EUR/NAT Routing Directory, Part 1 - Documentation

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# **1 Introduction**

## **1.1 Purpose of the Document**

The purpose of the document is to define the functional tests for an AMHS Conformance Test, which allows checking an AMHS implementation against the AMHS Technical Specifications [2] as a first step to ensure the interoperability between compliant systems.

## **1.2 Document Structure**

*Chapter 0* presents the test environment used for AMHS conformance testing.

*Chapter 0* defines the addressing plan implemented in the test environment.

*Chapter 0* contains the test procedures with subsections for each AMHS functional area. Each test procedure is presented in a structured way consisting of

- defined test criteria,
- a (brief) scenario description,
- reference to the relevant part of the standard specification (Doc 9880 section),
- reference to test classes (N, E<sub>n</sub>)

## **1.3 Test Identification Scheme**

Each test procedure has an identifier in the form

CT $xnn$

where CT is an acronym for Conformance Test,  $x$  is a number identifying the test group<sup>1</sup> and  $nn$  is a consecutive number identifying the individual test procedure.

Test procedures are presented in seven groups:

- test of submission operations ( $x=1$ ),
- test of delivery operations ( $x=2$ ),
- test of transfer operations ( $x=3$ ),
- test of gateway operations converting a user message from AMHS to AFTN ( $x=4$ ),
- test of gateway operations converting a user message from AFTN to AMHS ( $x=5$ ),
- tests with special focus on naming and addressing, e.g. address translations between AMHS and AFTN domains ( $x=6$ ), and

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<sup>1</sup> Test groups for AMHS conformance tests have been identified in [3].

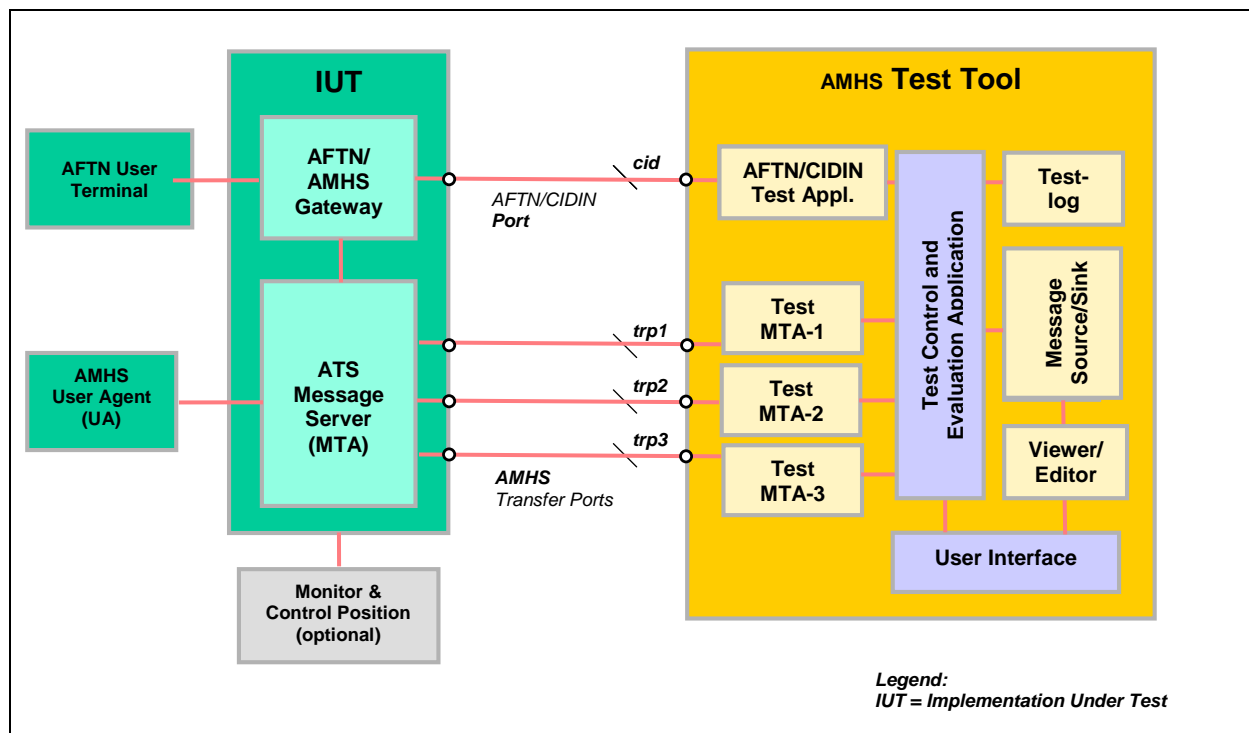
- specific error situations, e.g. tests using Non-Delivery-Reports (NDRs) or erroneous MHS/IPMS information objects generated by an AMHS test tool (x=7).

## 2 AMHS Conformance Test Environment

The AMHS Implementation Under Test (IUT) is embedded in a simulated operational environment formed by the AMHS test tool with three MTA instances (representing three adjacent ATS Message Servers or three neighbour PRMDs) and one AFTN/CIDIN source/sink (representing an adjacent AFTN/CIDIN environment).

The IUT has an AMHS User Agent (UA) attached, which is used in submission and delivery tests. Gateway tests involve either the AFTN/CIDIN test application or the AFTN user terminal. It is also possible to make use of the IUT's associated Monitor & Control Position – if available - to observe outcomes of the conversion process, especially in error situations.

The AMHS test tool implements three MTA test applications (MTA-1, -2 and -3) to send and receive AMHS messages (IPM, IPN), reports and probes to and from three directions. The test tool generates AMHS data at the X.400/P1 level. It uses the AFTN/CIDIN test application or the AFTN user terminal to send and receive AFTN user messages and AFTN service messages.



**Figure 1: AMHS Conformance Test Environment**

Figure 1 shows the test environment used for AMHS conformance tests and the components of the AMHS Test Tool. The AMHS Test Tool will be interconnected with the IUT's (standardized) external interfaces, i.e.

- three AMHS transfer ports (trp1, trp2, trp3) supporting the X.400/P1 protocol over a TCP/IP/LAN<sup>2</sup>, and

<sup>2</sup> Optionally, an ATN stack can be supported instead of the TCP/IP interface to support the AMHS X.400/P1 protocol.

- an AFTN/CIDIN/X.25 port (cid).

All test applications can be controlled independently via user interface through the Test Control and Evaluation Application. The Test Control and Evaluation Application:

- maintains test samples in a repository (message source)
- executes test scripts,
- verifies the received messages (message sink),
- evaluates each performed test step,
- stores every test step result in a test log, and
- keeps record of all sent and received messages during a test run.

Test scenarios involve the test components as depicted in *Figure 1* in the following way:

*Submission operation tests:*

AMHS User Agent      =>   IUT (ATS   Message   =>   MTA-1  
                                 Server)

*Transfer operation tests:*

MTA-1  $\Rightarrow$  IUT (ATS Message  $\Rightarrow$  MTA-2 (and for distribution tests also MTA-3))

*Delivery operation tests:*

MTA-1 => IUT (ATS Message Server) => AMHS User Agent

*AMHS to AFTN gateway tests:*

MTA-1                => IUT (ATS Message Server and Gateway)      => AFTN/CIDIN Test Application or AFTN User Terminal

*AFTN to AMHS gateway tests:*

AFTN/CIDIN Test => IUT (Gateway and => MTA-1  
Application or AFTN  
User Terminal  
ATS Message Server)

### 3 Addressing Plan for AMHS Conformance Testing

To meet the scope of testing, the test-address space used by AMHS Conformance Testing should include AMHS addresses placed in different AMHS PRMDs and AFTN addresses located in different countries.

As a minimum, there is a need of three generic PRMDs and three generic AFTN countries which may be called: AMHSLAND-1, AMHSLAND-2, AMHSLAND-3, AFTNLAND-1, AFTNLAND-2 and AFTNLAND-3. An extension of the address space has been introduced, so that it is possible to test handling of the User Address look-up table with a large number of entries.

This allows covering of all cases of selected addressing schemes, including:

- CAAS with one single organization-name value for all location indicators within the PRMD,
- CAAS with multiple organization-name values for different sets of location indicators within the PRMD,
- XF,
- CAAS-Like and XF-Like, through the use of the User Address look-up table.

The Nationality Letters AA, AB, AC, BA, BB and BC have been reserved for the purpose of AMHS testing. The PRMD names USERLAND-1 up to USERLAND-14 have been introduced for the execution of specific tests related to address conversion by means of the User Address look-up table, for which the use of nationality letters is not possible. The PRMD names and addressing schemes used for AMHS Conformance testing are indicated in *Table 1*:

Nationality Letter	C	ADMD	PRMD	Addressing Scheme
AA	XX	ICAO	AMHSLAND-1	CAAS
AB	XX	ICAO	AMHSLAND-2	CAAS
AC	XX	ICAO	AMHSLAND-3	XF
BA	XX	ICAO	AFTNLAND-1	CAAS
BB	XX	ICAO	AFTNLAND-2	CAAS
BC	XX	ICAO	AFTNLAND-3	XF
	XX	ICAO	USERLAND-1	CAAS-Like
	XX	ICAO	USERLAND-2	CAAS-Like
	XX	ICAO	USERLAND-3	CAAS-Like
	XX	ICAO	USERLAND-4	CAAS-Like
	XX	ICAO	USERLAND-5	CAAS-Like
	XX	ICAO	USERLAND-6	CAAS-Like
	XX	ICAO	USERLAND-7	CAAS-Like



Nationality Letter	C	ADMD	PRMD	Addressing Scheme
	XX	ICAO	USERLAND-8	XF-Like
	XX	ICAO	USERLAND-9	XF-Like
	XX	ICAO	USERLAND-10	XF-Like
	XX	ICAO	USERLAND-11	XF-Like
	XX	ICAO	USERLAND-12	XF-Like
	XX	ICAO	USERLAND-13	XF-Like
	XX	ICAO	USERLAND-14	XF-Like

Table 1: PRMD names and addressing schemes

The user addresses of AMHSLAND-1 (Addressing scheme: CAAS – single "O" value)

C=XX ADMD=ICAO PRMD=AMHSLAND-1

O=AA-REGION OU1=AAAA -> CN=AAAAMHAA till AAAAMHAZ  
and  
CN=AAAAMHBA till AAAAMHBZ

The user addresses of AMHSLAND-2 (Addressing scheme: CAAS – multiple "O" value)

C=XX ADMD=ICAO PRMD=AMHSLAND-2

O=AB-REGION1	OU1=ABAA	-> CN=ABAAMHAA till ABAAMHAZ
O=AB-REGION1	OU1=ABAB	-> CN=ABABMHAA till ABABMHAZ
O=AB-REGION2	OU1=ABBA	-> CN=ABBAMHAA till ABBAMHAZ
O=AB-REGION2	OU1=ABBB	-> CN=ABBBMHAA till ABBBMHAZ
O=AB-REGION3	OU1=ABCA	-> CN=ABCAMHAA till ABCAMHAZ
O=AB-REGION3	OU1=ABCB	-> CN=ABCBMHAA till ABCBMHAZ

Table 2: AMHSLAND-2

The user addresses of AMHSLAND-3 (Addressing scheme: XF)

C=XX ADMD=ICAO PRMD=AMHSLAND-3

O=AFTN OU1=ACCCMHAA till ACCCMHAZ and  
OU1=ACCCMHBA till ACCCMHBZ

The user addresses of AFTNLAND-1 (Addressing scheme: CAAS – single "O" value)

C=XX ADMD=ICAO PRMD=AFTNLAND-1

O=BA-REGION OU1=BAAA -> CN=BAAAFATA till BAAAFATZ

The user addresses of AFTNLAND-2 (Addressing scheme: CAAS – multiple "O" value)

C=XX ADMD=ICAO PRMD=AFTNLAND-2

O= <b>BB-REGION1</b>	OU1= <b>BBAA</b>	-> CN= <b>BBAAFTAA</b> till <b>BBAAFTAZ</b>
O= <b>BB-REGION1</b>	OU1= <b>BBAB</b>	-> CN= <b>BBABFTAA</b> till <b>BBABFTAZ</b>
O= <b>BB-REGION2</b>	OU1= <b>BBBA</b>	-> CN= <b>BBBAFTAA</b> till <b>BBBAFTAZ</b>
O= <b>BB-REGION2</b>	OU1= <b>BBBB</b>	-> CN= <b>BBBBFTAA</b> till <b>BBBBFTAZ</b>
O= <b>BB-REGION3</b>	OU1= <b>BBCA</b>	-> CN= <b>BBCAFTAA</b> till <b>BBCAFTAZ</b>
O= <b>BB-REGION3</b>	OU1= <b>BBCB</b>	-> CN= <b>BBCBFTAA</b> till <b>BBCBFTAZ</b>

**Table 3: AFTNLAND-2**

The user addresses of AFTNLAND-3 (Addressing scheme: XF)

C=**XX** ADMD=**ICAO** PRMD=**AFTNLAND-3**

O=**AFTN**                      OU1=**BCAAFTAA** till **BCAAFTAZ**      and  
                                  OU1=**BCAAFTBA** till **BCAAFTBZ**

Several additional PRMDs, USERLAND-1 up to USERLAND-14, have been introduced in order to facilitate the execution of specific test cases related to address translation by means of the User Address look-up table. The addressing scheme of the PRMDs USERLAND-1 up to USERLAND-7 is CAAS-Like, while the addressing scheme of the PRMDs USERLAND-8 up to USERLAND-14 is XF-Like. The user addresses of these PRMDs are listed in Table 8.

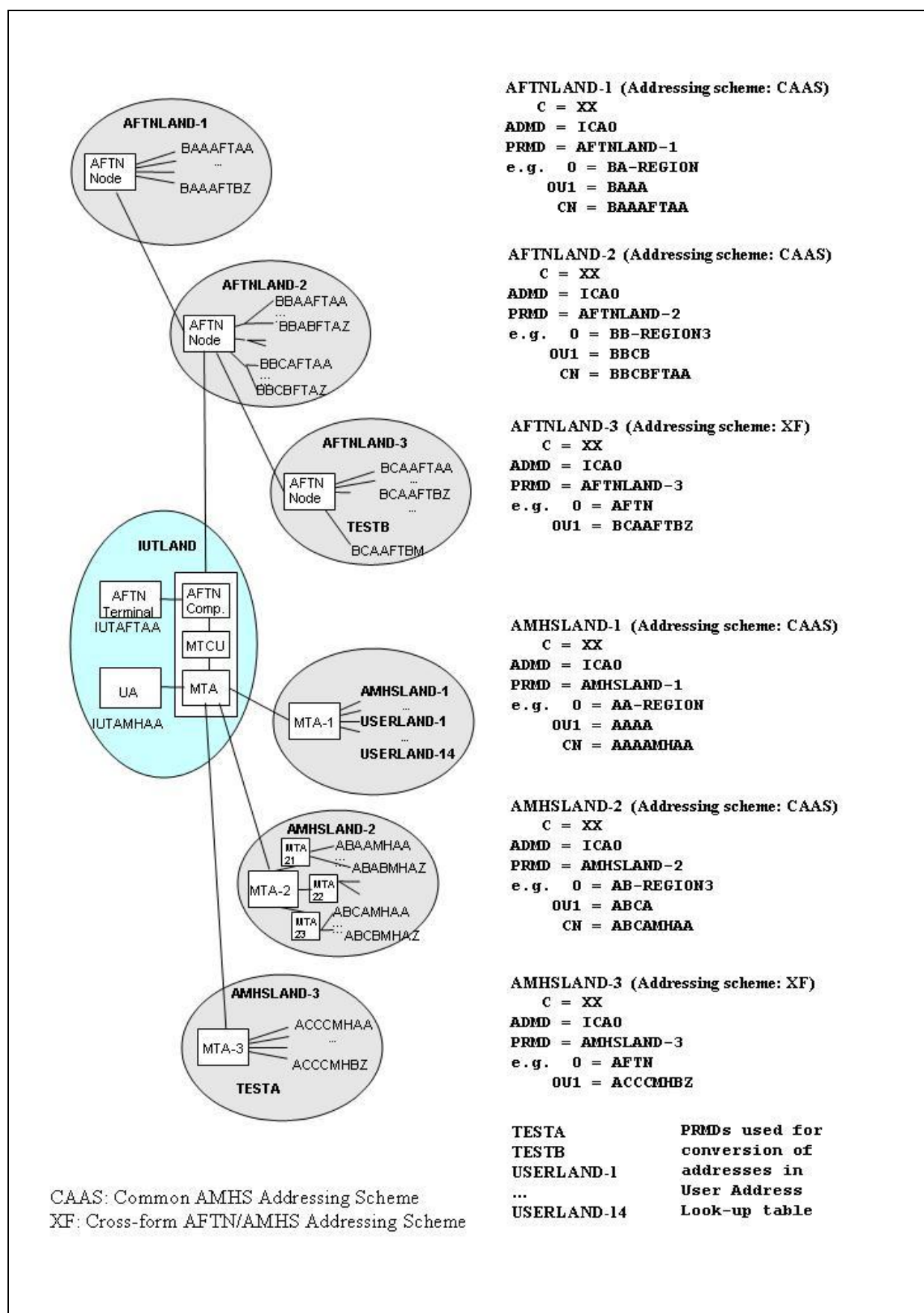


Figure 2: Addressing Plan

For the IUT itself, either of the following test addresses could be used:

- a) The original, operational AMHS and AFTN addresses assigned to the COM Centre
- or
- b) a generic address space taken from the fictitious PRMD/AFTN country IUTLAND including the generic user addresses IUTAFTAA and IUTAMHAA (or a more comprehensive set of addresses in case of CAAS with multiple "O" values) which may be mapped either onto the CAAS (preferred) or XF addressing scheme. The following table shows the generic address space assigned to the IUT.

<b>CAAS (preferred) – single "O"</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>IUT-REGION</b> OU1= <b>IUTA</b> CN= <b>IUTAFTAA</b>  C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>IUT-REGION</b> OU1= <b>IUTA</b> CN= <b>IUTAMHAA</b>
<b>CAAS (preferred) – multiple "O"</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>IUT-REGION1</b> OU1= <b>IUTA</b> CN= <b>IUTAFTAA</b> ... C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>IUT-REGION1</b> OU1= <b>IUTA</b> CN= <b>IUTAMHAA</b>  C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>IUT REGION2</b> OU1= <b>IUTB</b> CN= <b>IUTBFTAA</b> ... C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>IUT REGION2</b> OU1= <b>IUTB</b> CN= <b>IUTBMHAA</b>  C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>IUT-REGION3</b> OU1= <b>IUTC</b> CN= <b>IUTCFTAA</b> ... C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>IUT-REGION3</b> OU1= <b>IUTC</b> CN= <b>IUTCMHAA</b>
<b>XF</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>AFTN</b> OU1= <b>IUTAFTAA</b>  C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b> O= <b>AFTN</b> OU1= <b>IUTAMHAA</b>

**Table 4: Generic address spaces of the IUT**

Taking into consideration the test environment and addressing configuration used for the execution of the tests of this Appendix, the AFTN and AMHS Routing Tables of the IUT are presented below.

The **AFTN Routing Table** of the IUT shall contain at least the following entries listed in table 5. The AFTN Routing Indicators resulting from Table 8, *User Address look-up table settings of the AFTN/AMHS Gateway*, are included even though in some cases the entries are covered by shorter entries.

<b>AFTN Routing Indicator</b>	<b>Target</b>
AA	MTCU
AAAAUA	MTCU
AB	MTCU
ABAAUA	MTCU
ABABUA	MTCU
ABBAUA	MTCU
ABBBUA	MTCU
ABCAUA	MTCU

<b>ABCBMHAM</b> <i>Note: Routing indicator corresponding to PRMD=TESTA</i>	MTCU
<b>ABCBUA</b>	MTCU
<b>AC</b>	MTCU
<b>BA</b>	AFTN Circuit to test tool
<b>BAAUA</b> <i>Note: Routing indicator corresponding to PRMD= USERLAND-8 has to be explicitly mapped to the MTCU</i>	MTCU
<b>BB</b>	AFTN Circuit to test tool
<b>BBAAUA</b> <i>Note: Routing indicator corresponding to PRMD= USERLAND-9 has to be explicitly mapped to the MTCU</i>	MTCU
<b>BBABUA</b> <i>Note: Routing indicator corresponding to PRMD= USERLAND-10 have to be explicitly mapped to the MTCU</i>	MTCU
<b>BBBAUA</b> <i>Note: Routing indicator corresponding to PRMD= USERLAND-11 has to be explicitly mapped to the MTCU</i>	MTCU
<b>BBBBUA</b> <i>Note: Routing indicator corresponding to PRMD= USERLAND-12 has to be explicitly mapped to the MTCU</i>	MTCU
<b>BBCAUA</b> <i>Note: Routing indicator corresponding to PRMD= USERLAND-13 has to be explicitly mapped to the MTCU</i>	MTCU
<b>BBCBUA</b> <i>Note: Routing indicator corresponding to PRMD= USERLAND-14 has to be explicitly mapped to the MTCU</i>	MTCU
<b>BC</b>	AFTN Circuit to test tool
<b>BCAAFTBM</b> <i>Note: Routing indicator corresponding to PRMD=TESTB</i>	AFTN Circuit to test tool
<b>IU</b>	AFTN Circuit to test tool
<b>IUTADLAA</b>	MTCU
<b>IUTADLAB</b>	MTCU
<b>IUTAMHAA</b>	MTCU

**Table 5: AFTN Routing Table of IUT**

The AMHS Routing Table of the IUT shall contain at least the following entries:

<b>AMHS Routing Indicator</b>	<b>Target</b>
/C=XX/ADMD=ICAO/PRMD=AFTNLAND-1	MTCU
/C=XX/ADMD=ICAO/PRMD=AFTNLAND-2	MTCU
/C=XX/ADMD=ICAO/PRMD=AFTNLAND-3	MTCU
/C=XX/ADMD=ICAO/PRMD=AMHSLAND-1	MTA-1
/C=XX/ADMD=ICAO/PRMD=AMHSLAND-2	MTA-2
/C=XX/ADMD=ICAO/PRMD=AMHSLAND-3	MTA-3
/C=XX/ADMD=ICAO/PRMD=IUTLAND	MTCU
/C=XX/ADMD=ICAO/PRMD=IUTLAND/O=IUT-REGION/OU=IUTA/CN=IUTADLAA	Distribution List
/C=XX/ADMD=ICAO/PRMD=IUTLAND/O=IUT-	Distribution List

AMHS Routing Indicator	Target
REGION/OU=IUTA/CN=IUTADLAB	
/C=XX/ADMD=ICAO/PRMD=IUTLAND/O=IUT-REGION/OU=IUTA/CN=IUTAMHAA	Local User Agent
/C=XX/ADMD=ICAO/PRMD=TESTA	MTA-3 <i>Note: It could also be MTA-1 or MTA-2</i>
/C=XX/ADMD=ICAO/PRMD=TESTB	MTCU
/C=XX/ADMD=ICAO/PRMD=USERLAND-1	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-2	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-3	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-4	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-5	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-6	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-7	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-8	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-9	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-10	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-11	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-12	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-13	MTA-1
/C=XX/ADMD=ICAO/PRMD=USERLAND-14	MTA-1

**Table 6: AMHS Routing Table of IUT**

Specific test cases require the use of distribution lists. CT304 and CT411 define specific testing scenarios at which the recipient in the message transfer envelope (MTE) is addressing a Distribution List. Thus the **Table of Distribution Lists** shall contain at least the following entries:

Distribution List	Member Addresses
/C=XX/ADMD=ICAO/PRMD=IUTLAND /O=IUT-REGION/OU=IUTA/CN=IUTADLAA	/C=XX/ADMD=ICAO/PRMD=AMHSLAND-1 /O=AA-REGION/OU=AAAA/CN=AAAAMHAA
	/C=XX/ADMD=ICAO/PRMD=AMHSLAND-2 /O=AB-REGION1/OU=ABAA/CN=ABAAMHAA
	/C=XX/ADMD=ICAO/PRMD=AMHSLAND-3 /O=AFTN/OU=ACCCMHAA
/C=XX/ADMD=ICAO/PRMD=IUTLAND /O=IUT-REGION/OU=IUTA/CN=IUTADLAB	/C=XX/ADMD=ICAO/PRMD=AMHSLAND-2 /O=AB-REGION1/OU=ABAA/CN=ABAAMHAA
	/C=XX/ADMD=ICAO/PRMD=AFTNLAND-1 /O=BA-REGION/OU=BAAA/CN=BAAAFATA
	/C=XX/ADMD=ICAO/PRMD=AFTNLAND-1 /O=BA-REGION/OU=BAAA/CN=BAAAFATB

**Table 7: Table of Distribution Lists**

### 3.1 User Address Look-up table

Within the AFTN/AMHS address conversion tests CT609 and CT610 the following AMHS addresses are used to demonstrate the address conversion by means of the User Address look-up table:

AFTN address	Corresponding O/R address
ABCBMHAM	/C=XX/A=ICAO/P=TESTA/O=A-REGION/OU1=ABCB/CN=ABCBMHAM
BCAAFTBM	/C=XX/A=ICAO/P=TESTB/O=AFTN/OU1=BCAAFTBM
AAAAUAAA ... AAAAUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-1/O=ORG/OU1=AAAA/CN=AAAAUAAA ... /C=XX/A=ICAO/P=USERLAND-1/O=ORG/OU1=AAAA/CN=AAAAUAZZ
ABAAUAAA ... ABAAUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-2/O=ORG/OU1=ABAA/CN=ABAAUAAA ... /C=XX/A=ICAO/P=USERLAND-2/O=ORG/OU1=ABAA/CN=ABAAUAZZ
ABABUAAA ... ABABUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-3/O=ORG/OU1=ABAB/CN=ABABUAAA ... /C=XX/A=ICAO/P=USERLAND-3/O=ORG/OU1=ABAB/CN=ABABUAZZ
ABBAUAAA ... ABBAUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-4/O=ORG/OU1=ABBA/CN=ABBAUAAA ... /C=XX/A=ICAO/P=USERLAND-4/O=ORG/OU1=ABBA/CN=ABBAUAZZ
ABBBUAAA ... ABBBUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-5/O=ORG/OU1=ABBB/CN=ABBBUAAA ... /C=XX/A=ICAO/P=USERLAND-5/O=ORG/OU1=ABBB/CN=ABBBUAZZ
ABCAUAAA ... ABCAUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-6/O=ORG/OU1=ABCA/CN=ABCAUAAA ... /C=XX/A=ICAO/P=USERLAND-6/O=ORG/OU1=ABCA/CN=ABCAUAZZ
ABCBUAAA ... ABCBUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-7/O=ORG/OU1=ABCB/CN=ABCBUAAA ... /C=XX/A=ICAO/P=USERLAND-7/O=ORG/OU1=ABCB/CN=ABCBUAZZ
BAAAUAAA ... BAAUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-8/O=AFTN/OU1=BAAAUAAA ... /C=XX/A=ICAO/P=USERLAND-8/O=AFTN/OU1=BAAUAZZ
BBAAUAAA ... BBAAUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-9/O=AFTN/OU1=BBAAUAAA ... /C=XX/A=ICAO/P=USERLAND-9/O=AFTN/OU1=BBAAUAZZ
BBABUAAA ... BBABUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-10/O=AFTN/OU1=BBABUAAA ... /C=XX/A=ICAO/P=USERLAND-10/O=AFTN/OU1=BBABUAZZ
BBBAUAAA ... BBBAUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-11/O=AFTN/OU1=BBBAUAAA ... /C=XX/A=ICAO/P=USERLAND-11/O=AFTN/OU1=BBBAUAZZ
BBBBUAAA ... BBBBUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-12/O=AFTN/OU1=BBBBUAAA ... /C=XX/A=ICAO/P=USERLAND-12/O=AFTN/OU1=BBBBUAZZ
BBCAUAAA ... BBCAUAZZ (676 Addresses)	/C=XX/A=ICAO/P=USERLAND-13/O=AFTN/OU1=BBCAUAAA ... /C=XX/A=ICAO/P=USERLAND-13/O=AFTN/OU1=BBCAUAZZ
BBCBUAAA ... BBCBUAZZ	/C=XX/A=ICAO/P=USERLAND-14/O=AFTN/OU1=BBCBUAAA ... /C=XX/A=ICAO/P=USERLAND-14/O=AFTN/OU1=BBCBUAZZ

AFTN address	Corresponding O/R address
(676 Addresses)	

**Table 8: User Address look-up table settings of the AFTN/AMHS Gateway**

### 3.2 “Unknown” addresses used for “negative testing”

Some conformance tests use addresses, which are “unknown” for the IUT and provoke specific reaction, e.g. return of a NDR. Several cases must be distinguished:

- The AMHS component (MTA) of the IUT is not able to route the message, neither to an AMHS domain, nor to the AFTN/AMHS Gateway (MTCU). For example, this occurs, when the global domain identifier does not match any X.400 routing entry (Table 9).
- The AFTN/AMHS Gateway component (MTCU) of the IUT is not able to translate the originator or recipient address from AMHS to AFTN (Table 10).
- The AFTN/AMHS Gateway component (MTCU) of the IUT is not able to translate the originator or destination address from AFTN to AMHS (Table 11).
- The AFTN component of the IUT is not able to route an AFTN message.

*Note that AFTN routing is not subject of AMHS conformance tests, and therefore no requirement exists for “unknown” AFTN addresses that do not match a routing indicator in the AFTN routing table.*

The following “unknown” addresses may be used in the conformance tests:

“Unknown” AMHS addresses used to test MTA routing	
C=XX ADMD=ICAO PRMD=UNKNOWN O=AA-REGION OU1=AAAA CN=AAAAMHAA ... CN=AAAAMHBZ	
C=XX ADMD=ICAO PRMD=UNKNOWN O=AB-REGION1 OU1=ABAA CN=ABAAMHAA ... CN=ABAAMHBZ	
C=XX ADMD=ICAO PRMD=UNKNOWN O=AFTN OU1=ACCCMHAA ... OU1=ACCCMHBZ	

**Table 9: “Unknown” address spaces for MTA routing tests**



<b>“Unknown” AMHS addresses used to test MTCU mappings from AMHS to AFTN</b>					
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=BA-REGION	OU1=BAAA	CN=BAAAFTABC
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=BA-REGION	OU1=BAAA	CN=BAAAFT
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=BA-REGION	OU1=BAAA	CN=
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=BA-REGION	OU1=	CN=BAAAFTAA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=BA-REGION	OU1=BAAX	CN=BAAAFTAA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=	OU1=BAAA	CN=BAAAFTAA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=AA-REGION	OU1=AAAA	CN=AAAAMHABC
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=AA-REGION	OU1=AAAA	CN=AAAAMH
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=AA-REGION	OU1=AAAA	CN=
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=AA-REGION	OU1=	CN=AAAAMHAA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=AA-REGION	OU1=AAAX	CN=AAAAMHAA
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=	OU1=AAAA	CN=AAAAMHAA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-1	O=BA-REGION	OU1=BAAAFTAA	
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=AFTN	OU1=BCAAFTABC	
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=AFTN	OU1=BCAAFT	
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=AFTN	OU1=	
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=	OU1=BCAAFTAA	
C=XX	ADMD=ICAO	PRMD=AFTNLAND-3	O=ATFM	OU1=BCAAFTAA	
C=XX	ADMD=ICAO	PRMD=AMHSLAND-1	O=UNKNOWN	OU1=AAAAMHAA	
C=XX	ADMD=ICAO	PRMD=AMHSLAND-3	O=AFTN	OU1=ACCCMHABC	
C=XX	ADMD=ICAO	PRMD=AMHSLAND-3	O=AFTN	OU1=ACCCMH	
C=XX	ADMD=ICAO	PRMD=AMHSLAND-3	O=AFTN	OU1=	
C=XX	ADMD=ICAO	PRMD=AMHSLAND-3	O=	OU1=ACCCMHAA	
C=XX	ADMD=ICAO	PRMD=AMHSLAND-3	O=UNKNOWN	OU1=ACCCMHAA	

Remark: This table contains examples of “unknown” O/R addresses which cannot be converted into AF-addresses.

**Table 10: “Unknown” AMHS addresses for MTCU mapping tests**

**“Unknown” AFTN addresses used to test MTCU mappings from AFTN to AMHS**

**AAXXXXXX, AAAXXXXX, AAABXXXX,**  
**ABXXXXXX, ABAXXXXX, ABBXXXXX, ABCXXXXX, ABACXXXX, ABABXXXX**  
**ACXXXXXX, ACCXXXXX, ACAAXXXX, ACBAXXXX**  
**BAXXXXXX, BBXXXXXX, BCXXXXXX**

Remark: These addresses match a routing indicator in the AFTN routing table, but not any entry of the MD Look-up Table (Table 12).

**Table 11: “Unknown” AFTN addresses for MTCU mapping tests**

AFTN/AMHS Gateway settings

The following setting of the MD Lookup/CAAS Tables of the AFTN/AMHS Gateway (IUT) is recommended:

Nationality Letters	Mapped to	Used addressing scheme
<b>AA</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHSLAND-1</b>	CAAS
<b>AB</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHSLAND-2</b>	CAAS
<b>AC</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHSLAND-3</b>	XF
<b>BA</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTNLAND-1</b>	CAAS
<b>BB</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTNLAND-2</b>	CAAS
<b>BC</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTNLAND-3</b>	XF
<b>IU</b>	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>IUTLAND</b>	CAAS

**Table 12: MD Lookup Table settings of the AFTN/AMHS Gateway**

country-name	ADMD-name	PRMD-name	organization-name	organizational-unit-names
C= <b>XX</b>	ADMD= <b>ICAO</b>	PRMD= <b>AMHSLAND-1</b>	O= <b>AA-REGION</b>	OU1= <b>AAAA</b>
C= <b>XX</b>	ADMD= <b>ICAO</b>	PRMD= <b>AMHSLAND-2</b>	O= <b>AB-REGION1</b>	OU1= <b>ABAA</b>
C= <b>XX</b>	ADMD= <b>ICAO</b>	PRMD= <b>AMHSLAND-2</b>	O= <b>AB-REGION1</b>	OU1= <b>ABAB</b>
C= <b>XX</b>	ADMD= <b>ICAO</b>	PRMD= <b>AMHSLAND-2</b>	O= <b>AB-REGION2</b>	OU1= <b>ABBA</b>
C= <b>XX</b>	ADMD= <b>ICAO</b>	PRMD= <b>AMHSLAND-2</b>	O= <b>AB-REGION2</b>	OU1= <b>ABBB</b>
C= <b>XX</b>	ADMD= <b>ICAO</b>	PRMD= <b>AMHSLAND-2</b>	O= <b>AB-REGION3</b>	OU1= <b>ABCA</b>
C= <b>XX</b>	ADMD= <b>ICAO</b>	PRMD= <b>AMHSLAND-2</b>	O= <b>AB-REGION3</b>	OU1= <b>ABCB</b>
C= <b>XX</b>	ADMD= <b>ICAO</b>	PRMD= <b>AFTNLAND-1</b>	O= <b>BA-REGION</b>	OU1= <b>BAAA</b>
C= <b>XX</b>	ADMD= <b>ICAO</b>	PRMD= <b>AFTNLAND-2</b>	O= <b>BB-REGION1</b>	OU1= <b>BBAA</b>

country-name	ADMD-name	PRMD-name	organization-name	organizational-unit-names
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION1	OU1=BBAB
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION2	OU1=BBBA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION2	OU1=BBBB
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION3	OU1=BBCA
C=XX	ADMD=ICAO	PRMD=AFTNLAND-2	O=BB-REGION3	OU1=BBCB
C=XX	ADMD=ICAO	PRMD=IUTLAND	O=IUT-REGION	OU1=IUTA

*Table 13: CAAS Table settings of the AFTN/AMHS Gateway*

### 3.3 AMHS O/R addresses used for asymmetric re-conversion tests

Within the AFTN/AMHS address conversion tests the following AMHS addresses are used to demonstrate the robustness of the address conversion of the IUT introduced by the PDR M7100001<sup>3</sup>. The AFTN addresses will be extracted from the original O/R address, but the re-conversions do not result in the same AMHS addresses. These AMHS addresses, the AFTN addresses resulting from conversion and the re-converted AMHS addresses are listed in the following table:

---

<sup>3</sup> To reduce message rejections due to non-symmetrical address conversion, it is necessary to:

- detect such situations by checking the result of backward conversion of the address and report the error situations,
- convert the message to AFTN and transfer it, despite the detected non-symmetry.

	Used AMHS Address	converted AFTN Address	Re-converted AMHS Address
(1)	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTN</b> LAND-1 O= <b>BA-REGION</b> OU1= <b>BBAA</b> CN= <b>BBAAFTAA</b>	BBAAFTAA	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTN</b> LAND-2 O= <b>BB-REGION1</b> OU1= <b>BBAA</b> CN= <b>BBAAFTAA</b>
(2)	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTN</b> LAND-2 O= <b>AFTN</b> OU1= <b>BCAAFTAA</b>	BCAAFTAA	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTN</b> LAND-3 O= <b>AFTN</b> OU1= <b>BCAAFTAA</b>
(3)	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTN</b> LAND-3 O= <b>AFTN</b> OU1= <b>BCAA</b> CN= <b>BCAAFTAA</b>	BCAAFTAA	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTN</b> LAND-3 O= <b>AFTN</b> OU1= <b>BCAAFTAA</b>
(4)	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTN</b> LAND-1 O= <b>AFTN</b> OU1= <b>BAAAF</b> TAA	BAAAF	TAA C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTN</b> LAND-1 O= <b>BA-REGION</b> OU1= <b>BAAA</b> CN= <b>BAAAF</b> TAA
(5)	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHS</b> LAND-1 O= <b>AA-REGION</b> OU1= <b>ABAA</b> CN= <b>ABAAM</b> HAA	ABAAM	HAA C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHS</b> LAND-2 O= <b>AB-REGION1</b> OU1= <b>ABAA</b> CN= <b>ABAAM</b> HAA
(6)	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHS</b> LAND-1 O= <b>AFTN</b> OU1= <b>ACCCM</b> HAA	ACCCM	HAA C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AFTN</b> LAND-3 O= <b>AFTN</b> OU1= <b>ACCCM</b> HAA
(7)	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHS</b> LAND-3 O= <b>AFTN</b> OU1= <b>ACCC</b> CN= <b>ACCCM</b> HAA	ACCCM	HAA C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHS</b> LAND-3 O= <b>AFTN</b> OU1= <b>ACCCM</b> HAA
(8)	C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHS</b> LAND-1 O= <b>AFTN</b> OU1= <b>AAAAM</b> HAA	AAAAM	HAA C= <b>XX</b> ADMD= <b>ICAO</b> PRMD= <b>AMHS</b> LAND-1 O= <b>AA-REGION</b> OU1= <b>AAAA</b> CN= <b>AAAAM</b> HAA

Table 14: AMHS addresses used for asymmetric re-conversion tests

## 4 Test Procedures

*Note.*— Unless otherwise specified in the test case description, the AMHS test tool generates IPMs containing an **ia5-text**. Definition of the various body part types used in the following test cases is included in section 2 ‘Glossary and Definitions’ of Appendix A of this Manual.

### 4.1 Submission Operations

#### 4.1.1 CT101 - Forward a submitted IPM

*Note.*— The conformance test CT101 is passed successfully by the IUT if at least one of the tests CT101a, CT101b or CT101c was passed successfully

<b>CT101a</b>	<b>Forward a submitted IPM containing an ia5-text</b>
<b>Test criteria</b>	This test is successful, if the IUT forwards a submitted ATS message (IPM) containing an <b>ia5-text</b> to a peer MTA correctly.
<b>Scenario description</b>	<p>From the UA send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user reachable via AMHS transfer port <i>trp1</i>.</p> <ul style="list-style-type: none"> <li>• Message 1 (CT101aM01) shall have ATS-message-priority KK.</li> <li>• Message 2 (CT101aM02) shall have ATS-message-priority GG.</li> <li>• Message 3 (CT101aM03) shall have ATS-message-priority FF.</li> <li>• Message 4 (CT101aM04) shall have ATS-message-priority DD.</li> <li>• Message 5 (CT101aM05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall contain an <b>ia5-text</b> and have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty.</p> <p>Verify the messages received by the test tool at the AMHS interface. Check the format and contents of MTE, IPM heading and body.</p> <p>In particular, verify the priority value contained in the MTE (see <i>Table 19</i>) and the following elements contained in the message content:</p> <ul style="list-style-type: none"> <li>• Body part type,</li> <li>• Repertoire,</li> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.2 (ATS Message Server), 3.3.3.7 (ATS-message-header)
<b>Test class</b>	Normal AMHS communications (N)



<b>CT101b</b>	<b>Forward a submitted IPM containing an ia5-text-body-part</b>
<b>Test criteria</b>	This test is successful, if the IUT forwards a submitted ATS message (IPM) containing an <b>ia5-text-body-part</b> to a peer MTA correctly.
<b>Scenario description</b>	<p>From the UA send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user reachable via AMHS transfer port trp1.</p> <ul style="list-style-type: none"> <li>• Message 1 (CT101bM01) shall have ATS-message-priority KK.</li> <li>• Message 2 (CT101bM02) shall have ATS-message-priority GG.</li> <li>• Message 3 (CT101bM03) shall have ATS-message-priority FF.</li> <li>• Message 4 (CT101bM04) shall have ATS-message-priority DD.</li> <li>• Message 5 (CT101bM05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall contain an <b>ia5-text-body-part</b> and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received by the test tool at the AMHS interface. Check the format and contents of MTE, IPM heading and body.</p> <p>In particular, verify the priority value contained in the MTE (see <i>Table 19</i>) and the following elements contained in the message content:</p> <ul style="list-style-type: none"> <li>• Body part type,</li> <li>• Repertoire,</li> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.2 (ATS Message Server), 3.3.3.7 (ATS-message-header)
<b>Test class</b>	Normal AMHS communications (N)

<b>CT101c</b>	<b>Forward a submitted IPM containing a general-text-body-part with ISO 646 repertoire</b>
<b>Test criteria</b>	This test is successful, if the IUT forwards a submitted ATS message (IPM) containing a <b>general-text-body-part with ISO 646 repertoire</b> to a peer MTA correctly.
<b>Scenario description</b>	<p>From the UA send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user reachable via AMHS transfer port trp1.</p> <ul style="list-style-type: none"> <li>• Message 1 (CT101cM01) shall have ATS-message-priority KK.</li> <li>• Message 2 (CT101cM02) shall have ATS-message-priority GG.</li> <li>• Message 3 (CT101cM03) shall have ATS-message-priority FF.</li> <li>• Message 4 (CT101cM04) shall have ATS-message-priority DD.</li> <li>• Message 5 (CT101cM05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall contain a <b>general-text-body-part with ISO 646 repertoire</b> and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received by the test tool at the AMHS interface. Check the format and contents of MTE, IPM heading and body.</p> <p>In particular, verify the priority value contained in the MTE (see <i>Table 19</i>) and the following elements contained in the message content:</p> <ul style="list-style-type: none"> <li>• Body part type,</li> <li>• Repertoire,</li> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.2 (ATS Message Server), 3.3.3.7 (ATS-message-header)
<b>Test class</b>	Normal AMHS communications (N)

*Note. – The X.400 argument **repertoire** is based on an enumeration type and takes one of the values **ita2** (2) or **ia5** (5). In absence of the argument, the default value **ia5** is assumed.*



## 4.2 Delivery Operations

### 4.2.1 CT201 – Deliver an IPM to a local AMHS user

*Note.*– The conformance test CT201 is passed successfully by the IUT only if all tests CT201a, CT201b and CT201c were passed successfully.

<b>CT201a</b>	<b>Deliver an IPM containing an ia5-text to a local AMHS user</b>
<b>Test criteria</b>	This test is successful, if the IUT correctly delivers an ATS message (IPM) containing an <b>ia5-text</b> received from a peer MTA to its local AMHS user.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of five ATS messages (IPMs) containing an <b>ia5-text</b> to the IUT addressing a local UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have ATS-message-priority KK.</li> <li>• The second ATS message shall have ATS-message-priority GG.</li> <li>• The third ATS message shall have ATS-message-priority FF.</li> <li>• The fourth ATS message shall have ATS-message-priority DD.</li> <li>• The fifth ATS message shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received at the AMHS User Agent. In particular, verify the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	2.6 (AMHS routing) 3.1 (ATS Message User Agent) and Table 3-1, 3.2 (ATS Message Server), 3.3.3.7 (ATS-message-header)
<b>Test class</b>	Normal AMHS communications (N)

<b>CT201b</b>	<b>Deliver an IPM containing an ia5-text-body-part to a local AMHS user</b>
<b>Test criteria</b>	This test is successful, if the IUT correctly delivers an ATS message (IPM) containing an <b>ia5-text-body-part</b> received from a peer MTA to its local AMHS user.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of five ATS messages (IPMs) containing an <b>ia5-text-body-part</b> to the IUT addressing a local UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have ATS-message-priority KK.</li> <li>• The second ATS message shall have ATS-message-priority GG.</li> <li>• The third ATS message shall have ATS-message-priority FF.</li> <li>• The fourth ATS message shall have ATS-message-priority DD.</li> <li>• The fifth ATS message shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received at the AMHS User Agent. In particular, verify the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	2.6 (AMHS routing) 3.1 (ATS Message User Agent) and Table 3-1, 3.2 (ATS Message Server), 3.3.3.7 (ATS-message-header)
<b>Test class</b>	Normal AMHS communications (N)

<b>CT201c</b>	<b>Deliver an IPM containing a general-text-body-part with ISO 646 repertoire to a local AMHS user</b>
<b>Test criteria</b>	This test is successful, if the IUT correctly delivers an ATS message (IPM) containing a <b>general-text-body-part with ISO 646 repertoire</b> received from a peer MTA to its local AMHS user.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of five ATS messages (IPMs) containing a <b>general-text-body-part with ISO 646 repertoire</b> to the IUT addressing a local UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have ATS-message-priority KK.</li> <li>• The second ATS message shall have ATS-message-priority GG.</li> <li>• The third ATS message shall have ATS-message-priority FF.</li> <li>• The fourth ATS message shall have ATS-message-priority DD.</li> <li>• The fifth ATS message shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received at the AMHS User Agent. In particular, verify the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	2.6 (AMHS routing) 3.1 (ATS Message User Agent) and Table 3-1, 3.2 (ATS Message Server), 3.3.3.7 (ATS-message-header)
<b>Test class</b>	Normal AMHS communications (N)

#### **4.2.2 CT202 – Deliver an IPM containing erroneous ATS-message-header or ATS-message-text format**

<b>CT202</b>	<b>Deliver an IPM containing erroneous ATS-message-header or ATS-message-text format</b>
<b>Test criteria</b>	<p>This test is successful, if the IUT, when receiving an IPM containing erroneous ATS-message-header or ATS-message-text from a peer MTA:</p> <ul style="list-style-type: none"> <li>• delivers this message to its local AMHS user regardless of the contained error, or</li> <li>• indicates the error situation, or</li> <li>• returns a non-receipt notification or NDR.</li> </ul>
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of seven messages (IPMs) to the IUT addressed to a local UA.</p> <ul style="list-style-type: none"> <li>• The first message (IPM) shall contain an empty ATS-message-priority.</li> <li>• The second message (IPM) shall contain an invalid ATS-message-priority</li> <li>• The third message (IPM) shall contain an empty ATS-message-filing-time.</li> <li>• The fourth message (IPM) shall contain an invalid ATS-message-filing-time.</li> <li>• The fifth message (IPM) shall contain an OHI text longer than 53 characters.</li> <li>• The sixth message (IPM) shall contain an empty ATS-message-header.</li> <li>• The seventh message (IPM) shall contain an empty ATS-message-text.</li> </ul> <p>Verify that the messages are delivered to the UA. Analyse the IUT's log files with respect to delivered messages and reported errors, if any. Check the contents of the received ATS message and verify the ATS-message-priority, ATS-message-filing-time and ATS-message-text displayed at the UA<sup>4</sup>.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.3.3 (IPM text)
<b>Test class</b>	Erroneous AMHS parameters (E1)

<sup>4</sup> The displayed message depends on the UA capabilities

**4.2.3 CT203 – Deliver an IPM with empty or missing IPM heading address fields**

<b>CT203</b>	<b><u>Deliver an IPM with empty or missing IPM heading address fields</u></b>
<b>Test criteria</b>	This test is successful, if the IUT when receiving an ATS message (IPM) from a peer MTA with empty or missing IPM heading address fields delivers this message to its local AMHS user regardless of the empty or missing IPM heading address fields.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of messages (IPMs) to the IUT addressing a local UA. The MTE shall contain correct addresses whereas address fields are missing or empty in the IPM heading.</p> <ul style="list-style-type: none"> <li>• The first message shall contain no originator address in the IPM heading.</li> <li>• The second message shall contain no primary, copy or blind copy recipient addresses in the IPM heading.</li> </ul> <p>Check the IUT's log files with respect to delivered messages and reported errors, if any. Check any messages received and displayed at the UA<sup>5</sup>.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent – AMH21)
<b>Test class</b>	Normal AMHS communications (N)

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<sup>5</sup> The displayed message depends on the UA capabilities.

## 4.3 Transfer Operations

### 4.3.1 CT301 – Transfer messages (IPMs and IPNs)

<b>CT301</b>	<b>Transfer messages (IPMs and IPNs)</b>
<b>Test criteria</b>	This test is successful, if the IUT transfers (forwards) messages (IPMs, IPNs) correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of messages to the IUT's transfer port <i>trp1</i>. All envelopes shall contain a remote recipient address reachable via transfer port <i>trp2</i>. All messages shall have the <i>originator-report-request</i> flag and the <i>originating-MTA-report-request</i> flag set to "non-delivery-report". The sequence of messages shall consist of:</p> <ul style="list-style-type: none"> <li>• an IPM containing an ia5-text with ATS-message-header and ATS-message-text,</li> <li>• an IPM containing an ia5-text-body-part with ATS-message-header and ATS-message-text,</li> <li>• an IPM containing a general-text-body-part with ISO 646 repertoire, ATS-message-header and ATS-message-text,</li> <li>• an IPN containing a RN,</li> <li>• an IPN containing a NRN.</li> </ul> <p>Monitor the outcome of IUT transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>. Verify that:</p> <ul style="list-style-type: none"> <li>• all messages are routed correctly via transfer port <i>trp2</i>, and there is no message misrouted, i.e. no output from the IUT at transfer port <i>trp1</i> or <i>trp3</i>,</li> <li>• there is no NDR returned via <i>trp1</i>,</li> <li>• the content of the forwarded message has not changed, but is identical to the original content,</li> <li>• trace information is added in the message transfer envelope (MTE).</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.2 (ATS Message Server), 2.2.2 (AMHS information model)
<b>Test class</b>	Normal AMHS communications (N)

**4.3.2 CT302 – Transfer a report**

<b>CT302</b>	<b>Transfer a report</b>
<b>Test criteria</b>	This test is successful, if the IUT transfers (forwards) reports correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send two manually prepared reports (a DR and a NDR) to the IUT's transfer port <i>trp1</i>. The report transfer envelope shall contain a remote recipient address reachable via transfer port <i>trp2</i>. The reports shall contain fictitious values for those fields, which are normally automatically generated from the related subject message, for example, the subject-MTS-identifier and originally intended recipients.</p> <p>Monitor the outcome of IUT transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• all reports are routed correctly via transfer port <i>trp2</i>, and there is no report misrouted, i.e. no output from the IUT at transfer port <i>trp1</i> or <i>trp3</i>,</li> <li>• the content of the forwarded report has not changed, but is identical to the original report content,</li> <li>• trace information is added in the report transfer envelope (RTE).</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.2 (ATS Message Server), 2.2.2 (AMHS information model)
<b>Test class</b>	Normal AMHS communications (N)

**4.3.3 CT303 – Transfer a probe**

<b>CT303</b>	<b>Transfer a probe</b>
<b>Test criteria</b>	This test is successful, if the IUT transfers (forwards) a probe testing the reachability of a remote AMHS user correctly and returns a NDR, if the probe contains a content-length value which exceeds the length supported by the IUT's MTA component.
<b>Scenario description</b>	<p>From the AMHS Test Tool send two probes to the IUT's transfer port <i>trp1</i>. The probe (envelope) shall contain an intended recipient address reachable via transfer port <i>trp2</i>.</p> <ul style="list-style-type: none"> <li>• The first probe shall contain a content length value of 4.194.304 (octets), which is a length, which must be supported by the IUT's MTA component.</li> <li>• The second probe shall contain a content length value of 2.147.483.647 (octets), which is the maximum length in octets specified in X.411:06/1999. It equals the largest integer in 32 bits.</li> </ul> <p>Monitor the outcome of IUT transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>. Verify that:</p> <ul style="list-style-type: none"> <li>• the first probe is routed correctly via transfer port <i>trp2</i>, and there is not any NDR returned from the IUT,</li> <li>• the second probe is either routed correctly via transfer port <i>trp2</i> or rejected, if such a length is not supported by the IUT's transfer capabilities. Check, if either a forwarded probe or a NDR is received from the IUT.</li> </ul> <p><i>Note.– The AMHS Test Tool responds with a DR, if it receives a valid probe for a user residing in the test tool's domain.</i></p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.2 (ATS Message Server), 2.2.2 (AMHS information model)
<b>Test class</b>	Normal AMHS communications (N)



**4.3.4 CT304– Reject a message, if DL expansion is prohibited**

<b>CT304</b>	<b>Reject a message, if DL expansion is prohibited</b>
<b>Test criteria</b>	This test is successful, if the IUT distributes a received IPM addressing a distribution list (DL) only, if the <i>dl-expansion-prohibited</i> flag is set to “false” and rejects the message, if the <i>dl-expansion-prohibited</i> flag is set to “true”. In the latter case, the IUT shall return a NDR.
<b>Scenario description</b>	<p>From the AMHS Test Tool send two IPMs to the IUT’s transfer port <i>trp1</i>. The recipient in the message transfer envelope (MTE) shall address a distribution list. The distribution list, in turn, shall address three remote AMHS users, one reachable via transfer port <i>trp1</i>, one reachable via <i>trp2</i> and one via <i>trp3</i>. The first message shall have the <i>dl-expansion-prohibited</i> flag set to “false” and the second to “true”.</p> <p>Monitor the outcome of transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• only the first message is distributed by the IUT and three messages are received at the AMHS Test Tool,</li> <li>• a NDR is returned to <i>trp1</i> for the second message.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.2.2.1 (DL functional group)
<b>Test class</b>	Normal AMHS communications (N)

*Note.* – The X.400 argument ***dl-expansion-prohibited*** is based on an enumeration type and takes one of the values ***dl-expansion-allowed*** (0) or ***dl-expansion-prohibited*** (1). In absence of the argument, the default value ***dl-expansion-allowed*** is assumed.

**4.3.5 CT305– Loop detection**

<b>CT305</b>	<b>Loop detection</b>
<b>Test criteria</b>	This test is successful, if the IUT detects that the received message, IPN, report and probe have traversed a loop.
<b>Scenario description</b>	<p>Create a temporary routing loop, i.e. modify the routing table in MTA-2 to forward all messages addressed to AMHSLAND-2 to MTA-1, which in turn forwards those messages to the IUT.</p> <p>Configure the loop detection mechanism in the AMHS Test Tool (MTA-1 and MTA-2) to allow a message to run through the loop 32 times.</p> <p>From the AMHS Test Tool send an AMHS message (IPM) to the IUT addressing an AMHS user in AMHSLAND-2.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• the IUT detects the loop,</li> <li>• discards the message and</li> <li>• sends a NDR</li> </ul> <p>(before the test tool detects that the message has traversed the loop 32 times).</p> <p>Repeat the test for an IPN, a report and a probe. The IUT shall detect the loop in all cases and return a NDR for the IPN and the probe (but not for the report).</p>
<b>AMHS ref.: Doc 9880, Part II</b>	1.1.3 (ISO/IEC 10021), <i>See also ITU-T Rec. X.411 clause 14.3.1 and clause 12.3.1.</i>
<b>Test class</b>	MHS procedural errors (E2)

**4.3.6 CT306– Generate a NDR, if transfer fails**

<b>CT306</b>	<b>Generate a NDR, if transfer fails</b>
<b>Test criteria</b>	This test is successful, if the IUT correctly generates a NDR, if it cannot transfer the received IPM towards the specified recipient.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) to the IUT's transfer port <i>trp1</i>. All messages shall contain an unknown primary recipient address and have different combinations of settings for the <i>originator-report-request</i> flag and the <i>originating-mta-report-request</i> flag according to <i>Table 15</i>.</p> <p>Verify that in all cases the IUT returns a NDR. Verify that the report is always addressed to the originator of the message.</p> <p>Verify that the <i>originator-report-request</i> flag setting in the per-recipient-fields of the generated NDR is equal to the setting in the subject message.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.2.2.1 (AMH22/AMH11)
<b>Test class</b>	MHS/AMHS procedural errors (E2)

ATS Message	Value of the originator-report-request element	Value of the originating-MTA-report-request element	Expected result
1	no-report(0)	report(2)	IUT returns a NDR with the <i>originator-report-request</i> flag set to no-report(0).
2	non-delivery-report(1)	report(2)	IUT returns a NDR with the <i>originator-report-request</i> flag set to non-delivery-report(1).
3	report(2)	report(2)	IUT returns a NDR with the <i>originator-report-request</i> flag set to report(2).

**Table 15: CT306 report request settings<sup>6</sup>**

<sup>6</sup> Note that the originating-MTA-report-request argument shall specify at least the level specified in the originator-report-request (see ITU-T recommendation X.411, clause 12.2.1.1.1.8)

## 4.4 Gateway Operations (AMHS to AFTN)

### 4.4.1 CT401 – Convert an incoming IPM to AFTN format

<b>CT401</b>	<b>Convert an incoming IPM to AFTN format</b>
<b>Test criteria</b>	This test is successful, if the IUT converts an IPM into AFTN format correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have ATS-message-priority KK.</li> <li>• The second ATS message shall have ATS-message-priority GG.</li> <li>• The third ATS message shall have ATS-message-priority FF.</li> <li>• The fourth ATS message shall have ATS-message-priority DD.</li> <li>• The fifth ATS message shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text and address an AFTN user reachable via the AFTN/CIDIN port <i>cid1</i>. The optional-heading-information element shall be empty<sup>7</sup>. The implicit-conversion-prohibited attribute of the AMHS message must be set to “false”.</p> <p>Verify the messages received at the AFTN/CIDIN interface of the AMHS Test Tool. Check the correct format of the AFTN message.</p> <p>Verify the AFTN priority and filing time for each received message. Compare the AFTN message text with the original ATS-message-text.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2 (AMHS IPM conversion)
<b>Test class</b>	Normal AMHS communications (N)

<sup>7</sup> There is a separate test case specified, that will test the conversion of the optional-heading-information element.

#### **4.4.2 CT402 – Convert an IPM containing optional-heading-information in the ATS-message-header**

<b>CT402</b>	<b>Convert an IPM containing optional-heading-information in the ATS-message-header</b>
<b>Test criteria</b>	This test is successful, if the IUT converts an IPM containing optional-heading-information (OHI) in the ATS-message-header correctly into AFTN format and returns a non-delivery report, if it cannot convert the message, because the OHI text is too long.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over the AMHS transfer port to the IUT. The sequence of IPMs shall address a remote AFTN user.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have FF priority and contain OHI text of less than 53 characters<sup>8</sup>.</li> <li>• The second ATS message shall have FF priority and contain OHI text of exactly 53 characters.</li> <li>• The third ATS message shall have FF priority and contain OHI text of more than 53 characters.</li> <li>• The fourth ATS message shall have SS priority and contain OHI text of less than 48 characters<sup>9</sup>.</li> <li>• The fifth ATS message shall have SS priority and contain OHI text of exactly 48 characters.</li> <li>• The sixth ATS message shall have SS priority and contain OHI text of more than 48 characters.</li> </ul> <p>Check the AFTN messages received at the AFTN/CIDIN port and verify the AFTN format. In particular, check the format and contents of the OHI.</p> <p>Verify that the IUT returns a NDR for the third and sixth ATS message containing the following elements (as specified in the Doc 9880, Part II., section 4.5.2.1.5-b):</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li> <li>• “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and</li> <li>• “unable to convert to AFTN due to ATS-message-header or Heading Fields syntax error” for the supplementary-information.</li> </ul>

<sup>8</sup> OHI text of 53 characters is the maximum length for non-SS messages, if the total maximum line length is 69. (Total line length = OHI text + space + 6 digit filing time + space + 8 characters originator indicator)

<sup>9</sup> OHI text of 48 characters is the maximum length for SS messages, if the total maximum line length is 69. (Total line length = OHI text + space + 6 digit filing time + 8 characters originator indicator + 5 characters priority alarm)

<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.2.10 (OHI), 3.3.3.7.4 – 3.3.3.7.6 (ATS Message Optional Heading Information)
<b>Test class</b>	Normal AMHS communications (N) and Erroneous AMHS parameter (E1) in messages 3 and 4

**4.4.3 CT403 – Generate a DR for a successfully translated IPM**

<b>CT403</b>	<b>Generate a DR for a successfully translated IPM</b>
<b>Test criteria</b>	This test is successful, if the IUT returns a DR for a successfully translated ATS message (IPM), if a report was requested by the originator or the originating MTA.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) to the IUT addressing an AFTN user. The IPMs shall have ATS-Message-Priority “FF” and different combinations of settings for the <i>originator-report-request</i> flag and the <i>originating-mta-report-request</i> flag according to Table 16.</p> <p>The IUT shall convert all ATS messages into AFTN format and forward them via the AFTN/CIDIN port <i>cid1</i> to the AMHS Test Tool.</p> <p>Check the messages received at the AMHS interface, and verify that the IUT sends a DR for every ATS message, if:</p> <ul style="list-style-type: none"> <li>a) the <i>originator-report-request</i> element is set to “report”, or</li> <li>b) the <i>originating-mta-report-request</i> element is set to “report” or “audited-report”.</li> </ul> <p>(see Table 16).</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.6.1.3 (generation of AMHS reports)
<b>Test class</b>	Normal AMHS communications (N)

ATS Message	Value of the originator-report-request element	Value of the originating-MTA-report-request element	Expected result for conformance test CT403
1	no-report(0)	non-delivery-report(1)	IUT does not return a report
2	no-report(0)	report(2)	IUT returns a DR
3	no-report(0)	audited-report(3)	IUT returns a DR
4	non-delivery-report(1)	non-delivery-report(1)	IUT does not return a report
5	non-delivery-report(1)	report(2)	IUT returns a DR
6	non-delivery-report(1)	audited-report(3)	IUT returns a DR

ATS Message	Value of the originator-report-request element	Value of the originating-MTA-report-request element	Expected result for conformance test CT403
7	report(2)	report(2)	IUT returns a DR
8	report(2)	audited-report(3)	IUT returns a DR

**Table 16: CT403 report request settings<sup>10</sup>**

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<sup>10</sup> Note that the originating-MTA-report-request argument shall specify at least the level specified in the originator-report-request (see ITU-T recommendation X.411, clause 12.2.1.1.1.8)



**4.4.4 CT404 – Generate a NDR, if implicit conversion is prohibited**

<b>CT404</b>	<b>Generate a NDR, if implicit conversion is prohibited</b>
<b>Test criteria</b>	This test is successful, if the IUT rejects a received IPM addressed to an AFTN user, if the <i>implicit-conversion-prohibited</i> attribute is set to “true” and generates a NDR.
<b>Scenario description</b>	<p>From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port <i>trp1</i>. The IPMs shall have both the <i>originator-report-request</i> and the <i>originating-MTA-report-request</i> flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/CIDIN port <i>cid1</i>. The first message shall have the argument <i>implicit-conversion-prohibited</i> set to “false” and the second message set to “true”.</p> <p>Verify that only the first message is transferred over the AFTN/CIDIN test interface to the AMHS Test Tool, and a NDR is generated for the second message and received by the AMHS Test Tool via the transfer port <i>trp1</i>.</p> <p>Verify that this NDR contains the following elements (as specified in the Doc 9880, Part II 4.5.2.1.2):</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>,</li> <li>• “implicit-conversion-prohibited” for the <i>non-delivery-diagnostic-code</i>, and</li> <li>• “unable to convert to AFTN” for the <i>supplementary-information</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.2
<b>Test class</b>	Normal AMHS communications (N)

**4.4.5 CT405 – Generate a NDR, if the ATS-message-header has a syntax error**

<b>CT405</b>	<b>Generate a NDR, if the ATS-message-header has a syntax error</b>
<b>Test criteria</b>	This test is successful, if the IUT generates a NDR, if it receives an IPM addressed to an AFTN user containing erroneous ATS-message-header or ATS-message-text.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of seven messages (IPMs) to the IUT addressed to an AFTN user reachable via the IUT's gateway.</p> <ul style="list-style-type: none"> <li>• The first message (IPM) shall contain an empty ATS-message-priority.</li> <li>• The second message (IPM) shall contain an invalid ATS-message-priority</li> <li>• The third message (IPM) shall contain an empty ATS-message-filing-time.</li> <li>• The fourth message (IPM) shall contain an invalid ATS-message-filing-time.</li> <li>• The fifth message (IPM) shall contain OHI text longer than 53 characters.</li> <li>• The sixth message (IPM) shall contain an empty ATS-message-header.</li> <li>• The seventh message (IPM) shall contain an empty ATS-message-text.</li> </ul> <p>Check the messages received at the AMHS- and AFTN/CIDIN-interfaces of the AMHS Test Tool. Verify that the IUT - except for the seventh message<sup>11</sup> - does not convert the received AMHS messages into AFTN, but returns a NDR for each message via its transfer port <i>trp1</i>.</p> <p>Verify that all NDRs contains the following elements (as specified in the Doc 9880, Part II, section 4.5.2.1.5-b):</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li> <li>• “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and</li> <li>• “unable to convert to AFTN due to ATS-message-header or Heading Fields syntax error” for the supplementary-information.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.5-b), 3.3.3.7 (ATS Message Header)
<b>Test class</b>	Erroneous AMHS parameters (E1)

<sup>11</sup> Doc 9880, Part II (3.3.3.8) does not exclude an IPM containing empty ATS-message-text.

#### **4.4.6 CT406 – Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters**

<b>CT406</b>	<b>Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters</b>
<b>Test criteria</b>	<p>This test is successful, if the IUT, when it receives an ATS message with ATS-message-text of more than 1800 characters,</p> <ul style="list-style-type: none"> <li>a) rejects the message and returns a NDR, or</li> <li>b) splits the received IPM into several messages and converts the resulting messages into AFTN format as specified in ICAO Annex 10, Vol. II, Attm. B [1], or as specified in ENRD, Section 6.11 [7]; or</li> <li>c) converts the received IPM into a "long" AFTN message.</li> </ul> <p><i>Note. – The Doc 9880, Part II (4.5.2.1.7) specifies that the message can be rejected (case a) or split into several messages (case b). However, if AFTN operations allow or require longer messages to be transferred, conversion into a single long AFTN message (case c) is acceptable.</i></p>
<b>Scenario description</b>	<p>From the AMHS Test Tool send an ATS message (IPM) to the IUT containing ATS-message-text of 4500 characters to an AFTN user recipient.</p> <p><i>If case a) is implemented:</i> Verify that the IUT does not convert the IPM into AFTN format, but returns a NDR. Check the NDR contents received at the TSMS-AMHS interface. Verify that the NDR contains the following elements:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>;</li> <li>• “content-too-long” for the <i>non-delivery-diagnostic-code</i>; and</li> <li>• “unable to convert to AFTN due to message text length” for the <i>supplementary-information</i>.</li> </ul> <p><i>If case b) is implemented:</i> Verify that (at least) three AFTN messages are received at the AFTN/CIDIN test interface. Check the correct format of the AFTN messages. Check the text field of all received AFTN messages. Verify that the text is complete and unchanged, i.e. compare the received data with the <i>ATS-message-text</i> provided in the original IPM. Verify that the received messages contain the appropriate sequence indicators as specified in Attm. B of ICAO Annex 10, Vol. II [1] or as specified in ENRD, Section 6.11 [7].</p> <p><i>If case c) is implemented:</i> Verify that the AFTN message is received at the AFTN/CIDIN test interface. Check the correct format of the AFTN message. Verify that the text is complete and unchanged, i.e. compare the received data with the <i>ATS-message-text</i> provided in the original IPM.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.7
<b>Test class</b>	Normal AMHS communications (N)

#### **4.4.7 CT407 – Convert or reject an IPM, if the ATS-message-text contains lines with more than 69 characters**

<b>CT407</b>	<b>Convert or reject an IPM, if the ATS-message-text contains lines with more than 69 characters</b>
<b>Test criteria</b>	This test is successful, if the IUT converts a received IPM containing an ATS-messages-text with lines of more than 69 characters, if <i>conversion-with-loss-prohibited</i> is set to “false”. Otherwise the IUT shall reject the message and generate a NDR.
<b>Scenario description</b>	<p>From the AMHS Test Tool send two ATS messages (IPMs) to the IUT transfer port. The messages shall have both the <i>originator-report-request</i> and the <i>originating-MTA-report-request</i> flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/CIDIN port <i>cid1</i>. The IPM body shall contain ATS-message-text with lines exceeding 69 characters. In the first message the argument <i>conversion-with-loss-prohibited</i> shall be set to “false” and in the second message to the value “true”.</p> <p>Verify that only messages are received at the AFTN/CIDIN test interface of the AMHS Test Tool, if the <i>conversion-with-loss-prohibited</i> was set to “false”. Check the correct format of the AFTN message. Verify that an additional line feed has been inserted for every text line exceeding 69 characters.</p> <p>In case of message rejection, verify that a NDR is generated and received by AMHS Test Tool via the transfer port <i>trp1</i> with the following values:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> <li>• “line-too-long” for the diagnostic code.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.6 a) , 4.5.2.1.6 b)
<b>Test class</b>	Normal AMHS communications (N)

*Note.* – The X.400 argument *conversion-with-loss-prohibited* is based on an enumeration type and takes one of the values *conversion-with-loss-allowed* (0) or *conversion-with-loss-prohibited* (1). In absence of the argument, the default value *conversion-with-loss-allowed* is assumed.

#### **4.4.8 CT408a – Convert or reject an IPM, if the ATS-message-Text contains IA5 characters or IA5 character sequences not authorized by ICAO Annex 10**

<b>CT408a</b>	<b>Convert or reject an IPM, if the ATS-message-Text contains IA5 characters or IA5 character sequences not authorized by ICAO Annex 10</b>
<b>Test criteria</b>	This test is successful, if the IUT converts a received IPM containing an ATS-messages-Text with IA5 characters or IA5 character sequences not authorized by ICAO Annex 10, if the <i>conversion-with-loss-prohibited</i> argument is set to “allowed” and rejects the IPM and generates an NDR if the <i>conversion-with-loss-prohibited</i> argument is set to “prohibited”.
<b>Scenario description</b>	<p>From the AMHS Test Tool send six ATS messages (IPMs) to the IUT transfer port <i>trp1</i>. The messages shall have both the <i>originator-report-request</i> and the <i>originating-MTA-report-request</i> flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/CIDIN port <i>cid1</i>.</p> <ul style="list-style-type: none"> <li>• In the first message the ATS-message-Text shall contain one IA5 punctuation symbol that is not authorized by ICAO Annex 10, e.g. “,”(0x3B), and the <i>conversion-with-loss-prohibited</i> argument shall be set to “allowed”.</li> <li>• The second message shall contain the same ATS-message-Text as the first one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> <li>• In the third message the ATS-message-Text shall contain one IA5 alphabetical character that is not authorized by ICAO Annex 10, e.g. a lower case character, and the <i>conversion-with-loss-prohibited</i> argument shall be set to “allowed”.</li> <li>• The fourth message shall contain the same ATS-message-Text as the third one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> <li>• In the fifth message the ATS-message-Text shall contain an IA5 character sequence that is not authorized by ICAO Annex 10, e.g. the sequence “ZCZC” (0x5A 0x43 0x5A 0x43), and the <i>conversion-with-loss-prohibited</i> argument shall be set to “allowed”.</li> <li>• The sixth message shall contain the same ATS-message-Text as the fifth one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> </ul> <p>Verify that messages are received at the AFTN/CIDIN test interface of the AMHS Test Tool, if the <i>conversion-with-loss-prohibited</i> argument was set to “allowed”. Check the format of the AFTN messages resulting from the conversion. The AFTN messages shall contain only characters authorized by ICAO Annex 10. Each lower case IA5 character shall be replaced by the equivalent upper case character. Each other not authorized character shall be replaced by one “?” (0x3F) character. Not authorized character sequences shall be replaced by an equivalent number of “?” (0x3F) characters.</p>

	<p>Verify that messages are subject to rejection if the conversion-with-loss-prohibited argument was set to “prohibited”. Verify that in each case an NDR is generated and received by the AMHS Test Tool via the transfer port <i>trp1</i> with the following values:</p> <p>For the second message:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> <li>• “punctuation-symbol-loss” for the <i>non-delivery-diagnostic-code</i>.</li> </ul> <p>For the fourth message:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> <li>• “alphabetic-character-loss” for the <i>non-delivery-diagnostic-code</i>.</li> </ul> <p>For the sixth message:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> <li>• “conversion-with-loss-prohibited” for the <i>non-delivery-diagnostic-code</i></li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.6 c), d) and 4.5.2.2.11
<b>Test class</b>	Normal AMHS communications (N)

*Note. – The X.400 argument **conversion-with-loss-prohibited** is based on an enumeration type and takes one of the values “**conversion-with-loss-allowed**” (0) or “**conversion-with-loss-prohibited**” (1). In absence of the argument, the default value “**conversion-with-loss-allowed**” is assumed. This argument should not be confused with the value “**conversion-with-loss-prohibited**” (19) of the X.400 argument **non-delivery-diagnostic code**.*

**CT408b – Convert or reject an IPM, if the ATS-message-Text contains non-IA5IRV or control characters**

<b>CT408b</b>	<b>Convert or reject an IPM, if the ATS-message-Text contains non-IA5IRV or control characters</b>
Test criteria	This test is successful, if the IUT converts a received IPM containing an ATS-message-Text with non-IA5IRV or control characters, if <i>conversion-with-loss-prohibited</i> argument is set to “allowed” and rejects the IPM and generates an NDR if the <i>conversion-with-loss-prohibited</i> argument is set to “prohibited”.
Scenario description	<p>From the AMHS Test Tool send four ATS messages (IPMs) to the IUT transfer port <i>trp1</i>. The messages shall have both the <i>originator-report-request</i> and the <i>originating-MTA-report-request</i> flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/CIDIN port <i>cid1</i>. Furthermore, each message shall have a general-text-body-part with character set registration numbers 1, 6, 100.</p> <ul style="list-style-type: none"> <li>• In the first message the ATS-message-Text shall contain one or more non-IA5IRV characters, e.g. any character with a hex value from 0x80 to 0xFF and the <i>conversion-with-loss-prohibited</i> argument shall be set to “allowed”.</li> <li>• The second message shall contain the same ATS-message-Text as the first one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> <li>• In the third message the ATS-message-Text shall contain one or more control characters, e.g. &lt;SOH&gt; (0x01), &lt;STX&gt; (0x02), &lt;ETX&gt; (0x03), and the <i>conversion-with-loss-prohibited</i> argument shall be set to “allowed”.</li> <li>• The fourth message shall contain the same ATS-message-Text as the third one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> </ul> <p>a) In case the local policy of the AMHS management domain is to support the conversion of non-IA5IRV characters, verify that the messages are received at the AFTN/CIDIN test interface of the AMHS Test Tool, if the <i>conversion-with-loss-prohibited</i> arguments were set to “allowed”. Check the format of the AFTN messages resulting from the conversion. The AFTN messages shall contain only characters authorized by ICAO Annex 10. Each non-IA5IRV character shall be replaced by an IA5IRV character according to the locally defined conversion rules. Each control character shall be replaced by a question mark (“?”).</p> <p>Verify that the messages are subject to rejection if the <i>conversion-with-loss-prohibited</i> arguments were set to “prohibited”. Verify that NDRs are generated and received by the AMHS Test Tool via the transfer port <i>trp1</i> with the following values:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> <li>• “conversion-with-loss-prohibited” for the <i>non-delivery-diagnostic-code</i>.</li> </ul>

	<p>b) Otherwise, verify that the messages are subject to rejection and that NDRs are generated and received by the AMHS Test Tool via the transfer port trp1 with the following values:</p> <ul style="list-style-type: none"><li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li><li>• “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and</li></ul> <p>“unable to convert to AFTN due to unsupported body part type” for the <i>supplementary-information</i>.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.4, 4.5.2.2.11
<b>Test class</b>	Normal AMHS communications (N)



**CT408c – Convert or reject an IPM, if the optional-heading-information contains IA5 characters or IA5 character sequences not authorized by ICAO Annex 10**

CT408c	<b>Convert or reject an IPM, if the optional-heading-information contains IA5 characters or IA5 character sequences not authorized by ICAO Annex 10</b>
Test criteria	This test is successful, if the IUT converts a received IPM containing an optional-heading-information with IA5 characters or IA5 character sequences not authorized by ICAO Annex 10, if the <i>conversion-with-loss-prohibited</i> argument is set to “allowed” and rejects the IPM and generates an NDR if the <i>conversion-with-loss-prohibited</i> argument is set to “prohibited”.
Scenario description	<p>From the AMHS Test Tool send six ATS messages (IPMs) to the IUT transfer port <i>trp1</i>. The messages shall have both the <i>originator-report-request</i> and the <i>originating-MTA-report-request</i> flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/CIDIN port <i>cid1</i>.</p> <ul style="list-style-type: none"> <li>• In the first message the optional-heading-information shall contain one IA5 punctuation symbol that is not authorized by ICAO Annex 10, e.g. “,” (0x3B), and the <i>conversion-with loss-prohibited</i> argument set shall be to “allowed”.</li> <li>• The second message shall contain the same optional-heading-information as the first one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> <li>• In the third message the optional-heading-information shall contain an IA5 alphabetical character that is not authorized by ICAO Annex 10, e.g. a lower case character, and the <i>conversion-with-loss-prohibited</i> argument shall be set to “allowed”.</li> <li>• The fourth message shall contain the same optional-heading-information as the third one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> <li>• In the fifth message the optional-heading-information shall contain a character sequence that is not authorized by ICAO Annex 10, e.g. the sequence “NNNN” (0x4E 0x4E 0x4E 0x4E), and the <i>conversion-with-loss-prohibited</i> argument shall be set to “allowed”.</li> <li>• The sixth message shall contain the same optional-heading-information as the fifth one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> </ul> <p>Verify that messages are received at the AFTN/CIDIN test interface of the AMHS Test Tool, if the <i>conversion-with-loss-prohibited</i> argument was set to “allowed”. Check the format of the AFTN messages resulting from the conversion. The AFTN messages shall only contain characters authorized by ICAO Annex 10. Each lower case character shall be replaced by the equivalent upper case character. Each other not authorized character shall be replaced by one “?” (0x3F) character. Not authorized character sequences shall be replaced by an equivalent number of “?” (0x3F) characters.</p> <p>Verify that messages are subject to rejection if the <i>conversion-with-loss-</i></p>

	<p><i>prohibited</i> argument was set to “prohibited”. Verify that in each case an NDR is generated and received by the AMHS Test Tool via the transfer port <i>trp1</i> with the following values:</p> <p>For the second message:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> <li>• “punctuation-symbol-loss” for the <i>non-delivery-diagnostic-code</i>.</li> </ul> <p>For the fourth message:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> </ul> <p>“alphabetic-character-loss” for the <i>non-delivery-diagnostic-code</i>.</p> <p>For the sixth message:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> <li>• “conversion-with-loss-prohibited” for the <i>non-delivery-diagnostic-code</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

**CT408d – Convert or reject an IPM, if the optional-heading-information contains non-IA5IRV or control characters**

<b>CT408d</b>	<b>Convert or reject an IPM, if the optional-heading-information contains non-IA5 IRV or control characters</b>
Test criteria	This test is successful, if the IUT converts a received IPM containing an optional-heading-information with non-IA5 IRV or control characters, if the <i>conversion-with-loss-prohibited</i> argument is set to “allowed” and rejects the IPM and generates an NDR if the conversion-with-loss-prohibited argument is set to “prohibited”.
Scenario description	<p>From the AMHS Test Tool send four ATS messages (IPMs) to the IUT transfer port <i>trp1</i>. The messages shall have both the <i>originator-report-request</i> and the <i>originating-MTA-report-request</i> flag set to “non-delivery-report” and contain the recipient address of an AFTN user reachable via the AFTN/CIDIN port <i>cid1</i>. Furthermore, each message shall have a general-text-body-part with character set registration numbers 1, 6, 100.</p> <ul style="list-style-type: none"> <li>• In the first message the optional-heading-information shall contain one or more non-IA5IRV characters, e.g. any character with a hex value from 0x80 to 0xFF, and the <i>conversion-with loss-prohibited</i> argument shall be set to “allowed”.</li> <li>• The second message shall contain the same optional-heading-information as the first one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> <li>• In the third message the optional-heading-information shall contain one or more control characters, e.g. &lt;SOH&gt; (0x01), &lt;STX&gt; (0x02), &lt;ETX&gt; (0x03), and the <i>conversion-with-loss-prohibited argument</i> shall be set to “allowed”.</li> <li>• The fourth message shall contain the same optional-heading-information as the third one, but have the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</li> </ul> <p>a) In case the local policy of the AMHS management domain is to support the conversion of non-IA5IRV characters, verify that the messages are received at the AFTN/CIDIN test interface of the AMHS Test Tool, if the <i>conversion-with-loss-prohibited</i> arguments were set to “allowed”. Check the format of the AFTN message resulting from the conversion. The AFTN messages shall only contain characters authorized by ICAO Annex 10. Each non-IA5IRV character shall be replaced by an IA5IRV character according to the locally defined conversion rules.</p> <p>Verify that the message is subject to rejection only if the <i>conversion-with-loss-prohibited</i> was set to “prohibited”. Verify that NDRs are generated and received by the AMHS Test Tool via the transfer port <i>trp1</i> with the following values:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> <li>• “conversion-with-loss-prohibited” for the <i>non-delivery-diagnostic-code</i></li> </ul>

	<p>b) Otherwise, verify that the messages are subject to rejection and that NDRs are generated and received by the AMHS Test Tool via the transfer port trp1 with the following values:</p> <ul style="list-style-type: none"><li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li><li>• “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and</li><li>• “unable to convert to AFTN due to unsupported body part type” for the <i>supplementary-information</i>.</li></ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.4
<b>Test class</b>	Normal AMHS communications (N)

### **CT408e – Convert or reject an IPM if its conversion causes multiple types of information loss**

<b>CT408e</b>	<b><u>Convert or reject an IPM if its conversion causes multiple types of information loss</u></b>
Test criteria	This test is successful if the IUT rejects IPMs with ATS-message-Text and/or optional-heading-information containing different types of information loss and creates NDRs if the <i>conversion-with-loss-prohibited</i> argument is set to “prohibited”.
Scenario description	<p>From the AMHS test tool send five ATS messages (IPMs), each of them with the <i>conversion-with-loss-prohibited</i> argument set to “prohibited”.</p> <ul style="list-style-type: none"> <li>• In the first message the ATS-message-Text shall contain a line longer than 69 characters and a punctuation symbol not authorized by ICAO Annex 10, e.g. “;” (0x3B).</li> <li>• In the second message the optional-heading-information shall contain an IA5IRV alphabetical character and a punctuation symbol, both not authorized by ICAO Annex 10, e.g. a lower case character and the punctuation symbol “;” (0x3B).</li> <li>• The third message shall have a general-text-body-part with character set registration numbers 1, 6, 100. The optional-heading-information shall contain an IA5IRV alphabetical character not authorized by ICAO Annex 10, and the ATS-message-Text shall contain a non-IA5IRV character, e.g. any character with a hex value from 0x80 to 0xFF.</li> <li>• In the fourth message the optional-heading-information shall contain a sequence of IA5IRV characters not authorized by ICAO Annex 10, e.g. “ZCZC”, and the ATS-message-Text shall contain a line longer than 69 characters.</li> <li>• In the fifth message the optional-heading-information shall contain a punctuation symbol not authorized by ICAO Annex 10, e.g. “;” (0x3B), and the ATS-message-Text shall contain a control character, e.g. &lt;SOH&gt; (0x01), &lt;STX&gt; (0x02), &lt;ETX&gt; (0x03).</li> </ul> <p>Verify that all messages are rejected and NDRs are generated and received by the AMHS Test Tool via the transfer port <i>trp1</i>.</p> <p>a) For the first, second, fourth and fifth message, and for the third message in case the local policy of the AMHS management domain is to support the conversion of non-IA5IRV characters, the NDRs shall contain the following values:</p> <ul style="list-style-type: none"> <li>• “conversion-not-performed” for the <i>non-delivery-reason-code</i>, and</li> <li>• “multiple-information-loss” for the <i>non-delivery-diagnostic-code</i>.</li> </ul> <p>b) In case the local policy of the AMHS management domain is not to</p>

	<p>support the conversion of non-IA5IRV characters, for the third message the NDR shall contain the following values:</p> <ul style="list-style-type: none"><li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li><li>• “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and</li><li>• “unable to convert to AFTN due to unsupported body part type” for the <i>supplementary-information</i>.</li></ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.4, 4.5.2.1.6 e)
<b>Test class</b>	Normal AMHS communications (N)

**4.4.9 CT409 – Reject an IPM with multiple body part**

<b>CT409</b>	<b>Reject an IPM with multiple body parts</b>
<b>Test criteria</b>	This test is successful, if the IUT generates a NDR, if it receives an IPM addressed to an AFTN user containing multiple body parts.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an ATS message (IPM) to the IUT transfer port <i>trp1</i>. The message shall contain two (or more) ia5-text body parts.</p> <p>Verify that a NDR is generated and received by AMHS Test Tool via the transfer port <i>trp1</i> with the following elements:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li> <li>• “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and</li> <li>• “unable to convert to AFTN due to multiple body parts” for the <i>supplementary-information</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.3
<b>Test class</b>	Erroneous AMHS parameters (E1)

**4.4.10 CT410 – Distribute an IPM to AMHS and AFTN users**

<b>CT410</b>	<b>Distribute an IPM to AMHS and AFTN users</b>
<b>Test criteria</b>	This test is successful, if the IUT distributes an IPM addressing both an AMHS and an AFTN user correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send two ATS messages (IPMs) addressing both AMHS and AFTN users to the IUT via transfer port trp1.</p> <ul style="list-style-type: none"> <li>• The IPM Heading of the first message shall contain two primary recipients, which are one AMHS and one AFTN user and two copy recipients, which are also one AMHS and one AFTN user. All four addresses shall be contained as recipient-names in the Message Transfer Envelope (MTE).</li> <li>• The IPM Heading of the second message shall contain two primary recipients, which are one AMHS and one AFTN user and two blind copy recipients, which are also one AMHS and one AFTN user. Only the two blind-copy addresses shall be contained as recipient-names in the Message Transfer Envelope (MTE).</li> </ul> <p>The message shall have the originator-report-request flag set to “non-delivery-report”.</p> <p>Verify that both messages (IPMs) are:</p> <ul style="list-style-type: none"> <li>• relayed to AMHS transfer port trp2, and</li> <li>• relayed and converted to AFTN format and transferred via the AFTN/CIDIN port cid1.</li> </ul> <p>Check the messages received at the AMHS-interface. Verify that:</p> <ul style="list-style-type: none"> <li>• the first message contains an MTE with all AMHS recipient addresses and an IPM heading with all AMHS and AFTN recipients, and</li> <li>• the second message contains an MTE with the AMHS recipient address, which was the blind-copy recipient and an IPM heading with all AMHS and AFTN recipients.</li> </ul> <p>Check the messages received at the AFTN/CIDIN port. Verify that:</p> <ul style="list-style-type: none"> <li>• the first message contains the addressee indicators of both AFTN users, and</li> <li>• the second message contains the addressee indicator of the AFTN user, which was the blind-copy recipient.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent), 3.2 (ATS Message Server), 4.5.2 (IPM conversion)
<b>Test class</b>	Normal AMHS communications (N)



**4.4.11 CT411 – Expand a DL addressing both AMHS and AFTN users**

<b>CT411</b>	<b>Expand a DL addressing both AMHS and AFTN users</b>
<b>Test criteria</b>	This test is successful, if the IUT distributes an IPM addressing AMHS and AFTN users in a distribution list correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send two ATS messages (IPM) to the IUT transfer port <i>trp1</i>. The recipient contained in the MTE, shall address a distribution list, for which the IUT is responsible. The distribution list shall address one AMHS user and two AFTN users. The AMHS user is reachable via the AMHS transfer port <i>trp2</i> and the AFTN users are reachable via the AFTN/CIDIN port <i>cid1</i>. The first message shall have the <i>dl-expansion-prohibited</i> flag set to “false” and the second to “true”.</p> <p>Check the messages received at the AMHS and AFTN/CIDIN interfaces of the AMHS Test Tool.</p> <p>Verify that only the first IPM is:</p> <ul style="list-style-type: none"> <li>transferred via AMHS transfer port <i>trp2</i>, and</li> <li>converted to AFTN format and transferred via the AFTN/CIDIN port <i>cid1</i>.</li> </ul> <p>Verify for the first IPM that:</p> <ul style="list-style-type: none"> <li>one message is received at the AMHS-interface <i>trp2</i> containing (only) the AMHS recipient address in the MTE and the DL recipient address in the IPM heading</li> <li>one AFTN message is received at the AFTN/CIDIN-interface containing the addresses of both AFTN users</li> </ul> <p>Verify for the second message that:</p> <ul style="list-style-type: none"> <li>a NDR is returned to <i>trp1</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.2.2.1 (DL functional group), 4.5.2 (IPM conversion)
<b>Test class</b>	Normal AMHS communications (N)

*Note.* – The X.400 argument ***dl-expansion-prohibited*** is based on an enumeration type and takes one of the values ***dl-expansion-allowed*** (0) or ***dl-expansion-prohibited*** (1). In absence of the argument, the default value ***dl-expansion-allowed*** is assumed.

**4.4.12 CT412 –Split or reject an incoming IPM addressing more than 21 AFTN users**

<b>CT412</b>	<b>Split or reject an incoming IPM addressing more than 21 AFTN users</b>
<b>Test criteria</b>	<p>This test is successful, if the IUT receives an ATS message (IPM) addressing more than 21 AFTN users and</p> <ul style="list-style-type: none"> <li>a) splits the received IPM into several messages, each addressing 21 or less AFTN users if no more than 512 AFTN users are addressed, or</li> <li>b) rejects the received IPM and returns a NDR if more than 512 AFTN users are addressed.</li> </ul> <p><i>Note.– With the resolution of PDR M4050004 a message with more than 21, but no more than 512 recipient addresses must not be rejected by the gateway.</i></p>
<b>Scenario description</b>	<p>From the AMHS Test Tool send two ATS messages (IPM) to the IUT transfer port <i>trp1</i>. The message shall have the <i>originator-report-request</i> flag set to “non-delivery-report”.</p> <ul style="list-style-type: none"> <li>• Send one IPM with 512 recipients.</li> </ul> <p>Verify that this message is split into 25 AFTN messages, each of the first 24 messages containing 21 addresses, the last one containing 8 addresses.</p> <ul style="list-style-type: none"> <li>• Send one IPM with 513 recipients.</li> </ul> <p>Verify that the IUT does <u>not</u> convert the AMHS message into AFTN format, but returns a NDR via its transfer port <i>trp1</i> with the following elements:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li> <li>• “too-many-recipients” for the <i>non-delivery-diagnostic-code</i>, and</li> <li>• “unable to convert to AFTN due to number of recipients” for the <i>supplementary-information</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.8
<b>Test class</b>	Normal AMHS communications (N)

**4.4.13 CT413 – Remove an unknown address before conversion into AFTN format**

<b>CT413</b>	<b>Remove an unknown address before conversion into AFTN format</b>
<b>Test criteria</b>	This test is successful, if the IUT that receives an ATS message (IPM) addressed to multiple AFTN users removes any unknown address before conversion.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an ATS message (IPM) to the IUT via AMHS transfer port <i>trp1</i>. The message shall have two (primary) recipients addressing two AFTN users. Only the AMHS address of the first AFTN user can be translated by the MTCU into a valid AFTN addressee indicator, the AMHS address of the second AFTN user is unknown and the MTCU cannot find a match in its address look-up table.</p> <p>Check the messages received at the AMHS- and AFTN/CIDIN-interfaces of the AMHS Test Tool. Verify that the IUT:</p> <ul style="list-style-type: none"> <li>• converts the received AMHS message into AFTN format, removes the unknown address and sends it via the AFTN/CIDIN-interfaces <i>cid1</i>,</li> <li>• returns a NDR via transfer port <i>trp1</i> for the unknown recipient.</li> </ul> <p>Verify that the NDR contains the following elements (as specified in the Doc 9880, Part II, section 4.5.2.2.7 d):</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>, and</li> <li>• “unrecognised-OR-name” for the <i>non-delivery-diagnostic-code</i></li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.2.7
<b>Test class</b>	Normal AMHS communications (N)

**4.4.14 CT414 – Convert an incoming AFTN acknowledgement**

<b>CT414</b>	<b>Convert an incoming AFTN acknowledgement</b>
<b>Test criteria</b>	This test is successful, if the IUT converts an AFTN acknowledgement (SS ACK) message to a receipt notification or to an IPM (as recommended in EUR AMHS Manual section 8.5) correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface <i>trp1</i> to the IUT addressing a remote AFTN user reachable via the AFTN/CIDIN test interface <i>cid1</i>. The IPM shall have the <i>receipt-notification</i> request flag activated and the <i>ATS-message-priority</i> shall have the value “SS”. This is considered the subject message. The IUT shall convert the AMHS message to an AFTN message with priority indicator “SS” and send it via the AFTN/CIDIN test interface <i>cid1</i> to the AMHS Test Tool.</p> <p>Upon receipt of the AFTN message, the AMHS Test Tool shall return an AFTN acknowledgement related to the received AFTN message to the IUT (via the AFTN/CIDIN test interface <i>cid1</i>). The IUT shall</p> <ul style="list-style-type: none"> <li>• a) convert this AFTN acknowledgement to an AMHS receipt notification, or</li> <li>• b) convert this AFTN acknowledgment to an IPM</li> </ul> <p>and send it via the AMHS test interface <i>trp1</i>.</p> <p><i>If case a) is implemented:</i> Verify that the AMHS Test Tool receives a receipt notification. In particular, verify that:</p> <ul style="list-style-type: none"> <li>• the originator indicator contained in the AFTN acknowledgement is translated to the <i>ipn-originator</i> (IPN) and the <i>originator-name</i> (MTE),</li> <li>• the <i>receipt-time</i> of the IPN is generated from the <i>filing time</i> of the AFTN acknowledgement,</li> <li>• the value of the <i>priority</i> element in the MTE is set to “urgent” (see Table 19),</li> <li>• the values of <i>subject-ipm</i> and <i>recipient-name</i> are inserted correctly from log entries.</li> </ul> <p><i>If case b) is implemented:</i> Verify that the AMHS Test Tool receives an IPM containing the following elements:</p> <ul style="list-style-type: none"> <li>• a <i>subject</i> element in the IPM heading fields taking the value “AFTN service information”,</li> <li>• an <i>ATS-message-text</i> containing the text of the AFTN acknowledgement message.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.3 (conversion of AFTN acknowledgement messages)

<b>Test class</b>	Normal AMHS communications (N)
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*Note.— If the IUT is configurable to operate each of the two conversion options, this conformance test is passed, if case a) and case b) have both been verified successfully.*

**4.4.15 CT415 – Incoming AFTN acknowledgement with unknown AFTN originator**

<b>CT415</b>	<b>Incoming AFTN acknowledgement with unknown AFTN originator</b>
<b>Test criteria</b>	This test is successful, if the IUT informs its control position, when the AFTN acknowledgement (SS ACK message) cannot be converted because the AFTN originator is unknown.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface <i>trp1</i> to the IUT addressing a remote AFTN user reachable via the AFTN/CIDIN test interface <i>cid1</i>. The IPM shall have the <i>receipt-notification</i> request flag activated and the <i>ATS-message-priority</i> shall have the value “SS”. The IUT shall convert the AMHS message to an AFTN message with priority indicator “SS” and send it via the AFTN/CIDIN test interface <i>cid1</i> to the AMHS Test Tool.</p> <p>Upon receipt of the AFTN message, the AMHS Test Tool shall return an AFTN acknowledgement (SS ACK) to the IUT (via the AFTN/CIDIN test interface <i>cid1</i>). The subject message shall refer to the received AFTN user message, but the originator of the AFTN acknowledgement (SS ACK) message shall be unknown to the IUT, i.e. not contained in any of the IUT’s conversion or address mapping tables.</p> <p>Check the output of the IUT at the AMHS test interfaces and the control position.</p> <p>Verify that the IUT does not send any IPM nor IPN via the AMHS transfer port, but reports the error situation to the control position.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.3.2.3
<b>Test class</b>	MHS/AMHS procedural errors (E2)

#### **4.4.16 CT416 – Incoming AFTN acknowledgement relating to a subject message without receipt-notification request**

<b>CT416</b>	<b>Incoming AFTN acknowledgement relating to a subject message without receipt-notification request</b>
<b>Test criteria</b>	This test is successful, if the IUT encapsulates a received AFTN acknowledgement (SS ACK message) into an IPM, if the subject message did not have the receipt notification flag set.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface <i>trp1</i> to the IUT addressing a remote AFTN user reachable via the AFTN/CIDIN test interface <i>cid1</i>. The message shall have the <i>ATS-message-priority</i> set to “SS”, however, the <i>receipt-notification-request</i> shall be deactivated. The IUT shall convert the AMHS message into an AFTN message with priority indicator “SS” and send it over the AFTN/CIDIN test interface <i>cid1</i> to the AMHS Test Tool.</p> <p>Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN SS acknowledgement to the IUT with the subject message relating to the previously received AFTN user message. Since the initial ATS message (IPM) did not have the <i>receipt-notification-request</i> activated, the IUT shall <u>not</u> convert the AFTN acknowledgement into a RN, but encapsulate the AFTN acknowledgement into an IPM, instead.</p> <p>Check the output of the IUT at the AMHS test interface <i>trp1</i> and the control position. Verify that the IUT sends an ATS message (IPM) with the addressed AMHS user as recipient.</p> <p>Verify that the message contains the original AFTN acknowledgement in the ATS-message-text of the IPM body.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.3.1.2
<b>Test class</b>	MHS procedural errors (E2), Erroneous AMHS parameter (E1)

**4.4.17 CT417 – Incoming AFTN acknowledgement without related subject message**

<b>CT417</b>	Incoming AFTN acknowledgement without related subject message
<b>Test criteria</b>	This test is successful, if the IUT encapsulates a received AFTN acknowledgement (SS ACK message) into an IPM, if the subject message did not pass the Gateway before.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an AFTN acknowledgement (SS ACK message) via the AFTN/CIDIN test interface <i>cid1</i> to the IUT addressing an AMHS user. The AFTN acknowledgement shall have a fictitious origin subject message in the message text.</p> <p>Check the output of the IUT at the AMHS transfer port and the control position.</p> <p>Verify that the IUT sends an IPM with the addressed AMHS user as recipient.</p> <p>Verify that the IPM contains the original AFTN acknowledgement in the ATS-message-text of the IPM body.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.3.1.1
<b>Test class</b>	MHS/AMHS procedural errors (E2)



**4.4.18 CT418 – Convert an AFTN SVC message “ADS UNKNOWN”**

<b>CT418</b>	<b>Convert an AFTN SVC message “ADS UNKNOWN”</b>
<b>Test criteria</b>	This test is successful, if the IUT converts a received AFTN SVC message “ADS UNKNOWN” to an IPM (as defined in ICAO Doc 9880, Part II, 2 <sup>nd</sup> Edition) correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an ATS message (IPM) via AMHS test interface <i>trp1</i> to the IUT addressing a remote AFTN user reachable via the AFTN/CIDIN test interface <i>cid1</i>. The IUT shall convert the IPM to an AFTN user message and send it over AFTN/CIDIN test interface <i>cid1</i> to the AMHS Test Tool.</p> <p>Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN SVC message “ADS UNKNOWN” to the IUT that relates to the formerly received message. The IUT shall convert this AFTN SVC message to an IPM.</p> <p>Verify that an IPM is generated (as defined in ICAO Doc 9880, Part II, Second Edition, section 4.4.4) and received by the AMHS Test Tool via the AMHS test interface <i>trp1</i> with the following elements:</p> <ul style="list-style-type: none"> <li>• a <i>subject</i> element in the IPM heading fields taking the value “AFTN service information”,</li> <li>• an <i>ATS-message-text</i> containing the text of the AFTN SVC message.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.4 (conversion of AFTN SVC message “ADS UNKNOWN”)
<b>Test class</b>	Normal AMHS communications (N)

Note. - CT418 was modified due to the publication of the 2<sup>nd</sup> edition of ICAO Doc 9880, Part II.

**4.4.19 CT419 – Incoming AFTN SVC message “ADS UNKNOWN” without related subject message**

<b>CT419</b>	<b>Incoming AFTN SVC “Unknown Addressee Indicator” without related subject message</b>
<b>Test criteria</b>	This test is successful, if the IUT encapsulates a received AFTN SVC message “ADS UNKNOWN” into an IPM, if the subject message did not pass the Gateway before.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an AFTN SVC message “ADS UNKNOWN” to the IUT addressing an AMHS user. The AFTN SVC message shall have a fictitious origin subject message in the message text.</p> <p>Check the output of the IUT at the AMHS transfer port. Verify that the IUT sends an IPM with the addressed AMHS user as recipient.</p> <p>Verify that the IPM contains the original AFTN SVC message in the IPM body (ATS-message-text).</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.4
<b>Test class</b>	MHS/AMHS procedural errors (E2)

**4.4.20 CT420 – Processing of an incoming AFTN SVC message “QTA RPT”**

<b>CT420</b>	<b>Processing of an incoming AFTN SVC message “QTA RPT”</b>
<b>Test criteria</b>	<p>This test is successful, if the IUT when receiving an AFTN SVC message “QTA RPT” either:</p> <ul style="list-style-type: none"> <li>• a) repeats the subject AFTN message, or</li> <li>• b) converts the AFTN SVC message into an IPM, if it is not in possession of an unmutilated copy of the AFTN subject message.</li> </ul>
<b>Scenario description</b>	<p>From the AMHS Test Tool send an ATS message (IPM) to the IUT addressing an AFTN user. The IUT shall convert the message into AFTN format and send it over the AFTN/CIDIN test interface to the AMHS Test Tool. Upon receipt of the AFTN user message the AMHS Test Tool shall return an AFTN SVC message “QTA RPT” related to the previously received AFTN message.</p> <p>Verify that the IUT does not translate the AFTN SVC message into an IPM, but processes the QTA RPT so that the previous message is sent to the AFTN user (automatically or by operator intervention) a second time.</p> <p>From the AMHS Test Tool send another AFTN SVC message “QTA RPT” to the IUT, which is not related to any subject AFTN message. Verify that the IUT converts the AFTN SVC message “QTA RPT” into an IPM containing the following elements:</p> <ul style="list-style-type: none"> <li>• a <i>subject</i> element in the IPM heading fields taking the value “AFTN service information”,</li> <li>• an <i>ATS-message-text</i> containing the text of the AFTN SVC message.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.2.1.12
<b>Test class</b>	Normal AMHS communications (N)

**4.4.21 CT421 – Probe Conveyance Test**

<b>CT421</b>	<b>Probe Conveyance Test</b>
<b>Test criteria</b>	This test is successful, if the IUT (receiving a probe with an AFTN user as intended recipient) generates a DR, if conversion to AFTN is possible or an NDR, if conversion to AFTN is not possible.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of AMHS probes to the IUT.</p> <ul style="list-style-type: none"> <li>Probe 1 shall specify a content-length of 1800 and address an AFTN user recipient reachable via the AFTN/AMHS Gateway.</li> <li>Probe 2 shall specify a content-length of 1800 and address an AFTN user recipient, which is routed by the IUT via the gateway (MTCU), but which cannot be mapped onto a valid AFTN address by the MTCU.</li> <li>Probe 3 shall specify a content-length of 1800 and address two AFTN user recipients, one which can be mapped and one which cannot be mapped onto a valid AFTN address.</li> <li>Probe 4 shall specify a content-length of 10.000 and address an AFTN user recipient reachable via the AFTN/AMHS Gateway.</li> <li>Probe 5 shall specify a content-length of 100.000 and address an AFTN user recipient reachable via the AFTN/AMHS Gateway.</li> <li>Probe 6 shall have a recipient argument addressing 512 AFTN users.</li> <li>Probe 7 shall have a recipient argument addressing more than 512 AFTN users.</li> </ul> <p>Check the messages received at the AMHS Test Tool-AMHS interface. Verify that the IUT returns a report for each probe. Check the report contents and determine if it is a DR, NDR or combined report:</p> <ul style="list-style-type: none"> <li>A DR shall be returned in response to probe 1.</li> <li>A NDR shall be returned in response to probe 2.</li> <li>A DR and NDR (one combined report or two reports) shall be returned in response to probe 3.</li> <li>Depending on the gateway's capabilities, a DR or NDR shall be returned for probe 4 and 5.</li> <li>A DR shall be returned for Probe 6.</li> <li>A NDR shall be returned for Probe 7.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.5 (reception of AMHS Probe)
<b>Test class</b>	Normal AMHS communications (N)

**4.4.22 CT422 – Reject an IPM with unsupported content-type**

<b>CT422</b>	<b>Reject an IPM with unsupported content-type</b>
<b>Test criteria</b>	This test is successful, if the IUT's gateway component rejects an incoming message of content-type other than IPM 88 and generates a NDR.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of messages to the IUT via transfer port <i>trp1</i> addressed to an AFTN user recipient. The messages shall have different values for the content-type contained in the MTE.</p> <ul style="list-style-type: none"> <li>• The 1st message shall contain a <i>built-in content-type</i> value "interpersonal-messaging-1988(22)".</li> <li>• The 2nd message shall contain a <i>built-in content-type</i> value "interpersonal-messaging-1984(2)".</li> <li>• The 3rd message shall contain a <i>built-in content-type</i> value "edi-messaging(35)".</li> <li>• The 4th message shall contain a <i>built-in content-type</i> value "unidentified(0)".</li> </ul> <p>All messages shall contain an IPM body with ATS-message-header and ATS-message-text.<sup>12</sup></p> <p>Verify that the IUT accepts and converts the 1st message, but rejects 2nd, the 3rd and 4th message. Verify that the IUT returns a NDR for the 2nd, 3rd and 4th message containing:</p> <ul style="list-style-type: none"> <li>• "unable-to-transfer" for the <i>non-delivery-reason-code</i>, and</li> <li>• "content-type-not-supported" for the <i>non-delivery-diagnostic-code</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.1.1
<b>Test class</b>	Normal AMHS communications (N), Erroneous AMHS parameters (E1)

<sup>12</sup> It is assumed that MTAs on the relay path do not verify the specified content-type against the contained body part(s) and transfer all type of messages towards the gateway (MTCU).

**4.4.23 CT423 – Processing of the original-encoded-information-types (EIT)**

CT423	Processing of the original-encoded-information-types (EIT)
<b>Test criteria</b>	<p>This test is successful, if the IUT's gateway component evaluates the original-encoded-information-types contained in the incoming ATS message and:</p> <ul style="list-style-type: none"> <li>• accepts (and converts) the message, if it contains one of those values specified in section 4.5.2.1.1 of the Doc 9880, Part II, or</li> <li>• rejects the message, if it does not contain any of those values and generates a NDR.</li> </ul>
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user. The messages shall have the following values for the <i>original-encoded-information-types</i> (EIT) contained in the Message Transfer Envelope (MTE)</p> <ul style="list-style-type: none"> <li>• The 1st message shall contain <i>built-in-encoded-information-types</i> with value "ia5-text(2)".</li> <li>• The 2nd message shall contain <i>built-in-encoded-information-types</i> with value "unknown(0)".</li> <li>• The 3rd message shall contain <i>extended-encoded-information-types</i> with OID "2.6.3.4.2" for ia5-text information types.</li> <li>• The 4th message shall contain <i>extended-encoded-information-types</i> with OID "2.6.3.4.0" for unknown information types.</li> <li>• The 5th message shall contain <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1}.</li> <li>• The 6th message shall contain <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}.</li> <li>• The 7th message shall contain <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and OID {id-cs-eit-authority 100}.</li> <li>• The 8th message shall contain <i>extended-encoded-information-types</i> with (invalid) OID {id-cs-eit-authority 3}.</li> <li>• The 9th message shall contain <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1}, OID {id-cs-eit-authority 6} and (invalid) OID {id-cs-eit-authority 7}.</li> <li>• The 10th message shall contain <i>built-in-encoded-information-types</i> with value "ia5-text(2)" and <i>extended-encoded-information-types</i> with OID "2.6.3.4.2" for ia5-text as well as OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6}.</li> </ul> <p>The messages shall contain a body part corresponding to the (first valid) <i>original-encoded-information-types</i> value.</p> <p>Verify that all messages with valid EIT argument are accepted by the</p>

	<p>IUT's gateway component, converted to AFTN format and received at the AFTN/CIDIN test interface of the AMHS Test Tool.</p> <p>Verify that all messages with any invalid EIT argument are rejected by the IUT and a NDR is returned via transfer port <i>trp1</i> with the following elements:</p> <ul style="list-style-type: none"><li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>, and</li><li>• “encoded-information-types-unsupported” for the <i>non-delivery-diagnostic-code</i>.</li></ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.1
<b>Test class</b>	Normal AMHS communications (N) and Erroneous AMHS parameters (E1)

**4.4.24 CT424 – Incoming IPM with an ia5-text-body-part**

<b>CT424</b>	<b>Incoming IPM with an ia5-text-body-part</b>
<b>Test criteria</b>	This test is successful, if the IUT's gateway component accepts a received ATS message (IPM) with an ia5-text-body-part and converts the IPM into AFTN format correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user.</p> <ul style="list-style-type: none"> <li>The first message shall contain an ia5-text-body-part, which includes an ATS-message-header and ATS-message-text with IA-5 characters. The <i>original-encoded-information-types</i> attribute shall contain <i>extended-encoded-information-types</i> with OID "2.6.3.4.2" (ia5-text).</li> <li>The second message shall be equal except for the <i>original-encoded-information-types</i>, which has a <u>built-in</u> value for ia5-text(2)<sup>13</sup>.</li> <li>The third message shall be equal to the first, but the <i>repertoire</i> argument in the body shall be ita2(2).</li> </ul> <p>Verify that the first and second messages are accepted by the IUT's gateway component, converted to AFTN format and received at the AFTN/CIDIN test interface of the AMHS Test Tool.</p> <p>Check whether the third message is converted into AFTN format or rejected by the IUT. In case of rejection verify that an NDR is returned via transfer port <i>trp1</i> with the following elements:</p> <ul style="list-style-type: none"> <li>"unable-to-transfer" for the <i>non-delivery-reason-code</i>,</li> <li>"content-syntax-error" for the <i>non-delivery-diagnostic-code</i>, and</li> <li>"unable to convert to AFTN due to unsupported body part type" for the <i>supplementary-information</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.4 a) 2) and 4.5.2.1.4 b) 2)
<b>Test class</b>	Normal AMHS communications (N)

*Note.* – The X.400 argument **repertoire** is based on an enumeration type and takes one of the values **ita2** (2) or **ia5** (5). In absence of the argument, the default value **ia5** is assumed.

**4.4.25 CT425 – Incoming IPM with a general-text-body-part and ISO 646 repertoire**

<sup>13</sup> It is assumed that an extended ia5-text-body-part can be associated with either a built-in EIT or extended EIT value for ia5-text.



<b>CT425</b>	<b>Incoming IPM with a general-text-body-part and ISO 646 repertoire</b>
<b>Test criteria</b>	This test is successful, if the IUT's gateway component accepts a received ATS message (IPM) with a general-text-body-part of which the repertoire set description is Basic (ISO 646) and converts the IPM into AFTN format correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user recipient. All messages shall contain a general-text-body-part, which includes an ATS-message-header and ATS-message-text with general-text data. The <i>original-encoded-information-types</i> shall be set to <i>extended-encoded-information-types</i> with OID {id-cs-eit-authority 1} and OID {id-cs-eit-authority 6} and the <i>conversion-with-loss-prohibited</i> argument shall be set to "false".</p> <ul style="list-style-type: none"> <li>The 1st message shall contain character set registration numbers 1 and 6, which specify the Basic ISO 646 repertoire, and the text shall contain ISO 646 (US-ASCII) characters (see <i>Table 17</i>), only.</li> <li>The 2nd message shall contain character set registration numbers 1 and 6, which specify the Basic ISO 646 repertoire, but the text shall contain US-ASCII as well as non-listed US-ASCII characters.</li> </ul> <p>Verify that both messages are accepted by the IUT's gateway component, converted to AFTN format and received at the AFTN/CIDIN interface of the AMHS Test Tool. Analyse the received AFTN messages with respect to the AFTN message text. In the second message non-listed US-ASCII characters shall be replaced by question marks.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.4 a) 3)
<b>Test class</b>	Normal AMHS communications (N)

20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	
	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/	
30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?	
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_	
60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F	
€	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	
70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F	
p	q	r	s	t	u	v	w	x	y	z	{		}	~		

Table 17: The ISO 646 (US-ASCII) character set

#### **4.4.26 CT426 – Incoming IPM with a general-text-body-part and a repertoire different from ISO 646**

<b>CT426</b>	<b><u>Incoming IPM with a general-text-body-part and a repertoire different from ISO 646</u></b>
<b>Test criteria</b>	<p>This test is successful, if the IUT's gateway component processes a received ATS message (IPM) with a general-text-body-part of which the repertoire set description is different from ISO 646 according to its local AMHS Management Domain policy.</p> <p><i>Note.– Depending on the local policy of the AMHS Management Domain a received message with a general-text-body-part of which the repertoire set description is different from ISO 646 can be converted or rejected.</i></p>
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user recipient. All messages shall contain a general-text-body-part, which includes an ATS-message-header and ATS-message-text with general-text data. The <i>original-encoded-information-types</i> shall be set to <i>extended-encoded-information-types</i> with <i>eit-authority</i> 100} and the <i>implicit-conversion-prohibited</i> argument shall be set to “false”.</p> <p>The message text (data part) shall include ISO 646 (US-ASCII) and non-listed US-ASCII characters. The parameter argument in the IPM body part shall specify the following character sets:</p> <ul style="list-style-type: none"> <li>• The 1st message shall contain character set registration numbers 1, 6 and 100 which specify the ISO 8859-1 repertoire, i.e. ASCII plus Western European supplementary set (see <i>Table 18</i>).</li> <li>• The 2nd message shall contain character set registration numbers, which specify a repertoire from one of the following listed in A.1.3.2 of ISO/IEC ISP 12062-2: Cyrillic, Arabic, Greek or Hebrew .</li> <li>• The 3rd message shall contain character set registration numbers, which specify a repertoire from one of the following listed in A.1.3.2 of ISO/IEC ISP 12062-2: Chinese, Japanese or Korean.</li> </ul> <p>Check, if the messages are converted or rejected by the IUT according to its local policy.</p> <p>In case of conversion, analyse the received AFTN messages with respect to the characters contained in the AFTN message text.</p> <p>In case of message rejection, check, if the NDR returned via transfer port <i>trp1</i> contains the following elements:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li> <li>• “content-syntax-error” for the <i>non-delivery-diagnostic-code</i>, and</li> <li>• “unable to convert to AFTN due to unsupported body part type” for the <i>supplementary-information</i>.</li> </ul>
<b>AMHS ref.: Doc</b>	4.5.2.1.4 a) 4)

<b>9880, Part II</b>	4.5.2.1.4 b)
<b>Test class</b>	Normal AMHS communications (N) and Erroneous AMHS parameters (E1)

A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	AA	AB	AC	AD	AE	AF
	ı	Φ	£	¥	¥	ı	§	..	©	≡	«	¬	—	®	—
B0	°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾
C0	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î
D0	Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ
E0	à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î
F0	ö	ñ	õ	ö	ö	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

Table 18: The ISO 8859-1 character set

## 4.5 Gateway Operations (AFTN to AMHS)

### 4.5.1 CT501 – Convert an AFTN user message to AMHS format

<b>CT501</b>	<b>Convert an AFTN user message to AMHS format</b>
<b>Test criteria</b>	This test is successful, if the IUT converts an AFTN user message to an AMHS message (IPM) correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/CIDIN test interface to the IUT. The sequence of AFTN user messages shall address a remote AMHS user and consist of five messages, one for each AFTN priority, i.e. SS, DD, FF, GG, KK. The filing time shall be different for each message and the OHI field shall be empty for all messages<sup>14</sup>.</p> <p>Check the IPMs that the AMHS Test Tool receives from the IUT via the AMHS transfer port. Verify that the IUT has converted the messages correctly according to Table 4-3 of the Doc 9880, Part II – see section 4.4.2. Check message envelopes and contents. In particular, verify that:</p> <ul style="list-style-type: none"> <li>the <i>ATS-message-header</i> and <i>ATS-message-text</i> in the IPM body part has the correct format,</li> <li>the AFTN message text is correctly inserted in the <i>ATS-message-text</i> field,</li> <li>the AFTN message priority is correctly inserted in the <i>ATS-message-priority</i> field,</li> <li>that the IUT has translated the AFTN priority indicator and inserted the correct priority in the message transfer envelope (MTE) – see Table 19,</li> <li>the addressee indicator is correctly translated in the corresponding AMHS OR address and entered as <i>primary-recipient</i> in the IPM heading and as <i>recipient-name</i> in the MTE,</li> <li>the AFTN originator is translated in the AMHS OR address which was registered for identification of the AFTN originator in the AMHS and allocated to the elements <i>originator</i> (MTE), <i>originator-name</i> and the sub-component user of the element <i>this-IPM</i> (IPM heading),</li> <li>the filing time is correctly inserted in the <i>ATS-message-header</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.2
<b>Test class</b>	Normal AMHS communications (N)

<sup>14</sup> Conversion of the optional-heading-information element is subject to another test.

AFTN Priority Indicator	AMHS MTE priority	AMHS ATS-Message-Priority priority-indicator
SS	urgent	SS
DD	normal	DD
FF	normal	FF
GG	non-urgent	GG
KK	non-urgent	KK

**Table 19: Mapping of AFTN Priority Indicator for the Basic ATS Message Handling Service<sup>15</sup>**

*Note.* – The X.400 argument **priority** is based on an enumeration type and takes one of the values **normal** (0), **non-urgent** (1), or **urgent** (2). In absence of the argument, the default value **normal** is assumed.

<sup>15</sup> The mapping of the AFTN priority indicator is specified in Table 4-2 of Doc 9880, Part II [2].

#### **4.5.2 CT502 – Convert an AFTN user message containing optional heading information**

<b>CT502</b>	<b>Convert an AFTN user message containing optional heading information</b>
<b>Test criteria</b>	This test is successful, if the IUT converts an AFTN user message containing optional heading information (OHI) correctly into an AMHS message (IPM).
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/CIDIN test interface to the IUT. The sequence of AFTN user messages shall address a remote AMHS user and consist of</p> <ul style="list-style-type: none"> <li>• a normal (non-SS) priority AFTN message containing (short) OHI text,</li> <li>• a normal (non-SS) priority AFTN message containing OHI filling the originator line,</li> <li>• an SS priority AFTN message containing (short) OHI text,</li> <li>• an SS priority AFTN message containing OHI filling the originator line.</li> </ul> <p>Check the IPMs transferred via the AMHS transfer port. Verify that the IUT has converted the messages correctly. Check envelopes and contents. In particular, verify the correct format of the ATS-message-header.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.2.1.6
<b>Test class</b>	Normal AMHS communications (N)

**4.5.3 CT503 – Generate an AFTN SVC message “ADS UNKNOWN”**

<b>CT503</b>	<b>Generate an AFTN SVC message “ADS UNKNOWN”</b>
<b>Test criteria</b>	This test is successful, if the IUT returns an AFTN SVC message “ADS UNKNOWN”, if the translation of addressee indicator fails.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an AFTN messages over the AFTN/CIDIN test interface to the IUT. The AFTN message shall contain an addressee indicator which cannot be mapped by the IUT.</p> <p>Verify that the IUT does not convert the received AFTN message into an AMHS message (IPM), but returns an AFTN SVC message “ADS UNKNOWN” over the AFTN/CIDIN test interface.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.4 (NDR conversion)
<b>Test class</b>	Normal AMHS communications (N)

**4.5.4 CT504 – Incoming AFTN user message with unknown originator indicator**

<b>CT504</b>	<b>Incoming AFTN message with unknown originator indicator</b>
<b>Test criteria</b>	This test is successful, if the IUT informs its control position, if during the conversion process the translation of the originator indicator fails.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an AFTN messages over the AFTN/CIDIN test interface to the IUT. The AFTN message shall contain an originator indicator which is unknown in the IUT.</p> <p>Verify that the IUT does not send any message via the AFTN/CIDIN or AMHS interface but informs its control position that the gateway is not able to translate the originator indicator.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.2.1.4.1
<b>Test class</b>	MHS/AMHS procedural errors (E2)



**4.5.5 CT505 – Convert a receipt notification**

<b>CT505</b>	<b>Convert a receipt notification</b>
<b>Test criteria</b>	This test is successful, if the IUT converts a received IPN containing a receipt notification (RN) to an AFTN acknowledgement correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an AFTN user message with priority “SS” via the AFTN/CIDIN test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent as an IPM to the AMHS Test Tool via transfer port <i>trp1</i>. Upon receipt of the IPM the AMHS Test Tool returns a RN.</p> <p>Verify that the IUT converts the received RN correctly into an AFTN acknowledgement. In particular, verify that:</p> <ul style="list-style-type: none"> <li>the <i>originator-name</i> is translated into the <i>Originator Indicator</i> of the AFTN acknowledgement, the <i>receipt-time</i> forms the <i>Filing Time</i> of the AFTN acknowledgement, logged elements of the previously handled <i>subject AFTN message</i> are used and inserted correctly into the AFTN acknowledgement.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.3 (RN conversion),
<b>Test class</b>	Normal AMHS communications (N)

**4.5.6 CT506 – Incoming non-receipt notification**

<b>CT506</b>	<b>Incoming non-receipt notification</b>
<b>Test criteria</b>	This test is successful, if the IUT reports to its control position and stores the message, if it receives an IPN containing a NRN addressed to an AFTN user.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an AFTN message with priority “SS” via the AFTN/CIDIN test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port <i>trp1</i>. Upon receipt of the AMHS message the AMHS Test Tool returns a NRN.</p> <p>Verify that the IUT behaves as specified in the Doc 9880, Part II, section 4.5.1.2, i.e.</p> <ul style="list-style-type: none"> <li>• logs the error situation and reports to a control position, and</li> <li>• stores the message for appropriate processing at the control position.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.1.2 c) (processing of NRN)
<b>Test class</b>	MHS/AMHS procedural errors (E2)

**4.5.7 CT507 – Generate a NDR as a result of misrouted RN**

<b>CT507</b>	<b>Generate a NDR as a result of misrouted RN</b>
<b>Test criteria</b>	This test is successful, if the IUT rejects a misrouted IPN containing a receipt notification (RN) and returns a NDR.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a RN to the IUT via transfer port <i>trp1</i> addressed to an AFTN user. The RN contains a fictitious value for the subject-ipm (subject AFTN message) and is not related to any message that had previously passed the IUT.</p> <p>Verify that the IUT does not transfer any AFTN acknowledgement over the AFTN/CIDIN test interface to the AMHS Test Tool, but generates a NDR and sends it via the transfer port <i>trp1</i> to the AMHS Test Tool. Verify that the NDR contains the following elements as specified in the Doc 9880, Part II, section 4.5.3.1.1:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>;</li> <li>• “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>; and</li> <li>• “unable to convert RN to AFTN ACK SVC message due to misrouted RN” for the <i>supplementary-information</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.3.1.1
<b>Test class</b>	MHS/AMHS procedural errors (E2)

**4.5.8 CT508 – Convert a non-delivery report (NDR)**

<b>CT508</b>	<b>Convert a non-delivery report (NDR)</b>
<b>Test criteria</b>	This test is successful, if the IUT converts a received NDR with a <i>non-delivery-diagnostic-code</i> of the value “unrecognised-OR-name” to an AFTN SVC message “ADS UNKNOWN”.
<b>Scenario description</b>	<p>From the AMHS Test Tool send an AFTN message via the AFTN/CIDIN test interface to the IUT. The message shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port <i>trp1</i>. The AMHS Test Tool shall return a NDR related to the received message and with a <i>non-delivery-diagnostic-code</i> of the value “unrecognised-OR-name”.</p> <p>Verify that the IUT converts the received NDR into an AFTN SVC message and sends it over the AFTN/CIDIN test interface to the AMHS Test Tool. In particular, verify that:</p> <ul style="list-style-type: none"> <li>the <i>actual-recipient-name</i> elements (provided with the <i>per-recipient-fields</i> in the Report Transfer Content) are converted into AFTN addresses which form the <i>unknown-addressee-indicators</i> in the text of the AFTN SVC message. The priority indicator, addressee indicator, origin and the first-address-line of the subject message are taken from log entries made for the handled subject message, the filing time is generated correctly by the gateway component of the IUT,</li> <li>the originator indicator of the service message is the AFTN Address of the AFTN Component of the AFTN/AMHS Gateway.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.4 (NDR conversion), 4.5.4.2.6
<b>Test class</b>	Normal AMHS communications (N)

**4.5.9 CT509 – NDR conversion process failures**

<b>CT509</b>	<b>NDR conversion process failures</b>
<b>Test criteria</b>	This test is successful, if the IUT reports to its control position, whenever an error occurs in the NDR conversion process.
<b>Scenario description</b>	<p>From the AMHS Test Tool send three AFTN messages via the AFTN/CIDIN interface to the IUT. The messages shall address an AMHS user and be converted by the IUT into AMHS format and sent to the AMHS Test Tool via transfer port <i>trp1</i>. The AMHS Test Tool shall return a NDR for each received message.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> NDR shall contain a <i>non-delivery-diagnostic-code</i> different from “unrecognised-OR-name”. The 2<sup>nd</sup> NDR shall contain an unknown address in the <i>actual-recipient-name</i> element.</li> <li>• The 3<sup>rd</sup> NDR shall refer to a fictitious subject message that did never pass the gateway before.</li> </ul> <p>Check the output of the IUT at the control position. Verify that for each NDR the IUT behaves as specified in the relevant sections of the Doc 9880, Part II, i.e.</p> <ul style="list-style-type: none"> <li>• logs the non-delivery situation and reports to a control position, and</li> <li>• stores the non-delivery report for appropriate processing at the control position.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.4.1.1, 4.5.4.1.3
<b>Test class</b>	MHS/AMHS procedural errors (E2)

## 4.6 Naming and Addressing

### 4.6.1 CT601 – Symmetric address conversion from AMHS CAAS- and XF-addresses to AFTN addresses

<b>CT601</b>	<b>Symmetric address conversion from AMHS CAAS- and XF-addresses to AFTN addresses</b>
<b>Test criteria</b>	<p>This test is successful, if the IUT when converting an AMHS message (IPM) to an AFTN message translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators correctly. Conversion shall be correct for both types, i.e. CAAS and XF-addresses.</p> <p><i>Note.– The test cases in which the address conversion AMHS-AFTN-AMHS leads to asymmetric results are covered in CT607.</i></p>
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i> to the IUT, addressing different AFTN users reachable via the AFTN/CIDIN port <i>cid1</i>.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall be sent via MTA-1 with originator from AMHSLAND-1 addressing an AFTN user in AFTNLAND-1. Note that both PRMDs (AMHSLAND-1 and AFTNLAND-1) implement the CAAS with one single organization-name value for all location indicators within the PRMD.</li> <li>• The 2<sup>nd</sup> ATS message shall be sent via MTA-2 with originator from AMHSLAND-2, AB-REGION1 addressing an AFTN user in AFTNLAND-2, BB-REGION1. Note that both PRMDs (AMHSLAND-2 and AFTNLAND-2) implement the CAAS with multiple organization-name values for different sets of location indicators within the PRMD.</li> <li>• The 3<sup>rd</sup> ATS message shall be sent via MTA-2 with originator from AMHSLAND-2, AB-REGION2 addressing an AFTN user in AFTNLAND-2, BB-REGION2.</li> <li>• The 4<sup>th</sup> ATS message shall be sent via MTA-2 with originator from AMHSLAND-2, AB-REGION3 addressing an AFTN user in AFTNLAND-2, BB-REGION3.</li> <li>• The 5<sup>th</sup> ATS message shall be sent via MTA-3 with originator from AMHSLAND-3 addressing an AFTN user in AFTNLAND-3. Note that both PRMDs (AMHSLAND-3 and AFTNLAND-3) implement the XF addressing scheme.</li> <li>• The 6<sup>th</sup> ATS message shall be sent via MTA-1 with originator from AMHSLAND-1 addressing five AFTN users, one in AFTNLAND-1, three in AFTNLAND-2 (BB-REGION1, BB-REGION2 and BB-REGION3) and one in AFTNLAND-3.</li> <li>• The 7<sup>th</sup> ATS message shall be sent via MTA-2 with originator from AMHSLAND-2, AB-REGION1 addressing five AFTN users, one in AFTNLAND-1, three in AFTNLAND-2 (BB-REGION1, BB-REGION2 and BB-REGION3) and one in AFTNLAND-3.</li> </ul>

	<ul style="list-style-type: none"> <li>• The 8th ATS message shall be sent via MTA-2 with originator from AMHSLAND-2, AB-REGION2 addressing five AFTN users, one in AFTNLAND-1, three in AFTNLAND-2 (BB-REGION1, BB-REGION2 and BB-REGION3) and one in AFTNLAND-3.</li> <li>• The 9th ATS message shall be sent via MTA-2 with originator from AMHSLAND-2, AB-REGION3 addressing five AFTN users, one in AFTNLAND-1, three in AFTNLAND-2 (BB-REGION1, BB-REGION2 and BB-REGION3) and one in AFTNLAND-3.</li> <li>• The 10th ATS message shall be sent via MTA-3 with originator from AMHSLAND-3 addressing five AFTN users, one in AFTNLAND-1, three in AFTNLAND-2 (BB-REGION1, BB-REGION2 and BB-REGION3) and one in AFTNLAND-3.</li> </ul> <p>All messages shall have an ia5-text with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to “false”. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty<sup>16</sup>.</p> <p>Check the messages received at the AFTN/CIDIN interface. Verify that the IUT was able to map all AMHS O/R addresses to AFTN addresses.</p> <p>Verify the correct AFTN originator indicator and addressee indicators in the received AFTN messages.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	2.5 (Naming and Addressing Principles) 4.5.2.2.6 (Generation of the AFTN originator indicator) 4.5.2.2.7 (Generation of the AFTN addressee indicator)
<b>Test class</b>	Normal AMHS communications (N)

<sup>16</sup> Originator and recipient addresses in the IPM heading may be empty. According to Doc 9880, Part II, 4.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

#### **4.6.2 CT602 – Address conversion from AFTN addresses to AMHS CAAS- and XF-addresses**

<b>CT602</b>	<b>Address conversion from AFTN addresses to AMHS CAAS- and XF-addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT that converts an AFTN user message to AMHS translates the AFTN originator indicator and all addressee indicators into correct AMHS addresses, which may be either XF- or CAAS addresses.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/CIDIN port <i>cid1</i> to the IUT addressing different AMHS users reachable via the AMHS transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> AFTN user message shall be sent with originator from AFTNLAND-1 addressing an AMHS user in AMHSLAND-1. Note that both PRMDs (AFTNLAND-1 and AMHSLAND-1) implement the CAAS with one single organization-name value for all location indicators within the PRMD.</li> <li>• The 2nd AFTN user message shall be sent with originator from AFTNLAND-2, BB-REGION1 addressing an AMHS user in AMHSLAND-2, AB-REGION1. Note that both PRMDs (AFTNLAND-2 and AMHSLAND-2) implement the CAAS with multiple organization-name values for different sets of location indicators within the PRMD.</li> <li>• The 3rd AFTN user message shall be sent with originator from AFTNLAND-2, BB-REGION2 addressing an AMHS user in AMHSLAND-2, AB-REGION2.</li> <li>• The 4th AFTN user message shall be sent with originator from AFTNLAND-2, BB-REGION3 addressing an AMHS user in AMHSLAND-2, AB-REGION3.</li> <li>• The 5th AFTN user message shall be sent with originator from AFTNLAND-3 addressing an AMHS user in AMHSLAND-3. Note that both PRMDs (AFTNLAND-3 and AMHSLAND-3) implement the XF addressing scheme.</li> <li>• The 6th AFTN user message shall be sent with originator from AFTNLAND-1 addressing five AMHS users, one in AMHSLAND-1, three in AMHSLAND-2 (AB-REGION1, AB-REGION2 and AB-REGION3) and one in AMHSLAND-3.</li> <li>• The 7th AFTN user message shall be sent with originator from AFTNLAND-2, BB-REGION1 addressing five AMHS users, one in AMHSLAND-1, three in AMHSLAND-2 (AB-REGION1, AB-REGION2 and AB-REGION3) and one in AMHSLAND-3.</li> <li>• The 8th AFTN user message shall be sent with originator from AFTNLAND-2, BB-REGION2 addressing five AMHS users, one in AMHSLAND-1, three in AMHSLAND-2 (AB-REGION1, AB-REGION2 and AB-REGION3) and one in AMHSLAND-3.</li> <li>• The 9th AFTN user message shall be sent with originator from AFTNLAND-2, BB-REGION3 addressing five AMHS users, one</li> </ul>



	<p>in AMHSLAND-1, three in AMHSLAND-2 (AB-REGION1, AB-REGION2 and AB-REGION3) and one in AMHSLAND-3.</p> <ul style="list-style-type: none"> <li>The 10th AFTN user message shall be sent with originator from AFTNLAND-3 addressing five AMHS users, one in AMHSLAND-1, three in AMHSLAND-2 (AB-REGION1, AB-REGION2 and AB-REGION3) and one in AMHSLAND-3.</li> </ul> <p>Check the messages received at AMHS transfer ports <i>trp1</i>, <i>trp2</i> and <i>trp3</i>.</p> <p>Verify that the IUT was able to map all AFTN originator and addressee indicators to AMHS O/R addresses. Verify the correct AMHS O/R addresses in the originator and recipient fields of both MTE and IPM headings.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	<p>2.5 (Naming and Addressing Principles)</p> <p>4.4.2.1.4.1 (Translation of the AFTN originator indicator)</p> <p>4.4.2.1.4.2 (Translation of the AFTN addressee indicator)</p>
<b>Test class</b>	Normal AMHS communications (N)

**4.6.3 CT603 – Reject an IPM with invalid recipient address similar to CAAS**

<b>CT603</b>	<b>Reject an IPM with invalid recipient address similar to CAAS</b>
<b>Test criteria</b>	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains a recipient address of type CAAS which cannot be mapped to a valid AFTN addressee indicator.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user in the PRMD “AFTNLAND-1” that implements the CAAS. All messages shall have a valid originator address and an erroneous recipient address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty<sup>17</sup>.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall contain a recipient address with an invalid <i>common-name</i> attribute, that contains 9 letters, e.g. “BAAAF<del>T</del>ABC”.</li> <li>• The 2<sup>nd</sup> ATS message shall contain a recipient address with an invalid <i>common-name</i> attribute, that contains only 6 letters, e.g. “BAAAF<del>T</del>”.</li> <li>• The 3<sup>rd</sup> ATS message shall contain a recipient address with a valid <i>organizational-unit-names</i> attribute “BAAA”, but an empty <i>common-name</i> attribute.</li> <li>• The 4<sup>th</sup> ATS message shall contain a recipient address with a valid <i>common-name</i> attribute “BAAAF<del>T</del>AA”, but an empty <i>organizational-unit-names</i> attribute.</li> <li>• The 5<sup>th</sup> ATS message shall contain a recipient address with a valid <i>common-name</i> attribute “BAAAF<del>T</del>AA”, but an <i>organizational-unit-names</i> attribute that is different from the first 4 letters of the <i>common-name</i> attribute, e.g. “BAAX”.</li> <li>• The 6<sup>th</sup> ATS message shall contain a recipient address with a valid <i>common-name</i> attribute “BAAAF<del>T</del>AA” and correct <i>organizational-unit-names</i> attribute “BAAA”, but an empty <i>organization-name</i> attribute.</li> </ul> <p>Verify that for each message a NDR is generated by the IUT with the following elements:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>, and</li> <li>• “unrecognised-OR-name” for the <i>non-delivery-diagnostic-code</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.2.6 (Generation of the AFTN originator indicator) 4.5.2.2.7 (Generation of the AFTN addressee indicator)
<b>Test class</b>	Erroneous AMHS parameters (E1)

<sup>17</sup> Originator and recipient addresses in the IPM heading may be empty. According to Doc 9880, Part II, 4.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

**4.6.4 CT604 – Reject an IPM with invalid recipient address similar to XF**

<b>CT604</b>	<b>Reject an IPM with invalid recipient address similar to XF</b>
<b>Test criteria</b>	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains a recipient address of type XF which cannot be mapped to a valid AFTN addressee indicator.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user in the PRMD “AFTNLAND-3” that implements the XF addressing scheme. All messages shall have a valid originator address and an erroneous recipient address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty<sup>18</sup>.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall contain a recipient address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute, e.g. value “BCAAFTABC”.</li> <li>• The 2<sup>nd</sup> ATS message shall contain a recipient address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute, e.g. value “BCAAFT”.</li> <li>• The 3<sup>rd</sup> ATS message shall contain a recipient address with the value “AFTN” in the <i>organization-name</i> attribute, but an empty <i>organizational-unit-names</i> attribute.</li> <li>• The 4<sup>th</sup> ATS message shall contain an originator address with an empty <i>organization-name</i> attribute and a valid <i>organizational-unit-names</i> attribute, e.g. value “BCAAFTAA”.</li> <li>• The 5<sup>th</sup> ATS message shall contain an originator address with an invalid organization-name attribute, e.g. “ATFM” and a valid <i>organizational-unit-names</i> attribute, e.g. value “BCAAFTAA”.</li> </ul> <p>Verify that for each message a NDR is generated by the IUT with the following elements:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>, and</li> <li>• “unrecognised-OR-name” for the <i>non-delivery-diagnostic-code</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.2.6 (Generation of the AFTN originator indicator) 4.5.2.2.7 (Generation of the AFTN addressee indicator)
<b>Test class</b>	Erroneous AMHS parameters (E1)

<sup>18</sup> Originator and recipient addresses in the IPM heading may be empty. According to Doc 9880, Part II, 4.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

#### 4.6.5 CT605 – Reject an IPM with invalid originator address similar to CAAS

<b>CT605</b>	<b>Reject an IPM with invalid originator address similar to CAAS</b>
<b>Test criteria</b>	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains an originator address of type CAAS which cannot be mapped to a valid AFTN originator indicator.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT addressing an AFTN user reachable via the AFTN/CIDIN port <i>cid1</i>. All messages shall be originated from the PRMD “AMHSLAND-1” which implements the CAAS. They shall have a valid recipient address for the PRMD “AFTNLAND-1”, but an erroneous originator address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty<sup>19</sup>.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall contain an originator address with an invalid <i>common-name</i> attribute, e.g. “<b>AAAAMHABC</b>”.</li> <li>• The 2<sup>nd</sup> ATS message shall contain an originator address with an invalid <i>common-name</i> attribute that contains only 6 letters, e.g. “<b>AAAAMH</b>”.</li> <li>• The 3<sup>rd</sup> ATS message shall contain an originator address with a valid <i>organizational-unit-names</i> attribute “<b>AAAA</b>”, but an empty <i>common-name</i> attribute.</li> <li>• The 4<sup>th</sup> ATS message shall contain an originator address with a valid <i>common-name</i> attribute “<b>AAAAMHAA</b>”, but an empty <i>organizational-unit-names</i> attribute.</li> <li>• The 5<sup>th</sup> ATS message shall contain an originator address with a valid <i>common-name</i> attribute “<b>AAAAMHAA</b>”, but an <i>organizational-unit-names</i> attribute that is different from the first 4 letters of the <i>common-name</i> attribute, e.g. “<b>AAAX</b>”.</li> <li>• The 6<sup>th</sup> ATS message shall contain an originator address with a valid <i>common-name</i> attribute “<b>AAAAMHAA</b>” and correct <i>organizational-unit-names</i> attribute “<b>AAAA</b>”, but an empty <i>organization-name</i> attribute.</li> </ul> <p>Verify that for each message a NDR is generated by the IUT with the following elements:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li> <li>• “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>, and</li> <li>• “unable to convert to AFTN due to unrecognized originator O/R address” for the <i>supplementary-information</i>.</li> </ul>
<b>AMHS ref.: Doc</b>	4.5.2.2.6 (Generation of the AFTN originator indicator)

<sup>19</sup> Originator and recipient addresses in the IPM heading may be empty. According to Doc 9880, Part II, 4.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

<b>9880, Part II</b>	4.5.2.2.7 (Generation of the AFTN addressee indicator)
<b>Test class</b>	Erroneous AMHS parameters (E1)

**4.6.6 CT606 – Reject an IPM with invalid originator address similar to XF**

<b>CT606</b>	<b>Reject an IPM with invalid originator address similar to XF</b>
<b>Test criteria</b>	This test is successful, if the IUT generates a NDR, when it receives an ATS message (IPM) that contains an originator address of type XF which cannot be mapped to a valid AFTN originator indicator.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp3</i> to the IUT addressing an AFTN user reachable via the AFTN/CIDIN port <i>cid1</i>. All messages shall be originated from the PRMD “AMHSLAND-3” which implements the XF addressing scheme. They shall have a valid recipient address for the PRMD “AFTNLAND-3”, but an erroneous originator address in the MTE. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty<sup>20</sup>.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHABC”.</li> <li>• The 2<sup>nd</sup> ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMH”.</li> <li>• The 3<sup>rd</sup> ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an empty <i>organizational-unit-names</i> attribute.</li> <li>• The 4<sup>th</sup> ATS message shall contain an originator address with an empty <i>organization-name</i> attribute and a valid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHAA”.</li> <li>• The 5<sup>th</sup> ATS message shall contain an originator address with an invalid <i>organization-name</i> attribute, e.g. “UNKNOWN” and a valid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHAA”.</li> </ul> <p>Verify that for each message a NDR is generated by the IUT with the following elements:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the <i>non-delivery-reason-code</i>,</li> <li>• “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>, and</li> <li>• “unable to convert to AFTN due to unrecognized originator O/R address” for the <i>supplementary-information</i>.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.2.6 (Generation of the AFTN originator indicator) 4.5.2.2.7 (Generation of the AFTN addressee indicator)
<b>Test class</b>	Erroneous AMHS parameters (E1)

<sup>20</sup> Originator and recipient addresses in the IPM heading may be empty. According to Doc 9880, Part II, 4.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

#### **4.6.7 CT607 – Asymmetric address conversion from AMHS CAAS- and XF-recipient addresses to AFTN addresses**

<b>CT607</b>	<b>Asymmetric address conversion from AMHS CAAS- and XF-recipient addresses to AFTN addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT when converting an AMHS message (IPM) to an AFTN message translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators although the re-conversions of the AFTN addressee indicators lead to O/R addresses different from the original recipient O/R addresses (asymmetric). The asymmetric recipient address conversion shall be logged and reported to the Control Position.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp1</i> to the IUT, addressing different AFTN users reachable via the AFTN/CIDIN port <i>cid1</i>.</p> <ul style="list-style-type: none"> <li>The 1<sup>st</sup> ATS message shall be sent via MTA-1 with correct originator from AMHSLAND-1 containing CAAS and XF recipient addresses which are translated into AFTN addresses of which the retranslations do not deliver the same AMHS addresses<sup>21</sup>:             <ol style="list-style-type: none"> <li>/C=XX/ADMD=ICAO/PRMD=AFTNLAND-1 /O=BA-REGION/OU1=BBAA/CN=BBAAFTAA,</li> <li>/C=XX/ADMD=ICAO/PRMD=AFTNLAND-2 /O=AFTN/OU1=BCAAFTAA.</li> </ol> </li> <li>The 2<sup>nd</sup> ATS message shall be sent via MTA-1 with correct originator from AMHSLAND-1 containing a CAAS recipient address with a PRMD value of an MD which has implemented the XF addressing scheme and a valid XF recipient address with a PRMD value of an MD which has implemented the CAAS addressing scheme:             <ol style="list-style-type: none"> <li>/C=XX/ADMD=ICAO/PRMD=AFTNLAND-3 /O=AFTN/OU1=BCAA/CN=BCAAFTAA,</li> <li>/C=XX/ADMD=ICAO/PRMD=AFTNLAND-1 /O=AFTN/OU1=BAAAFATAA.</li> </ol> </li> </ul> <p>All messages shall have an ia5-text with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to “false”. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty<sup>22</sup>.</p> <p>Check the messages received at the AFTN/CIDIN interface.</p> <p>Verify that the IUT was able to convert all AMHS O/R addresses to AFTN addresses. Verify the correct AFTN originator indicator and</p>

<sup>21</sup> The AMHS addresses are listed in *Table 14*.

<sup>22</sup> Originator and recipient addresses in the IPM heading may be empty. According to Doc 9880, Part II, 4.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

	addressee indicator in the received AFTN messages. Check that conversion asymmetries of the recipient addresses are logged and reported to the Control Position.
<b>AMHS ref.: Doc 9880, Part II</b>	2.5 (Naming and Addressing Principles) 4.5.2.2.6 (Generation of the AFTN originator indicator) 4.5.2.2.7 (Generation of the AFTN addressee indicator)
<b>Test class</b>	Normal AMHS communications (N)



#### **4.6.8 CT608 – Asymmetric address conversion from AMHS CAAS- and XF- originator addresses to AFTN addresses**

<b>CT608</b>	<b>Asymmetric address conversion from AMHS CAAS- and XF- originator addresses to AFTN addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT, when converting an AMHS message (IPM) to an AFTN message, translates the originator and recipient addresses to the AFTN originator indicator and addressee indicators, although the re-conversion of the AFTN originator indicator leads to an originator O/R address different from the original O/R address (asymmetric). The asymmetric originator address conversion shall be logged and reported to the Control Position.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer ports <i>trp1</i> and <i>trp3</i> to the IUT, addressing different AFTN users reachable via the AFTN/CIDIN port <i>cid1</i>.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall be sent via MTA-1 with a CAAS originator address which is translated into an AFTN address of which the retranslation does not deliver the same AMHS address<sup>23</sup>:  (5) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-1  /O=AA-REGION/OU1=ABAA/CN=ABAAMHAA  The recipient shall be an AFTN user in AFTNLAND-1.</li> <li>• The 2<sup>nd</sup> ATS message shall be sent via MTA-1 with a XF originator address which is translated into an AFTN address of which the retranslation does not deliver the same AMHS address:  (6) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-1  /O=AFTN/OU1=ACCCMHAA  The recipient shall be an AFTN user in AFTNLAND-1.</li> <li>• The 3<sup>rd</sup> ATS message shall be sent via MTA-3 with a CAAS originator address with a PRMD value of an MD which has implemented the XF addressing scheme:  (7) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-3  /O=AFTN/OU1=ACCC/CN=ACCCMHAA  The recipient shall be an AFTN user in AFTNLAND-1.</li> <li>• The 4<sup>th</sup> ATS message shall be sent via MTA-1 with a XF originator address with a PRMD value of an MD which has implemented the CAAS addressing scheme:  (8) /C=XX/ADMD=ICAO/PRMD=AMHSLAND-1  /O=AFTN/OU1=AAAAMHAA  The recipient shall be an AFTN user in AFTNLAND-1.</li> </ul> <p>All messages shall have an ia5-text with ATS-message-header. The implicit-conversion-prohibited attribute in the MTE shall be set to “false”.</p>

<sup>23</sup> Originator and recipient addresses in the IPM heading may be empty. According to Doc 9880, Part II, 4.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

	<p>Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty.</p> <p>Check the messages received at the AFTN/CIDIN interface.</p> <p>Verify that the IUT was able to convert all AMHS O/R addresses<sup>24</sup> to AFTN addresses. Verify the correct AFTN originator indicator and addressee indicator in the received AFTN messages.</p> <p>Check that the conversion asymmetries of the originator addresses are logged and reported to the Control Position.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	<p>2.5 (Naming and Addressing Principles)</p> <p>4.5.2.2.6 (Generation of the AFTN originator indicator)</p> <p>4.5.2.2.7 (Generation of the AFTN addressee indicator)</p>
<b>Test class</b>	Normal AMHS communications (N)

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<sup>24</sup> The AMHS addresses are listed in *Table 14*.

#### 4.6.9 CT609 –Address conversion from AMHS addresses listed in the User Address look-up table to AFTN addresses

<b>CT609</b>	<b>Address conversion from AMHS addresses listed in the User Address look-up table to AFTN addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT when converting an AMHS message (IPM) to an AFTN message translates the originator and recipient addresses <b>listed in the User Address look-up table</b> to the AFTN originator indicator and addressee indicators correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over AMHS transfer port <i>trp2</i> to the IUT, addressing different AFTN users reachable via the AFTN/CIDIN port <i>cid1</i>.</p> <ul style="list-style-type: none"> <li>The 1<sup>st</sup> ATS message shall be sent from originator /C=XX/A=ICAO/P=AMHSLAND-2/O=AB-REGION3/OU1=ABCB/CN=ABCBMHAA to 21 recipients starting from /C=XX/A=ICAO/P=AFTNLAND-3/O=AFTN/OU1=BCAAFTBA till /C=XX/A=ICAO/P=AFTNLAND-3/O=AFTN/OU1=BCAAFTBU (including /C=XX/A=ICAO/P=TESTB/O=AFTN/OU1=BCAAFTBM listed in the User Address look-up table).</li> <li>The 2<sup>nd</sup> ATS message shall be sent from originator /C=XX/A=ICAO/P=TESTA/O=A-REGION/OU1=ABCB/CN=ABCBMHAM listed in the User Address look-up table to recipient C=XX/A=ICAO/P=AFTNLAND-3/O=AFTN/OU1=BCAAFTBA.</li> <li>The 3<sup>rd</sup> ATS message shall be sent from originator /C=XX/A=ICAO/P=USERLAND-1/O=ORG/OU1=AAAA/CN=AAAAUAAA to recipient /C=XX/A=ICAO/P=TESTB/O=AFTN/OU1=BCAAFTBM both listed in the User Address look-up table.</li> </ul> <p>All messages shall have the implicit-conversion-prohibited attribute in the MTE set to “false”. Originator and recipient addresses in the IPM heading shall be equal to those in the MTE or empty<sup>25</sup>.</p> <p>Check the messages received at the AFTN/CIDIN interface. Verify that the IUT was able to map all AMHS O/R addresses to AFTN addresses.</p> <p>Verify the correct AFTN originator indicator and addressee indicators in the received AFTN messages.</p> <p>Check the indications at the Monitor and Control Position: There shall be no report about address conversion asymmetries concerning the originator or recipient address.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	2.5 (Naming and Addressing Principles) 4.5.2.2.6 (Generation of the AFTN originator indicator) 4.5.2.2.7 (Generation of the AFTN addressee indicator)
<b>Test class</b>	Normal AMHS communications (N)

<sup>25</sup> Originator and recipient addresses in the IPM heading may be empty. According to Doc 9880, Part II, 4.5.2.3 “Use of IPM elements” those addresses are discarded by the MTCU.

#### **4.6.10 CT610 – Address conversion from AFTN addresses to AMHS addresses listed in the User Address look-up table**

<b>CT610</b>	<b>Address conversion from AFTN addresses to AMHS addresses listed in the User Address look-up table</b>
<b>Test criteria</b>	This test is successful, if the IUT that converts an AFTN user message to AMHS translates the AFTN originator indicator and addressee indicators <b>listed in the User Address look-up table</b> into correct AMHS addresses.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of AFTN user messages over the AFTN/CIDIN port <i>cid1</i> to the IUT addressing different AMHS users reachable via the AMHS transfer ports <i>trp1</i>, <i>trp2</i> or <i>trp3</i>.</p> <ul style="list-style-type: none"> <li>The 1<sup>st</sup> AFTN user message shall be sent from originator BCAAFTBA to 21 destination addresses ABCBMHAA to ABCBMHAU (including ABCBMHAM listed in the User Address look-up table)</li> <li>The 2<sup>nd</sup> AFTN user message shall be sent from originator BCAAFTBM listed in the User Address look-up table to destination address ABCBMHAA.</li> <li>The 3<sup>rd</sup> AFTN user message shall be sent from originator BCAAFTBM to recipients AAAAUABB and BBABUAYY all listed in the User Address look-up table.</li> </ul> <p>Check the messages received at AMHS transfer ports <i>trp1</i>, <i>trp2</i> or <i>trp3</i>. Verify that the IUT was able to map all AFTN originator and addressee indicators to AMHS O/R addresses respecting the given User Address Table. Verify the correct AMHS O/R addresses in the originator and recipient fields of both MTE and IPM headings.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	2.5 (Naming and Addressing Principles) 4.4.2.1.4.1 (Translation of the AFTN originator indicator) 4.4.2.1.4.2 (Translation of the AFTN addressee indicator)
<b>Test class</b>	Normal AMHS communications (N)

No.	C	ADMD	PRMD	O	OU1	CN	AFTN address
0001	XX	ICAO	USERLAND-1	ORG	AAAA	AAAAUAAA	AAAAUAAA
0002	XX	ICAO	USERLAND-1	ORG	AAAA	AAAAUAAB	AAAAUAAB
...	XX	ICAO	USERLAND-1	ORG	...	...	...
0676	XX	ICAO	USERLAND-1	ORG	AAAA	AAAAUAZZ	AAAAUAZZ
0677	XX	ICAO	USERLAND-2	ORG	ABAA	ABAAUAAA	ABAAUAAA
...	XX	ICAO	USERLAND-2	ORG	...	...	...
1352	XX	ICAO	USERLAND-2	ORG	ABAA	ABAAUAZZ	ABAAUAZZ
...							
4733	XX	ICAO	USERLAND-8	AFTN	BAAAUAAA		BAAAUAAA
...		ICAO	USERLAND-8	AFTN	...		
5408	XX	ICAO	USERLAND-8	AFTN	BAAAUZZZ		BAAAUZZZ
...							
9464	XX	ICAO	USERLAND-14	AFTN	BBCBUZZZ		BBCBUZZZ
9465	XX	ICAO	TESTA	A-REGION	ABCB	ABCBMHAM	ABCBMHAM
9466	XX	ICAO	TESTB	AFTN	BCAAFTBM		BCAAFTBM

Attachment: AMC csv files:

AppendixD\_AMC\_files.zip

## 4.7 Specific error situations

### 4.7.1 CT701 – Transfer a non-delivery report (NDR)

<b>CT701</b>	<b>Transfer a non-delivery report (NDR)</b>
<b>Test criteria</b>	This test is successful, if the IUT transfers (forwards) non-delivery reports containing the standardized reason and diagnostic codes correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a set of non-delivery reports to the IUT transfer port <i>trp1</i> to be forwarded to another domain.</p> <p>The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 20 below).</p> <p>The report transfer envelope shall contain a remote recipient address (Report Destination) reachable via transfer port <i>trp2</i>. The reports may contain fictitious values for those fields which are normally related to a subject message, like subject-MTS-identifier and encoded-information types and originally intended recipients.</p> <p>Monitor the outcome of IUT transfer port <i>trp2</i>.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>all reports are routed correctly via transfer port <i>trp2</i>, and</li> <li>the reason and diagnostic codes of the forwarded report are identical to those contained in the original report.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

AMHS Report ID	number of Per-Recipient-Fields	reason code	diagnostic codes (range)
CT701M01	16	0	0 - 15
CT701M02	31	0	0 - 30
CT701M03	31	1	0 - 30
CT701M04	5	1	46 - 50
CT701M05	3	2	8 - 10
CT701M06	7	2	19 - 25
CT701M07	1	3	31
CT701M08	14	4	32 - 45
CT701M09	1	5	not used
CT701M10	1	6	not used

AMHS Report ID	number of Per-Recipient-Fields	reason code	diagnostic codes (range)
CT701M11	1	7	not used
CT701M12	28	8	51 - 78

**Table 20: AMHS non-delivery-reason-codes and non-delivery-diagnostic-codes used in test messages of CT701 – CT703<sup>26</sup>**

*Note 1.– The non-delivery-diagnostic-code is an optional element and, for example, not contained in test messages CT701M09, CT701M10 and CT701M11.*

*Note 2.– Depending on the level of service implemented by the IUT the range of valid non-delivery-reason-codes as well as non-delivery-diagnostic-codes could be different:*

Level of Service	ISO/IEC Version	Reason Code Range	Diagnostic Code Range
<b>Basic</b>	ISO/IEC 10021-4:1990	0 - 7	1 - 49
<b>Extended</b>	ISO/IEC 10021-4:1999	0 - 8	1 - 78

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<sup>26</sup> Every standardized reason code (0 ... 8) and every standardized diagnostic code (0 ... 78) is contained at least once in the test messages.

**4.7.2 CT702 – Deliver a non-delivery report (NDR) to an AMHS user**

<b>CT702</b>	<b>Deliver a non-delivery report (NDR) to an AMHS user</b>
<b>Test criteria</b>	This test is successful, if the IUT delivers non-delivery reports containing the standardized reason and diagnostic codes to an AMHS user correctly.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a set of non-delivery reports to the IUT transfer port <i>trp1</i> to be forwarded to a directly attached AMHS user.</p> <p>The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 20).</p> <p>The report transfer envelope shall contain the recipient address of an AMHS user connected to the IUT. The reports may contain fictitious values for those fields which are normally related to a subject message, like subject-MTS-identifier and encoded-information types and originally intended recipients.</p> <p>Monitor the reports received at the AMHS User Agent.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• all reports are delivered to the AMHS User Agent, and</li> <li>• the reason and diagnostic codes of the delivered reports are identical to those contained in the reports sent from the AMHS test tool.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

*Note.— Note 2 of CT701 applies also to CT702.*

### **4.7.3 CT703 – Handling of received non-delivery report (NDR) in the AFTN/AMHS Gateway**

<b>CT703</b>	<b>Handling of received non-delivery report (NDR) in the AFTN/AMHS Gateway</b>
<b>Test criteria</b>	This test is successful, if the IUT upon reception by the MTCU of an AMHS non-delivery report logs the error situation and reports to the control position, if the report does not refer to any previously generated subject message or contains a <i>non-delivery-diagnostic-code</i> value other than “unrecognised-OR-name(0)”.
<b>Scenario description</b>	<p>From the AMHS Test Tool send a set of non-delivery reports to the IUT addressed to an AFTN user reachable via the AFTN/AMHS Gateway.</p> <p>The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 20).</p> <p>The report transfer envelope shall contain the recipient address of an AFTN user reachable via the IUT’s AFTN/AMHS Gateway. The reports relate to fictitious subject messages that have never been generated by the MTCU.</p> <p>Monitor the events at the Control Position.</p> <p>Verify that the IUT logs the error situation and reports to the control position for every received NDR.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

*Note.– Note 2 of CT701 applies also to CT703.*



**4.7.4 CT704 – Transfer a NDR containing non-standard reason or diagnostic codes**

<b>CT704</b>	<b>Transfer a NDR containing non-standard reason or diagnostic codes</b>
<b>Test criteria</b>	This test is successful, if the IUT transfers non-delivery reports containing reason and diagnostic codes which are syntactically correct, but different from those defined in section 8.3.1.2.1.11 and section 8.3.1.2.1.12 of ISO/IEC 10021-4 (ITU-T Rec. X.411).
<b>Scenario description</b>	<p>From the AMHS Test Tool send several NDRs to the IUT transfer port <i>trp1</i> to be forwarded to a recipient address reachable via transfer port <i>trp2</i>. The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes:</p> <ul style="list-style-type: none"> <li>• CT704M01 contains “9” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT704M02 contains “255” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT704M03 contains “32767” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT704M04 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “79” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT704M05 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “255” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT704M06 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “32767” for the <i>non-delivery-diagnostic-code</i>.</li> </ul> <p>Monitor the outcome of IUT transfer port <i>trp2</i>.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• all reports are routed correctly via transfer port <i>trp2</i>, and</li> <li>• the reason and diagnostic codes of the forwarded report are identical to those contained in the original report.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	
<b>Test class</b>	Erroneous AMHS parameters (E1)

#### **4.7.5 CT705 – Deliver a NDR containing non-standard reason or diagnostic codes to an AMHS User Agent**

<b>CT705</b>	<b>Deliver a NDR containing non-standard reason or diagnostic codes to an AMHS User Agent</b>
<b>Test criteria</b>	This test is successful, if the IUT delivers non-delivery reports containing reason and diagnostic codes which are syntactically correct, but different from those defined in section 8.3.1.2.1.11 and section 8.3.1.2.1.12 of ISO/IEC 10021-4 (ITU-T Rec. X.411) to an AMHS User Agent.
<b>Scenario description</b>	<p>From the AMHS Test Tool send several NDRs to the IUT transfer port <i>trp1</i> to be forwarded to a directly attached AMHS user.</p> <p>The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes:</p> <ul style="list-style-type: none"> <li>• CT705M01 contains “9” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT705M02 contains “255” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT705M03 contains “32767” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT705M04 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “79” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT705M05 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “255” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT705M06 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “32767” for the <i>non-delivery-diagnostic-code</i>.</li> </ul> <p>Verify that all NDRs are delivered to the AMHS User Agent.</p> <p>Check the contained reason and diagnostic codes (if any).</p> <p>Verify that no misleading information is presented to the AMHS user.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	
<b>Test class</b>	Erroneous AMHS parameters (E1)

#### **4.7.6 CT706 – Handling of NDR containing non-standard reason or diagnostic codes in the AFTN/AMHS Gateway**

<b>CT706</b>	<b>Handling of NDR containing non-standard reason or diagnostic codes in the AFTN/AMHS Gateway</b>
<b>Test criteria</b>	This test is successful, if the IUT upon reception by the MTCU of an AMHS non-delivery report logs the error situation and reports to the control position, if the NDR contains non-standard reason or diagnostic codes.
<b>Scenario description</b>	<p>From the AMHS Test Tool send several AMHS non-delivery reports to the IUT addressed to an AFTN user reachable via the AFTN/AMHS Gateway. The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes:</p> <ul style="list-style-type: none"> <li>• CT706M01 contains “9” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT706M02 contains “255” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT706M03 contains “32767” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT706M04 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “79” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT706M05 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “255” for the <i>non-delivery-diagnostic-code</i>.</li> <li>• CT706M06 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “32767” for the <i>non-delivery-diagnostic-code</i>.</li> </ul> <p>Monitor the events at the Control Position.</p> <p>Verify that the IUT logs the error situation and reports to the control position for every received NDR.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	
<b>Test class</b>	Erroneous AMHS parameters (E1)

**4.7.7 CT707 - Incoming IPM with invalid argument in the body part**

CT707	Incoming IPM with invalid argument in the body part
<b>Test criteria</b>	<p>This test is successful, if the IUT's gateway component processes a received ATS message containing an invalid argument in the ia5-text-body-part without interruption of service in one of the following ways:</p> <ul style="list-style-type: none"> <li>• conversion of the message ignoring the invalid argument ,</li> <li>• rejection of the message and generation of a NDR, or</li> <li>• reporting the error situation to a control position and storage of the message for further processing.</li> </ul>
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over the P1 interface to the IUT addressing an AFTN user recipient. All messages shall contain (built-in or extended) <i>original-encoded-information-types</i> in the message transfer envelope indicating ia5-text.</p> <ul style="list-style-type: none"> <li>• The first message shall contain an ia5-text with (valid) repertoire value ia5(5).</li> <li>• The second message shall contain an ia5-text-body-part with (valid) repertoire value ia5(5).</li> <li>• The third message shall contain an ia5-text with (invalid) repertoire value "3".</li> <li>• The fourth message shall contain an ia5-text-body-part with (invalid) repertoire value "99".</li> </ul> <p>Verify that the first two (valid) messages are converted to AFTN and all other messages are either converted to AFTN, rejected with NDR or stored for further processing.</p> <p>In case of conversion, analyse the received AFTN messages with respect to the characters contained in the AFTN message text.</p> <p>In case of message rejection, verify that an NDR is returned containing the following elements:</p> <ul style="list-style-type: none"> <li>• "unable-to-transfer" for the <i>non-delivery-reason-code</i>,</li> <li>• "content-syntax-error" for the <i>non-delivery-diagnostic-code</i>, and</li> <li>• "unable to convert to AFTN due to unsupported body part type" for the <i>supplementary-information</i>.</li> </ul> <p>If the IUT's reaction is neither message conversion nor rejection with NDR, verify that</p> <ul style="list-style-type: none"> <li>• the message is stored and the service is not interrupted, and</li> <li>• the error situation is reported at the control position with sufficient information for an operator to handle the situation.</li> </ul> <p>Take note of the observed Gateway behaviour (conversion, rejection or storage of message) and the events at the monitor and control position (if any).</p>
<b>AMHS ref.: Doc</b>	4.5.2.1.4

<b>9880, Part II</b>	
<b>Test class</b>	Erroneous IPMS information objects (E31)

**4.7.8 CT708 - Incoming IPM with invalid argument in the general-text-body-part**

<b>CT708</b>	<b>Incoming IPM with invalid argument in the general-text-body-part</b>
<b>Test criteria</b>	<p>This test is successful, if the IUT's gateway component processes a received ATS message containing an invalid argument in the general-text-body-part without interruption of service in one of the following ways:</p> <ul style="list-style-type: none"> <li>• conversion of the message ignoring the invalid argument ,</li> <li>• rejection of the message and generation of a NDR, or</li> <li>• reporting the error situation to a control position and storage of the message for further processing.</li> </ul>
<b>Scenario description</b>	<p>From the AMHS Test Tool send a sequence of ATS messages (IPMs) over the P1 interface to the IUT addressing an AFTN user recipient. All messages shall have unspecified (i.e. missing) <i>original-encoded-information-types</i> in the message transfer envelope.</p> <ul style="list-style-type: none"> <li>• The first message shall contain a general-text-body-part with character set registration numbers 1 and 6 (ISO646 or IA5 repertoire).</li> <li>• The second message shall contain a general-text-body-part with character set registration numbers 1 and 5 (unknown repertoire).</li> <li>• The third message shall contain a general-text-body-part with character set registration numbers 1 and 6 (ISO646 or IA5 repertoire), but the text shall include non-IA5IRV characters.</li> <li>• The fourth message shall have an empty list of character set registration numbers.</li> </ul> <p>Verify that the first message is converted to AFTN and all other messages are either converted to AFTN, rejected with NDR or stored for further processing.</p> <p>In case of conversion, analyse the received AFTN message with respect to the characters contained in the AFTN message text.</p> <p>In case of message rejection, verify that an NDR is returned containing the following elements:</p> <ul style="list-style-type: none"> <li>• “unable-to-transfer” for the non-delivery-reason-code,</li> <li>• “content-syntax-error” for the non-delivery-diagnostic-code, and</li> <li>• “unable to convert to AFTN due to unsupported body part type” for the supplementary-information.</li> </ul> <p>If the IUT's reaction is neither message conversion nor rejection with NDR, verify that</p> <ul style="list-style-type: none"> <li>• the message is stored and the service is not interrupted, and</li> <li>• the error situation is reported at the control position with sufficient information for an operator to handle the situation.</li> </ul> <p>Take note of the observed Gateway behaviour (conversion, rejection or storage of message) and the events at the monitor and control position (if any).</p>
<b>AMHS ref.: Doc</b>	4.5.2.1.4

<b>9880, Part II</b>	
<b>Test class</b>	Erroneous IPMS information objects (E31)

**END of Appendix D**



# EUR AMHS Manual

## Appendix D-UA

AMHS UA Conformance Tests	
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## References

- [1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures
- [2] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS), Second Edition – 2016
- [3] EUR Doc 020, EUR AMHS Manual, Main Part
- [4] EUR Doc 020, EUR AMHS Manual, Appendix C, AMHS Testing Requirements
- [5] EUR Doc 020, EUR AMHS Manual, Appendix D, AMHS Conformance Test
- [6] EUR Doc 020, EUR AMHS Manual, Appendix E, AMHS Interoperability Test
- [7] EUR Doc 020, EUR AMHS Manual, Appendix G, European Directory Service
- [8] EUR Doc 021, ATS Messaging Management Manual, Appendix D (AMHS User Capabilities)

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# 1. **Introduction**

## 1.1 **Purpose of the Document**

The purpose of the document is to define the functional tests for an AMHS UA Conformance Test, which allows checking any AMHS User Agent (UA) implementation against the AMHS Technical Specifications [2] as a primary step to ensure the end-to-end interoperability between compliant systems.

## 1.2 **Document Structure**

*Chapter 2* presents the test environment used for AMHS User Agent conformance testing.

*Chapter 3* defines the addressing plan implemented in the test environment and gives an overview about the user capabilities to be tested.

*Chapter 4* contains the test procedures for the Basic AMHS Service with subsections for each AMHS functional area. Each test procedure is presented in a structured way consisting of:

- defined test criteria,
- a (brief) scenario description,
- reference to the relevant part of the standard specification (Doc 9880 section),
- reference to the pre-defined user capabilities (EUR Doc 021),
- reference to test classes (N, En).

*Chapter 5* contains the test procedures of the Extended AMHS Service for the AMHS functional group: IPM heading extension (IHE) with subsections for each AMHS functional area as above in Chapter 4. Each test procedure is presented as well in the same structure as in Chapter 4.

*Chapter 6* is intended to contain the test procedures of the Extended AMHS Service for the AMHS functional group: Use of Directory Services (DIR). These test procedures have to be developed.

*Chapter 7* is intended to contain the test procedures of the Extended AMHS Service with subsections for the AMHS functional group: Security (SEC). These test procedures have to be developed.

## 1.3 **Test Identification Scheme**

Each test procedure has an identifier in the form

CTUAY $xnn$

where CTUA is an acronym for User Agent Conformance Test,  $y$  represents the number of a Functional Group (FG),  $x$  is a number identifying the test group<sup>1</sup> and  $nn$  is a consecutive number identifying the individual test procedure.

Functional Groups (FG) have been assigned numbers as follows:

- Basic AMHS Service – Test Procedures (y no value)
- Extended AMHS Service – Test Procedures with IHE (IPM heading extension) (y=1)
- Extended AMHS Service – Test Procedures with DIR (Use of Directory Services) (y=2)
- Extended AMHS Service – Test Procedures with SEC (Security) (y=3)

Test procedures are presented in six groups identified by numbers as follows:

- basic submission operations (x=1),
- basic delivery operations (x=2),
- specific submission operations (x=3),
- specific delivery operations (x=4),
- enhanced submission UA capabilities (x=5), and
- enhanced delivery UA capabilities (x=6).

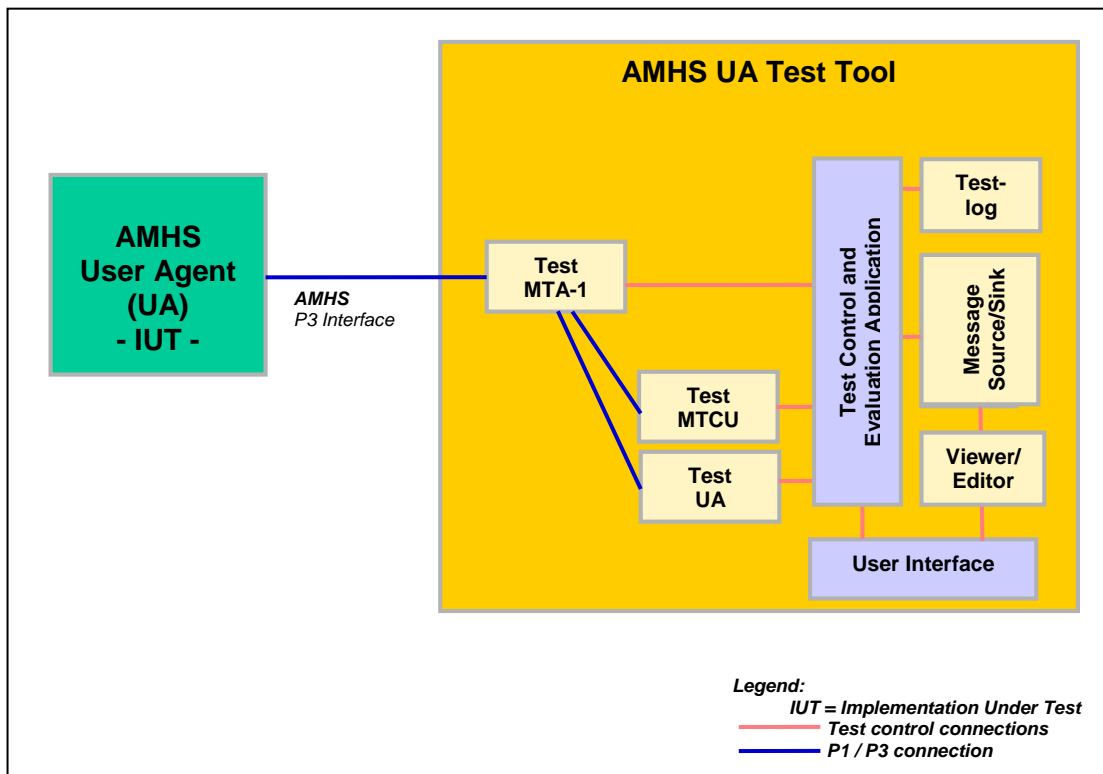
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<sup>1</sup> Test groups for general AMHS Conformance Tests have been identified in [4].



## 2. AMHS UA Conformance Test environment

The AMHS User Agent (UA) Implementation Under Test (IUT-UA) is embedded in a simulated operational environment formed by the AMHS UA Test Tool with an MTA instance (representing the ATS Message Servers serving the UA), an MTCU (representing one counterpart in indirect end-to-end communication) and one UA (representing one counterpart in direct end-to-end communication).



**Figure 1: AMHS UA Conformance Test environment**

Figure 1 shows the test environment used for AMHS UA Conformance Tests and the components of the AMHS UA Test Tool. The AMHS UA Test Tool will be interconnected with the IUT-UA's (standardized) external interface, i.e. an AMHS interface supporting the X.400/P3 protocol over a TCP/IP/LAN.

All test applications can be controlled independently via a user interface through the Test Control and Evaluation Application. The Test Control and Evaluation Application:

- maintains test samples in a repository (message source)
- executes test scripts,
- verifies the received messages (message sink),
- evaluates the result of each performed test step,
- stores every test step result in a test log, and
- keeps record of all sent and received messages during a test run.

Test scenarios involve the test components as depicted in Figure 1 in the following way:

*Submission test procedure groups (x=1, 3, 5):*

IUT-UA                                    =>    Test ATS Message Server    =>    Test MTCU

IUT-UA                                    =>    Test ATS Message Server    =>    Test UA

*Delivery test procedure groups (x=2, 4, 6):*

Test MTCU                                =>    Test ATS Message Server    =>    IUT-UA

Test UA                                    =>    Test ATS Message Server    =>    IUT-UA

### 3. Addressing Plan and User capabilities for AMHS UA conformance testing

#### 3.1 Remote addresses (Recipient or Originator addresses)

To meet the scope of testing, the test-address space used by the AMHS UA conformance testing should include AMHS addresses placed in different AMHS PRMDs and AFTN addresses located in different countries.

As a minimum, there is a need of three generic PRMDs and three generic AFTN countries which may be called: AMHSLAND-1, AMHSLAND-2, AMHSLAND-3, AFTNLAND-1, AFTNLAND-2 and AFTNLAND-3. If required, an extension of the address space should follow the same principles.

This allows covering of all cases of selected addressing schemes, including:

- CAAS with one single *organization-name* value for all location indicators within the PRMD,
- CAAS with multiple *organization-name* values for different sets of location indicators within the PRMD,
- XF.

The Nationality Letters AA, AB, AC, BA, BB and BC have been reserved for the purpose of AMHS testing. The PRMD names and addressing schemes used for AMHS conformance testing are indicated in Table 1:

Nationality Letter	Country-name (C)	ADMD-name (A)	PRMD-name (P)	Addressing Scheme
AA	XX	ICAO	AMHSLAND-1	CAAS
AB	XX	ICAO	AMHSLAND-2	CAAS
AC	XX	ICAO	AMHSLAND-3	XF
BA	XX	ICAO	AFTNLAND-1	CAAS
BB	XX	ICAO	AFTNLAND-2	CAAS
BC	XX	ICAO	AFTNLAND-3	XF

*Table 1: PRMD names and addressing schemes*

The user addresses of AMHSLAND-1 (Addressing scheme: CAAS – single "O" value)

/C=**XX**/A=**ICAO**/P=**AMHSLAND-1**/

O=**AA-REGION**      OUI=**AAAA**      -> CN=**AAAAMHAA** till **AAAAMHAZ**  
and  
CN=**AAAAMHBA** till **AAAAMHBZ**

The user addresses of AMHSLAND-2 (Addressing scheme: CAAS – multiple "O" value)

/C=**XX**/A=**ICAO**/P=**AMHSLAND-2**/

O= <b>AB-REGION1</b>	OU1= <b>ABAA</b>	-> CN= <b>ABAAMHAA</b> till <b>ABAAMHAZ</b>
O= <b>AB-REGION1</b>	OU1= <b>ABAB</b>	-> CN= <b>ABABMHAA</b> till <b>ABABMHAZ</b>
O= <b>AB-REGION2</b>	OU1= <b>ABBA</b>	-> CN= <b>ABBAMHAA</b> till <b>ABBAMHAZ</b>
O= <b>AB-REGION2</b>	OU1= <b>ABBB</b>	-> CN= <b>ABBBMHAA</b> till <b>ABBBMHAZ</b>
O= <b>AB-REGION3</b>	OU1= <b>ABCA</b>	-> CN= <b>ABCAMHAA</b> till <b>ABCAMHAZ</b>
O= <b>AB-REGION3</b>	OU1= <b>ABCB</b>	-> CN= <b>ABCBMHAA</b> till <b>ABCBMHAZ</b>

**Table 2: CAAS Table of AMHSLAND-2**

The user addresses of AMHSLAND-3 (Addressing scheme: XF)

/C=**XX**/A=**ICAO**/P=**AMHSLAND-3**/

O=**AFTN**                      OU1=**ACCCMHAA** till **ACCCMHAZ**      and  
    OU1=**ACCCMHBA** till **ACCCMHBZ**

The user addresses of AFTNLAND-1 (Addressing scheme: CAAS – single "O" value)

/C=**XX**/A=**ICAO**/P=**AFTNLAND-1**/

O=**BA-REGION**              OU1=**BAAA**      -> CN=**BAAAFATA** till **BAAAFATZ**

The user addresses of AFTNLAND-2 (Addressing scheme: CAAS – multiple "O" value)

/C=**XX**/A=**ICAO**/P=**AFTNLAND-2**/

O= <b>BB-REGION1</b>	OU1= <b>BBAA</b>	-> CN= <b>BBAAFTAA</b> till <b>BBAAFTAZ</b>
O= <b>BB-REGION1</b>	OU1= <b>BBAB</b>	-> CN= <b>BBABFTAA</b> till <b>BBABFTAZ</b>
O= <b>BB-REGION2</b>	OU1= <b>BBBA</b>	-> CN= <b>BBBAFTAA</b> till <b>BBBAFTAZ</b>
O= <b>BB-REGION2</b>	OU1= <b>BBBB</b>	-> CN= <b>BBBBFTAA</b> till <b>BBBBFTAZ</b>
O= <b>BB-REGION3</b>	OU1= <b>BBCA</b>	-> CN= <b>BBCAFTAA</b> till <b>BBCAFTAZ</b>
O= <b>BB-REGION3</b>	OU1= <b>BBCB</b>	-> CN= <b>BBCBFTAA</b> till <b>BBCBFTAZ</b>

**Table 3: CAAS Table of AFTNLAND-2**

The user addresses of AFTNLAND-3 (Addressing scheme: XF)

/C=**XX**/A=**ICAO**/P=**AFTNLAND-3**/

O=**AFTN**                      OU1=**BCAAFTAA** till **BCAAFTAZ**      and  
    OU1=**BCAAFTBA** till **BCAAFTBZ**

### 3.2 IUT addresses (Recipient or Originator addresses)

For the IUT-UA itself the test addresses has to be selected from following alternatives:

<b>CAAS</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>IUTLAND</b> /O= <b>IUT-REGION</b> /OU1= <b>IUTA</b> /CN= <b>IUTAMHSA</b> /
<b>XF</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>IUTLAND</b> /O= <b>AFTN</b> /OU1= <b>IUTAMHSA</b> /

*Table 4: Generic address spaces of the IUT User Agent*

### 3.3 “Unknown” addresses used for “negative testing”

The following “unknown” or invalid addresses are used in UA conformance tests:

<b>“Unknown” or invalid AMHS addresses used during delivery tests to IUT-UA</b>	
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-1</b> /O= <b>AA-REGION</b> /OU1= <b>AAAA</b> /CN= <b>AAAAMHABC</b> /	
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-1</b> /O= <b>AA-REGION</b> /OU1= <b>AAAA</b> /CN= <b>AAAAMH</b> /	
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-1</b> /O= <b>AA-REGION</b> /OU1= <b>AAAA</b> /CN=	
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-1</b> /O= <b>AA-REGION</b> /OU1=	/CN= <b>AAAAMHAA</b> /
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-1</b> /O= <b>AA-REGION</b> /OU1= <b>AAAX</b> /CN= <b>AAAAMHAA</b> /	
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-1</b> /O=	/OU1= <b>AAAA</b> /CN= <b>AAAAMHAA</b> /
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-3</b> /O= <b>AFTN</b> /OU1= <b>ACCCMHABC</b> /	
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-3</b> /O= <b>AFTN</b> /OU1= <b>ACCCMH</b> /	
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-3</b> /O= <b>AFTN</b> /OU1=	
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-3</b> /O=	/OU1= <b>ACCCMHAA</b> /
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-3</b> /O= <b>UNKNOWN</b> /OU1= <b>ACCCMHAA</b> /	

*Table 5: “Unknown” or invalid AMHS addresses for “negative” UA testing*

### 3.4 AMHS User Capabilities for AMHS UA Conformance

The user capabilities were taken from Section D.5.2 of [8]:

#### **D.5.2 Representation of the User Address related capabilities**

D.5.2.1 The AMHS User Capabilities are represented by pre-defined capabilities and values. Additional capabilities and values may be defined in the future. The following Capability Classes and values could be selected at present:

Capability class	Capabilities	Value	Remark
<b>body-parts</b>	IA5 BP and GT BP (Repertoire A), up to 1800 characters	A2	(IA5 BP - ia5-text body-part, GT BP - general-text-body-part, FTBP - file-transfer-body-part)  Only one of the entries is selectable
	IA5 BP and GT BP (Repertoire A), up to 16k characters	A16	
	IA5 BP and GT BP (Repertoire A), up to 64k characters	A64 <sup>2</sup>	
	IA5 BP and GT BP (Repertoire A and B), up to 1800 characters	B2	
	IA5 BP and GT BP (Repertoire A and B), up to 16k characters	B16	
	IA5 BP and GT BP (Repertoire A and B), up to 64k characters	B64 <sup>3</sup>	
	Text-body-part type A and FTBP	A64+F2048 <sup>4</sup>	
	Text-body-part type B and FTBP	B64+F2048	
	FTBP, up to 1M bytes	F1024 <sup>5</sup>	Only selectable if A64+F2048 or B64+F2048 is not selected
	FTBP, up to 2M bytes	F2048	
	FTBP, up to 4M bytes	F4096	For later use
	FTBP, up to 8M bytes	F8192	For later use
<b>Address type</b>	Distribution List	DL	Exactly one of the four is selectable
	Elementary Address (direct AMHS User Address)	EA	
	Elementary Address (indirect AMHS User Address)	EI	
	Group of Addresses	GA	
<b>IPM heading extensions</b>	Support of IPM heading extension information	IHE	
<b>Directory</b>	Use of Directory Services	DIR	
<b>AMHS Security</b>	Use of AMHS Security features	SEC	

Table 6: Capability classes and capability values

<sup>2</sup> If higher values are required the use of file-transfer-body-part is recommended.

<sup>3</sup> same note as above

<sup>4</sup> Other values not recommended.

<sup>5</sup> Lower values not recommended

In order to test the conformance of a User Agent the capability classes “body-parts” and “IPM heading extensions” are relevant. The capability classes “Directory” and “AMHS Security” could be considered later, if necessary.

The above overview leads to the conclusion that the minimum capability of an UA is: **A2**.

All other capabilities should be seen as enhanced capabilities.

### 3.5 Required settings in the AMHS UA Test Tool

To fulfil the requirements of the “unknown” addresses the following setting of the MD Lookup/CAAS Tables of the Test-MTCU of the AMHS UA Test Tool is requested:

Nationality Letters, Location Indicator	Mapped to	Used addressing scheme
<b>AAAA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-1</b> /	CAAS
<b>ABAA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-2</b> /	CAAS
<b>ABBA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-2</b> /	CAAS
<b>ABCA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-2</b> /	CAAS
<b>ACCC</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-3</b> /	XF
<b>BAAA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AFTNLAND-1</b> /	CAAS
<b>BBAA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AFTNLAND-2</b> /	CAAS
<b>BBBA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AFTNLAND-2</b> /	CAAS
<b>BBCA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AFTNLAND-2</b> /	CAAS
<b>BCAA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AFTNLAND-3</b> /	XF
<b>IUTA</b>	/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>IUTLAND</b> /	CAAS/XF

*Table 7: MD Lookup Table settings of the Test MTCU*

country-name/ADMD-name/PRMD-name	organization-name	organizational-unit-name
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-1</b> /	O= <b>AA-REGION</b>	OU1= <b>AAAA</b>
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-2</b> /	O= <b>AB-REGION1</b>	OU1= <b>ABAA</b>
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-2</b> /	O= <b>AB-REGION2</b>	OU1= <b>ABBA</b>
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AMHSLAND-2</b> /	O= <b>AB-REGION3</b>	OU1= <b>ABCA</b>
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AFTNLAND-1</b> /	O= <b>BA-REGION</b>	OU1= <b>BAAA</b>
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AFTNLAND-2</b> /	O= <b>BB-REGION1</b>	OU1= <b>BBAA</b>
/C= <b>XX</b> /A= <b>ICAO</b> /P= <b>AFTNLAND-2</b> /	O= <b>BB-REGION2</b>	OU1= <b>BBBA</b>

country-name/ADMD-name/PRMD-name	organization-name	organizational-unit-name
/C=XX/A=ICAO/P=AFTNLAND-2/	O=BB-REGION3	OU1=BBCA
/C=XX/A=ICAO/P=IUTLAND/	O=IUT-REGION	OU1=IUTA

*Table 8: CAAS Table settings of the Test MTCU*

### 3.6 User Address Look-up table

Within the AMHS/AFTN address conversion tests in Chapter 6 (Use of Directory Services) the following AMHS addresses are used to demonstrate the address conversion by means of the User Address look-up table:

AFTN address	Corresponding O/R address
ABAAMHAM	/C=XX/A=ICAO/P=TESTA/O=TEST-A/OU1=ABAA/CN=ABAAMHAM/
BCAAFTBM	/C=XX/A=ICAO/P=TESTB/O=AFTN/OU1=BCAAFTBM/

*Table 9: User Address look-up table entries for address conversion tests*



## 4. Basic AMHS Service – Test Procedures

*Note.*– Unless otherwise specified in the test case description, the AMHS UA Test Tool generates IPMs containing **ia5-text**. Definition of the various body part types used in the following test cases is included in section 2 ‘Glossary and Definitions’ of Appendix A of this Manual.

### 4.1 Basic Submission Operations (A2)

#### 4.1.1 CTUA101 – Submit an IPM – basic capability (A2)

*Note.*– The conformance test CTUA101 is passed successfully by the IUT if at least one of the tests CTUA101a, CTUA101b or CTUA101c is passed successfully

<b>CTUA101a</b>	<b>Submit an IPM containing an ia5-text</b>
<b>Test criteria</b>	This test is successful, if the IUT submits ATS messages (IPMs) containing an <b>ia5-text</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of five ATS messages (IPMs) addressing a remote AMHS user.</p> <ul style="list-style-type: none"> <li>• Message 1 (CT101aM01) shall have ATS-message-priority KK;</li> <li>• Message 2 (CT101aM02) shall have ATS-message-priority GG;</li> <li>• Message 3 (CT101aM03) shall have ATS-message-priority FF;</li> <li>• Message 4 (CT101aM04) shall have ATS-message-priority DD;</li> <li>• Message 5 (CT101aM05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall contain an <b>ia5-text</b> and have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty.</p> <p>Verify the messages received by the AMHS UA Test Tool at the AMHS interface. Check the format and contents of the submission envelope, IPM heading and body.</p> <p>Verify in particular, the priority value contained in the submission envelope and the following elements contained in the message content:</p> <ul style="list-style-type: none"> <li>• body part type,</li> <li>• Repertoire,</li> <li>• ATS-Message-Header syntax,</li> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.3.3.7 (ATS-Message-Header)

<b>Test class</b>	Normal AMHS communications (N)
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<b>CTUA101b</b>	<b>Submit an IPM containing an ia5-text-body-part</b>
<b>Test criteria</b>	This test is successful, if the IUT submits ATS messages (IPMs) containing an <b>ia5-text-body-part</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of five ATS messages (IPMs) addressing a remote AMHS user.</p> <ul style="list-style-type: none"> <li>• Message 1 (CT101bM01) shall have ATS-message-priority KK;</li> <li>• Message 2 (CT101bM02) shall have ATS-message-priority GG;</li> <li>• Message 3 (CT101bM03) shall have ATS-message-priority FF;</li> <li>• Message 4 (CT101bM04) shall have ATS-message-priority DD;</li> <li>• Message 5 (CT101bM05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall contain an <b>ia5-text-body-part</b> and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received by the AMHS UA Test Tool at the AMHS interface. Check the format and contents of the submission envelope, IPM heading and body.</p> <p>Verify in particular, the priority value contained in the submission envelope and the following elements contained in the message content:</p> <ul style="list-style-type: none"> <li>• body part type,</li> <li>• Repertoire,</li> <li>• ATS-Message-Header syntax,</li> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.3.3.7 (ATS-Message-Header)
<b>Test class</b>	Normal AMHS communications (N)

<b>CTUA101c</b>	<b>Submit an IPM containing a general-text-body-part with ISO 646 repertoire</b>
<b>Test criteria</b>	This test is successful, if the IUT submits ATS messages (IPMs) containing a <b>general-text-body-part with ISO 646 repertoire</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of five ATS messages (IPMs) addressing a remote AMHS user.</p> <ul style="list-style-type: none"> <li>• Message 1 (CT101cM01) shall have ATS-message-priority KK;</li> <li>• Message 2 (CT101cM02) shall have ATS-message-priority GG;</li> <li>• Message 3 (CT101cM03) shall have ATS-message-priority FF;</li> <li>• Message 4 (CT101cM04) shall have ATS-message-priority DD;</li> <li>• Message 5 (CT101cM05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall contain a <b>general-text-body-part with ISO 646 repertoire</b> and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received by the AMHS UA Test Tool at the AMHS interface. Check the format and contents of the submission envelope, IPM heading and body.</p> <p>Verify in particular, the priority value contained in the submission envelope and the following elements contained in the message content:</p> <ul style="list-style-type: none"> <li>• body part type,</li> <li>• Repertoire,</li> <li>• ATS-Message-Header syntax,</li> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.3.3.7 (ATS-Message-Header)
<b>Test class</b>	Normal AMHS communications (N)

#### 4.1.2 **CTUA102 – Submit an IPM containing optional-heading-information in the ATS-message-header**

<b>CTUA102</b>	<b>Submit an IPM containing optional-heading-information in the ATS-message-header with maximum A2 message length</b>
<b>Test criteria</b>	This test is successful, if the IUT submits IPMs containing optional-heading-information (OHI) in the ATS-message-header and A2 text length correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) addressing a remote AMHS user.</p> <p>The message text length shall be 1800 characters.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have priority FF and contain OHI text of 40 characters;</li> <li>• The second ATS message shall have priority FF and contain OHI text of maximum possible length;</li> <li>• The third ATS message shall have priority SS and contain OHI text of 40 characters;</li> <li>• The fourth ATS message shall have priority SS and contain OHI text of maximum possible length.</li> </ul> <p>Each message shall contain one body part and have different ATS-filing-time and ATS-message-text.</p> <p>Check the ATS messages submitted by the IUT-UA and verify the correct contents of the message (text length 1800 characters) and in particular, check the format and contents of the OHI.</p> <p>Check the maximum length of the OHI in case of FF<sup>6</sup> and SS<sup>7</sup> messages.</p>
<b>AMHS ref: Doc 9880, Part II</b>	4.5.2.2.10 (OHI), 3.3.3.7.4 – 3.3.3.7.6 (ATS Message Optional Heading Information)
<b>Test class</b>	Normal AMHS communications (N)

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<sup>6</sup> OHI text of 53 characters is the maximum length for non-SS messages, if the total maximum line length is 69 characters. (Total line length = OHI text + space + 6 digit filing time + space + 8 characters originator indicator)

<sup>7</sup> OHI text of 48 characters is the maximum length for SS messages, if the total maximum line length is 69 characters. (Total line length = OHI text + space + 6 digit filing time + 8 characters originator indicator + 5 characters priority alarm)

### 4.1.3 **CTUA103 – Submit an IPM containing recipient addresses of different addressing schemes**

<b>CTUA103</b>	<b>Submit an IPM containing recipient addresses of different addressing schemes</b>
<b>Test criteria</b>	This test is successful, if the IUT submits IPMs addressing different addressing schemes of recipient addresses of remote AMHS and AFTN users correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) addressing different kinds of remote AMHS and AFTN users.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have 3 recipient addresses of addressing scheme XF;</li> <li>• The second ATS message shall have 3 recipient addresses of addressing scheme CAAS (single O),</li> <li>• The third ATS message shall have 3 recipient addresses of addressing scheme CAAS (multiple O);</li> <li>• The fourth ATS message shall have 6 recipient addresses; 2 recipient addresses of each type of addressing scheme as above.</li> </ul> <p>Each message shall contain one body part and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty. Each message shall have ATS-message-priority FF.</p> <p>Check the messages received at the AMHS UA Test Tool.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• each message contains in the submission envelope the respective number of AMHS recipient addresses and an IPM heading with the same number of AMHS and AFTN recipients.</li> <li>• the ATS-message-priority is FF</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

**4.1.4 CTUA104 – Submit an IPM containing different numbers of recipient addresses**

<b>CTUA104</b>	<b>Submit an IPM containing different numbers of recipient addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an IPM addressing different numbers of recipient addresses of remote AMHS and AFTN users correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) addressing different numbers of remote AMHS and AFTN users.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have 7 recipient addresses (one shall be the Test User Agent) and ATS-message-priority KK;</li> <li>• The second ATS message shall have 14 recipient addresses (one shall be the Test User Agent) and ATS-message-priority GG;</li> <li>• The third ATS message shall have 21 recipient addresses (one shall be the Test User Agent) and ATS-message-priority FF;</li> <li>• (optional) The fourth ATS message shall have more than 21 recipient addresses, if possible (one shall be the Test User Agent) and ATS-message-priority DD.</li> </ul> <p>Each message shall contain one body part and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Check the messages received at the AMHS UA Test Tool.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• each message contains in the submission envelope the respective number of AMHS recipient addresses (7, 14, 21, more) and an IPM heading with the same number of AMHS and AFTN recipients.</li> <li>• the ATS-message-priority is according to the message sent.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

**4.1.5 CTUA105 – Submit an IPM containing different kinds of recipient addresses**

<b>CTUA105</b>	<b>Submit an IPM containing different kinds of recipient addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT submits IPMs addressing different kinds of recipient addresses of remote AMHS and AFTN users correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) addressing different kinds of remote AMHS and AFTN users.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have two primary recipients and two copy recipients (one shall be the Test User Agent);</li> <li>• The second ATS message shall have two primary recipients and two blind-copy recipients (one shall be the Test User Agent);</li> <li>• The third ATS message shall have two primary recipients, two copy recipients and two blind-copy recipients (one shall be the Test User Agent).</li> </ul> <p>Each message shall contain one body part and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty. Each message shall have ATS-message-priority FF.</p> <p>Verify that the messages (IPMs) are submitted to the AMHS UA Test Tool.</p> <p>Check the messages received at the AMHS UA Test Tool. Verify that:</p> <ul style="list-style-type: none"> <li>• the first message contains in the submission envelope all recipient addresses (the 2 primary and the 2 copy) and an IPM heading with all AMHS and AFTN recipients,</li> <li>• the second message should be split into 3 messages by the IUT-UA: <ul style="list-style-type: none"> <li>○ two messages each of which has only one of the blind-copy recipient (Bcc) addresses in the submission envelope and all addresses except the other Bcc address or except both Bcc addresses in the IPM Heading, and</li> <li>○ one message which has only the 2 primary recipients' addresses in the submission envelope and in the IPM Heading.</li> </ul> <p>Only this message shall have the originator-report-request flag set to "non-delivery-report",</p> </li> <li>• the third message should be split into 3 messages by the IUT-UA: <ul style="list-style-type: none"> <li>○ two messages which have only one Bcc address in the submission envelope and all addresses except the other Bcc address or except both Bcc addresses in the IPM Heading, and</li> <li>○ one message which has all other (the 2 primary and the 2 copy) addresses in the submission envelope and in the</li> </ul> </li> </ul>



	<p>IPM Heading.</p> <p>Only this message shall have the originator-report-request flag set to “non-delivery-report”.</p> <p>Check the messages received at the Test UA. Verify that:</p> <ul style="list-style-type: none"> <li>the first message addressed to the Test UA contains all addresses (the 2 primary and the 2 copy) in the IPM Heading,</li> <li>the second message addressed to the Test UA as Bcc contains the 2 primary addresses in the IPM Heading,</li> <li>the third message addressed to the Test UA as Bcc contains all addresses (the 2 primary and the 2 copy) in the IPM Heading.</li> </ul> <p><i>Note.— Depending on the implementation of the IUT-UA the IPM Heading of the second and third message contains additionally the blind-copy address belonging to the Test UA or no blind-copy address.</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent), 4.5.2 (IPM conversion)
<b>Test class</b>	Normal AMHS communications (N)

## 4.2 Basic Delivery Operations (A2)

### 4.2.1 CTUA201 – Deliver an IPM to the IUT – basic capability (A2)

*Note.*– The conformance test CTUA201 is passed successfully by the IUT only if all tests CTUA201a, CTUA201b and CTUA201c are passed successfully.

<b>CTUA201a</b>	<b>Deliver an IPM containing an ia5-text to the IUT-UA</b>
<b>Test criteria</b>	This test is successful, if the IUT receives ATS messages (IPMs) containing an <b>ia5-text</b> delivered from the Test MTA.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of five ATS messages (IPMs) containing an <b>ia5-text</b> to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have ATS-message-priority KK;</li> <li>• The second ATS message shall have ATS-message-priority GG;</li> <li>• The third ATS message shall have ATS-message-priority FF;</li> <li>• The fourth ATS message shall have ATS-message-priority DD;</li> <li>• The fifth ATS message shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received at the AMHS User Agent.</p> <p>Verify in particular, the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.3.3.7 (ATS-Message-Header)
<b>Test class</b>	Normal AMHS communications (N)

<b>CTUA201b</b>	<b>Deliver an IPM containing an ia5-text-body-part to the IUT-UA</b>
<b>Test criteria</b>	This test is successful, if the IUT receives ATS messages (IPMs) containing an <b>ia5-text-body-part</b> delivered from the Test MTA.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of five ATS messages (IPMs) containing an <b>ia5-text-body-part</b> to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have ATS-message-priority KK;</li> <li>• The second ATS message shall have ATS-message-priority GG;</li> <li>• The third ATS message shall have ATS-message-priority FF;</li> <li>• The fourth ATS message shall have ATS-message-priority DD;</li> <li>• The fifth ATS message shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received at the AMHS User Agent.</p> <p>Verify in particular, the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.3.3.7 (ATS-Message-Header)
<b>Test class</b>	Normal AMHS communications (N)

<b>CTUA201c</b>	<b>Deliver an IPM containing a general-text-body-part with ISO 646 repertoire to the IUT-UA</b>
<b>Test criteria</b>	This test is successful, if the IUT correctly receives ATS messages (IPMs) containing a <b>general-text-body-part with ISO 646 repertoire</b> delivered from the Test MTA.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of five ATS messages (IPMs) containing a <b>general-text-body-part with ISO 646 repertoire</b> to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have ATS-message-priority KK;</li> <li>• The second ATS message shall have ATS-message-priority GG;</li> <li>• The third ATS message shall have ATS-message-priority FF;</li> <li>• The fourth ATS message shall have ATS-message-priority DD;</li> <li>• The fifth ATS message shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received at the AMHS User Agent.</p> <p>Verify in particular, the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.3.3.7 (ATS-Message-Header)
<b>Test class</b>	Normal AMHS communications (N)

#### 4.2.2 **CTUA202 – Deliver an IPM containing erroneous ATS-message-header or ATS-message-text format**

<b>CTUA202</b>	<b>Deliver an IPM containing erroneous ATS-message-header or ATS-message-text format</b>
<b>Test criteria</b>	<p>This test is successful, if the IUT, when receiving IPMs containing erroneous ATS-message-header or ATS-message-text from a peer MTA:</p> <ul style="list-style-type: none"> <li>• displays the message to its local AMHS user regardless of the contained error, or</li> <li>• indicates the error situation</li> </ul>
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of seven messages (IPMs) to the IUT addressed to the local UA.</p> <ul style="list-style-type: none"> <li>• The first message (IPM) shall contain an empty ATS-message-priority;</li> <li>• The second message (IPM) shall contain an invalid ATS-message-priority;</li> <li>• The third message (IPM) shall contain an empty ATS-message-filing-time;</li> <li>• The fourth message (IPM) shall contain an invalid ATS-message-filing-time;</li> <li>• The fifth message (IPM) shall contain an empty ATS-message-header;</li> <li>• The sixth message (IPM) shall contain an empty ATS-message-text.</li> </ul> <p>Verify that the messages are received at the UA.</p> <p>Check the contents of each received ATS message and verify the ATS-message-priority, ATS-message-filing-time and ATS-message-text displayed at the UA or note the error indications<sup>8</sup>.</p>
<b>AMHS ref: Doc 9880, Part II</b>	3.3.3 (IPM text)
<b>Test class</b>	Erroneous AMHS parameters (E1)

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<sup>8</sup> The displayed message depends on the UA capabilities

#### 4.2.3 **CTUA203 – Deliver an IPM containing optional-heading-information in the ATS-message-header**

<b>CTUA203</b>	<b>Deliver an IPM containing optional-heading-information in the ATS-message-header with maximum A2 message length</b>
<b>Test criteria</b>	This test is successful, if the IUT displays IPMs containing optional-heading-information (OHI) in the ATS-message-header correctly or indicates an error if the OHI text is too long. Additionally, the reception of the A2 message length capability shall be checked.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have priority FF and contain OHI text of less than 53 characters<sup>9</sup>;</li> <li>• The second ATS message shall have priority FF and contain OHI text of exactly 53 characters;</li> <li>• The third ATS message shall have priority FF and contain OHI text of more than 53 characters;</li> <li>• The fourth ATS message shall have priority SS and contain OHI text of less than 48 characters<sup>10</sup>;</li> <li>• The fifth ATS message shall have priority SS and contain OHI text of exactly 48 characters;</li> <li>• The sixth ATS message shall have priority SS and contain OHI text of more than 48 characters.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The message text length shall be 1800 characters.</p> <p>Check the ATS messages received at IUT-UA and verify the correct contents of the messages (text length 1800 characters) and in particular, check the format and contents of the OHI.</p> <p>Verify that the IUT-UA indicates an error for the third and sixth ATS message if it could not be displayed.</p>
<b>AMHS ref: Doc 9880, Part II</b>	4.5.2.2.10 (OHI), 3.3.3.7.4 – 3.3.3.7.6 (ATS Message Optional Heading Information)
<b>Test class</b>	Normal AMHS communications (N), Erroneous AMHS parameters (E1)

<sup>9</sup> OHI text of 53 characters is the maximum length for non-SS messages, if the total maximum line length is 69 characters. (Total line length = OHI text + space + 6 digit filing time + space + 8 characters originator indicator)

<sup>10</sup> OHI text of 48 characters is the maximum length for SS messages, if the total maximum line length is 69 characters. (Total line length = OHI text + space + 6 digit filing time + 8 characters originator indicator + 5 characters priority alarm)

**4.2.4 CTUA204 – Deliver an IPM containing different kinds of recipient address**

<b>CTUA204</b>	<b>Deliver an IPM containing different kinds of recipient addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT displays IPMs containing different kinds of recipient address of the IUT-UA correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) addressing the IUT-UA in different ways.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have the IUT-UA address as primary recipient;</li> <li>• The second ATS message shall have the IUT-UA address as copy recipient;</li> <li>• The third ATS message shall have the IUT-UA address as blind-copy recipient.</li> </ul> <p>Each message shall have ATS-message-priority FF, different ATS-filing-time and different ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify that all messages (IPMs) are displayed at the IUT-UA correctly.</p> <p>Check that the recipient address is correctly indicated as:</p> <ul style="list-style-type: none"> <li>• primary recipient (first message)</li> <li>• copy recipient (second message), and</li> <li>• blind-copy recipient (third message).</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

**4.2.5 CTUA205 – Deliver an IPM with empty or missing IPM heading address fields**

<b>CTUA205</b>	<b>Deliver an IPM with empty or missing IPM heading address fields</b>
<b>Test criteria</b>	This test is successful if the IUT, when receiving an ATS message (IPM) from a peer MTA with empty or missing IPM heading address fields, delivers this message to its local AMHS user regardless of the empty or missing IPM heading address fields.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of messages (IPMs) to the IUT-UA. The delivery envelope shall contain correct addresses whereas address fields are missing or empty in the IPM heading.</p> <ul style="list-style-type: none"> <li>• The first message shall contain no originator address in the IPM heading.</li> <li>• The second message shall contain no primary, copy or blind copy recipient addresses in the IPM heading.</li> </ul> <p>Each message shall have ATS-message-priority FF, different ATS-filing-time and different ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Check any messages received and displayed at the UA<sup>11</sup>.</p> <p>Check the IUT-UA's log files with respect to delivered messages and reported errors, if any.</p>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent – AMH21)
<b>Test class</b>	Normal AMHS communications (N)

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<sup>11</sup> The displayed message depends on the UA capabilities.



**4.2.6 CTUA206 – Deliver an IPM with invalid originator address similar to CAAS**

<b>CTUA206</b>	<b>Deliver an IPM with invalid originator address similar to CAAS</b>
<b>Test criteria</b>	This test is successful, if the IUT is able to receive ATS messages (IPMs) that contain originator addresses looking like CAAS type ones but being invalid.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send to the IUT-UA a sequence of ATS messages (IPMs) being originated from the PRMD “AMHSLAND-1” which uses CAAS. The messages shall have a valid recipient address, but an erroneous originator address in the IPM heading.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall contain an originator address with an invalid <i>common-name</i> attribute that consists of 9 letters, e.g. “<b>AAAAMHABC</b>”;</li> <li>• The 2<sup>nd</sup> ATS message shall contain an originator address with an invalid <i>common-name</i> attribute that consists of only 6 letters, e.g. “<b>AAAAMH</b>”;</li> <li>• The 3<sup>rd</sup> ATS message shall contain an originator address with a valid <i>organizational-unit-names</i> attribute “<b>AAAA</b>”, but an empty <i>common-name</i> attribute;</li> <li>• The 4<sup>th</sup> ATS message shall contain an originator address with a valid <i>common-name</i> attribute “<b>AAAAMHAA</b>”, but an empty <i>organizational-unit-names</i> attribute;</li> <li>• The 5<sup>th</sup> ATS message shall contain an originator address with a valid <i>common-name</i> attribute “<b>AAAAMHAA</b>”, but an <i>organizational-unit-names</i> attribute that is different from the first 4 letters of the <i>common-name</i> attribute, e.g. “<b>AAAX</b>”;</li> <li>• The 6<sup>th</sup> ATS message shall contain an originator address with a valid <i>common-name</i> attribute “<b>AAAAMHAA</b>” and correct <i>organizational-unit-names</i> attribute “<b>AAAA</b>”, but an empty <i>organization-name</i> attribute.</li> </ul> <p>Verify that the IUT-UA displays the messages with invalid originator O/R address or indicates an error.</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Erroneous AMHS parameters (E1)

**4.2.7 CTUA207 – Deliver an IPM with invalid originator address similar to XF**

<b>CTUA207</b>	<b>Deliver an IPM with invalid originator address similar to XF</b>
<b>Test criteria</b>	This test is successful if the IUT is able to receive ATS messages (IPMs) that contain originator addresses looking like XF type ones but being invalid.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send to the IUT-UA a sequence of ATS messages (IPMs) being originated from the PRMD “AMHSLAND-3” which uses XF. The messages shall have a valid recipient address, but an erroneous originator address in the IPM heading.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute that consists of 9 letters, e.g. value “ACCCMHABC”;</li> <li>• The 2<sup>nd</sup> ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute that consists of only 6 letters, e.g. value “ACCCMH”;</li> <li>• The 3<sup>rd</sup> ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an empty <i>organizational-unit-names</i> attribute;</li> <li>• The 4<sup>th</sup> ATS message shall contain an originator address with an empty <i>organization-name</i> attribute and a valid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHAA”;</li> <li>• The 5<sup>th</sup> ATS message shall contain an originator address with an invalid <i>organization-name</i> attribute, e.g. “UNKNOWN” and a valid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHAA”.</li> </ul> <p>Verify that the IUT-UA displays the messages with invalid originator O/R address or indicates an error.</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Erroneous AMHS parameters (E1)

**4.2.8 CTUA208 – Deliver a redirected IPM to the IUT**

<b>CTUA208</b>	<b>Deliver a redirected IPM to the IUT-UA</b>
<b>Test criteria</b>	This test is successful, if the IUT receives redirected ATS messages (IPMs) containing one body part and delivered from the Test MTA.
<b>Scenario description</b>	<p>Redirect an AMHS O/R address different from the address of the IUT-UA to the address of the IUT-UA.</p> <p>From the AMHS UA Test Tool send a sequence of five ATS messages (IPMs) containing an ia5-text to the redirected address.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have ATS-message-priority KK;</li> <li>• The second ATS message shall have ATS-message-priority GG;</li> <li>• The third ATS message shall have ATS-message-priority FF;</li> <li>• The fourth ATS message shall have ATS-message-priority DD;</li> <li>• The fifth ATS message shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify the messages received at the AMHS User Agent.</p> <p>Verify in particular, the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• recipient address(es), all recipient addresses in the IPM Heading as originally sent by the AMHS UA Test Tool.</li> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul> <p>Check, if the user gets any indication that the message was subject to redirection, for example, a display of the redirection-history or the originally-intended-recipient-name.</p> <p>Verify for the received priority SS message, that the user gets a request to return a receipt notification.</p>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-1, 3.3.3.7 (ATS-Message-Header)
<b>Test class</b>	Normal AMHS communications (N)

## 4.3 Specific Submission Operations

### 4.3.1 CTUA301 – Submission of acknowledgements to messages with ATS-message-priority “SS”

<b>CTUA301</b>	<b>Submission of acknowledgements to messages with ATS-message-priority “SS”</b>
<b>Test criteria</b>	This test is successful, if the IUT submits the acknowledgement to a message with ATS-Message-priority “SS” as receipt notification and/or as IPM correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) with <i>ATS-message-priority</i> “SS” and the <i>receipt-notification</i> request flag set to ‘true’ to the IUT-UA.</p> <p>Each message shall have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>The first and the second ATS messages are addressed to the IUT-UA directly.</p> <p>The third and the fourth ATS messages are addressed to users other than the IUT-UA but are redirected to the IUT-UA.</p> <p>The IUT-UA shall return after user action (manual intervention) acknowledgements for the first and the third message as AMHS receipt notifications, and for the second and the fourth message as IPMs containing the respective AFTN acknowledgement messages.</p> <p>Verify that the received receipt notifications have been generated correctly, in particular, that:</p> <ul style="list-style-type: none"> <li>• the <i>ipn-originator</i> (IPN) represents the IUT-UA,</li> <li>• the <i>receipt-time</i> of the IPN is generated from the time at which the IUT-UA received the subject IPM,</li> <li>• the value of the <i>priority</i> element of the IPN is set to “urgent”,</li> <li>• the values of <i>subject-ipm</i> and <i>recipient-name</i> are inserted correctly from log entries.</li> </ul> <p>Verify that the received IPMs have been generated correctly, in particular, that:</p> <ul style="list-style-type: none"> <li>• the <i>originator-name</i> of the IPM is used as originator indicator in the text (R &lt;filing time&gt; &lt;originator&gt;) and as recipient address of the AFTN acknowledgement message,</li> <li>• the <b>filing time</b> in the text of the AFTN acknowledgement message is taken from the <i>ATS-message-filing-time</i> of the IPM,</li> <li>• the value of the <i>priority</i> element of the IPM is set to “urgent”.</li> </ul>

<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

### 4.3.2 CTUA302 – Submission of probes

<b>CTUA302</b>	<b>Submission of probes</b>
<b>Test criteria</b>	This test is successful, if the IUT submits probes testing the capability of a remote AMHS user correctly and displays the result of any returned AMHS report.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of probes to the AMHS UA Test Tool containing an intended recipient address (Test UA).</p> <ul style="list-style-type: none"> <li>• The first probe shall contain a content-length value up to 16k (octets);</li> <li>• Optional: If the IUT-UA supports the selection of different types of text body parts the submission of the first probe with a content-length value up to 16k (octets) should be repeated with the possible selections.</li> <li>• The second probe shall contain a content-length value of at least 64 k (octets).</li> <li>• Optional: If the IUT-UA supports the selection of different types of text body parts the submission of the second probe with a content-length value of at least 64 k (octets) should be repeated with the possible selections.</li> <li>• Optional: The third probe shall contain a content-length value up to 2 Mbytes and original-encoded-information-type with OID id-eit-file-transfer which is related to the file-transfer-body-part;</li> <li>• Optional: The fourth probe shall contain a content-length value up to 2 Mbytes and original-encoded-information-types related to the text body part and the file-transfer-body-part;</li> <li>• Optional: If the IUT-UA supports the selection of different types of text body parts the submission of the fourth probe with two body parts should be repeated with the possible selections.</li> </ul> <p>The AMHS UA Test Tool shall return DRs for the first probe as well as for the first optional probes, if generated. The other probes shall be responded by NDRs.</p> <p>Verify that the probes are correctly composed in all elements.</p> <p>Verify that in all submitted probes the originator-report-request argument is set to “report”.</p> <p>Verify in particular, that the values contained in the content-length and original-encoded-information-types correspond to the input of the user.</p> <p>Verify that the returned AMHS reports are correctly received and displayed at the IUT-UA.</p>
<b>AMHS ref: Doc 9880, Part II</b>	2.2.2 (AMHS information model)
<b>Test class</b>	Normal AMHS communications (N)

#### 4.3.3 CTUA303 – Checking of default envelope elements (flag setting) in submitted IPMs

<b>CTUA303</b>	<b>Checking of default envelope elements (flag setting) in submitted IPMs</b>
<b>Test criteria</b>	This test is successful, if the IUT submits IPMs with the correct default envelope elements (“flags”).
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) to the AMHS UA Test Tool.</p> <ul style="list-style-type: none"> <li>• The first message shall be addressed to an AMHS Direct User (the Test UA) with normal (default) flag setting;</li> <li>• The second message shall be addressed to an AMHS Indirect User (Test MTCU) with normal (default) flag setting,</li> <li>• The third message shall be addressed to an AMHS distribution list.</li> </ul> <p>Each message shall contain one text body part and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty. Each message shall have ATS-message-priority FF.</p> <p>Verify the setting of the following envelope elements (flags). As default values the following settings are expected:</p> <p>Per-message-indicators: The per-message-indicators shall be absent or set to the default values as follows:</p> <ul style="list-style-type: none"> <li>• <i>disclosure-of-other-recipients -prohibited (0)</i></li> <li>• <i>implicit-conversion -allowed (0)</i></li> <li>• <i>alternate-recipient-prohibited (0)</i></li> <li>• <i>content-return -not-requested (0)</i></li> </ul> <p>Originator-report-request element (for all recipients): The originator-report-request element shall be set to: <i>non-delivery-report</i>.</p> <p>Extensions elements: The following extensions elements shall not be used or take their default values:</p> <ul style="list-style-type: none"> <li>• <i>recipient-reassignment-allowed (0)</i></li> <li>• <i>dl-expansion- allowed (0)</i></li> <li>• <i>conversion-with-loss-allowed (0)</i></li> </ul> <p><i>Note.– Default values are those as defined in ISO/IEC 10021-4 (ITU-T X.411).</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	4.4.2.3.17, 4.4.2.3.18 and 4.4.2.3.20 (per-message-indicators), 4.4.2.3.8.1 (extension elements)
<b>Test class</b>	Normal AMHS communications (N)

#### 4.3.4 **CTUA304 – Checking of user settings in the envelopes of submitted IPMs (optional)**

<b>CTUA304</b>	<b>Checking of user settings in the envelopes of submitted IPMs (optional)</b>
<b>Test criteria</b>	This test is successful, if the IUT submits IPMs with the expected settings of the different <b>envelope elements</b> (“flags”) as set by the user if such a feature is implemented.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) to the AMHS UA Test Tool with different possible flags set by the user if implemented.</p> <ul style="list-style-type: none"> <li>• The first IPM shall be submitted with per-message-indicators (only for those supported at the user interface) set as follows: <ul style="list-style-type: none"> <li>○ <i>disclosure-of-other-recipients-requested(1)</i></li> <li>○ <i>implicit-conversion-prohibited(1)</i></li> <li>○ <i>alternate-recipient-allowed(1)</i></li> <li>○ <i>content-return-requested(1)</i></li> </ul> </li> <li>• The second IPM shall be submitted using extensions elements (only for those supported at the user interface) as follows: <ul style="list-style-type: none"> <li>○ <i>recipient-reassignment-prohibited(1)</i></li> <li>○ <i>dl-expansion-prohibited(1)</i></li> <li>○ <i>conversion-with-loss-prohibited(1)</i></li> </ul> </li> </ul> <p>Each message shall contain one body part and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty. Each message shall have ATS-message-priority FF.</p> <p>Verify the setting of the envelope elements (flags) in accordance with the performed user actions.</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)



#### 4.3.5 CTUA305 – Checking of user settings, especially report request, in submitted IPMs (optional)

<b>CTUA305</b>	<b>Checking of user settings, especially report request, in submitted IPMs (optional)</b>
<b>Test criteria</b>	This test is successful, if the IUT submits IPMs with the expected report request settings in the message submission envelope.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) to the AMHS UA Test Tool with the originator-report-request element either set to a default (pre-configured) value or set to a value which corresponds to a selection made by the user (if such function is implemented).</p> <ul style="list-style-type: none"> <li>• The first IPM shall be submitted to two recipients (A and B) with <b>default</b> report requests (no selection made by the user);</li> <li>• Optional: The second IPM shall be submitted to two recipients (A and B) with <b>non-delivery report</b> requested for recipient A and <b>report</b> requested for recipient B;</li> <li>• Optional: The third IPM shall be submitted to two recipients (A and B) with <b>report</b> requested for recipient A and <b>non-delivery report</b> requested for recipient B;</li> <li>• Optional: The fourth IPM shall be submitted to two recipients (A and B) with <b>report</b> requested for both recipients.</li> </ul> <p>Each message shall contain one body part and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty. Each message shall have ATS-message-priority FF.</p> <p>Check the report request settings in the first IPM. The expected value of the report request elements for both recipients is: <b>“non-delivery report”</b>.</p> <p>Verify that in all other IPMs the report request elements contained in the message submission envelopes correspond to the selection performed by the user.</p> <p><i>Note.— It is recommended that the setting “no-report” is prevented at the UA (operational requirements dictate that upon reception of an NDR the responsibility for the message remains at the UA user site, therefore the generation of NDRs should not be preventable by the UA settings).</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

## 4.4 Specific Delivery Operations

### 4.4.1 CTUA401 – Deliver a non-delivery report (NDR) to an AMHS user

<b>CTUA401</b>	<b>Deliver a non-delivery report (NDR) to an AMHS user</b>
<b>Test criteria</b>	This test is successful, if the IUT displays non-delivery reports containing the standardized reason and diagnostic codes to an AMHS user correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a set of non-delivery reports to the IUT-UA directly attached.</p> <p>The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see Table 10).</p> <p>The report delivery envelope shall contain the report-destination of the IUT-UA. The reports may contain fictitious values for those elements which are normally related to a subject message, like subject-identifier, original-encoded-information-types and originally-intended-recipient-name.</p> <p>Monitor that the reports are received at the IUT-UA and displayed.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• the reported recipient(s) in report content is/are displayed,</li> <li>• the reason and diagnostic codes of the delivered reports are identical to those contained in the reports sent from the AMHS UA Test Tool.</li> <li>• the text associated with the reason and diagnostic codes is displayed correctly, i.e. as standardized in ISO/IEC 10021-4 or ITU-T Rec. X.411 (Abstract Syntax Definition in Figure 2 - Part 16).</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

AMHS Report ID	<i>number of Per-Recipient-Fields</i>	reason code	diagnostic codes (range)
CTUA401M01	16	0	0 - 15
CTUA401M02	31	0	0 - 30
CTUA401M03	31	1	0 - 30
CTUA401M04	5	1	46 - 50
CTUA401M05	3	2	8 - 10
CTUA401M06	7	2	19 - 25
CTUA401M07	1	3	31
CTUA401M08	14	4	32 - 45
CTUA401M09	1	5	not used
CTUA401M10	1	6	not used
CTUA401M11	1	7	not used
CTUA401M12	28	8	51 - 78

**Table 10: Non-delivery-reason-codes and non-delivery-diagnostic-codes used in CTUA401**

*Note.*— The non-delivery-diagnostic-code is an optional element and, for example, not contained in test messages CTUA401M09, CTUA401M10 and CTUA401M11.

**4.4.2 CTUA402 – Deliver an NDR containing non-standard reason or diagnostic codes**

<b>CTUA402</b>	<b>Deliver an NDR containing non-standard reason or diagnostic codes</b>
<b>Test criteria</b>	This test is successful, if the IUT displays non-delivery reports containing reason and diagnostic codes which are syntactically correct, but different from those defined in section 8.3.1.2.1.11 and section 8.3.1.2.1.12 of ISO/IEC 10021-4 (ITU-T Rec. X.411).
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send several NDRs to the IUT-UA.</p> <p>The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes:</p> <ul style="list-style-type: none"> <li>• CTUA402M01 contains “9” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA402M02 contains “255” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA402M03 contains “32767” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA402M04 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “79” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA402M05 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “255” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA402M06 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “32767” for the <i>non-delivery-diagnostic-code</i>.</li> </ul> <p>Verify that all NDRs are delivered to the IUT-UA.</p> <p>Check the contained reason and diagnostic codes (if any).</p> <p>Verify that no misleading information is presented to the AMHS user.</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Erroneous AMHS parameters (E1)

#### 4.4.3 **CTUA403 – Deliver IPNs containing receipt (RN) or non-receipt (NRN) notification**

<b>CTUA403</b>	<b>Deliver IPNs containing receipt notification (RN) or non-receipt notification (NRN)</b>
<b>Test criteria</b>	This test is successful, if the IUT displays IPNs containing receipt notification (RN) and/or non-receipt notification (NRN) to an AMHS user correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of IPNs to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first IPN shall contain one receipt notification (RN);</li> <li>• The second IPN shall contain another receipt notification (RN);</li> <li>• The third IPN shall contain one non-receipt notification (NRN);</li> <li>• The fourth IPN shall contain another non-receipt notification (NRN).</li> </ul> <p>Monitor the IPNs received at the IUT-UA.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• all IPNs are delivered to the IUT-UA, and</li> <li>• the receipt (RN) or non-receipt (NRN) notifications are displayed correctly.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	IPN
<b>Test class</b>	Normal AMHS communications (N)

#### 4.4.4 **CTUA404 – Deliver a report containing delivery (DR) and/or non-delivery (NDR) information**

<b>CTUA404</b>	<b>Deliver a report containing delivery (DR) and/or non-delivery (NDR) information</b>
<b>Test criteria</b>	This test is successful, if the IUT displays delivery and non-delivery reports to an AMHS user correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a set of reports to the IUT-UA directly attached.</p> <ul style="list-style-type: none"> <li>• The first report shall contain one delivery (DR) information;</li> <li>• The second report shall contain two delivery (DR) information;</li> <li>• The third report shall contain ten delivery (DR) information;</li> <li>• The fourth report shall contain one non-delivery (NDR) information;</li> <li>• The fifth report shall contain two non-delivery (NDR) information;</li> <li>• The sixth report shall contain ten non-delivery (NDR) information;</li> <li>• The seventh report shall contain one delivery (DR) and one non-delivery (NDR) information,</li> <li>• The eighth report shall contain two delivery (DR) and two non-delivery (NDR) information;</li> <li>• The ninth report shall contain ten delivery (DR) and ten non-delivery (NDR) information.</li> </ul> <p>Monitor the reports received at the IUT-UA.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• all reports are delivered to the IUT-UA, and</li> <li>• all the delivery (DR) and non-delivery (NDR) information is displayed correctly.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	DR
<b>Test class</b>	Normal AMHS communications (N)

**4.4.5 CTUA405 – Deliver IPMs containing optional arguments in the delivery envelope**

<b>CTUA405</b>	<b>Deliver IPMs containing optional arguments in the delivery envelope</b>
<b>Test criteria</b>	This test is successful, if the IUT receives IPMs containing optional delivery envelope arguments and displays the values correctly for those elements supported at the user interface.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first message shall contain only the mandatory delivery envelope arguments, i.e. message-delivery-identifier, message-submission-time, message-delivery-time, originator-name, this-recipient-name and content-type. The priority argument shall be absent or take its default value (normal);</li> <li>• The second message shall contain the following optional delivery envelope element: other-recipient-names;</li> <li>• The third message shall contain the following optional delivery envelope element: original-encoded-information-types;</li> <li>• The fourth message shall contain the following optional delivery envelope element: content-identifier;</li> <li>• The fifth message shall contain the following delivery envelope extension element: trace-information;</li> <li>• The sixth message shall contain the following delivery envelope extension element: dl-expansion-history;</li> <li>• The seventh message shall contain the following delivery envelope extension element: redirection-history;</li> </ul> <p>Each message shall contain one general-text-body-part<sup>12</sup> and have different ATS-filing-time and ATS-message-text. The optional-heading-information element shall be empty.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• all messages are received at the IUT-UA, and</li> <li>• the values of the mandatory and optional delivery envelope arguments, which are supported at the user interface, are displayed correctly.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

<sup>12</sup> The general-text-body-part is used to check the original-encoded-information-types (see 3<sup>rd</sup> message).

## 4.5 Enhanced Submission UA Capability

*Note.— Only those messages shall be used which meet the AMHS User Capability of the IUT.*

### 4.5.1 CTUA501 – Submit an IPM with the implemented capability of one body part

<b>CTUA501</b>	<b>Submit an IPM with the implemented capability of one body part</b>
<b>Test criteria</b>	This test is successful, if the IUT submits ATS messages (IPMs) containing <b>one body part with length equal to that defined for the respective capability class</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) addressing the AMHS UA Test Tool and meeting the defined user capability.</p> <ul style="list-style-type: none"> <li>• <u>Capability A16</u>: This Message shall have one body part with message text length of 16 k characters;</li> <li>• <u>Capability A64</u>: This Message shall have one body part with message text length of 64 k characters;</li> <li>• <u>Capability B2</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 1800 characters;</li> <li>• <u>Capability B16</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 16 k characters;</li> <li>• <u>Capability B64</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 64 k characters;</li> <li>• <u>Capability F1024</u><sup>13</sup>: This Message shall have one file-transfer-body-part with body part size of 1 M bytes;</li> <li>• <u>Capability F2048</u>: This Message shall have one file-transfer-body-part with body part size of 2 M bytes.</li> </ul> <p>Each ATS message (except those with FTBP) shall have ATS-message-priority GG and a different ATS-filing-time. The <i>optional-heading-information</i> element shall be empty.</p> <p>Verify the messages received by the AMHS UA Test Tool. Check the format and contents of the submission envelope, IPM heading and body.</p> <p>Verify in particular, the respective message length and body part type.</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

<sup>13</sup> Lower values not recommended



#### 4.5.2 CTUA502 – Submit an IPM with the implemented capability of two body parts

<b>CTUA502</b>	<b>Submit an IPM with the implemented capability of two body parts</b>
<b>Test criteria</b>	This test is successful, if the IUT submits ATS messages (IPMs) containing <b>two body parts with values equal to those defined for the respective capability class</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) addressing the AMHS UA Test Tool and meeting the defined user capability.</p> <ul style="list-style-type: none"> <li>• <u>Capability A64+F2048<sup>14</sup></u>: This Message shall have two body parts; one body part with message text length of 64 k characters and one file-transfer-body-part with body part size of 2 M bytes;</li> <li>• <u>Capability B64+F2048</u>: This Message shall have two body parts; one general-text-body-part with Repertoire B and with message text length of 64 k characters and one file-transfer-body-part with body part size of 2 M bytes.</li> </ul> <p>For each user capability an ATS message shall be generated with ATS-message-header in the text body-part (having the ATS-message-priority GG, different ATS-filing-time and an empty <i>optional-heading-information</i> element).</p> <p>Verify the messages received by the AMHS UA Test Tool. Check the format and contents of the submission envelope, IPM heading and body (two body-parts).</p> <p>Verify in particular,</p> <ul style="list-style-type: none"> <li>• the respective message length/body part size and body part types of bothbody parts,</li> <li>• the ATS-message header.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

<sup>14</sup> Other values not recommended.

## 4.6 Enhanced Delivery UA Capability

*Note.*— Only those messages shall be used meeting the AMHS User Capability of the IUT.

### 4.6.1 CTUA601 – Deliver an IPM with the implemented capability of one body part

<b>CTUA601</b>	<b>Deliver an IPM with the implemented capability of one body part</b>
<b>Test criteria</b>	This test is successful, if the IUT displays ATS messages (IPM) containing <b>one body part with length equal to that defined for the respective capability class</b> correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) addressing the IUT-UA and meeting the defined user capability.</p> <ul style="list-style-type: none"> <li>• <u>Capability A16</u>: This Message shall have one body part with message text length of 16 k characters.</li> <li>• <u>Capability A64</u>: This Message shall have one body part with message text length of 64 k characters.</li> <li>• <u>Capability B2</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 1800 characters.</li> <li>• <u>Capability B16</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 16 k characters.</li> <li>• <u>Capability B64</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 64 k characters.</li> <li>• <u>Capability F1024</u><sup>15</sup>: This Message shall have one file-transfer-body-part with body part size of 1 M bytes.</li> <li>• <u>Capability F2048</u>: This Message shall have one file-transfer-body-part with body part size of 2 M bytes.</li> </ul> <p>Each ATS message (except those with FTBP) shall have ATS-message-priority FF and different ATS-filing-time. The <i>optional-heading-information</i> element shall be empty.</p> <p>Verify that all messages, which are supported by the IUT-UA, are correctly received.</p> <p>Verify in particular, that</p> <ul style="list-style-type: none"> <li>• the message text (in full length) and ATS-message-header elements are displayed correctly.</li> <li>• the respective body part size and content for messages with FTBP</li> </ul>

<sup>15</sup> Lower values not recommended

	are correct.
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

#### 4.6.2 CTUA602 – Deliver an IPM with the implemented capability of two body parts

<b>CTUA602</b>	<b>Deliver an IPM with the implemented capability of two body parts</b>
<b>Test criteria</b>	This test is successful, if the IUT displays ATS messages (IPMs) containing <b>two body parts with values equal to those defined for the respective capability class</b> correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) addressing the IUT-UA and meeting the defined user capability.</p> <ul style="list-style-type: none"> <li>• <u>Capability A64+F2048<sup>16</sup></u>: This Message shall have two body parts; one body part with message text length of 64 k characters and one file-transfer-body-part with body part size of 2 M bytes.</li> <li>• <u>Capability B64+F2048</u>: This Message shall have two body parts; one general-text-body-part with Repertoire B and with message text length of 64 k characters and one file-transfer-body-part with body part size of 2 M bytes.</li> </ul> <p>For each user capability an ATS message shall be generated with ATS-message-header in the text body part (having the ATS-message-priority GG, different ATS-filing-time and an empty <i>optional-heading-information</i> element).</p> <p>Verify that all messages, which are supported by the IUT-UA, are correctly received.</p> <p>Verify in particular, that</p> <ul style="list-style-type: none"> <li>• the message text (in full length) and ATS-message-header elements (if present) are displayed correctly; and</li> <li>• the respective body part size and content are correct.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

<sup>16</sup> Other values not recommended.

## 5. Extended AMHS Service – Test Procedures with IHE (IPM heading extension)

*Note.– Unless otherwise specified in the test case description, the AMHS UA Test Tool generates IPMs containing an ia5-text. Definition of the various body part types used in the following test cases is included in section 2 ‘Glossary and Definitions’ of Appendix A of this Manual.*

### 5.1 Submission Operations (A2-IHE)

#### 5.1.1 CTUA1101 – Submit an IPM with IHE – basic capability (A2-IHE)

*Note.– The conformance test CTUA1101 is passed successfully by the IUT if at least one of the tests CTUA1101a, CTUA1101b or CTUA1101c is passed successfully*

<b>CTUA1101a</b>	<b>Submit an IPM with IHE, containing an ia5-text</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an ATS message (IPM) with IHE, containing an <b>ia5-text</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of five ATS messages (IPMs) with IHE addressing a remote AMHS user.</p> <ul style="list-style-type: none"> <li>• Message 1 (CT1101aM01) shall have priority KK;</li> <li>• Message 2 (CT1101aM02) shall have priority GG;</li> <li>• Message 3 (CT1101aM03) shall have priority FF;</li> <li>• Message 4 (CT1101aM04) shall have priority DD;</li> <li>• Message 5 (CT1101aM05) shall have priority SS.</li> </ul> <p>Each message shall contain an ia5-text and have different filing time and message text. The originators-reference (OHI) element shall be absent.</p> <p>Verify the messages received by the AMHS UA Test Tool at the AMHS interface. Check the format and contents of the submission envelope, IPM heading and body.</p> <p>Verify in particular, the priority value contained in the submission envelope and the following elements contained in the IPM:</p> <ul style="list-style-type: none"> <li>• body part type,</li> <li>• Repertoire,</li> <li>• absence of originators-reference (OHI),</li> <li>• precedence-policy-identifier set to value 1.3.27.8.0.0<sup>17</sup>,</li> <li>• precedence equivalent to the ATS message priority,</li> </ul>

<sup>17</sup> object-identifier value {iso (1) identifiedorganisation (3) icao (27) atn-amhs (8) parameters (0) amhs-precedence-policy (0)}.

	<ul style="list-style-type: none"><li>• authorization-time (filing time),</li><li>• message text.</li></ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2, 3.3.4 (Use of IPM elements in support of the extended ATSMHS)
<b>Test class</b>	Normal AMHS communications (N)

<b>CTUA1101b</b>	<b>Submit an IPM with IHE, containing an ia5-text-body-part</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an ATS message (IPM) with IHE, containing an <b>ia5-text-body-part</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of five ATS messages (IPMs) with IHE addressing a remote AMHS user.</p> <ul style="list-style-type: none"> <li>• Message 1 (CT1101bM01) shall have priority KK;</li> <li>• Message 2 (CT1101bM02) shall have priority GG;</li> <li>• Message 3 (CT1101bM03) shall have priority FF;</li> <li>• Message 4 (CT1101bM04) shall have priority DD;</li> <li>• Message 5 (CT1101bM05) shall have priority SS.</li> </ul> <p>Each message shall contain an <b>ia5-text-body-part</b> and have different filing time and message text. The originators-reference (OHI) element shall be absent.</p> <p>Verify the messages received by the AMHS UA Test Tool at the AMHS interface. Check the format and contents of the submission envelope, IPM heading and body.</p> <p>Verify in particular, the priority value contained in the submission envelope and the following elements contained in the message content:</p> <ul style="list-style-type: none"> <li>• body part type,</li> <li>• Repertoire,</li> <li>• absence of originators-reference (OHI),</li> <li>• precedence-policy-identifier set to value 1.3.27.8.0.0<sup>18</sup>,</li> <li>• precedence equivalent to the ATS message priority,</li> <li>• authorization-time (filing time),</li> <li>• message text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2, 3.3.4 (Use of IPM elements in support of the extended ATSMHS)
<b>Test class</b>	Normal AMHS communications (N)

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<sup>18</sup> See CTUA1101a

<b>CTUA1101c</b>	<b>Submit an IPM with IHE, containing a general-text-body-part with ISO 646 repertoire</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an ATS message (IPM) with IHE, containing a <b>general-text-body-part with ISO 646 repertoire</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of five ATS messages (IPMs) with IHE addressing a remote AMHS user.</p> <ul style="list-style-type: none"> <li>• Message 1 (CT1101cM01) shall have priority KK;</li> <li>• Message 2 (CT1101cM02) shall have priority GG;</li> <li>• Message 3 (CT1101cM03) shall have priority FF;</li> <li>• Message 4 (CT1101cM04) shall have priority DD;</li> <li>• Message 5 (CT1101cM05) shall have priority SS.</li> </ul> <p>Each message shall contain a <b>general-text-body-part with ISO 646 repertoire</b> and have different filing time and message text. The originators-reference (OHI) element shall be absent.</p> <p>Verify the messages received by the AMHS UA Test Tool at the AMHS interface. Check the format and contents of the submission envelope, IPM heading and body.</p> <p>Verify in particular, the priority value contained in the submission envelope and the following elements contained in the message content:</p> <ul style="list-style-type: none"> <li>• body part type,</li> <li>• Repertoire,</li> <li>• absence of originators-reference (OHI);</li> <li>• precedence-policy-identifier set to value 1.3.27.8.0.0<sup>19</sup>,</li> <li>• precedence equivalent to the ATS message priority,</li> <li>• authorization-time (filing time),</li> <li>• message text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2, 3.3.4 (Use of IPM elements in support of the extended ATSMHS)
<b>Test class</b>	Normal AMHS communications (N)

<sup>19</sup> See CTUA1101a



**5.1.2 CTUA1102 – Submit an IPM with IHE, containing optional heading information**

<b>CTUA1102</b>	<b>Submit an IPM with IHE, containing optional heading information</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an IPM with IHE, containing originators-reference (OHI) element and A2 text length correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) addressing a remote AMHS user.</p> <p>The message text length shall be 1800 characters.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have priority FF and contain originators-reference (OHI) text of 40 characters;</li> <li>• The second ATS message shall have priority FF and contain originators-reference (OHI) text of maximum possible length;</li> <li>• The third ATS message shall have priority SS and contain originators-reference (OHI) text of 40 characters;</li> <li>• The fourth ATS message shall have priority SS and contain originators-reference (OHI) text of maximum possible length.</li> </ul> <p>Each message shall contain one body part with maximum A2 message length and have a different filing time and message text.</p> <p>Check the ATS messages submitted by the IUT-UA and verify the correct contents of the message (text length 1800 characters) and in particular, check the format and contents of the originators-reference (OHI).</p> <p>Check the maximum length of the originators-reference (OHI) in case of FF<sup>20</sup> and SS<sup>21</sup> messages.</p>
<b>AMHS ref: Doc 9880, Part II</b>	4.5.2.2.10 (OHI), 3.3.4.3 – 3.3.4.4 (Originators-reference)
<b>Test class</b>	Normal AMHS communications (N)

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<sup>20</sup> OHI text of 53 characters is the maximum length for non-SS messages, if the total maximum line length is 69 characters. (Total line length = OHI text + space + 6 digit filing time + space + 8 characters originator indicator)

<sup>21</sup> OHI text of 48 characters is the maximum length for SS messages, if the total maximum line length is 69 characters. (Total line length = OHI text + space + 6 digit filing time + 8 characters originator indicator + 5 characters priority alarm)

### 5.1.3 CTUA1103 – Submit an IPM with IHE, containing recipient addresses of different addressing schemes

<b>CTUA1103</b>	<b>Submit an IPM with IHE, containing recipient addresses of different addressing schemes</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an IPM with IHE, addressing recipient addresses of remote AMHS and AFTN users of different addressing schemes of correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) with IHE, addressing different kinds of remote AMHS and AFTN users.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have 3 recipient addresses of addressing scheme XF;</li> <li>• The second ATS message shall have 3 recipient addresses of addressing scheme CAAS (single O);</li> <li>• The third ATS message shall have 3 recipient addresses of addressing scheme CAAS (multiple O);</li> <li>• The fourth ATS message shall have 6 recipient addresses; 2 recipient addresses of each type of addressing scheme as above.</li> </ul> <p>Each message shall contain one body part and have a different filing time and message text. The originators-reference (OHI) element shall be absent. Each message shall have priority FF.</p> <p>Check the messages received at the AMHS UA Test Tool.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• each message contains in the submission envelope the respective number of AMHS recipient addresses and an IPM heading with the same number of AMHS and AFTN recipients.</li> <li>• the precedence value is equivalent to the ATS message priority FF and associated to each recipient address.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

#### 5.1.4 **CTUA1104 – Submit an IPM with IHE, containing different numbers of recipient addresses**

<b>CTUA1104</b>	<b>Submit an IPM with IHE, containing different numbers of recipient addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an IPM with IHE, addressing different numbers of recipient addresses of remote AMHS and AFTN users correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) with IHE, addressing different numbers of remote AMHS and AFTN users.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have 7 recipient addresses (one shall be the Test User Agent) and priority KK;</li> <li>• The second ATS message shall have 14 recipient addresses (one shall be the Test User Agent) and priority GG;</li> <li>• The third ATS message shall have 21 recipient addresses (one shall be the Test User Agent) and priority FF;</li> <li>• (optional) The fourth ATS message shall have more than 21 recipient addresses, if possible (one shall be the Test User Agent) and priority DD.</li> </ul> <p>Each message shall contain one body part and have a different filing time and message text. The originators-reference (OHI) element shall be absent.</p> <p>Check the messages received at the AMHS UA Test Tool.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• each message contains in the submission envelope the respective number of AMHS recipient addresses (7, 14, 21, more) and an IPM heading with the same number of AMHS and AFTN recipients.</li> <li>• the precedence value is equivalent to the respective ATS message priority and associated to each recipient address.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

### 5.1.5 **CTUA1105 – Submit an IPM with IHE, containing different kinds of recipient addresses**

<b>CTUA1105</b>	<b>Submit an IPM with IHE, containing different kinds of recipient addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an IPM with IHE, addressing different kinds of recipient addresses of remote AMHS and AFTN users correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) with IHE, addressing different kinds of remote AMHS and AFTN user.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have two primary recipients and two copy recipients (one shall be the Test User Agent);</li> <li>• The second ATS message shall have two primary recipients and two blind-copy recipients (one shall be the Test User Agent);</li> <li>• The third ATS message shall have two primary recipients, two copy recipients and two blind-copy recipients (one shall be the Test User Agent).</li> </ul> <p>Each message shall contain one body part and have different filing time and message text. The originators-reference (OHI) element shall be absent. Each message shall have priority FF.</p> <p>Verify that the messages (IPMs) are submitted to the AMHS UA Test Tool.</p> <p>Check the messages received at the AMHS UA Test Tool. Verify that:</p> <ul style="list-style-type: none"> <li>• the first message contains in the submission envelope all recipient addresses (the 2 primary and the 2 copy) and an IPM heading with all AMHS and AFTN recipients,</li> <li>• the second message should be split into 3 messages by the IUT-UA: <ul style="list-style-type: none"> <li>○ two messages each of which has only one of the blind-copy recipient (Bcc) addresses in the submission envelope and all addresses except the other Bcc address or except both Bcc addresses in the IPM Heading, and</li> <li>○ one message which has only the 2 primary recipients' addresses in the submission envelope and in the IPM Heading.</li> </ul> <p>Only this message shall have the originator-report-request flag set to "non-delivery-report",</p> </li> <li>• the third message should be split into 3 messages by the IUT-UA: <ul style="list-style-type: none"> <li>○ two messages which have only one Bcc address in the submission envelope and all addresses except the other Bcc address or except both Bcc addresses in the IPM Heading, and</li> <li>○ one message which has all other (the 2 primary and the 2</li> </ul> </li> </ul>

	<p>copy) addresses in the submission envelope and in the IPM Heading.</p> <p>Only this message shall have the originator-report-request flag set to “non-delivery-report”.</p> <p>Check the messages received at the Test UA. Verify that:</p> <ul style="list-style-type: none"> <li>• the first message addressed to the Test UA contains all addresses (the 2 primary and the 2 copy) in the IPM Heading,</li> <li>• the second message addressed to the Test UA as Bcc contains the 2 primary addresses in the IPM Heading,</li> <li>• the third message addressed to the Test UA as Bcc contains all addresses (the 2 primary and the 2 copy) in the IPM Heading.</li> </ul> <p><i>Note.— Depending on the implementation of the IUT-UA the IPM Heading of the second and third message contains additionally the blind-copy address belonging to the Test UA or no blind-copy address.</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2, 4.5.2 (IPM conversion)
<b>Test class</b>	Normal AMHS communications (N)

## 5.2 Delivery Operations (A2-IHE)

### 5.2.1 CTUA1201 – Deliver an IPM with IHE to the IUT – basic capability (A2-IHE)

*Note.*– The conformance test CTUA1201 is passed successfully by the IUT only if all tests CTUA1201a, CTUA1201b and CTUA1201c are passed successfully.

<b>CTUA1201a</b>	<b>Deliver an IPM with IHE, containing an ia5-text to the IUT-UA</b>
<b>Test criteria</b>	This test is successful, if the IUT receives an ATS message (IPM) with IHE, containing an <b>ia5-text</b> delivered from the Test MTA.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of five ATS messages (IPMs) with IHE, containing an <b>ia5-text</b> to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have priority KK;</li> <li>• The second ATS message shall have priority GG;</li> <li>• The third ATS message shall have priority FF;</li> <li>• The fourth ATS message shall have priority DD;</li> <li>• The fifth ATS message shall have priority SS.</li> </ul> <p>Each message shall have a different filing time and message text. The originators-reference (OHI) element shall be absent.</p> <p>Verify the messages received at the AMHS User Agent.</p> <p>Verify in particular, the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• precedence equivalent to the ATS message priority,</li> <li>• authorization-time (filing time),</li> <li>• message text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2, 3.3.4 (Use of IPM elements in support of the extended ATSMHS)
<b>Test class</b>	Normal AMHS communications (N)

<b>CTUA1201b</b>	<b>Deliver an IPM with IHE, containing an ia5-text-body-part to the IUT-UA</b>
<b>Test criteria</b>	This test is successful, if the IUT receives an ATS message (IPM) with IHE, containing an <b>ia5-text-body-part</b> delivered from the Test MTA.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of five ATS messages (IPMs) with IHE, containing an <b>ia5-text-body-part</b> to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have priority KK;</li> <li>• The second ATS message shall have priority GG;</li> <li>• The third ATS message shall have priority FF;</li> <li>• The fourth ATS message shall have priority DD;</li> <li>• The fifth ATS message shall have priority SS.</li> </ul> <p>Each message shall have a different filing time and message text. The originators-reference (OHI) element shall be absent.</p> <p>Verify the messages received at the AMHS User Agent.</p> <p>Verify in particular, the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• precedence equivalent to the ATS message priority,</li> <li>• authorization-time (filing time),</li> <li>• message text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2, 3.3.4 (Use of IPM elements in support of the extended ATSMHS)
<b>Test class</b>	Normal AMHS communications (N)

<b>CTUA1201c</b>	<b>Deliver an IPM with IHE, containing a general-text-body-part with ISO 646 repertoire to the IUT-UA</b>
<b>Test criteria</b>	This test is successful, if the IUT correctly receives an ATS message (IPM) with IHE, containing a <b>general-text-body-part with ISO 646 repertoire</b> delivered from the Test MTA.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of five ATS messages (IPMs) with IHE, containing a <b>general-text-body-part with ISO 646 repertoire</b> to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have priority KK;</li> <li>• The second ATS message shall have priority GG;</li> <li>• The third ATS message shall have priority FF;</li> <li>• The fourth ATS message shall have priority DD;</li> <li>• The fifth ATS message shall have priority SS.</li> </ul> <p>Each message shall have a different filing time and message text. The originators-reference (OHI) element shall be absent.</p> <p>Verify the messages received at the AMHS User Agent.</p> <p>Verify in particular, the following elements displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• precedence equivalent to the ATS message priority,</li> <li>• authorization-time (filing time),</li> <li>• message text.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2, 3.3.4 (Use of IPM elements in support of the extended ATSMHS)
<b>Test class</b>	Normal AMHS communications (N)



### 5.2.2 CTUA1202 – Deliver an IPM with erroneous IHE elements

<b>CTUA1202</b>	<b>Deliver an IPM with erroneous IHE elements</b>
<b>Test criteria</b>	This test is successful, if the IUT, when receiving an IPM containing erroneous IHE elements, displays this message to its local AMHS user regardless of the contained error, or indicates the error situation
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of messages (IPMs) to the IUT addressed to the local UA.</p> <ul style="list-style-type: none"> <li>• The first message (IPM) shall contain no <i>precedence-policy-identifier</i> extension element;</li> <li>• The second message (IPM) shall contain an invalid OID in the <i>precedence-policy-identifier</i> extension element;</li> <li>• The third message (IPM) shall contain no <i>precedence</i> extension element associated with the recipient;</li> <li>• The fourth message (IPM) shall contain an invalid <i>precedence</i> value (ATS message priority indicator);</li> <li>• The fifth message (IPM) shall contain no <i>authorization-time</i> (filing time) extension element;</li> <li>• The sixth message (IPM) shall contain an invalid <i>authorization-time</i> (filing time);</li> <li>• The seventh message (IPM) shall contain (valid) IPM heading extension elements and additionally an ATS-message-header containing equivalent values;</li> <li>• The eighth message (IPM) shall contain (valid) IPM heading extension elements and additionally an ATS-message-header containing values which are different from those contained in the IPM heading extensions.</li> </ul> <p>The originators-reference (OHI) element shall not be used.</p> <p>Verify that the messages are received at the UA.</p> <p>If they are displayed at the UA, check the contents of each received ATS message and verify the precedence (ATS message priority), authorization-time (filing time) and message text displayed<sup>22</sup>.</p> <p>If they are not displayed at the UA, check that the error situation is indicated.</p>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2
<b>Test class</b>	Erroneous AMHS parameters (E1)

<sup>22</sup> The displayed message depends on the UA capabilities

### 5.2.3 CTUA1203 – Deliver an IPM with IHE, containing optional heading information

<b>CTUA1203</b>	<b>Deliver an IPM with IHE, containing optional heading information</b>
<b>Test criteria</b>	This test is successful, if the IUT displays IPMs with IHE, containing the optional heading information (OHI) in the originators-reference element correctly or indicates an error, if the OHI text is too long. Under this condition, the reception of the A2 message length capability shall be checked.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) with IHE to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have priority FF and contain OHI text of less than 53 characters in the originators-reference<sup>23</sup>;</li> <li>• The second ATS message shall have priority FF and contain OHI text of exactly 53 characters in the originators-reference;</li> <li>• The third ATS message shall have priority FF and contain OHI text of more than 53 characters in the originators-reference;</li> <li>• The fourth ATS message shall have priority SS and contain OHI text of less than 48 characters<sup>24</sup> in the originators-reference;</li> <li>• The fifth ATS message shall have priority SS and contain OHI text of exactly 48 characters in the originators-reference;</li> <li>• The sixth ATS message shall have priority SS and contain OHI text of more than 48 characters in the originators-reference.</li> </ul> <p>Each message shall have different filing time and message text. The message text length in the body part shall be 1800 characters.</p> <p>Check the ATS messages received at IUT-UA and verify the correct contents of the messages (text length 1800 characters) and in particular, check the format and contents of the OHI being displayed.</p> <p>Verify that the IUT-UA indicates an error for the third and sixth ATS message if they are not displayed.</p>
<b>AMHS ref: Doc 9880, Part II</b>	4.5.2.2.10 (OHI), 3.3.4.3 – 3.3.4.4 (Originators-reference)
<b>Test class</b>	Normal AMHS communications (N), Erroneous AMHS parameters (E1)

<sup>23</sup> OHI text of 53 characters is the maximum length for non-SS messages, if the total maximum line length is 69 characters. (Total line length = OHI text + space + 6 digit filing time + space + 8 characters originator indicator)

<sup>24</sup> OHI text of 48 characters is the maximum length for SS messages, if the total maximum line length is 69 characters. (Total line length = OHI text + space + 6 digit filing time + 8 characters originator indicator + 5 characters priority alarm)

#### 5.2.4 **CTUA1204 – Deliver an IPM with IHE, containing different kinds of recipient address**

<b>CTUA1204</b>	<b>Deliver an IPM with IHE, containing different kinds of recipient addresses</b>
<b>Test criteria</b>	This test is successful, if the IUT displays IPMs with IHE, containing different kinds of recipient address of the IUT-UA correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) with IHE, addressing the IUT-UA in different ways.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have the IUT-UA address as primary recipient;</li> <li>• The second ATS message shall have the IUT-UA address as copy recipient;</li> <li>• The third ATS message shall have the IUT-UA address as blind-copy recipient.</li> </ul> <p>Each message shall have a different filing time and message text. The originators-reference (OHI) element shall be absent and the priority shall be FF.</p> <p>Verify that all messages (IPMs) are displayed at the IUT-UA correctly.</p> <p>Check that the recipient address is correctly indicated as:</p> <ul style="list-style-type: none"> <li>• primary recipient (first message),</li> <li>• copy recipient (second message), and</li> <li>• blind-copy recipient (third message)</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

### 5.2.5 **CTUA1205 – Deliver an IPM with IHE, containing empty or missing IPM heading fields**

<b>CTUA1205</b>	<b>Deliver an IPM with IHE, containing empty or missing IPM heading address fields</b>
<b>Test criteria</b>	This test is successful, if the IUT, when receiving an ATS message (IPM) with IHE from a peer MTA with empty or missing IPM heading address fields, delivers this message to its local AMHS user regardless of the empty or missing IPM heading address fields.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of messages (IPMs) with IHE to the IUT-UA. The delivery envelope shall contain correct addresses whereas address fields are missing or empty in the IPM heading.</p> <ul style="list-style-type: none"> <li>• The first message shall contain no originator address in the IPM heading.</li> <li>• The second message shall contain no primary, copy, or blind copy recipient addresses in the IPM heading.</li> </ul> <p>Each message shall have different filing time and message text. The originators-reference (OHI) element shall be absent and the priority FF.</p> <p>Check any messages received and displayed at the UA<sup>25</sup>.</p> <p>Check the IUT-UA's log files with respect to delivered messages and reported errors, if any.</p>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2 (AMH21)
<b>Test class</b>	Normal AMHS communications (N)

<sup>25</sup> The displayed message depends on the UA capabilities.

### 5.2.6 CTUA1206 – Deliver an IPM with IHE and invalid originator address similar to CAAS

<b>CTUA1206</b>	<b>Deliver an IPM with IHE and invalid originator address similar to CAAS</b>
<b>Test criteria</b>	This test is successful, if the IUT is able to receive ATS messages (IPMs) with IHE that contain originator addresses looking like CAAS type ones but being invalid.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send to the IUT-UA a sequence of ATS messages (IPMs) with IHE being originated from the PRMD “AMHSLAND-1” which uses CAAS. The messages shall have a valid recipient address, but an erroneous originator address in the IPM heading.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall contain an originator address with an invalid <i>common-name</i> attribute that consists of 9 letters, e.g. “<b>AAAAMHABC</b>”;</li> <li>• The 2<sup>nd</sup> ATS message shall contain an originator address with an invalid <i>common-name</i> attribute that consists of only 6 letters, e.g. “<b>AAAAMH</b>”;</li> <li>• The 3<sup>rd</sup> ATS message shall contain an originator address with a valid <i>organizational-unit-names</i> attribute “<b>AAAA</b>”, but an empty <i>common-name</i> attribute;</li> <li>• The 4<sup>th</sup> ATS message shall contain an originator address with a valid <i>common-name</i> attribute “<b>AAAAMHAA</b>”, but an empty <i>organizational-unit-names</i> attribute;</li> <li>• The 5<sup>th</sup> ATS message shall contain an originator address with a valid <i>common-name</i> attribute “<b>AAAAMHAA</b>”, but an <i>organizational-unit-names</i> attribute that is different from the first 4 letters of the <i>common-name</i> attribute, e.g. “<b>AAAX</b>”;</li> <li>• The 6<sup>th</sup> ATS message shall contain an originator address with a valid <i>common-name</i> attribute “<b>AAAAMHAA</b>” and correct <i>organizational-unit-names</i> attribute “<b>AAAA</b>”, but an empty <i>organization-name</i> attribute.</li> </ul> <p>Verify that the IUT-UA displays the messages with invalid originator O/R address or indicates an error.</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Erroneous AMHS parameters (E1)

### 5.2.7 CTUA1207 – Deliver an IPM with IHE and invalid originator address similar to XF

<b>CTUA1207</b>	<b>Deliver an IPM with IHE and invalid originator address similar to XF</b>
<b>Test criteria</b>	This test is successful, if the IUT is able to receive ATS messages (IPMs) that contain originator addresses looking like XF type ones but being invalid.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send to the IUT-UA a sequence of ATS messages (IPMs) with IHE being originated from the PRMD “AMHSLAND-3” which uses XF. The messages shall have a valid recipient address, but an erroneous originator address in the IPM heading.</p> <ul style="list-style-type: none"> <li>• The 1<sup>st</sup> ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute that consists of 9 letters, e.g. value “ACCCMHABC”;</li> <li>• The 2<sup>nd</sup> ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an invalid <i>organizational-unit-names</i> attribute that consists of 6 letters, e.g. value “ACCCMH”;</li> <li>• The 3<sup>rd</sup> ATS message shall contain an originator address with the value “AFTN” in the <i>organization-name</i> attribute, but an empty <i>organizational-unit-names</i> attribute;</li> <li>• The 4<sup>th</sup> ATS message shall contain an originator address with an empty <i>organization-name</i> attribute and a valid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHAA”;</li> <li>• The 5<sup>th</sup> ATS message shall contain an originator address with an invalid <i>organization-name</i> attribute, e.g. “UNKNOWN” and a valid <i>organizational-unit-names</i> attribute, e.g. value “ACCCMHAA”.</li> </ul> <p>Verify that the IUT-UA displays the messages with invalid originator O/R address or indicates an error.</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Erroneous AMHS parameters (E1)

**5.2.8 CTUA1208 – Deliver a redirected IPM with IHE to the IUT**

<b>CTUA1208</b>	<b>Deliver a redirected IPM with IHE to the IUT-UA</b>
<b>Test criteria</b>	This test is successful, if the IUT receives a redirected ATS message (IPM) with IHE, containing one body part delivered from the Test MTA.
<b>Scenario description</b>	<p>Redirect an AMHS O/R address different from the address of the IUT-UA to the address of the IUT-UA.</p> <p>From the AMHS UA Test Tool send a sequence of five ATS messages (IPMs) with IHE, containing an ia5-text to the recipient address, which is subject to redirection.</p> <ul style="list-style-type: none"> <li>• The first ATS message shall have priority KK;</li> <li>• The second ATS message shall have priority GG;</li> <li>• The third ATS message shall have priority FF;</li> <li>• The fourth ATS message shall have priority DD;</li> <li>• The fifth ATS message shall have priority SS.</li> </ul> <p>Each message shall have different filing time and message text. The originators-reference (OHI) element shall be absent.</p> <p>Verify that all messages are received at the AMHS User Agent.</p> <p>Verify in particular, that the following elements are displayed at the AMHS User Agent:</p> <ul style="list-style-type: none"> <li>• the recipient address in the IPM Heading as originally sent by the AMHS UA Test Tool,</li> <li>• precedence equivalent to the ATS message priority,</li> <li>• authorization-time (filing time),</li> <li>• message text.</li> </ul> <p>Check, if the user gets any indication that the message was subject to redirection, for example, a display of the redirection-history or the originally-intended-recipient-name.</p> <p>Verify for the received priority SS message, that the user gets a request to return a receipt notification.</p>
<b>AMHS ref: Doc 9880, Part II</b>	3.1 (ATS Message User Agent) and Table 3-2
<b>Test class</b>	Normal AMHS communications (N)

### 5.3 Specific Submission Operations with IHE

#### 5.3.1 CTUA1301 – Submission of acknowledgements to messages with precedence equivalent to “SS”

<b>CTUA1301</b>	<b>Submission of acknowledgements to messages with precedence equivalent to “SS”</b>
<b>Test criteria</b>	This test is successful, if the IUT submits the acknowledgement to a message with <i>precedence equivalent to “SS”</i> as receipt notification and/or as IPM correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) with IHE with <i>precedence equivalent to “SS”</i> and the <i>receipt-notification</i> request flag set to ‘true’ to the IUT-UA.</p> <p>Each message shall have different filing time and message text. The originators-reference (OHI) element shall be absent.</p> <p>The first and the second ATS messages are addressed to the IUT-UA directly.</p> <p>The third and the fourth ATS messages are addressed to users other than the IUT-UA but are redirected to the IUT-UA.</p> <p>The IUT-UA shall return after user action (manual intervention) acknowledgements for the first and the third message as AMHS receipt notifications, and for the second and the fourth message as IPMs with IHE containing the respective AFTN acknowledgement messages.</p> <p>Verify that the receipt notifications have been generated correctly, in particular, that:</p> <ul style="list-style-type: none"> <li>• the <i>ipn-originator</i> (IPN) represents the IUT-UA,</li> <li>• the <i>receipt-time</i> of the IPN is generated from the time at which the IUT-UA received the subject IPM,</li> <li>• the value of the <i>priority</i> element of the IPN is set to “urgent”,</li> <li>• the values of <i>subject-ipm</i> and <i>recipient-name</i> are inserted correctly from log entries.</li> </ul> <p>Verify that the IPMs with IHE have been generated correctly, in particular, that:</p> <ul style="list-style-type: none"> <li>• the <i>originator-name</i> of the incoming IPM is used as originator indicator in the text (R &lt;filing time&gt; &lt;originator&gt;) and as recipient address of the AFTN acknowledgement message,</li> <li>• the <b>filing time</b> in the text of the AFTN acknowledgement is taken from the <i>authorization-time</i> of the incoming IPM,</li> <li>• the value of the <i>priority</i> element in the message envelope is set to “urgent”,</li> </ul>



<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

### 5.3.2 CTUA1302 – Submission of probes

CTUA1302	Submission of probes
<b>Test criteria</b>	This test is successful, if the IUT submits probes testing the capability of a remote AMHS user correctly and displays the result of any returned AMHS report.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of probes to the AMHS UA Test Tool containing an intended recipient address (Test UA).</p> <ul style="list-style-type: none"> <li>• The first probe shall contain a content-length value up to 16k (octets);</li> <li>• Optional: If the IUT-UA supports the selection of different types of text body parts the submission of the first probe with a content-length value up to 16k (octets) should be repeated with the possible selections;</li> <li>• The second probe shall contain a content-length value of at least 64 k (octets);</li> <li>• Optional: If the IUT-UA supports the selection of different types of text body parts the submission of the second probe with a content-length value of at least 64 k (octets) should be repeated with the possible selections;</li> <li>• Optional: The third probe shall contain a content-length value up to 2 Mbytes and original-encoded-information-type with OID id-eit-file-transfer which is related to the file-transfer-body-part;</li> <li>• Optional: The fourth probe shall contain a content-length value up to 2 Mbytes and original-encoded-information-types related to the text body part and the file-transfer-body-part;</li> <li>• Optional: If the IUT-UA supports the selection of different types of text body parts the submission of the fourth probe with two body parts should be repeated with the possible selections.</li> </ul> <p>The AMHS UA Test Tool shall return DRs for the first probe as well as for the first optional probes, if generated. The other probes shall be responded by NDRs.</p> <p>Verify that the probes are correctly composed in all elements.</p> <p>Verify that in all submitted probes the originator-report-request argument is set to “report”.</p> <p>Verify in particular, that the values contained in the content-length and original-encoded-information-types correspond to the input of the user.</p> <p>Verify that the returned AMHS reports are correctly received and displayed at the IUT-UA.</p> <p><i>Note. – The test is identical to CTUA302 and the same results are expected (independent from the user capability IHE).</i></p>

<b>AMHS ref: Doc 9880, Part II</b>	2.2.2 (AMHS information model)
<b>Test class</b>	Normal AMHS communications (N)

### 5.3.3 CTUA1303 – Checking of default envelope elements (flag setting) in submitted IPMs with IHE

<b>CTUA1303</b>	<b>Checking of default envelope elements (flag setting) in submitted IPMs with IHE</b>
<b>Test criteria</b>	This test is successful, if the IUT submits IPMs with IHE, with the correct default envelope elements (“flags”).
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) with IHE to the AMHS UA Test Tool.</p> <ul style="list-style-type: none"> <li>• The first message shall be addressed to an AMHS Direct User (the Test UA) with normal (default) flag setting;</li> <li>• The second message shall be addressed to an AMHS Indirect User (Test MTCU) with normal (default) flag setting;</li> <li>• The third message shall be addressed to an AMHS distribution list.</li> </ul> <p>Each message shall contain one body part and have different filing time and message text. The originators-reference (OHI) element shall be absent. Each message shall have precedence equivalent to FF.</p> <p>Verify the setting of the following envelope elements (flags). As default values the following settings are expected:</p> <p>Per-message-indicators: The per-message-indicators shall be absent or set to the default values as follows:</p> <ul style="list-style-type: none"> <li>• <i>disclosure-of-other-recipients- prohibited (0)</i></li> <li>• <i>implicit-conversion- allowed (0)</i></li> <li>• <i>alternate-recipient- prohibited (0)</i></li> <li>• <i>content-return- not-requested (0)</i></li> </ul> <p>Originator-report-request element (for all recipients): The originator-report-request element shall be set to: <i>non-delivery-report</i>.</p> <p>Extensions elements: The following extensions elements shall not be used or take their default values:</p> <ul style="list-style-type: none"> <li>• <i>recipient-reassignment- allowed (0)</i></li> <li>• <i>dl-expansion- allowed (0)</i></li> <li>• <i>conversion-with-loss- allowed (0)</i></li> </ul> <p><i>Note.– Default values are those as defined in ISO/IEC 10021-4 (ITU-T X.411).</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	4.4.2.3.17, 4.4.2.3.18 and 4.4.2.3.20 (per-message-indicators), 4.4.2.3.8.1 (extension elements)
<b>Test class</b>	Normal AMHS communications (N)

### 5.3.4 CTUA1304 – Checking of user settings in the envelopes of submitted IPMs with IHE (optional)

<b>CTUA1304</b>	<b>Checking of user settings in the envelopes of submitted IPMs with IHE (optional)</b>
<b>Test criteria</b>	This test is successful, if the IUT submits IPMs with IHE, with the expected settings of the different <b>envelope elements</b> (“flags”) as set by the user if such a feature is implemented.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) with IHE to the AMHS UA Test Tool with different possible flags set by the user if implemented.</p> <ul style="list-style-type: none"> <li>• The first IPM shall be submitted with per-message-indicators (only for those supported at the user interface) set as follows: <ul style="list-style-type: none"> <li>○ <i>disclosure-of-other-recipients-requested (1)</i></li> <li>○ <i>implicit-conversion-prohibited (1)</i></li> <li>○ <i>alternate-recipient-allowed (1)</i></li> <li>○ <i>content-return-requested (1)</i></li> </ul> </li> <li>• The second IPM shall be submitted using extensions elements (only for those supported at the user interface) as follows: <ul style="list-style-type: none"> <li>○ <i>recipient-reassignment-prohibited (1)</i></li> <li>○ <i>dl-expansion-prohibited (1)</i></li> <li>○ <i>conversion-with-loss-prohibited (1)</i></li> </ul> </li> </ul> <p>Each message shall contain one body part and have different filing time and message text. The originators-reference (OHI) element shall be absent. Each message shall have precedence equivalent to FF.</p> <p>Verify the setting of the envelope elements (flags) in accordance with the performed user actions.</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

### 5.3.5 CTUA1305 – Checking of user settings, especially report request, in submitted IPMs with IHE (optional)

<b>CTUA1305</b>	<b>Checking of user settings, especially report request, in submitted IPMs with IHE (optional)</b>
<b>Test criteria</b>	This test is successful, if the IUT submits IPMs with IHE and with the expected report request settings in the message submission envelope.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) with IHE to the AMHS UA Test Tool with the originator-report-request element either set to a default (pre-configured) value or set to a value which corresponds to a selection made by the user (if such function is implemented).</p> <ul style="list-style-type: none"> <li>• The first IPM shall be submitted to two recipients (A and B) with <b>default</b> report requests (no selection made by the user);</li> <li>• Optional: The second IPM shall be submitted to two recipients (A and B) with <b>non-delivery report</b> requested for recipient A and <b>report</b> requested for recipient B;</li> <li>• Optional: The third IPM shall be submitted to two recipients (A and B) with <b>report</b> requested for recipient A and <b>non-delivery report</b> requested for recipient B;</li> <li>• Optional: The fourth IPM shall be submitted to two recipients (A and B) with <b>report</b> requested for both recipients;</li> </ul> <p>Each message shall contain one body part and have different filing time and message text. The originators-reference (OHI) element shall be unused. Each message shall have precedence equivalent to FF.</p> <p>Check the report request settings in the first IPM. The expected value of the report request elements for both recipients is: “<b>non-delivery report</b>”.</p> <p>Verify that in all other IPMs the report request elements contained in the message submission envelopes correspond to the selection performed by the user.</p> <p><i>Note.– It is recommended that the setting to “no-report” is prevented at the UA (operational requirements dictate that upon reception of an NDR the responsibility for the message remains at the UA user site, therefore the generation of NDRs should not be preventable by the UA settings).</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

## 5.4 Specific Delivery Operations with IHE

### 5.4.1 CTUA1401 – Deliver a non-delivery report (NDR) to an AMHS user

<b>CTUA1401</b>	<b>Deliver a non-delivery report (NDR) to an AMHS user</b>
<b>Test criteria</b>	This test is successful, if the IUT displays non-delivery reports containing the standardized reason and diagnostic codes to an AMHS user correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a set of non-delivery reports to the IUT-UA directly attached.</p> <p>The set of NDRs shall cover the full scope of reason and diagnostic codes standardized in ISO/IEC 10021-4 (ITU-T Rec. X.411), section 8.3.1.2.1.11 and section 8.3.1.2.1.12, respectively (see <a href="#">Table 11</a>).</p> <p>The report delivery envelope shall contain the report-destination of the IUT-UA. The reports may contain fictitious values for those elements which are normally related to a subject message, like subject -identifier, original-encoded-information-types and originally-intended-recipient-name.</p> <p>Monitor that the reports are received at the IUT-UA and displayed.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• reported recipient(s) in report content is/are displayed,</li> <li>• the reason and diagnostic codes of the delivered reports are identical to those contained in the reports sent from the AMHS UA Test Tool.</li> <li>• the text associated with the reason and diagnostic codes is displayed correctly, i.e. as standardized in ISO/IEC 10021-4 or ITU-T Rec. X.411 (Abstract Syntax Definition in Figure 2 - Part 16).</li> </ul> <p><i>Note.— The test is identical to CTUA401 and the same results are expected (independent from the user capability IHE).</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

AMHS Report ID	number of Per-Recipient-Fields	reason code	diagnostic codes (range)
CTUA1401M01	16	0	0 - 15
CTUA1401M02	31	0	0 - 30
CTUA1401M03	31	1	0 - 30
CTUA1401M04	5	1	46 - 50
CTUA1401M05	3	2	8 - 10
CTUA1401M06	7	2	19 - 25
CTUA1401M07	1	3	31
CTUA1401M08	14	4	32 - 45
CTUA1401M09	1	5	not used
CTUA1401M10	1	6	not used
CTUA1401M11	1	7	not used
CTUA1401M12	28	8	51 - 78

**Table 11: Non-delivery-reason-codes and non-delivery-diagnostic-codes used in CTUA1401**

*Note.*— The non-delivery-diagnostic-code is an optional element and, for example, not contained in test messages CTUA1401M09, CTUA1401M10 and CTUA1401M11.



#### 5.4.2 **CTUA1402 – Deliver an NDR containing non-standard reason or diagnostic codes**

<b>CTUA1402</b>	<b>Deliver an NDR containing non-standard reason or diagnostic codes</b>
<b>Test criteria</b>	This test is successful, if the IUT displays non-delivery reports containing reason and diagnostic codes which are syntactically correct, but different from those defined in section 8.3.1.2.1.11 and section 8.3.1.2.1.12 of ISO/IEC 10021-4 (ITU-T Rec. X.411).
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send several NDRs to the IUT-UA.</p> <p>The NDRs may contain fictitious values for those fields which are normally related to a subject message. Six NDRs shall be sent containing the following reason and diagnostic codes:</p> <ul style="list-style-type: none"> <li>• CTUA1402M01 contains “9” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA1402M02 contains “255” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA1402M03 contains “32767” for the <i>non-delivery-reason-code</i> and “invalid-arguments” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA1402M04 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “79” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA1402M05 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “255” for the <i>non-delivery-diagnostic-code</i>;</li> <li>• CTUA1402M06 contains “unable-to-transfer” for the <i>non-delivery-reason-code</i> and “32767” for the <i>non-delivery-diagnostic-code</i>.</li> </ul> <p>Verify that all NDRs are delivered to the IUT-UA.</p> <p>Check the contained reason and diagnostic codes (if any).</p> <p>Verify that no misleading information is presented to the AMHS user.</p> <p><i>Note.— The test is identical to CTUA402 and the same results are expected (independent from the user capability IHE).</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Erroneous AMHS parameters (E1)

### 5.4.3 **CTUA1403 – Deliver IPNs containing receipt (RN) or non-receipt (NRN) notification**

<b>CTUA1403</b>	<b>Deliver IPNs containing receipt notification (RN) or non-receipt notification (NRN)</b>
<b>Test criteria</b>	This test is successful, if the IUT displays IPNs containing receipt notification (RN) and/or non-receipt notification (NRN) to an AMHS user correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of IPNs to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first IPN shall contain one receipt notification (RN);</li> <li>• The second IPN shall contain another receipt notification (RN);</li> <li>• The third IPN shall contain one non-receipt notification (NRN);</li> <li>• The fourth IPN shall contain another non-receipt notification (NRN).</li> </ul> <p>Monitor the IPNs received at the IUT-UA.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• all IPNs are delivered to the IUT-UA, and</li> <li>• the receipt (RN) or non-receipt (NRN) notification are displayed correctly.</li> </ul> <p><i>Note.— The test is identical to CTUA403 and the same results are expected (independent from the user capability IHE).</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	IPN
<b>Test class</b>	Normal AMHS communications (N)

#### 5.4.4 **CTUA1404 – Deliver a report containing delivery (DR) and/or non-delivery (NDR) information**

<b>CTUA1404</b>	<b>Deliver a report containing delivery (DR) and/or non-delivery (NDR) information</b>
<b>Test criteria</b>	This test is successful, if the IUT displays delivery and non-delivery reports to an AMHS user correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a set of reports to the IUT-UA directly attached.</p> <ul style="list-style-type: none"> <li>• The first report shall contain one delivery (DR) information;</li> <li>• The second report shall contain two delivery (DR) information;</li> <li>• The third report shall contain ten delivery (DR) information;</li> <li>• The fourth report shall contain one non-delivery (NDR) information;</li> <li>• The fifth report shall contain two non-delivery (NDR) information;</li> <li>• The sixth report shall contain ten non-delivery (NDR) information;</li> <li>• The seventh report shall contain one delivery (DR) and one non-delivery (NDR) information;</li> <li>• The eighth report shall contain two delivery (DR) and two non-delivery (NDR) information;</li> <li>• The ninth report shall contain ten delivery (DR) and ten non-delivery (NDR) information.</li> </ul> <p>Monitor the reports received at the IUT-UA.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• all reports are delivered to the IUT-UA, and</li> <li>• all the delivery (DR) and non-delivery (NDR) information is displayed correctly.</li> </ul> <p><i>Note.– The test is identical to CTUA404 and the same results are expected (independent from the user capability IHE).</i></p>
<b>AMHS ref: Doc 9880, Part II</b>	DR
<b>Test class</b>	Normal AMHS communications (N)

#### 5.4.5 **CTUA1405 – Deliver IPMs with IHE containing optional arguments in the delivery envelope**

<b>CTUA1405</b>	<b>Deliver IPMs with IHE containing optional arguments in the delivery envelope</b>
<b>Test criteria</b>	This test is successful, if the IUT receives IPMs with IHE, containing optional delivery envelope arguments and displays the values correctly for those elements supported at the user interface.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) with IHE to the IUT-UA.</p> <ul style="list-style-type: none"> <li>• The first message shall contain only the mandatory delivery envelope arguments, i.e. message-delivery-identifier, message-submission-time, message-delivery-time, originator-name, this-recipient-name and content-type. The priority argument shall be absent or take its default value (normal);</li> <li>• The second message shall contain the following optional delivery envelope element: other-recipient-names;</li> <li>• The third message shall contain the following optional delivery envelope element: original-encoded-information-types;</li> <li>• The fourth message shall contain the following optional delivery envelope element: content-identifier;</li> <li>• The fifth message shall contain the following delivery envelope extension element: trace-information;</li> <li>• The sixth message shall contain the following delivery envelope extension element: dl-expansion-history;</li> <li>• The seventh message shall contain the following delivery envelope extension element: redirection-history;</li> </ul> <p>Each message shall contain one general-text-body-part<sup>26</sup> and have different filing time and message text. The originators-reference (OHI) element shall be unused.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• all messages are received at the IUT-UA, and</li> <li>• the values of the mandatory and optional delivery envelope arguments, which are supported at the user interface, are displayed correctly.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	

<sup>26</sup> The general-text-body-part is used to check the original-encoded-information-types (see 3<sup>rd</sup> message).

<b>Test class</b>	Normal AMHS communications (N)
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## 5.5 Enhanced Submission UA Capability with IHE

*Note.*— Only those messages shall be used which meet the AMHS User Capability of the IUT.

### 5.5.1 CTUA1501 – Submit an IPM with IHE with the implemented capability of one body part

<b>CTUA1501</b>	<b>Submit an IPM with IHE with the implemented capability of one body part</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an ATS message (IPM) with IHE containing <b>one body part with length equal to that defined for the respective capability class</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) with IHE addressing the AMHS UA Test Tool and meeting the defined user capability.</p> <ul style="list-style-type: none"> <li>• <u>Capability A16</u>: This Message shall have one body part with message text length of 16 k characters;</li> <li>• <u>Capability A64</u>: This Message shall have one body part with message text length of 64 k characters;</li> <li>• <u>Capability B2</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 1800 characters;</li> <li>• <u>Capability B16</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 16 k characters;</li> <li>• <u>Capability B64</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 64 k characters;</li> <li>• <u>Capability F1024</u><sup>27</sup>: This Message shall have one file-transfer-body-part with body part size of 1 M bytes;</li> <li>• <u>Capability F2048</u>: This Message shall have one file-transfer-body-part with body part size of 2 M bytes.</li> </ul> <p>Each ATS message with IHE shall have <i>precedence equivalent to GG</i> (ATS priority) and a different <i>authorization-time</i> (filing time). The <i>originators-reference</i> (OHI) element shall be absent.</p> <p>Verify the messages received by the AMHS UA Test Tool. Check the format and contents of the submission envelope, IPM heading and body.</p> <p>Verify in particular, the respective message length and body part type.</p>

<sup>27</sup> Lower values not recommended

<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

### 5.5.2 **CTUA1502 – Submit an IPM with IHE with the implemented capability of two body parts**

<b>CTUA1502</b>	<b>Submit an IPM with IHE with the implemented capability of two body parts</b>
<b>Test criteria</b>	This test is successful, if the IUT submits an ATS message (IPM) with IHE, containing <b>two body parts with values equal to those defined for the respective capability class</b> to a peer UA correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) with IHE addressing the AMHS UA Test Tool and meeting the defined user capability.</p> <ul style="list-style-type: none"> <li>• <u>Capability A64+F2048<sup>28</sup></u>: This Message shall have two body parts; one body part with message text length of 64 k characters and one file-transfer-body-part with body part size of 2 M bytes;</li> <li>• <u>Capability B64+F2048</u>: This Message shall have two body parts; one general-text-body-part with Repertoire B and with message text length of 64 k characters and one file-transfer-body-part with body part size of 2 M bytes.</li> </ul> <p>Each ATS message shall have <i>precedence equivalent to GG</i> (ATS priority) and different <i>authorization-time</i> (filing time). The <i>originators-reference</i> (OHI) element shall be absent.</p> <p>Verify the messages received by the AMHS UA Test Tool. Check the format and contents of the submission envelope, IPM heading and body (two body parts).</p> <p>Verify in particular:</p> <ul style="list-style-type: none"> <li>• the respective message length/body part size and body part types of both body parts,</li> <li>• <i>priority</i> element “non-urgent”.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

<sup>28</sup> Other values not recommended.



## 5.6 Enhanced Delivery UA Capability with IHE

*Note.*— Only those messages shall be used meeting the AMHS User Capability of the IUT.

### 5.6.1 CTUA1601 – Deliver an IPM with IHE with the implemented capability of one body part

<b>CTUA1601</b>	<b>Deliver an IPM with IHE with the implemented capability of one body part</b>
<b>Test criteria</b>	This test is successful, if the IUT displays ATS messages (IPMs) with IHE, containing <b>one body part with length equal to that defined for the respective capability class</b> , correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) with IHE addressing the IUT-UA and meeting the defined user capability.</p> <ul style="list-style-type: none"> <li>• <u>Capability A16</u>: This Message shall have one body part with message text length of 16 k characters;</li> <li>• <u>Capability A64</u>: This Message shall have one body part with message text length of 64 k characters;</li> <li>• <u>Capability B2</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 1800 characters;</li> <li>• <u>Capability B16</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 16 k characters;</li> <li>• <u>Capability B64</u>: This Message shall have one general-text-body-part with Repertoire B and with message text length of 64 k characters;</li> <li>• <u>Capability F1024</u><sup>29</sup>: This Message shall have one file-transfer-body-part with body part size of 1 M bytes;</li> <li>• <u>Capability F2048</u>: This Message shall have one file-transfer-body-part with body part size of 2 M bytes.</li> </ul> <p>Each ATS message shall have <i>precedence equivalent to GG</i> (ATS priority) and different <i>authorization-time</i> (filing time). The <i>originators-reference</i> (OHI) element shall be absent.</p> <p>Verify that all messages, which are supported by the IUT-UA, are correctly received.</p> <p>Verify in particular, that</p> <ul style="list-style-type: none"> <li>• the message text (in full length) and IHE elements are displayed correctly.</li> </ul>

<sup>29</sup> Lower values not recommended

	<ul style="list-style-type: none"><li>the respective body part size and content for messages with FTBP are correct.</li></ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

### 5.6.2 **CTUA1602 – Deliver an IPM with IHE with the implemented capability of two body parts**

<b>CTUA1602</b>	<b>Deliver an IPM with IHE with the implemented capability of two body parts</b>
<b>Test criteria</b>	This test is successful, if the IUT displays ATS messages (IPMs) with IHE, containing <b>two body parts with values equal to those defined for the respective capability class</b> , correctly.
<b>Scenario description</b>	<p>From the AMHS UA Test Tool send a sequence of ATS messages (IPMs) with IHE addressing the IUT-UA and meeting the defined user capability.</p> <ul style="list-style-type: none"> <li>• <u>Capability A64+F2048<sup>30</sup></u>: This Message shall have two body parts; one body part with message text length of 64 k characters and one file-transfer-body-part with body part size of 2 M bytes;</li> <li>• <u>Capability B64+F2048</u>: This Message shall have two body parts; one general-text-body-part with Repertoire B and with message text length of 64 k characters and one file-transfer-body-part with body part size of 2 M bytes.</li> </ul> <p>Each ATS message shall have <i>precedence equivalent to GG</i> (ATS priority) and different <i>authorization-time</i> (filing time). The <i>originators-reference</i> (OHI) element shall be absent.</p> <p>Verify that all messages, which are supported by the IUT-UA, are correctly received.</p> <p>Verify in particular, that</p> <ul style="list-style-type: none"> <li>• the message text (in full length) and IHE elements are displayed correctly; and</li> <li>• the respective body part size and content are correct.</li> <li>• <i>priority</i> element “non-urgent”.</li> </ul>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

<sup>30</sup> Other values not recommended.

## **6. Extended AMHS Service – Test Procedures with DIR (Use of Directory Services)**

### **6.1 Submission Operations (DIR)**

#### **6.1.1 CTUA2101 – Submission of an IPM with use of Directory Services (DIR)**

<b>CTUA2101</b>	<b>Submission of an IPM with use of Directory Services (DIR)</b>
<b>Test criteria</b>	This test is successful, if the IUT submits ... correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) ...</p> <ul style="list-style-type: none"> <li>•</li> </ul> <p>Verify ...</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

– To be developed –

## 6.2 Delivery Operations (DIR)

### 6.2.1 CTUA2201 – Delivery of an IPM with use of Directory Services (DIR)

<b>CTUA2201</b>	<b>Delivery of an IPM with use of Directory Services (DIR)</b>
<b>Test criteria</b>	This test is successful, if the IUT displays ... correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) ...</p> <ul style="list-style-type: none"> <li>•</li> </ul> <p>Verify ...</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

– To be developed –

## 7. Extended AMHS Service – Test Procedures with SEC (Security)

### 7.1 Submission Operations (SEC)

#### 7.1.1 CTUA3101 – Submission of an IPM with Security (SEC)

<b>CTUA3101</b>	<b>Submission of an IPM with Security (SEC)</b>
<b>Test criteria</b>	This test is successful, if the IUT submits ... correctly.
<b>Scenario description</b>	From the IUT-UA send a sequence of ATS messages (IPMs) ...  •  Verify ...
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

– To be developed –

## 7.2 Delivery Operations (SEC)

### 7.2.1 CTUA3201 – Delivery of an IPM with Security (SEC)

<b>CTUA3201</b>	<b>Delivery of an IPM with Security (SEC)</b>
<b>Test criteria</b>	This test is successful, if the IUT displays ... correctly.
<b>Scenario description</b>	<p>From the IUT-UA send a sequence of ATS messages (IPMs) ...</p> <ul style="list-style-type: none"> <li>•</li> </ul> <p>Verify ...</p>
<b>AMHS ref: Doc 9880, Part II</b>	
<b>Test class</b>	Normal AMHS communications (N)

– To be developed –

**END of Appendix D-UA**



# EUR AMHS Manual

## Appendix E

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## References

- [1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures
- [2] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS), Second Edition – 2016
- [3] EUR Doc 020, EUR AMHS Manual, Main Part
- [4] EUR Doc 020, EUR AMHS Manual, Appendix C, AMHS Testing Requirements
- [5] Aeronautical Communications Panel (ACP), Working Group N – Networking, Subgroup N3 – Ground-Ground Applications, Montreal, 12<sup>th</sup>-13<sup>th</sup> May 2005 (Third meeting): Introduction of Standardized Addresses for AMHS Testing (Rev.a), Doc-Ref. ACP-WG N/SGb N3-WP/3-3 Rev.a, 24/Apr/2005
- [6] First Multipartite International Realization of ICAO SARPs AMHS Trials (FIRST), Test Plans for Interoperability Testing, Part 1a: Bilateral Basic Tests
- [7] First Multipartite International Realization of ICAO SARPs AMHS Trials (FIRST), Test Plans for Interoperability Testing, Part 1b: Bilateral Extended Tests
- [8] First Multipartite International Realization of ICAO SARPs AMHS Trials (FIRST), Test Plans for Interoperability Testing, Part 2: Trilateral Network Tests
- [9] EUR/NAT Routing Directory, Part 1 – Documentation
- [10] ICAO Doc 9896: Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols, Second Edition –2015

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# 1. Introduction

## 1.1 Purpose of the Document

The purpose of the document is to define the functional tests for AMHS Interoperability in order to ensure the end-to-end interoperability between AMHS systems under test. These tests are performed after the successful completion of AMHS conformance testing, through which the compliance of all systems under test to the AMHS technical specifications has been demonstrated.

For this reason the data used in the interoperability tests are generated either:

- manually; or,
- using records obtained by copy (duplication) and storage of some real traffic occurred among users in service; or
- using parallel duplicated traffic.

Implementations tested in this phase will not be operational systems, but test beds in order to neither disturb the real traffic nor cause potential outages in the operational systems.

As a summary, the correct performance of the interoperability tests included in this document is the previous step to progress the IUT towards a future operational system; this will be done by means of a transition plan to real traffic in the future operational environment.

## 1.2 Document Structure

*Chapter 2* presents the test environment used for AMHS interoperability testing.

*Chapter 3* defines the addressing plan implemented in the test environment.

*Chapters 4 and 5* contain the general description of the bilateral and trilateral test procedures with subsections for each AMHS functional area. Each test procedure is presented in a structured way consisting of

- defined test criteria,
- a (brief) scenario description,
- reference to the relevant part of the standard specification (Doc 9880, Part II, section),
- reference to similar test(s) performed in the FIRST interoperability tests [6] [7],

*Chapters 6 and 7* contain the detailed test-case descriptions for the bilateral and trilateral test procedures.

*Chapter 8* contains the templates for the test messages.



## 1.3 Test Identification Scheme

Each Interoperability Test procedure has an identifier in the form

*ITxnn;*

where IT is an acronym for Interoperability Test, *x* is a number identifying the test group<sup>1</sup> and *nn* is a consecutive number identifying the individual test procedure.

Test procedures are classified in two blocks: Bilateral Tests and Trilateral Tests.

The bilateral test groups consist of tests using messages specifically generated by IUTs for trials. The following six groups have been identified:

- testing of submission, transfer and delivery operations (x=1),
- testing of gateway operations converting a user message from AFTN to AMHS (x=2),
- testing of gateway operations converting a user message from AMHS to AFTN (x=3),
- testing of gateway operations converting a user message from AFTN to AMHS and back to AFTN (x=4),
- testing of gateway operations – special cases (x=5)and
- testing of stress traffic situations (x=6)

The two trilateral test groups are:

- testing of transfer (relay) operations (x=7),
- testing of special situations (alternate routing, traffic loop) (x=8).

---

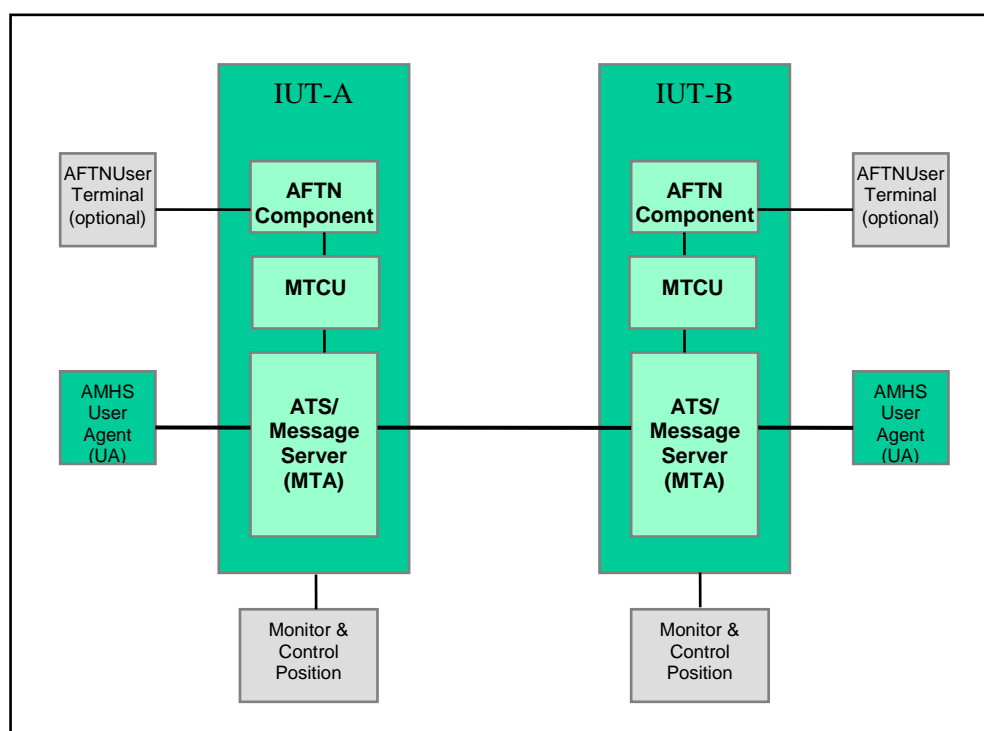
<sup>1</sup> Test groups for AMHS conformance tests have been identified in [4].

## 2. AMHS Interoperability Test Environment

### 2.1 Application infrastructure

Both AMHS Implementations Under Test (IUTs) are complete systems constituted by AFTN, AMHS and AFTN/AMHS Gateway components, with corresponding AFTN and AMHS user terminals and supervision positions, as decided locally by the corresponding organization.

In each IUT, an AMHS User Agent is used in submission and delivery tests. Gateway tests involve an AFTN user terminal. The use of the Monitor & Control Position is required in order to observe the outcome of the conversion processes, especially in out-of-line situations.



**Figure 1: AMHS Interoperability Test Environment**

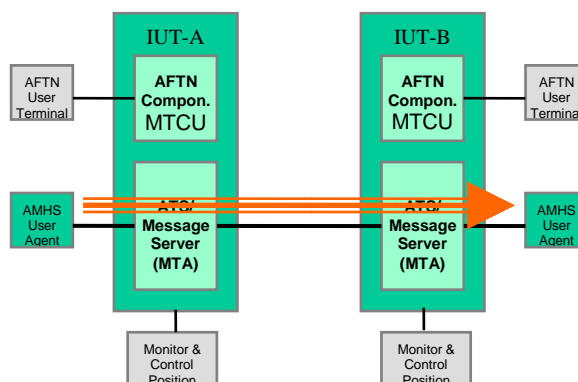
Figure 1 shows the test environment used for AMHS interoperability tests. Both IUTs will be interconnected via AMHS transfer ports supporting the X.400/P1 protocol over a TCP/IP/LAN.

*Note.— In Figure 1 the AFTN Terminal is directly connected to the AFTN Component in an abstract way. There may exist different implementations with an AFTN component only connected to an AFTN switch or integrated AFTN/AMHS switches. For the interoperability tests it does not matter whether the AFTN Terminal is connected directly or indirectly.*

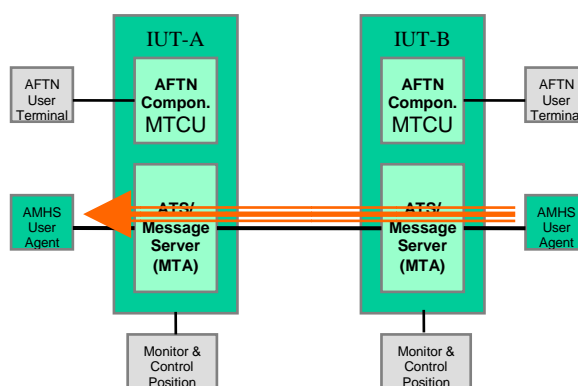
The components of the test environment as depicted in Figure 1 are involved in the test procedures in following way:

### ***Submission, Transfer and Delivery operation tests (AMHS => AMHS) (x=1):***

AMHS User Agent => ATS Message Server => ATS Message Server => AMHS User Agent



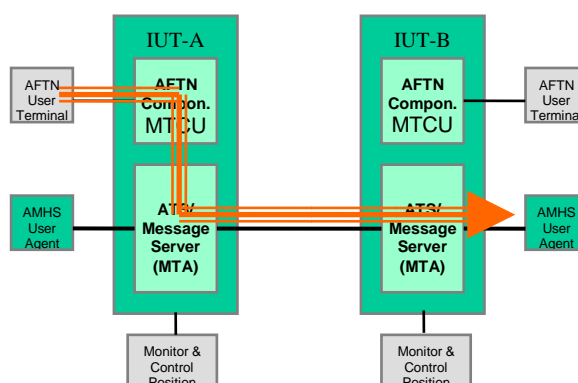
***Figure 2: UA to UA (IUT-A to IUT-B)***



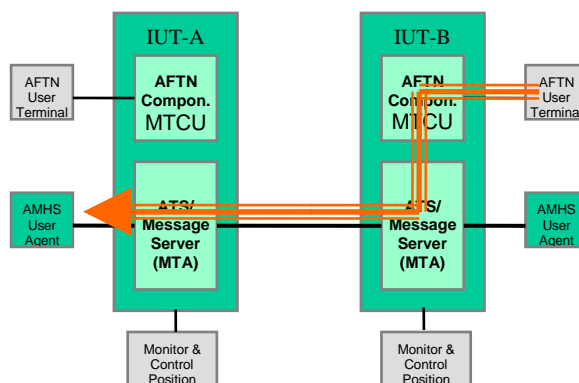
***Figure 3: UA to UA (IUT-B to IUT-A)***

### ***AMHS / AFTN gateway tests (AFTN => AMHS) (x=2):***

AFTN Terminal => Gateway and ATS Message Server => UA



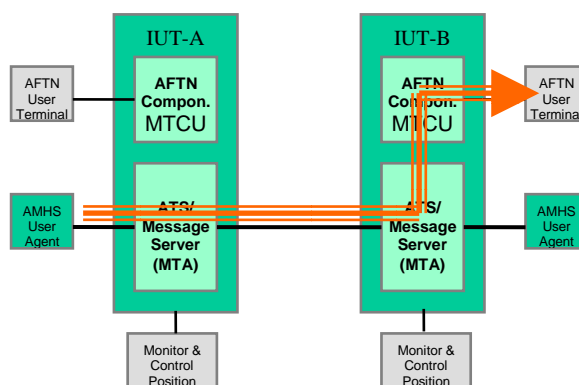
***Figure 4: AFTN Terminal to UA (IUT-A to IUT-B)***



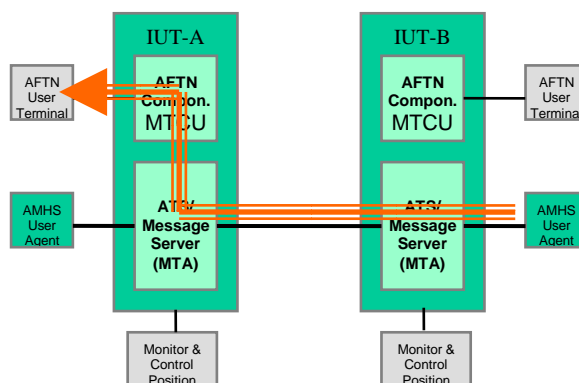
**Figure 5: AFTN Terminal to UA (IUT-B to IUT-A)**

**AMHS / AFTN gateway tests (AMHS => AFTN) (x=3):**

UA => ATS Message Server and Gateway => AFTN Terminal



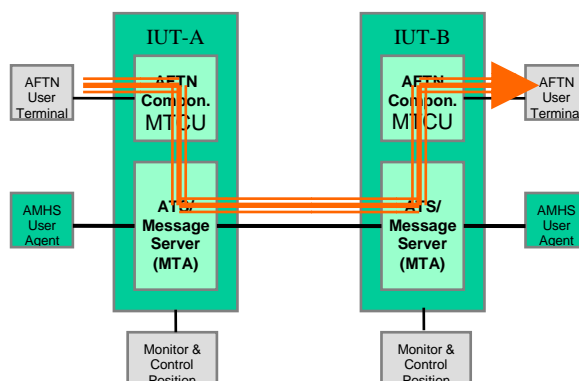
**Figure 6: UA to AFTN Terminal (IUT-A to IUT-B)**



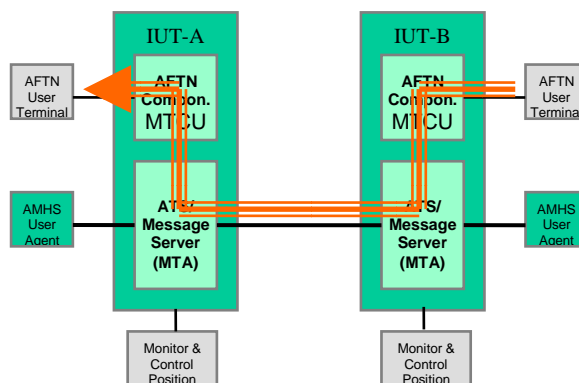
**Figure 7: UA to AFTN Terminal (IUT-B to IUT-A)**

### ***AMHS / AFTN gateway tests (AFTN => AMHS => AFTN) (x=4):***

AFTN Terminal => Gateway => ATS Message Servers => Gateway => AFTN Terminal



***Figure 8: AFTN Terminal to AFTN Terminal (IUT-A to IUT-B)***



***Figure 9: AFTN Terminal to AFTN Terminal (IUT-B to IUT-A)***

### ***Gateway Operations – special case scenarios (x=5)***

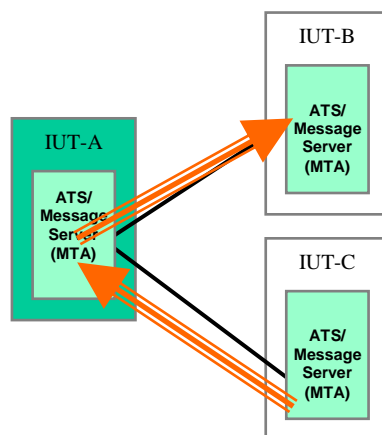
For the special case scenarios different combinations of the flows shown above are used.

### ***Stress traffic situations (x=6)***

Depending on the stress scenario chosen combinations of the flows shown above are used.

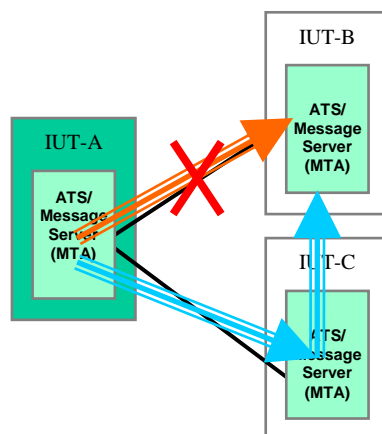
**“Relay” operation tests (x=7)** – (optional - additional test partner required – IUT-C)

Peer IUT => IUT (ATS Message Server) => peer IUT

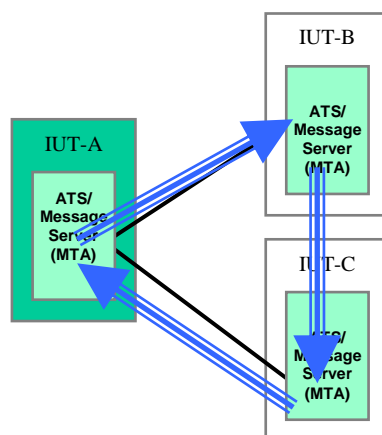


**Figure 10: “Relay” operation tests**

**Testing of special situations (x=8)** – (optional - additional test partner required – IUT-C and – additional connectivity required IUT-B - IUT-C)



**Figure 11: Alternate MTA routing**



**Figure 12: Traffic loop test**

## 2.2 Transport infrastructure

To perform the bilateral interoperability tests, an underlying infrastructure for message transport between the two IUTs has to be agreed.

In case of multilateral tests an underlying infrastructure for message transport between the involved IUTs (minimum three) has to be agreed.

In the EUR Region the infrastructure to be used is based in the TCP/IP protocol (IPv4/IPv6). However, other, “non-standard” solutions may be used for testing. Those refer to the actual network environment or other means offered by communications suppliers, such as ADSL, public internet; in this case, agreement among the parties is necessary due to the potential impact of this solution on the configuration of the timers of the systems concerned, as compared to the standard solution.

## 2.3 General parameters to be agreed

The AMHS systems involved in the interoperability tests are expected to be “as close as possible” to the operational systems in terms of hardware and software.

The following entries and/or parameters shall be agreed between the test partners. It is recommended to use the default values.

Parameter	Default Values			Remarks
	TEST PARTNER 1	TEST PARTNER 2	TEST PARTNER 3	
<b>IP addresses</b>	to be agreed bilaterally	to be agreed bilaterally	to be agreed	In line with the EUROCONTROL IP address allocation plan
<b>TCP Port</b>	102	102	102	Doc 9896, section 1.2
<b>S/W release versions</b>				
<b>MTA name</b>	MTA-IUTA-1	MTA-IUTB-1	MTA-IUTC-1	As per AMHSM section 8.2 <i>See Note below</i>
<b>MTA password</b>	ICAO-IUTA-1	ICAO-IUTB-1	ICAO-IUTC-1	As per AMHSM section 8.2 <i>See Note below</i>
<b>Calling Presentation Address</b>	No	No	No	Yes or No Depending on SW implementation, parameter may have to be Yes
<b>Authentication requirements</b>	Simple	Simple	Simple	Simple, strong or bilateral. Not mandated but may be agreed among test partners.
<b>TSAP addresses</b>	to be agreed bilaterally	to be agreed bilaterally	to be agreed	Hex e.g. ‘544350’ (“TCP”) or ‘4D4853’ (“MHS”)

Parameter	Default Values			Remarks
	TEST PARTNER 1	TEST PARTNER 2	TEST PARTNER 3	
Protocol type	X.400/1988	X.400/1988	X.400/1988	IPM 1984 phased out (AMHSM App.B)
Type of associations	monologue	monologue	monologue	Monologue or Two-way alternate (AMHSM App. B)
Number of associations incoming				The number of incoming associations should be equal to the number of outgoing ones.
Number of associations outgoing				
Connection	Dynamic	Dynamic	Dynamic	Permanent or Dynamic
Minimum message size support	4 Mbytes	4 Mbytes	4 Mbytes	(AMHSM App. B)
Addressing scheme				XF or CAAS with single or multiple O
Type of body part used in IPMs by UA	general-text-body-part with ISO646 repertoire	general-text-body-part with ISO646 repertoire	general-text-body-part with ISO646 repertoire	ia5-text, ia5-text-body-part, or general-text-body-part with ISO646 repertoire

**Table 1: Configuration parameters for AMHS Interoperability tests**

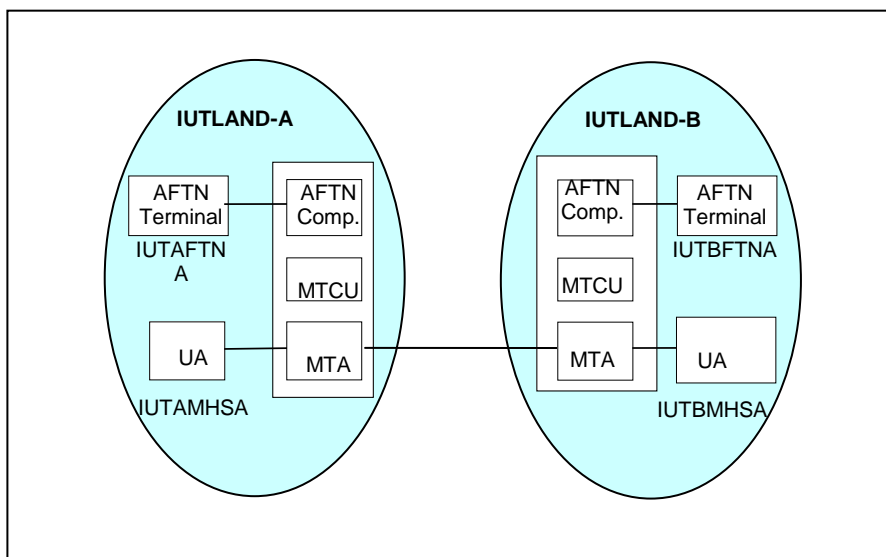
*Note.- Upon agreement of the test partners involved, the default values of the MTA name and MTA password could include location indicators based on the corresponding ICAO two letter State/territory identifier, as may be found in ICAO Doc 7910.*



### 3. Addressing Plan for AMHS Interoperability Testing

#### 3.1 User addresses

To meet the scope of testing, the test-address space used by AMHS Interoperability Testing should include, for each IUT, the respective AFTN and AMHS addresses and the corresponding AMHS PRMD.



**Figure 13: Addressing Plan**

The original, operational AMHS and AFTN addresses assigned to the COM Centre could be used as test addresses for each IUT. To distinguish between operational and test addresses it is recommended to use a generic address space taken from fictitious PRMD/AFTN countries IUTLAND-A and IUTLAND-B. This includes generic user addresses IUTAFTNA and IUTAMHSA for IUTLAND-A as well as IUTBFTNA and IUTBMHSA for IUTLAND-B, which may be mapped either according to the CAAS (preferred, or a more comprehensive set of addresses in case of CAAS with multiple "O" values) or the XF addressing scheme.

*This approach has been applied to all addressing aspects of interoperability testing specified in this Appendix, including formulation of DL addresses, AFTN and X.400 Routing Tables, the generic Look-up Table and the Local AMHS User address book.*

The following tables show the generic address space assigned to the two IUTs and a third IUT if trilateral network tests are performed.

*Alternatively, upon agreement of the test partners involved, AMHS and AFTN addresses similar to the operational addresses assigned to the COM Centre, could be used as test addresses for each IUT. Caution should be taken so that these addresses are not operationally transmitted. For example, test addresses could include location indicators based on the corresponding ICAO two letter State/territory identifier, as may be found in ICAO Doc7910. This alternative would then be applied to all addressing aspects of interoperability testing, including formulation of user addresses, formulation of DL addresses, AFTN and X.400 Routing Tables, the generic Look-up Table and the Local AMHS User address book.*

CAAS (preferred) – single "O"	CAAS – multiple "O"	XF
C = XX ADMD = ICAO PRMD = IUTLAND-A O = A-REGION OU1 = IUTA CN = IUTAFTNA ... IUTAMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-A O = A-REGION1 OU1 = IUTA CN = IUTAFTNA ... IUTAMHSA O = A-REGION2 OU1 = IUAA CN = IUAAFTNA ... IUAAAMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-A O = AFTN OU1 = IUTAFTNA ... IUTAMHSA

Table 2: Generic address spaces of IUTLAND-A

CAAS (preferred) – single "O"	CAAS – multiple "O"	XF
C = XX ADMD = ICAO PRMD = IUTLAND-B O = B-REGION OU1 = IUTB CN = IUTBFTNA ... IUTBMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-B O = B-REGION1 OU1 = IUTB CN = IUTBFTNA ... IUTBMHSA O = B-REGION2 OU1 = IUBB CN = IUBBFTNA ... IUBBMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-B O = AFTN OU1 = IUTBFTNA ... IUTBMHSA

Table 3: Generic address spaces of IUTLAND-B

CAAS (preferred) – single "O"	CAAS – multiple "O"	XF
C = XX ADMD = ICAO PRMD = IUTLAND-C O = C-REGION OU1 = IUTC CN = IUTCFTNA ... IUTCMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-C O = B-REGION1 OU1 = IUTC CN = IUTCFTNA ... IUTCMHSA O = B-REGION2 OU1 = IUCC CN = IUCCFTNA ... IUCCMHSA	C = XX ADMD = ICAO PRMD = IUTLAND-C O = AFTN OU1 = IUTCFTNA ... IUTCMHSA

Table 4: Generic address spaces of IUTLAND-C

## 3.2 DL addresses

Distribution List name	Addresses included in the DL	Remarks
IUTADLLO	IUTBFTNA IUTBFTNB IUTBMHSA	
IUTADLRE	IUTAFTNA IUTAFTNB IUTAMHSA	

*Table 5: DL addresses of IUT-A*

Distribution List name	Addresses included in the DL	Remarks
IUTBDLLO	IUTAFTNA IUTAFTNB IUTAMHSA	
IUTBDLRE	IUTBFTNA IUTBFTNB IUTBMHSA	

*Table 6: DL addresses of IUT-B*

## 3.3 AFTN and X.400 Routing Tables

### 3.3.1 AFTN and X.400 Routing Tables of IUT-A

AFTN Routing Indicator	Routing direction	Remarks
IUTAFT*	AFTN Terminal	
IUTA*	MTCU	
IUTB*	MTCU	
IUTC*	MTCU	

*Table 7: AFTN Routing Table of IUT-A*

X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-A /O=A-REGION/OU1=IUTA/CN=IUTAMHSA/	UA IUT-A	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-A /O=A-REGION/OU1=IUTA/CN=IUTAMHSB/	UA IUT-A	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-A /O=A-REGION/OU1=IUTA/CN=IUTAMHSC/	UA IUT-A	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-A /O=AFTN/OU1=IUTAMHSA/	UA IUT-A	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-A /O=AFTN/OU1=IUTAMHSB/	UA IUT-A	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-A /O=AFTN/OU1=IUTAMHSC/	UA IUT-A	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-A	MTCU	
/C=XX/A=ICAO/P=IUTLAND-B	MTA-IUTB-1	See note below
/C=XX/A=ICAO/P=IUTLAND-C	MTA-IUTC-1	See note below
/C=XX/A=ICAO/P=IUTLAND-X	MTA-IUTB-1	See note below

**Table 8: X.400 Routing Table of IUT-A**

*Note.— The naming scheme described in [3], Chapter 8 is used.*

### 3.3.2 AFTN and X.400 Routing Tables of IUT-B

AFTN Routing Indicator	Routing direction	Remarks
IUTBFT*	AFTN Terminal	
IUTA*	MTCU	
IUTB*	MTCU	
IUTC*	MTCU	

**Table 9: AFTN Routing Table of IUT-B**

X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-B /O=B-REGION/OU1=IUTB/CN=IUTBMHSA/	UA IUT-B	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-B /O=B-REGION/OU1=IUTB/CN=IUTBMHSA/	UA IUT-B	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-B /O=B-REGION/OU1=IUTB/CN=IUTBMHSC/	UA IUT-B	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-B /O=AFTN/OU1=IUTBMHSA/	UA IUT-B	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-B /O=AFTN/OU1=IUTBMHSA/	UA IUT-B	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-B /O=AFTN/OU1=IUTBMHSC/	UA IUT-B	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-B	MTCU	
/C=XX/A=ICAO/P=IUTLAND-A	MTA-IUTA-1	See note in 3.3.1
/C=XX/A=ICAO/P=IUTLAND-C	MTA-IUTC-1	See note in 3.3.1
/C=XX/A=ICAO/P=IUTLAND-X	MTA-IUTC-1	See note in 3.3.1

**Table 10: X.400 Routing Table of IUT-B**

### 3.3.3 AFTN and X.400 Routing Tables of IUT-C

AFTN Routing Indicator	Routing direction	Remarks
IUTCFT*	AFTN Terminal	
IUTA*	MTCU	
IUTB*	MTCU	
IUTC*	MTCU	

Table 11: AFTN Routing Table of IUT-C

X.400 Routing Indicator	Routing direction	Remarks
/C=XX/A=ICAO/P=IUTLAND-C /O=C-REGION/OU1=IUTC/CN=IUTCMHSA/	UA IUT-C	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-C /O=C-REGION/OU1=IUTC/CN=IUTCMHSB/	UA IUT-C	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-C /O=C-REGION/OU1=IUTC/CN=IUTCMHSC/	UA IUT-C	If CAAS “single “O” type
/C=XX/A=ICAO/P=IUTLAND-C /O=AFTN/OU1=IUTCMHSA/	UA IUT-C	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-C /O=AFTN/OU1=IUTCMHSB/	UA IUT-C	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-C /O=AFTN/OU1=IUTCMHSC/	UA IUT-C	If “XF” type
/C=XX/A=ICAO/P=IUTLAND-C	MTCU	
/C=XX/A=ICAO/P=IUTLAND-A	MTA-IUTA-1	See note in 3.3.1
/C=XX/A=ICAO/P=IUTLAND-B	MTA-IUTB-1	See note in 3.3.1
/C=XX/A=ICAO/P=IUTLAND-X	MTA-IUTA-1	See note in 3.3.1

Table 12: X.400 Routing Table of IUT-C

## 3.4 Look-up Table

### 3.4.1 Generic look-up Table for all Implementations Under Test (IUT) (CAAS single “O” type)

AFTN address	O/R Address (CAAS single “O” type)
IUTAFTN*	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/
IUTAFTA*	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLRE/

AFTN address	O/R Address (CAAS single “O” type)
IUTBFTN*	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/
IUTBFTA*	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLRE/
IUTCFTNA	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=X-REGION/OU1=IUTX/CN=IUTXLOOP/

Table 13: Generic look-up table (CAAS single “O” type)

### 3.4.2 Generic look-up Table for all Implementations Under Test (IUT) (“XF” type)

AFTN address	O/R Address (“XF” type)
IUTAFTN*	/C=XX/A=ICAO/P=IUTLAND-A/
IUTAFTA*	/C=XX/A=ICAO/P=IUTLAND-A/
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLRE/
IUTBFTN*	/C=XX/A=ICAO/P=IUTLAND-B/
IUTBFTA*	/C=XX/A=ICAO/P=IUTLAND-B/
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLRE/
IUTCFTNA	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCFTNA/
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCMHSA/
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=AFTN/OU1=IUTXLOOP/

Table 14: Generic look-up table (“XF” type)

*Note.*– There are further possibilities: IUT-A could have XF addressing scheme whilst IUT-B has CAAS, or vice-versa. In such a case, the corresponding table entries are selected. To simplify matters it is recommended to use CAAS single “O” type or “XF” type only.

## 3.5 Local AMHS User address book

### 3.5.1 Addresses of IUT-A in a local AMHS User address book

If IUT-A is configured as a domain using the CAAS addressing scheme, the entries as in Table 15 and Table 17 are used within the tests. If IUT-A is configured as a domain using the XF addressing scheme, the entries as in Table 16 and Table 17 are used. The test partners may include the addresses into their local address books.

Nick name	O/R Address (CAAS single "O" type)
IUTAFTNA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNA/
IUTAFTNB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNB/
IUTAFTNC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNC/
IUTAFTND	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTND/
IUTAFTNE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNE/
IUTAFTNF	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNF/
IUTAFTNG	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNG/
IUTAFTNH	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNH/
IUTAFTNI	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNI/
IUTAFTNJ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNJ/
IUTAFTNK	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNK/
IUTAFTNL	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNL/
IUTAFTNM	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNM/
IUTAFTNN	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNN/
IUTAFTNO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNO/
IUTAFTNP	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNP/
IUTAFTNQ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNQ/
IUTAFTNR	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNR/
IUTAFTNS	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNS/
IUTAFTNT	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNT/
IUTAFTNU	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNU/
IUTAFTNV	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNV/
IUTAFTNW	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNW/
IUTAFTNX	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNX/
IUTAFTNY	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTNY/
IUTAFTAA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAA/
IUTAFTAB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAB/
IUTAFTAC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAC/
IUTAFTAD	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAD/
IUTAFTAE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAE/
IUTAFTAF	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAF/
IUTAFTAG	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAG/
IUTAFTAH	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAH/
IUTAFTAI	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAI/
IUTAFTAJ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAJ/
IUTAFTAK	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAK/
IUTAFTAL	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAL/
IUTAFTAM	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAM/
IUTAFTAN	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAN/

Nick name	O/R Address (CAAS single “O” type)
IUTAFTAO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAO/
IUTAFTAP	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAP/
IUTAFTAQ	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAQ/
IUTAFTAR	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAR/
IUTAFTAS	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAS/
IUTAFTAT	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAT/
IUTAFTAU	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAU/
IUTAFTAV	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAV/
IUTAFTAW	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAW/
IUTAFTAX	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAX/
IUTAFTAY	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAFTAY/
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTA/CN=IUTADLRE/

**Table 15: Addresses of IUT-A (CAAS single “O” type) in a local AMHS user address book**

Nick name	O/R Address (“XF” type)
IUTAFTNA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNA/
IUTAFTNB	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNB/
IUTAFTNC	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNC/
till	<b>To be continued till</b>
IUTAFTNY	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTNY/
IUTAFTAA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTAA/
till	<b>To be continued till</b>
IUTAFTAY	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFTAY/
IUTAMHSA	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSA/
IUTAMHSB	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSB/
IUTAMHSC	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAMHSC/
IUTADLLO	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLLO/
IUTADLRE	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTADLRE/

**Table 16: Addresses of IUT-A (“XF” type) in a local AMHS user address book**

Nick name	O/R Address
IUTAFTUU	/C=XX/A=ICAO/P=IUTLAND-A/O=A-REGION/OU1=IUTC/CN=IUTAFTUU/
IUTAFTUV	/C=XX/A=ICAO/P=IUTLAND-A/O=AFTN/OU1=IUTAFT/

**Table 17: O/R addresses in IUT-A which cannot be converted into AFTN addresses**

The addresses as in Table 17 must not be included in the User Address Look-Up table of IUT-A.



### 3.5.2 Addresses of IUT-B in a local AMHS User address book

If IUT-B is configured as a domain using the CAAS addressing scheme, the entries as in Table 18 and Table 20 are used within the tests. If IUT-B is configured as a domain using the XF addressing scheme, the entries as in Table 19 and Table 20 are used. The test partners may include the addresses into their local address books.

Nick name	O/R Address (CAAS single “O” type)
IUTBFTNA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNA/
IUTBFTNB	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNB/
IUTBFTNC	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNC/
till	<b>To be continued till</b>
IUTBFTNY	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTNY/
IUTBFTAA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTAA/
till	<b>To be continued till</b>
IUTBFTAY	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBFTAY/
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTB/CN=IUTBDLRE/

**Table 18: Addresses of IUT-B (CAAS single “O” type) in a local AMHS user address book**

Nick name	O/R Address (“XF” type)
IUTBFTNA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNA/
IUTBFTNB	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNB/
IUTBFTNC	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNC/
till	<b>To be continued till</b>
IUTBFTNY	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTNY/
IUTBFTAA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTAA/
till	<b>To be continued till</b>
IUTBFTAY	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFTAY/
IUTBMHSA	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSA/
IUTBMHSB	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSB/
IUTBMHSC	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBMHSC/
IUTBDLLO	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLLO/
IUTBDLRE	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBDLRE/

**Table 19: Addresses of IUT-B (XF type) in a local AMHS user address book**

Nick name	O/R Address
IUTBFTUU	/C=XX/A=ICAO/P=IUTLAND-B/O=B-REGION/OU1=IUTC/CN=IUTBFTUU/
IUTBFTUV	/C=XX/A=ICAO/P=IUTLAND-B/O=AFTN/OU1=IUTBFT/

**Table 20: O/R addresses in IUT-B which cannot be converted into AFTN addresses**

The addresses as in Table 20 must not be included in the User Address Look-Up table of IUT-B.

### 3.5.3 Addresses of IUT-C in a local AMHS User address book

If IUT-C is configured as a domain using the CAAS addressing scheme, the entry as in Table 21 is used within the tests. If IUT-C is configured as a domain using the XF addressing scheme, the entry as in Table 22 is used. The test partners may include the addresses into their local address books.

Nick name	O/R Address (CAAS single “O” type)
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=C-REGION/OU1=IUTC/CN=IUTCMHSA/

*Table 21: Addresses of IUT-C (CAAS single “O” type) in a local AMHS user address book*

Nick name	O/R Address (“XF” type)
IUTCMHSA	/C=XX/A=ICAO/P=IUTLAND-C/O=AFTN/OU1=IUTCMHSA/

*Table 22: Addresses of IUT-C (XF type) in a local AMHS user address book*

### 3.5.4 Addresses used for loop detection tests

Nick name	O/R Address (CAAS single “O” type)
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=X-REGION/OU1=IUTX/CN=IUTXLOOP/

*Table 23: Addresses used for loop detection tests (CAAS single “O” type)*

Nick name	O/R Address (“XF” type)
IUTXLOOP	/C=XX/A=ICAO/P=IUTLAND-X/O=AFTN/OU1=IUTXLOOP/

*Table 24: Addresses used for loop detection tests (XF type)*

*Note.*— For the loop detection test it is irrelevant whether IUTXLOOP is a CAAS or an XF address.

## 4. Bilateral Test Procedures

Before the tests, the test partners should coordinate and document the type of body part used in IPMs submitted by their User Agents when submitting text messages, either as:

- IPMs containing an ia5-text, or
- IPMs containing an ia5-text-body-part, or
- IPMs containing a general-text-body-part with ISO646 repertoire.

Depending on the implemented capabilities of the IUTs and the AMHS user agents involved in the interoperability tests, test partners may agree upon the submission, transfer and delivery of:

- IPMs containing a single body part being an FTBP, or
- IPMs containing two body parts, as defined in section 3.3.2 of Appendix B

### 4.1 Submission, Transfer and Delivery Operation (AMHS to AMHS)

#### 4.1.1 IT101 – Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)

<b>IT101</b>	<b>Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)</b>
<b>Test criteria</b>	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPM) correctly to a peer MTA which delivers the ATS messages (IPM) to the UA of the receiving IUT.
<b>Scenario description</b>	<p>From the UA of IUT-A send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user in the peer IUT, via AMHS.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT101M01) shall have ATS-message-priority KK.</li> <li>• Message 2 (IT101M02) shall have ATS-message-priority GG.</li> <li>• Message 3 (IT101M03) shall have ATS-message-priority FF.</li> <li>• Message 4 (IT101M04) shall have ATS-message-priority DD.</li> <li>• Message 5 (IT101M05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty.</p> <p>Verify the messages received by the remote UA.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent), 3.2 (ATS Message Server), 3.3.3.7 (ATS-Message-Header)
<b>Related FIRST interoperability test(s)</b>	ITP001/C41/C42

<b>Test class</b>	Normal AMHS communications (N)
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**4.1.2 IT102 – Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)**

<b>IT102</b>	<b>Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)</b>
<b>Test criteria</b>	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPM) correctly to a peer MTA which delivers the ATS messages (IPM) to the UA of the receiving IUT.
<b>Scenario description</b>	<p>From the UA of IUT-B send a sequence of five ATS messages (IPMs) to the IUT addressing a remote AMHS user in the peer IUT, via AMHS.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT102M01) shall have ATS-message-priority KK.</li> <li>• Message 2 (IT102M02) shall have ATS-message-priority GG.</li> <li>• Message 3 (IT102M03) shall have ATS-message-priority FF.</li> <li>• Message 4 (IT102M04) shall have ATS-message-priority DD.</li> <li>• Message 5 (IT102M05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty.</p> <p>Verify the messages received by the remote UA.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent), 3.2 (ATS Message Server), 3.3.3.7 (ATS-Message-Header)
<b>Related FIRST interoperability test(s)</b>	ITP001/C41/C42
<b>Test class</b>	Normal AMHS communications (N)

#### 4.1.3 **IT103 – Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-A to UA IUT-B)**

<b>IT103</b>	<b>Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-A to UA IUT-B)</b>
<b>Test criteria</b>	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPMs) correctly to a peer MTA which delivers the ATS messages (IPMs) to the UA of the receiving IUT.
<b>Scenario description</b>	<p>From the UA of IUT-A send a sequence of two ATS messages (IPMs) to the UA of IUT-B.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT103M01) shall have a single body part being an FTBP and containing a file of 16 Kbytes;</li> <li>• Message 2 (IT103M02) shall have a single body part being an FTBP and containing a file of 2Mbytes.</li> </ul> <p>Verify the messages received by the remote UA. Check the format and contents of the message delivery envelopes, IPM headings and bodies.</p> <p>In particular, verify the respective body part type, the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA.</p> <p>Note: This test aims to check submission, transfer and delivery of IPMs containing only one body part, as specified above. Thus the presence of the IHE elements is out of scope of this test.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent), 3.2 (ATS Message Server)
<b>Related FIRST interoperability test(s)</b>	
<b>Test class</b>	Normal AMHS communications (N)

#### 4.1.4 **IT104 - Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-B to UA IUT-A)**

<b>IT104</b>	<b>Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-B to UA IUT-A)</b>
<b>Test criteria</b>	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPMs) correctly to a peer MTA which delivers the ATS messages (IPMs) to the UA of the receiving IUT.
<b>Scenario description</b>	<p>From the UA of IUT-B send a sequence of two ATS messages (IPMs) to the UA of IUT-A.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT104M01) shall have a single body part being an FTBP and containing a file of 16 Kbytes;</li> <li>• Message 2 (IT104M02) shall have a single body part being an FTBP and containing a file of 2Mbytes.</li> </ul> <p>Verify the messages received by the remote UA. Check the format and contents of the message delivery envelopes, IPM headings and bodies.</p> <p>In particular, verify the respective body part type, the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA.</p> <p>Note: This test aims to check submission, transfer and delivery of IPMs containing only one body part, as specified above. Thus the presence of the IHE elements is out of scope of this test.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent), 3.2 (ATS Message Server)
<b>Related FIRST interoperability test(s)</b>	
<b>Test class</b>	Normal AMHS communications (N)

#### 4.1.5 **IT105 - Submission, transfer and delivery of an IPM containing two body parts (UA IUT-A to UA IUT-B)**

<b>IT105</b>	<b>Submission, transfer and delivery of an IPM containing two body parts (UA IUT-A to UA IUT-B)</b>
<b>Test criteria</b>	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPMs) correctly to a peer MTA which delivers the ATS messages (IPMs) to the UA of the receiving IUT.
<b>Scenario description</b>	<p>From the UA of IUT-A send a sequence of two ATS messages (IPMs) to the UA of IUT-B.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT105M01) shall have two body parts; one general-text-body-part with text length up to 1800 characters and one file-transfer-body-part containing a file of 2Mbytes;</li> <li>• Message 2 (IT105M02) shall have two body parts; one ia5-text with text length up to 1800 characters and one file-transfer-body-part containing a file of 2Mbytes.</li> </ul> <p>Note: Message 2 can only be sent if the optional support of ia5-text body part upon message submission is implemented in the sending UA.</p> <p>The generated ATS messages shall include an ATS-message-header in the text body part, including ATS-message-priority GG, ATS-filing-time, but no optional-heading-information element.</p> <p>Verify the messages received by the remote UA. Check the format and content of the message delivery envelopes, IPM headings and bodies (two body parts).</p> <p>In particular, for each received message verify:</p> <ul style="list-style-type: none"> <li>• the respective body part type of both body parts,</li> <li>• the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA,</li> <li>• the ATS-message-header.</li> </ul> <p>Note: The ATSMHS subset Basic+FTBP is considered for this specific test.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent), 3.2 (ATS Message Server)
<b>Related FIRST interoperability test(s)</b>	
<b>Test class</b>	Normal AMHS communications (N)



#### 4.1.6 **IT106 - Submission, transfer and delivery of an IPM containing two body parts (UA IUT-B to UA IUT-A)**

<b>IT106</b>	<b>Submission, transfer and delivery of an IPM containing two body parts (UA IUT-B to UA IUT-A)</b>
<b>Test criteria</b>	This test is successful, if the MTA of the sending IUT transfers the submitted ATS messages (IPMs) correctly to a peer MTA which delivers the ATS messages (IPMs) to the UA of the receiving IUT.
<b>Scenario description</b>	<p>From the UA of IUT-B send a sequence of two ATS messages (IPMs) to the UA of IUT-A.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT106M01) shall have two body parts; one general-text-body-part with text length up to 1800 characters and one file-transfer-body-part containing a file of 2Mbytes;</li> <li>• Message 2 (IT106M02) shall have two body parts; one ia5-text with text length up to 1800 characters and one file-transfer-body-part containing a file of 2Mbytes.</li> </ul> <p>Note: Message 2 can only be sent if the optional support of ia5-text body part upon message submission is implemented in the sending UA.</p> <p>The generated ATS messages shall include an ATS-message-header in the text body part, including ATS-message-priority GG, ATS-filing-time, but no optional-heading-information element.</p> <p>Verify the messages received by the remote UA. Check the format and content of the message delivery envelopes, IPM headings and bodies (two body parts).</p> <p>In particular, for each received message verify:</p> <ul style="list-style-type: none"> <li>• the respective body part type of both body parts,</li> <li>• the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA,</li> <li>• the ATS-message-header.</li> </ul> <p>Note: The ATSMHS subset Basic+FTBP is considered for this specific test.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS Message User Agent), 3.2 (ATS Message Server)
<b>Related FIRST interoperability test(s)</b>	
<b>Test class</b>	Normal AMHS communications (N)

## 4.2 Gateway Operations (AFTN to AMHS)

### 4.2.1 IT201 – Convert an AFTN message to AMHS format (IUT-A)

<b>IT201</b>	<b>Convert an AFTN message to AMHS format (IUT-A)</b>
<b>Test criteria</b>	This test is successful, if the sending IUT converts AFTN messages correctly to AMHS messages (IPM).
<b>Scenario description</b>	<p>From the sending IUT send a sequence of AFTN messages addressing a remote AMHS user, consisting of five messages:</p> <ul style="list-style-type: none"> <li>• AFTN message 1 (IT201M01) shall have priority KK.</li> <li>• AFTN message 2 (IT201M02) shall have priority GG.</li> <li>• AFTN message 3 (IT201M03) shall have priority FF.</li> <li>• AFTN message 4 (IT201M04) shall have priority DD.</li> <li>• AFTN message 5 (IT201M05) shall have priority SS.</li> </ul> <p>The filing time shall be different in each message and the OHI field of each message shall be empty.</p> <p>Check the IPMs that the AMHS user receives in the receiving IUT.</p> <p>Verify that the IUT has converted the messages correctly according to Table 4-3 of the AMHS technical specifications – see section 4.4.2. In particular:</p> <ul style="list-style-type: none"> <li>• verify that each message has different ATS-filing-time;</li> <li>• verify that the optional-heading-information element is empty;</li> <li>• check the correct format of the ATS message;</li> <li>• verify the ATS-message-priority and the related message transfer priority for each received message;</li> <li>• compare the ATS-message-text with the original AFTN message text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.2
<b>Related FIRST interoperability test(s)</b>	ITP001/C21/C31/C51/C53
<b>Test class</b>	Normal AMHS communications (N)

**4.2.2 IT202 – Convert an AFTN message to AMHS format (IUT-B)**

<b>IT202</b>	<b>Convert an AFTN message to AMHS format (IUT-B)</b>
<b>Test criteria</b>	This test is successful, if the sending IUT converts AFTN messages correctly to AMHS messages (IPM).
<b>Scenario description</b>	<p>From the sending IUT send a sequence of AFTN messages addressing a remote AMHS user, consisting of five messages:</p> <ul style="list-style-type: none"> <li>• AFTN message 1 (IT202M01) shall have priority KK.</li> <li>• AFTN message 2 (IT202M02) shall have priority GG.</li> <li>• AFTN message 3 (IT202M03) shall have priority FF.</li> <li>• AFTN message 4 (IT202M04) shall have priority DD.</li> <li>• AFTN message 5 (IT202M05) shall have priority SS.</li> </ul> <p>The filing time shall be different in each message and the OHI field of each message shall be empty.</p> <p>Check the IPMs that the AMHS user receives in the receiving IUT.</p> <p>Verify that the IUT has converted the messages correctly according to Table 4-3 of the AMHS technical specifications – see section 4.4.2. In particular:</p> <ul style="list-style-type: none"> <li>• verify that each message has different ATS-filing-time;</li> <li>• verify that the optional-heading-information element is empty;</li> <li>• check the correct format of the ATS message;</li> <li>• verify the ATS-message-priority and the related message transfer priority for each received message;</li> <li>• compare the ATS-message-text with the original AFTN message text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.2
<b>Related FIRST interoperability test(s)</b>	ITP001/C21/C31/C51/C53
<b>Test class</b>	Normal AMHS communications (N)

### 4.3 Gateway Operations (AMHS to AFTN)

#### 4.3.1 IT301 – Convert an IPM generated by the UA of IUT-A to AFTN format

<b>IT301</b>	<b>Convert an IPM to AFTN format (IUT-B)</b>
<b>Test criteria</b>	This test is successful, if the receiving IUT converts IPMs correctly into AFTN format.
<b>Scenario description</b>	<p>Send from IUT-A (UA) a sequence of ATS messages (IPMs) to the IUT-B, addressing an AFTN terminal.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT301M01) shall have ATS-message-priority KK.</li> <li>• Message 2 (IT301M02) shall have ATS-message-priority GG.</li> <li>• Message 3 (IT301M03) shall have ATS-message-priority FF.</li> <li>• Message 4 (IT301M04) shall have ATS-message-priority DD.</li> <li>• Message 5 (IT301M05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty.</p> <p>The implicit-conversion-prohibited attribute of the AMHS message must be set to “false”.</p> <p>Check the correct format of the AFTN message. Verify the AFTN priority and filing time for each received message. Compare the AFTN message text with the original ATS-message-text.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2 (AMHS IPM conversion)
<b>Related FIRST interoperability test(s)</b>	ITP001/C31/C32/C52/C54
<b>Test class</b>	Normal AMHS communications (N)

**4.3.2 IT302 – Convert an IPM generated by the UA of IUT-B to AFTN format**

<b>IT302</b>	<b>Convert an IPM to AFTN format (IUT-A)</b>
<b>Test criteria</b>	This test is successful, if the receiving IUT converts IPMs correctly into AFTN format.
<b>Scenario description</b>	<p>From the sending IUT send a sequence of ATS messages (IPMs) to the receiving IUT, addressing an AFTN terminal.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT302M01) shall have ATS-message-priority KK.</li> <li>• Message 2 (IT302M02) shall have ATS-message-priority GG.</li> <li>• Message 3 (IT302M03) shall have ATS-message-priority FF.</li> <li>• Message 4 (IT302M04) shall have ATS-message-priority DD.</li> <li>• Message 5 (IT302M05) shall have ATS-message-priority SS.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty.</p> <p>The implicit-conversion-prohibited attribute of the AMHS message must be set to “false”.</p> <p>Check the correct format of the AFTN message. Verify the AFTN priority and filing time for each received message. Compare the AFTN message text with the original ATS-message-text.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2 (AMHS IPM conversion)
<b>Related FIRST interoperability test(s)</b>	ITP001/C31/C32/C52/C54
<b>Test class</b>	Normal AMHS communications (N)

## 4.4 Gateway Operations (AFTN to AMHS to AFTN)

### 4.4.1 IT401 – Convert an AFTN message to AMHS and back to AFTN format (IUT-A to IUT-B)

<b>IT401</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-A to IUT-B)</b>
<b>Test criteria</b>	This test is successful, if the sending IUT-A converts AFTN user messages correctly to AMHS messages (IPM) and the IPMs are converted back to AFTN in IUT-B.
<b>Scenario description</b>	<p>From IUT-A send a sequence of AFTN messages addressing a remote AFTN user in IUT-B, consisting of five messages:</p> <ul style="list-style-type: none"> <li>• AFTN message 1 (IT401M01) shall have priority KK.</li> <li>• AFTN message 2 (IT401M02) shall have priority GG.</li> <li>• AFTN message 3 (IT401M03) shall have priority FF.</li> <li>• AFTN message 4 (IT401M04) shall have priority DD.</li> <li>• AFTN message 5 (IT401M05) shall have priority SS.</li> </ul> <p>The filing time shall be different in each message and the OHI field of each message shall be empty.</p> <p>Check the AFTN message received by the AFTN user in the IUT-B.</p> <ul style="list-style-type: none"> <li>• Check the correct format of the AFTN message.</li> <li>• Each AFTN message shall have original filing time.</li> <li>• Each message shall have an empty OHI.</li> <li>• Verify the AFTN priority for each received message.</li> <li>• Compare the AFTN message text with the original AFTN message text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.2, 4.5.2
<b>Related FIRST interoperability test(s)</b>	ITP001/C21/C31/C51/C53
<b>Test class</b>	Normal AMHS communications (N)

#### 4.4.2 **IT402 – Convert an AFTN message to AMHS and back to AFTN format (IUT-B to IUT-A)**

<b>IT402</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-B to IUT-A)</b>
<b>Test criteria</b>	This test is successful, if the sending IUT-B converts AFTN user messages correctly to AMHS messages (IPM) and the IPMs are converted back to AFTN in IUT-A.
<b>Scenario description</b>	<p>From IUT-B send a sequence of AFTN messages addressing a remote AFTN user in IUT-A, consisting of five messages:</p> <ul style="list-style-type: none"> <li>• AFTN message 1 (IT402M01) shall have priority KK.</li> <li>• AFTN message 2 (IT402M02) shall have priority GG.</li> <li>• AFTN message 3 (IT402M03) shall have priority FF.</li> <li>• AFTN message 4 (IT402M04) shall have priority DD.</li> <li>• AFTN message 5 (IT402M05) shall have priority SS.</li> </ul> <p>The filing time shall be different in each message and the OHI field of each message shall be empty.</p> <p>Check the AFTN message received by the AFTN user in the IUT-A.</p> <ul style="list-style-type: none"> <li>• Check the correct format of the AFTN message.</li> <li>• Each AFTN message shall have original filing time.</li> <li>• Each message shall have an empty OHI.</li> <li>• Verify the AFTN priority for each received message.</li> <li>• Compare the AFTN message text with the original AFTN message text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.4.2, 4.5.2
<b>Related FIRST interoperability test(s)</b>	ITP001/C21/C31/C51/C53
<b>Test class</b>	Normal AMHS communications (N)

## 4.5 Gateway Operations – special case scenarios

*Note.– The following special case scenarios are symmetric. That means, all test-cases have to be performed by IUT-A as well as IUT-B.*

### 4.5.1 IT501 – Distribute an IPM to AMHS and AFTN users

<b>IT501</b>	<b>Distribute an IPM to AMHS and AFTN users</b>
<b>Test criteria</b>	This test is successful, if the receiving IUT distributes an IPM addressing both an AMHS and an AFTN user correctly.
<b>Scenario description</b>	<p>From the sending IUT send an ATS message (IPM), addressing both AMHS and AFTN users, at the receiving IUT.</p> <p>The IPM Heading of the message shall contain two primary recipients, which are one AMHS and one AFTN user.</p> <p>The IPM Heading of the next message shall contain additionally, two copy recipients, which are also one AMHS and one AFTN user.</p> <p>Verify that all the users, whose addresses have been included in the IPM, receive the message correctly.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.1 (ATS message user agent), 3.2 (ATS message server), 4.5.2 (IPM conversion)
<b>Related FIRST interoperability test(s)</b>	ITP053/C51/C52/C53/C54/C55/C56
<b>Test class</b>	Normal AMHS communications (N)



**4.5.2 IT502 – Expand a DL addressing both AMHS and AFTN users**

<b>IT502</b>	<b>Expand a DL addressing both AMHS and AFTN users</b>
<b>Test criteria</b>	This test is successful, if the receiving IUT distributes an IPM, addressing AMHS and AFTN users in a distribution list, correctly.
<b>Scenario description</b>	<p>From the sending IUT send an ATS message (IPM) to the receiving IUT. The recipient contained in the MTE addresses a distribution list, for which the receiving IUT is responsible. The distribution list shall have the addresses of one AMHS user and two AFTN users as members. The message shall have the <i>dl-expansion-prohibited</i> attribute set to “false”.</p> <p>Check the messages received in each AFTN user address verifying that each one contains its corresponding address.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	3.2.2.1 (DL functional group), 4.5.2 (IPM conversion)
<b>Related FIRST interoperability test(s)</b>	ITP055/C51/C52, ITP057/C51/C52
<b>Test class</b>	Normal AMHS communications (N)

#### 4.5.3 **IT503 – Convert an IPM, if the ATS-message-text contains more than 1800 characters**

<b>IT503</b>	<b>Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters</b>
<b>Test criteria</b>	<p>This test is successful, if the IUT, when it receives an ATS message with ATS-message-text longer than 1800 characters,</p> <ol style="list-style-type: none"> <li>rejects the message and returns a NDR, or</li> <li>splits the received IPM into several messages and converts the resulting messages into AFTN format as specified in ICAO Annex 10, Attm. B [1], or as specified in ENRD, Section 6.11 [9]; or</li> <li>converts the received IPM into a “long” AFTN message.</li> </ol> <p><i>Note.– The AMHS technical specifications (4.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b). However, if AFTN operations allow or require longer messages to be transferred, conversion into a single long AFTN message (case c) is acceptable.</i></p>
<b>Scenario description</b>	<p>From the sending IUT send an ATS message (IPM) containing ATS-message-text of 4500 characters to an AFTN recipient of the receiving IUT.</p> <p><u><i>If case a is implemented:</i></u> Verify that the receiving IUT does not convert the IPM into AFTN format, but returns a NDR. Check the NDR contents received at the sending User Agent. Verify that the NDR contains the following elements:</p> <ul style="list-style-type: none"> <li>“unable-to-transfer” for the <i>non-delivery-reason-code</i>;</li> <li>“content-too-long” for the <i>non-delivery-diagnostic-code</i>; and</li> <li>“unable to convert to AFTN due to message text length” for the <i>supplementary-information</i>.</li> </ul> <p><u><i>If case b is implemented:</i></u> Verify that (at least) three AFTN messages are received by the AFTN recipient. Check the correct format of the AFTN messages. Check the text field of all received AFTN messages. Verify that the text is complete and unchanged, i.e. compare the received data with the <i>ATS-message-text</i> provided in the original IPM. Verify that the received messages contain the appropriate sequence indicators as specified in Attm. B of ICAO Annex 10, Vol. II [1] or as specified in ENRD, Section 6.11 [9].</p> <p><u><i>If case c is implemented:</i></u> Verify that the AFTN message is received by the AFTN recipient. Check the correct format of the received AFTN message. Verify that the text is complete and unchanged, i.e. compare the received data with the <i>ATS-message-text</i> provided in the original IPM.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.7
<b>Related FIRST interoperability test(s)</b>	ITP007/C31/C32/C51/C52

<b>Test class</b>	Normal AMHS communications (N)
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**4.5.4 IT504 – Split an incoming IPM addressing more than 21 AFTN users**

<b>IT504</b>	<b>Split an incoming IPM addressing more than 21 AFTN users</b>
<b>Test criteria</b>	<p>This test is successful, if the receiving IUT receives an ATS message (IPM) addressing more than 21 AFTN users and splits the received IPM into several messages each addressing 21 or less AFTN users.</p> <p><i>Note.– PDR M4050004 (Title: AMHS - Too Many Recipients) is resolved. Therefore the message is split into several messages.</i></p>
<b>Scenario description</b>	<p>From the sending IUT send an ATS message (IPM) to the receiving IUT. The message shall address 50 (primary) recipients.</p> <p>Verify that the receiving IUT converts the IPM into AFTN format and sends three AFTN messages to its AFTN component. Check the addressee indicators contained in the AFTN messages. Verify that no AFTN recipient is lost and the total number of AFTN addressee indicators contained in all three messages is 50. For example:</p> <ul style="list-style-type: none"> <li>• the first AFTN message contains addressee indicators for the first 21 recipients,</li> <li>• the second AFTN message contains addressee indicators for the next 21 recipients, and</li> <li>• the third AFTN message contains addressee indicators for the remaining 8 recipients.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.2.1.8
<b>Related FIRST interoperability test(s)</b>	ITP008/C31/C32
<b>Test class</b>	Normal AMHS communications (N)

#### 4.5.5 IT505 – Probe Conveyance Test

<b>IT505</b>	<b>Probe Conveyance Test</b>
<b>Test criteria</b>	This test is successful, if the receiving IUT generates appropriate reports, when it receives probes.
<b>Scenario description</b>	<p>From the sending IUT, send AMHS probes to the receiving IUT:</p> <ul style="list-style-type: none"> <li>a) containing 3 recipient O/R addresses, two of which belonging to AFTN users, the third one belonging to an AMHS user,</li> <li>b) containing 3 recipient O/R addresses, one of which belonging to an AFTN user, the two others routed to the MTCU in the target IUT as well, but not convertible into AFTN addresses.</li> </ul> <p>Verify that the receiving IUT returns</p> <ul style="list-style-type: none"> <li>a. one DR with 2 AFTN recipients from the MTCU and one DR with one recipient from the MTA</li> <li>b. a combined DR and NDR or one DR and one NDR in response to the probe received.</li> </ul> <p>Verify in all cases that the DRs reporting about the AFTN addresses which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	4.5.5 (reception of AMHS probe), 4.5.6.2.27
<b>Related FIRST interoperability test(s)</b>	ITP066/C51/C52
<b>Test class</b>	Normal AMHS communications (N)

## 4.6 Stress traffic situations

### 4.6.1 IT601 – Stress load

<b>IT601</b>	<b>Stress load</b>
<b>Test criteria</b>	This test is successful, if both IUTs perform AMHS traffic interchange correctly for a number of messages queued in advance.
<b>Scenario description</b>	<p>Defined numbers of messages (beginning with 100, 200, 400 till 4000 messages) have to be selected from the data base or generated by the UA or the AFTN terminal.</p> <p>These messages need to be queued (in MTAs) in both IUTs, preferably by disabling the physical connector used to send information to the underlying network in one of the IUTs. When reconnecting, the messages queued in both IUTs will be sent simultaneously from the two sites, the rate being defined by the line speed of the interconnection, as well as the process followed by each system.</p> <p>No errors due to malfunction of the IUTs should be observed during the interchange period.</p> <p>The time from sending the first till receiving the last message has to be measured and analysed in both IUTs.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	None
<b>Related FIRST interoperability test(s)</b>	None
<b>Test class</b>	Normal (forced) AMHS communications (N)

**4.6.2 IT602 – Stress load with long messages**

<b>IT602</b>	<b>Stress load <u>with long messages</u></b>
<b>Test criteria</b>	This test is successful, if both IUTs perform AMHS traffic interchange correctly for a number of “long” messages queued in advance.
<b>Scenario description</b>	<p>Defined numbers of messages (400 and 4000 messages) have to be selected from the data base or generated by the UA or the AFTN terminal. These messages need to be queued (in MTAs) in both IUTs, preferably by disabling the physical connector used to send information to the underlying network in one of the IUTs. When reconnecting, the messages queued in both IUTs will be sent simultaneously from the two sites, the rate being defined by the line speed of the interconnection, as well as the process followed by each system.</p> <p>No errors due to malfunction of the IUTs should be observed during the interchange period.</p> <p>The time from sending the first till receiving the last message has to be measured and analysed in both IUTs.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	None
<b>Related FIRST interoperability test(s)</b>	None
<b>Test class</b>	Normal (forced) AMHS communications (N)

#### 4.6.3 **IT603 – Stress load with IPMs containing a single text body part and IPMs containing a file transfer body part and optionally a text body part**

<b>IT603</b>	<b>Stress load with IPMs containing a single text body part and IPMs containing a file transfer body part and optionally a text body part</b>
<b>Test criteria</b>	This test is successful, if both IUTs perform AMHS traffic interchange correctly for a number of IPMs containing a single text body part of 1000 chars and, in parallel, a number of IPMs containing a file transfer body part and optionally a text body part queued in advance.
<b>Scenario description</b>	<p>Defined numbers of messages (100, 400 and 4000 messages) have to be selected from the data base or generated by the UA.</p> <p>These messages shall be IPMs with a single text body part of 1000 characters and IPMs containing a file transfer body part representing a file of approximately 3500 bytes and optionally a text body part with text length of bilaterally agreed number of characters.</p> <p>The sizes of the text body parts shall be agreed between the test partners, depending on bandwidth and system limitations as well as expected message traffic volumes and types.</p> <p>The priorities of the above messages shall be bilaterally agreed, based on the expected traffic types and volumes to be exchanged.</p> <p>These messages need to be queued (in MTAs) in either one or both IUTs (depending on expected traffic flow direction(s)), preferably by disabling the physical connector used to send information to the underlying network in one of the IUTs. When reconnecting, the messages queued in the IUT (or IUTs) will be sent (simultaneously from the two sites in case of bidirectional traffic), the rate being defined by the line speed of the interconnection, as well as the process followed by each system.</p> <p>While messages are being interchanged, the 2 IUTs shall exchange, at least one, SS priority message with a single text body part, to confirm that these messages are handled with higher priority.</p> <p>No errors due to malfunction of the IUTs should be observed during the interchange period.</p> <p>The time from sending the first till receiving the last message has to be measured and analysed in both IUTs.</p> <p>The delay from sending the SS priority message(s) from one IUT till receiving this SS priority message(s) at the other IUT has to be measured and analyzed in both IUTs.</p> <p>The number of inbound/outbound P1 associations needs to be analysed, in relation to the volume and priorities of the messages.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	None
<b>Related FIRST interoperability test(s)</b>	None
<b>Test class</b>	Normal (forced) AMHS communications (N)



## 5. Trilateral Test procedures – optional

Before the tests, the test partners should coordinate and document the type of body part used in IPMs submitted by their User Agents when submitting text messages, either as:

- IPMs containing an ia5-text, or
- IPMs containing an ia5-text-body-part, or
- IPMs containing a general-text-body-part with ISO646 repertoire.

### 5.1 Submission/Transfer/Delivery and Relay operations

#### 5.1.1 IT701 – Submission /Transfer/Delivery between the partner MTAs

<b>IT701</b>	<b>Submission / Transfer / Delivery between the partner MTAs</b>
<b>Test criteria</b>	This test is successful, if the messages from all UAs are received by the corresponding UAs of the other the IUTs.
<b>Scenario description</b>	<p>Create a “normal” X.400 routing: (see 3.3, AFTN and X.400 Routing Tables)</p> <p>From the UA send an ATS message (IPM) with ATS-message-priority FF addressed to the UA of the other IUTs.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT701M01) from UA IUT-A to UAs of IUT-B and IUT-C</li> <li>• Message 2 (IT701M02) from UA IUT-B to UAs of IUT-A and IUT-C.</li> <li>• Message 3 (IT701M03) from UA IUT-C to UAs of IUT-A and IUT-B.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty.</p> <p>Verify the messages received by both remote UAs.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	None
<b>Related FIRST interoperability test(s)</b>	None
<b>Test class</b>	Normal AMHS communications (N)

### 5.1.2 **IT702 – Relay operations**

<b>IT702</b>	<b>Relay operations</b>
<b>Test criteria</b>	This test is successful, if the message from the sending UA is routed by the IUT in between and received by the addressed UA.
<b>Scenario description</b>	<p>Create a “transfer” X.400 routing:</p> <p>The X.400 routing table of IUT-A routes PRMD=IUTLAND-B and PRMD=IUTLAND-C to IUT-B.</p> <p>The X.400 routing table of IUT-B routes PRMD=IUTLAND-A and PRMD=IUTLAND-C to IUT-C.</p> <p>The X.400 routing table of IUT-C routes PRMD=IUTLAND-A and PRMD=IUTLAND-B to IUT-A.</p> <p>From the UA send an ATS message (IPM) with ATS-message-priority FF to one UA of another IUT.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT702M01) from UA IUT-A to UA of IUT-C</li> <li>• Message 2 (IT702M02) from UA IUT-B to UA of IUT-A.</li> <li>• Message 3 (IT702M03) from UA IUT-C to UA of IUT-B.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty.</p> <p>Verify the messages received by the remote UA and passed the IUT in between.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	None
<b>Related FIRST interoperability test(s)</b>	None
<b>Test class</b>	Normal AMHS communications (N)

## 5.2 Test of special situations

### 5.2.1 IT801 – Alternate MTA routing

<b>IT801</b>	<b>Alternate MTA routing</b>
<b>Test criteria</b>	This test is successful, if the message from the sending UA is received by the addressed UA
<b>Scenario description</b>	<p>Create a “normal” X.400 routing: (see 3.3, AFTN and X.400 Routing Tables)</p> <p>Cut the direct connection to the IUT to which you intend to send a message. From the UA send an ATS message (IPM) with ATS-message-priority FF to the UA of the IUT concerned.</p> <ul style="list-style-type: none"> <li>• Message 1 (IT801M01) from UA IUT-A to UA of IUT-B</li> <li>• Message 2 (IT801M02) from UA IUT-B to UAs of IUT-C.</li> <li>• Message 3 (IT801M03) from UA IUT-C to UAs of IUT-A.</li> </ul> <p>Each message shall have different ATS-filing-time and ATS-message-text. The <i>optional-heading-information</i> element shall be empty.</p> <p>If alternate MTA routing functionality is implemented and configured the message will be forwarded automatically via the “other” connection; otherwise the queued message should be forced to follow the alternate routing by the adequate means (manually).</p> <p>Verify the messages received by the remote UA and passed the IUT in between.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>
<b>AMHS ref.: Doc 9880, Part II</b>	None
<b>Related FIRST interoperability test(s)</b>	None
<b>Test class</b>	Normal AMHS communications (N)

### 5.2.2 IT802– Loop detection

<b>IT802</b>	<b>Loop detection</b>
<b>Test criteria</b>	This test is successful; if each of the three IUTs proves its capability to detect that a message has traversed a loop, regardless from which IUT the message has been submitted.
<b>Scenario description</b>	<p>Create a temporary routing loop.  The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B.  The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C.  The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A.</p> <p>Subsequently set the loop detection parameters in the three IUTs in that way that at first IUT-A, then IUT-B and finally IUT-C will detect the loop.</p> <p>With each setting of the loop detection parameters send messages addressed to IUTXLOOP from UAs in each IUT. Due to the routing table settings the messages will perform loops.</p> <p>Verify that:</p> <ul style="list-style-type: none"> <li>• the IUT which is configured to detect the loop really detects it,</li> <li>• this IUT discards the message and</li> <li>• generates a NDR</li> </ul> <p>Verify that the sending UA receives the NDR.</p>
<b>AMHS ref.: Doc 9880, Part II</b>	1.1.3 (ISO/IEC 10021), 2.6 (AMHS routing), <i>See also ITU-T Rec. X.411 clause 14.3.1 and clause 12.3.1.</i>
<b>Related FIRST interoperability test(s)</b>	<i>Note.– The FIRST bilateral tests [6], [7] are not related to transfer operations.</i>
<b>Test class</b>	MHS procedural errors (E2)

## 6. Bilateral Test Procedures – Test Scenarios

### 6.1 Introduction

The following tables contain the scenarios for the different Interoperability Tests (IT) described in the previous chapters.

The test scenarios consist of several test-cases. The test-case reference is as follows:

ITxxx/TCzz

Test scenario: ITxxx where xxx is the scenario number

Test-case: TCzz where zz is the number of test-case.

Before the tests, the test partners should coordinate and document the type of body part used in IPMs submitted by their User Agents when submitting text messages, either as:

- IPMs containing an ia5-text, or
- IPMs containing an ia5-text-body-part, or
- IPMs containing a general-text-body-part with ISO646 repertoire.

In addition, depending on the implemented capabilities of the IUTs and the AMHS user agents involved at the interoperability tests, test partners may agree the submission, transfer and delivery of:

- IPMs containing a single body part being an FTBP, or
- IPMs containing two body parts, as defined in section 3.3.2 of Appendix B.

## 6.2 Submission, Transfer and Delivery Operation (AMHS to AMHS)

<b>IT101</b>	<b>Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT101/TC01</b>	A KK priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA:</p> <p>PRI: KK  FT: &lt;FT&gt;  OHI:  TEST IT101/TC01</p> <p>Get the message with IUTBMHSA (UA-terminal of IUT-B).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: KK</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT101</b>	<b>Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT101/TC02</b>	A GG priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA:</p> <p>PRI: GG  FT: &lt;FT&gt;  OHI:  TEST IT101/TC02</p> <p>Get the message with IUTBMHSA (UA-terminal of IUT-B).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: GG</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT101</b>	<b>Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT101/TC03</b>	An FF priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA:</p> <p>PRI: FF  FT: &lt;FT&gt;  OHI:  TEST IT101/TC03</p> <p>Get the message with IUTBMHSA (UA-terminal of IUT-B).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: FF</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT101</b>	<b>Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT101/TC04</b>	A DD priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA:</p> <p>PRI: DD  FT: &lt;FT&gt;  OHI:  TEST IT101/TC04</p> <p>Get the message with IUTBMHSA (UA-terminal of IUT-B).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: DD</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT101</b>	<b>Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT101/TC05</b>	An SS priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the UA IUTBMHSA:</p> <p>PRI: SS FT: &lt;FT&gt; OHI: TEST IT101/TC05</p> <p>The message is received at IUTBMHSA (UA-terminal of IUT-B). A RN or an IPM containing the SS ACK message is submitted when the message is displayed.</p> <p><i>Note.— Depending on UA implementation the user might be requested to send a notification, either as a RN or an IPM containing the SS ACK message, as recommended in sections 8.5.2.1 and 8.5.2.2 of the EUR AMHS Manual.</i></p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: SS</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul> <p>Check the reception of a RN or an IPM containing the SS ACK message on the UA IUTAMHSA of the IUT-A system.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT102</b>	<b>Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT102/TC01</b>	A KK priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA:</p> <p>PRI: KK  FT: &lt;FT&gt;  OHI:  TEST IT102/TC01</p> <p>Get the message with IUTAMHSA (UA-terminal of IUT-A).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: KK</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT102</b>	<b>Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT102/TC02</b>	A GG priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA:</p> <p>PRI: GG  FT: &lt;FT&gt;  OHI:  TEST IT102/TC02</p> <p>Get the message with IUTAMHSA (UA-terminal of IUT-A).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: GG</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT102</b>	<b>Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT102/TC03</b>	An FF priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA:</p> <p>PRI: FF  FT: &lt;FT&gt;  OHI:  TEST IT102/TC03</p> <p>Get the message with IUTAMHSA (UA-terminal of IUT-A).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: FF</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT102</b>	<b>Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT102/TC04</b>	A DD priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA:</p> <p>PRI: DD  FT: &lt;FT&gt;  OHI:  TEST IT102/TC04</p> <p>Get the message with IUTAMHSA (UA-terminal of IUT-A)</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: DD</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT102</b>	<b>Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with different ATS-message-priorities		
<b>IT102/TC05</b>	An SS priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the UA IUTAMHSA:</p> <p>PRI: SS  FT: &lt;FT&gt;  OHI:  TEST IT102/TC05</p> <p>The message is received at IUTAMHSA (UA-terminal of IUT-A). A RN or an IPM containing the SS ACK message is submitted when the message is displayed.</p> <p><i>Note.— Depending on UA implementation the user might be requested to send a notification, either as a RN or an IPM containing the SS ACK message, as recommended in sections 8.5.2.1 and 8.5.2.2 of the EUR AMHS Manual.</i></p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: SS</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul> <p>Check the reception of a RN or an IPM containing the SS ACK message on the UA IUTBMHSA of the IUT-B system.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT103</b>	<b>Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-A to UA IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with a single body part being an FTBP.		
<b>IT103/TC01</b>	A message with normal X.400 priority, including a single body part being an FTBP and containing a file of 16 Kbytes is submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send a message including a single body part being an FTBP and containing a file of 16 Kbytes to the UA IUTBMHSA.</p> <p>Get the message at IUTBMHSA (UA terminal of IUT-B).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check the format and content of the message delivery envelope, IPM heading and body.</p> <p>Verify in particular the respective body part type, the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA.</p> <p>Note: This test aims to check submission, transfer and delivery of an IPM containing only one body part, as specified above. Thus the presence of the IHE elements is out of scope of this test.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT103</b>	<b>Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-A to UA IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with a single body part being an FTBP.		
<b>IT103/TC02</b>	A message with normal X.400 priority, including a single body part being an FTBP and containing a file of 2 Mbytes is submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send a message including a single body part being an FTBP and containing a file of 2 Mbytes to the UA IUTBMHSA.</p> <p>Get the message at IUTBMHSA (UA terminal of IUT-B).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check the format and content of the message delivery envelope, IPM heading and body.</p> <p>Verify in particular the respective body part type, the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA.</p> <p>Note: This test aims to check submission, transfer and delivery of an IPM containing only one body part, as specified above. Thus the presence of the IHE elements is out of scope of this test.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT104</b>	<b>Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-B to UA IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with a single body part being an FTBP.		
<b>IT104/TC01</b>	A message with normal X.400 priority, including a single body part being an FTBP and containing a file of 16 Kbytes is submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send a message including a single body part being an FTBP and containing a file of 16 Kbytes to the UA IUTAMHSA.</p> <p>Get the message at IUTAMHSA (UA terminal of IUT-A).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check the format and content of the message delivery envelope, IPM heading and body.</p> <p>Verify in particular the respective body part type, the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA.</p> <p>Note: This test aims to check submission, transfer and delivery of an IPM containing only one body part, as specified above. Thus the presence of the IHE elements is out of scope of this test.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT104</b>	<b>Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-B to UA IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with a single body part being an FTBP.		
<b>IT104/TC02</b>	A message with normal X.400 priority, including a single body part being an FTBP and containing a file of 2 Mbytes is submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send a message including a single body part being an FTBP and containing a file of 2 Mbytes to the UA IUTAMHSA.</p> <p>Get the message at IUTAMHSA (UA terminal of IUT-A).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check the format and content of the message delivery envelope, IPM heading and body.</p> <p>Verify in particular the respective body part type, the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA.</p> <p>Note: This test aims to check submission, transfer and delivery of an IPM containing only one body part, as specified above. Thus the presence of the IHE elements is out of scope of this test.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT105</b>	<b>Submission, transfer and delivery of an IPM containing two body parts (UA IUT-A to UA IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with two body parts.		
<b>IT105/TC01</b>	A message with ATS-message-priority FF, including a general-text-body-part with ISO 646 repertoire and text length up to 1800 characters and one FTBP containing a file of 2Mbytes, is submitted from the UA of IUT-A and delivered to the UA of IUT-B.		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message:</p> <p>PRI: FF</p> <p>FT: &lt;FT&gt;</p> <p>TEST IT105/TC01</p> <div data-bbox="518 719 684 929" data-label="Image"> </div> <p>Get the message at IUTBMHSA (UA terminal of IUT-B).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check the format and content of the message delivery envelope, IPM heading and body (two body parts).</p> <p>Verify in particular:</p> <ul style="list-style-type: none"> <li>- the respective body part types,</li> <li>- the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA,</li> <li>- the ATS-message header</li> </ul> <p>Note: The ATSMHS subset Basic+FTBP is considered for this specific test.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT105</b>	<b>Submission, transfer and delivery of an IPM containing two body parts (UA IUT-A to UA IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with two body parts.		
<b>IT105/TC02</b>	<p>A message with ATS-message-priority FF, including an ia5-text with text length up to 1800 characters and one FTBP containing a file of 2Mbytes, is submitted from the UA of IUT-A and delivered to the UA of IUT-B.</p> <p>This test case can only be performed if the optional support of ia5-text upon message submission is implemented in the sending UA.</p>		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message:</p> <p>PRI: FF</p> <p>FT: &lt;FT&gt;</p> <p>TEST IT105/TC02</p> <div data-bbox="518 779 683 987" data-label="Image"> </div> <p>Get the message at IUTBMHSA (UA terminal of IUT-B).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check the format and content of the message delivery envelope, IPM heading and body (two body parts).</p> <p>Verify in particular:</p> <ul style="list-style-type: none"> <li>- the respective body part types,</li> <li>- the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA,</li> <li>- the ATS-message header.</li> </ul> <p>Note: The ATSMHS subset Basic+FTBP is considered for this specific test.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT106</b>	<b>Submission, transfer and delivery of an IPM containing two body parts (UA IUT-B to UA IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages with two body parts.		
<b>IT106/TC01</b>	A message with ATS-message-priority FF, including a general-text-body-part with ISO 646 repertoire and text length up to 1800 characters and one FTBP containing a file of 2Mbytes, is submitted from the UA of IUT-B and delivered to the UA of IUT-A.		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message:</p> <p>PRI: FF</p> <p>FT: &lt;FT&gt;</p> <p>TEST IT106/TC01</p> <div data-bbox="518 719 683 929" data-label="Image"> </div> <p>Get the message at IUTAMHSA (UA terminal of IUT-A).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check the format and content of the message delivery envelope, IPM heading and body (two body parts).</p> <p>Verify in particular:</p> <ul style="list-style-type: none"> <li>- the respective body part types,</li> <li>- the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA,</li> <li>- the ATS-message header.</li> </ul> <p>Note: The ATSMHS subset Basic+FTBP is considered for this specific test.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT106</b>	<b>Submission, transfer and delivery of an IPM containing two body parts (UA IUT-B to UA IUT-A)</b>		
<b>Test-case id:</b>  <b>IT106/TC02</b>	<p>Tested functionality: Submission, transfer and delivery of messages with two body parts.</p> <p>A message with ATS-message-priority FF, including an ia5-text with text length up to 1800 characters and one FTBP containing a file of 2Mbytes, is submitted from the UA of IUT-B and delivered to the UA of IUT-A.</p> <p>This test case can only be performed if the optional support of ia5-text upon message submission is implemented in the sending UA.</p>		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message:</p> <p>PRI: FF</p> <p>FT: &lt;FT&gt;</p> <p>TEST IT106/TC02</p> <div data-bbox="518 813 683 1023" data-label="Image"> </div> <p>Get the message at IUTAMHSA (UA terminal of IUT-A).</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check the format and content of the message delivery envelope, IPM heading and body (two body parts).</p> <p>Verify in particular:</p> <ul style="list-style-type: none"> <li>- the respective body part types,</li> <li>- the size of the data and the indicated size by the mandatory element object-size of the element file-attributes, if available at the receiving UA,</li> <li>- the ATS-message header.</li> </ul> <p>Note: The ATSMHS subset Basic+FTBP is considered for this specific test.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

### 6.3 Gateway Operations (AFTN to AMHS)

<b>IT201</b>	<b>Convert an AFTN message to AMHS format (IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT201/TC01</b>	A KK priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B:</p> <p>KK IUTBMHSA &lt;FT&gt; IUTAFTNA TEST IT201/TC01</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: KK</li> <li>- the message transfer priority: NON URGENT</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT201</b>	<b>Convert an AFTN message to AMHS format (IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT201/TC02</b>	A GG priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B:</p> <p>GG IUTBMHSA &lt;FT&gt; IUTAFTNA TEST IT201/TC02</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: GG</li> <li>- the message transfer priority: NON URGENT</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT201</b>	<b>Convert an AFTN message to AMHS format (IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT201/TC03</b>	An FF priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B:</p> <p>FF IUTBMHSA &lt;FT&gt; IUTAFTNA TEST IT201/TC03</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: FF</li> <li>- the message transfer priority: NORMAL</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT201</b>	<b>Convert an AFTN message to AMHS format (IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT201/TC04</b>	A DD priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B:</p> <p>DD IUTBMHSA &lt;FT&gt; IUTAFTNA TEST IT201/TC04</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: DD</li> <li>- the message transfer priority: NORMAL</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT201</b>	<b>Convert an AFTN message to AMHS format (IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT201/TC05</b>	An SS priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA of IUT-A send the following message to the User Agent (UA) of IUT-B:</p> <p>SS IUTBMHSA &lt;FT&gt; IUTAFTNA TEST IT201/TC05</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-A.</p> <p><i>Generate a RN or an IPM containing the SS ACK message at the receiving UA IUTBMHSA of IUT-B.</i></p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTBMHSA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: SS</li> <li>- the message transfer priority: URGENT</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul> <p><i>If a RN or an IPM containing the SS ACK message is sent from the UA IUTBMHSA of IUT-B, the MTCU of IUT-A converts it into an AFTN SS ACK message which is sent to the AFTN terminal of IUT-A.</i></p> <p><i>Check the reception of the SS Ack message at the AFTN terminal IUTAFTNA of IUT-A. Its originator indicator shall be the AFTN address IUTBMHSA, and its text shall be “R &lt;FT&gt; IUTAFTNA”, where &lt;FT&gt; denotes the filing time of the subject AFTN message.</i></p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT202</b>	<b>Convert an AFTN message to AMHS format (IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT202/TC01</b>	A KK priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
<b>Test description:</b>	<p>From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A:</p> <p>KK IUTAMHSA &lt;FT&gt; IUTBFTNA TEST IT202/TC01</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: KK</li> <li>- the message transfer priority: NON URGENT</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT202</b>	<b>Convert an AFTN message to AMHS format (IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT202/TC02</b>	A GG priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
<b>Test description:</b>	<p>From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A:</p> <p>GG IUTAMHSA &lt;FT&gt; IUTBFTNA TEST IT202/TC02</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: GG</li> <li>- the message transfer priority: NON URGENT</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT202</b>	<b>Convert an AFTN message to AMHS format (IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT202/TC03</b>	An FF priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
<b>Test description:</b>	<p>From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A:</p> <p>FF IUTAMHSA &lt;FT&gt; IUTBFTNA TEST IT202/TC03</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: FF</li> <li>- the message transfer priority: NORMAL</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT202</b>	<b>Convert an AFTN message to AMHS format (IUT-B)</b>		
<b>Test-case id:</b>  <b>IT202/TC04</b>	<p>Tested functionality: Conversion of messages with different AFTN priorities</p> <p>A DD priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.</p>		
<b>Test description:</b>	<p>From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A:</p> <p>DD IUTAMHSA &lt;FT&gt; IUTBFTNA TEST IT202/TC04</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: DD</li> <li>- the message transfer priority: NORMAL</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT202</b>	<b>Convert an AFTN message to AMHS format (IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT202/TC05</b>	An SS priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.		
<b>Test description:</b>	<p>From the AFTN terminal IUTBFTNA of IUT-B send the following message to the User Agent (UA) of IUT-A:</p> <p>SS IUTAMHSA &lt;FT&gt; IUTBFTNA TEST IT202/TC05</p> <p>The message is converted from AFTN into AMHS format in the MTCU of IUT-B.</p> <p><i>Generate a RN or an IPM containing the SS ACK message at the receiving UA IUTAMHSA of IUT-A.</i></p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the UA IUTAMHSA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the ATS-message-priority: PRI: SS</li> <li>- the message transfer priority: URGENT</li> <li>- the ATS-message-filing-time and</li> <li>- the ATS-message-text</li> </ul> <p><i>If a RN or an IPM containing the SS ACK message is sent from the UA IUTAMHSA of IUT-A, the MTCU of IUT-B converts it into an ASFTN SS ACK message which is sent to the AFTN terminal of IUT-B.</i></p> <p><i>Check the reception of the SS Ack message at the AFTN terminal IUTBFTNA of IUT-B. Its originator indicator shall be the AFTN address IUTAMHSA, and its text shall be "R &lt;FT&gt; IUTBFTNA", where &lt;FT&gt; denotes the filing time of the subject AFTN message.</i></p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

## 6.4 Gateway Operations (AMHS to AFTN)

<b>IT301</b>	<b>Convert an IPM to AFTN format (IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different ATS-message-priorities		
<b>IT301/TC01</b>	A KK priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>PRI: KK  FT: &lt;FT&gt;  OHI:  TEST IT301/TC01</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: KK</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT301</b>	<b>Convert an IPM to AFTN format (IUT-B)</b>		
<b>Test-case id:</b>  <b>IT301/TC02</b>	<p>Tested functionality: Conversion of messages with different ATS-message-priorities</p> <p>A GG priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.</p>		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>PRI: GG FT: &lt;FT&gt; OHI: TEST IT301/TC02</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message at the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: GG</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT301</b>	<b>Convert an IPM to AFTN format (IUT-B)</b>		
<b>Test-case id:</b>  <b>IT301/TC03</b>	<p>Tested functionality: Conversion of messages with different ATS-message-priorities</p> <p>An FF priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.</p>		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>PRI: FF FT: &lt;FT&gt; OHI: TEST IT301/TC03</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: FF</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT301</b>	<b>Convert an IPM to AFTN format (IUT-B)</b>		
<b>Test-case id:</b>  <b>IT301/TC04</b>	<p>Tested functionality: Conversion of messages with different ATS-message-priorities</p> <p>A DD priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.</p>		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>PRI: DD FT: &lt;FT&gt; OHI: TEST IT301/TC04</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: DD</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT301</b>	<b>Convert an IPM to AFTN format (IUT-B)</b>		
<b>Test-case id:</b>  <b>IT301/TC05</b>	<p>Tested functionality: Conversion of messages with different ATS-message-priorities</p> <p>An SS priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.</p>		
<b>Test description:</b>	<p>From the User Agent IUTAMHSA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>PRI: SS FT: &lt;FT&gt; OHI: TEST IT301/TC05</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-B.</p> <p><i>An SS Acknowledgement message is sent from the receiving AFTN terminal.</i></p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: SS</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul> <p><i>The MTCU of IUT-B either converts the SS Acknowledgment message into:</i></p> <ul style="list-style-type: none"> <li><i>a) a RN, or</i></li> <li><i>b) an IPM containing the SS Acknowledgment message</i></li> </ul> <p><i>If case a) is implemented check the reception of the RN at the UA IUTAMHSA of IUT-A.</i></p> <p><i>If case b) is implemented check the reception of an IPM containing the SS Acknowledgment message at the UA IUTAMHSA of IUT-A.</i></p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT302</b>	<b>Convert an IPM to AFTN format (IUT-A)</b>		
<b>Test-case id:</b>  <b>IT302/TC01</b>	<p>Tested functionality: Conversion of messages with different ATS-message-priorities</p> <p>A KK priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.</p>		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>PRI: KK FT: &lt;FT&gt; OHI: TEST IT302/TC01</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: KK</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT302</b>	<b>Convert an IPM to AFTN format (IUT-A)</b>		
<b>Test-case id:</b>  <b>IT302/TC02</b>	<p>Tested functionality: Conversion of messages with different ATS-message-priorities</p> <p>A GG priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.</p>		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>PRI: GG FT: &lt;FT&gt; OHI: TEST IT302/TC02</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: GG</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT302</b>	<b>Convert an IPM to AFTN format (IUT-A)</b>		
<b>Test-case id:</b>  <b>IT302/TC03</b>	<p>Tested functionality: Conversion of messages with different ATS-message-priorities</p> <p>An FF priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.</p>		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>PRI: FF FT: &lt;FT&gt; OHI: TEST IT302/TC03</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: FF</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT302</b>	<b>Convert an IPM to AFTN format (IUT-A)</b>		
<b>Test-case id:</b>  <b>IT302/TC04</b>	<p>Tested functionality: Conversion of messages with different ATS-message-priorities</p> <p>A DD priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.</p>		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>PRI: DD FT: &lt;FT&gt; OHI: TEST IT302/TC04</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: DD</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT302</b>	<b>Convert an IPM to AFTN format (IUT-A)</b>		
<b>Test-case id:</b>  <b>IT302/TC05</b>	<p>Tested functionality: Conversion of messages with different ATS-message-priorities</p> <p>An SS priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.</p>		
<b>Test description:</b>	<p>From the User Agent IUTBMHSA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>PRI: SS FT: &lt;FT&gt; OHI: TEST IT302/TC05</p> <p>The message is converted from AMHS into AFTN format in the MTCU of IUT-A.</p> <p><i>An SS Acknowledgement message is sent from the receiving AFTN terminal.</i></p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: SS</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul> <p><i>The MTCU of IUT-A either converts the SS Acknowledgment message into:</i></p> <ul style="list-style-type: none"> <li><i>a) a RN, or</i></li> <li><i>b) an IPM containing the SS Acknowledgment message</i></li> </ul> <p><i>If case a) is implemented check the reception of the RN at the UA IUTBMHSA of IUT-B.</i></p> <p><i>If case b) is implemented check the reception of an IPM containing the SS Acknowledgment message at the UA IUTBMHSA of IUT-B.</i></p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

## 6.5 Gateway Operations (AFTN to AMHS to AFTN)

<b>IT401</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-A to IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT401/TC01</b>	An AFTN message with KK priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>KK IUTBFTNA &lt;FT&gt; IUTAFTNA TEST IT401/TC01</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-A,</li> <li>- transferred via the MTA of IUT A to the MTA of IUT-B,</li> <li>- routed to the MTCU of IUT-B and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-B.</li> </ul> <p>.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: KK</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT401</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-A to IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT401/TC02</b>	An AFTN message with GG priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>GG IUTBFTNA &lt;FT&gt; IUTAFTNA TEST IT401/TC02</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-A,</li> <li>- transferred via the MTA of IUT A to the MTA of IUT-B,</li> <li>- routed to the MTCU of IUT-B and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-B.</li> </ul> <p>.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: GG</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT401</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-A to IUT-B)</b>		
<b>Test-case id:</b>  <b>IT401/TC03</b>	<p>Tested functionality: Conversion of messages with different AFTN priorities</p> <p>An AFTN message with FF priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.</p>		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>FF IUTBFTNA &lt;FT&gt; IUTAFTNA TEST IT401/TC03</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-A,</li> <li>- transferred via the MTA of IUT A to the MTA of IUT-B,</li> <li>- routed to the MTCU of IUT-B and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-B.</li> </ul> <p>.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: FF</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT401</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-A to IUT-B)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT401/TC04</b>	An AFTN message with DD priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>DD IUTBFTNA &lt;FT&gt; IUTAFTNA TEST IT401/TC04</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-A,</li> <li>- transferred via the MTA of IUT A to the MTA of IUT-B,</li> <li>- routed to the MTCU of IUT-B and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-B.</li> </ul>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: DD</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT401</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-A to IUT-B)</b>		
<b>Test-case id:</b>  <b>IT401/TC05</b>	<p>Tested functionality: Conversion of messages with different AFTN priorities</p> <p>An AFTN message with SS priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.</p>		
<b>Test description:</b>	<p>From the AFTN terminal IUTAFTNA send the following message to the AFTN terminal IUTBFTNA of IUT-B:</p> <p>SS IUTBFTNA &lt;FT&gt; IUTAFTNA TEST IT401/TC05</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-A,</li> <li>- transferred via the MTA of IUT A to the MTA of IUT-B,</li> <li>- routed to the MTCU of IUT-B and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-B.</li> </ul> <p><i>An SS Acknowledgement message is sent from the receiving AFTN terminal.</i></p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTBFTNA of the IUT-B system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: SS</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul> <p><i>When the SS Ack message is sent, the MTCU of IUT-B converts it into a RN or an IPM containing the SS Acknowledgement message; the RN or the IPM is re-converted to an SS Acknowledgement message in the MTCU of IUT-A.</i></p> <p><i>Check the reception of the SS Acknowledgement at the AFTN terminal IUTAFTNA of IUT-A.</i></p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT402</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-B to IUT-A)</b>		
<b>Test-case id:</b>  <b>IT402/TC01</b>	<p>Tested functionality: Conversion of messages with different AFTN priorities</p> <p>An AFTN message with KK priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.</p>		
<b>Test description:</b>	<p>From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>KK IUTAFTNA &lt;FT&gt; IUTBFTNA TEST IT402/TC01</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-B,</li> <li>- transferred via the MTA of IUT B to the MTA of IUT-A,</li> <li>- routed to the MTCU of IUT-A and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-A.</li> </ul>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: KK</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT402</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-B to IUT-A)</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with different AFTN priorities		
<b>IT402/TC02</b>	An AFTN message with GG priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.		
<b>Test description:</b>	<p>From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>GG IUTAFTNA &lt;FT&gt; IUTBFTNA TEST IT402/TC02</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-B,</li> <li>- transferred via the MTA of IUT B to the MTA of IUT-A,</li> <li>- routed to the MTCU of IUT-A and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-A.</li> </ul>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: GG</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT402</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-B to IUT-A)</b>		
<b>Test-case id:</b>  <b>IT402/TC03</b>	<p>Tested functionality: Conversion of messages with different AFTN priorities</p> <p>An AFTN message with FF priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.</p>		
<b>Test description:</b>	<p>From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>FF IUTAFTNA &lt;FT&gt; IUTBFTNA TEST IT402/TC03</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-B,</li> <li>- transferred via the MTA of IUT B to the MTA of IUT-A,</li> <li>- routed to the MTCU of IUT-A and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-A.</li> </ul>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: FF</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT402</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-B to IUT-A)</b>		
<b>Test-case id:</b>  <b>IT402/TC04</b>	<p>Tested functionality: Conversion of messages with different AFTN priorities</p> <p>An AFTN message with DD priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.</p>		
<b>Test description:</b>	<p>From the AFTN terminal IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>DD IUTAFTNA &lt;FT&gt; IUTBFTNA TEST IT402/TC04</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-B,</li> <li>- transferred via the MTA of IUT B to the MTA of IUT-A,</li> <li>- routed to the MTCU of IUT-A and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-A.</li> </ul>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: DD</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT402</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-B to IUT-A)</b>		
<b>Test-case id:</b>  <b>IT402/TC05</b>	<p>Tested functionality: Conversion of messages with different AFTN priorities</p> <p>An AFTN message with SS priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.</p>		
<b>Test description:</b>	<p>From the AFTN terminal of IUTBFTNA send the following message to the AFTN terminal IUTAFTNA of IUT-A:</p> <p>SS IUTAFTNA &lt;FT&gt; IUTBFTNA TEST IT402/TC05</p> <p>The message is</p> <ul style="list-style-type: none"> <li>- converted from AFTN into AMHS format in the MTCU of IUT-B,</li> <li>- transferred via the MTA of IUT B to the MTA of IUT-A,</li> <li>- routed to the MTCU of IUT-A and</li> <li>- converted from AMHS into AFTN format in the MTCU of IUT-A.</li> </ul> <p><i>An SS Acknowledgement message is sent from the receiving AFTN terminal.</i></p>		
<b>Test control:</b>	<p>Check the correct reception of the message on the AFTN terminal IUTAFTNA of the IUT-A system.</p> <p>Check</p> <ul style="list-style-type: none"> <li>- the AFTN priority: SS</li> <li>- the AFTN filing time and</li> <li>- the AFTN message text</li> </ul> <p><i>When the SS Ack message is sent, the MTCU of IUT-A converts it into a RN or an IPM containing the SS Acknowledgement message; the RN or the IPM is re-converted to an SS Acknowledgement message in the MTCU of IUT-B.</i></p> <p><i>Check the reception of the SS Acknowledgement at the AFTN terminal IUTBFTNA of ITU-B.</i></p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

## 6.6 Gateway Operations – special cases

<b>IT501</b>	<b>Distribute an IPM to AMHS and AFTN users</b>		
<b>Test-case id:</b> <b>IT501/TC01</b>	Tested functionality: Distribution of IPM  A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients addressing an AFTN terminal and a UA in IUT-B.		
<b>Test description:</b>	From IUTAMHSA send the following message to: <u>Primary Recipients:</u> IUTBMHSA and IUTBFTNA PRI: FF FT: <FT> TEST IT501/TC01  Get the message at the UA- and AFTN terminals of IUT-B.		
<b>Test control:</b>	Check the correct reception of the message by IUTBFTNA and IUTBMHSA in the IUT-B configuration.		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT501</b>	<b>Distribute an IPM to AMHS and AFTN users</b>		
<b>Test-case id:</b> <b>IT501/TC02</b>	<p>Tested functionality: Distribution of IPM</p> <p>A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients addressing an AFTN terminal and a UA in IUT-A.</p>		
<b>Test description:</b>	<p>From IUTBMHSA send the following message to:</p> <p><u>Primary Recipients</u>: IUTAMHSA and IUTAFTNA</p> <p>PRI: FF</p> <p>FT: &lt;FT&gt;</p> <p>TEST IT501/TC02</p> <p>Get the message at the UA- and AFTN terminals of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message by IUTAFTNA and IUTAMHSA in the IUT-A configuration.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT501</b>	<b>Distribute an IPM to AMHS and AFTN users</b>		
<b>Test-case id:</b> <b>IT501/TC03</b>	<p>Tested functionality: Distribution of IPM</p> <p>A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients and Copy Recipients, addressing AFTN terminals and UAs in IUT-B.</p>		
<b>Test description:</b>	<p>From IUTAMHSA send the following message to:</p> <p><u>Primary Recipients:</u> IUTBMHSA and IUTBFTNA</p> <p><u>Copy Recipients:</u> IUTBMHSB and IUTBFTNB</p> <p>PRI: FF</p> <p>FT: &lt;FT&gt;</p> <p>TEST IT501/TC03</p> <p>Get the message at the UA- and AFTN terminals of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message by IUTBFTNA, IUTBFTNB and IUTBMHSA, IUTBMHSB in the IUT-B configuration.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT501</b>	<b>Distribute an IPM to AMHS and AFTN users</b>		
<b>Test-case id:</b> <b>IT501/TC04</b>	<p>Tested functionality: Distribution of IPM</p> <p>A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients and Copy Recipients, addressing AFTN terminals and UAs in IUT-A.</p>		
<b>Test description:</b>	<p>From IUTBMHSA send the following message to:</p> <p><u>Primary Recipients:</u> IUTAMHSA and IUTAFTNA</p> <p><u>Copy Recipients:</u> IUTAMHSB and IUTAFTNB</p> <p>PRI: FF</p> <p>FT: &lt;FT&gt;</p> <p>TEST IT501/TC04</p> <p>Get the message at the UA- and AFTN terminals of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message by IUTAFTNA, IUTAFTNB and IUTAMHSA, IUTAMHSB in the IUT-A configuration.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT502</b>	<b>Expand a DL addressing both AMHS and AFTN users</b>		
<b>Test-case id:</b> <b>IT502/TC01</b>	<p>Tested functionality: Expanding of Distribution list</p> <p>The message will be sent from a UA on IUT-A addressing a local DL which contains addresses of AFTN terminals and the UA in IUT-B.</p>		
<b>Test description:</b>	<p>IUTADLLO must be configured as a local DL entry in IUT-A containing the addresses IUTBFTNA IUTBFTNB and IUTBMHSA.</p> <p>From IUTAMHSA send the following message to IUTADLLO:            PRI: FF            FT: &lt;FT&gt;            TEST IT502/TC01</p> <p>Get the message at the UA and AFTN terminals of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message by AFTN terminals IUTBFTNA, IUTBFTNB and UA IUTBMHSA in the IUT-B configuration.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT502</b>	<b>Expand a DL addressing both AMHS and AFTN users</b>		
<b>Test-case id:</b> <b>IT502/TC02</b>	<p>Tested functionality: Expanding of Distribution list</p> <p>The message will be sent from a UA on IUT-B addressing a local DL which contains addresses of AFTN terminals and the UA in IUT-A.</p>		
<b>Test description:</b>	<p>IUTBDLLO must be configured as a local DL entry in IUT-B containing the addresses IUTAFTNA, IUTAFTNB and IUTAMHSA.</p> <p>From IUTBMHSA send the following message to IUTBDLLO:            PRI: FF            FT: &lt;FT&gt;            TEST IT502/TC02</p> <p>Get the message at the UA and AFTN terminals of IUT-A.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message by AFTN terminals IUTAFTNA, IUTAFTNB and UA IUTAMHSA in the IUT-A configuration.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT502</b>	<b>Expand a DL addressing both AMHS and AFTN users</b>		
<b>Test-case id:</b> <b>IT502/TC03</b>	<p>Tested functionality: Expanding of Distribution list</p> <p>The message will be sent from a UA on IUT-A addressing a remote DL in IUT-B which contains addresses of AFTN terminals and the UA in IUT-B.</p>		
<b>Test description:</b>	<p>IUTBDLRE must be configured as a local DL entry in IUT-B containing the addresses IUTBFTNA, IUTBFTNB and IUTBMHSA.</p> <p>From IUTAMHSA send the following message to IUTBDLRE:            PRI: FF            FT: &lt;FT&gt;            TEST IT502/TC03</p> <p>Get the message at the UA and AFTN terminals of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message by AFTN terminals IUTBFTNA, IUTBFTNB and UA IUTBMHSA in the IUT-B configuration.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT502</b>	<b>Expand a DL addressing both AMHS and AFTN users</b>		
<b>Test-case id:</b> <b>IT502/TC04</b>	<p>Tested functionality: Expanding of Distribution list</p> <p>The message will be sent from a UA on IUT-B addressing a remote DL in IUT-A which contains addresses of AFTN terminals and the UA in IUT-A.</p>		
<b>Test description:</b>	<p>IUTADLRE must be configured as a local DL entry in IUT-A containing the addresses IUTAFTNA, IUTAFTNB and IUTAMHSA.</p> <p>From IUTBMHSA send the following message to IUTADLRE:            PRI: FF            FT: &lt;FT&gt;            TEST IT502/TC04</p> <p>Get the message at the UA- and AFTN terminals of IUT-B.</p>		
<b>Test control:</b>	<p>Check the correct reception of the message by AFTN terminals IUTAFTNA, IUTAFTNB and UA IUTAMHSA in the IUT-A configuration.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT503</b>	<b>Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters</b>		
<b>Test-case id:</b> <b>IT503/TC01</b>	<p>Tested functionality: Conversion of “long” messages</p> <p>A message with normal priority and length of about 4500 characters is sent from the IUT-A to the IUT-B.</p>		
<b>Test description:</b>	<p>From UA IUTAMHSA of IUT-A send the following message to the AFTN terminal IUTBFTNA:</p> <p>PRI: FF FT: &lt;FT&gt; OHI: TEST IT503/TC01 TEXT 4500 CHARACTERS 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 ... 123456789012345678901234567890123456789012345678901234567890123456789 END</p>		
<b>Test control:</b>	<p>The technical specifications (4.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b). If the system provides “long AFTN message” capability the message will be converted (case c).</p> <p><u>If case a is implemented:</u> The message is not conveyed to the AFTN component. Check the Report received at the User Agent position IUTAMHSA Verify the following Per-Recipient-Report Non-Delivery information: - Actual-recipient-name: MF-form address of IUTBFTNA - reason code 1 signifies "unable-to-transfer" - diagnostic code 7 signifies "content-too-long". - supplementary information: "unable to convert to AFTN due to message text length".</p> <p><u>If case b is implemented:</u> Check that IUTBFTNA receives several messages.</p> <p><u>If case c is implemented:</u> Check that IUTBFTNA receives one message.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>
	a / b / c		

<b>IT503</b>	<b>Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters</b>		
<b>Test-case id:</b> <b>IT503/TC02</b>	<p>Tested functionality: Conversion of “long” messages</p> <p>A message with normal priority and length of about 4500 characters is sent from the IUT-B to the IUT-A.</p>		
<b>Test description:</b>	<p>From UA IUTBMHSA of IUT-B send the following message to the AFTN terminal IUTAFTNA:</p> <p>PRI: FF FT: &lt;FT&gt; OHI: TEST IT503/TC02 TEXT 4500 CHARACTERS 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 ... 123456789012345678901234567890123456789012345678901234567890123456789 END</p>		
<b>Test control:</b>	<p>The technical specifications (4.5.2.1.7) specify that the message can be rejected (case a) or split into several messages (case b). If the system provides “long AFTN message” capability the message will be converted (case c).</p> <p><u>If case a is implemented:</u></p> <p>The message is not conveyed to the AFTN component.</p> <p>Check the Report received at the User Agent position IUTBMHSA</p> <p>Verify the following Per-Recipient-Report Non-Delivery information:</p> <ul style="list-style-type: none"> <li>- Actual-recipient-name: MF-form address of IUTAFTNA</li> <li>- reason code 1 signifies "unable-to-transfer"</li> <li>- diagnostic code 7 signifies "content-too-long".</li> <li>- supplementary information: "unable to convert to AFTN due to message text length".</li> </ul> <p><u>If case b is implemented:</u></p> <p>Check that IUTAFTNA receives several messages.</p> <p><u>If case c is implemented:</u></p> <p>Check that IUTAFTNA receives one message.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>
	a / b / c		

<b>IT504</b>	<b>Split an incoming IPM addressing more than 21 AFTN users</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with more than 21 addressees		
<b>IT504/TC01</b>	A message with normal priority containing 50 recipients is sent from the IUT-A to the IUT-B.		
<b>Test description:</b>	<p>From IUTAMHSA send the following message to the following addressees (all recipients in the corresponding MF-Form):</p> <p>IUTBFTNA, IUTBFTNB, IUTBFTNC, IUTBFTND, IUTBFTNE, IUTBFTNF, IUTBFTNG, IUTBFTNH, IUTBFTNI, IUTBFTNJ, IUTBFTNK, IUTBFTNL, IUTBFTNM, IUTBFTNN, IUTBFTNO, IUTBFTNP, IUTBFTNQ, IUTBFTNR, IUTBFTNS, IUTBFTNT, IUTBFTNU, IUTBFTNV, IUTBFTNW, IUTBFTNX, IUTBFTNY,</p> <p>IUTBFTAA, IUTBFTAB, IUTBFTAC, IUTBFTAD, IUTBFTAE, IUTBFTAF, IUTBFTAG, IUTBFTAH, IUTBFTAI, IUTBFTAJ, IUTBFTAK, IUTBFTAL, IUTBFTAM, IUTBFTAN, IUTBFTAO, IUTBFTAP, IUTBFTAQ, IUTBFTAR, IUTBFTAS, IUTBFTAT, IUTBFTAU, IUTBFTAV, IUTBFTAW, IUTBFTAX, IUTBFTAY</p> <p>PRI: FF FT: &lt;FT&gt; OHI: TEST IT504/TC01</p>		
<b>Test control:</b>	<p>PDR M4050004 (Title: AMHS - Too Many Recipients) is resolved. Therefore the message shall be split into several messages.</p> <p>The message is split into 3 copies, each conveyed to the AFTN component.</p> <p>The first copy is addressed to 21 of the 50 addressee indicators.</p> <p>The second copy is addressed to further 21 addressee indicators.</p> <p>The third copy is addressed to the remaining 8 of the 50 addressee indicators.</p> <p>Check the correct reception of the messages on the AFTN terminal of IUT-B.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT504</b>	<b>Split an incoming IPM addressing more than 21 AFTN users</b>		
<b>Test-case id:</b>	Tested functionality: Conversion of messages with more than 21 addressees		
<b>IT504/TC02</b>	A message with normal priority containing 50 recipients is sent from the IUT-B to the IUT-A.		
<b>Test description:</b>	<p>From IUTBMHSA send the following message to the following addressees (all recipients in the corresponding MF-Form):</p> <p>IUTAFTNA, IUTAFTNB, IUTAFTNC, IUTAFTND, IUTAFTNE, IUTAFTNF, IUTAFTNG, IUTAFTNH, IUTAFTNI, IUTAFTNJ, IUTAFTNK, IUTAFTNL, IUTAFTNM, IUTAFTNN, IUTAFTNO, IUTAFTNP, IUTAFTNQ, IUTAFTNR, IUTAFTNS, IUTAFTNT, IUTAFTNU, IUTAFTNV, IUTAFTNW, IUTAFTNX, IUTAFTNY,</p> <p>IUTAFTAA, IUTAFTAB, IUTAFTAC, IUTAFTAD, IUTAFTAE, IUTAFTAF, IUTAFTAG, IUTAFTAH, IUTAFTAI, IUTAFTAJ, IUTAFTAK, IUTAFTAL, IUTAFTAM, IUTAFTAN, IUTAFTAO, IUTAFTAP, IUTAFTAQ, IUTAFTAR, IUTAFTAS, IUTAFTAT, IUTAFTAU, IUTAFTAV, IUTAFTAW, IUTAFTAX, IUTAFTAY</p> <p>PRI: FF FT: &lt;FT&gt; OHI: TEST IT504/TC02</p>		
<b>Test control:</b>	<p>PDR M4050004 (Title: AMHS - Too Many Recipients) is resolved. Therefore the message shall be split into several messages.</p> <p>The message is split into 3 copies, each conveyed to the AFTN component.</p> <p>The first copy is addressed to 21 of the 50 addressee indicators.</p> <p>The second copy is addressed to further 21 addressee indicators.</p> <p>The third copy is addressed to the remaining 8 of the 50 addressee indicators.</p> <p>Check the correct reception of the messages on the AFTN terminal of IUT-A.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT505</b>	<b>Probe Conveyance Test</b>		
<b>Test-case id:</b> <b>IT505/TC01</b>	<p>Tested functionality: Processing of Probe Messages by UA and MTCU</p> <p>The probe will be sent from a UA on IUT-A to IUT-B, addressing AFTN terminals and UAs in IUT-B.</p>		
<b>Test description:</b>	<p>From IUTAMHSA send a probe to IUTBFTNA, IUTBFTNB, IUTBMHSA.</p>		
<b>Test control:</b>	<p>On IUT-A UA IUTAMHSA:</p> <p>One Delivery Report (DR) with 2 AFTN recipients from the MTCU and one DR with one recipient from the MTA</p> <p>Verify that the DR reporting about the AFTN addresses contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT505</b>	<b>Probe Conveyance Test</b>		
<b>Test-case id:</b> <b>IT505/TC02</b>	<p>Tested functionality: Processing of Probe Messages by UA and MTCU</p> <p>The probe will be sent from a UA on IUT-B to IUT-A, addressing AFTN terminals and UAs in IUT-A.</p>		
<b>Test description:</b>	<p>From IUTBMHSA send a probe to IUTAFTNA, IUTAFTNB, IUTAMHSA.</p>		
<b>Test control:</b>	<p>On IUT-B UA IUTBMHSA:</p> <p>One Delivery Report (DR) with 2 AFTN recipients from the MTCU and one DR with one recipient from the MTA</p> <p>Verify that the DR reporting about the AFTN addresses contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT505</b>	<b>Probe Conveyance Test</b>		
<b>Test-case id:</b> <b>IT505/TC03</b>	<p>Tested functionality: Processing of Probe Messages by UA and MTCU</p> <p>The probe will be sent from a UA on IUT-A to IUT-B, containing the address of an AFTN terminal of IUT-B and two MF addresses which cannot be translated by the MTCU of IUT-B.</p>		
<b>Test description:</b>	<p>From IUTAMHSA send a probe to IUTBFTNA, IUTBFTUU and IUTBFTUV (the latter 2 being the nicknames of the addresses as in 3.5, Table 20).</p>		
<b>Test control:</b>	<p>Verify that at UA IUTAMHSA:</p> <p>A Delivery Report (DR), containing the reported recipient IUTBFTNA and a Non-Delivery Report (NDR), containing the reported recipient IUTBFTUU and IUTBFTUV, with:</p> <ul style="list-style-type: none"> <li>- non-delivery-reason-code set to “unable-to-transfer”,</li> <li>- non-delivery-diagnostic-code set to “unrecognized-OR-name”</li> </ul> <p>are received.</p> <p>Verify that the DR reporting about the address which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT505</b>	<b>Probe Conveyance Test</b>		
<b>Test-case id:</b> <b>IT505/TC04</b>	<p>Tested functionality: Processing of Probe Messages by UA and MTCU</p> <p>The probe will be sent from a UA on IUT-B to IUT-A, containing the address of an AFTN terminal of IUT-A and two MF addresses which cannot be translated by the MTCU of IUT-A.</p>		
<b>Test description:</b>	<p>From IUTBMHSA send a probe to IUTAFTNA, IUTAFTUU and IUTAFTUV (the latter 2 being the nicknames of the addresses as in 3.5, Table 17).</p>		
<b>Test control:</b>	<p>Verify that at UA IUTBMHSA:</p> <p>A Delivery Report (DR), containing the reported recipient IUTAFTNA and a Non-Delivery Report (NDR), containing the reported recipient IUTAFTUU and IUTAFTUV, with:</p> <ul style="list-style-type: none"> <li>- non-delivery-reason-code set to “unable-to-transfer”,</li> <li>- non-delivery-diagnostic-code set to “unrecognized-OR-name”</li> </ul> <p>are received.</p> <p>Verify that the DR reporting about the address which could be translated contains the supplementary information “This report only indicates successful (potential) conversion to AFTN, not delivery to a recipient”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

## 6.7 Stress traffic situations

The following table should be used to make notes of the Test Control Result of IT601:

Test Control	Result IT601/TC01	Result IT601/TC02	Result IT601/TC03	Result IT601/TC04
1. Notice the time of re-establishing the connection sending direction.				
2. Notice the time of sending the first message.				
3. Notice the time of sending the last message.				
4. Notice the time of re-establishing the connection receiving direction.				
5. Notice the time of receiving the first message.				
6. Notice the time of receiving the last message.				
7. Notice the number of messages received (shall be equal to the number of messages expected.)				
8. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.				
9. Check the event logging / traffic traces for NDRs. (No NDRs are awaited.)				
10. Check for Control Position events. (No related events are awaited.)				
11. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).				
12. Monitor the underlying network infrastructure (network specialist).				
13. At both sides note the amount of time needed to flush the queues. (Unacceptable delays shall be treated as “FAILED” – see Note below Table 25)				

**Table 25: Table of Results – Test Controls of IT601**

*Note.*– An “**Unacceptable delay**” is defined as an unacceptable deviation of the measured transmission time of a burst of messages from the expected (calculated) transmission time.

*The time to transmit the burst of messages depends on the number of messages, the message profile (size of message and number of recipients both influencing the overhead per message) and the bandwidth available.*

The AMHS switching component is included in the total time required to transmit all messages. The time required to switch all messages is nearly "zero" compared to the transmission time and is therefore not included in the calculated time.

Table 26 that follows provides guidance for the assessment of the test results based on the deviation of the measured transmission time from the expected (calculated) transmission time.

<i>Deviation</i>	<i>Result</i>	<i>Required actions</i>
< 10%	"Acceptable delay"	none
10% – 25 %	"Acceptable delay"	Investigations recommended
> 25%	"Unacceptable delay", Test failed	Investigations required

**Table 26: Guidance for test result assessment**

<b>IT601</b>	<b>Stress load</b>		
<b>Test-case id:</b>	Tested functionality: AMHS traffic interchange after queuing a number of messages		
<b>IT601/TC01</b>	After queuing a number of of messages both IUTs start sending a burst of 100 messages.		
<b>Test description:</b>	<p>Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs.</p> <p>Select from the data base or generated by the UA and/or the AFTN terminal 100 messages, with 150 characters each, in both IUTs.</p> <p>For example, from IUTAFTNA send 100 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 100 messages to IUTAFTNA, IUTAMHSA,</p> <p>In the result on IUT-A and IUT-B there are 100 messages queued in direction to the peer IUT.</p> <p>Re-establish the connection between IUT-A and IUT-B.</p> <p>The queued messages will be sent simultaneously from both IUTs.</p> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>from re-establishing the connection till sending the first message and</li> <li>from sending the first till sending the last message.</li> </ul> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>from re-establishing the connection till receiving the first message and</li> <li>from receiving the first message till receiving the last message.</li> </ul>		
<b>Test control:</b>	<p>Check that all 100 messages are received at the addressed terminals.</p> <p>Check that no errors or malfunction are reported or observed at the IUTs during the interchange period.</p> <p>Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as “FAILED”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT601</b>	<b>Stress load</b>		
<b>Test-case id:</b>	Tested functionality: AMHS traffic interchange after queuing a number of messages		
<b>IT601/TC02</b>	After queuing a number of messages both IUTs start sending a burst of 200 messages.		
<b>Test description:</b>	<p>Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs.</p> <p>Select from the data base or generated by the UA and/or the AFTN terminal 200 messages, with 150 characters each, in both IUTs.</p> <p>For example, from IUTAFTNA send 200 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 200 messages to IUTAFTNA, IUTAMHSA,</p> <p>In the result on IUT-A and IUT-B there are 200 messages queued in direction to the peer IUT.</p> <p>Re-establish the connection between IUT-A and IUT-B.</p> <p>The queued messages will be sent simultaneously from both IUTs.</p> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till sending the first message and</li> <li>• from sending the first till sending the last message.</li> </ul> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till receiving the first message and</li> <li>• from receiving the first message till receiving the last message.</li> </ul>		
<b>Test control:</b>	<p>Check that all 200 messages are received at the addressed terminals.</p> <p>Check that no errors or malfunction are reported or observed at the IUTs during the interchange period.</p> <p>Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as "FAILED".</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT601</b>	<b>Stress load</b>		
<b>Test-case id:</b>	Tested functionality: AMHS traffic interchange after queuing a number of messages		
<b>IT601/TC03</b>	After queuing a number of messages both IUTs start sending a burst of 400 messages.		
<b>Test description:</b>	<p>Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs.</p> <p>Select from the data base or generated by the UA and/or the AFTN terminal 400 messages, with 150 characters each, in both IUTs.</p> <p>For example, from IUTAFTNA send 400 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 400 messages to IUTAFTNA, IUTAMHSA,</p> <p>In the result on IUT-A and IUT-B there are 400 messages queued in direction to the peer IUT.</p> <p>Re-establish the connection between IUT-A and IUT-B.</p> <p>The queued messages will be sent simultaneously from both IUTs.</p> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>from re-establishing the connection till sending the first message and</li> <li>from sending the first till sending the last message.</li> </ul> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>from re-establishing the connection till receiving the first message and</li> <li>from receiving the first message till receiving the last message.</li> </ul>		
<b>Test control:</b>	<p>Check that all 400 messages are received at the addressed terminals.</p> <p>Check that no errors or malfunction are reported or observed at the IUTs during the interchange period.</p> <p>Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as "FAILED".</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT601</b>	<b>Stress load</b>		
<b>Test-case id:</b>	Tested functionality: AMHS traffic interchange after queuing a number of messages		
<b>IT601/TC04</b>	After queuing a number of messages both IUTs start sending a burst of 4000 messages.		
<b>Test description:</b>	<p>Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs.</p> <p>Select from the data base or generated by the UA and/or the AFTN terminal 4000 messages, with 150 characters each, in both IUTs.</p> <p>For example, from IUTAFTNA send 4000 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 4000 messages to IUTAFTNA, IUTAMHSA,</p> <p>In the result on IUT-A and IUT-B there are 4000 messages queued in direction to the peer IUT.</p> <p>Re-establish the connection between IUT-A and IUT-B.</p> <p>The queued messages will be sent simultaneously from both IUTs.</p> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>from re-establishing the connection till sending the first message and</li> <li>from sending the first till sending the last message.</li> </ul> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>from re-establishing the connection till receiving the first message and</li> <li>from receiving the first message till receiving the last message.</li> </ul>		
<b>Test control:</b>	<p>Check that all 4000 messages are received at the addressed terminals.</p> <p>Check that no errors or malfunction are reported or observed at the IUTs during the interchange period.</p> <p>Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as "FAILED".</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

The following table should be used to make notes of the Test Control Result of IT602:

<b>Test Control</b>	<b>Result IT602/TC01</b>	<b>Result IT602/TC02</b>
1. Notice the time of re-establishing the connection sending direction.		
2. Notice the time of sending the first message.		
3. Notice the time of sending the last message.		
4. Notice the time of re-establishing the connection receiving direction.		
5. Notice the time of receiving the first message.		
6. Notice the time of receiving the last message.		
7. Notice the number of messages received (shall be equal to the number of messages expected.)		
8. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.		
9. Check the event logging / traffic traces for NDRs. (No NDRs are awaited.)		
10. Check for Control Position events. (No related events are awaited.)		
11. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).		
12. Monitor the underlying network infrastructure (network specialist).		
13. At both sides note the amount of time needed to flush the queues. (Unacceptable delays shall be treated as "FAILED" – see Note below Table 25)		

**Table 27: Table of Results – Test Controls of IT602**

<b>IT602</b>	<b>Stress load <u>with long messages</u></b>		
<b>Test-case id:</b>	Tested functionality: AMHS traffic interchange after queuing a number of “long” messages		
<b>IT602/TC01</b>	After queuing a number of messages both IUTs start sending a burst of 400 “long” messages.		
<b>Test description:</b>	<p>Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs.</p> <p>Select from the data base or generated by the UA and/or the AFTN terminal 400 messages, with 2000 characters each, in both IUTs.</p> <p><i>Note.– If test cases IT503/TC01 and TC02 have revealed that the IUT rejects or splits “long messages”, then the number of characters may be reduced from 2000 to 1800 or the system configuration may be adapted in both IUTs to support “long AFTN message” capability.</i></p> <p>For example, from IUTAFTNA send 400 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 400 messages to IUTAFTNA, IUTAMHSA,</p> <p>In the result on IUT-A and IUT-B there are 400 “long” messages queued in direction to the peer IUT.</p> <p>Re-establish the connection between IUT-A and IUT-B.</p> <p>The queued messages will be sent simultaneously from both IUTs.</p> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till sending the first message and</li> <li>• from sending the first till sending the last message.</li> </ul> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till receiving the first message and</li> <li>• from receiving the first message till receiving the last message.</li> </ul>		
<b>Test control:</b>	<p>Check that all 400 messages are received at the addressed terminals.</p> <p>Check that no errors or malfunction are reported or observed at the IUTs during the interchange period.</p> <p>Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as “FAILED”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT602</b>	<b>Stress load <u>with long messages</u></b>		
<b>Test-case id:</b>	Tested functionality: AMHS traffic interchange after queuing a number of “long” messages		
<b>IT602/TC02</b>	After queuing a number of messages both IUTs start sending a burst of 4000 “long” messages.		
<b>Test description:</b>	<p>Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs.</p> <p>Select from the data base or generated by the UA and/or the AFTN terminal 4000, with 2000 characters each, messages in both IUTs.</p> <p><i>Note.– If test cases IT503/TC01 and TC02 have revealed that the IUT rejects or splits “long messages”, then the number of characters may be reduced from 2000 to 1800 or the system configuration may be adapted in both IUTs to support “long AFTN message” capability.</i></p> <p>For example, from IUTAFTNA send 4000 messages to IUTBFTNA, IUTBMHSA. and from IUTBFTNA send 4000 messages to IUTAFTNA, IUTAMHSA,</p> <p>In the result on IUT-A and IUT-B there are 4000 “long” messages queued in direction to the peer IUT.</p> <p>Re-establish the connection between IUT-A and IUT-B.</p> <p>The queued messages will be sent simultaneously from both IUTs.</p> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till sending the first message and</li> <li>• from sending the first till sending the last message.</li> </ul> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till receiving the first message and</li> <li>• from receiving the first message till receiving the last message.</li> </ul>		
<b>Test control:</b>	<p>Check that all 4000 messages are received at the addressed terminals.</p> <p>Check that no errors or malfunction are reported or observed at the IUTs during the interchange period.</p> <p>Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues. Unacceptable delays shall be treated as “FAILED”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

The following tables should be used to make notes of the Test Control Result of **IT603**:

Direction IUT-A to IUT-B				
IPMs with one text body part	Text body part size (bytes)		Message priority (Urgent/Normal/Non-Urgent)	Number of IPMs to be sent
IPMs with one FTBP containing a file of approximately 3500 bytes and optionally a text body part	Text body part size (bytes) <i>optional</i>	File Transfer Body Part File Size (KBytes)	Message priority (Urgent/Normal/Non-Urgent)	Number of IPMs to be sent

**Table 28: IT603 messages – Direction IUT-A to IUT-B**

Direction IUT-B to IUT-A				
IPMs with one text body part	Text body part size (bytes)		Message priority (Urgent/Normal/Non-Urgent)	Number of IPMs to be sent
IPMs with one FTBP containing a file of approximately 3500 bytes and optionally a text body part	Text body part size (bytes) <i>optional</i>	File Transfer Body Part File Size (KBytes)	Message priority (Urgent/Normal/Non-Urgent)	Number of IPMs to be sent

**Table 29: IT603 messages – Direction IUT-B to IUT-A**

Test Control	Result IT603/TC01	Result IT603/TC02	Result IT603/TC03
1. Notice the time of re-establishing the connection sending direction.			
2. Notice the time of sending the first message containing a single text body part.			

3. Notice the time of sending the first message containing a FTBP.			
4. Notice the time(s) of sending the SS priority message(s).			
5. Notice the time of sending the last message containing a single text body part.			
6. Notice the time of sending the last message containing a FTBP.			
7. Notice the time of re-establishing the connection receiving direction.			
8. Notice the time of receiving the first message containing a single text body part.			
9. Notice the time of receiving the first message containing a FTBP.			
10. Notice the time of receiving the last message containing a single text body part.			
11. Notice the time of receiving the last message containing a FTBP.			
12. Notice the time(s) of receiving the SS priority message(s).			
13. Notice the number of messages received (shall be equal to the number of messages expected).			
14. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.			
15. Check the event logging / traffic traces for NDRs (No NDRs are awaited).			
16. Check for Control Position events (No related events are awaited).			
17. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).			
18. Monitor the underlying network infrastructure (network specialist).			
19. At both sides note the amount of time needed to flush the queues. (Unacceptable delays shall be treated as "FAILED" – see Note below.			
20. At both sides note the time needed to interchange the SS priority messages. These messages shall have been			



interchanged given the proper priority.			
21. At both sides note the time of the establishment and release of all utilized P1 associations.			
22. At both sides analyse the number of P1 associations utilized and their impact on the delivery of all types of messages.			

**Table 30: Table of Results – Test Controls of IT603**

<b>IT603</b>	<b>Stress load <u>with IPMs containing</u> a single text body part and IPMs containing a file transfer body part and optionally a text body part</b>
<b>Test-case id:</b>  <b>IT603/TC01</b>	<p>Tested functionality: AMHS traffic interchange after queuing a number of IPMs containing a single text body part and IPMs containing a file transfer body part and optionally a text body part.</p> <p>After queuing 100 IPMs containing a single text body part and 100 IPMs containing a file transfer body part and optionally a text body part, both IUTs start sending a burst of these messages.</p>
<b>Test description:</b>	<p>Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs.</p> <p>At both IUTs select from the data base or generate by the UA and queue 100 IPMs with a single text body part of 1000 chars and, in parallel, 100 IPMs with a file transfer body part of 3.5KB and optionally a text body part.</p> <p>For example, from IUTAFTNA or IUTAMHSA send 100 messages with a text body part of 1000 chars to IUTBFTNA, IUTBMHSA and from IUTAMHSA send 100 messages with a file transfer body part of 3.5KB and a text body part to IUTBMHSA. From IUTBFTNA or IUTBMHSA send 100 messages with a text body part of 1000 chars to IUTAFTNA, IUTAMHSA and from IUTBMHSA send 100 messages with a file transfer body part of 3.5KB and a text body part to IUTAMHSA.</p> <p>As a result, on IUT-A and IUT-B there are 200 messages queued in direction to the peer IUT.</p> <p>Re-establish the connection between IUT-A and IUT-B.</p> <p>The queued messages will be sent simultaneously from both IUTs.</p> <p>While messages are being interchanged, the 2 IUTs shall exchange, at least one, SS priority message with a single text body part, to confirm that these messages are handled with higher priority.</p> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till sending the first message and</li> <li>• from sending the first till sending the last message.</li> </ul> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till receiving the first message and</li> <li>• from receiving the first message till receiving the last message.</li> </ul> <p>At both IUTs analyse the timestamps of:</p> <ul style="list-style-type: none"> <li>• SS priority message(s) sent and</li> <li>• SS priority message(s) received.</li> </ul> <p>Note: In case of a high bandwidth connectivity between the two IUTs, exchanging SS priority messages while the queued messages are being exchanged may not be feasible as the queues may quickly flush, especially</p>

	when relatively small numbers of queued messages and small FTBP sizes are used.		
<b>Test control:</b>	<p>Check that all 200 messages are received at the addressed terminals.</p> <p>Check that no errors or malfunction are reported or observed at the IUTs during the interchange period.</p> <p>Analyse the measured time. Calculate at both IUTs amount of time needed to flush the queues.</p> <p>Analyse the SS priority message(s) sent/receive times and potential delays.</p> <p>Unacceptable delays shall be treated as “FAILED”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT603</b>	<b>Stress load <u>with IPMs containing</u> a single text body part and IPMs containing a file transfer body part and optionally a text body part</b>
<b>Test-case id:</b>  <b>IT603/TC02</b>	<p>Tested functionality: AMHS traffic interchange after queuing a number of IPMs containing a single text body part and IPMs containing a file transfer body part and optionally a text body part.</p> <p>After queuing 400 IPMs containing a single text body part and 400 IPMs containing a file transfer body part and optionally a text body part, both IUTs start sending a burst of these messages.</p>
<b>Test description:</b>	<p>Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs.</p> <p>At both IUTs select from the data base or generate by the UA, and queue 400 IPMs with a single text body part of 1000 chars and, in parallel, 400 IPMs with a file transfer body part of 3.5KB and optionally a text body part.</p> <p>For example from IUTAFTNA or IUTAMHSA send 400 messages with a text body part of 1000 chars to IUTBFTNA, IUTBMHSA and from IUTAMHSA send 400 messages with a file transfer body part of 3.5KB and a text body part to IUTBMHSA. From IUTBFTNA or IUTBMHSA send 400 messages with a text body part of 1000 chars to IUTAFTNA, IUTAMHSA and from IUTBMHSA send 400 messages with a file transfer body part of 3.5KB and a text body part to IUTAMHSA.</p> <p>As a result, on IUT-A and IUT-B there are 800 messages queued in direction to the peer IUT.</p> <p>Re-establish the connection between IUT-A and IUT-B.</p> <p>The queued messages will be sent simultaneously from both IUTs.</p> <p>While messages are being interchanged, the 2 IUTs shall exchange, at least one, SS priority message with a single text body part, to confirm that these messages are handled with higher priority.</p> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>from re-establishing the connection till sending the first message and</li> <li>from sending the first till sending the last message.</li> </ul> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>from re-establishing the connection till receiving the first message and</li> <li>from receiving the first message till receiving the last message.</li> </ul> <p>At both IUTs analyse the timestamps of:</p> <ul style="list-style-type: none"> <li>SS priority message(s) sent and</li> <li>SS priority message(s) received.</li> </ul> <p>Note: In case of a high bandwidth connectivity between the two IUTs, exchanging SS priority messages while the queued messages are being exchanged may not be feasible as the queues may quickly flush, especially when relatively small numbers of queued messages and small FTBP sizes</p>

	are used.		
<b>Test control:</b>	<p>Check that all 800 messages are received at the addressed terminals.</p> <p>Check that no errors or malfunction are reported or observed at the IUTs during the interchange period.</p> <p>Analyse the measured time. Calculate at both IUTs the amount of time needed to flush the queues.</p> <p>Analyse the SS priority message(s) sent/receive times and potential delays.</p> <p>Unacceptable delays shall be treated as “FAILED”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT603</b>	<b>Stress load <u>with IPMs containing</u> a single text body part and IPMs containing a file transfer body part and optionally a text body part</b>
<b>Test-case id:</b>  <b>IT603/TC03</b>	<p>Tested functionality: AMHS traffic interchange after queuing a number of IPMs containing a single text body part and IPMs containing a file transfer body part and optionally a text body part.</p> <p>After queuing 4000 IPMs containing a single text body part and 4000 IPMs containing a file transfer body part and optionally a text body part, both IUTs start sending a burst of these messages.</p>
<b>Test description:</b>	<p>Interrupt the connection between IUT-A and IUT-B by disabling the physical connector used to send information to the underlying network in one of the IUTs.</p> <p>At both IUTs select from the data base or generated by the UA, and queue 4000 IPMs with a single text body part of 1000 chars and, in parallel, 4000 IPMs with a file transfer body part of 3.5KB and optionally a text body part.</p> <p>For example from IUTAFTNA or IUTAMHSA send 4000 messages with a text body part of 1000 chars to IUTBFTNA, IUTBMHSA and from IUTAMHSA send 4000 messages with a file transfer body part of 3.5KB and a text body part to IUTBMHSA. From IUTBFTNA or IUTBMHSA send 4000 messages with a text body part of 1000 chars to IUTAFTNA, IUTAMHSA and from IUTBMHSA send 4000 messages with a file transfer body part of 3.5KB and a text body part to IUTAMHSA.</p> <p>As a result, on IUT-A and IUT-B there are 8000 messages queued in direction to the peer IUT.</p> <p>Re-establish the connection between IUT-A and IUT-B.</p> <p>The queued messages will be sent simultaneously from both IUTs.</p> <p>While messages are being interchanged, the 2 IUTs shall exchange, at least one, SS priority message with a single text body part, to confirm that these messages are handled with higher priority.</p> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till sending the first message and</li> <li>• from sending the first till sending the last message.</li> </ul> <p>Measure the time:</p> <ul style="list-style-type: none"> <li>• from re-establishing the connection till receiving the first message and</li> <li>• from receiving the first message till receiving the last message.</li> </ul> <p>At both IUTs analyse the timestamps of:</p> <ul style="list-style-type: none"> <li>• SS priority message(s) sent and</li> <li>• SS priority message(s) received.</li> </ul> <p>Note: In case of a high bandwidth connectivity between the two</p>

	IUTs, exchanging SS priority messages while the queued messages are being exchanged may not be feasible as the queues may quickly flush, especially when relatively small numbers of queued messages and small FTBP sizes are used.		
<b>Test control:</b>	<p>Check that all 8000 messages are received at the addressed terminals.</p> <p>Check that no errors or malfunction are reported or observed at the IUTs during the interchange period.</p> <p>Analyse the measured time. Calculate at both sides the amount of time needed to flush the queues.</p> <p>Analyse the SS priority message(s) sent/receive times and potential delays.</p> <p>Unacceptable delays shall be treated as “FAILED”.</p>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

## 7. Trilateral Test procedures - optional

### 7.1 Submission/Transfer/Delivery and Relay operations

<b>IT701</b>	<b>Submission / Transfer / Delivery between the partner MTAs</b>		
<b>Test-case id:</b>	Tested functionality: Submission, transfer and delivery of messages to different IUTs		
<b>IT701/TC01</b>	An IPM submitted in IUT-A is transferred to IUT-B, IUT-C and delivered to the UAs of IUT-B, IUT-C.		
<b>Test description:</b>	<p>Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B and PRMD=IUTLAND-C to IUT-C.</p> <p>From UA IUTAMHSA send an ATS message (IPM) to UA IUTBMHSA and IUTCMHSA:</p> <p>PRI: FF FT: &lt;FT&gt; OHI: TEST IT701/TC01</p>		
<b>Test control:</b>	<p>Verify that the message is received by both remote UAs in IUT-B and IUT-C.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority FF,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT701</b>	<b>Submission / Transfer / Delivery between the partner MTAs</b>		
<b>Test-case id</b>	Tested functionality: Submission, transfer and delivery of messages to different IUTs		
<b>IT701/TC02</b>	An IPM submitted in IUT-B is transferred to IUT-C, IUT-A and delivered to the UAs of IUT-C, IUT-A.		
<b>Test description:</b>	<p>Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-B routes PRMD=IUTLAND-C to IUT-C and PRMD=IUTLAND-A to IUT-A.</p> <p>From the UA IUTBMHSA send an ATS message (IPM) to UA IUTAMHSA and IUTCMHSA.</p> <p>PRI: FF</p> <p>FT: &lt;FT&gt;</p> <p>OHI:</p> <p>TEST IT701/TC02</p>		
<b>Test control:</b>	<p>Verify that the message is received by both remote UAs in IUT-A and IUT-C.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT701</b>	<b>Submission / Transfer / Delivery between the partner MTAs</b>		
<b>Test-case id</b>	Tested functionality: Submission, transfer and delivery of messages to different IUTs		
<b>IT701/TC03</b>	An IPM submitted in IUT-C is transferred to IUT-A, IUT-B and delivered to the UA of IUT-A, IUT-B.		
<b>Test description:</b>	<p>Verify that the X.400 routing tables are configured according section 3.3, thus: The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-B to IUT-B.</p> <p>From the UA IUTCMHSA send an ATS message (IPM) to UA IUTAMHSA and IUTBMHSA.</p> <p>PRI: FF</p> <p>FT: &lt;FT&gt;</p> <p>OHI:</p> <p>TEST IT701/TC03</p>		
<b>Test control:</b>	<p>Verify that the message is received by both remote UAs in IUT-A and IUT-B.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT702</b>	<b>Relay operations</b>		
<b>Test-case id</b> <b>IT702/TC01</b>	Tested functionality: Transfer of messages by an IUT in between An IPM is routed via an intermediate MTA, transferred from IUT-A to IUT-C via “relay” IUT-B.		
<b>Test description:</b>	<p>Modify the X.400 routing as follows:  The X.400 routing table of IUT-A routes PRMD=IUTLAND-B and PRMD=IUTLAND-C to IUT-B.  The X.400 routing table of IUT-B routes PRMD=IUTLAND-C to IUT-C.  Hence, IUT-B is the “relay” IUT.</p> <p>From the UA IUTAMHSA send an ATS message (IPM) to the UA IUTCMHSA.  PRI: FF  FT: &lt;FT&gt;  OHI:  TEST IT702/TC01</p>		
<b>Test control:</b>	<p>Verify that the message has passed the IUT-B in between (if possible).  Verify that the message is received by the UA IUTCMHSA.  In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT702</b>	<b>Relay operations</b>		
<b>Test-case id</b> <b>IT702/TC02</b>	Tested functionality: Transfer of messages by an IUT in between An IPM is routed via an intermediate MTA, transferred from IUT-B to IUT-A via “relay” IUT-C.		
<b>Test description:</b>	<p>Modify the X.400 routing as follows:  The X.400 routing table of IUT-B routes PRMD=IUTLAND-A and PRMD=IUTLAND-C to IUT-C.  The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A.  Hence, IUT-C is the “relay” IUT.</p> <p>From the UA IUTBMHSA send an ATS message (IPM) to the UA IUTAMHSA.  PRI: FF  FT: &lt;FT&gt;  OHI:  TEST IT702/TC02</p>		
<b>Test control:</b>	<p>Verify that the message has passed the IUT-C in between (if possible).  Verify that the message is received by the UA IUTAMHSA.  In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT702</b>	<b>Relay operations</b>		
<b>Test-case id</b> <b>IT702/TC03</b>	Tested functionality: Transfer of messages by an IUT in between An IPM is routed via an intermediate MTA, transferred from IUT-C to IUT-B via “relay” IUT-A.		
<b>Test description:</b>	<p>Modify the X.400 routing as follows:  The X.400 routing table of IUT-C routes PRMD=IUTLAND-A and PRMD=IUTLAND-B to IUT-A.  The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B.  Hence, IUT-A is the “relay” IUT.</p> <p>From the UA IUTCMHSA send an ATS message (IPM) to the UA IUTBMHSA.  PRI: FF  FT: &lt;FT&gt;  OHI:  TEST IT702/TC03</p>		
<b>Test control:</b>	<p>Verify that the message has passed the IUT-A in between (if possible).  Verify that the message is received by the UA IUTBMHSA.  In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

## 7.2 Test of special situations

<b>IT801</b>	<b>Alternate MTA routing</b>		
<b>Test-case id</b> <b>IT801/TC01</b>	<p>Tested functionality: Alternate routing capability</p> <p>An ATS message (IPM) queued in one MTA (IUT-A) due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT-C).</p>		
<b>Test description:</b>	<p>Verify that the X.400 routing tables are configured according section 3.3, thus:</p> <p>The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B and PRMD=IUTLAND-C to IUT-C.</p> <p>The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-B to IUT-B.</p> <p>Cut the direct connection from IUT-A to IUT-B.</p> <p>From the UA IUTAMHSA send an ATS message (IPM) to the UA IUTBMHSA.</p> <p>If alternate MTA routing functionality is implemented and configured in IUT-A, the message will be transferred automatically via the “alternate” connection.</p> <p>Otherwise:</p> <p>Reroute the queued message manually (an operational procedure for should exist).</p>		
<b>Test control:</b>	<p>Verify that the messages had passed the IUT-C in between (if possible). Verify the message received by the UA IUTBMHSA.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT801</b>	<b>Alternate MTA routing</b>		
<b>Test-case id</b> <b>IT801/TC02</b>	<p>Tested functionality: Alternate routing capability</p> <p>An ATS message (IPM) queued in one MTA (IUT-B) due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT-A).</p>		
<b>Test description:</b>	<p>Verify that the X.400 routing tables are configured according section 3.3, thus:</p> <p>The X.400 routing table of IUT-A routes PRMD=IUTLAND-B to IUT-B and PRMD=IUTLAND-C to IUT-C.</p> <p>The X.400 routing table of IUT-B routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-C to IUT-C.</p> <p>Cut the direct connection from IUT-B to IUT-C.</p> <p>From the UA IUTBMHSA send an ATS message (IPM) to the UA IUTCMHSA.</p> <p>If alternate MTA routing functionality is implemented and configured in IUT-B, the message will be transferred automatically via the “alternate” connection.</p> <p>Otherwise:</p> <p>Reroute the queued message manually (an operational procedure for should exist).</p>		
<b>Test control:</b>	<p>Verify that the message had passed the IUT-A in between (if possible). Verify the message received by the UA of IUTCMHSA.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT801</b>	<b>Alternate MTA routing</b>		
<b>Test-case id</b> <b>IT801/TC03</b>	<p>Tested functionality: Alternate routing capability</p> <p>An ATS message (IPM) queued in one MTA (IUT-C) due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT-B).</p>		
<b>Test description:</b>	<p>Verify that the X.400 routing tables are configured according section 3.3, thus:</p> <p>The X.400 routing table of IUT-B routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-C to IUT-C.</p> <p>The X.400 routing table of IUT-C routes PRMD=IUTLAND-A to IUT-A and PRMD=IUTLAND-B to IUT-B.</p> <p>Cut the direct connection from IUT-C to IUT-A.</p> <p>From the UA IUTCMHSA send an ATS message (IPM) to the UA IUTAMHSA.</p> <p>If alternate MTA routing functionality is implemented and configured in IUT-C, the message will be transferred automatically via the “alternate” connection.</p> <p>Otherwise:</p> <p>Reroute the queued message manually (an operational procedure for should exist).</p>		
<b>Test control:</b>	<p>Verify that the message had passed the IUT-B in between (if possible). Verify the message received by the UA of IUTAMHSA.</p> <p>In particular, verify:</p> <ul style="list-style-type: none"> <li>• ATS-message-priority,</li> <li>• ATS-message-filing-time,</li> <li>• ATS-message-text.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT802</b>	<b>Loop detection</b>		
<b>Test-case id</b> <b>IT802/TC01</b>	Tested functionality: Loop detection capability in IUT-A IUT-A detects that a message submitted in IUT-A is traversing a loop.		
<b>Test description:</b>	<p>Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Set the loop detection parameters of the IUTs in that way that IUT-A will detect the loop first!</p> <p>From UA IUTAMHSA send a message (IT802/M01) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop.</p> <p>IUT-A detects that the message is looping, stops the further transfer and non-delivers the message.</p> <p><i>Note.— The addressing scheme of the MD /C=XX/ADMD=ICAO/PRMD=IUTLAND-X is irrelevant for the loop detection tests IT802. Therefore it does not matter whether the recipient address IUTXLOOP in tests IT802 has CAAS or XF form.</i></p>		
<b>Test control:</b>	<p>Verify that:</p> <ul style="list-style-type: none"> <li>• IUT-A detects that the message is looping,</li> <li>• the message is discarded in IUT-A,</li> <li>• at UA IUTAMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT802</b>	<b>Loop detection</b>		
<b>Test-case id</b> <b>IT802/TC02</b>	Tested functionality: Loop detection capability in IUT-A IUT-A detects that a message submitted in IUT-B is traversing a loop.		
<b>Test description:</b>	<p><i>Create a temporary routing loop.</i></p> <p><i>The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B.</i></p> <p><i>The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C.</i></p> <p><i>The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A.</i></p> <p><i>Set the loop detection parameters of the IUTs in that way that IUT-A will detect the loop first!</i></p> <p><i>From UA IUTBMHSA send a message (IT802/M02) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop.</i></p> <p><i>IUT-A detects that the message is looping, stops the further transfer and non-delivers the message.</i></p> <p><i>Note.– The addressing scheme of the MD /C=XX/ADMD=ICAO/PRMD=IUTLAND-X is irrelevant for the loop detection tests IT802. Therefore it does not matter whether the recipient address IUTXLOOP in tests IT802 has CAAS or XF form.</i></p>		
<b>Test control:</b>	<p>Verify that:</p> <ul style="list-style-type: none"> <li>• IUT-A detects that the message is looping,</li> <li>• the message is discarded in IUT-A,</li> <li>• at UA IUTBMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT802</b>	<b>Loop detection</b>		
<b>Test-case id</b> <b>IT802/TC03</b>	Tested functionality: Loop detection capability in IUT-A IUT-A detects that a message submitted in IUT-C is traversing a loop.		
<b>Test description:</b>	<p>Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Set the loop detection parameters of the IUTs in that way that IUT-A will detect the loop first!</p> <p>From UA IUTCMHSA send a message (IT802/M03) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop.</p> <p>IUT-A detects that the message is looping, stops the further transfer and non-delivers the message.</p> <p><i>Note.– The addressing scheme of the MD /C=XX/ADMD=ICAO/PRMD=IUTLAND-X is irrelevant for the loop detection tests IT802. Therefore it does not matter whether the recipient address IUTXLOOP in tests IT802 has CAAS or XF form.</i></p>		
<b>Test control:</b>	<p>Verify that:</p> <ul style="list-style-type: none"> <li>• IUT-A detects that the message is looping.</li> <li>• the message is discarded in IUT-A,</li> <li>• at UA IUTCMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT802</b>	<b>Loop detection</b>		
<b>Test-case id</b> <b>IT802/TC04</b>	Tested functionality: Loop detection capability in IUT-B IUT-B detects that a message submitted in IUT-A is traversing a loop.		
<b>Test description:</b>	<p>Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Set the loop detection parameters of the IUTs in that way that IUT-B will detect the loop first!</p> <p>From UA IUTAMHSA send a message (IT802/M01) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop.</p> <p>IUT-B detects that the message is looping, stops the further transfer and non-delivers the message.</p> <p><i>Note.– The addressing scheme of the MD /C=XX/ADMD=ICAO/PRMD=IUTLAND-X is irrelevant for the loop detection tests IT802. Therefore it does not matter whether the recipient address IUTXLOOP in tests IT802 has CAAS or XF form.</i></p>		
<b>Test control:</b>	<p>Verify that:</p> <ul style="list-style-type: none"> <li>• IUT-B detects that the message is looping,</li> <li>• the message is discarded in IUT-B,</li> <li>• at UA IUTAMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT802</b>	<b>Loop detection</b>		
<b>Test-case id</b> <b>IT802/TC05</b>	Tested functionality: Loop detection capability in IUT-B IUT-B detects that a message submitted in IUT-B is traversing a loop.		
<b>Test description:</b>	<p>Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Set the loop detection parameters of the IUTs in that way that IUT-B will detect the loop first!</p> <p>From UA IUTBMHSA send a message (IT802/M02) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop.</p> <p>IUT-B detects that the message is looping, stops the further transfer and non-delivers the message.</p> <p><i>Note.– The addressing scheme of the MD /C=XX/ADMD=ICAO/PRMD=IUTLAND-X is irrelevant for the loop detection tests IT802. Therefore it does not matter whether the recipient address IUTXLOOP in tests IT802 has CAAS or XF form.</i></p>		
<b>Test control:</b>	<p>Verify that:</p> <ul style="list-style-type: none"> <li>• IUT-B detects that the message is looping,</li> <li>• the message is discarded in IUT-B,</li> <li>• at UA IUTBMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT802</b>	<b>Loop detection</b>		
<b>Test-case id</b> <b>IT802/TC06</b>	Tested functionality: Loop detection capability in IUT-B IUT-B detects that a message submitted in IUT-C is traversing a loop.		
<b>Test description:</b>	<p>Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Set the loop detection parameters of the IUTs in that way that IUT-B will detect the loop first!</p> <p>From UA IUTCMHSA send a message (IT802/M03) addressed to IUTXLOOP. The message will be routed cyclically so that it is finally performing a loop.</p> <p>IUT-B detects that the message is looping, stops the further transfer and non-delivers the message.</p> <p><i>Note.– The addressing scheme of the MD /C=XX/ADMD=ICAO/PRMD=IUTLAND-X is irrelevant for the loop detection tests IT802. Therefore it does not matter whether the recipient address IUTXLOOP in tests IT802 has CAAS or XF form.</i></p>		
<b>Test control:</b>	<p>Verify that:</p> <ul style="list-style-type: none"> <li>• IUT-B detects that the message is looping,</li> <li>• the message is discarded in IUT-B</li> <li>• at UA IUTCMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT802</b>	<b>Loop detection</b>		
<b>Test-case id</b> <b>IT802/TC07</b>	Tested functionality: Loop detection capability in IUT-C IUT-C detects that a message submitted in IUT-A is traversing a loop.		
<b>Test description:</b>	<p>Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Set the loop detection parameters of the IUTs in that way that IUT-C will detect the loop first!</p> <p>From UA IUTAMHSA send a message (IT802/M01) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop.</p> <p>IUT-C detects that the message is looping, stops the further transfer and non-delivers the message.</p> <p><i>Note.– The addressing scheme of the MD /C=XX/ADMD=ICAO/PRMD=IUTLAND-X is irrelevant for the loop detection tests IT802. Therefore it does not matter whether the recipient address IUTXLOOP in tests IT802 has CAAS or XF form.</i></p>		
<b>Test control:</b>	<p>Verify that:</p> <ul style="list-style-type: none"> <li>• IUT-C detects that the message is looping,</li> <li>• the message is discarded in IUT-C,</li> <li>• at UA IUTAMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

<b>IT802</b>	<b>Loop detection</b>		
<b>Test-case id</b> <b>IT802/TC08</b>	Tested functionality: Loop detection capability in IUT-C IUT-C detects that a message submitted in IUT-B is traversing a loop.		
<b>Test description:</b>	<p>Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Set the loop detection parameters of the IUTs in that way that IUT-C will detect the loop first!</p> <p>From UA IUTBMHSA send a message (IT802/M02) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop.</p> <p>IUT-C detects that the message is looping, stops the further transfer and non-delivers the message.</p> <p><i>Note.– The addressing scheme of the MD /C=XX/ADMD=ICAO/PRMD=IUTLAND-X is irrelevant for the loop detection tests IT802. Therefore it does not matter whether the recipient address IUTXLOOP in tests IT802 has CAAS or XF form.</i></p>		
<b>Test control:</b>	<p>Verify that:</p> <ul style="list-style-type: none"> <li>• IUT-C detects that the message is looping,</li> <li>• the message is discarded in IUT-C,</li> <li>• at UA IUTBMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>



<b>IT802</b>	<b>Loop detection</b>		
<b>Test-case id</b> <b>IT802/TC09</b>	Tested functionality: Loop detection capability in IUT-C IUT-C detects that a message submitted in IUT-C is traversing a loop.		
<b>Test description:</b>	<p>Create a temporary routing loop. The X.400 routing table of IUT-A routes PRMD=IUTLAND-X to IUT-B. The X.400 routing table of IUT-B routes PRMD=IUTLAND-X to IUT-C. The X.400 routing table of IUT-C routes PRMD=IUTLAND-X to IUT-A. Set the loop detection parameters of the IUTs in that way that IUT-C will detect the loop first!</p> <p>From UA IUTCMHSA send a message (IT802/M03) addressed to IUTXLOOP. This message will be routed cyclically so that it is finally performing a loop.</p> <p>IUT-C detects that the message is looping, stops the further transfer and non-delivers the message.</p> <p><i>Note.– The addressing scheme of the MD /C=XX/ADMD=ICAO/PRMD=IUTLAND-X is irrelevant for the loop detection tests IT802. Therefore it does not matter whether the recipient address IUTXLOOP in tests IT802 has CAAS or XF form.</i></p>		
<b>Test control:</b>	<p>Verify that:</p> <ul style="list-style-type: none"> <li>• IUT-C detects that the message is looping,</li> <li>• the message is discarded in IUT-C,</li> <li>• at UA IUTCMHSA a Non-Delivery-Report is received with non-delivery-reason “transfer-failure” and non-delivery-diagnostic-code “loop detected”.</li> </ul>		
<b>Test result:</b>	<b>PASS</b>	<b>FAILED</b>	<b>INCONCLUSIVE</b>

## 8. Test summary tables

### 8.1 Summary of agreed configuration parameters among test partners

Parameter	Agreed Values			Remarks
	TEST PARTNER 1	TEST PARTNER 2	TEST PARTNER 3	
IP addresses				
TCP Port				
S/W release versions				
MTA name				
MTA password				
Calling Presentation Address				
Authentication requirements				
TSAP addresses				
Protocol type				
Type of associations				
Number of associations incoming				
Number of associations outgoing				
Connection				
Minimum message size supported				
Addressing scheme				

Parameter	Agreed Values			Remarks
	TEST PARTNER 1	TEST PARTNER 2	TEST PARTNER 3	
Type of body part used in IPMs by UA				

Table 31: Configuration parameters for AMHS Interoperability tests

## 8.2 Summary of Bilateral Tests

Test case	Tested functionality	Result
<b>6.2 Submission, Transfer and Delivery Operation (AMHS to AMHS)</b>		
<b>IT101</b>	<b>Submit, transfer and deliver an IPM (UA IUT-A to UA IUT-B)</b>	
IT101/TC01	A KK priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.	
IT101/TC02	A GG priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.	
IT101/TC03	An FF priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.	
IT101/TC04	A DD priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.	
IT101/TC05	An SS priority message will be submitted from the UA of IUT-A and delivered to the UA of IUT-B.	
<b>IT102</b>	<b>Submit, transfer and deliver an IPM (UA IUT-B to UA IUT-A)</b>	
IT102/TC01	A KK priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.	
IT102/TC02	A GG priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.	
IT102/TC03	An FF priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.	
IT102/TC04	A DD priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.	
IT102/TC05	An SS priority message will be submitted from the UA of IUT-B and delivered to the UA of IUT-A.	

Test case	Tested functionality	Result
<b>IT103</b>	<b>Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-A to UA IUT-B)</b>	
IT103/TC01	A message with normal X.400 priority, including a single body part being an FTBP and containing a file of 16 Kbytes is submitted from the UA of IUT-A and delivered to the UA of IUT-B.	
IT103/TC02	A message with normal X.400 priority, including a single body part being an FTBP and containing a file of 2 Mbytes is submitted from the UA of IUT-A and delivered to the UA of IUT-B.	
<b>IT104</b>	<b>Submission, transfer and delivery of an IPM containing a single body part being an FTBP (UA IUT-B to UA IUT-A)</b>	
IT104/TC01	A message with normal X.400 priority, including a single body part being an FTBP and containing a file of 16 Kbytes is submitted from the UA of IUT-B and delivered to the UA of IUT-A.	
IT104/TC02	A message with normal X.400 priority, including a single body part being an FTBP and containing a file of 2 Mbytes is submitted from the UA of IUT-B and delivered to the UA of IUT-A.	
<b>IT105</b>	<b>Submission, transfer and delivery of an IPM containing two body parts (UA IUT-A to UA IUT-B)</b>	
IT105/TC01	A message with ATS-message-priority FF, including a general-text-body-part with ISO 646 repertoire and text length up to 1800 characters and one FTBP containing a file of 2Mbytes, is submitted from the UA of IUT-A and delivered to the UA of IUT-B.	
IT105/TC02	A message with ATS-message-priority FF, including an ia5-text with text length up to 1800 characters and one FTBP containing a file of 2Mbytes, is submitted from the UA of IUT-A and delivered to the UA of IUT-B.	
<b>IT106</b>	<b>Submission, transfer and delivery of an IPM containing two body parts (UA IUT-B to UA IUT-A)</b>	
IT106/TC01	A message with ATS-message-priority FF, including a general-text-body-part with ISO 646 repertoire and text length up to 1800 characters and one FTBP containing a file of 2Mbytes, is submitted from the UA of IUT-B and delivered to the UA of IUT-A.	
IT106/TC02	A message with ATS-message-priority FF, including an ia5-text with text length up to 1800 characters and one FTBP containing a file of 2Mbytes, is submitted from the UA of IUT-B and delivered to the UA of IUT-A.	
<b>6.3 Gateway Operations (AFTN to AMHS)</b>		

Test case	Tested functionality	Result
<b>IT201</b>	<b>Convert an AFTN message to AMHS format (IUT-A)</b>	
IT201/TC01	A KK priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.	
IT201/TC02	A GG priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.	
IT201/TC03	An FF priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.	
IT201/TC04	A DD priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.	
IT201/TC05	An SS priority message will be sent from the AFTN terminal of IUT-A, converted to AMHS and received at the UA of IUT-B.	
<b>IT202</b>	<b>Convert an AFTN message to AMHS format (IUT-B)</b>	
IT202/TC01	A KK priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.	
IT202/TC02	A GG priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.	
IT202/TC03	An FF priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.	
IT202/TC04	A DD priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.	
IT202/TC05	An SS priority message will be sent from the AFTN terminal of IUT-B, converted to AMHS and received at the UA of IUT-A.	
<b>6.4 Gateway Operations (AMHS to AFTN)</b>		
<b>IT301</b>	<b>Convert an IPM to AFTN format (IUT-B)</b>	
IT301/TC01	A KK priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.	
IT301/TC02	A GG priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.	
IT301/TC03	An FF priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.	
IT301/TC04	A DD priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.	
IT301/TC05	An SS priority message will be submitted from the UA of IUT-A, converted to AFTN in IUT-B and received at the AFTN terminal of IUT-B.	

Test case	Tested functionality	Result
<b>IT302</b>	<b>Convert an IPM to AFTN format (IUT-A)</b>	
IT302/TC01	A KK priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.	
IT302/TC02	A GG priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.	
IT302/TC03	An FF priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.	
IT302/TC04	A DD priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.	
IT302/TC05	An SS priority message will be submitted from the UA of IUT-B, converted to AFTN in IUT-A and received at the AFTN terminal of IUT-A.	
<b>6.5 Gateway Operations (AFTN to AMHS to AFTN)</b>		
<b>IT401</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-A to IUT-B)</b>	
IT401/TC01	An AFTN message with KK priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.	
IT401/TC02	An AFTN message with GG priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.	
IT401/TC03	An AFTN message with FF priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.	
IT401/TC04	An AFTN message with DD priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.	
IT401/TC05	An AFTN message with SS priority will be sent from the AFTN terminal of IUT-A to the AFTN terminal of IUT-B.	
<b>IT402</b>	<b>Convert an AFTN message to AMHS and back to AFTN format (IUT-B to IUT-A)</b>	
IT402/TC01	An AFTN message with KK priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.	
IT402/TC02	An AFTN message with GG priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.	
IT402/TC03	An AFTN message with FF priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.	
IT402/TC04	An AFTN message with DD priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.	

Test case	Tested functionality	Result
IT402/TC05	An AFTN message with SS priority will be sent from the AFTN terminal of IUT-B to the AFTN terminal of IUT-A.	
<b>6.6 Gateway Operations – special cases</b>		
<b>IT501</b>	<b>Distribute an IPM to AMHS and AFTN users</b>	
IT501/TC01	A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients addressing an AFTN terminal and a UA in IUT-B.	
IT501/TC02	A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients addressing an AFTN terminal and a UA in IUT-A.	
IT501/TC03	A message will be sent from a UA on IUT-A to IUT-B with Primary Recipients and Copy Recipients, addressing AFTN terminals and UAs in IUT-B.	
IT501/TC04	A message will be sent from a UA on IUT-B to IUT-A with Primary Recipients and Copy Recipients, addressing AFTN terminals and UAs in IUT-A.	
<b>IT502</b>	<b>Expand a DL addressing both AMHS and AFTN users</b>	
IT502/TC01	The message will be sent from a UA on IUT-A addressing a local DL which contains addresses of AFTN terminals and the UA in IUT-B.	
IT502/TC02	The message will be sent from a UA on IUT-B addressing a local DL which contains addresses of AFTN terminals and the UA in IUT-A.	
IT502/TC03	The message will be sent from a UA on IUT-A addressing a remote DL in IUT-B which contains addresses of AFTN terminals and the UA in IUT-B.	
IT502/TC04	The message will be sent from a UA on IUT-B addressing a remote DL in IUT-A which contains addresses of AFTN terminals and the UA in IUT-A.	
<b>IT503</b>	<b>Convert or reject an IPM, if the ATS-message-text contains more than 1800 characters</b>	
IT503/TC01	A message with normal priority and length of about 4500 characters is sent from the IUT-A to the IUT-B.	
IT503/TC02	A message with normal priority and length of about 4500 characters is sent from the IUT-B to the IUT-A	
<b>IT504</b>	<b>Split an incoming IPM addressing more than 21 AFTN users</b>	
IT504/TC01	A message with normal priority containing 50 recipients is sent from the IUT-A to the IUT-B.	
IT504/TC02	A message with normal priority containing 50 recipients is sent from the IUT-B to the IUT-A.	

Test case	Tested functionality	Result
<b>IT505</b>	<b>Probe Conveyance Test</b>	
IT505/TC01	The probe will be sent from a UA on IUT-A to IUT-B, addressing AFTN terminals and UAs in IUT-B.	
IT505/TC02	The probe will be sent from a UA on IUT-B to IUT-A, addressing AFTN terminals and UAs in IUT-A.	
IT505/TC03	The probe will be sent from a UA on IUT-A to IUT-B, containing the address of an AFTN terminal of IUT-B and two MF addresses which cannot be translated by the MTCU of IUT-B.	
IT505/TC04	The probe will be sent from a UA on IUT-B to IUT-A, containing the address of an AFTN terminal of IUT-A and two MF addresses which cannot be translated by the MTCU of IUT-A.	
<b>6.7 Stress traffic situations</b>		
<b>IT601</b>	<b>Stress load</b>	
IT601/TC01	After queuing a number of messages both IUTs start sending a burst of 100 messages.	
IT601/TC02	After queuing a number of messages both IUTs start sending a burst of 200 messages.	
IT601/TC03	After queuing a number of messages both IUTs start sending a burst of 400 messages.	
IT601/TC04	After queuing a number of messages both IUTs start sending a burst of 4000 messages.	
<b>IT602</b>	<b>Stress load <u>with long messages</u></b>	
IT602/TC01	After queuing a number of messages both IUTs start sending a burst of 400 “long” messages.	
IT602/TC02	After queuing a number of messages both IUTs start sending a burst of 4000 “long” messages.	
<b>IT602</b>	<b>Stress load with long messages</b>	
IT603/TC01	After queuing a number of messages, both IUTs start sending a burst of 100 IPMs containing a single text body part and a burst of 100 IPMs containing a file transfer body part and optionally a text body part.	
IT603/TC02	After queuing a number of messages, both IUTs start sending a burst of 400 IPMs containing a single text body part and a burst of 400 IPMs containing a file transfer body part and optionally a text body part.	



Test case	Tested functionality	Result
IT603/TC03	After queuing a number of messages, both IUTs start sending a burst of 4000 IPMs containing a single text body part and a burst of 4000 IPMs containing a file transfer body part and optionally a text body part.	

***Table 32: Bilateral Test Summary Table***

### 8.3 Summary of Trilateral Tests – optional

Test case	Tested functionality	Result
<b>7.1 Submission/Transfer/Delivery and Relay operations</b>		
<b>IT701</b>	<b>Submission / Transfer / Delivery between the partner MTAs</b>	
IT701/TC01	An IPM submitted in IUT-A is transferred to IUT-B, IUT-C and delivered to the UAs of IUT-B, IUT-C.	
IT701/TC02	An IPM submitted in IUT-B is transferred to IUT-C, IUT-A and delivered to the UAs of IUT-C, IUT-A.	
IT701/TC03	An IPM submitted in IUT-C is transferred to IUT-A, IUT-B and delivered to the UA of IUT-A, IUT-B.	
<b>IT702</b>	<b>Relay operations</b>	
IT702/TC01	An IPM is routed via an intermediate MTA, transferred from IUT-A to IUT-C via “relay” IUT-B.	
IT702/TC02	An IPM is routed via an intermediate MTA, transferred from IUT-B to IUT-A via “relay” IUT-C.	
IT702/TC03	An IPM is routed via an intermediate MTA, transferred from IUT-C to IUT-B via “relay” IUT-A.	
<b>7.2 Test of special situations</b>		
<b>IT801</b>	<b>Alternate MTA routing</b>	
IT801/TC01	An ATS message (IPM) queued in one MTA (IUT-A) due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT-C).	
IT801/TC02	An ATS message (IPM) queued in one MTA (IUT-B) due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT-A).	
IT801/TC03	An ATS message (IPM) queued in one MTA (IUT-C) due to outage of the primary X.400 routing path is routed via an alternate MTA (IUT-B).	
<b>IT802</b>	<b>Loop detection</b>	
IT802/TC01	IUT-A detects that a message submitted in IUT-A is traversing a loop.	
IT802/TC02	IUT-A detects that a message submitted in IUT-B is traversing a loop.	

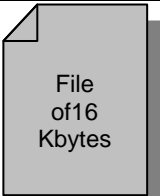
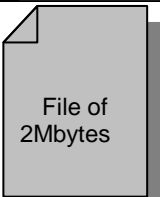
Test case	Tested functionality	Result
IT802/TC03	IUT-A detects that a message submitted in IUT-C is traversing a loop.	
IT802/TC04	IUT-B detects that a message submitted in IUT-A is traversing a loop.	
IT802/TC05	IUT-B detects that a message submitted in IUT-B is traversing a loop.	
IT802/TC06	IUT-B detects that a message submitted in IUT-C is traversing a loop.	
IT802/TC07	IUT-C detects that a message submitted in IUT-A is traversing a loop.	
IT802/TC08	IUT-C detects that a message submitted in IUT-B is traversing a loop.	
IT802/TC09	IUT-C detects that a message submitted in IUT-C is traversing a loop.	

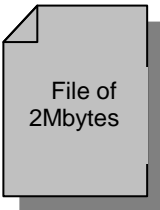
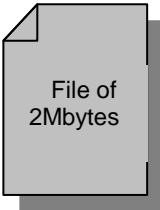
**Table 33: Optional Trilateral Test Summary Table**

## 9. Test message templates

### 9.1 Test message templates for IUT-A

#### 9.1.1 Input device User Agent (UA): IUTAMHSA

From UA IUTAMHSA	to UA IUTBMHSA
Test message ID: IT101M01	PRI: KK FT: <FT> OHI: TEST IT101/TC01
Test message ID: IT101M02	PRI: GG FT: <FT> OHI: TEST IT101/TC02
Test message ID: IT101M03	PRI: FF FT: <FT> OHI: TEST IT101/TC03
Test message ID: IT101M04	PRI: DD FT: <FT> OHI: TEST IT101/TC04
Test message ID: IT101M05	PRI: SS FT: <FT> OHI: TEST IT101/TC05
Test message ID: IT103M01	 File of 16 Kbytes
Test message ID: IT103M02	 File of 2Mbytes

Test message ID: IT105M01	PRI: FF FT: <FT> TEST IT105/TC01 
Test message ID: IT105M02	PRI: FF FT: <FT> TEST IT105/TC02 

<b>From UA IUTAMHSA</b>	<b>to UA IUTBFTNA</b>
Test message ID: IT301M01	PRI: KK FT: <FT> OHI: TEST IT301/TC01
Test message ID: IT301M02	PRI: GG FT: <FT> OHI: TEST IT301/TC02
Test message ID: IT301M03	PRI: FF FT: <FT> OHI: TEST IT301/TC03
Test message ID: IT301M04	PRI: DD FT: <FT> OHI: TEST IT301/TC04
Test message ID: IT301M05	PRI: SS FT: <FT> OHI: TEST IT301/TC05

<b>From UA IUTAMHSA</b> Test message ID: IT501M01	<u>To Primary Recipients:</u> IUTBMHSA and IUTBFTNA PRI: FF FT: <FT> OHI: TEST IT501/TC01
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Test message ID: IT501M03	<u>To Primary Recipients:</u> IUTBMHSA and IUTBFTNA <u>To Copy Recipients:</u> IUTBMHSB and IUTBFTNB PRI: FF FT: <FT> OHI: TEST IT501/TC03
<b>From UA</b> <b>IUTAMHSA</b> Test message ID: IT502M01	<u>To:</u> IUTADLLO PRI: FF FT: <FT> OHI: TEST IT502/TC01
Test message ID: IT502M03	<u>To:</u> IUTBDLRE PRI: FF FT: <FT> OHI: TEST IT502/TC03
<b>From UA</b> <b>IUTAMHSA</b> Test message ID: IT503M01	<u>To:</u> AFTN terminal IUTBFTNA PRI: FF FT: <FT> OHI: TEST IT503/TC01 TEXT 4500 CHARACTERS 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 123456789012345678901234567890123456789012345678901234567890123456789 ... <63 figure lines 1234567890 ... 123456789> 123456789012345678901234567890123456789012345678901234567890123456789 END
<b>From UA</b> <b>IUTAMHSA</b> Test message ID: IT504M01	<u>To</u> IUTBFTNA, IUTBFTNB, IUTBFTNC, IUTBFTND, IUTBFTNE, IUTBFTNF, IUTBFTNG, IUTBFTNH, IUTBFTNI, IUTBFTNJ, IUTBFTNK, IUTBFTNL, IUTBFTNM, IUTBFTNN, IUTBFTNO, IUTBFTNP, IUTBFTNQ, IUTBFTNR, IUTBFTNS, IUTBFTNT, IUTBFTNU, IUTBFTNV, IUTBFTNW, IUTBFTNX, IUTBFTNY,  IUTBFTAA, IUTBFTAB, IUTBFTAC, IUTBFTAD, IUTBFTAE, IUTBFTAF, IUTBFTAG, IUTBFTAH, IUTBFTAI, IUTBFTAJ, IUTBFTAK, IUTBFTAL, IUTBFTAM, IUTBFTAN, IUTBFTAO, IUTBFTAP, IUTBFTAQ, IUTBFTAR, IUTBFTAS, IUTBFTAT, IUTBFTAU, IUTBFTAV, IUTBFTAW, IUTBFTAX, IUTBFTAY  PRI: FF FT: <FT> OHI: TEST IT504/TC01

### 9.1.2 Input device AFTN Terminal: IUTAFTNA

<b>From AFTN</b> <b>Terminal</b> <b>IUTAFTNA</b>	<b>to UA IUTBMHSA</b>
Test message ID: IT201M01	KK IUTBMHSA <FT> IUTAFTNA TEST IT201/TC01

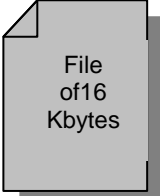
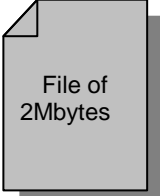
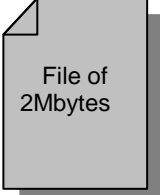
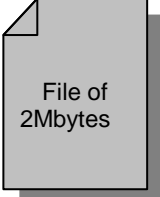
Test message ID: IT201M02	GG IUTBMHSA <FT> IUTAFTNA TEST IT201/TC02
Test message ID: IT201M03	FF IUTBMHSA <FT> IUTAFTNA TEST IT201/TC03
Test message ID: IT201M04	DD IUTBMHSA <FT> IUTAFTNA TEST IT201/TC04
Test message ID: IT201M05	SS IUTBMHSA <FT> IUTAFTNA TEST IT201/TC05

<b>From AFTN Terminal IUTAFTNA</b>	<b>to AFTN Terminal IUTBFTNA</b>
Test message ID: IT401M01	KK IUTBFTNA <FT> IUTAFTNA TEST IT401/TC01
Test message ID: IT401M02	GG IUTBFTNA <FT> IUTAFTNA TEST IT401/TC02
Test message ID: IT401M03	FF IUTBFTNA <FT> IUTAFTNA TEST IT401/TC03
Test message ID: IT401M04	DD IUTBFTNA <FT> IUTAFTNA TEST IT401/TC04
Test message ID: IT401M05	SS IUTBFTNA <FT> IUTAFTNA TEST IT401/TC05

## 9.2 Test message templates for IUT-B

### 9.2.1 Input device User Agent (UA): IUTBMHSA

<b>From UA IUTBMHSA</b>	<b>to UA IUTAMHSA</b>
Test message ID: IT102M01	PRI: KK FT: <FT> OHI: TEST IT102/TC01
Test message ID: IT102M02	PRI: GG FT: <FT> OHI: TEST IT102/TC02

Test message ID: IT102M03	PRI: FF FT: <FT> OHI: TEST IT102/TC03
Test message ID: IT102M04	PRI: DD FT: <FT> OHI: TEST IT102/TC04
Test message ID: IT102M05	PRI: SS FT: <FT> OHI: TEST IT102/TC05
Test message ID: IT104M01	
Test message ID: IT104M02	
Test message ID: IT106M01	PRI: FF FT: <FT> TEST IT106/TC01  
Test message ID: IT106M02	PRI: FF FT: <FT> TEST IT106/TC02  

<b>From UA IUTBMHSA</b>	<b>to AFTN Terminal IUTAFTNA</b>
Test message ID: IT302M01	PRI: KK FT: <FT> OHI: TEST IT302/TC01



<b>From UA IUTBMHSA</b>	<b>to AFTN Terminal IUTAFTNA</b>
Test message ID: IT302M02	PRI: GG FT: <FT> OHI: TEST IT302/TC02
Test message ID: IT302M03	PRI: FF FT: <FT> OHI: TEST IT302/TC03
Test message ID: IT302M04	PRI: DD FT: <FT> OHI: TEST IT302/TC04
Test message ID: IT302M05	PRI: SS FT: <FT> OHI: TEST IT302/TC05

<b>From UA IUTBMHSA</b> Test message ID: IT501M02	<u>To Primary Recipients:</u> IUTAMHSA and IUTAFTNA PRI: FF FT: <FT> OHI: TEST IT501/TC02
Test message ID: IT501M04	<u>To Primary Recipients:</u> IUTAMHSA and IUTAFTNA <u>To Copy Recipients:</u> IUTAMHSB and IUTAFTNB PRI: FF FT: <FT> OHI: TEST IT501/TC04
<b>From UA IUTBMHSA</b> Test message ID: IT502M02	<u>To:</u> IUTBDLLO PRI: FF FT: <FT> OHI: TEST IT502/TC02
Test message ID: IT502M04	<u>To:</u> IUTADLRE PRI: FF FT: <FT> OHI: TEST IT502/TC04
<b>From UA IUTBMHSA</b> Test message ID: IT503M02	<u>To:</u> AFTN Terminal IUTAFTNA PRI: FF FT: <FT> OHI: TEST IT503/TC02 TEXT 4500 CHARACTERS 12345678901234567890123456789012345678901234567890123456789 12345678901234567890123456789012345678901234567890123456789 12345678901234567890123456789012345678901234567890123456789 ... <63 figure lines 1234567890 ... 123456789> 12345678901234567890123456789012345678901234567890123456789 END

<b>From UA</b> <b>IUTBMHSA</b> Test message ID: IT504M02	<b>To:</b> IUTAFTNA, IUTAFTNB, IUTAFTNC, IUTAFTND, IUTAFTNE, IUTAFTNF, IUTAFTNG, IUTAFTNH, IUTAFTNI, IUTAFTNJ, IUTAFTNK, IUTAFTNL, IUTAFTNM, IUTAFTNN, IUTAFTNO, IUTAFTNP, IUTAFTNQ, IUTAFTNR, IUTAFTNS, IUTAFTNT, IUTAFTNU, IUTAFTNV, IUTAFTNW, IUTAFTNX, IUTAFTNY,  IUTAFTAA, IUTAFTAB, IUTAFTAC, IUTAFTAD, IUTAFTAE, IUTAFTAF, IUTAFTAG, IUTAFTAH, IUTAFTAI, IUTAFTAJ, IUTAFTAK, IUTAFTAL, IUTAFTAM, IUTAFTAN, IUTAFTAO, IUTAFTAP, IUTAFTAQ, IUTAFTAR, IUTAFTAS, IUTAFTAT, IUTAFTAU, IUTAFTAV, IUTAFTAW, IUTAFTAX, IUTAFTAY  PRI: FF FT: <FT> OHI: TEST IT504/TC02
---	--

### 9.2.2 Input device AFTN Terminal: IUTBFTNA

<b>From AFTN Terminal IUTBFTNA</b>	<b>to UA IUTAMHSA</b>
Test message ID: IT202M01	KK IUTAMHSA <FT> IUTBFTNA TEST IT202/TC01
Test message ID: IT202M02	GG IUTAMHSA <FT> IUTBFTNA TEST IT202/TC02
Test message ID: IT202M03	FF IUTAMHSA <FT> IUTBFTNA TEST IT202/TC03
Test message ID: IT202M04	DD IUTAMHSA <FT> IUTBFTNA TEST IT202/TC04
Test message ID: IT202M05	SS IUTAMHSA <FT> IUTBFTNA TEST IT202/TC05

<b>From AFTN Terminal IUTBFTNA</b>	<b>to AFTN Terminal IUTAFTNA</b>
Test message ID: IT402M01	KK IUTAFTNA <FT> IUTBFTNA TEST IT402/TC01
Test message ID: IT402M02	GG IUTAFTNA <FT> IUTBFTNA TEST IT402/TC02
Test message ID: IT402M03	FF IUTAFTNA <FT> IUTBFTNA TEST IT402/TC03
Test message ID: IT402M04	DD IUTAFTNA <FT> IUTBFTNA TEST IT402/TC04
Test message ID: IT402M05	SS IUTAFTNA <FT> IUTBFTNA TEST IT402/TC05

### 9.3 Test message templates for multilateral tests

<b>From UA IUTAMHSA</b> Test message ID: IT701M01	To: IUTBMHSA and IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT701/TC01
<b>From UA IUTBMHSA</b> Test message ID: IT701M02	To: IUTAMHSA and IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT701/TC02
<b>From UA IUTCMHSA</b> Test message ID: IT701M03	To: IUTAMHSA and IUTBMHSA PRI: FF FT: <FT> OHI: TEST IT701/TC03

<b>From UA IUTAMHSA</b> Test message ID: IT702M01	To: IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT702/TC01
<b>From UA IUTBMHSA</b> Test message ID: IT702M02	To: IUTAMHSA PRI: FF FT: <FT> OHI: TEST IT702/TC02
<b>From UA IUTCMHSA</b> Test message ID: IT702M03	To: IUTBMHSA PRI: FF FT: <FT> OHI: TEST IT702/TC03

<b>From UA</b> <b>IUTAMHSA</b> Test message ID: IT801M01	<u>To</u> : IUTBMHSA PRI: FF FT: <FT> OHI: TEST IT801/TC01
<b>From UA</b> <b>IUTBMHSA</b> Test message ID: IT801M02	<u>To</u> : IUTCMHSA PRI: FF FT: <FT> OHI: TEST IT801/TC02
<b>From UA</b> <b>IUTCMHSA</b> Test message ID: IT801M03	<u>To</u> : IUTAMHSA PRI: FF FT: <FT> OHI: TEST IT801/TC03

<b>From UA</b> <b>IUTAMHSA</b> Test message ID: IT802M01	<u>To</u> : IUTXLOOP PRI: FF FT: <FT> OHI: TEST IT802/TC01, TC04, TC07
<b>From UA</b> <b>IUTBMHSA</b> Test message ID: IT802M02	<u>To</u> : IUTXLOOP PRI: FF FT: <FT> OHI: TEST IT802/TC02, TC05, TC08
<b>From UA</b> <b>IUTCMHSA</b> Test message ID: IT802M03	<u>To</u> : IUTXLOOP PRI: FF FT: <FT> OHI: TEST IT802/TC03, TC06, TC09

**END of Appendix E**



# EUR AMHS Manual

## Appendix F

AMHS Pre-operational Tests	
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## References

- [1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures
- [2] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications – Air Traffic Services Message Handling Service (ATSMHS), Second Edition – 2016
- [3] EUR Doc 020 – EUR AMHS Manual, Main Part
- [4] EUR Doc 020 – EUR AMHS Manual, Appendix B, European ATS Messaging Service Profile
- [5] EUR Doc 020 – EUR AMHS Manual, Appendix C, AMHS Testing Requirements
- [6] EUR Doc 020 – EUR AMHS Manual, Appendix D, AMHS Conformance Tests
- [7] EUR Doc 020 – EUR AMHS Manual, Appendix E, AMHS Interoperability Tests
- [8] EUR Doc 021 – ATS Messaging Management Manual

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# 1. Introduction

## 1.1 Purpose of the Document

The purpose of the document is to define AMHS Pre-operational Tests in order to ensure the interoperability between AMHS systems prepared for going into operation. The document defines the objectives and prerequisites as well as the tests themselves.

The AMHS Pre-operational Tests are interoperability type tests. They are the last tests between Operational Systems and should be performed within the operational network environment before the “AMHS cut-over”.

After "AMHS cut-over" the AMHS relation between the two systems is operational. That means: the exchange of the complete operational traffic (or a part of that) is performed by means of AMHS only. For this traffic no other means (AFTN or CIDIN) are used.

## 1.2 Objectives of the Pre-operational Tests

The objectives of the AMHS Pre-operational Tests are:

1. To test the interoperability between the AMHS systems in an operational environment.
2. To test the integrity of the messages exchanged.
3. To test the message exchange after a disturbance (e.g. queued messages).

The prerequisites of the AMHS Pre-operational Tests are:

- Successful performance of AMHS Conformance Tests as specified in [6], through which the compliance of all systems under test to the [2] has been demonstrated, and
- Successful performance of AMHS Interoperability Tests as specified in [7], through which the interoperability of these AMHS systems in a test (bed) environment has been demonstrated, and

*Note. – Under specific conditions and upon mutual agreement between the involved parties, Interoperability Tests could be skipped as specified in section 7.3.2.2 of [3].*

- Successful performance of Underlying Network Tests, through which is demonstrated that the underlying (IP) network is available and stable, and
- System configuration on both systems (The agreed set is loaded and established.)

The messages used in the AMHS Pre-operational Tests are generated either:

- manually; or
- using operational bilateral or parallel duplicated traffic;

## 1.3 Test Overview

The following tests have to be performed:

1. PRE001: Go-NoGo Test, Establishment of MTA associations;  
A simple test which checks that MTA associations are properly configured and established. It is a prerequisite for the subsequent tests.
2. PRE002: Go-NoGo Test, Preliminary message exchange;  
Exchange of two test messages (from Direct User A to Direct User B and from Direct User B to Direct User A) to check systems configuration and proper underlying network functions. It is a prerequisite for the subsequent tests.
3. PRE003 (Conditional): Direct User A to Direct User B and Indirect User B;  
Series of three test messages sent from Direct User A to Direct User B and Indirect User B, using different message characteristics.
4. PRE004 (Conditional): Direct User B to Direct User A and Indirect User A;  
Series of three test messages sent from Direct User B to Direct User A and Indirect User A, using different message characteristics.
5. PRE005 (Conditional): Indirect User A to Direct User B and Indirect User B;  
Series of three test messages sent from Indirect User A to Direct User B and Indirect User B, using different message characteristics.
6. PRE006 (Conditional): Indirect User B to Direct User A and Indirect User A;  
Series of three test messages sent from Direct User B to Direct User A and Indirect User A, using different message characteristics.
7. PRE007 (Conditional): Direct User A to Direct User B with FTBP;  
One message sent from Direct User A to Direct User B with FTBP.
8. PRE008 (Conditional): Direct User B to Direct User A with FTBP;  
One message sent from Direct User B to Direct User A with FTBP.
9. PRE009 (Conditional): Re-routing arrangement from system A to system B, via system C;  
One test message sent from Direct User A to Direct User B, via a relay third system C.
10. PRE010 (Conditional): Re-routing arrangement from system B to system A, via system C;  
One test message sent from Direct User B to Direct User A, via a relay third system C.
11. PRE011: Go-NoGo Test for message integrity;  
One message with the text "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG" (ICAO Annex 10 Vol. III 8.2.8 Recommendation 8.2.8) is sent from Direct User A to Direct User B and Indirect User B. The same text is sent from Direct User B to Direct User A and Indirect User A.
12. PRE012: Load Tests;  
A message queue is created in both systems. The amount of queued messages should correspond to the expected traffic during a determined period. The queue is flushed and the time needed to restore the normal traffic flow is measured.  
PRE012/TC01: Load Test using IPMs with a single text body part;

PRE012/TC02 (Conditional): Load Test using a) IPMs with a single text body part (optional) and b) IPMs with a file transfer body part and optionally a text body part;

13. PRE013a: Go-NoGo Test with operational bilateral traffic;  
Exchange of operational bilateral traffic without duplication.

Or,

PRE013b: Go-NoGo Test with duplicated operational traffic;  
Exchange of duplicated operational traffic.

14. (Optional) Selected test cases from the AMHS Interoperability Tests:  
Due to the fact that in the pre-operational test phase the operational systems include the complete operational setup, a selection of interoperability tests may be repeated.

The estimated duration of the AMHS Pre-operational Tests is about 2 days and calculated as follows:

Test ID	Duration	Remark
PRE001 and PRE002	1 hour	inclusive set-up / co-ordination
From PRE003 to PRE006	2 hours	<b>Conditional</b> - IOT
PRE007 and PRE008	1 hour	<b>Conditional</b> - FTBP
PRE009 and PRE010	2 hours	<b>Conditional</b> - Re-routing arrangements, including set-up and co-ordination
PRE011 and PRE012	1 day	
PRE013a or PRE013b	1 day	
<b>Optional</b> (selected Interoperability Tests)	To be defined	Upon mutual agreement

**Table 1: Estimated duration of the AMHS Pre-operational Tests**

## 1.4 Document Structure

*Chapter 1* presents the purpose, objectives and test overview.

*Chapter 2* presents the test environment used for AMHS Pre-operational Testing.

*Chapter 3* defines the set-up and configuration of the AMHS systems.

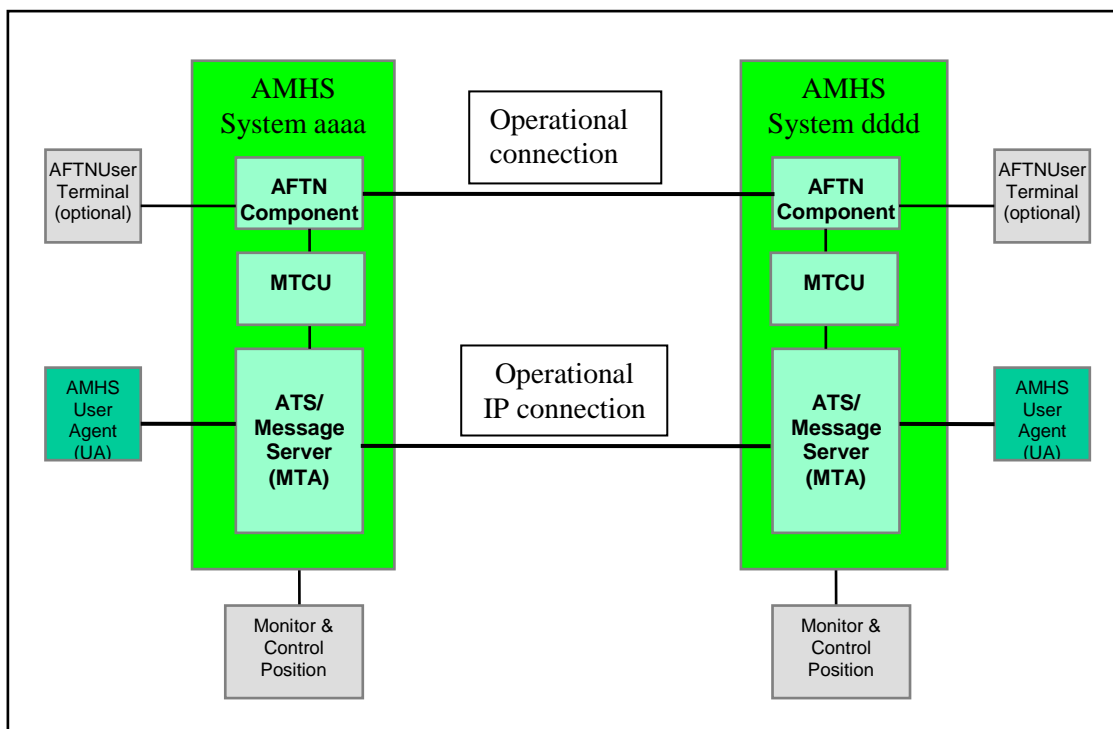
*Chapter 4* defines the addressing plan for AMHS Pre-operational Testing.

*Chapter 5* contains the description of the Pre-operational Tests.

## 2. AMHS Pre-operational Test Environment

### 2.1 Application infrastructure

The AMHS systems prepared for going into operation are interconnected by means of the operational infrastructure (cf. Figure 1).



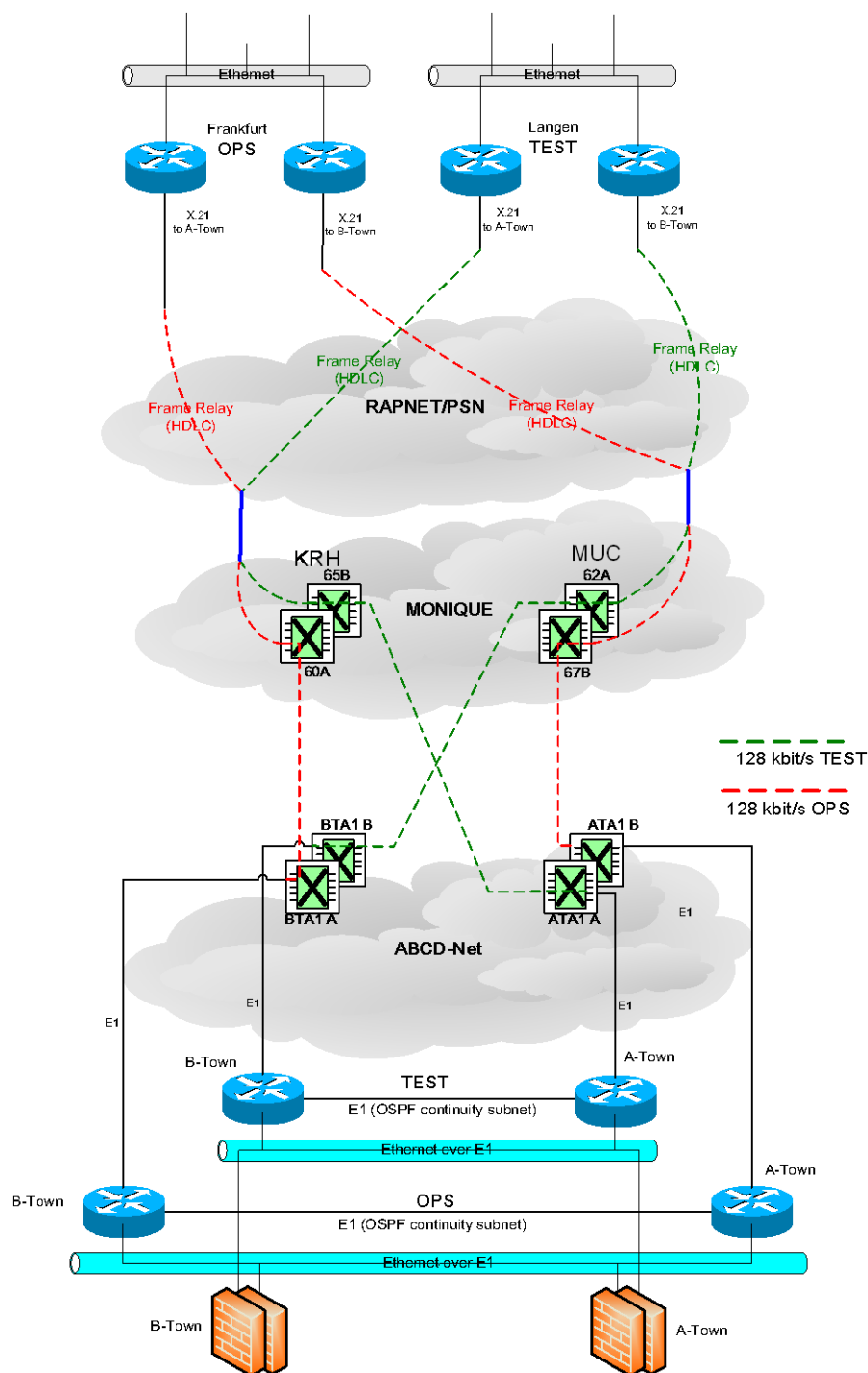
*Figure 1: AMHS Pre-operational Test Environment*

### 2.2 Transport infrastructure

In the EUR Region, the infrastructure to be used is based on the TCP/IP protocol (IPv4/IPv6). In line with existing recommendations<sup>1</sup>, the operational IP connection should utilise IPv6 at the international level and should provide a redundant connectivity. The redundancy concept of the network ensures the reachability in any case between the MTAs, while the MTA uses single IP addresses only.

Figure 2 shows a generic example how a redundant IP connectivity can be designed. The real configuration and details shall be agreed between the test partners.

<sup>1</sup> The EUROCONTROL Task Force for Aeronautical data exchange over IP (iPAX-TF) had recommended to use IPv6 on international level (between the member States) and had proposed an IPv6 addressing plan. In this context EUROCONTROL acts on behalf of the ANSPs as a "IPv6 provider" towards RIPE Network Coordination Centre (NCC) and is responsible for the registration and maintenance of the IPv6 addresses for the European (EUROCONTROL member) States. (The RIPE NCC is one of five Regional Internet Registries (RIRs) providing Internet resource allocations, registration services and co-ordination activities that support the operation of the Internet globally.)



**Figure 2: Example for a redundant international IP connection (Operational and Test)**

*Note. – This figure has to be replaced by the real configured and used infrastructure.*

The RAPNET/MONIQUE/ABCD-Net infrastructure in this case should be replaced by PENS partly or completely later on if available.

### 3. Operational system setup - Configuration

The AMHS Systems involved in the pre-operational tests are expected to be configured “as close” to the Operational Systems as possible (with respect to routing tables and look-up tables).

Special addresses needed for testing are listed in this document.

MTA names etc. shall follow the recommendations laid down in [3]. For completeness they are listed hereafter.

#### 3.1 Configuration Lower Layers

Item	Test partner 1	Test partner 2	recommended values
TSAP	TBD	TBD	e.g. '544350' (“TCP”) or '4D4853' (“MHS”)
IPv6 Address	TBD	TBD	in line with the EUROCONTROL addressing plan
IP Port	TBD	TBD	102

*Table 2: Configuration Lower Layers*

#### 3.2 Configuration Upper Layers

Item	Test partner 1	Test partner 2	recommended values
MTA Name	MTA-aaaa <sup>2</sup> -1	MTA-dddd <sup>3</sup> -1	cf. [3] section 8.2
Password	TBD	TBD	should be exchanged between involved partners
PSAP	not used	not used	not used
SSAP	not used	not used	not used
Number of incoming associations	TBD	TBD	should be equal to the outgoing number

<sup>2</sup> Where aaaa = the location indicator of the MTA location of the Test partner 1.

<sup>3</sup> Where dddd = the location indicator of the MTA location of the Test partner 2.



Item	Test partner 1	Test partner 2	recommended values
Number of outgoing associations	TBD	TBD	should be equal to the incoming number
Protocol type	X.400/1988	X.400/1988	cf. PDR M6080001 Phasing out of IPM 1984
Dialogue mode	Monologue	Monologue	see [4]

*Table 3: Configuration Upper Layers*

## 4. Addressing Plan for AMHS Pre-operational Testing

### 4.1 User addresses

To meet the scope of testing, the test-address space used by AMHS Pre-operational Testing should include, at a minimum, one Direct User and one Indirect User for each test partner.

#### 4.1.1 AMHS Users for Test partner 1

User Name	MF-address	Remarks
aaaaAMHA	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aaaa /CN=aaaaAMHA	Direct User or other than AMHA
aaaaAFTN	/C=XX/A=ICAO/P=bbbb/O=cccc/OU1=aaaa /CN=aaaaAFTN	Indirect User or other than AFTN
		or more

**Table 4: Registered AMHS Users (Test partner 1)**

Example:

User Name	MF-address	Remarks
LEEEAMHA	/C=XX/A=ICAO/P=SPAIN/O=LEEE/OU1=LEEE /CN=LEEEAMHA	Direct User
LEEEAFTN	/C=XX/A=ICAO/P=SPAIN/O=LEEE/OU1=LEEE/CN=LEEEAFTN	Indirect User

#### 4.1.2 AMHS Users for Test partner 2

User Name	MF-address	Remarks
ddddAMHA	/C=XX/A=ICAO/P=eeee/O=ffff/OU1=dddd /CN=ddddAMHA	Direct User or other than AMHA
ddddAFTN	/C=XX/A=ICAO/P=eeee/O=ffff/OU1=dddd /CN=ddddAFTN	Indirect User or other than AFTN
		or more

**Table 5: Registered AMHS Users (Test partner 2)**

Example:

User Name	MF-address	Remarks
EDDDAMHA	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1=EDDD /CN=EDDDAMHA	Direct User
EDDDAFTN	/C=XX/A=ICAO/P=GERMANY/O=EDDD/OU1=EDDD /CN=EDDDAFTN	Indirect User

### 4.1.3 AMHS Users for Test partner 3

User Name	MF-address	Remarks
ggggAMHA	/C=XX/A=ICAO/P=hhhh/O=iiii/OU1=gggg /CN=ggggAMHA	Direct User or other than AMHA
ggggAFTN	/C=XX/A=ICAO/P=hhhh/O=iiii/OU1=gggg /CN=ggggAFTN	Indirect User or other than AFTN
		or more

**Table 6: Registered AMHS Users (Test partner 3)**

Example:

User Name	MF-address	Remarks
LGGGAMHA	/C=XX/A=ICAO/P=GREECE/O=LGGG/OU1=LGGG /CN=LGGGAMHA	Direct User
LGGGAFTN	/C=XX/A=ICAO/P=GREECE/O=LGGG/OU1=LGGG /CN=LGGGAFTN	Indirect User

## 4.2 AFTN and X.400 Routing Tables

Systems already in AMHS operation and involved in the Pre-operational Tests are configured with the latest valid **AFTN and X400 Routing Table** available in the AMC, including the minor changes needed for the Pre-operational Tests themselves.

For systems not in AMHS operation, the following actions are recommended:

- The systems involved in the Pre-operational Tests are configured with the latest valid **AFTN Routing Table** available in the AMC, including the minor changes needed for the Pre-operational Tests themselves.
- Only for the selected traffic (bilaterally agreed addresses) shall AFTN routing paths through the MTCU be set up.

- The systems are configured with the **complete X.400 Routing Table** covering all existing PRMD names. For all PRMD names which are not involved in the Pre-operational Tests, a default routing to a "Dummy MTA direction" shall be defined in order to handle exceptional situations within the Pre-operational Tests as well as for future operations.
- Only for the selected traffic (bilaterally agreed addresses) shall respective X.400 routing paths through the MTCU or to the adjacent MTA be set up.
- The recommended complete setup of the X.400 Routing table allows the responsible international COM Centre to ensure that each message entered into an international Network (AFTN, CIDIN as well as AMHS) is correct in format and addressing. When using a reduced X.400 routing table (use of general default routing entries), such checking of addressing cannot be performed, especially if domestic UAs are connected. Only with the full set of PRMD routing entries a minimum checking of address validity is possible.

## 4.3 Look-up Tables

### 4.3.1 Generic look-up Tables

It is recommended that the systems are configured with the complete set of information required for the address translation.

The tables needed are reflected in the Intra MD Addressing function of the ATS Messaging Management Centre (AMC). From the AMC the complete **MD Look-up Table** (AmhsMdRegister\_OPER...csv), the complete **CAAS Look-up Tables** (AmhsCaasTable\_OPER....csv) and the complete **User Address Look-Up Table** (UserAddresses\_OPER....csv) can be downloaded.

Loading of the complete tables is recommended to ensure that the AMHS application is able to handle the extensive content of the tables covering the address translation of all existing AFTN addresses into AMHS O/R addresses (XF as well as CAAS) and vice versa.

## 5. Test Description

### 5.1 Test Scenarios

The tests are described in the following test scenarios:

PRExxx where xxx is the scenario number.

The following table contains an overview of the test scenarios:

Test-case id	Test function
PRE001 Go-NoGo	Establishment of MTA associations, Test partner 1 to Test partner 2 and Test partner 2 to Test partner 1
PRE002 Go-NoGo	Preliminary message exchange, Test partner 1 to Test partner 2 and Test partner 2 to Test partner 1
PRE003 Conditional	Messages from Direct User A to Direct User B and Indirect User B
PRE004 Conditional	Messages from Direct User B to Direct User A and Indirect User A
PRE005 Conditional	Messages from Indirect User A to Direct User B and Indirect User B
PRE006 Conditional	Messages from Indirect User B to Direct User A and Indirect User A
PRE007 Conditional	Messages with FTBP from Direct User A to Direct User B
PRE008 Conditional	Messages with FTBP from Direct User B to Direct User A
PRE009 Conditional	Message from Direct User A to Direct User B, via a relay Centre C
PRE010 Conditional	Message from Direct User B to Direct User A, via a relay Centre C
PRE011 Go-NoGo	Integrity test with a reference message from Test partner 1 to Test partner 2 and from Test partner 2 to Test partner 1
PRE012	Load Test, exchange of queue data of the size of the expected amount of operational messages exchanged
PRE013a or, PRE013b Go-NoGo	Integrity test with operational bilateral traffic (a) or duplicated operational traffic (b)

*Table 7: Test Scenario overview*

### 5.2 Pre-operational AMHS Tests

This section contains the test-cases. Each test-case is written on a test sheet, which should be completed during testing.

The top of the test-sheet contains the **test-case id** and a description of the **tested functionality**.

The **Test description** contains the instructions for the tester, the addresses used and the test message used.

The **Test control** contains the expected reaction/observation of the Systems Under Test (SUTs).

The section **Test result** is used to log the test results.

The **Conditional test cases** listed in this document are **optional**, when the AMHS Interoperability Tests as specified in [7] have been successfully passed. However, when the involved parties have commonly agreed to skip the AMHS Interoperability Tests as specified in [7], the execution of the **conditional** test cases listed in this document is **strongly recommended**.

Test cases from PRE007 to PRE010 and PRE012/TC02 remain **conditional** but can only be performed if the user capabilities allow so (FTBP test cases) or if a third partner is available (re-routing test cases).

The characteristics of the test messages are represented in this document according to the AMHS User Capabilities, as listed in the ATS Messaging Management Manual [8], section D5 “AMHS User Capabilities related file (AMHS User Capabilities Management)”.

- A2 : IA5 BP and GT BP (Repertoire A), up to 1800 characters
- A16: IA5 BP and GT BP (Repertoire A), up to 16k characters
- A64: IA5 BP and GT BP (Repertoire A), up to 64k characters
- B2: IA5 BP and GT BP (Repertoire A and B), up to 1800 characters
- B16: IA5 BP and GT BP (Repertoire A and B), up to 16k characters
- B64: IA5 BP and GT BP (Repertoire A and B), up to 64k characters
- F2048: FTBP, up to 2M Bytes
- EA: Elementary Address (direct AMHS User Address)
- EI : Elementary Address (indirect AMHS User Address)

### 5.2.1 Go-NoGo test cases

Test reference : PRE001/TC01 Go-NoGo	Tested functionality : Establish and administrate MTA associations. It is a prerequisite for subsequent tests.
---	---

**Test description:**

Test partner A shall establish an MTA association to test partner B.

**Test control:**

Based on the agreed MTA bind parameters the established association shall be monitored in order to verify that:

- In case of permanent connection the association(s) remains even if no messages are transferred.
- In case of dynamic connection the association(s) is closed after the specified timer.
- The partners do not establish more associations than agreed.

**Test result:**

PASS	FAILED	INCONCLUSIVE

Test reference : PRE001/TC02 Go-NoGo	Tested functionality : Establish and administrate MTA associations. It is a prerequisite for subsequent tests.
---	---

**Test description:**

Test partner B shall establish an MTA association to test partner A.

**Test control:**

Based on the agreed MTA bind parameters the established association shall be monitored in order to verify that:

- In case of permanent connection the association(s) remains even if no messages are transferred.
- In case of dynamic connection the association(s) is closed after the specified timer.
- The partners do not establish more associations than agreed.

**Test result:**

PASS	FAILED	INCONCLUSIVE



Test reference :	Tested functionality :
PRE002/TC01 Go-NoGo	<p>This is a simple test with the purpose to check that the configuration and underlying network work correctly. It is a prerequisite for subsequent tests.</p> <p>Direct User A to Direct User B (A2 + EA) communication with priority FF.</p>

**Test description:**

From aaaaAMHA send the following FF priority message to ddddAMHA:

```
PRE002/TC01
12345678901234567890123456789012345678901234567890123456789
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
( and so on till )
ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ
```

Check the correct reception at ddddAMHA and send the following acknowledgement if the message is received correctly.

From ddddAMHA send the following message to aaaaAMHA:

```
ACK001 PLS CONTINUE
```

**Test control:**

Check the correct reception of the message at ddddAMHA. No difference must exist between the message as defined above and the received message.

**Test result:**

PASS	FAILED	INCONCLUSIVE

Test reference :	Tested functionality :
PRE002/TC02 Go-No-Go	<p>This is a simple test with the purpose to check that the configuration and underlying network work correctly. It is a prerequisite for subsequent tests.</p> <p>Direct User B to Direct User A (A2 + EA) communication with priority FF.</p>

**Test description:**

From ddddAMHA send the following FF priority message to aaaaAMHA:

```
PRE002/TC02
123456789012345678901234567890123456789012345678901234567890123456789
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
(and so on till)
ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ
```

Check the correct reception at aaaaAMHA and send the following acknowledgement if the message is received correctly.

From aaaaAMHA send the following message to ddddAMHA:

```
ACK002 PLS CONTINUE
```

**Test control:**

Check the correct reception of the message at aaaaAMHA. No difference must exist between the message as defined above and the received message.

**Test result:**

PASS	FAILED	INCONCLUSIVE

### 5.2.2 Conditional test cases

Test reference : PRE003/TC01 Conditional	Tested functionality : Distribution of IPM and conversion of IPM to AFTN format  Direct User A to Direct User B (A2 + EA) and Indirect User B (A2 + EI) communication with priority FF.
---	--

#### Test description:

From aaaaAMHA send the following message to ddddAFTN and ddddAMHA:

```
PRI: FF
FT: <FT>
OHI:

TEST PRE003/TC01
```

#### Test control:

Check the correct reception of the message by ddddAFTN and ddddAMHA.

#### Test result:

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT501/TC01)

Test reference : PRE003/TC02 Conditional	Tested functionality : Distribution of IPM and conversion of IPM to AFTN format  Direct User A to Direct User B (A16 + EA) and Indirect User B (A16 + EI) communication with priority FF and text length of 8000 characters.
---	---

**Test description:**

From aaaaAMHA send the following message to ddddAFTN and ddddAMHA:

```
PRI: FF
FT: <FT>
OHI:

TEST PRE003/TC02
TEXT 8000 CHARACTERS
12345678901234567890123456789012345678901234567890
...
12345678901234567890123456789012345678901234567890
END
```

**Test control:**

Check the correct reception of the message by ddddAMHA.

Concerning the reception by ddddAFTN, the AMHS technical specifications define that the message can be rejected (case A) or split into several messages (case B). If the system provides "long AFTN message" capability, the message will be converted (case C).

If case A is implemented, the message is not conveyed to the AFTN component and a NDR is returned. Check the received NDR at aaaaAMHA and verify the following Per-Recipient-Report Non-Delivery information:

- Actual-recipient-name: MF-form address of ddddAFTN
- reason code 1 signifies "unable-to-transfer"
- diagnostic code 7 signifies "content-too-long".
- supplementary-information: "unable to convert to AFTN due to message text length".

If case B is implemented: Check that ddddAFTN receives several messages.

If case C is implemented: Check that ddddAFTN receives one message.

**Test result:**

PASS	FAILED	INCONCLUSIVE
a / b / c		
SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT501/TC01 and IT503/TC01)	

Test reference : PRE003/TC03 Conditional	Tested functionality : Distribution of IPM and conversion of IPM to AFTN format  Direct User A to Direct User B (A2 + EA) and Indirect User B (A2 + EI) communication with priority SS.
---	--

**Test description:**

From aaaaAMHA send the following message to ddddAFTN and ddddAMHA:

```
PRI: SS
FT: <FT>
OHI:

TEST PRE003/TC03
```

**Test control:**

Check the correct reception of the SS message by ddddAFTN and ddddAMHA. Check the corresponding reception of a RN or an IPM containing the SS ACK message by aaaaAMHA sent by ddddAMHA.

When the SS Ack message is sent by ddddAFTN, check the corresponding reception of a RN or an IPM containing the SS ACK message by aaaaAMHA.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT501/TC01, IT101/TC05 and IT301/TC05)

Test reference : PRE004/TC01 Conditional	Tested functionality : Distribution of IPM and conversion of IPM to AFTN format  Direct User B to Direct User A (A2 + EA) and Indirect User A (A2 + EI) communication with priority FF.
---	--

**Test description:**

From ddddAMHA send the following message to aaaaAFTN and aaaaAMHA:

```
PRI: FF
FT: <FT>
OHI:

TEST PRE004/TC01
```

**Test control:**

Check the correct reception of the message by aaaaAFTN and aaaaAMHA.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT501/TC02)

Test reference : PRE004/TC02 Conditional	Tested functionality : Distribution of IPM and conversion of IPM to AFTN format  Direct User B to Direct User A (A16 + EA) and Indirect User A (A16 + EI) communication with priority FF and text length of 8000 characters.
---	---

**Test description:**

From ddddAMHA send the following message to aaaaAFTN and aaaaAMHA:

```

PRI: FF
FT: <FT>
OHI:

TEST PRE004/TC02
TEXT 8000 CHARACTERS
12345678901234567890123456789012345678901234567890
...
12345678901234567890123456789012345678901234567890
END

```

**Test control:**

Check the correct reception of the message by aaaaAMHA.

Concerning the reception by aaaaAFTN, the AMHS technical specifications define that the message can be rejected (case A) or split into several messages (case B). If the system provides "long AFTN message" capability, the message will be converted (case C).

If case A is implemented, the message is not conveyed to the AFTN component and a NDR is returned. Check the received NDR at ddddAMHA and verify the following Per-Recipient-Report Non-Delivery information:

- Actual-recipient-name: MF-form address of aaaaAFTN
- reason code 1 signifies "unable-to-transfer"
- diagnostic code 7 signifies "content-too-long".
- supplementary-information: "unable to convert to AFTN due to message text length".

If case B is implemented: Check that aaaaAFTN receives several messages.

If case C is implemented: Check that aaaaAFTN receives one message.

**Test result:**

PASS	FAILED	INCONCLUSIVE
a / b / c		

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT501/TC02 and IT503/TC02)

Test reference : PRE004/TC03 Conditional	Tested functionality : Distribution of IPM and conversion of IPM to AFTN format Direct User B to Direct User A (A2 + EA) and Indirect User A (A2 + EI) communication with priority SS.
---	--

**Test description:**

From ddddAMHA send the following message to aaaaAFTN and aaaaAMHA:

```
PRI: SS
FT: <FT>
OHI:

TEST PRE004/TC03
```

**Test control:**

Check the correct reception of the SS message by aaaaAFTN and aaaaAMHA. Check the corresponding reception of a RN or an IPM containing the SS ACK message by ddddAMHA sent by aaaaAMHA.

When the SS Ack message is sent by aaaaAFTN, check the corresponding reception of a RN or an IPM containing the SS ACK message by ddddAMHA.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT501/TC02, IT102/TC05 and IT302/TC05)



Test reference : PRE005/TC01 Conditional	Tested functionality : Distribution of AFTN message and conversion of an AFTN message to AMHS format  Indirect User A to Direct User B (A2 + EA) and Indirect User B (A2 + EI) communication with priority FF.
---	---

**Test description:**

From aaaaAFTN send the following message to ddddAMHA and ddddAFTN:

```
FF ddddAMHA ddddAFTN
FT aaaaAFTN

TEST PRE005/TC01
```

**Test control:**

Check the correct reception of the message by ddddAMHA and ddddAFTN.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT201/TC03, IT401/TC03)

Test reference : PRE005/TC02 Conditional	Tested functionality : Distribution of AFTN message and conversion an AFTN message to AMHS format  Indirect User A to Direct User B (A16 + EA) and Indirect User B (A16 + EI) communication with priority FF and text length of 8000 characters.
---	---

**Test description:**

From aaaaAFTN send the following message to ddddAMHA and ddddAFTN:

*Note.– If the SUT rejects or splits “long messages”, then the number of characters may be reduced from 8000 to 1800 or the system configuration may be adapted in both SUTs to support “long AFTN message” capability.*

```
FF ddddAMHA ddddAFTN
FT aaaaAFTN

TEST PRE005/TC02
TEXT 8000 CHARACTERS
12345678901234567890123456789012345678901234567890
...
12345678901234567890123456789012345678901234567890
END
```

**Test control:**

Check the correct reception of the message by ddddAMHA and by ddddAFTN.

**Test result:**

PASS	FAILED	INCONCLUSIVE

<b>SKIPPED</b>	The functionality has been already tested during the AMHS Interoperability Tests (IT201/TC03)
----------------	---

Test reference : PRE005/TC03 Conditional	Tested functionality : Distribution of AFTN message and conversion of an AFTN message to AMHS format  Indirect User A to Direct User B (A2 + EA) and Indirect User B (A2 + EI) communication with priority SS.
---	---

**Test description:**

From aaaaAFTN send the following message to ddddAMHA and ddddAFTN:

```
SS ddddAMHA ddddAFTN
FT aaaaAFTN

TEST PRE005/TC03
```

**Test control:**

Check the correct reception of the message by ddddAMHA and ddddAFTN.

Check the correct reception by aaaaAFTN of the SS ACK message sent by ddddAMHA and ddddAFTN.

*Note:*

*When an SS Ack message is sent by ddddAFTN, the MTCU of SUT-B converts it into a RN or an IPM containing the SS ACK message, the RN or IPM is re-converted to an SS Ack message in the MTCU of SUT-A.*

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT201/TC05, IT401/TC05)

Test reference : PRE006/TC01 Conditional	Tested functionality : Distribution of AFTN message and conversion of an AFTN message to AMHS format  Indirect User B to Direct User A (A2 + EA) and Indirect User A (A2 + EI) communication with priority FF.
---	---

**Test description:**

From ddddAFTN send the following message to aaaaAMHA and aaaaAFTN:

```
FF aaaaAMHA aaaaAFTN
FT ddddAFTN

TEST PRE006/TC01
```

**Test control:**

Check the correct reception of the message by aaaaAMHA and aaaaAFTN.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT202/TC03, IT402/TC03)

Test reference : PRE006/TC02 Conditional	Tested functionality : Distribution of AFTN message and conversion of an AFTN message to AMHS format  Indirect User B to Direct User A (A16 + EA) and Indirect User A (A16 + EI) communication with priority FF and text length of 8000 characters.
---	--

**Test description:**

From ddddAFTN send the following message to aaaaAMHA and aaaaAFTN:

*Note.– If the SUT rejects or splits “long messages”, then the number of characters may be reduced from 8000 to 1800 or the system configuration may be adapted in both SUTs to support “long AFTN message” capability.*

```
FF aaaaAMHA aaaaAFTN
FT ddddAFTN

TEST PRE006/TC02
TEXT 8000 CHARACTERS
123456789012345678901234567890123456789012345678901234567890
...
123456789012345678901234567890123456789012345678901234567890
END
```

**Test control:**

Check the correct reception of the message by aaaaAMHA and by aaaaAFTN.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT202/TC03, IT402/TC03)

Test reference : PRE006/TC03 Conditional	Tested functionality : Distribution of AFTN message and conversion of an AFTN message to AMHS format  Indirect User B to Direct User A (A2 + EA) and Indirect User A (A2 + EI) communication with priority SS.
---	---

**Test description:**

From ddddAFTN send the following message to aaaaAMHA and aaaaAFTN:

```
SS aaaaAMHA aaaaAFTN
FT ddddAFTN

TEST PRE006/TC03
```

**Test control:**

Check the correct reception of the message by aaaaAMHA and aaaaAFTN.

Check the correct reception by ddddAFTN of the SS ACK message sent by aaaaAMHA and aaaaAFTN.

*Note:*

*When an SS Ack message is sent by aaaaAFTN, the MTCU of SUT-A converts it into a RN or an IPM containing the SS ACK message, the RN or IPM is re-converted to an SS Ack message in the MTCU of SUT-B.*

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT202/TC05, IT402/TC05)

Test reference : PRE007 Conditional	Tested functionality : AMHS Extended Service - FTBP  Direct User A to Direct User B (A2 + F2048 + EA) communication with normal priority and two body parts (one FTBP up to 2M bytes and one text-body-part)
--	---

**Test description:**

From aaaaAMHA send the following message to ddddAMHA:

<pre>PRI: FF FT: &lt;FT&gt; OHI:  TEST PRE007</pre> <div data-bbox="295 810 512 1120">  </div>
--

**Test control:**

Check the correct reception of the message and of the associated FTBP by ddddAMHA.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality cannot be tested due to unsupported operational functionality, AMHS Extended Service – FTBP.

Test reference : PRE008 Conditional	Tested functionality : AMHS Extended Service – FTBP  Direct User B to Direct User A (A2 + F2048 + EA) communication with normal priority and two body parts (one FTBP up to 2M bytes and one text-body-part)
--	---

**Test description:**

From ddddAMHA send the following message to aaaaAMHA:

<pre>PRI: FF FT: &lt;FT&gt; OHI:  TEST PRE008</pre> 
--

**Test control:**

Check the correct reception of the message and of the associated FTBP by aaaaAMHA.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality cannot be tested due to unsupported operational functionality, AMHS Extended Service – FTBP.



Test reference : PRE009 Conditional	Tested functionality : Alternate routing capability  Re-routing arrangements with a third COM Centre C as relay between COM Centre A and COM Centre B.
--	---

**Test description:**

An ATS message (IPM) is queued in MTA-A (SUT-A). Due to outage of the primary X.400 routing path with MTA-B (SUT-B), the message is routed via alternate MTA-C (SUT-C).

- Verify that the X.400 routing table of SUT-A routes PRMD=eeee to SUT-B and PRMD=hhhh to SUT-C.
- Verify that the X.400 routing table of SUT-C routes PRMD=bbbb to SUT-A and PRMD=eeee to SUT-B.
- Cut the direct connection between SUT-A and SUT-B
- From aaaaAMHA send the following message to ddddAMHA:

```
PRI: FF
FT: <FT>
OHI:

TEST PRE009
```

If alternate MTA routing functionality is implemented and configured in SUT-A, the message will be transferred automatically via the “alternate” connection. Otherwise, reroute the queued message manually (according to partner's operational procedures).

**Test control:**

Verify that the message has passed through SUT-C in between (if possible) and verify that the message is received by ddddAMHA.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT801/TC01).
	The functionality cannot be tested or the test case is not agreed between the involved parties.

Test reference : PRE010 Conditional	Tested functionality : Alternate routing capability  Re-routing arrangements with a third COM Centre C as relay between COM Centre B and COM Centre A.
--	---

**Test description:**

An ATS message (IPM) is queued in MTA-B (SUT-B). Due to outage of the primary X.400 routing path with MTA-A (SUT-A) the message is routed via alternate MTA-C (SUT-C).

- Verify that the X.400 routing table of SUT-B routes PRMD=bbbb to SUT-A and PRMD=hhhh to SUT-C.
- Verify that the X.400 routing table of SUT-C routes PRMD=bbbb to SUT-A and PRMD=eeee to SUT-B.
- Cut the direct connection between SUT-A and SUT-B
- From ddddAMHA send the following message to aaaaAMHA:

```
PRI: FF
FT: <FT>
OHI:

TEST PRE010
```

If alternate MTA routing functionality is implemented and configured in SUT-B, the message will be transferred automatically via the “alternate” connection. Otherwise, reroute the queued message manually (according to partner's operational procedures).

**Test control:**

Verify that the message has passed through SUT-C in between (if possible) and verify that the message is received by aaaaAMHA.

**Test result:**

PASS	FAILED	INCONCLUSIVE

SKIPPED	The functionality has been already tested during the AMHS Interoperability Tests (IT702/TC02).
	The functionality cannot be tested or the test case is not agreed between the involved parties.

### 5.2.3 Go-No Go test cases for preliminary message integrity verification

Test reference : PRE011/TC01 Go-NoGo	Tested functionality : Message integrity.  Direct User A to Direct User B and Indirect User B with the reference text "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG" sent with FF priority.
---	---

#### **Test description:**

From aaaaAMHA send the following message to ddddAFTN and ddddAMHA:

```
PRI: FF
FT: <FT>
OHI:

TEST PRE011/TC01

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
```

#### **Test control:**

Check the correct reception of the message as well as the reference text by ddddAFTN and ddddAMHA.

#### **Test result:**

PASS	FAILED	INCONCLUSIVE

Test reference : PRE011/TC02 Go-NoGo	Tested functionality : Message integrity.  Direct User B to Direct User A and Indirect User A with the reference text "THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG" sent with FF priority.
---	---

**Test description:**

From ddddAMHA send the following message to aaaaAFTN and aaaaAMHA:

```
PRI: FF
FT: <FT>
OHI:

TEST PRE011/TC02

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
```

**Test control:**

Check the correct reception of the message as well as the reference text by aaaaAFTN and aaaaAMHA.

**Test result:**

PASS	FAILED	INCONCLUSIVE

## 5.2.4 Load Tests

### 5.2.4.1 Load Test using IPMs with a text body part only

Test reference : PRE012/TC01	Tested functionality : This test is performed to observe the behaviour of both systems during a load situation and in particular the capability of the operational network infrastructure to allow immediate relay of a high amount of messages.
---------------------------------	---

#### Introduction

As per ICAO Annex 10 Vol. II para. 4.4.1.3.2.1, diversion routing has to be initiated within a ten minute period after detection of the circuit outage. This means that for this test case, the expected number of operational messages exchanged between SUT-A and SUT-B during 10 minutes can be used to define the size of the respective message queues.

It could be inferred from ICAO Annex 10 Vol. II par. 4.4.9.2, that a message has to be transmitted within five minutes, including the time lost in a queue. This means that for this test case, the queues shall be completely flushed in no longer than five minutes after the end of the circuit outage.

In order to complete the analysis, the number of the messages potentially queued during ten minutes is added to the number of messages pending during the five minutes allowed to restore the outage. Therefore, the following formula can be used to determine the message queue size for SUT-A and SUT-B.

Number of messages queued	=	Calculate the sum of messages per minute intended to be migrated to the new AMHS connection	X	15 minutes
---------------------------	---	---	---	------------

The content and the size of messages to be exchanged shall be coordinated between the test partners.

#### Test description:

- Both sides shall inform each other about the amount of messages to be expected.
- At **Test partner 2** (or 1) interrupt the LAN connection to **Test partner 1** (or 2) by appropriate commands (should be agreed between the Test partners).
- At **Test partner 1** and **Test partner 2** create message queues as agreed in 1.
- After co-ordination, at **Test partner 2** (or 1) re-establish the LAN connection by appropriate commands.
- Observe and notice the incoming and outgoing message flow. Record the time it takes from re-connecting the LAN until the message queues are empty.

#### Test control:

- The number of messages received shall be equal to the number of messages expected.

2. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.
3. Check the event logging / traffic traces for NDRs.
4. Check for Control Position events.
5. Check the X.400 / AMHS diagnostics, check the number of associations used (in particular for possible hanging/unused associations).
6. At both sides note the amount of time needed to flush the queues.

The following table can be used to make notes of the Test Control result.

Test Control	Result
1. The number of messages received shall be equal to the number of messages expected.	
2. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.	
3. Check the event logging / traffic traces for NDRs.	
4. Check for events at the Control Position.	
5. Check the X.400 / AMHS diagnostics check the number of used associations (in particular possible hanging/unused associations).	
6. At both sides note the amount of time needed to flush the queues.	

*The test is failed if messages are lost, duplicated, corrupted or if the queues are flushed in more than five minutes.*

*The observations have to be exchanged between the involved parties in the form of a test log and discussed in a test review.*

**Test result:**

PASS	FAILED	INCONCLUSIVE

### 5.2.4.2 Load Test using a) IPMs with a single text body part (optional) and b) IPMs with a FTBP and optionally a text body part – *Conditional*

<u>Test reference:</u>  <u>PRE012/TC02 Conditional</u>	<u>Tested functionality:</u>  The tests described below are performed to observe the behaviour of both systems during a load situation where IPMs containing a FTBP are involved, as well as the capability and performance of the operational network infrastructure to allow the fast relay of a high amount of messages.
--	---

#### Introduction

As per ICAO Annex 10 Vol. II para. 4.4.1.3.2.1, diversion routing has to be initiated within a ten minute period after detection of the circuit outage. This means that for this test case, the expected number of operational messages exchanged between SUT-A and SUT-B during 10 minutes can be used to define the size of the respective message queues.

It could be inferred from ICAO Annex 10 Vol. II par. 4.4.9.2, that a message has to be transmitted within five minutes, including the time lost in a queue. This means that for this test case, the queues shall be completely flushed in no longer than five minutes after the end of the circuit outage.

In order to complete the analysis, the number of the messages potentially queued during ten minutes is added to the number of messages pending during the five minutes allowed to restore the outage. Therefore, the following formula can be used to determine the message queue size, message types and priorities for SUT-A and SUT-B.

The numbers, sizes, contents and body part types of the messages to be exchanged shall be coordinated between the test partners.

Number of IPMs with a single text body part queued (optional)	=	Number of IPMs with a single text body part per minute intended to be migrated to the new AMHS connection	X	15 min	text body part size (bytes)		Message priority (Normal/Non-urgent)
Number of IPMs with a FTBP and optionally a text body part queued	=	Number of IPMs with a FTBP and optionally a text body part per minute intended to be migrated to the new AMHS connection	X	15 min	FTBP size (kBytes)	text body part size (bytes) (optional)	Message priority (Normal/Non-urgent)

**Test description:**

1. Both sides shall agree on the numbers, sizes, contents and body part types of the messages to be expected.
2. Both sides shall consider diverting all operational traffic via alternate routes.
3. At Test partner 2 (or 1) interrupt the LAN connection to Test partner 1 (or 2) or the P1 connection to Test partner 1 (or 2), by appropriate commands (should be agreed between the Test partners).
4. At Test partner 1 and Test partner 2 create message queues, as agreed in step 1.
5. After coordination, at Test partner 2 (or 1) re-establish the LAN connection or the P1 connection, by appropriate commands.
6. Observe and notice the incoming and outgoing message flows. Record the time it takes from re-establishing the LAN or P1 connection until the message queues are empty.

**Test Control:**

1. The number of messages (per body part type) received shall be equal to the number of messages expected.
2. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.
3. Check the event logging / traffic traces for NDRs.
4. Check for events at the Control Position.
5. Check the X.400 / AMHS diagnostics.
6. Check the number of associations used (in particular for possible hanging/unused associations).
7. At both sides note the amount of time needed to flush the queues.



The following table can be used to make notes of the Test Control result.

Test Control	Result	
1. The number of messages (per body part type) received shall be equal to the number of messages expected.	IPMs Sent (total and per body part type)	IPMs Received (total and per body part type)
2. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.		
3. Check the event logging / traffic traces for NDRs.		
4. Check for events at the Control Position.		
5. Check the X.400 / AMHS diagnostics		
6. Check the number of used associations (in particular possible hanging/unused associations).		
7. At both sides note the amount of time needed to flush the queues.		

*The test is failed if messages are lost, duplicated, corrupted or if the queues are flushed in more than five minutes.*

*The observations have to be exchanged between the involved parties in the form of a test log and discussed in a test review.*

**Test result:**

PASS	FAILED	INCONCLUSIVE

## 5.2.5 Go-No Go test cases with operational traffic

### 5.2.5.1 Exchange of operational bilateral traffic

Test reference : PRE013a Go-NoGo	Tested functionality : Message integrity. Exchange of operational bilateral traffic without duplication.
-------------------------------------	--

#### **Test control:**

1. Re-route the bilateral operational traffic to the respective MTAs (SUTs).
2. Monitor the new X.400 connection until the first operational message is transmitted and check the system behaviour. Contact the test partner to confirm the correct reception of the operational message. This action shall be performed for the first operational messages of each partner.
3. Permanently monitor the new X.400 connection. The test partners shall contact each other from time-to-time to check the transmission / reception of messages. The time intervals are commonly agreed during the tests and can vary according to the amount of messages exchanged.
4. The test duration shall be set upon common agreement and relative to the amount of bilateral traffic.

During the test, each partner permanently monitors the following items:

- System event logs, abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.
- Event logging / traffic traces for NDRs.
- Control Position events.

At each contact, partners shall confirm the reciprocity of their mutual traffic.

*The test is immediately stopped when a message is lost, duplicated, corrupted or if a critical event occurs.*

*The observations have to be exchanged between involved parties, in order to be discussed.*

PASS	FAILED	INCONCLUSIVE

### 5.2.5.2 Exchange of duplicated traffic

Test reference :	Tested functionality :
PRE013b Go-No Go	Message integrity. For selected AFTN destination addresses all traffic will be duplicated to corresponding AMHS recipient addresses at the remote system. At the remote system the AFTN messages received will be compared with the copies transmitted via AMHS.

*Note:* In case PRE013a is not performed, execution of PRE013b is strongly recommended.

#### **Addresses for Traffic Duplication**

Due to the fact that the Pre-operational tests will be performed in an operational environment the addresses selected for duplication cannot be pre-determined in this document. The test partners are free to define and select appropriately.

#### **Test description:**

On the system of **Test partner 1** enable the duplication of Operational traffic for the agreed AFTN addressee indicators.

On the system of **Test partner 2** enable the duplication of Operational traffic for the agreed AFTN addressee indicators.

The test duration should be set by mutual agreement.

#### **Test control:**

*Note:* Not all details of test control can be defined since two different systems are involved. Therefore the control is done in a general form. The main purpose of this test is to prove the integrity of the message exchange. At the same time, it is possible to detect problems which have not been spotted during previous tests.

1. Compare the number of messages received at the AFTN addresses with the number of messages received as copies at the corresponding AMHS addresses (check if all duplicated messages are received)..
2. Compare the contents of the messages received for one randomly selected hour of traffic per day. The method of comparison is a local matter. Some options are:
  - a) the messages can be displayed on two screens and compared one by one,
  - b) the traffic log can be exported and compared (partly) electronically/in an automated way.
3. Check the event logging of the system for abnormalities in the area of AMHS/X.400/AFTN/AMHS Gateway.

4. Check the event logging / traffic traces for NDRs.
5. Check for Control Position events.
6. Check the X.400/AMHS Diagnostics, check the number of associations used (in particular possible hanging/unused associations).

The following table can be used to make notes of the Test Control result.

Test Control	Result
1. Compare the number of messages received as AFTN copy with the number of messages received as AMHS copy	
2. Compare the contents of the messages.	
3. The messages can be displayed on two screens and compared one by one.	
4. The traffic log can be exported and compared (partly) electronically/in an automated way.	
5. Check the event logging of the system for abnormalities in the area of AMHS / X.400 / AFTN/AMHS Gateway.	
6. Check whether NDRs have been received or transmitted.	
7. Check for events at the Control Position.	
8. X.400 / AMHS diagnostics, check the number of associations used (in particular possible hanging/unused associations).	

*The test is failed if messages are lost, duplicated or corrupted. The other observations have to be forwarded to each other in the form of a test log and discussed in a test review.*

**Test result:**

PASS	FAILED	INCONCLUSIVE

### **5.2.6 Additional selected and agreed Interoperability Tests**

*The selected and bilaterally agreed Test cases should be listed in this section.*

**END of Appendix F**



# EUR AMHS Manual

## Appendix G-A

EDS User Interface Control Document	
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## References

- [1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures, Seventh Edition, July 2016
- [2] ICAO Doc 9880 AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II — Ground-Ground Applications — Air Traffic Services Message Handling Services (ATSMHS), 2nd Edition, 2016
- [3] ICAO Doc 9880 AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part IV — Directory Services, Security and Identifier Registration, 2nd Edition, 2016
- [4] ICAO Doc 9896 Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocol, 2nd Edition, 2015
- [5] EUR Doc 020, EUR AMHS Manual
- [6] EUR Doc 021, ATS Messaging Management Manual,
- [7] EUROCONTROL-SPEC-0136 EUROCONTROL Specification on the Air Traffic Services Message Handling System (AMHS), Edition 2.0, 18/09/2009  
*Note.– Specification's reference published as a Community specification in the Official Journal of the European Union, C 323/24, 31.12.2009.*
- [8] EUROCONTROL European Directory Service (EDS) – Operational Concept – WP2 (Concept), Version 1.0, 26/10/2011
- [9] EUROCONTROL European Directory Service – EDS User Interface Manual – Version 2.0 Edition Date: 11/12/2015, Status: Released Issue, Intended for: AFSG
- [10] ISO/IEC 7498-1 Information technology – Open Systems Interconnection – Basic Ref. Model: The Basic Model, 2nd Edition, 1994
- [11] ISO/IEC 9594-n Information technology – Open Systems Interconnection – The Directory (multi-part), 5th Edition, 2005  
*Note.– This set of standards was also published as ITU-T X.500 (08/2005) set of standards.*
- [12] ISO/IEC 10021-7 Information technology – Message Handling Systems (MHS) – Interpersonal Messaging System, 2003
- [13] IETF RFC 1006 ISO Transport Service on top of the TCP, Version: 3, May 1987
- [14] IETF RFC 2126 ISO Transport Service on top of TCP (ITOT), March 1997

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# 1 Introduction

## 1.1 *Scope of the Document*

1.1.1 This document describes the interface of European Directory Service (EDS) for co-operating and adjacent users. It summarises interface details for the exchange of information between the Central European DSA, and Co-operating and Adjacent DSAs.

1.1.2 The European Directory Service (EDS) is the implementation of ATN Directory services [3] in Europe. The EDS provides future, directory-based means for collection and distribution of information within Europe and exchange of information with other Regions, States and Organisations.

1.1.3 EUROCONTROL has implemented the Central European DSA for the initial step according to the EDS Operational Concept initially defined in the EUROCONTROL EDS Operational Concept document [8], adopted by the Aeronautical Fixed Services Group (AFSG) and published in Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [5].

1.1.4 In the initial step of the EDS Operational Concept the ATS Messaging Management Centre (AMC) is the single source of information for distribution by EDS. In support of the ATS Message Handling Service (ATSMHS) the AMC supplies related information to the Central European DSA which in turn distributes the information to Co-operating and Adjacent DSAs.

## 1.2 *Purpose of the Document*

1.2.1 The purpose of this document is the establishment of an Interface Control Document (ICD) for the interface between the Central European DSA on the one hand and Co-operating and Adjacent DSAs on the other hand. The document summarises the communications means of EDS. It shall assist in setting up communications with the Central European DSA. Furthermore, it includes guidance material and advice for trouble shooting.

1.2.2 The operators, engineering and maintenance personnel of States or Organisations operating Co-operating and Adjacent DSAs are the intended, primary audience of this document. In addition, this document might serve implementers and users as guidance material.

## 1.3 *Structure of the Document*

1.3.1 This document is composed of the following chapters:

- Chapter 1 (this chapter) contains an introduction to the document.
- Chapter 2 gives an overview on EDS and the EDS user interface.
- Chapter 3 specifies the EDS interface protocols.
- Chapter 4 provides guidance on setup of systems.
- Chapter 5 gives assistance for trouble-shooting.
- Chapter 6 provides guidelines for software updates and directory structure changes.

## 2 Overview

### 2.1 EDS Operational Concept

2.1.1 The EDS Operational Concept adopts and refines the approach given by the AMHS Community Specification [7], further referred to as AMHS CS. The AMHS CS (Chapter 4) outlines a centralised Directory service as a European Common Facility.

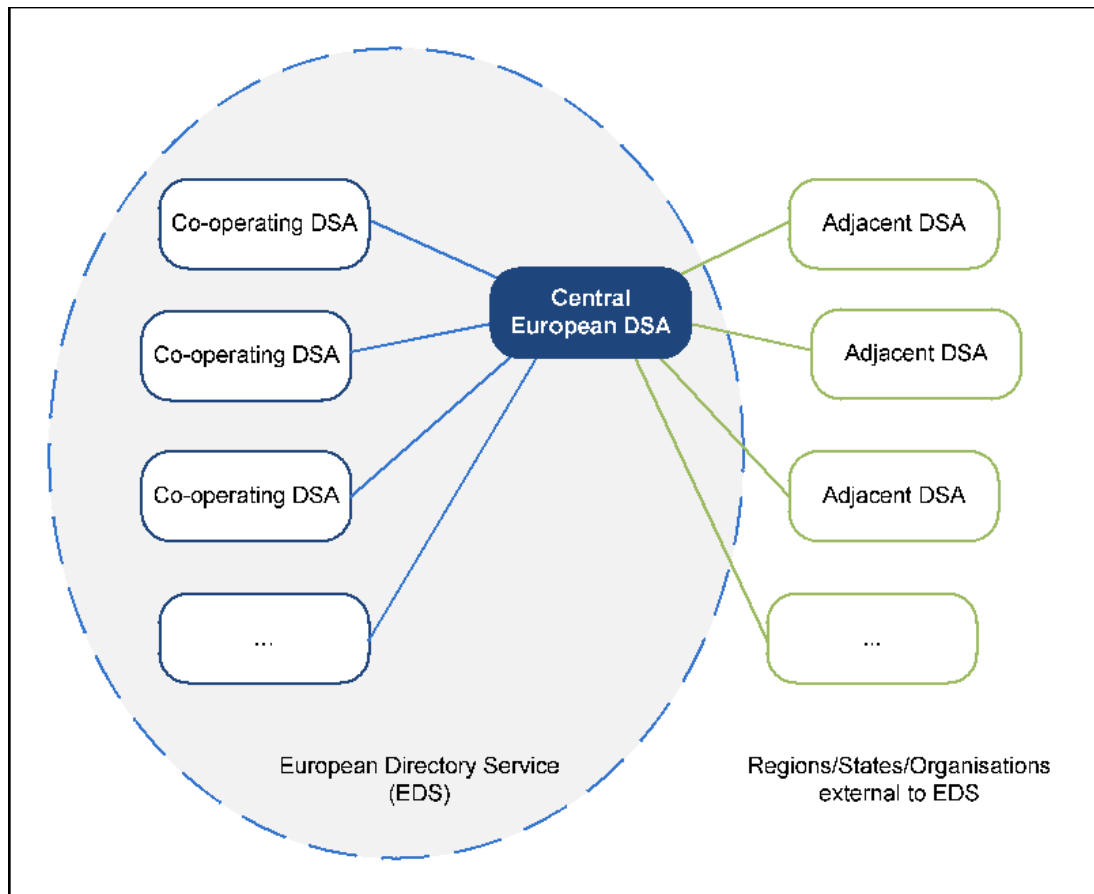
2.1.2 In addition to an isolated European solution, the EDS Operational Concept considers the global aspect of Directory services. Regions, States, and Organisations not directly participating in the concept, need to exchange data with the Central European DSA and/or States and Organisations participating in the concept.

2.1.3 The EDS Operational Concept given in Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [5] considers existing implementations, current network infrastructure, established management procedures and proposes a three-step transition process consisting of the initial, intermediate and final step. This document focuses on the initial step of the EDS Operational Concept.

### 2.2 Topology

2.2.1 The EDS Operational Concept describes an overall online Directory solution. In the framework of the European Directory Service (EDS) the term “online” refers to a service that provides direct and automated communication means between the involved entities using well-defined protocols. Communication is established and takes place on demand or by schedule. Manual initiation or intervention by human users on a regular basis is not foreseen. A permanent exchange of information on a 24 hour basis is not implied by the term online.

2.2.2 The EDS Operational Concept as specified in Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [5] describes the relationship of the Central European DSA with Co-operating and Adjacent DSAs implemented by participating and non-participating States and Organisations. Figure 1 gives an abstract overview of the EDS topology.



**Figure 1: EDS Topology**

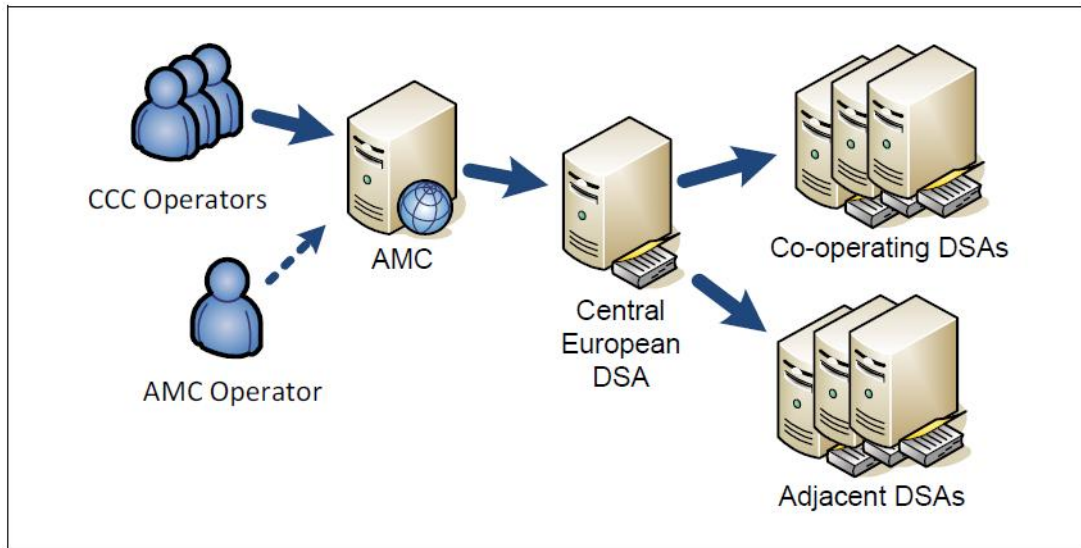
## 2.3 Flow of Information – Initial Step

2.3.1 In the initial step of EDS, the ATS Messaging Management Centre (AMC) remains the single source of relevant information. CCC Operators and AMC Operators remain in charge of management, consolidation and distribution of information. The EDS complements the AMC services and serves as a second means for distribution of information.

2.3.2 In line with the procedures specified in ICAO EUR Doc 021 (ATS Messaging Management Manual) [6], the AMC periodically provides relevant information to the Central European DSA, which in turn distributes the modifications to Co-operating and Adjacent DSAs of States and Organisations. These periodical events are when:

- Pre-operational Area status becomes ‘in preparation’ or ‘proposed’;
- Pre-operational Area status becomes ‘released’; and
- Pre-operational Area with status ‘released’ is moved to the Operational Area

2.3.3 The basic flow of information in the initial step of the EDS Operational Concept as specified by the EUR AMHS Manual [5] is outlined in Figure 2 below.

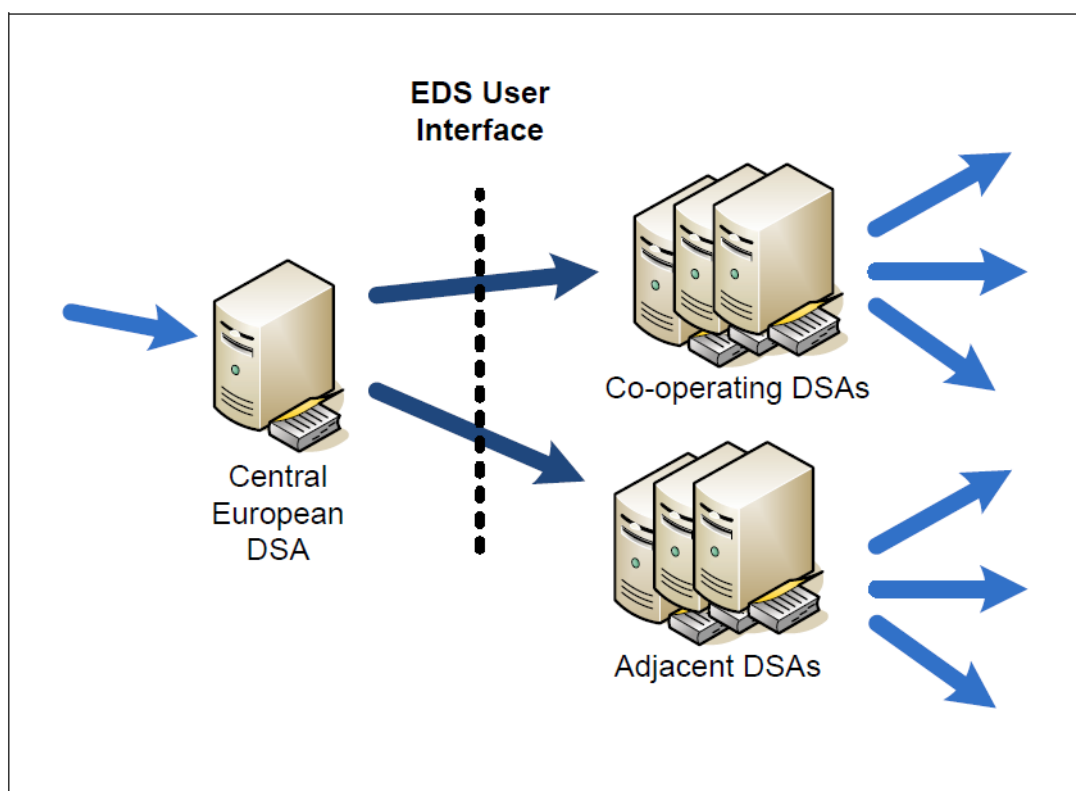


**Figure 2: Flow of Information – Initial step**

2.3.4 The processing of the information provided at the Co-operating and Adjacent DSAs by the Central European DSA and the provision of information to end users is a local matter and considered out of scope.

## **2.4 EDS User Interface**

2.4.1 The focus of this document is the EDS user interface between the Central European DSA and the EDS users, as outlined in Figure 3. In this context, EDS users are identified as the users of the centralised service provided by the Central European DSA, as a European Common Facility. In other words, this document is concerned with aspects of the interface between the Central European DSA and the Co-operating and Adjacent DSAs.



*Figure 3: EDS User Interface*

## 3 EDS Interface Protocols

### 3.1 General

3.1.1 This chapter recaps the X.500 protocols deployed between the Central European DSA, and Co-operating and Adjacent DSAs, further referred to as peer DSAs.

3.1.2 The EDS Operational Concept identifies the Directory Information Shadowing Protocol (DISP) and the Directory System Protocol (DSP) for exchange of information between peer DSAs.

### 3.2 Directory Information Shadowing Protocol

3.2.1 The Directory Information Shadowing Protocol (DISP) specified in ISO/IEC 9594-9 [11] supports shadowing between two DSAs where a copy of a sub-tree of the Directory Information Tree (DIT) is made available at another DSA. Shadowing is the standard way of replication for X.500-based Directory services. Following the proposal introduced by the AMHS CS [7], the EDS Operational Concept recommends DISP for the purpose of distribution of information from the Central European DSA to Co-operating and Adjacent DSAs.

3.2.2 A shadowing agreement needs to be established between the involved parties, which defines a unique identifier and version, as well as other parameters such as the unit of replication and the update mode.

3.2.3 When DISP is used for distribution of information within EDS, the Central European DSA always acts as the supplier of the information and the Co-operating or Adjacent DSA always takes the role of the consumer of the information. On change of information the Central European DSA initiates shadowing providing an incremental update of the information that has changed. Prior to perform shadowing, the Central European DSA establishes an application association as necessary using the operation *dSAShadowBind* which corresponds to the operation *dSABind*, if not already established as a result of a previous action. Shadowing is performed through the shadowing operations *coordinateShadowUpdate* and *updateShadow*.

### 3.3 Directory System Protocol

3.3.1 The Directory System Protocol (DSP) specified in ISO/IEC 9594-5 [11] supports communications between two DSAs, where a request for information cannot or at least cannot fully be resolved by one DSA and is forwarded to another DSA.

3.3.2 Taking into account available products, implementations and the fact that DISP was not mandated by ICAO Doc 9880 Part IV [3] or the AMHS CS [7], the EDS Operational Concept allows for other, non-standard or proprietary means of bulk retrieval from the Central European DSA using chaining by DSP.

3.3.3 When DSP is used to retrieve information from the Central European DSA, the Co-operating or Adjacent DSA acts as the initiator of uni-chained interrogation operations such as *chainedread* and *chainedlist*. Bulk retrieval needs to be initiated by a specialised Directory



User Agent (DUA), which initiates the chained operation by emitting interrogation operations to the local, Co-operating or Adjacent DSA. Prior to perform chained interrogation operations the Co-operating or Adjacent DSA establishes an application association by means of the operation *dSABind*, if not already established as a result of a previous action.

3.3.4 Whereas shadowing is the primary means for distribution of information within EDS (push distribution), States and Organisations might implement specialised DUAs in order to indirectly retrieve the information from the Central European DSA through their local Co-operating or Adjacent DSAs (pull distribution). It is not the intention to retrieve the information on a case by case basis, but to retrieve a full copy of relevant information using chained operations of DSP.

## 4 Setup of the EDS Systems

### 4.1 Prerequisites

4.1.1 This section establishes basic conformance requirements that are considered prerequisites for interoperability and validation testing.

4.1.2 A Co-operating or Adjacent DSA is an implementation of an X.500 Directory System Agent (DSA). Co-operating and Adjacent DSA have to implement the profiles identified by ICAO Doc 9880 Part IV [3] and the AMHS Community Specification [7]. Support of DISP is strongly recommended, however not mandated.

4.1.3 *Conformance Requirement:* An implementation of a Co-operating or Adjacent DSA shall conform to ISO/IEC 9594 set of standards [11] and the profiles defined by ICAO Doc 9880 Part IV [3] and the AMHS Community Specification [7].

4.1.4 In the EDS, peer DSAs make use of the Directory Information Shadowing Protocol (DISP) or the Directory System Protocol (DSP) as already outlined in chapter 3. These protocols in turn are based on the 7-layer ISO Open Systems Interconnection (OSI) model as given in ISO/IEC 7498-1 [10]. In case DISP is not supported by an implementation, distribution of information could be achieved through DSP requiring some additional effort for the development of a specialised DUA implementing pull distribution.

4.1.5 *Conformance Requirement:* The implementation of the Directory Information Shadowing Protocol (DISP) by a Co-operating or Adjacent DSA shall conform to ISO/IEC 9594-9 [11] supporting simple authentication and on-change, supplier-initiated, total and incremental updates.

4.1.6 *Conformance Requirement:* The implementation of the Directory System Protocol (DSP) by a Co-operating or Adjacent DSA shall conform to the ISO/IEC 9594-5 [11] supporting simple authentication and chaining of type cross reference.

4.1.7 EDS follows the principles of IP-based networking set out in the ICAO Doc 9896 [4] and ICAO EUR Doc 020 (EUR AMHS Manual) [5]. At the transport layer, deviating from the ISO/OSI model, EDS peer communication deploys the Transmission Control Protocol (TCP) and the Internet Protocol version 4 (IPv4) by providing an ISO transport service on top of TCP according to RFC 1006 [13]. In support of future use of the Internet Protocol version 6 (IPv6), provisions for an ISO transport mapping on top of TCP according to RFC 2126 [14] is recommended.

4.1.8 *Conformance Requirement:* A Co-operating or Adjacent DSA shall implement the ISO transport service on top of TCP (transport mapping) in conformance with RFC 1006 [13] for IPv4. In case the implementation supports IPv6, the implementation of the transport mapping shall conform to RFC 2126 [14].

*Note.— The use of TCP/IP enables the deployment of a wide range of commercial Directory products and use of existing, common network infrastructure.*

4.1.9 The Directory schema of EDS is defined in Appendix G-B to ICAO EUR Doc 020 (EUR AMHS Manual) [5]. The implementation needs to support the relevant basic, the ATN-specific and the EDS-specific attribute types and object classes.

4.1.10 *Conformance Requirement:* The Directory schema implemented by Co-operating and Adjacent DSAs shall conform to the EDS schema defined in Appendix G-B to ICAO EUR Doc 020 (EUR AMHS Manual).

4.1.11 In order to access the information at local Co-operating and Adjacent DSAs for testing, validation and checking purposes, it is strongly recommended that implementations incorporate an Operational Personnel DUA as specified in ICAO Doc 9880 Part IV [3] as a minimum.

4.1.12 In terms of the underlying network there are two options to establish communications with the Central European DSA.

4.1.13 It is noted that communications between EDS peers occur in bursts during distribution of information.

#### Pan-European Network Service

4.1.14 The preferred option for the underlying network is the Pan-European Network Service (PENS). PENS is an international ground/ground communications infrastructure jointly implemented by EUROCONTROL and the European air navigation service providers (ANSPs) in order to meet existing and future air traffic communication requirements. PENS provides a common IP-based network service across the European region. EDS makes use of the following PENS VPNs:

- ANSP Test Messaging VPN, for validation and test purposes
- ANSP Operational Messaging VPN, for operations

#### Virtual Private Network/Internet

4.1.15 A site to site Virtual Private Network (VPN) established over the public Internet is the secondary option which could be made available after mutual agreement. The establishment of a VPN is based on Internet Protocol Security (IPSec) and requires the negotiation of additional VPN-related parameters between the parties involved.

4.1.16 For communications over the Internet (VPN) a bandwidth of 64 Kbit/s is proposed as a minimum.

## **4.2 Peers**

4.2.1 Within EDS, identification of a DSA is achieved by its Distinguished Name (DN). EDS requires only simple authentication which implies the use of passwords. In other words, each communication peer is authenticated by its DN and password. The DNs and passwords form the credentials used in the bind operations; operation *dSABind* in case of DSP and operation *dSAShadowBind* in case of DISP.

4.2.2 Furthermore a presentation address is associated with each DSA in order to address the application entity of the communication peer in the network. A presentation address is composed of the following:

- Presentation selector;
- Session selector;
- Transport selector; and
- Network address.

4.2.3 In the EDS it is proposed to omit presentation, session and transport selectors, i.e. the selectors are not present in the presentation address. The network address is composed of the IP address and the TCP port. Depending on the network firewalls performing network address translation (NAT) the IP address needs to be adjusted accordingly. TCP port 102 is well known for ISO services on top of TCP, but other TCP ports may be used depending on local requirements.

4.2.4 Table 1 provides an overview on the parameters required to setup peers. This table could be used to bilaterally agree on and exchange the peer parameters.

Parameter	Central European DSA	Co-operating or Adjacent DSA
Distinguished Name		
Password		
Presentation Selector		
Session Selector		
Transport Selector		
Network Address TCP Port IPv4 Address		

**Table 1: Peer Parameters**

4.2.5 The parameters of the Central European DSA are provided by the Central Administrator. The operational facility is known by the value  $O=EUXX$ .

4.2.6 The Operator of a Co-operating or Adjacent DSA shall define the related parameters in accordance with the provisions given below, except for the password which is provided by the Central Administrator in order to ensure a minimum password complexity.

4.2.7 The distinguished name of the operational DSAs shall be represented by the attribute type *organization* taking the value of the location indicator of the respective COM Centre, e.g.  $O=EDDD$ .

4.2.8 The presentation, session and transport selectors are proposed to be absent. Values may be defined by mutual agreement.

4.2.9 The network address consists of the TCP port and the IPv4 address. The potential range of IP addresses is restricted by the common underlying network infrastructure in use. Within the network of the State or Organisation operating the Co-operating or Adjacent DSA the agreed TCP port and IP address may be mapped to a different IP address and different TCP port in line with local requirements.

*Note.— The detailed way and particular steps required to configure the peer parameters depend on the implementation.*

#### Shadowing

4.2.10 Shadowing using DISP is the preferred way for distribution of information. EDS makes use of supplier initiated, incremental updates triggered automatically on change. Further details on shadowing using DISP are given in section 3.2.

4.2.11 Before shadowing takes place between two DSAs, an agreement covering the terms of the shadowing is required. The shadowing agreement established off-line between the supplier and the consumer defines:

- Agreement identifier: Unique identifier and version;
- Unit of replication; and
- Update mode.

4.2.12 Table 2 provides an overview of the parameters required to setup a shadowing agreement. This table could be used to bilaterally agree on and exchange the shadowing parameters.

Parameter	Central European DSA	Co-operating or Adjacent DSA
Identifier	See below	
Version	0 (See also below)	
Role	Supplier	Consumer
Unit of replication	O=European-Directory	
Update Mode	Supplier Initiated, On Change	
Access Point	Central European DSA (See Peers)	

**Table 2: Shadowing Parameters**

4.2.13 The parameter *identifier* of the agreement is required to be unique with regard to the pair of peer DSAs. The Central Administrator provides the value of the parameter *identifier*. The value of the parameter *version* is initially set to zero. In the unlikely case of a modification of the agreement, the involved parties might agree to increment the parameter *version*. In case of a modification of the agreement, the Central European DSA performs a full update.

*Note.– The detailed way and particular steps required to configure shadowing depend on the implementation.*

### Chaining

4.2.14 Chaining using DSP is a secondary means for distribution of information. The Co-operating or Adjacent DSA triggers this activity as given in section 3.3.

4.2.15 In order to setup chaining, the Co-operating or Adjacent DSA has to define a knowledge reference. A knowledge reference associates a distinguished name in the DIT, including the sub-tree below, with a DSA holding the entry.

4.2.16 In order to allow a Co-operating or Adjacent DSA to perform chained operations, a knowledge reference is required. The knowledge reference of type subordinate reference associates the entry with the distinguished name O=European-Directory with the Central European DSA.

4.2.17 Table 3 provides an overview on the parameters required to setup a knowledge reference.

Parameter	Co-operating or Adjacent DSA
Content Prefix	O=European-Directory
Type	Cross Reference
Access Point	Central European DSA (See Peers)

**Table 3: Knowledge Reference Parameters**

*Note.*— The way and steps required to configure chaining depend on the implementation.

## 4.3 Users

4.3.1 Although the EDS user interface describes the relation between the Central European DSA and the Co-operating or Adjacent DSAs, this section addresses users of the EDS accessing the information stored within the EDS through a Directory User Agent connected to the local DSAs.

4.3.2 Within EDS, identification of users is achieved by Distinguished Names (DNs). EDS requires only simple authentication which implies the use of passwords. In other words, each user is authenticated by its DN and password. The DNs and passwords form the credentials used in the *directoryBind* operation. Prior to perform any DAP operation, users have to authenticate against EDS using the *directoryBind* operation. As a matter of principle, users always bind to their local Co-operating, Adjacent or a subordinate DSA.

4.3.3 Table 4 provides an overview on the parameters required to setup users. This table could be used to exchange user parameters.

Parameter	User
Distinguished Name	See below
Password	See below

**Table 4: User Parameters**

4.3.4 The Operational Concept of EDS identifies two types of users:

- Co-operating and Adjacent Operators; and
- End users.

4.3.5 Access to EDS by end users being either a human or system users is restricted to interrogation operations to the operational area with the distinguished name O=European-Directory; OU=Operational. End users are managed by the respective Directory Management Domain (DMD) to which they are allocated.

*Note.*— The detailed way and particular steps required to configure end user is a local matter of the Co-operating or Adjacent DSA and depend on the implementation deployed as Co-operating or Adjacent DSA.

4.3.6 Co-operating and Adjacent Operators have to register with the Central European DSA, as – at a later stage – these users will have the right to perform modification operations to the background area of EDS. After successful registration, the Central Administrator creates a user entry for the respective Co-operating or Adjacent Operator, and provides him with his

DN and his initial password. Co-operating and Adjacent Operators may perform interrogation and modification operation on their own entry, allowing them to change their password.

4.3.7 Co-operating and Adjacent Operators can also perform interrogation operations on the pre-operational area. Access to the pre-operational area enables Co-operating and Adjacent Operators to prepare the information for legacy, not directory-aware implementations. Preparation of information is a local matter depending on the implementation of the legacy systems.

4.3.8 It is noted, that in the intermediate and final step of EDS, Co-operating Operators can perform modification operations to their data in the background area of EDS, located at the Central European DSA only. The background area is not utilised in the initial step of EDS.

## 5 Trouble Shooting

### 5.1 General

5.1.1 This chapter provides considerations and basic advice for the purpose of trouble shooting.

5.1.2 Due to the complexity and distributed nature of the overall system there are several potential reasons in case communication between the Central European DSA and a Co-operating or Adjacent DSA is not working as expected. This chapter lists a number of sources for malfunction and tools in support of the analysis.

5.1.3 The listings and examples in this chapter do not claim to be complete, however provide starting points and a selection of tools that may be useful.

### 5.2 Sources of Malfunction

5.2.1 A failure to establish an association through a bind operation or the disruption of service between the Central European DSA and the Co-operating or Adjacent DSA is getting visible only in case one of the involved entities tries to establish communication for the exchange of information. The bind operation or a subsequent shadowing or chaining operation could fail.

5.2.2 Basically two scenarios need to be considered in case of failures:

- Establishment of association (especially after setup):
  - The association between the Central European DSA and the Co-operating or - Adjacent DSA could not be established.
- Exchange of information:
  - An operation following the successful bind operation fails.

5.2.3 The establishment of an association through the bind operations *dSABind* (for DSP) or *dSAShadowBind* (for DISP) could fail for the following main reasons (bottom-up):

- A device is disconnected.  
After installation a device such as a server, router, firewall, etc. might not be properly connected to the network. Ensure that all devices involved in end-to-end communication are properly connected to the network(s).
- A device is not running properly.  
The start-up of a device might fail. Ensure that all devices involved in end-to-end communication are up and running.
- VPN setup is not aligned or inaccurate.  
In case a VPN is used, the VPN setup is an essential prerequisite for end-to-end communication. Ensure that the VPN is configured in accordance with the agreed parameters.
- Network security system blocks TCP port or IP address.  
A network security system such as a security appliance, firewall or proxy prevents end-to-end communication by blocking one of the TCP ports or IP addresses. Ensure that



any involved network security system is configured to support the TCP ports and IP addresses listed in Table 1.

- Mapping of TCP port or translation of IP address is not aligned or inaccurate.  
In case mapping of TCP port or translation of IP address appears, the configuration of involved devices have to be configured in accordance with the mapping of TCP ports and translation of IP addresses. Ensure that any mapping of TCP ports or translation of IP addresses is reflected in the communication setup of the involved components.
- The configuration of DSAs is not aligned or inaccurate.  
The peer DSAs have to implement the parameters listed in Table 1 considering any mapping of TCP ports or translation of IP addresses that appear in the local network infrastructure. Ensure that the DSAs are configured using the parameters listed in Table 1 and that any mapping of TCP ports or translation of IP addresses is considered in local DSA setup. Ensure that the remote DSA is reachable (e.g. network ping).
- The underlying network infrastructure is (temporarily) unavailable.  
It is not possible to establish end-to-end communication at the network level or a VPN could not be established. Ensure that end-to-end communication is possible and that the other end system is reachable (e.g. network ping).
- The Co-operating or Adjacent DSA is not available.  
The Co-operating or Adjacent DSA does not initiate or does not respond to bind requests. Ensure that the DSA is configured in accordance with the parameters listed in Table 1 taking into account mapping of TCP ports and translation of IP addresses with the local network infrastructure. Ensure that the credentials, i.e. distinguished names and passwords, are configured accordingly.
- The Central European DSA is not available.  
The Central European DSA does not initiate or does not respond to requests. Ensure that the local DSAs are configured in accordance with the parameters listed in Table 2 taking into account mapping of TCP ports and translation of IP addresses with the local network infrastructure. Ensure that the credentials (distinguished name and password) are configured accordingly.

5.2.4 Once an association has been established successfully a subsequent Directory operation such as *coordinateShadowUpdate*, *updateShadow*, *chainedRead*, *chainedList*, etc. could fail for the following main reasons:

- Network or device failed temporarily.  
Even though the bind operation was successful, any subsequent operation could fail as a result of a temporary outage of the network or a device involved in end-to-end communication. Ensure that all components are in operation, that end-to-end communication is possible and that the other end system is reachable (e.g. network ping).
- The Central European DSA, the Co-operating or Adjacent DSA refuses exchange of information.  
In order to perform replication or chained operations the DSAs have to be configured accordingly. Ensure that the configuration for replication and chaining of both DSAs is aligned and in accordance with the parameters listed in Table 2 (replication) or Table 3 (chaining).

## 5.3 Analysis

5.3.1 This section describes approaches for analysis in case of malfunction. The approaches make use of the Directory System Agent, Directory User Agent or tools that may be available

from a second source. The following description does not claim to be complete, but provides starting points.

#### 5.3.1 Directory System Agent

5.3.1.1 Most implementations of Directory System Agents (DSAs) provide a Human-Machine-Interface for configuration and management of the DSA. Using this HMI, it should be possible to determine the operational status of the DSA and to check the communication setup between the peers.

5.3.1.2 Logging information provided in a database or a log file can also serve as input for analysis.

5.3.1.3 Please note the availability of management capabilities and logging information depends on the implementation and on the potential configuration options.

#### 5.3.2 Directory User Agent

5.3.2.1 A simple method to check the operational status of a DSA is to bind to the DSA using a Directory User Agent (DUA).

5.3.2.2 By means of the DUA it is also possible to check the contents of the EDS, i.e. of the contents available at the local DSA.

#### 5.3.3 Network Analysis Tool

5.3.3.1 Using a packet analyser, also known as network analyser, protocol analyser or packet sniffer, it is possible to analyse the data streams across the network, to identify whether communication between the peers appears in general and to analyse in depth the exchanged packets at the different layers up to the application layer. Some tools allow to record or capture packet exchanged over the network.

5.3.3.2 A variety of tools with distinct capabilities, under different licenses and at variable costs is available. The tool of choice should be able to decode packets not only at the transport layer but also up to the application layer and should be able to display the contents of Application PDUs in a human readable form.

5.3.3.3 Wireshark, formerly known as Ethereal, is just one example for a free of cost packet analyser published under the GNU General Public License (GNU GPL). Another non-commercial tool is, for example, tcpdump. There are also several commercial products available.

## 6 Assessment of impact of modifications to the Directory Schema

### 6.1 General

6.1.1 All systems and users involved in the European Directory Service (EDS) have to be aware of the Directory schema in order to enable the exchange and the use of information made available by EDS. The directory schema specifies the objects contained in EDS by a set of data structures and rules. End users often have even to be aware of semantics in order to make use of the information.

6.1.2 Modifications to the Directory schema of EDS can have an impact to the implementations of DSAs and DUAs depending on the approach implemented for handling of the Directory schema. In case the Directory schema is fixed by the implementation (software), modifications to the Directory schema most probably imply adjustments of the implementation. In case the Directory schema is subject to configuration or even supplied by Directory means, modifications of the Directory schema usually have no impact to the implementation. With regard to EDS the Central European DSA, the Co-operating DSA and the Adjacent DSA as well as any generic DUA fall into this category.

6.1.3 Entities interpreting the Directory information semantically, such as users retrieving information by a DUA for further processing, depend on their knowledge on the Directory schema and on the semantics of the information. It is expected that modifications to the Directory schema have a significant impact to those kinds of implementations. However, such implementations are considered as a local matter.

6.1.4 In any case, modifications to the Directory schema need to be well-coordinated. Thus, any future modification of the Directory schema requires:

- a change process as defined in the EUR AMHS Manual and the approval by AST TF based on Change Proposals (CP);
- an assessment on the impact of the proposed modification; and
- a synchronisation of the implementation based on the results of the assessment.

6.1.5 The following sections focus on following aspects:

- Implementations of DSAs,
- Implementations of DUAs,
- Kind of modification.

### 6.2 Implementations of DSAs

6.2.1 The major difference to X.400/AMHS and advantage of X.500 DISP (Directory Information Shadowing Protocol) is the fact that the schema definition is part of the replication. Using DISP the Central European DSA replicates the schema in use prior to replicate the information. With this, Co-operating and Adjacent DSAs can receive the Directory schema by means of DISP.

6.2.2 In order to avoid complicated international procedures for Directory schema modifications (between the Central European DSA and the Co-operating and Adjacent DSAs), it is highly recommended that all DSA implementations support DISP and process the replicated Directory schema.

6.2.3 If there are serious reasons for a DSA implementation to ignore the replicated schema, then this DSA implementation should be tolerant, accepting and storing "unknown" elements on replication or as last resort ignore those elements as a minimum requirement.

6.2.4 Existing Co-operating and Adjacent DSAs in operation make use of the replicated schema definition and are, to the extent possible, prepared for modifications of the schema definition.

6.2.5 Nevertheless, the impact of a proposed modification shall be tested and assessed in the European EDS Test environment before implementing operationally.

### **6.3 Implementations of DUAs**

6.3.1 Implementations of DUAs are by nature more sensitive to modifications of the schema definition than DSAs. It is supposed that most modifications to the schema definition require the adaption of the respective DUA implementation.

6.3.2 Adding new elements should not harm the operation of DUAs. But DUAs might use (system DUA) or display properly (human DUA) new elements only after adaption.

6.3.3 Modifications to the schema definition can impact the implementations of DUAs depending on the kind of modifications.

### **6.4 Kind of Modification**

6.4.1 Taking into account DSA implementations ignoring the replicated schema definition, three basic kinds of modifications to the schema definition need to be looked at:

- potentially harmless,
- potentially harmful, and
- conflicting.

#### **6.4.2 Harmless Modification**

This kind of modification is expected to cause no or very limited issues in implementations of DSAs and DUAs, and thus might be introduced with limited synchronisation and short lead times.

6.4.3 Modifications of this kind are for example:

- Adding a new, structural or auxiliary object class
- Adding a new attribute type based on standard types
- Adding an attribute type to an existing object class
- Adding a new sub-tree or introduce new elements in an existing sub-tree (structure rule)

#### 6.4.4 Harmful Modification

This kind of modification is expected to potentially cause issues in at least some implementations of DSAs and DUAs. It is proposed to avoid such modifications. If necessary, this kind of modification requires co-ordination and synchronisation. A staged approach (introduction of new elements in phase 1, removal of existing elements in phase 2) might be suitable to mitigate the impact.

6.4.5 Modifications of this kind are for example:

- Removal of a (mandatory) attribute type from an object class
- Removal of an object class
- Alteration of a structure rule

#### 6.4.6 Conflicting modifications

This kind of modification is expected to potentially cause serious issues to implementations of DSAs and DUAs. This kind of modification must not occur and shall be replaced by modifications of the first two categories.

6.4.7 Modifications of this kind are for example:

- Modification of the definition of an existing attribute type
- Modification of the type of an existing object class (structural, auxiliary)
- Modification of the OID of an existing attribute type, object class or name form
- Making an optional attribute mandatory and vice versa
- Using non-standard syntaxes and matching rules

Standard syntaxes and matching rules as included in ISO/IEC 9594-6 (ITU-T X.520) are expected to be available in a wide range of commercial off-the-shelf products. Non-standard syntaxes however might not be available in implementations and require modifications to the implementations.

**END of Appendix G-A**



# EUR AMHS Manual

## Appendix G-B

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## References

- [1] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures
- [2] ICAO Doc 9880-AN/466: Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Message Handling Services (ATSMHS), Second Edition – 2016
- [3] ICAO Doc 9880 AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part IV — Directory Services, Security and Identifier Registration, Second Edition, 2016
- [4] ICAO Doc 9896 Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols, 2nd Edition, 2015
- [5] EUR Doc 020, EUR AMHS Manual
- [6] EUR Doc 021, ATS Messaging Management Manual
- [7] EUROCONTROL-SPEC-0136 EUROCONTROL Specification on the Air Traffic Services Message Handling System (AMHS), Edition 2.0, 18/09/2009  
*Note.– Specification's reference published as a Community specification in the Official Journal of the European Union, C 323/24, 31.12.2009.*
- [8] EUROCONTROL European Directory Service (EDS) – Operational Concept – WP2 (Concept), Version 1.0, 26/10/2011
- [9] EUROCONTROL European Directory Service – EDS User Interface Manual – Version 2.0 Edition Date: 11/12/2015, Status: Released Issue, Intended for: AFSG
- [10] EUROCONTROL European Directory Service – AMC-EDS Interface Specification – Version 2.0 Edition Date: 11/12/2015, Status: Released Issue, Intended for : AFSG
- [11] ISO/IEC 7498-1 Information technology – Open Systems Interconnection – Basic Ref. Model: The Basic Model, 2nd Edition, 1994
- [12] ISO/IEC 9594-n Information technology – Open Systems Interconnection – The Directory (multi-part), 5th Edition, 2005  
*Note.– This set of standards was also published as ITU-T X.500 (08/2005) set of standards.*
- [13] ISO/IEC 10021-7 Information technology – Message Handling Systems (MHS) – Interpersonal Messaging System, 2003
- [14] IETF RFC 1006 ISO Transport Service on top of the TCP, Version: 3, May 1987
- [15] IETF RFC 2126 ISO Transport Service on top of TCP (ITOT), March 1997

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# **1 Introduction**

## **1.1 Scope of the Document**

1.1.1 This document describes the information provided by the European Directory Service (EDS). It provides details regarding the structure and elements (Object Classes and associated Attribute Types) used by the Directory Tree in the Central European DSA and as replication in the Co-operating and Adjacent DSAs.

1.1.2 The European Directory Service (EDS) is the implementation of ATN Directory services [3] in Europe. The EDS provides future, directory-based means for collection and distribution of information within Europe and exchange of information with other Regions, States and Organisations.

1.1.3 EUROCONTROL has implemented the Central European DSA for the initial step according to the EDS Operational Concept initially defined in the EUROCONTROL EDS Operational Concept document [8], adopted by the Aeronautical Fixed Services Group (AFSG) and published in Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [5].

1.1.4 In the initial step of the EDS Operational Concept the ATS Messaging Management Centre (AMC) is the single source of information for distribution by EDS. In support of the ATS Message Handling Service (ATSMHS) the AMC supplies related information to the Central European DSA which in turn distributes the information to Co-operating and Adjacent DSAs.

## **1.2 Purpose of the Document**

1.2.1 The purpose of this document is the establishment of a reference document for the information/data provided by the Central European DSA and replicated in the Co-operating and Adjacent DSAs. This document describes the structure of the EDS Directory Information Tree (DIT), the Object Classes (OC) and Attribute Types, the mapping of AMC information to the directory elements and provides guidance for implementation to the parties involved.

1.2.2 The operators, engineering and maintenance personnel of States or Organisations operating Co-operating and Adjacent DSAs are the intended, primary audience of this document. In addition, this document might serve implementers and users as guidance material.

## **1.3 Document Structure**

1.3.1 This document is composed of the following chapters:

- Chapter 1 (this chapter) contains an introduction to the document.
- Chapter 2 gives an overview on EDS content and structure.
- Chapter 3 specifies the Object Classes, Attribute Types and Object Identifiers used.
- Chapter 4 provides the mapping information between AMC and EDS data.
- Chapter 5 gives example of EDS information use.

## **2 EDS Content and Structure**

### **2.1 EDS Content in support of AMHS**

2.1.1 The AMHS as specified in ICAO Doc 9880 Part II [2] is one of the target applications to be supported by the ATN Directory services. Currently, the ATS Messaging Management Centre (AMC) as specified in ICAO EUR Doc 021 (ATS Messaging Management Manual) [6] manages and holds a portion of the information that has been already planned for distribution by Directory services. The information is required for:

- Determination of AMHS O/R addresses of users from their Directory Name (DN) in support of the ATS Message User Agent, the ATS Message Servers and the AFTN/AMHS Gateway;
- Address conversion in support of the AFTN/AMHS Gateway; and
- Determination of AMHS user capabilities in support of the ATS Message User Agent and the AFTN/AMHS Gateway.

2.1.2 Enabling the exchange of ATS messages between AFTN and AMHS, the Message Control and Transfer Unit (MTCU) of the AFTN/AMHS Gateway is in charge of the conversion between AFTN and AMHS addresses and vice versa.

2.1.3 Different capabilities are associated with AMHS users such as maximum length of message content and support of different message content types. In order to make use of only supported elements and to avoid Non-delivery Reports (NDRs) in the AMHS, a message originator in the Extended ATSMHS needs to determine the capabilities of the intended recipients prior to the submission of the AMHS message.

2.1.4 The specification of the ATN Directory as laid down in ICAO Doc 9880 Part IV [3] also covers address information required for AFTN/AMHS address conversion as well as the AMHS user capabilities.

2.1.5 On a Regional basis the Aeronautical Fixed Services Group (AFSG) defined in Appendix B to the ICAO EUR Doc 020 (EUR AMHS Manual) [5] the European ATS Messaging Service Profile which among other things further refines the capabilities of AMHS users.

2.1.6 In addition to information specified by ICAO Doc 9880, the ATS Messaging Management Centre (AMC) also manages among others routing information in support of the AFTN, CIDIN and ATS Message Handling Service (ATSMHS).

2.1.7 The EDS includes the information outlined above for distribution by the Central European DSA as follows:

- AMHS User Address Book; and
- Routing information of EUR Region.

### **2.2 Structure of EDS**

2.2.1 The EDS Operational Concept merges two approaches for management and distribution of relevant information. The specification of the ATN Directory as specified by

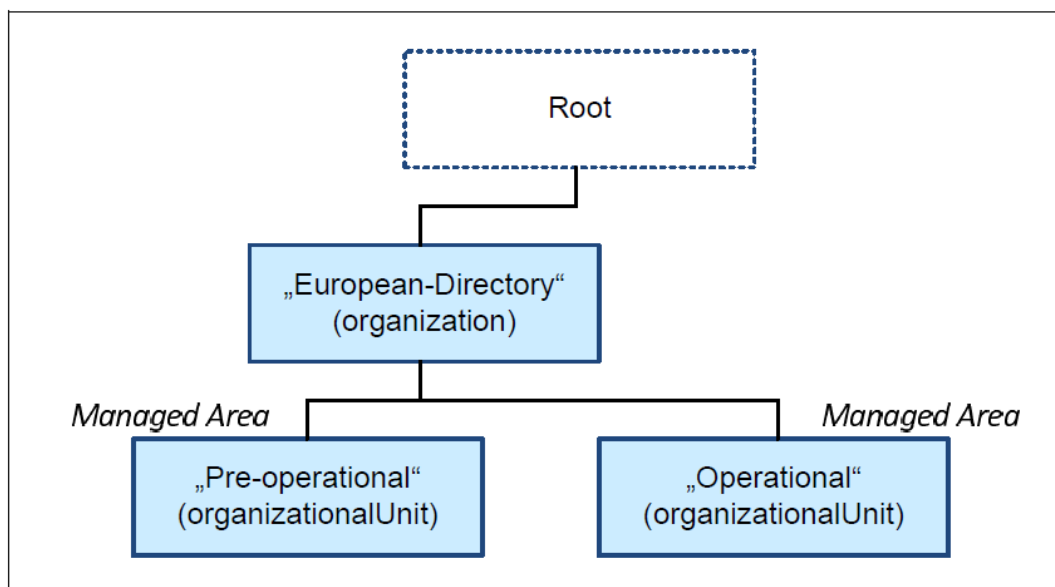
ICAO Doc 9880 Part IV [3] describing an online service and the offline management of information as specified in ICAO EUR Doc 021 (ATS Messaging Management Manual) [6].

2.2.2 In the initial step of EDS, the AMC manages and provides the relevant information on a periodic basis to EDS. The AMC remains the single source of information. The Central European DSA in turn distributes this information as a second means. There is no modification of information within EDS in the initial step.

2.2.3 Within ATS Messaging Management, there are two areas for distribution of information: the Pre-operational and the Operational Area. EDS adopted these areas and allocated them as Managed Areas directly below the EDS base entry which in turn is allocated directly below the virtual root.

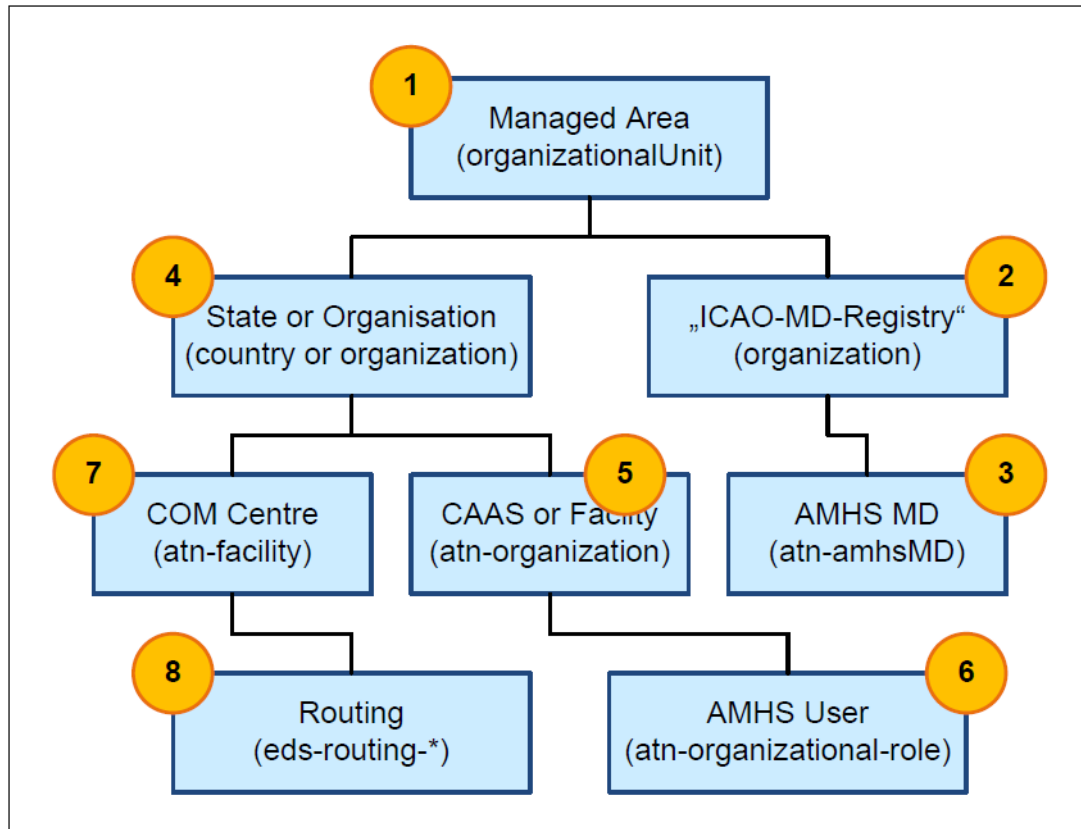
2.2.4 The EDS base entry is of the object-class *organization*. The naming attribute of type *organizationName* takes the value “European-Directory”. The managed areas are represented by entries of standard object class *organizationalUnit*. The naming attributes of type *organizationalUnitName* take the value of the respective managed area, i.e. the areas are identified as “Pre-operational” and “Operational”. Version information made available by AMC is associated with each Managed Area through the auxiliary object class *eds-collective-version* which allows for distinction of information belonging to two different cycles.

2.2.5 The general target structure for EDS given in Figure 1 shows the allocation of the Managed Areas below the EDS base entry.



**Figure 1: EDS Base Entry and Managed Areas**

2.2.6 The EDS sub-schema of the pre-operational and operational areas is structured identically as outlined in Figure 2.



**Figure 2: EDS Target Structure of Managed Areas**

2.2.7 Figure 2 shows the allocation of the respective managed area (1), the ICAO MD Registry (2) including subordinate entries (3), States and Organisations (4), CAAS mapping information facilities (5), AMHS users (6), COM Centres (7) and associated routing information (8).

2.2.8 Derived from the ICAO Doc 9880 Part IV [3], the structure of EDS managed areas as given in Figure 2 holds the following information:

- AMHS MD Register (2, 3);
- CAAS mapping information (5);
- AMHS user address information (6);
- AMHS user capabilities (6); and
- Routing information (7, 8).

2.2.9 The detailed description and representation by object classes of the EDS information mentioned above is provided in the following chapters.

## 3 Object Classes

### 3.1 Basic Object Classes

3.1.1 ISO/IEC 9594-7, a standard of the X.500 series [12], contains a number of basic object classes. The definition of ATN-specific object classes in ICAO Doc 9880 Part IV [3] and the definition of EDS-specific object classes in section 3.3 refer to these basic object classes.

### 3.2 ATN-specific object classes

3.2.1 This section lists the ATN-specific object classes in support of the ATSMHS which refer to the definition provided by ICAO Doc 9880 Part IV [3]. In case of discrepancies the subsequent definition shall prevail.

3.2.2 The ATN-specific object class ***atn-organization*** shall be defined by the ASN.1 syntax:

```
atn-organization OBJECT-CLASS ::= {
    SUBCLASS OF      { organization }
    MUST CONTAIN     { atn-facility-name }
    MAY CONTAIN      { atn-per-certificate |
                     atn-der-certificate }
    ID               id-oc-atn-Organization }
```

3.2.3 The ATN-specific object class ***atn-amhsMD*** shall be defined by the ASN.1 syntax:

```
atn-amhsMD OBJECT-CLASS ::= {
    SUBCLASS OF      { top }
    MUST CONTAIN     { commonName |
                     atn-global-domain-identifier |
                     atn-icao-designator |
                     atn-amhs-addressing-scheme }
    MAY CONTAIN      { atn-amhsMD-naming-context }
    ID               id-oc-atn-amhsMD }
```

3.2.4 The ATN-specific object class ***atn-organizational-role*** shall be defined by the ASN.1 syntax:

```
atn-organizational-role OBJECT-CLASS ::= {
    SUBCLASS OF      { organizationalRole }
    MUST CONTAIN     { }
    MAY CONTAIN      { atn-per-certificate |
                     atn-der-certificate }
    ID               id-oc-atn-OrganizationalRole }
```

3.2.5 The ATN-specific object class ***atn-amhs-user*** shall be defined by the ASN.1 syntax:

```
atn-amhs-user OBJECT-CLASS ::= {
    SUBCLASS OF      { top }
    KIND             AUXILIARY
    MUST CONTAIN     { mhs-or-addresses }
```

	atn-ipm-heading-extensions
	atn-amhs-direct-access }
MAY CONTAIN	{ mhs-maximum-content-length
	mhs-deliverable-content-types
	mhs-acceptable-eits
	mhs-exclusively-acceptable-eits
	atn-maximum-number-of-body-parts
	atn-maximum-text-size
	atn-maximum-file-size
	mhs-message-store-dn
	atn-per-certificate
	atn-der-certificate
	atn-use-of-amhs-security
	atn-use-of-directory
	atn-group-of-addresses
	atn-AF-address }
ID	id-oc-atn-AmhsUser }

*Note.— Auxiliary object classes such as the object class **atn-amhs-user** can be associated with structural object classes; however they are not suitable to structure the DIT.*

3.2.6 The ATN-specific object class **atn-facility** shall be defined by the ASN.1 syntax:

```

atn-facility OBJECT-CLASS ::= {
    SUBCLASS OF      { top }
    MUST CONTAIN     { atn-facility-name }
    MAY CONTAIN      { atn-per-certificate |
                     atn-der-certificate }
    ID               id-oc-atn-Facility }

```

### 3.3 EDS-specific object classes

3.3.1 The EDS-specific object class **eds-collective-version** shall be defined by the ASN.1 syntax:

```

eds-collective-version OBJECT-CLASS ::= {
    SUBCLASS OF      { top }
    KIND             AUXILIARY
    MUST CONTAIN     { eds-airac-version |
                     eds-routing-aftn-version |
                     eds-routing-cidin-version |
                     eds-routing-amhs-version }
    ID               id-oc-eds-collective-version }

```

3.3.2 The EDS-specific object class **eds-amhs-user** shall be defined by the ASN.1 syntax:

```

eds-amhs-user OBJECT-CLASS ::= {
    SUBCLASS OF      { atn-amhs-user }
    KIND             AUXILIARY
    MUST CONTAIN     { }
    MAY CONTAIN      { eds-type-of-user |    -- extends atn-group-of-addresses
                     eds-external-user }
    ID               id-oc-eds-amhs-user }

```



3.3.3 The EDS-specific object class ***eds-routing-element*** shall be defined by the ASN.1 syntax:

```
eds-routing-element OBJECT-CLASS ::= {
    SUBCLASS OF      { top }
    KIND              ABSTRACT
    MUST CONTAIN      { }
    MAY CONTAIN       { eds-routing-existing-main-protocol |
                        eds-routing-existing-main-com |
                        eds-routing-existing-alt-protocol |
                        eds-routing-existing-alt-com |
                        eds-routing-existing-coordination |
                        eds-routing-planned-main-protocol |
                        eds-routing-planned-main-com |
                        eds-routing-planned-alt-protocol |
                        eds-routing-planned-alt-com |
                        eds-routing-planned-coordination |
                        eds-routing-planned-event |
                        eds-routing-planned-date |
                        eds-routing-planned-description }
    ID                id-oc-eds-routing-element }
```

*Note.*— The object class ***eds-routing-element*** serves as an object superclass.

3.3.4 The EDS-specific object class ***eds-routing-aftn*** shall be defined by the ASN.1 syntax:

```
eds-routing-aftn OBJECT-CLASS ::= {
    SUBCLASS OF      eds-routing-element
    MUST CONTAIN      { eds-routing-aftn-indicators }
    MAY CONTAIN       { }
    ID                id-oc-eds-routing-aftn }
```

3.3.5 The EDS-specific object class ***eds-routing-cidin*** shall be defined by the ASN.1 syntax:

```
eds-routing-cidin OBJECT-CLASS ::= {
    SUBCLASS OF      eds-routing-element
    MUST CONTAIN      { eds-routing-cidin-indicators }
    MAY CONTAIN       { }
    ID                id-oc-eds-routing-cidin }
```

3.3.6 The EDS-specific object class ***eds-routing-amhs*** shall be defined by the ASN.1 syntax:

```
eds-routing-amhs OBJECT-CLASS ::= {
    SUBCLASS OF      eds-routing-element
    MUST CONTAIN      { eds-routing-amhs-addresses }
    MAY CONTAIN       { eds-routing-amhs-comment }
    ID                id-oc-eds-routing-amhs }
```

3.3.7 The EDS-specific object class ***eds-unit*** shall be defined by the ASN.1 syntax:

```
eds-unit OBJECT-CLASS ::= {
    SUBCLASS OF      { top }
    KIND              AUXILIARY
    MAY CONTAIN       { eds-caas-entry }
```

ID id-oc-eds-unit }

3.3.8 The EDS-specific object class **eds-heartbeat** shall be defined by the ASN.1 syntax:

```
eds-heartbeat OBJECT-CLASS ::= {
    SUBCLASS OF      { top }
    KIND              AUXILIARY
    MUST CONTAIN     { eds-timestamp
                      eds-frequency }      -- interval in minutes
    ID                id-oc-eds-heartbeat }
```

## 3.4 Attribute Types

### 3.4.1 Basic Attribute Types

3.4.1.1 ISO/IEC 9594-6, a standard of the X.500 series [12], contains a number of basic attribute types. The definition of ATN-specific attribute types in ICAO Doc 9880 Part IV [3] and the definition of EDS-specific attribute types in section 3.4.3 refer to these basic attribute types.

### 3.4.2 ATN-specific Attribute Types

3.4.2.1 This section lists the ATN-specific attribute types in support of the ATSMHS which refer to the definition provided by ICAO Doc 9880 Part IV [3]. In case of discrepancies the subsequent definition shall prevail.

3.4.2.2 The ATN-specific attribute type **atn-facility-name** shall be defined by the ASN.1 syntax:

```
atn-facility-name ATTRIBUTE ::= {
    WITH SYNTAX      PrintableString (SIZE (1..64))
    ID                id-at-atn-facilityName }
```

3.4.2.3 The ATN-specific attribute type **atn-global-domain-identifier** shall be defined by the ASN.1 syntax:

```
atn-global-domain-identifier ATTRIBUTE ::= {
    SUBTYPE OF      mhs-or-addresses
    SINGLE VALUE     TRUE
    ID                id-at-atn-global-domain-identifier }
```

3.4.2.4 The ATN-specific attribute type **atn-icao-designator** shall be defined by the ASN.1 syntax:

```
atn-icao-designator ATTRIBUTE ::= {
    WITH SYNTAX      PrintableString (SIZE (2..7))
    ID                id-at-atn-icao-designator }
```

3.4.2.5 The ATN-specific attribute type **atn-amhs-addressing-scheme** shall be defined by the ASN.1 syntax:

```
atn-amhs-addressing-scheme ATTRIBUTE ::= {
    WITH SYNTAX      INTEGER {
                      xf (0),
```

	caas (1), other (2) }
SINGLE VALUE	TRUE
ID	id-at-atn-Amhs-addressing-scheme }

3.4.2.6 The ATN-specific attribute type *atn-amhsMD-naming-context* shall be defined by the ASN.1 syntax:

```
atn-amhsMD-naming-context ATTRIBUTE ::= {
    WITH SYNTAX      PrintableString (SIZE (1..64))
    SINGLE VALUE     TRUE
    ID               id-at-atn-AmhsMD-naming-context }
```

3.4.2.7 The ATN-specific attribute type *atn-ipm-heading-extensions* shall be defined by the ASN.1 syntax:

```
atn-ipm-heading-extensions ATTRIBUTE ::= {
    WITH SYNTAX      BOOLEAN
    ID               id-at-atn-ipm-heading-extensions }
```

3.4.2.8 The ATN-specific attribute type *atn-amhs-direct-access* shall be defined by the ASN.1 syntax:

```
atn-amhs-direct-access ATTRIBUTE ::= {
    WITH SYNTAX      BOOLEAN
    ID               id-at-atn-amhs-direct-access }
```

3.4.2.9 The ATN-specific attribute type *atn-per-certificate* shall be defined by the ASN-1 syntax:

```
atn-per-certificate ATTRIBUTE ::= {
    WITH SYNTAX      OCTET STRING
    ID               id-at-atn-PerCertificate }
```

3.4.2.10 The ATN-specific attribute type *atn-der-certificate* shall be defined by the ASN-1 syntax:

```
atn-der-certificate ATTRIBUTE ::= {
    WITH SYNTAX      Certificate
    ID               id-at-atn-DerCertificate }
```

3.4.2.11 The ATN-specific attribute type *atn-AF-address* shall be defined by the ASN.1 syntax:

```
atn-AF-address ATTRIBUTE ::= {
    WITH SYNTAX      PrintableString (SIZE (8))
    SINGLE VALUE     TRUE
    ID               id-at-atn-AF-address }
```

3.4.2.12 The ATN-specific attribute type *atn-maximum-number-of-body-parts* shall be defined by the ASN.1 syntax:

```
atn-maximum-number-of-body-parts ATTRIBUTE ::= {
    WITH SYNTAX      INTEGER
    SINGLE VALUE     TRUE
    ID               id-at-atn-maximum-number-of-body-parts }
```

3.4.2.13 The ATN-specific attribute type *atn-maximum-text-size* shall be defined by the ASN.1 syntax:

```

atn-maximum-text-size ATTRIBUTE ::= {
    WITH SYNTAX      ContentLength
    SINGLE VALUE     TRUE
    ID               id-at-atn-maximum-text-size }

```

3.4.2.14 The ATN-specific attribute type *atn-maximum-file-size* shall be defined by the ASN.1 syntax:

```

atn-maximum-file-size ATTRIBUTE ::= {
    WITH SYNTAX      ContentLength
    SINGLE VALUE     TRUE
    ID               id-at-atn-maximum-file-size }

```

3.4.2.15 The ATN-specific attribute type *atn-use-of-amhs-security* shall be defined by the ASN.1 syntax:

```

atn-use-of-amhs-security ATTRIBUTE ::= {
    WITH SYNTAX      BOOLEAN
    SINGLE VALUE     TRUE
    ID               id-at-atn-use-of-amhs-security }

```

3.4.2.16 The ATN-specific attribute type *atn-use-of-directory* shall be defined by the ASN.1 syntax:

```

atn-use-of-directory ATTRIBUTE ::= {
    WITH SYNTAX      BOOLEAN
    SINGLE VALUE     TRUE
    ID               id-at-atn-use-of-directory }

```

3.4.2.17 The ATN-specific attribute type *atn-group-of-addresses* shall be defined by the ASN.1 syntax:

```

atn-group-of-addresses ATTRIBUTE ::= {
    WITH SYNTAX      BOOLEAN
    SINGLE VALUE     TRUE
    ID               id-at-atn-group-of-addresses }

```

### **3.4.3 EDS-specific Attribute Types**

3.4.3.1 This section provides the definition of EDS-specific attribute types.

3.4.3.2 The EDS-specific attribute type *eds-airac-version* shall be defined by the ASN.1 syntax:

```

eds-airac-version ATTRIBUTE ::= {
    WITH SYNTAX      PRINTABLESTRING
    SINGLE VALUE     TRUE
    ID               id-at-eds-airac-version }

```

3.4.3.3 The EDS-specific attribute type *eds-routing-aftn-version* shall be defined by the ASN.1 syntax:

```

eds-routing-aftn-version ATTRIBUTE ::= {
    WITH SYNTAX      PRINTABLESTRING
    SINGLE VALUE     TRUE
    ID               id-at-eds-routing-aftn-version }

```

3.4.3.4 The EDS-specific attribute type *eds-routing-cidin-version* shall be defined by the

ASN.1 syntax:

```
eds-routing-cidin-version ATTRIBUTE ::= {
    WITH SYNTAX      PRINTABLESTRING
    SINGLE VALUE     TRUE
    ID               id-at-eds-routing-cidin-version }
```

3.4.3.5 The EDS-specific attribute type *eds-routing-amhs-version* shall be defined by the ASN.1 syntax:

```
eds-routing-amhs-version ATTRIBUTE ::= {
    WITH SYNTAX      PRINTABLESTRING
    SINGLE VALUE     TRUE
    ID               id-at-eds-routing-amhs-version }
```

3.4.3.6 The EDS-specific attribute type *eds-type-of-user* shall be defined by the ASN.1 syntax:

```
eds-type-of-user ATTRIBUTE ::= {
    WITH SYNTAX      INTEGER {
                                elementary-address (0),
                                group-of-addresses (1),
                                distribution-list (2) }
    SINGLE VALUE     TRUE
    ID               id-at-eds-type-of-user }
```

3.4.3.7 The EDS-specific attribute type *eds-external-user* shall be defined by the ASN.1 syntax:

```
eds-external-user ::= {
    WITH SYNTAX      BOOLEAN
    SINGLE VALUE     TRUE
    ID               id-at-eds-external-user }
```

3.4.3.8 The EDS-specific attribute type *eds-routing-aftn-indicators* shall be defined by the ASN.1 syntax:

```
eds-routing-aftn-indicators ATTRIBUTE ::= {
    WITH SYNTAX      PRINTABLESTRING (SIZE (1..8))
    ID               id-at-eds-routing-aftn-indicators }
```

3.4.3.9 The EDS-specific attribute type *eds-routing-cidin-indicators* shall be defined by the ASN.1 syntax:

```
eds-routing-cidin-indicators ATTRIBUTE ::= {
    WITH SYNTAX      PRINTABLESTRING (SIZE (1..8))
    ID               id-at-eds-routing-cidin-indicators }
```

3.4.3.10 The EDS-specific attribute type *eds-routing-amhs-addresses* shall be defined by the ASN.1 syntax:

```
eds-routing-amhs-addresses ATTRIBUTE ::= {
    SUBTYPE OF      mhs-or-addresses
    -- as per A.2.13 of ISO/IEC 10021-2:2003
    ID               id-at-eds-routing-amhs-addresses }
```

3.4.3.11 The EDS-specific attribute type *eds-routing-network* shall be defined by the ASN.1 syntax:

```
eds-routing-network ATTRIBUTE ::= {
    WITH SYNTAX      INTEGER {
                        aftn (0),
                        cidin (1),
                        amhs (2),
                        other (3) }
    ID               id-at-eds-routing-network }
```

*Note.*— The attribute type *eds-routing-network* serves as an attribute supertype.

3.4.3.12 The EDS-specific attribute type *eds-routing-existing-main-protocol* shall be defined by the ASN.1 syntax:

```
eds-routing-existing-main-protocol ATTRIBUTE ::= {
    SUBTYPE OF      eds-routing-network
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-existing-main-protocol }
```

3.4.3.13 The EDS-specific attribute type *eds-routing-existing-main-com* shall be defined by the ASN.1 syntax:

```
eds-routing-existing-main-com ATTRIBUTE ::= {
    SUBTYPE OF      atn-facility-name
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-existing-main-com }
```

3.4.3.14 The EDS-specific attribute type *eds-routing-existing-alt-protocol* shall be defined by the ASN.1 syntax:

```
eds-routing-existing-alt-protocol ATTRIBUTE ::= {
    SUBTYPE OF      eds-routing-network
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-existing-alt-protocol }
```

3.4.3.15 The EDS-specific attribute type *eds-routing-existing-alt-com* shall be defined by the ASN.1 syntax:

```
eds-routing-existing-alt-com ATTRIBUTE ::= {
    SUBTYPE OF      atn-facility-name
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-existing-alt-com }
```

3.4.3.16 The EDS-specific attribute type *eds-routing-existing-coordination* shall be defined by the ASN.1 syntax:

```
eds-routing-existing-coordination ATTRIBUTE ::= {
    WITH SYNTAX      BOOLEAN
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-existing-coordination }
```

3.4.3.17 The EDS-specific attribute type *eds-routing-planned-main-protocol* shall be defined by the ASN.1 syntax:

```
eds-routing-planned-main-protocol ATTRIBUTE ::= {
    SUBTYPE OF      eds-routing-network
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-planned-main-protocol }
```

3.4.3.18 The EDS-specific attribute type *eds-routing-planned-main-com* shall be

defined by the ASN.1 syntax:

```
eds-routing-planned-main-com ATTRIBUTE ::= {
    SUBTYPE OF      atn-facility-name
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-planned-main-com }
```

3.4.3.19 The EDS-specific attribute type *eds-routing-planned-alt-protocol* shall be defined by the ASN.1 syntax:

```
eds-routing-planned-alt-protocol ATTRIBUTE ::= {
    SUBTYPE OF      eds-routing-network
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-planned-alt-protocol }
```

3.4.3.20 The EDS-specific attribute type *eds-routing-planned-alt-com* shall be defined by the ASN.1 syntax:

```
eds-routing-planned-alt-com ATTRIBUTE ::= {
    SUBTYPE OF      atn-facility-name
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-planned-alt-com }
```

3.4.3.21 The EDS-specific attribute type *eds-routing-planned-coordination* shall be defined by the ASN.1 syntax:

```
eds-routing-planned-coordination ATTRIBUTE ::= {
    WITH SYNTAX      BOOLEAN
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-planned-coordination }
```

3.4.3.22 The EDS-specific attribute type *eds-routing-amhs-comment* shall be defined by the ASN.1 syntax:

```
eds-routing-amhs-comment ATTRIBUTE ::= {
    WITH SYNTAX      PRINTABLESTRING
    ID              id-at-eds-routing-amhs-comment }
```

3.4.3.23 The EDS-specific attribute type *eds-routing-planned-event* shall be defined by the ASN.1 syntax:

```
eds-routing-planned-event ATTRIBUTE ::= {
    WITH SYNTAX      INTEGER {
                        add (0),
                        change (1),
                        remove (2) }
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-planned-event }
```

3.4.3.24 The EDS-specific attribute type *eds-routing-planned-date* shall be defined by the ASN.1 syntax:

```
eds-routing-planned-date ATTRIBUTE ::= {
    WITH SYNTAX      GeneralizedTime
                        -- as per 46.3 b) or c) of ISO/IEC 8824-1:2008
    EQUALITY MATCHING RULE    generalizedTimeMatch
    ORDERING MATCHING RULE    generalizedTimeOrderingMatch
    SINGLE VALUE    TRUE
    ID              id-at-eds-routing-planned-date }
```

3.4.3.25 The EDS-specific attribute type ***eds-routing-planned-description*** shall be defined by the ASN.1 syntax:

```
eds-routing-planned-description ATTRIBUTE ::= {
    WITH SYNTAX      PRINTABLESTRING
    SINGLE VALUE     TRUE
    ID                id-at-eds-routing-planned-description }
```

3.4.3.26 The EDS-specific attribute type ***eds-caas-entry*** shall be defined by the ASN.1 syntax:

```
eds-caas-entry ATTRIBUTE ::= {
    WITH SYNTAX      BOOLEAN
    SINGLE VALUE     TRUE
    ID                id-at-eds-caas-entry }
```

3.4.3.27 The EDS-specific attribute type ***eds-timestamp*** shall be defined by the ASN.1 syntax:

```
eds-timestamp ATTRIBUTE ::= {
    WITH SYNTAX      GeneralizedTime
                        -- as per 46.3 b) or c) of ISO/IEC 8824-1:2008
    EQUALITY MATCHING RULE generalizedTimeMatch
    ORDERING MATCHING RULE generalizedTimeOrderingMatch
    SINGLE VALUE     TRUE
    ID                id-at-eds-timestamp }
```

3.4.3.28 The EDS-specific attribute type ***eds-frequency*** shall be defined by the ASN.1 syntax:

```
eds-frequency ATTRIBUTE ::= {
    WITH SYNTAX      INTEGER
    SINGLE VALUE     TRUE
    ID                id-at-eds-frequency }
```

## 3.5 Name Forms

3.5.1 ICAO Doc 9880 Part IV [3] identifies name forms of relevant basic object classes and defines name forms for ATN-specific object classes.

3.5.2 This section provides the definition of EDS-specific name forms. EDS-specific name forms shall comply with the following ASN.1 definition:

```
edsRoutingAftnNameForm NAME-FORM ::= {
    NAMES      eds-routing-aftn
    WITH ATTRIBUTES { eds-routing-aftn-indicators }
    ID          id-nf-eds-RoutingAftnNameForm }

edsRoutingCidinNameForm NAME-FORM ::= {
    NAMES      eds-routing-cidin
    WITH ATTRIBUTES { eds-routing-cidin-indicators }
    ID          id-nf-eds-RoutingCidinNameForm }

edsRoutingAmhsNameForm NAME-FORM ::= {
    NAMES      eds-routing-amhs
    WITH ATTRIBUTES { eds-routing-amhs-addresses }
    ID          id-nf-eds-RoutingAmhsNameForm }
```



## 3.6 Object Identifiers

### 3.6.1 Basic Object Identifiers

3.6.1.1 Standards of the X.500 series [12] contain definitions of basic object identifiers. International Standardized Profiles (ISPs) contain object identifiers of further elements such as name forms and related object identifiers.

### 3.6.2 ATN-specific Object Identifiers

3.6.2.1 This section lists the ATN-specific object identifiers in support of the ATSMHS which refer to the definition provided by ICAO Doc 9880 Part IV [3]. In case of discrepancies the subsequent definition shall prevail.

3.6.2.2 For the ATN Directory, object identifiers are allocated below the ATN Directory arc of ICAO. ICAO Doc 9880 Part IV [3] defines the sub-arcs for object identifiers of object classes, attribute types and name forms by the following ASN.1 definition:

```
id-oc OBJECT IDENTIFIER ::=
    { iso(1) identified-organisation(3) icao(27) atn-directory(7) oc 0 }

id-at OBJECT IDENTIFIER ::=
    { iso(1) identified-organisation(3) icao(27) atn-directory(7) at 1 }

id-nf OBJECT IDENTIFIER ::=
    { iso(1) identified-organisation(3) icao(27) atn-directory(7) nf 2 }
```

3.6.2.3 Values of object class object identifiers shall comply with the following reference definition:

```
id-oc-atn-AmhsUser OBJECT IDENTIFIER ::= { id-oc 1 }
id-oc-atn-OrganizationalRole OBJECT IDENTIFIER ::= { id-oc 4 }
id-oc-atn-Facility OBJECT IDENTIFIER ::= { id-oc 11 }
id-oc-atn-amhsMD OBJECT IDENTIFIER ::= { id-oc 12 }
id-oc-atn-Organization OBJECT IDENTIFIER ::= { id-oc 15 }
```

3.6.2.4 Values of attribute type object identifiers shall comply with the following reference definition:

```
id-at-atn-AF-address OBJECT IDENTIFIER ::= { id-at 1 }
id-at-atn-PerCertificate OBJECT IDENTIFIER ::= { id-at 2 }
id-at-atn-DerCertificate OBJECT IDENTIFIER ::= { id-at 3 }
id-at-atn-amhs-direct-access OBJECT IDENTIFIER ::= { id-at 4 }
id-at-atn-facilityName OBJECT IDENTIFIER ::= { id-at 5 }
id-at-atn-ipm-heading-extensions OBJECT IDENTIFIER ::= { id-at 8 }
id-at-atn-global-domain-identifier OBJECT IDENTIFIER ::= { id-at 9 }
id-at-atn-icao-designator OBJECT IDENTIFIER ::= { id-at 10 }
id-at-atn-Amhs-addressing-scheme OBJECT IDENTIFIER ::= { id-at 12 }
id-at-atn-AmhsMD-naming-context OBJECT IDENTIFIER ::= { id-at 13 }
id-at-atn-maximum-number-of-body-parts OBJECT IDENTIFIER ::= { id-at 14 }
```

id-at-atn-maximum-text-size OBJECT IDENTIFIER ::= { id-at 15 }

id-at-atn-maximum-file-size OBJECT IDENTIFIER ::= { id-at 16 }

id-at-atn-use-of-amhs-security OBJECT IDENTIFIER ::= { id-at 17 }

id-at-atn-use-of-directory OBJECT IDENTIFIER ::= { id-at 18 }

id-at-atn-group-of-addresses OBJECT IDENTIFIER ::= { id-at 19 }

3.6.2.5 Values of name form object identifiers shall comply with the following reference definition:

id-nf-atnOrgRoleNameForm OBJECT IDENTIFIER ::= { id-nf 2 }

id-nf-atnAmhsMDNameForm OBJECT IDENTIFIER ::= { id-nf 7 }

id-nf-atnOrgNameForm OBJECT IDENTIFIER ::= { id-nf 8 }

id-nf-atnFacilityNameForm OBJECT IDENTIFIER ::= { id-nf 10 }

### **3.6.3 EDS-specific Object Identifiers**

3.6.3.1 This section provides the definition of EDS-specific object identifiers.

3.6.3.2 For the EDS, object identifiers are allocated below the ATN Directory arc of ICAO. The following sub-arcs for object identifiers of object classes, attribute types and name forms are defined by the following ASN.1 definition:

id-reg OBJECT IDENTIFIER ::= -- regional  
     { iso(1) identified-organisation(3) icao(27) atn-directory(7) reg 3 }  
     -- Regional Implementations

id-eds OBJECT IDENTIFIER ::= -- EDS  
     { iso(1) identified-organisation(3) icao(27) atn-directory(7) reg(3) eds 0 }  
     -- European Directory Service (EDS)

id-eoc OBJECT IDENTIFIER ::= { id-eds eoc 0 }

id-eat OBJECT IDENTIFIER ::= { id-eds eat 1 }

id-enf OBJECT IDENTIFIER ::= { id-eds enf 2 }

3.6.3.3 Values of EDS-specific object class object identifiers shall comply with the following reference definition:

id-oc-eds-collective-version OBJECT IDENTIFIER ::= { id-eoc 0 }

id-oc-eds-amhs-user OBJECT IDENTIFIER ::= { id-eoc 1 }

id-oc-eds-routing-element OBJECT IDENTIFIER ::= { id-eoc 2 }

id-oc-eds-routing-aftn OBJECT IDENTIFIER ::= { id-eoc 3 }

id-oc-eds-routing-cidin OBJECT IDENTIFIER ::= { id-eoc 4 }

id-oc-eds-routing-amhs OBJECT IDENTIFIER ::= { id-eoc 5 }

id-oc-eds-unit OBJECT IDENTIFIER ::= { id-eoc 6 }

id-oc-eds-heartbeat OBJECT IDENTIFIER ::= { id-eoc 7 }

3.6.3.4 Values of EDS-specific attribute type object identifiers shall comply with the following reference definition:

id-at-eds-airac-version OBJECT IDENTIFIER ::= { id-eat 0 }

id-at-eds-routing-aftn-version- OBJECT IDENTIFIER ::=	{ id-eat 1 }
id-at-eds-routing-cidin-version OBJECT IDENTIFIER ::=	{ id-eat 2 }
id-at-eds-routing-amhs-version OBJECT IDENTIFIER ::=	{ id-eat 3 }
id-at-eds-type-of-user OBJECT IDENTIFIER ::=	{ id-eat 4 }
id-at-eds-external-user OBJECT IDENTIFIER ::=	{ id-eat 5 }
id-at-eds-routing-aftn-indicators OBJECT IDENTIFIER ::=	{ id-eat 6 }
id-at-eds-routing-cidin-indicators OBJECT IDENTIFIER ::=	{ id-eat 7 }
id-at-eds-routing-amhs-addresses OBJECT IDENTIFIER ::=	{ id-eat 8 }
id-at-eds-routing-network OBJECT IDENTIFIER ::=	{ id-eat 9 }
id-at-eds-routing-existing-main-protocol OBJECT IDENTIFIER ::=	{ id-eat 10 }
id-at-eds-routing-existing-main-com OBJECT IDENTIFIER ::=	{ id-eat 11 }
id-at-eds-routing-existing-alt-protocol OBJECT IDENTIFIER ::=	{ id-eat 12 }
id-at-eds-routing-existing-alt-com OBJECT IDENTIFIER ::=	{ id-eat 13 }
id-at-eds-routing-existing-coordination OBJECT IDENTIFIER ::=	{ id-eat 14 }
id-at-eds-routing-planned-main-protocol OBJECT IDENTIFIER ::=	{ id-eat 15 }
id-at-eds-routing-planned-main-com OBJECT IDENTIFIER ::=	{ id-eat 16 }
id-at-eds-routing-planned-alt-protocol OBJECT IDENTIFIER ::=	{ id-eat 17 }
id-at-eds-routing-planned-alt-com OBJECT IDENTIFIER ::=	{ id-eat 18 }
id-at-eds-routing-planned-coordination OBJECT IDENTIFIER ::=	{ id-eat 19 }
id-at-eds-routing-planned-event OBJECT IDENTIFIER ::=	{ id-eat 20 }
id-at-eds-routing-planned-date OBJECT IDENTIFIER ::=	{ id-eat 21 }
id-at-eds-routing-planned-description OBJECT IDENTIFIER ::=	{ id-eat 22 }
id-at-eds-routing-amhs-comment OBJECT IDENTIFIER ::=	{ id-eat 23 }
id-at-eds-caas-entry OBJECT IDENTIFIER ::=	{ id-eat 24 }
id-at-eds-timestamp OBJECT IDENTIFIER ::=	{ id-eat 25 }
id-at-eds-frequency OBJECT IDENTIFIER ::=	{ id-eat 26 }

3.6.3.5 Values of EDS-specific name form object identifiers shall comply with the following reference definition:

id-nf-eds-RoutingAftnNameForm OBJECT IDENTIFIER ::=	{ id-enf 0 }
id-nf-eds-RoutingCidinNameForm OBJECT IDENTIFIER ::=	{ id-enf 1 }
id-nf-eds-RoutingAmhsNameForm OBJECT IDENTIFIER ::=	{ id-enf 2 }

## **4 Mapping of Information AMC – EDS**

### **4.1 AMHS MD Register**

4.1.1 The information of the ICAO Register of AMHS Management Domains (ICAO-MD Registry) is maintained by AMC and originates from the AMC address management function (AMHS MD Register).

4.1.2 The AMHS MD Register is represented by a base entry of standard object class *organization* with the naming attribute *organizationName* taking the fixed value “ICAO-MD-Registry” and its subordinate entries.

4.1.3 The AMHS MD Register includes at least one entry for each State or Organisation of ATN-specific object class *atn-amhsMD*.

4.1.4 In addition to well-formed ICAO designators such as four character location indicators, the attribute type *atn-icao-designator* may take one of the values ‘ORG1’, ‘ORG2’ to ‘ORG9’ in case the entry represents a State or Organisation external to the Aeronautical Fixed Services (AFS).

### **4.2 States and Organisation**

4.2.1 Base entries of States and Organisations are allocated on top-level of the respective Managed Area. States are represented by entries of standard object class *country* and Organisations are represented by entries of standard object class *organization*.

### **4.3 CAAS Mapping Information**

4.3.1 The CAAS mapping information is maintained by AMC and originates from the AMC CAAS tables.

4.3.2 Below the States’ and Organisations’ base entries, the CAAS mapping information is held using entries of ATN-specific object class *atn-organization*.

4.3.3 In order to enable restoration of a table corresponding to the AMC CSV MD look-up export the EDS-specific object class *eds-unit*, the EDS-specific attribute type *eds-caas-entry*, as well as the respective OID values have been defined.

### **4.4 AMHS User Addresses and Capabilities**

4.4.1 The AMHS user addresses and capabilities are maintained by AMC and originate from the AMC user addresses and user capabilities tables.

4.4.2 An AMHS user is represented by an entry of ATN-specific object class *atn-organizational-role* with an EDS-specific, auxiliary object class *eds-amhs-user*. The object class *atn-organizational-role* is derived from the standard object class *organizationalRole*. The EDS-specific object class *eds-amhs-user* is derived from the ATN-specific object class *atn-amhs-user*.

4.4.3 It is noted that ICAO EUR Doc 021 (ATS Messaging Management Manual) [6] describes the capabilities of AMHS users by profiles and the related AMC CSV export denotes the capabilities of AMHS users by the corresponding profile name (e.g. A64+F2048-EA-DIR). In contrast, the ATN Directory and EDS express individual capabilities of AMHS users by corresponding attribute/value pairs (e.g. attribute types *atn-maximum-number-of-body-parts*, *atn-maximum-text-size*, *eds-type-of-user*, etc.).

4.4.4 The user short name managed by AMC is provided as the value of the attribute type *description*, which is an element of the standard object class *organizationalRole*.

## 4.5 COM Centres

4.5.1 COM Centres are represented by entries of ATN-specific object class *atn-facility* allocated below the respective State or Organisation operating the COM Centre.

## 4.6 Routing Information

4.6.1 The routing information of a COM Centre is allocated below the entry of the respective COM Centre and is represented by entries of

- EDS-specific object class *eds-routing-aftn* for the AFTN;
- EDS-specific object class *eds-routing-cidin* for the CIDIN; and
- EDS-specific object class *eds-routing-amhs* for the AMHS.

## **5 Example of EDS Information Use**

### **5.1 AFTN/AMHS Gateway**

5.1.1 The Message Transfer and Control Unit (MTCU) of the AFTN/AMHS Gateway needs to perform address conversion between AF- and MF-addresses and determine the AMHS user capabilities.

5.1.2 ICAO Doc 9880 Part II [2] describes the conversion of addresses using tables. This section outlines one potential way for conversion of addresses using the EDS following the principles set out by ICAO Doc 9880 Part II. It is noted that there might be other ways of achieving identical results.

#### AFTN to AMHS address conversion

5.1.3 The address conversion of AF- into MF-addresses comes in up to three steps which might also be used for the reverse address lookup for address conversion of MF- to AF-addresses:

- Check for availability of individual information for a specific AMHS user.
- Determine the AMHS MD of this user, the associated Global Domain Identifier (GDI), addressing scheme and naming context.
- Determine the X.400 O/R address attribute organization in order to complete the AMHS MF-address of the user.

5.1.4 First, the EDS is searched below the base entries of States and Organisations for an individual entry of object class *atn-organizational-role* with an associated object class *eds-amhs-user*. The matching criteria is an entry of object class *eds-amhs-user* including an attribute type *atn-AF-address* taking the value of the full AF-address. If an entry matches the criteria, the value of attribute type *mhs-or-addresses* is read and address conversion is successfully terminated, otherwise the next step is followed.

5.1.5 If no individual entry exists, the address conversion follows the algorithmic mapping of addresses. Starting with seven characters of the AF-address down to two (ICAO designators), the AMHS MD Register is searched for an entry with a value of the attribute type *atn-icao-designator* matching the ICAO designators determined from the AF-address. If no matching entry could be determined, the address conversion terminates unsuccessfully; otherwise the values of the attribute types *atn-global-domain-identifier* and the *atn-amhs-addressing-scheme* are read. If the addressing scheme identified by the value of the attribute type *atn-amhs-addressing-scheme* corresponds to the XF addressing scheme, the address conversion is successfully terminated; otherwise the value of the attribute type *atn-amhsMD-naming-context* is read and next step is followed.

5.1.6 A search within the State's or Organisation's entries indicated by the value of the attribute type *atn-amhsMD-naming-context* is initiated, for the mapping of the location indicator into the geographical unit. In order to meet the use of wildcards in CAAS mapping information, the values of the attribute type *organizationName* of object class *organization* are searched for the location indicator of the AF-address starting with all four characters down to one. If a match could be determined with a value for attribute type *eds-caas-entry* set to true, the value of the attribute type *atn-facility-name* is read and conversion is successfully terminated; otherwise the search is unsuccessfully terminated.

5.1.7 In case of successful termination in the first step, the MF-address is determined by the value of the attribute type *mhs-or-addresses*; otherwise the X.400 address attributes *country-name*, *administration-domain-name* and *private-domain-name* are determined by the stored GDI and the MF-address is completed depending on the addressing scheme as follows:

- XF addressing scheme: the X.400 address attribute *organization-name* is set to the fixed value “AFTN” and the first element of the X.400 address attribute *organizational-unit-names* is set to the value of the AF-address.
- CAAS addressing scheme: the X.400 address attribute *organization-name* is set to the value determined by the EDS attribute type *atn-facility-name*, the first element of the X.400 address attribute *organizational-unit-names* is set to the value of the 4-character location indicator of the AF-address and the X.400 address attribute *common-name* is set to the full, 8-character, AMHS AF-address.

#### AMHS User Capability

5.1.8 In order to determine the appropriate format of the AMHS message, the MTCU needs to determine the AMHS user capabilities of the intended recipients. Section 5.2 describes how user capabilities may be determined.

## 5.2 ATS Message User Agent

5.2.1 In support of the Extended ATS Message Handling Service an ATS Message User Agent needs to determine through its DUA the capabilities of the AMHS recipient(s) prior to encoding the AMHS message. The capabilities are used to determine the level of the service supported by the AMHS recipient(s) and to generate the AMHS message according to the common, minimum level of support.

#### Determination of AMHS User Capabilities

5.2.2 According to ICAO Doc 9880 Part II [2], an AMHS user supporting the Extended ATS Message Handling Service is identified by its MF-address and additionally by its Directory name which is a distinguished name. However, in case the Directory name is not available, it could be determined by searching the EDS for a match of the recipient’s MF-address.

5.2.3 In order to determine the capabilities of an AMHS user, a simple read operation using his Directory name is sufficient. In case the read operation reports success, the attribute types of the object class *eds-/atn-amhs-user* deliver the user’s capabilities; otherwise capabilities of the user are not available in EDS. Please refer to ICAO EUR Doc 021 (EUR ATS Messaging Management Manual, Appendix D) [6] for a list of capabilities defined for AMHS users.

5.2.4 The type and individual capabilities of an AMHS user are determined from the attribute types as given in Table 1.

Attribute Type	Description
eds-type-of-user	Type of user as defined in ICAO EUR Doc 021 (ATS Messaging Management Manual) [6] being an individual AMHS user (elementary address), a distribution list, or a group of several addresses. The distinction between direct and indirect AMHS users can be determined by means of the attribute type <i>atn-amhs-direct-access</i> . In absence of this attribute an individual address is assumed
eds-external-user	Identification of AMHS users external to the AFS. In absence or set to false, the AMHS user is considered part of the AFS
atn-ipm-heading-extensions	Support of the AMHS IPM Heading Extensions Functional Group (IHE FG) if set to true.
atn-amhs-direct-access	Indication of direct AMHS user if set to true; otherwise indication of indirect AMHS user.
mhs-maximum-content-length	Maximum deliverable content length given in number of octets.
mhs-acceptable-eits	Attribute type is for further study.
mhs-exclusively-acceptable-eits	Supported Encoded Information Types (EITs). Value specification may be repeated (multi-valued). Values are Object Identifiers (OIDs). See below for further details.
atn-maximum-number-of-body-parts	Maximum number of body parts supported by the AMHS user; no limitation assumed if absent.
atn-maximum-text-size	Maximum number of characters in textual body part types supported by the AMHS user; no limitation
atn-maximum-file-size	Maximum number of octets transferred in a File Transfer Body Part (FTBP) supported by the AMHS user; no limitation assumed if absent
atn-use-of-amhs-security	Indication of support of the AMHS security functional group (SEC FG) by the AMHS user if present and set to true
atn-use-of-directory	Indication of support of Use of Directory functional group (DIR FG) by the AMHS user if present and set to true

**Table 1: User Capabilities**

5.2.5 The optional attribute type *mhs-exclusively-acceptable-eits* is a list of Object Identifiers (OIDs) representing the user's capabilities with regard to different types of information. Following OID values are used to indicate the user's support of content types.

Capability	Object Identifier Values
IA5 Text	2.6.3.4.2 (ia5-text)



Capability	Object Identifier Values
General Text	1.0.10021.7.1.0.1 (basic control set C0), 1.0.10021.7.1.0.6 (graphics set G0 US ASCII), 1.0.10021.7.1.0.100 (graphics set G1 Basic-1)
Bilaterally Defined Body Part	2.6.3.4.0 (undefined)
File Transfer Body Part	2.6.1.12.0 (file transfer)

**Table 2: Object Identifier Values**

*Note.*— Above *OID* values for basic and extended IA5 Text Body Part Types, Bilaterally Defined Body Part Type and File Transfer Body Part Type are derived from ISO/IEC 10021-7 [13]. The AMHS CS [1] describes indication for support of the AMHS Functional Group FTBP through inclusion of the above *OID* value in the attribute type *mhs-exclusively-acceptable-eits*. For the General Text Body Part Type above *OID* values are derived from ICAO Doc 9880 Part II [2]. Use of Bilaterally Defined Body Part Type is discouraged and not supported by AMC.

### 5.3 Restoration of CAAS Look-up Table

5.3.1 For AFTN/AMHS Gateways without Directory access to EDS by means of the Directory Access Protocol, the EDS operator might need to recreate the CAAS look-up table from the EDS.

5.3.2 The restoration of the CAAS look-up table requires a two iteration step procedure. The first iteration step loops over all State and Organisations and the second iteration step loops over all entries of object class *atn-organization* allocated directly below the States and Organisations. The description in the next paragraphs assumes the determination of the CAAS look-up table from the pre-operational area.

5.3.3 First, a list or search operation is performed starting at *O=European-Directory*; *OU=Pre-operational* for entries of object class *country* or object class *organization*.

5.3.4 Secondly, for all entries of States and Organisation identified above a list or search operation is performed for entries of object class *atn-organization*. Entries of object class *atn-organization* belong to the CAAS look-up table, if the attribute type *eds-caas-entry* (part of object class *eds-unit*) is present and takes the value true.

5.3.5 The CAAS look-up table is composed of entries matching the above criteria. The values required for address translation are determined by the attribute types *organizationName* (O) and *atn-facility-name*.

**END of Appendix G-B**



# EUR AMHS Manual

## Appendix G-C

EDS Testing Guidelines	
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## References

- [1] ICAO Doc 9880 AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II — Ground-Ground Applications — Air Traffic Services Message Handling Services (ATSMHS), 2nd Edition, 2016
- [2] ICAO Doc 9880 AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part IV — Directory Services, Security and Identifier Registration, 2nd Edition, 2016
- [3] ICAO Doc 9896 Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols, 2nd Edition, 2015
- [4] EUR Doc 020, EUR AMHS Manual, Appendix G – European Directory Service
- [5] EUR Doc 020, EUR AMHS Manual, Appendix G-A – EDS User Interface Control Document
- [6] EUR Doc 020, EUR AMHS Manual, Appendix G-B – EDS Data Description
- [7] EUR Doc 021, ATS Messaging Management Manual
- [8] EUROCONTROL European Directory Service – EDS Test Document – Version 2.0 Edition Date: 11/12/2015, Status: Released Issue, Intended for: AFSG
- [9] ISO/IEC 9594-n Information technology – Open Systems Interconnection – The Directory (multi-part), 5th Edition, 2005  
*Note.– This set of standards was also published as ITU-T X.500 (08/2005) set of standards.*
- [10] IETF RFC 1006 ISO Transport Service on top of the TCP, Version: 3, May 1987

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# 1 Introduction

## 1.1 Scope of the Document

1.1.1 This document describes the European Directory Service (EDS) testing activity by providing a:

- Customisation of the EDS user interface between the Central European Test Directory System Agent (Test-DSA) and Co-operating or Adjacent Test-DSAs as given by the EDS User Interface Control Document [5] for the purpose of the EDS testing activity;
- Description of general aspects of the EDS testing activity such as prerequisites, environment and strategy; and
- Definition of the steps of the EDS testing activity.

1.1.2 The European Directory Service (EDS) is the implementation of ATN Directory services [2] in Europe. The EDS provides future, directory-based means for collection, management and distribution of information within Europe and exchange of information with other Regions, States and Organisations.

1.1.3 Especially for testing activities, EUROCONTROL has implemented the Central European Test-DSA for the initial step according to the EDS Operational Concept adopted by the Aeronautical Fixed Services Group (AFSG) and published in Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [4].

## 1.2 Purpose of the Document

1.2.1 The purpose of this document is to enable involved parties to carry out the EDS testing activity, basically between implementations of the Central European Test-DSA and Co-operating and Adjacent Test-DSAs.

1.2.2 This document identifies targets of the activity, describes the overall testing strategy and environment, lists prerequisites and parameters for setup of implementations and specifies the individual steps of the activity.

1.2.3 Readers of this document should be familiar with the EDS Operational Concept specified in Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [4] and the EDS User Interface Control document [5] which summarises the EDS user interface details for communication between the Central European DSA and Co-operating or Adjacent DSAs. For testing and validation, EDS makes use of a dedicated test environment.

## 1.3 Structure of the Document

1.3.1 This document is composed of the following chapters:

- Chapter 1 (this chapter) contains an introduction to the document.
- Chapter 2 provides an overview on general aspect of the EDS testing activity.

- Chapter 3 identifies prerequisites and provides parameters for communication setup of implementations involved in the testing activity.
- Chapter 4 specifies the steps of the EDS testing activity.



## 2 Overview

### 2.1 Objectives

2.1.1 The EDS testing activity has the target to validate an EDS implementation before interconnection with the operational European Directory Service (EDS) is established.

2.1.2 The primary objectives of the EDS testing activity are to determine on the suitability of the:

- Implementations of Co-operating and Adjacent Test-DSAs; and
- Distribution of information within EDS regarding
  - Underlying networks;
  - Protocols; and
  - Directory schema (data structure);

2.1.3 End users and supply of information to end users are considered outside the scope of the EDS Operational Concept and thus are not directly addressed by the EDS testing activity. However, at a local basis involved parties might include end users in their activities.

2.1.4 Besides the primary objectives, the EDS testing activity allows involved parties to familiarise themselves with the X.500 Directory technology [9] at an early stage and ensures interoperability of Co-operating and Adjacent Test-DSAs with the Central European Test-DSA prior to putting them into service.

### 2.2 Testing Strategy

2.2.1 The general testing strategy follows the principles of ATS Messaging Management as specified for AMC by ICAO EUR Doc 021 (ATS Messaging Management Manual) [7] and for EDS by Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [4].

2.2.2 The general overall strategy used in the EDS testing activity follows the full life cycle of information processing ensuring an appropriate coverage of related aspects.

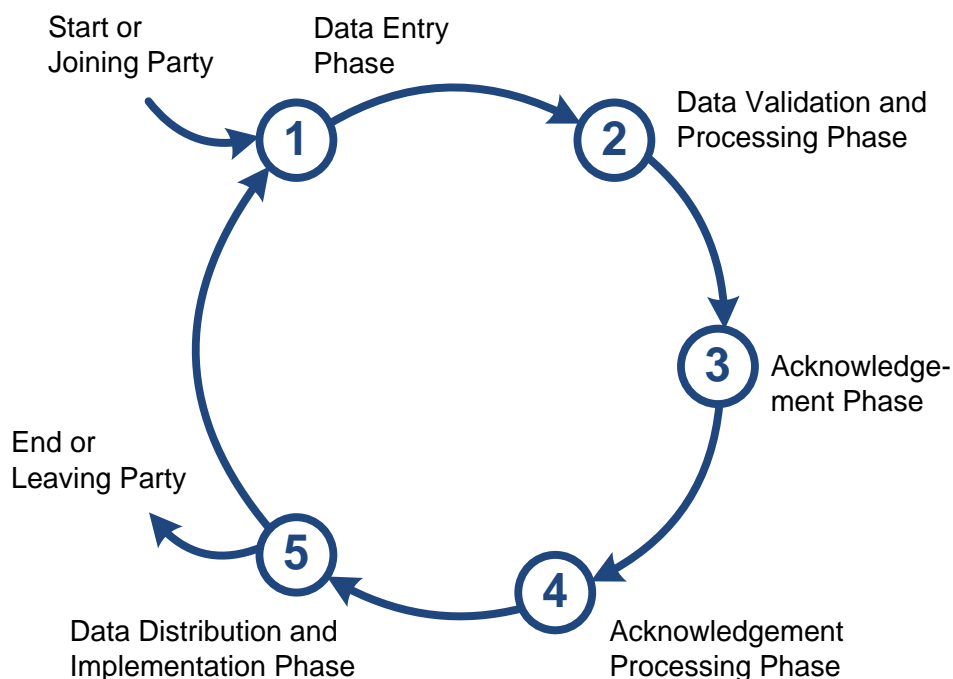
2.2.3 The procedures adopted by the ATS Messaging Management describe repeated 28-days cycles consisting of five phases. Each cycle starts with the “Data entry phase”, goes through the “Data validation and processing phase” and ends with the “Data distribution and implementation phase”.

2.2.4 The start of the EDS testing activity and when new parties are joining the EDS testing activity are considered special situations, which are not reflected in the ATS Messaging Management. The EDS testing activity, including cases that new parties are joining the EDS testing activity for the first time, starts with the data entry phase. The EDS testing activity, including cases that participating parties leave the EDS testing activity, ends with the data distribution and implementation phase.

2.2.5 Further details regarding the procedures and phases could be found in the respective manuals:

- Section 5.1 of ICAO EUR Doc 021 (ATS Messaging Management Manual) [7] that describes the AMC operational procedures in general and gives the details of the individual phases;
- Section 5.4 of Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [4] that establishes the relationship to ATS Messaging Management and describes further aspects related to EDS.

2.2.6 Figure 1 outlines the general overall strategy of the EDS testing activity along the five phases of ATS Messaging Management.



*Figure 1: Repeated Phases*

## 2.3 Test Environment

2.3.1 The EDS testing activity takes place in a distributed environment consisting of the following functional test components:

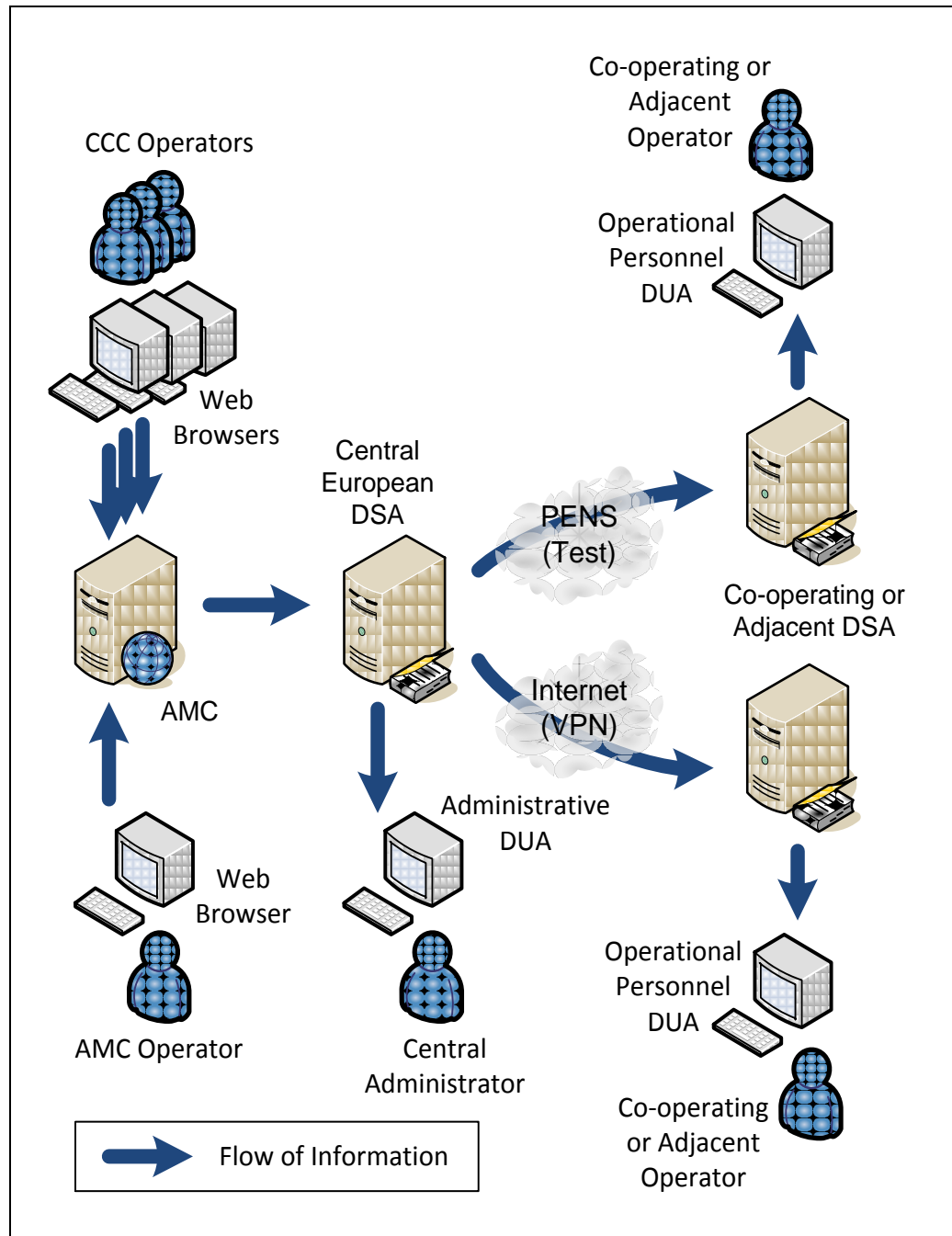
- Test ATS Messaging Management Centre (Test-AMC);
- Central European Test-DSA; and
- the respective Co-operating Test-DSA(s) and/or Adjacent Test-DSA(s).

2.3.2 DUAs accompany the Test-DSAs in order to enable the EDS Central Administrator, Co-operating and Adjacent Operators to access the Directory information in the Test-EDS. An

Administrative DUA is involved at the Central European Test-DSA; Operational Personnel DUAs are used at Co-operating and Adjacent Test-DSAs.

2.3.3 The Test-AMC is the single source of information. The AMC Operator and CCC Operators make use of web browsers for maintenance of information at the Test-AMC. Initiated by the AMC Operator, the AMC periodically provides the EDS information to the Central European Test-DSA. The EDS Central Administrator accesses the EDS information at the Central European Test-DSA through the associated Administrative DUA. After receiving the EDS information from the Test-AMC, the Central European Test-DSA in turn provides this information to Co-operating and Adjacent Test-DSAs through the adopted X.500 protocols.

2.3.4 Figure 2 describes the overall environment of the EDS testing activity including Test-AMC, Test-DSAs, DUAs, involved roles and flow of information.



**Figure 2: EDS Testing Environment**

2.3.5 Communication between Co-operating and Adjacent Test-DSAs on one hand and the Central European Test-DSA on the other hand is established over a common network infrastructure. The Pan-European Network Service (PENS) is the preferred means for communications. Virtual Private Networks (VPNs) established over the public Internet serve as an alternate means of communications in cases where PENS is not available. The use of VPNs established over the public Internet is subject to bilateral agreement.

2.3.6 It is recalled that Co-operating Test-DSAs receive the full set of information whereas Adjacent Test-DSAs receive the information of co-operating States and Organisations only. In order to receive the full set of information, Adjacent Test-DSAs have to exchange information

with other Adjacent Test-DSAs. For Co-operating Test-DSAs there is no need to establish other communication paths for the exchange of information at international level.

2.3.7 Co-operating and Adjacent Operators access the EDS information at the local Test-DSAs through their Operational Personnel DUAs. The EDS Central Administrator accesses the Central European Test-DSA through his Administrative DUA.

2.3.8 Even though considered out of scope of the EDS testing activity, the information available at Co-operating and Adjacent Test-DSAs might be made available to DUAs of end users in order to test the full chain at a local level. An example of a system end user is the AFTN/AMHS Gateway as per ICAO Doc 9880 Part II [1].

## 2.4 *Actors and Coordination*

2.4.1 In order to provide input, to trigger actions and to validate results, following roles take an active part in the EDS testing activity:

- **AMC Operator** for management of information at the Test-AMC and for initiating transfer of information from the Test-AMC to the Test-EDS.
- **CCC Operators** of States and Organisations participating in the EDS testing activity for management of information at the Test-AMC.
- **EDS Central Administrator** for checking EDS content at the Central European Test-DSA and testing the results of push distribution through shadowing.
- **Co-operating Operators** and **Adjacent Operators** for testing the result of distribution and EDS content at local Test-DSAs.

2.4.2 For the EDS testing activity EUROCONTROL nominates at least one person taking the role of the AMC Operator and at least one person taking the role of the EDS Central Administrator. Nominations shall include name, email address and telephone number. A single individual may fulfil both roles.

2.4.3 States and Organisations participating in the EDS testing activity nominate at least one person taking the role of the CCC Operator and at least one person taking the role of the Co-operating or Adjacent Operator. Nominations shall include name, email address and telephone number. A single individual may fulfil both roles.

2.4.4 The distributed nature of the EDS testing activity and the number of active roles demand coordination and exchange of information beyond the automated exchange of information by EDS. Email is proposed for direct communication between individuals. Due to the central position, the EDS Central Administrator is the focal point for the exchange of information between the actors.

2.4.5 This document defines two methods for provision of modifications applied to the Test-AMC Background Area and which require testing in EDS:

- AMC Static Report (updated data), and
- Collection and Distribution via email.

2.4.6 The AMC Static Report (updated data) is available for download in the Pre-operational Area at the Test-AMC. In application of the second method, the CCC Operator collects relevant modifications and reports to the EDS Central Administrator. The EDS

Central Administrator collects the reports and in turn provides a collection of reports to the Co-operating and Adjacent Operators. The EDS Central Administrator informs involved parties on the method of choice.

2.4.7 Co-operating and Adjacent Operators shall as a minimum validate the modifications that have been applied by the CCC Operator of the respective State or Organisation. The Central Administrator shall as a minimum validate the modifications that have been applied by the AMC Operator. At this point every modification is at least validated once. Co-operating and Adjacent Operators as well as the Central Administrator may validate other modifications which have been reported.

2.4.8 Using email Co-Operating and Adjacent Operators report the results of their testing of EDS content to the Central Administrator.

## 2.5 *Schedule*

2.5.1 The start and duration of the EDS testing activity is subject to announcement by EUROCONTROL.

2.5.2 The cycle applied to the EDS testing activity basically follows the AIRAC Cycle defined in ICAO EUR Doc 021 (ATS Messaging Management Manual) [7], which lasts 28 days. The duration of a cycle in the EDS testing activity may deviate from the duration of an AIRAC Cycle. The duration of a cycle may be shortened in order to accelerate the EDS testing activity and to increase the overall number of cycles performed during the testing period. A phase in the EDS testing activity takes one day as a minimum resulting in a cycle with a period of at least five, consecutive days. The EDS testing activity may be suspended as necessary.

2.5.3 The schedule of a cycle includes start and end dates of the cycle as well as allocation of the phases with start and end dates. The EDS Central Administrator announces the schedule of a cycle by email.

## 3 Testing Setup

### 3.1 Prerequisites

3.1.1 Implementations intended to participate in the EDS testing activity shall implement a Directory System Agent (Test-DSA) accompanied by a Personnel DUA as a minimum. For further details and conformance requirements please refer to the EDS User Interface Control document [5], Section 4.1.

3.1.2 The Test-DSA acting as either Co-operating or Adjacent Test-DSA shall support Directory protocols on top of the Transmission Control Protocol (TCP) and the Internet Protocol version 4 (IPv4) by providing an ISO transport service on top of TCP according to RFC 1006 [10]. The underlying common network infrastructure shall be either the ANSP Test Messaging VPN of PENS or a site to site VPN over the Internet as outlined in the EDS User Interface Control document [5].

3.1.3 In order to prevent address conflicts in the network EUROCONTROL provides the external IP address of the Co-operating or Adjacent Test-DSA (accessible hosts) for the establishment of the connection using a VPN over the Internet. The State or Organisation operating the Co-operating or Adjacent Test-DSA is invited to map the external IP address provided by EUROCONTROL to the local IP address within the network of the respective State or Organisation as necessary.

3.1.4 It is recalled at this point that Co-operating or Adjacent Test-DSAs shall support ATN- and EDS-specific object classes and attribute types and shall implement the Directory schema of EDS specified in Appendix G-B to the ICAO EUR Doc 020 (EUR AMHS Manual) [4].

### 3.2 Peers

3.2.1 The setup of peers follows the EDS User Interface Control document [5], Section 4.2 using the parameters given by Table 1. The State or Organisation participating in the EDS testing is requested to complete the information in the table.

Parameter	Central European Test-DSA	Co-operating or Adjacent Test-DSA
Distinguished Name	O=EUXX	See below
Password	PWD-EUXX	See below
Presentation Selector	-	
Session Selector	-	
Transport Selector	-	
Network Address TCP Port	3003	3003 (See below)

Parameter	Central European Test-DSA	Co-operating or Adjacent Test-DSA
IPv4 Address (PENS) IPv4 Address (Internet)		See below See below

**Table 1: Peer Parameters**

3.2.2 The Central European Test-DSA uses the parameters given in Table 1 for the establishment of associations with Co-operating and Adjacent Test-DSAs. In the presentation address of the Central European Test-DSA the presentation, session and transport selectors are omitted, i.e. these selectors are not present in the presentation address of the Central European Test-DSA. The IP address of the Central European Test-DSA is either the PENS or the Internet IPv4 address given in Table 1, depending on the common underlying network infrastructure in use for this connection.

3.2.3 The parameters of a Co-operating or Adjacent Test-DSA shall be defined in accordance with the following provisions:

- The *distinguished name* shall be represented by an attribute of type *organization*. The value of the attribute shall take the location indicator of the respective COM Centre.
- The value of the attribute *password* follows a similar scheme whereas *PWD* is used as a prefix separated by a hyphen, e.g. *PWD-EDDD*.
- The *TCP port* should be set to the value provided in Table 1. A configuration using a TCP port different from this value requires bilateral agreement between the parties operating the peers. Within the network of the State or Organisation operating the Co-operating or Adjacent Test-DSA this TCP port might be mapped to a different TCP port in line with local requirements.
- The *IP address* of the Co-operating or Adjacent Test-DSA is restricted by the common underlying network infrastructure in use. Only one IP address is required. In case of PENS the IPv4 address needs to be allocated to the ANSP Test Messaging VPN. In case of a VPN over the Internet the IP address is provided by EUROCONTROL in order to prevent address conflicts.

3.2.4 States or Organisations with the intention to participate in the EDS testing activity provide the parameters of their Co-operating or Adjacent Test-DSA. The presentation address is used by the Central European Test-DSA and has to reflect measures applied by routers, firewalls or security appliances such as Network Address Translation (NAT).

### Shadowing

3.2.5 The setup of replication using shadowing follows the EDS User Interface Control document [5], Section 4.2 using the parameters given in Table 2.

Parameter	Central European Test-DSA	Co-operating or Adjacent Test-DSA
Identifier	See below	
Version	0	
Role	Supplier	Consumer



Parameter	Central European Test-DSA	Co-operating or Adjacent Test-DSA
Unit of replication	O=European-Directory	
Mode	Supplier Initiated, On Change	
Access Point	See Table 1 (Central European Test-DSA)	

**Table 2: Shadowing Parameters**

3.2.6 The parameter *identifier* denoting the replication agreement is provided by the Central Administrator.

#### Chaining

3.2.7 The setup of chaining follows the EDS User Interface Control document [5], Section 4.2 using the parameters given in Table 3.

Parameter	Co-operating or Adjacent Test-DSA
Content Prefix	O=European-Directory
Type	Cross Reference
Access Point	See Table 1 (Central European Test-DSA)

**Table 3: Knowledge Reference Parameters**

### 3.3 Users

3.3.1 The setup of Co-operating and Adjacent Operators follows the EDS User Interface Control document [5], Section 4.3 using the parameters given in Table 4.

Parameter	User
Distinguished Name	See below
Password	See below

**Table 4: User Parameters**

3.3.2 Co-operating and Adjacent Operators are allocated and managed by the Central Administrator who provides Co-operating and Adjacent Operators with their distinguished names and initial passwords. An operator may change his password.

3.3.3 Allocation and management of EDS end users is a local matter; however, the same parameters apply in general.

## 4 Testing Process

### 4.1 General

4.1.1 The description of the EDS testing activity follows a common approach widely used in distributed test environments and trials where involved parties join and leave the activity in a controlled manner.

4.1.2 The overall EDS testing activity consists of repeated cycles. Each cycle is composed of five phases. The principles of cycles and phases have been adopted by Appendix G to the ICAO Doc 020 (EUR AMHS Manual). After completion of the final phase of a cycle, a new cycle starts with the first phase. The precondition of a phase corresponds to the post-condition of the previous phase. Figure 1 outlines this general approach with repeated cycles and phases.

4.1.3 The phases of the EDS testing activity correspond to the five phases of the EDS Operational Concept as per Appendix G to ICAO Doc 020 (EUR AMHS Manual) [4]. A tabular description provides the details of each testing phase. Table 5 lists the elements of the description and gives a brief definition of the elements.

Identification	Unique identification of testing step
Phase	Phase according to the EDS Operational Concept
Description	High level description of the testing step
Under Test	Aspects, elements and features under testing
Environment	Involved components, roles and data areas
Input	Testing input (input action, input data)
Output	Testing output (expected results, output events and data)
Information	Additional information

**Table 5: Description of Phases**

4.1.4 Each phase is identified by a unique identifier. The details include the related phase, the reference to Appendix G of ICAO EUR Doc 020 (EUR AMHS Manual) [4], a high level description, elements under test, the environment, input to the testing, expected output, and additional information as necessary.

4.1.5 The identifier serves two purposes. It identifies a test description in this document and during the EDS testing activity, it uniquely identifies a given phase of a given cycle and supports identification of the related test description. The unique identifier composes out of the prefix *EDSTest*, the two-digit number of the cycle and the consecutive two-digit number of the phase. The description of the EDS testing phases makes use of the placeholder CC for the cycle number. During the EDS testing activity, the initial cycle number takes the value

one, i.e. CC equals 01. The cycle number is incremented after completion of a cycle. The phases are numbered starting with one for the Data Entry Phase to 5 for the Data Distribution and Implementation Phase. The hyphen is used to separate the elements from each other.

Examples:

EDSTest-CC-01: Identifier used in the description of the Data Entry Phase.

EDSTest-02-05: Identifier for Data Distribution and Implementation Phase in the second cycle.

## 4.2 Data Entry Phase

4.2.1 In the initial step of EDS, this phase does not imply activities on EDS side apart from the establishment of prerequisites and setup as per Chapter 3, when applicable. However, essential test data used in the EDS testing activity is compiled in this phase.

4.2.2 The EDS testing activity begins with this phase. New parties also join at the beginning of this phase.

4.2.3 Table 6 provides the description of the Data Entry Phase.

Identification	EDSTest-CC-01
Reference	Section 5.4.2.1 of Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [4]
Description	Modification of information in the AMC Background Area
Under Test	N/a in initial phase of EDS
Environment	<u>Components</u> : Test-AMC <u>Roles</u> : AMC and CCC Operators <u>Areas</u> : AMC Background
Input	<u>Data</u> : Valid set of information in the AMC Background Area <u>AMC Operator</u> : Data entry in the AMC background area for the AMHS MD Register and AFTN, CIDIN and AMHS routing information. Data entry in the AMC background area of AMHS address information (CAAS table, AMHS user address look-up table) and AMHS user capabilities of States and Organisations not participating in the EDS testing activity as necessary. <u>CCC Operator</u> : Data entry of AMHS address information (CAAS table, AMHS user address lookup table) and AMHS user capabilities in the AMC Background Area
Output	<u>Data</u> : Modified and validated set of information in the AMC Background Area

Information	<p>Modification of EDS related types of information maintained at AMC:</p> <ul style="list-style-type: none"> <li>• AMHS MD Register</li> <li>• CAAS tables</li> <li>• AMHS user address lookup table</li> <li>• AMHS user capabilities</li> <li>• AFTN, CIDIN and AMHS routing matrices</li> </ul>
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**Table 6: Data Entry Phase**

4.2.4 This testing phase simulates the modification of AMHS-related information without immediate effect to the EDS. It is required to compile the input for subsequent testing phases. Modifications to the AMC Background Area shall get logged for the purpose of tracking and verification.

4.2.5 The AMC Operator is in charge of maintenance of the AMHS MD Register and the AFTN, CIDIN and AMHS routing directory. In addition, the AMC Operator maintains the CAAS tables, AMHS user address lookup tables and AMHS user capabilities of States and Organisation not participating in the EDS testing activity whenever considered necessary. It is proposed to simulate a variety of use cases and typical scenarios, such as:

- Introduction of a new AMHS Management Domain by insertion of an entry in the AMHS MD Register;
- Modification of the PRMD name of an existing AMHS Management Domain;
- Change of the AMHS Address Scheme of an existing AMHS Management Domain;
- Revocation of an existing AMHS Management Domain by removal of the respective entry from the AMHS MD Register;
- Insertion of new routing entries for AFTN, CIDIN and AMHS;
- Modification of existing routing entries for AFTN, CIDIN and AMHS;
- Removal of existing routing entries for AFTN, CIDIN and AMHS; and
- Use cases of CCC Operator on behalf of non-participating States and Organisations, as indicated in the next paragraph.

4.2.6 The CCC Operator is in charge of maintenance of the respective CAAS table, the AMHS user address lookup table and the AMHS user capabilities table. It is proposed to simulate a variety of use cases and typical scenarios, such as:

- CAAS table, AMHS user address lookup table and AMHS user capabilities tables:
  - Introduction of a new entry;
  - Modification of individual fields of an existing entry; and
  - Removal of an existing entry.

### 4.3 Data Validation and Processing Phase

4.3.1 Table 7 provides the description of the Data Validation and Processing Phase.

Identification	EDSTest-CC-02
Reference	Section 5.4.2.2 of Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [4]
Description	Validation of information in the AMC Background Area by the AMC Operator and transfer of information to the EDS Pre-operational Area. Validation of information in the Pre-operational Area of the Central European Test-DSA by the EDS Central Administrator and of the Co-operating and Adjacent Test-DSAs by the EDS Co-operating and Adjacent Operators.
Under Test	<u>AMC-EDS user interface</u> : Transfer of information to EDS Pre-operational Area. <u>Distribution of information</u> : Push distribution by DISP or Pull distribution by DSP.
Environment	<u>Components</u> : Test-AMC, Central European Test-DSA, Co-operating and Adjacent Test-DSAs <u>Roles</u> : AMC Operator, EDS Administrator, Co-operating and Adjacent Operators <u>Areas</u> : AMC Background, AMC and EDS Pre-operational
Input	<u>Data</u> : Validated set of information in the AMC Background Area <u>AMC Operator</u> : Transfer of information to the EDS Pre-operational Area at the Central European Test-DSA
Output	<u>Data</u> : Modified set of data in the EDS Pre-operational Area at the Central European, Co-operating and Adjacent Test-DSAs
Information	Assessment of the test phase by inspection

**Table 7: Data Validation and Processing Phase**

4.3.2 At the AMC, the AMC Operator initiates the transfer of information to the EDS Pre-operational Area. The result of the operation is reported by AMC.

4.3.3 At the Central European Test-DSA, the EDS Central Administrator checks as a minimum:

- Result of transfer operation by inspection of the attribute values of the auxiliary object class *eds-unit* associated with the entry with the distinguished name O=European-Directory; OU=Pre-operational;
- Existence of new entries added by the AMC Operator (DUA);
- Absence of entries removed by the AMC Operator (DUA);

- Values of attribute types resulting from modifications by the AMC Operator (DUA); and
- Results of distribution for each Co-operating and Adjacent Test-DSA using replication through shadowing.

4.3.4 At Co-operating and Adjacent Test-DSAs, the Co-operating or Adjacent Operator checks as a minimum:

- Result of distribution by the Central European Test-DSA. The way to determine the results of push or pull distribution depends on the implementation. It is assumed that implementations provide this information at a Human-Machine-Interface for configuration and management or by log files;
- Existence of new entries added by the CCC Operator of the respective State or Organisation (DUA);
- Absence of entries removed by the CCC Operator of the respective State or Organisation (DUA); and
- Values of attribute types resulting from modifications by the CCC Operator of the respective State or Organisation (DUA).

4.3.5 The Central Administrator, Co-operating and Adjacent Operators may validate EDS information beyond the minimum requirements specified above. The results of the testing shall be logged and reported according to Section 2.4.

## 4.4 Acknowledgement Phase

4.4.1 Table 8 provides the description of the Acknowledgement Phase.

Identification	EDSTest-CC-03
Reference	Section 5.4.2.3 of Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [4]
Description	Acknowledgment of routing matrices by CCC Operators.
Under Test	N/a in initial phase of EDS
Environment	<u>Components</u> : Test-AMC <u>Roles</u> : CCC Operators <u>Areas</u> : AMC Pre-operational Area
Input	<u>Data</u> : Valid set of information in the AMC and EDS Pre-operational Area <u>CCC Operator</u> : Acknowledgement of AFTN, CIDIN and AMHS routing matrices if updated
Output	<u>Data</u> : Valid and acknowledged set of information in the AMC Pre-operational Area

Information	<p>This test phase is maintained for compatibility with the ATS Messaging Management process in order to allow for future implementation of an acknowledgement within the workflow mechanism of EDS. Acknowledgement is required for information generated by the Central European Test-DSA such as routing information.</p> <p>No modification of EDS related types of information appear in this phase.</p>
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**Table 8: Acknowledgement Phase**

4.4.2 This testing phase simulates the acknowledgement by CCC Operators without an immediate effect to the EDS.

## 4.5 Acknowledgement Processing Phase

4.5.1 Table 9 provides the description of the Acknowledgement Processing Phase.

Identification	EDSTest-CC-04
Reference	Section 5.4.2.4 of Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [4]
Description	Acknowledgment processing by the AMC Operator
Under Test	<p><u>AMC-EDS user interface</u>: Transfer of information to the EDS Pre- operational Area (optional)</p> <p><u>Distribution of information</u>: Push distribution by DISP or Pull distribution by DSP (optional)</p>
Environment	<p><u>Components</u>: Test-AMC, Central European Test-DSA, Co-operating and Adjacent Test-DSAs</p> <p><u>Roles</u>: AMC Operator, EDS Administrator, Co-operating and Adjacent Operators</p> <p><u>Areas</u>: AMC and EDS Pre-operational</p>
Input	<p><u>Data</u>: Validated and acknowledged set of information in the AMC Pre-Operational Area</p> <p><u>AMC Operator</u>: Status update of routing matrices and transfer of information to the EDS Pre-operational Area at the Central European Test-DSA (optional)</p>
Output	<u>Data</u> : Modified and acknowledged set of data in the EDS Pre-operational Area at the Central European, Co-operating and Adjacent Test-DSAs

Information	Modification of EDS related types of information maintained at AMC: <ul style="list-style-type: none"> <li>• AFTN, CIDIN and AMHS routing matrices</li> </ul>
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**Table 9: Acknowledgement Processing Phase**

4.5.2 This phase might result in one or potentially several repetitions as given below.

4.5.3 Depending on the acknowledgments received during the acknowledgment phase, the AMC Operator adjusts the status of the routing matrices (in preparation, proposed, released) and re-transfers the updated information to the EDS Pre-operational Area. The result of the operation is reported by AMC.

4.5.4 At the Central European Test-DSA, the EDS Central Administrator checks as a minimum:

- Result of transfer operation by inspection of the attribute values of the auxiliary object class *eds-unit* associated with the entry with the distinguished name O=European-Directory; OU=Pre-operational;
- Modifications applied to routing entries, if any; and
- Results of distribution for each Co-operating and Adjacent Test-DSA using replication through shadowing.

4.5.5 At Co-operating and Adjacent Test-DSAs, no checks are required by the Co-operating or Adjacent Operator in order to achieve the minimum coverage.

4.5.6 The Central Administrator, Co-operating and Adjacent Operators may validate EDS information beyond the minimum requirements specified above. The results of testing shall be logged and reported according to Section 2.4.

## 4.6 Data Distribution and Implementation Phase

4.6.1 The EDS testing activity ends with this phase and participants leave at the end of this phase.

4.6.2 Table 10 provides the description of the Data Distribution and Implementation Phase.

Identification	EDSTest-CC-05
Reference	Section 5.4.2.5 of Appendix G to ICAO EUR Doc 020 (EUR AMHS Manual) [4]
Description	Transfer of information to the EDS Operational Area. Testing of information in the Operational Area of the Central European Test-DSA by the EDS Central Administrator and of the Co-operating and Adjacent Test-DSAs by the EDS Co-operating and Adjacent Operators. Report of results.



Under Test	<u>AMC-EDS interface</u> : Transfer of information to the EDS Operational Area. <u>Distribution of information</u> : Push distribution by DISP or Pull distribution by DSP.
Environment	<u>Components</u> : Test-AMC, Central European Test-DSA, Co-operating and Adjacent Test-DSAs <u>Roles</u> : AMC Operator, EDS Administrator, Co-operating and Adjacent Operators <u>Areas</u> : AMC Pre-operational Area, AMC and EDS Operational Areas
Input	<u>Data</u> : Validated set of information in the AMC Operational Area <u>AMC Operator</u> : Transfer of information to the EDS Operational Area at the Central European Test-DSA
Output	<u>Data</u> : Modified set of data in the EDS Operational Area at the Central European, Co-operating and Adjacent Test-DSAs
Information	Assessment of the test phase by inspection

**Table 10: Data Distribution and Implementation Phase**

4.6.3 At the AMC, the AMC Operator initiates the transfer of information to the EDS Operational Area. The result of the operation is reported by AMC.

4.6.4 At the Central European Test-DSA, the EDS Central Administrator checks as a minimum:

- Result of transfer operation by inspection of the attribute values of the auxiliary object class *eds-unit* associated with the entry with the distinguished name O=European-Directory; OU=Operational;
- Existence of new entries added by the AMC Operator (DUA);
- Absence of entries removed by the AMC Operator (DUA);
- Values of attribute types resulting from modifications by the AMC Operator (DUA); and
- Results of distribution for each Co-operating and Adjacent Test-DSA using replication through shadowing.

4.6.5 At Co-operating and Adjacent Test-DSAs, the Co-operating or Adjacent Operator checks as a minimum:

- Result of distribution by the Central European Test-DSA. The way to determine the results of push or pull distribution depends on the implementation. It is assumed that implementations provide this information at a Human-Machine-Interface for configuration and management or by log files;
- Existence of new entries added by the CCC Operator of the respective State or Organisation (DUA);

- Absence of entries removed by the CCC Operator of the respective State or Organisation (DUA); and
- Values of attribute types resulting from modifications by the CCC Operator of the respective State or Organisation (DUA).

4.6.6 The Central Administrator, Co-operating and Adjacent Operators may validate EDS information beyond the minimum requirements specified above. The results of testing shall be logged and reported according to Section 2.4.

**END of Appendix G-C**



# EUR AMHS Manual

## Appendix G

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- APPENDIX G-A: EDS USER INTERFACE CONTROL DOCUMENT
- APPENDIX G-B: EDS DATA DESCRIPTION
- APPENDIX G-C: EDS TESTING GUIDELINES

## References

- [1] EUROCONTROL Specification on the Air Traffic Services Message Handling System (AMHS), Edition 2.0, 18/09/2009

*Note.— Specification's reference published as a Community specification in the Official Journal of the European Union, C 323/24, 31.12.2009.*

- [2] ICAO EUR Doc 020 EUR AMHS Manual, latest version
- [3] ICAO EUR Doc 021 ATS Messaging Management Manual, latest version
- [4] ICAO EUR Doc 022 EUR AFS Security Guidelines, latest version
- [5] ICAO Doc 9880 AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part I — Air-Ground Applications, Second Edition, 2016
- [6] ICAO Doc 9880 AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II — Ground-Ground Applications — Air Traffic Services Message Handling Services (ATSMHS), Second Edition, 2016
- [7] ICAO Doc 9880 AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part III — Upper Layer Communications Service (ULCS) and Internet Communications Service (ICS), Second Edition, 2016
- [8] ICAO Doc 9880 AN/466 Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part IV — Directory Services, Security and Identifier Registration, Second Edition, 2016
- [9] ICAO Doc 9896 Manual on the Aeronautical Telecommunication Network (ATN) using Internet Protocol Suite (IPS) Standards and Protocols, Second Edition, 2015
- [10] ISO/IEC 9594-n Information technology – Open Systems Interconnection – The Directory (multi-part), 5<sup>th</sup> Edition, 2005

*Note.— This set of standards was also published as ITU-T X.500 (08/2005) set of standards.*

- [11] IETF RFC 4511 Lightweight Directory Access Protocol (LDAP): The Protocol, June 2006
- [12] IETF RFC 2849 The LDAP Data Interchange Format (LDIF) - Technical Specification, June 2000
- [13] IETF RFC 1006 ISO Transport Service on top of the TCP, Version 3, May 1987
- [14] IETF RFC 2126 ISO Transport Service on top of TCP (ITOT), March 1997
- [15] European Directory Service (EDS) Operational Concept – WP1 (Analysis), Version 1.0, October 2011
- [16] European Directory Service (EDS) Operational Concept – WP2 (Concept), Version 1.0, October 2011



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# **1 Introduction**

## **1.1 Scope of the Document**

1.1.1 This document constitutes the specification of the European Directory Service (EDS) Operational Concept, describing how the EDS should be used as a common European facility in support of ATN applications and AMHS in particular.

1.1.2 The specification laid down in the EUROCONTROL EDS concept document [16] was developed in the framework of the EUROCONTROL EDS Operational Concept study and handed over to the ICAO AFSG for consideration, subsequent adoption and maintenance thereafter. The AFSG decided to incorporate the specification into the EUR AMHS Manual as an Appendix.

## **1.2 Purpose of the Document**

1.2.1 The purpose of this document is to provide a comprehensive analysis of the various aspects of the solution for the European Directory Service. Besides technology considerations, the document addresses operational, cooperation and transitional issues.

1.2.2 The document aims to give advice in support of the implementation and operations of the European Directory Service. The major focus is set on the exchange of information at the international level. Distribution of information at national or local levels and access to information by Directory users are taken into account to give the full picture, however they are considered local implementation matters.

## **1.3 Structure of the Document**

1.3.1 This document consists of the following chapters:

- Chapter 1 (this chapter) provides an introduction to the document.
- Chapter 2 gives the overall picture from the topology point of view.
- Chapter 3 discusses the refinement of functional objects.
- Chapter 4 outlines the X.500 protocols to be used for exchange of information between functional objects.
- Chapter 5 describes the concept of operation including aspects of cooperation with Regions, States and Organisations not participating in the concept.
- Chapter 6 looks at the schema definition.
- Chapter 7 considers transition and migration towards the European Directory Service.
- Chapter 8 discusses capacity and performance considerations with respect to the implementation of the European Directory Service.
- Chapter 9 outlines future options of the European Directory Service.

1.3.2 This document is supplemented by Appendices G-A, G-B and G-C providing specific information with regard to the following matters:

- Appendix G-A: EDS User Interface Control Document

This Appendix provides the Interface Control Document (ICD) of the European Directory Service (EDS) for co-operating and adjacent users. It summarises interface details for the exchange of information between the Central European DSA, and Co-operating and Adjacent DSAs.

- Appendix G-B: EDS Data Description

This Appendix describes the information provided by the European Directory Service (EDS). It provides details regarding the structure and elements (Object Classes and associated Attribute Types) used by the Directory Tree in the Central European DSA, and as replication in the Co-operating and Adjacent DSAs.

- Appendix G-C: EDS Testing Guidelines

This Appendix provides guidelines in order to enable involved parties to carry out the EDS testing activity, basically between implementations of the Central European Test-DSA and Co-operating and Adjacent Test-DSAs.

## **2 Overall Topology**

2.1 The European Directory Service (EDS) Operational Concept adopts and refines the approach given by the AMHS Community Specification [1], further referred to as AMHS CS. In Chapter 4 the AMHS CS outlines a central Directory service as a European Common Facility.

2.2 The AMHS CS makes reference to ICAO EUR Doc 020 [2] and ICAO Doc 9880 Part IV [8]. ICAO Doc 9880 Part IV describes the ATN Directory service, in particular the functional objects, protocols and schema definition with respect to the X.500 base standards [10].

2.3 ICAO EUR Doc 020 indicates in Annex K of Appendix B, the directory information needed to support the AMHS.

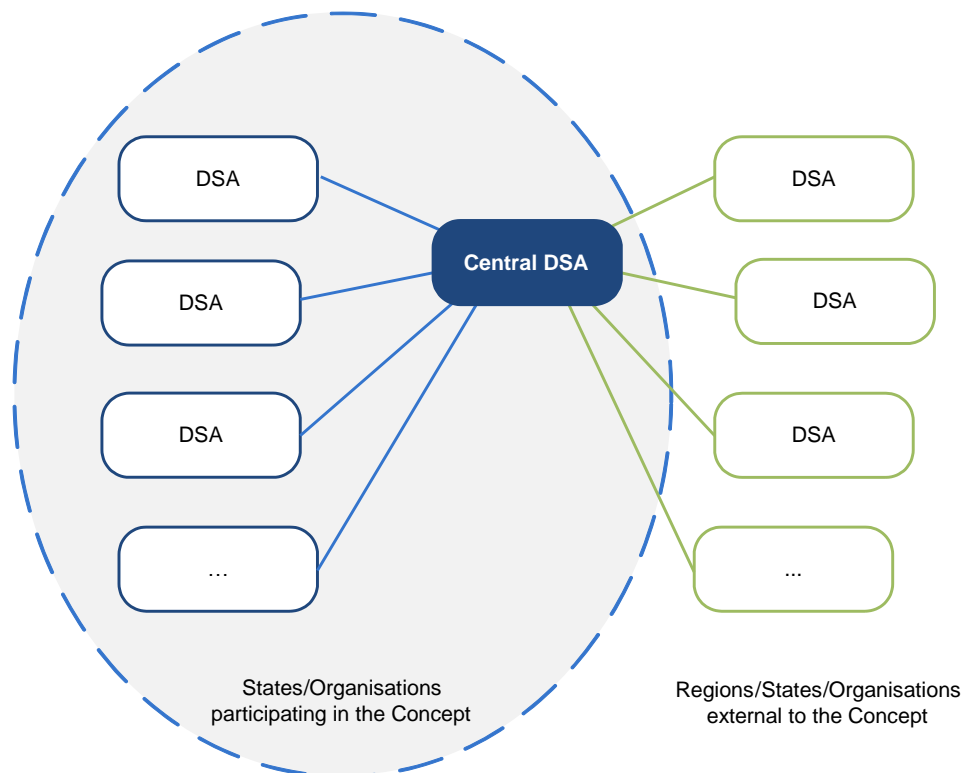
2.4 The AMHS CS describes an architecture with the Directory System Agents (DSA) of the various Directory Management Domains (DMDs) connected to one central DSA. The role of the central DSA is to collect data from participating States and Organisations as well as from Regions, States and Organisations not directly participating in the concept; to check consistency of the collected data, and to provide validated data to States and Organisations. With regard to the ATS Messaging Management process, ICAO EUR Doc 021 [3] contains a detailed description.

2.5 The EDS analysis [15] confirms the centralised approach of the AMHS CS [1] in order to implement a Directory service as a Common Facility in the European area. The EDS Operational Concept describes the exchange of information at the international level between the participating States and Organisations with regard to the overall topology, used protocols, data structures, workflow, and procedures. The European Directory Service (EDS) is expected to support the various ATN applications, especially the AMHS in implementation of the Extended ATS Message Handling Service. The EDS Operational Concept also describes the protocols used by Directory users for access to the information stored in the Directory. Further aspects of access by users and national respective local distribution of information are considered out of scope of the EDS Operational Concept.

2.6 In addition to a pure European solution, the EDS Operational Concept considers the global aspect of Directory services. Regions, States and Organisations not directly participating in the concept, need to exchange data with the central DSA and/or States and Organisations participating in the concept. Regions, States and Organisations not participating in the concept also provide data that is required by the participating States and Organisations as well as vice versa.

2.7 The EDS Operational Concept describes an overall online Directory solution.

2.8 In the framework of the European Directory Service the term “online” refers to a service that provides direct and automated communication means between the involved entities using well-defined protocols. Communication is established and takes place on demand or by schedule, but without manual initiation or intervention by human users. A permanent connection on a 24 hour basis is not implied by the term online.



**Figure 1: Participating and non-participating Directory Management Domains**

2.9 The EDS Operational Concept specifies the cooperation of the central DSA with the DSAs in the participating and non-participating DMDs. These DMDs might implement further, subordinate DSAs in support of geographical deployment, quality of service, redundancy, etc. Those subordinate DSAs may communicate among themselves and with the DMD's top level DSA however they do not communicate with the central DSA and do not directly participate in the concept. Subordinate DSAs implemented by the DMDs are therefore considered out of scope in the context of the concept.

## 3 Functional Objects

### 3.1 Relationship to Base Standards and Doc 9880

3.1.1 The functional model of the ATN Directory service as per ICAO Doc 9880 Part IV [8] refines the basic, functional model given by the X.500 base standards [10], which is further refined by the EDS Operational Concept.

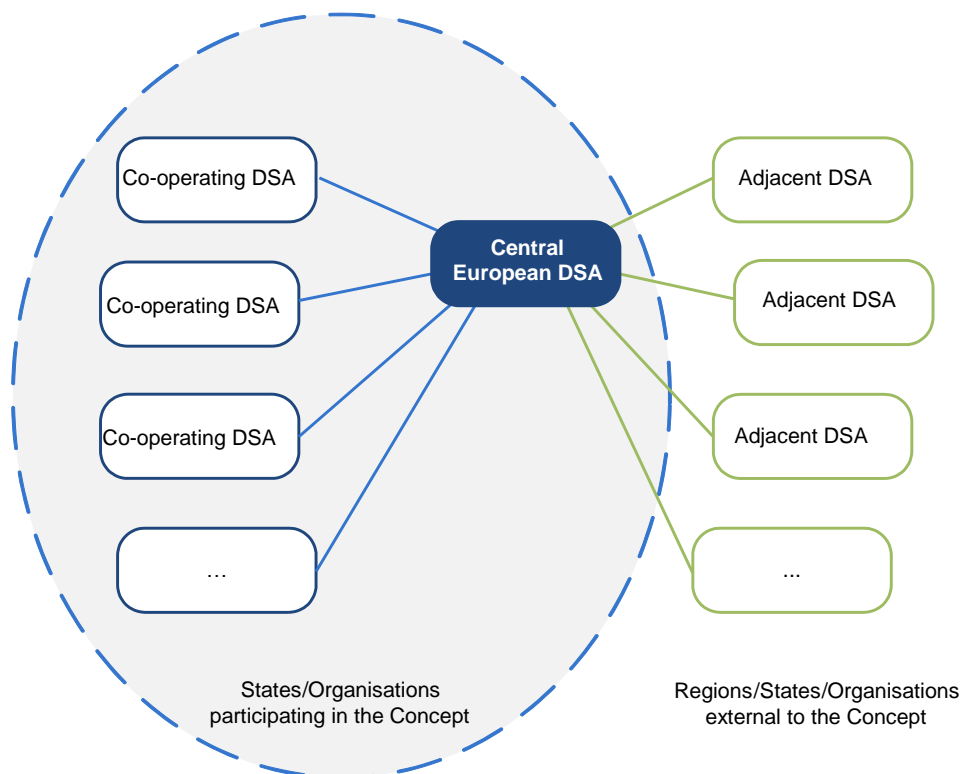
### 3.2 Directory System Agent

3.2.1 A Directory System Agent (DSA) is a functional object in the model of the ATN Directory service.

3.2.2 According to the X.500 model, a DSA provides access to the information stored in the Directory for other DSAs and users.

3.2.3 A DSA within the EDS Operational Concept implements one of the following profiles according to the function of the respective DSA:

- Central European DSA; or
- Co-operating DSA; or
- Adjacent DSA.



**Figure 2: Directory System Agents within the EDS Operational Concept**

### Central European DSA

3.2.4 The Central European DSA is implemented as a Common Facility within the European Directory Service (EDS).

3.2.5 The role of this facility is to:

- collect data from participating States and Organisations;
- collect data from non-participating Regions, States and Organisations;
- apply a workflow mechanism;
- ensure consistency of collected data;
- provide overall validated data to participating States and Organisations; and
- provide validated data with regard to participating States and Organisation to non-participating Regions, States and Organisations.

*Note.– The amount of data collected from and provided to a DSA depends on the profile implemented by the DSA.*

3.2.6 With regard to non-participating Regions, States and Organisations, the Central European DSA acts on behalf of the Co-operating DSAs. In this respect, there is no need for a Co-operating DSA to exchange data with any other DSA, but the Central European DSA.

### Co-operating DSA

3.2.7 A Co-operating DSA participates in the concept and contributes to the overall functions within the European Directory Service.

3.2.8 The role of this facility is to:

- allow users to modify local data;
- provide local data to the Central European DSA;
- receive validated data provided by the Central European DSA; and
- provide validated data to subordinate DSAs and local users.

3.2.9 The validated data received from the Central European DSA covers data collected from any other Co-operating or Adjacent DSA.

### Adjacent DSA

3.2.10 An Adjacent DSA does not directly participate in the concept; however, it provides data to and receives data from the Central European DSA.

3.2.11 The role of this facility is to:

- provide local/regional data to the Central European DSA and
- receive a part of the validated data provided by the Central European DSA.

*Note.– The above listing identifies only a minimum set of profiles in order to enable exchange of data with the Central European DSA.*

3.2.12 The part of the validated data received from the Central European DSA covers data collected from all Co-operating DSAs on whose behalf the Central European DSA acts.

3.2.13 Any other Region, State or Organisation may operate an Adjacent DSA.

### 3.3 Directory User Agent

3.3.1 A Directory User Agent (DUA) is a functional object in the model of the ATN Directory service.

3.3.2 Services available at a DUA are provided by the Directory in response to operations initiated by a human or system user. There are operations to allow interrogation of the Directory and others to allow modifications.

3.3.3 A DUA within the EDS Operational Concept implements one of the following profiles according to the function of the respective DUA:

- Administrative DUA
- Operational Personnel DUA
- Autonomous Operational DUA

*Note.— The profiles of the previous three DUA types are specified in ICAO Doc 9880 Part IV [8].*

- Central Administrative DUA

#### Administrative DUA

3.3.4 An Administrative DUA provides the user with the full range of Directory operations and is suitable for Directory administrators of various kinds. It needs access to all of the Directory operations, and it is subject to access controls for the modification operations. It is also required to protect the integrity and accuracy of the data held in the Directory Information Base (DIB).

#### Operational Personnel DUA

3.3.5 An Operational Personnel DUA provides a (human) operational user with the limited range of Directory operations enabling interrogation of the Directory without being granted access to the modification operations. Typical users of Operational Personnel DUAs include operators of systems in the ATN, AMHS users and users of end systems supporting other ATN applications. Planners and management personnel also belong to this profile. This DUA requires guarantees of data integrity and accuracy.

#### Autonomous Operational DUA

3.3.6 An Autonomous Operational DUA (supporting, for example, AMHS MTAs, UAs, MS and MTCUs, or other ATN applications) is an autonomous process with limited requirements of Directory interrogation operations (e.g. it requires the read, compare and search operations only) and it operates without human intervention to invoke Directory operations and evaluate results. This DUA requires guarantees of data accuracy.



### Central Administrative DUA

3.3.7 The Central Administrative DUA is an Administrative DUA as specified by ICAO Doc 9880 Part IV [8] designed to provide the user with workflow capabilities in order to implement the ATS Messaging Management process at the Central European DSA. A typical user of the Central Administrative DUA is the administrator of the Central European DSA in charge of consistency and validation of the collected data.

## 4 Protocols

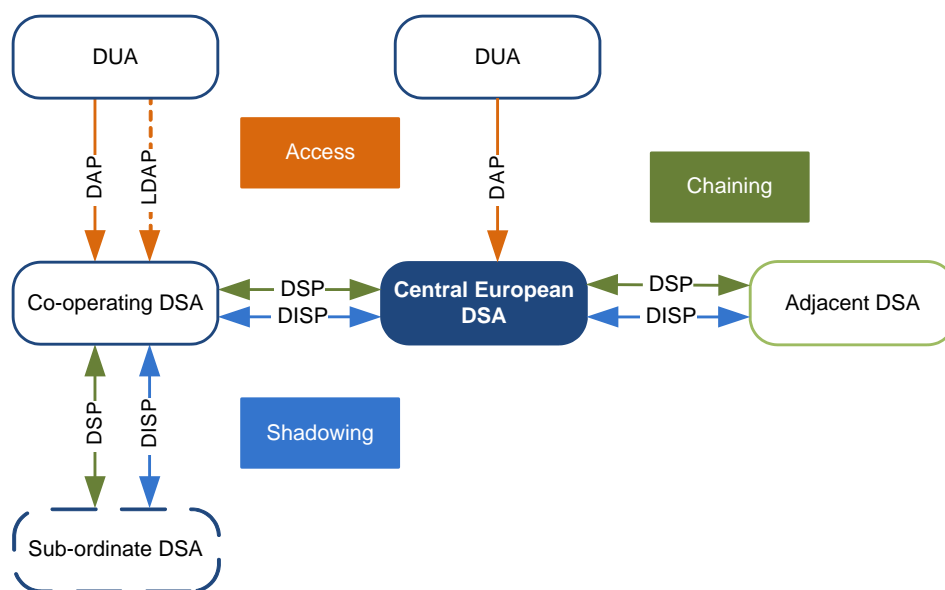
4.1 The X.500 Directory base standards define protocols for communications between the functional objects:

- Directory System Protocol (DSP)
- Directory Information Shadowing Protocol (DISP)
- Directory Access Protocol (DAP)
- Directory Operational Bindings Management Protocol (DOP)

*Note.*— In the context of the European Directory Service, DOP is considered out of scope as already stated by the AMHS Community Specification [1].

4.2 DSP supports communications between two DSAs, where a request cannot be fully resolved by one DSA and forwarded to one or more other DSAs through chaining. Use of referrals is discouraged by the EDS Operational Concept as it increases the number of access points for the users' DUAs. Use of DSP for chaining is recommended.

4.3 DISP supports shadowing between two DSAs where a copy of data is made available at another DSA. Use of DISP reduces the dependency from underlying international networks and facilitates the holding of data close to the user. Use of DISP for shadowing is recommended.



**Figure 3: European Directory Service communications protocols**

4.4 DAP is used by DUAs in order to enable users to access the European Directory Service. Depending on the access rights, the user can access data in the Directory Information Base (DIB) and perform operations.

4.5 The available DAP operations fall in two categories as specified in the X.500 base standards [10]:

- Interrogation operations which allow to query the Directory; and
- Modification operations which apply changes to the Directory.

4.6 Using DAP the X.500 base standards specify the following operations for Directory interrogation:

- *Read* to determine the attributes of an entry and related values;
- *Compare* to check whether a supplied value matches a value of a particular attribute of a particular entry;
- *List* to receive a list of immediate subordinates of a particular entry;
- *Search* to identify entries in portions of the Directory that satisfy a supplied filter; and
- *Abandon* to inform the Directory that the initiating user of a previous interrogation operation is no longer interested in the operation being carried out.

4.7 Using DAP the X.500 base standards specify the following operations for Directory modification:

- *Add entry* to insert a new leaf entry;
- *Remove entry* to delete an existing leaf entry;
- *Modify entry* to apply a sequence of changes to a particular entry; and
- *Modify distinguished name* to change the relative distinguished name of a particular entry.

4.8 Use of DAP is recommended for management purposes and is proposed for other purposes depending on the needs of the respective applications.

4.9 In addition to DAP specified by ICAO Doc 9880 Part IV [8] for access by Directory users, Operational Personnel DUA and Autonomous Operational DUAs of end users with limited needs may make use of the Lightweight Directory Access Protocol (LDAP) [11].

4.10 LDAP was developed as an alternate, simpler means to access a Directory compared to DAP, aiming to provide equivalent operations. In contrast to previous versions, the current version 3 of LDAP (LDAPv3) supports peer authentication, which is considered essential in the context of ATN Directory and EDS. Use of LDAPv3 is optional for end users with limited needs.

*Note.— LDAPv3 does not support read and list operations.*

4.11 An ATN application accessing the Directory shall make use of either DAP or LDAPv3.

*Note.— LDAP provides alternate access to an X.500 Directory by protocol means. Support of LDAP by COTS X.500 DSAs is widely available. For the exchange of information between DSAs, the use of X.500 protocols is recommended.*

4.12 At the transport layer, the implementations of Directory protocols can make use of an OSI lower layer stack. However, in the light of emerging European network infrastructure, it is proposed to implement a transport mapping from the OSI transport layer to the

Transmission Control Protocol (TCP) similar to the transport mapping for the AMHS in the EUR Region as specified by ICAO EUR 020 [2]. Such a transport mapping implements RFC 1006 [13] or RFC 2126 [14] for Internet Protocol Versions 4 (IPv4) or 6 (IPv6) respectively. ICAO Doc 9896 [9] adopted IPv6 for the Aeronautical Telecommunication Network. The transport mapping onto TCP and the use of IP would allow the use of available, international IP-based network infrastructure in Europe.

*Note.— Support of transport mapping from OSI transport to TCP using RFC 1006 or RFC 2126 as well as support of IPv4 and IPv6 by X.500 COTS products is widely available.*

## 5 Concept of Operation

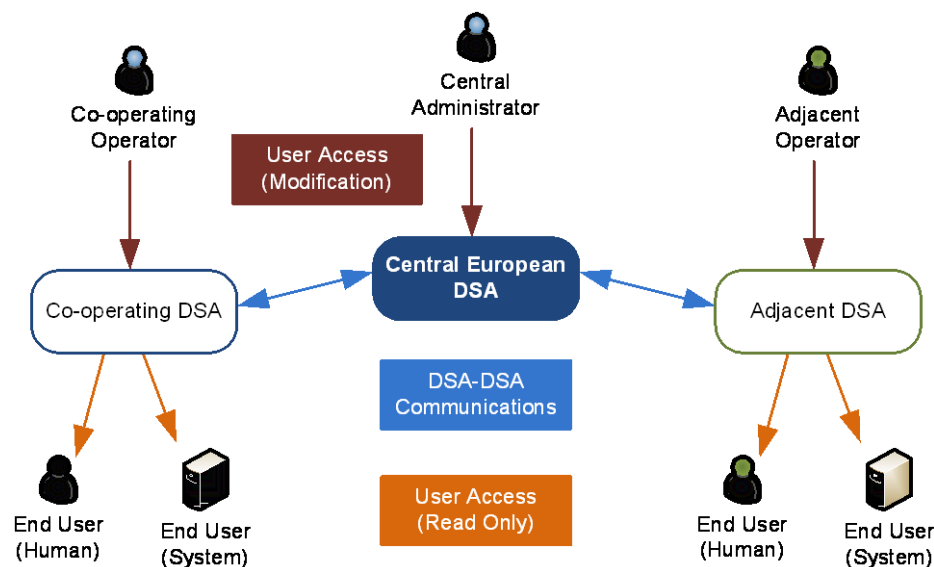
### 5.1 Relationship to Doc 9880

5.1.1 ICAO Doc 9880 Part IV [8] specifies technical aspects of the ATN Directory service such as DIT structure, objects classes, attribute types, protocols, etc. However, the specification does not address operational aspects given in this chapter.

### 5.2 Roles

5.2.1 In terms of management of the European Directory Service (EDS), the EDS Operational Concept identifies the following roles:

- Central administrator
- Co-operating operator
- Adjacent operator
- End User



**Figure 4: Interaction of European Directory Service roles**

#### Central Administrator

5.2.2 The Central Administrator is in charge of systems management of the Central European DSA. The Central Administrator manages the connections to the other DSAs and controls access to data mastered by the Central European DSA. Furthermore, he manages global data mastered by the Central European DSA.

5.2.3 The Central Administrator uses a Central Administrative DUA and performs workflow operations. He validates data ensuring consistency of data mastered by the Central European DSA. The Central Administrator can perform interrogation and modification

operations to global data and Managed Data as well as interrogation operations to all other data.

### Co-operating Operator

5.2.4 The Co-Operating Operator is in charge of management of data provided by the respective State or Organisation participating in the concept.

5.2.5 For management of local data mastered by the Co-operating DSA, the Co-operating Operator accesses the local DSA. For management of data mastered by the Central European DSA, the Co-operating Operator accesses the local DSA and the local DSA forwards the request to the Central European DSA for processing of the request.

5.2.6 The Co-operating Operator uses an Administrative DUA and can perform interrogation operations to all data and additionally modification operations to the data he manages.

5.2.7 Co-operating Operators are allocated and managed by the Central Administrator who provides Co-operating Operators with their distinguished names and initial passwords.

### Adjacent Operator

5.2.8 The Adjacent Operator fulfils a task similar to Co-operating Operator.

5.2.9 The Adjacent Operator uses an Administrative DUA and can perform interrogation and modification operations to data he manages, as well as interrogation operations to data replicated by the Central European DSA. However, the Adjacent Operator typically does not directly access the Central European DSA.

5.2.10 Adjacent Operators are allocated and managed by the Central Administrator who provides Adjacent Operators with their distinguished names and initial passwords.

### End User

5.2.11 End Users are consumers of Directory data and can perform interrogation operations to the Directory. Modification operations by End Users are not permitted.

5.2.12 End Users are either human or machine/system users. Human users utilise an Operational Personnel DUA whereas system users make use of an Autonomous Operational DUA.

5.2.13 Human end users are for instance direct AMHS users and operators of ATN applications making use of the Directory service. Typical system users are components of ATN applications such as the AFTN/AMHS Gateway and the ATS Message User Agent with only limited requirements. Access of system users is restricted to interrogation operations and to sub-trees as required in order to implement the specified function. The ATS Message Server can also appear as a system user to the Directory service; however, the use of Directory by the ATS Message Server is not specified by ICAO Doc 9880 Part II [6] and thus is considered a local implementation matter. Nevertheless, ICAO Doc 9880 Part IV [8] contains objects classes appropriate for use by the ATS Message Server.

5.2.14 Due to the nature of end users, allocation and management of end users is a local matter.

### Relations to AMC User Categories

5.2.15 Due to the differences in nature of EDS and AMC, the roles of EDS cannot be mapped directly onto the user categories of AMC identified by ICAO EUR Doc 021 [3]. However, similar tasks are assigned to EDS roles and AMC user categories, that allow the following comparison at an abstract level.

<b>EDS Role</b>	<b>AMC User Category</b>
Central Administrator	AMC Operator
Co-operating Operator	CCC Operator
Adjacent Operator	External COM Operators
End User (Human)	AMF-I Users
End User (Human)	Read/Only Users
End User (System)	n/a (Access by systems not intended)
n/a (Concept restricted to active roles)	Participating COM Centres

*Table 1: EDS Roles and AMC User categories*

## **5.3 Flow of Data**

### **5.3.1 Collection and Distribution of Information**

5.3.1.1 In order to make relevant information locally available, the EDS Operational Concept proposes to provide copies of information by replication. Replication between DSAs in the framework of the European Directory Service appears in two situations: collection and distribution of information. Collection is needed for information not hosted by the Central European DSA, which, nevertheless, is intended to be provided to States and Organisations. Distribution is used to provide a copy of information to States and Organisations.

5.3.1.2 The X.500 base standards [10] specify the Directory Information Shadowing Protocol (DISP) for replication of information. Also, the AMHS CS [1] mentions DISP for replication. Consequently, the EDS Operational Concept proposes to make use of DISP for the purpose of collection and distribution of information.

5.3.1.3 However, taking into account available products, existing systems and the fact, that DISP was not mandated by the above documents, the EDS Operational Concept explicitly allows for other, non-standard or proprietary means of collection and distribution.

5.3.1.4 Within the context of the European Directory Service, collection and distribution is performed in one of the following forms:

- Push collection/distribution

- Pull collection/distribution

#### Push Collection/Distribution

5.3.1.5 Collection and Distribution is driven by the Central European DSA. The DSAs perform replication by protocol means using DISP (shadowing). For collection and distribution of information, the Central European DSA initiates push replication.

#### Pull Collection/Distribution

5.3.1.6 Collection and Distribution is driven by a dedicated, non-standard application such as a specialised DUA or a script interfacing the DSA. Data is collected and distributed over protocol e.g. Directory Access Protocol (DAP) and Directory System Protocol (DSP). For collection of information, the Central European DSA initiates pull collection. For distribution of information, the Co-operating respectively Adjacent DSA initiates pull distribution.

5.3.1.7 The flow of data between the involved DSAs depends on the nature of the data. Within the European Directory we find two types of data:

- Shared Data
- Managed Data

5.3.1.8 Managed Data allows for central management and control of data (e.g. for address management data) whereas Shared Data is handled in a distributed way (e.g. white pages).

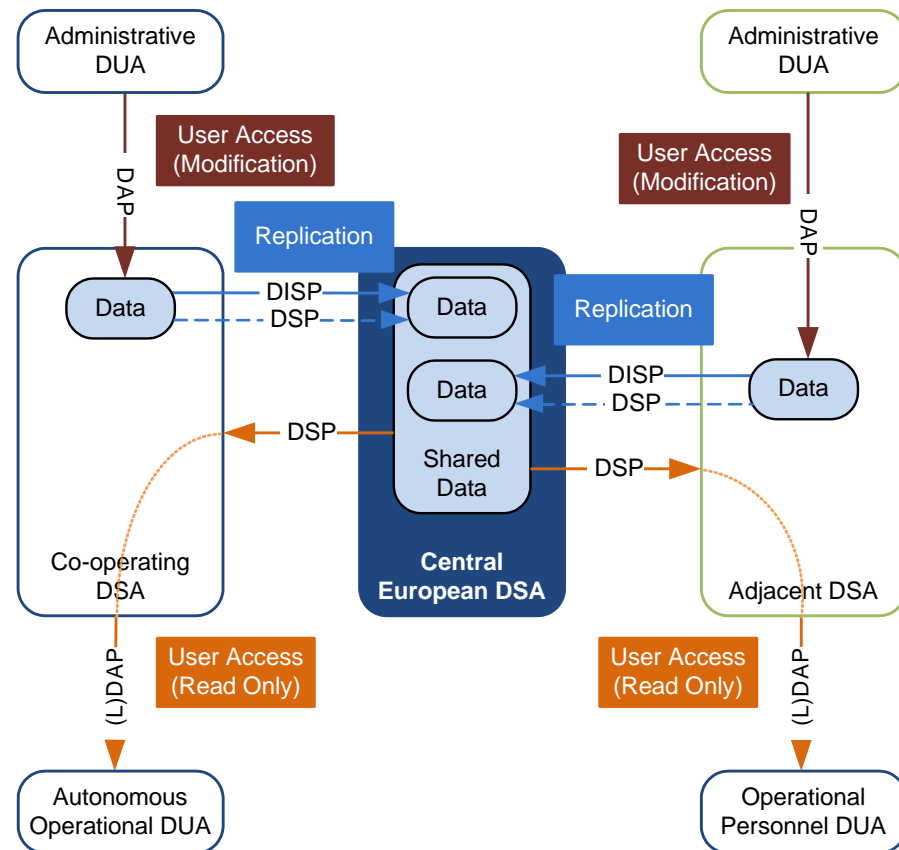
### **5.3.2 Shared Data**

5.3.2.1 Shared Data is maintained in a decentralised manner using a replicated topology to populate the Central European DSA with the data. The Central European DSA makes the overall data available to each State and Organisation through a distributed topology.

5.3.2.2 Each Co-operating and Adjacent DSA masters the respective part of the Shared Data, i.e. the master copy of the data is hosted by the local DSAs. The Co-operating and Adjacent Operators apply modifications to their part of the Shared Data through the Administrative DUA accessing the local DSA by means of DAP.

5.3.2.3 Workflow mechanisms do not apply to Shared Data since it is maintained in a decentralised manner.





**Figure 5: Decentralised maintenance of Shared Data**

5.3.2.4 The parts of Shared Data hosted by Co-operating and Adjacent DSAs are replicated to the Central European DSA by means of DISP. Where DISP is not available at a Co-Operating or Adjacent DSA, the Central European DSA provides a collecting mechanism based on DSP. At the Central European DSA the overall data collected from Regions, States and Organisations is available for retrieval. The Central European DSA allows the Shared Data to be accessed by every Region, State or Organisation using chaining. As data is shadowed to the Central European DSA, the change can be instantly observed by other DSAs.

5.3.2.5 End Users within Regions, States and Organisations access the data through their local DSA by means of the DAP. LDAP may be used instead of DAP for access by human users or applications with limited needs. Human and system End Users perform interrogation operations only. The local DSAs forward the requests initiated by the End Users to the Central European DSA by means of the DSP (chaining). Access to the local DSA provides a single access point to End Users.

### **5.3.3 Managed Data**

5.3.3.1 Managed Data is centrally maintained, validated and supplied to other Regions, States and Organisations based on a centralised and replicated topology. Managed data is subject to workflow mechanisms and supports different sets of data, also referred to as versions of data.

5.3.3.2 The Central European DSA masters the Managed Data, i.e. the master copy of the data is hosted by the Central European DSA. Mastered Data includes data collected from participating and non-participating Regions, States and Organisations. Co-operating DSAs apply modifications to Mastered Data through their Administrative DUAs accessing their local DSAs by means of the DAP. The local DSAs forward the request to the Central

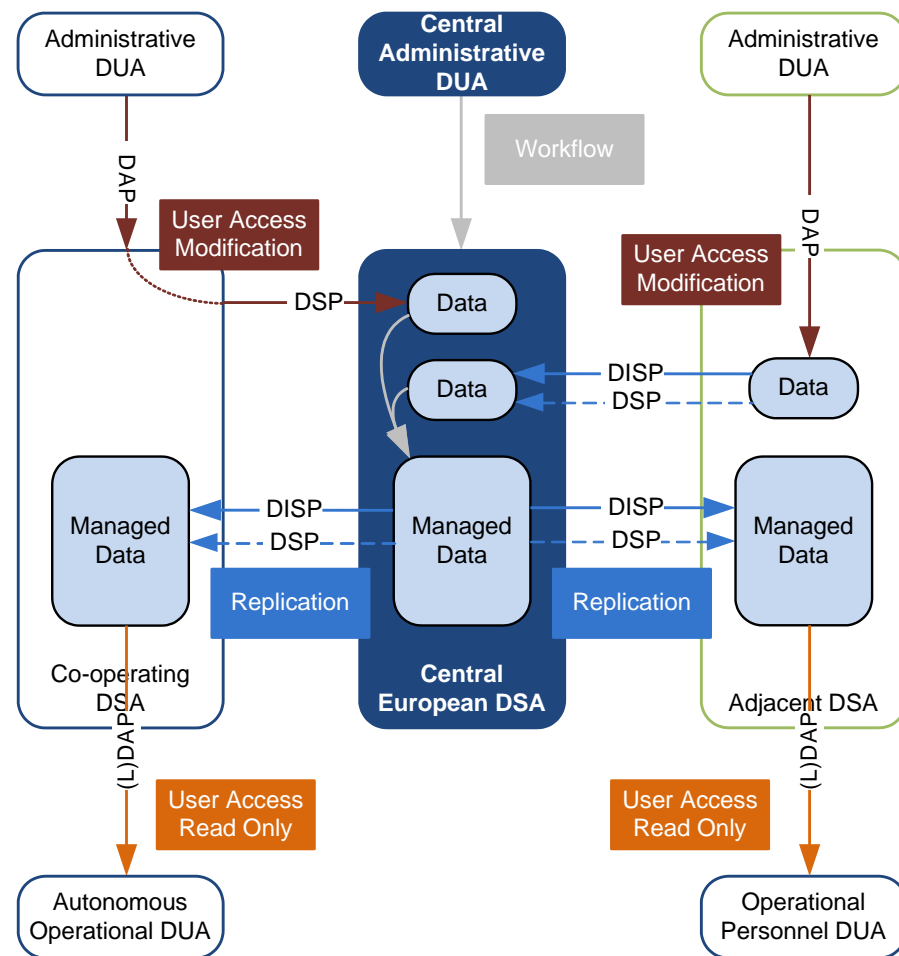
European by means of the DSP (chaining). Adjacent Operators apply modifications to their local data mastered by the Adjacent DSA. The Central European DSA receives Managed Data from Adjacent DSAs through collection means.

5.3.3.3 The Adjacent DSA then replicates the local data to the Central European DSA by means of DISP (shadowing). In case DISP is not available at an Adjacent DSA, the Central European DSA provides a collecting mechanism based on DSP. Access to the local DSA provides a single access point to End Users.

5.3.3.4 Since all of the Managed Data is available at the Central European DSA, it is possible to apply a workflow mechanism modelled according to ATS Messaging Management process. The workflow mechanism applied through the Central Administrative DUA allows for a controlled way of collection, validation, management, versioning, and distribution on a time cycle basis. However, it needs to be applied on top of standard Directory systems interfacing with the Central European DSA. On approval, the consistent and validated data is copied to the appropriate sub-tree for distribution.

5.3.3.5 The Central European DSA replicates the consistent and validated data to the Co-operating and Adjacent DSAs by means of the DISP. In case DISP is not available at a Co-Operating or Adjacent DSA, the Central European DSA provides access to the Managed Data by means of DSP. The amount of data replicated to the DSAs depends on the respective role. Co-operating DSAs receive a full copy of the Managed Data including data collected from participating and non-participating Regions, States and Organisations.

5.3.3.6 Adjacent DSAs receive only a portion of the Managed Data. The data replicated to Adjacent DSAs is restricted to the data collected from the Co-operating DSAs. Data originating from Regions, States and Organisation not participating in the concept is not replicated to Adjacent DSAs. Further restriction could be applied to distribution on a per DSA basis.



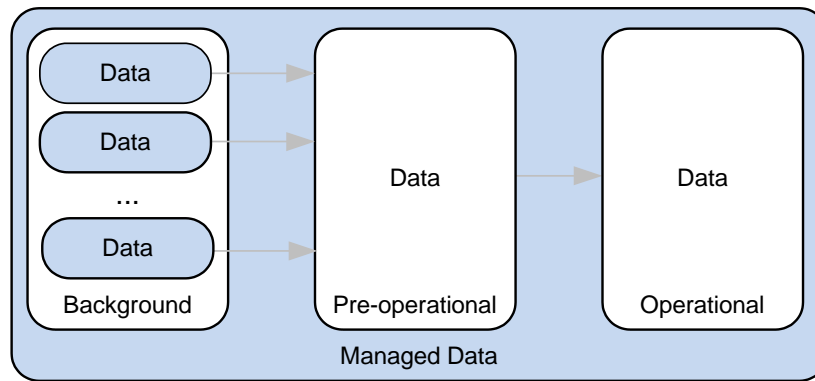
**Figure 6: Centralised maintenance of Managed Data**

5.3.3.7 End users within Regions, States and Organisations access the replicated data at their local DSAs using DAP. LDAP may be used instead of DAP for access by human users or applications with limited needs. Human and system End Users perform interrogation operations only. Modification operations are not permitted to End Users.

### **5.3.4 Managed Data Areas**

5.3.4.1 Different versions of information are supported by distinct areas containing a complete set of information. The Managed Data consists of three areas for management of data using the workflow mechanism:

- Background Area
- Pre-operational Area
- Operational Area



**Figure 7: Managed Data areas**

### Background Area

5.3.4.2 The background area is intended for collection and management of information. The background area comprises parts of information provided by different sources and by different means.

5.3.4.3 Information provided by Co-operating States and Organisations is hosted in this area and accessible for management by Co-operating Operators. Information provided by Adjacent States and Organisations is hosted by Adjacent DSAs and replicated by schedule to make it available in the background area. Data of Bodies, States, and Organisations, that do not provide their data by protocol means, is hosted at the Central European DSA and maintained by the Central Administrator on behalf of the respective Body, State, or Organisation.

5.3.4.4 Bodies, States and Organisations without a local Directory infrastructure might manage their data through a web interface if implemented by the Central European DSA.

### Pre-operational Area

5.3.4.5 The pre-operational area is intended for distribution of information prior to becoming effective. The information in the pre-operational area is a copy of the parts of information in the background area and remains available and unchanged until the next cycle. Distribution of information beforehand allows States and Organisations to prepare legacy systems that will not be able to retrieve the information from the European Directory Service using an Autonomous Operational DUA and to take measures in line with local policy.

5.3.4.6 In case a Co-operating or Adjacent DSA does not support push distribution using DISP, the information is also available for pull distribution beforehand in order to have the information already available when it receives operational status.

### Operational Area

5.3.4.7 The operational area is intended for distribution of effective information.

5.3.4.8 Distribution of information in the operational area makes effective information available to users and systems at the predetermined time. The information in the operational area is a copy of the pre-operational area and remains available and unchanged until the next cycle.

*Note.— When pull distribution is used, the Co-operating or Adjacent Operator is responsible to initiate the action at the predetermined times.*

### **5.3.5 Managed Data in Support of the ATSMHS**

5.3.5.1 Derived from the ATS Messaging Management process, the EDS Operational Concept proposes to apply the workflow mechanism in support of the ATSMHS.

5.3.5.2 The following elements are put under the control of Managed Data:

- AMHS MD Register;
- CAAS mapping information;
- User Address information; and
- AMHS user capabilities.

5.3.5.3 The workflow mechanism may be applied to further elements depending on the requirements of the respective applications.

### **5.3.6 Managed Data in Support of AFTN, CIDIN and AMHS Routing**

5.3.6.1 Derived from the ATS Messaging Management process, application of the workflow mechanism in support of AFTN, CIDIN and AMHS routing is proposed.

5.3.6.2 The following elements are put under the Control of Managed Data:

- AFTN routing information;
- CIDIN routing information; and
- AMHS routing information.

## **5.4 Procedures**

### **5.4.1 AMC Procedures**

5.4.1.1 ICAO Doc 9880 Part IV [8] specifies various technical aspects of the ATN Directory service, however does not address organisational and procedural details. With respect to AMHS address management and management of further data such as network inventory, routing directory, collection of statistics, etc., ICAO EUR Doc 021 (ATS Messaging Management Manual) [3] describes procedures known as the *AMC Procedures*.

5.4.1.2 In the context of this concept, functions of the AMC partially overlap with functions of the ATN Directory service. Both deal with AMHS-related information in support of management of users and address conversion. Even though some services of AMC might need to be migrated to Directory services, it is not the intention of the EDS Operational Concept to promote the replacement of further functions of AMC.

5.4.1.3 The ATS Messaging Management Manual [3] identifies *Co-operating COM Centres* and *External COM Centres* as involved entities. Co-operating COM Centres participate in the ATS Messaging Management as a whole and adhere to its specification, whereas External COM Centres participate in a limited way only.

5.4.1.4 The AIRAC (Aeronautical Information Regulation And Control) cycle as given by the ATS Messaging Manual [3] is used to collect, validate acknowledge and publish information. One cycle lasts 28 days and is split into five phases. In order to allow parallel operation of

AMC and European Directory Services during transition, the establishment of aligned procedures for EDS is required.

5.4.1.5 No dedicated procedures are associated with Shared Data. Information is replicated on change by DISP making it immediately visible at the Central European DSA. Distribution to the Central European DSA using DSP is performed daily at 11:00 UTC in order to limit the effort for the pull mechanism performed by the Central European DSA.

5.4.1.6 For the Managed Data the EDS Operational Concept adopts the basic concept of the 28 day AIRAC cycle. The duration of cycles might be adjusted in coordination with the ATS Messaging Management process or after completion of the transition to the European Directory Service. To ease transition and to support parallel operation of AMC, the phases in the EDS are strictly aligned to the description of the AIRAC cycle in the ATS Messaging Management Manual [3], including the breakdown of days. In contrast to the AMC procedures, procedures in the EDS offer a high level of automation, which is synchronised at 11:00 UTC. I.e. Preparatory actions have to be completed by 11:00 UTC in order to allow automated processes to start at 11:00 UTC.

#### 5.4.2 Five AMC phases within the AIRAC cycle

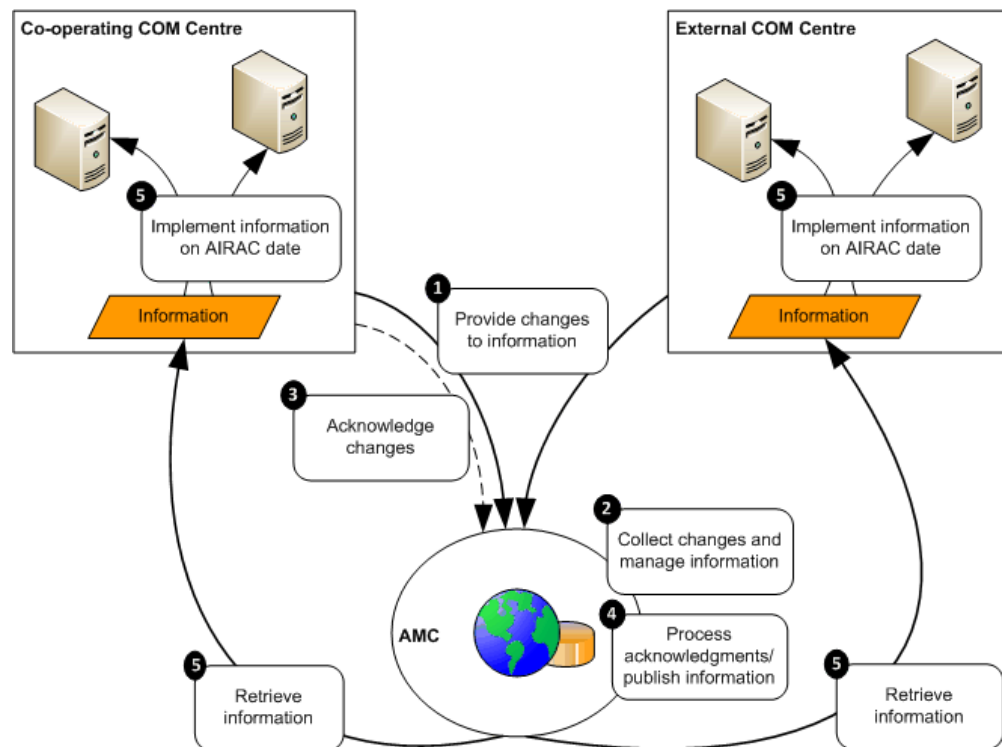


Figure 8: Phases within the AIRAC cycle

##### 5.4.2.1 Data Entry Phase

Period:	Phase starts day 1, ends day 7.
Area involved:	Background.
Co-operating/Adjacent Operator tasks:	Perform interrogation and modification operations to the background area of the Managed Data in order to maintain data.

Central Administrator tasks:	Perform interrogation and modification operations to the background area of the Managed Data in order to maintain data.
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5.4.2.1.1 Co-operating Operators, in charge of managing States' or Organisations' information perform interrogation and modification operations to the respective part of the background area hosted by the Central European DSA. Adjacent Operators perform interrogation and modification operations at their local DSA.

5.4.2.1.2 Changes applied at Adjacent DSAs are not immediately visible at the Central European DSA. The Central Administrator performs interrogation and modification operations to information he manages on behalf of Bodies, States and Organisations, that do not provide their data through Directory services.

5.4.2.1.3 At the end of this phase, the data provided by Regions, States and Organisation is up to date.

5.4.2.1.4 During the transition period the EDS Operational Concept proposes additional means for States and Organisations that do not participate directly in Directory services by implementing a DSA. In this situation, the Central European DSA hosts the information on behalf of the respective States and Organisations.

5.4.2.1.5 There are several possibilities to allow for management of the State's or Organisation's information in the background area of the Managed Data.

5.4.2.1.6 Further transitional considerations are provided in Chapter 7.

#### 5.4.2.2 Data Validation and Processing Phase

Period:	Phase starts day 8, ends day 14.
Area involved:	Background and pre-operational.
Co-operating/Adjacent Operator tasks:	Coordinate with Central Administrator as necessary. Initiate distribution of data, if triggered manually.
Central Administrator tasks:	Initiate collection of data from Adjacent DSAs, if triggered manually. Validate data and coordinate with Co-operating/Adjacent Operator as necessary. Make overall data available in pre-operational area.

5.4.2.2.1 The data validation and processing phase is used to collect information from Adjacent DSAs, to validate the overall data in the background area, and to provide validated overall data to the pre-operational area.

5.4.2.2.2 On day 8 at 11:00 UTC, collection of data from Adjacent Regions, States and Organisations is initiated by the Central European DSA. Collection is triggered by schedule or manually by the Central Administrator. In case an Adjacent DSA does not support replication by protocol (DISP), the Central Administrator collects the data by other means (e.g. DSP).

5.4.2.2.3 The Central Administrator validates data provided by Regions, States and Organisations and coordinates with Co-Operating and Adjacent Operators as necessary in order to ensure consistency of data at the last day of the cycle.

5.4.2.2.4 Coordination may take place using any communication means such as email, telephone, fax, etc. At the end of this step, the background area holds a validated set of information.

5.4.2.2.5 The EDS may be complemented by a locking mechanism in case it is considered necessary. Such a locking mechanism would prevent from modifications to the data in the background area during validation and prior to the transfer to pre-operational area.

5.4.2.2.6 On day 14 before 11:00 UTC, the Central Administrator applies workflow and transfers validated data to the pre-operational area of the Managed Data.

5.4.2.2.7 Distribution of Managed Data in the pre-operational area to other Regions, States and Organisations is initiated at 11:00 UTC by the Central European DSA. In case a Co-operating or Adjacent DSA does not support distribution by protocol (DISP), the respective Operator has to initiate distribution at 11:00 UTC in order to make pre-operational data locally available.

5.4.2.2.8 At the end of this phase, the pre-operational area holds a validated set of information.

### 5.4.2.3 Acknowledgement Phase

Period:	Phase starts day 15, ends day 20.
Area involved:	None.
Co-operating/Adjacent Operator tasks:	None.
Central Administrator tasks:	None

5.4.2.3.1 No activities are associated with this phase of the EDS Operational Concept.

*Note.— This phase is maintained for compatibility with the ATS Messaging Management process in order to allow for implementation of an acknowledgement within the workflow mechanism. Acknowledgement would be required for information generated by the Central European DSA such as routing information.*

### 5.4.2.4 Acknowledgement Processing Phase

Period:	Phase starts day 21, ends day 24.
Area involved:	None
Co-operating/Adjacent Operator tasks:	None
Central Administrator tasks:	None

5.4.2.4.1 No activities are associated with this phase of the EDS Operational Concept.



*Note.— This phase is maintained for compatibility with the ATS Messaging Management process in order to allow for implementation of an acknowledgement within the workflow mechanism. Acknowledgement would be required for information generated by the Central European DSA such as routing information.*

#### 5.4.2.5 Data Distribution and Implementation Phase

Period:	Phase starts day 25, ends day 28.
Area involved:	Operational
Co-operating/Adjacent Operator tasks:	Initiate distribution if triggered manually. Provide data to legacy applications, i.e. applications without means of access to Directory.
Central Administrator tasks:	Make overall data available in operational area.

5.4.2.5.1 The data distribution and implementation phase is used to distribute data in the operational area and to make new data available to operational systems.

5.4.2.5.2 From day 25 on and depending on local policy and needs, data in the pre-operational area is processed by Co-operating and Adjacent Operators. In support of legacy applications without access to Directory services, data in the pre-operational area could be processed for later implementation on the upcoming AIRAC date.

5.4.2.5.3 On day 28 before 11:00 UTC, the Central Administrator applies the workflow and transfers previously validated data from the pre-operational to the operational area of the Managed Data. At 11:00 UTC distribution of Managed Data in the operational area to other Regions, States and Organisations is initiated by the Central European DSA. In case a Co-operating or Adjacent DSA does not support replication by protocol (DISP), the respective Operator has to initiate distribution at 11:00 UTC in order to make operational data locally available.

5.4.2.5.4 At the end of this phase, the operational area holds a new, validated set of information available to the end users. Directory-based and legacy applications make use of the new, validated set of information.

### 5.4.3 Heartbeat

5.4.3.1 Even though the associations between the Central European and the Co-operating and Adjacent DSAs might be established on a permanent basis, an outage of a communication peer or of the communication infrastructure might not be detected until a replication of information or other means of communications between the involved entities is expected to take place. Feasibility of information exchange between the communication peers at any time, ensuring availability of most recent information, can only be assured by permanent availability of communication infrastructure and communication peers.

5.4.3.2 Within EDS, a heartbeat procedure enables the validation of communication means on a regular, frequent basis. Implementation of the heartbeat procedure is achieved through a frequently updated timestamp allocated to the root entry of EDS. Modifications of the timestamp are replicated on change to Co-operating and Adjacent DSAs using DISP or can be retrieved using DSP.

5.4.3.3 The timestamp shall be updated with a frequency between one minute and 24 hours. The frequency complements the heartbeat by indicating the interval in minutes. Based on operational requirements the Central Administrator determines on the value of the frequency.

## **5.5 Authentication and Access Control**

### **5.5.1 Security Policy**

5.5.1.1 The EDS Operational Concept defines a security policy for authentication and access control for DSAs and DUAs based on the X.500 standards [10].

### **5.5.2 Authentication**

5.5.2.1 Authentication in the context of Directory services identifies DSAs and Directory users. Authentication for Directory users accessing the Directory through DAP and between DSAs communicating through DSP and DISP is implemented by means of the respective bind and unbind operations of the protocols (Directory Bind/Unbind, DSA Bind/Unbind, DSA Shadow Bind/Unbind). The period of communication is initiated by the bind operation and closed by the unbind operation.

5.5.2.2 Simple authentication is used in the bind operation. Both entities involved shall make use of credentials composed of name and password. Strong authentication would require the establishment of a public key infrastructure and may be used after bilateral agreement between two communication entities.

### **5.5.3 Access Control**

5.5.3.1 Access to the Directory is controlled by granting or denying permissions to perform a particular operation on an element in the DIB. The X.500 security model establishes a framework for the specification of access control which is used to implement access control in the context of the European Directory Service.

5.5.3.2 An access control scheme is associated with every portion of the DIT.

5.5.3.3 The Basic Access Control scheme shall be applied to the DIT. Following the Basic Access Control scheme, the access control decision involves:

- the element being accessed (protected item);
- the user requesting the operation (requestor);
- a right to complete a portion of the operation (permission); and
- one or more attributes governing access to the item (ACI).

5.5.3.4 By means of Basic Access Controls, the EDS Operational Concept establishes access control depending on

- the role of the Directory user,
- the operation performed by the Directory user; and
- the nature and location of the information in the DIB accessed by the Directory user.

5.5.3.5 Section 5.2 identifies the roles as Central Administrator, Co-operating Operator, Adjacent Operator and End User. Chapter 4 categorises the operations as interrogation and

modification operations. Access control as given by the EDS Operational Concept distinguishes between interrogation and modification operations. The EDS Operational Concept identifies several distinct areas.

5.5.3.6 Access control to the DIB proposed by EDS Operational Concept is summarised as follows, whereas *int* indicates interrogation operations and *mod* indicates modification operations:

Data		End User	Adjacent Operator	Co-operating Operator	Central Administrator
Shared	Own	int	int / mod	int / mod	int / mod
	Others	int	int	int	int
Managed	Own Background	-	int / mod	int / mod	int / mod
	Other Background	-	int	int	int
	Pre-operational	-	int	int	int / mod
	Operational	int	int	int	int / mod

**Table 2: DIB access control summary**

## 5.6 Cooperation

5.6.1 The EDS Operational Concept focuses on the European Directory Service; however, it takes the global role of Directory services into account.

5.6.2 The EDS Operational Concept basically describes the cooperation between the Central European DSA and DSAs implemented by States and Organisations participating in this concept. The Central European DSA releases Co-operating DSAs from the exchange of information with other participating as well as non-participating States and Organisations.

5.6.3 With respect to non-participating States and Organisations the Central European DSA acts on behalf of participating States and Organisations. All information of participating States and Organisations is exchanged through the Central European DSA.

5.6.4 Overall, the Central European DSA reduces the number of communications relationships for the benefit of participating as well as non-participating Regions, States and Organisations.

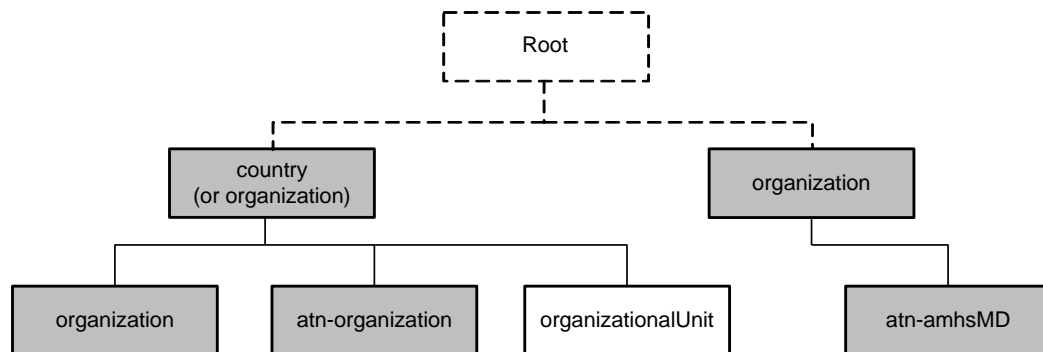
## 6 Directory Schema

### 6.1 Relationship to Doc 9880 and Community Specification

6.1.1 The schema deployed within the European Directory Service (EDS) implements the schema definition given by ICAO Doc 9880 Part IV [8] and the AMHS CS [1]. This chapter provides the DIT structure.

### 6.2 DIT Structure

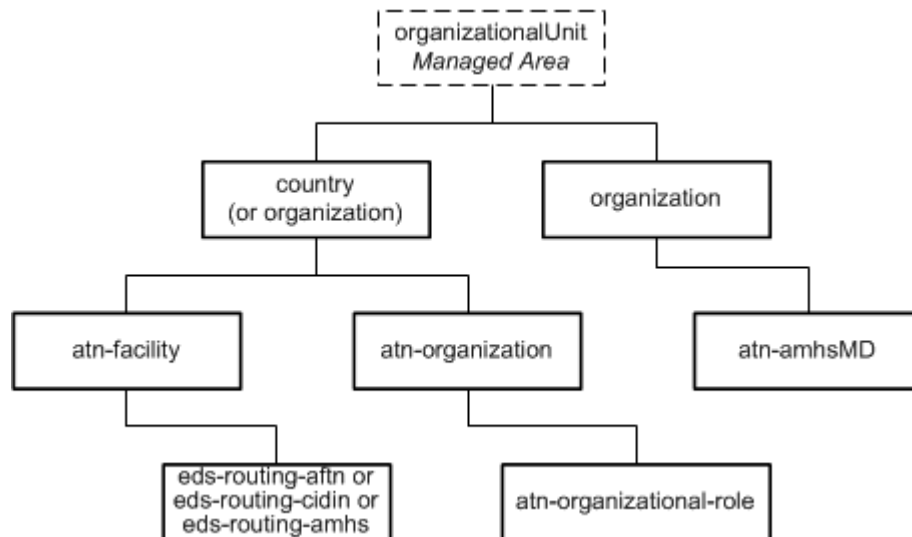
6.2.1 In order to allow the EDS to collect, to validate and to distribute data, the DIT definition of the European Directory Service makes use of following DIT structure described in ICAO Doc 9880 Part IV [8].



**Figure 9: ICAO DIT structure**

6.2.2 This addition to the DIT structure given by ICAO Doc 9880 Part IV [8] defines a further element in the DIT below the level of the Organisations that allows the organisation operating the Central European DSA to provide data in a controlled manner. The areas of the Managed Data are represented by the object class `organizationalUnit`. Depending on the requirements of the applications, the DIT structure below the object class `organizationalUnit` element may be extended as necessary to hold the information of the respective applications.

6.2.3 The DIT structure in support of the ATSMHS and in support of routing in the AFTN, CIDIN and AMHS (see Figure 10) includes the elements to hold the information provided by Co-operating and Adjacent States and Organisations as foreseen in sections 5.3.5 and 5.3.6.



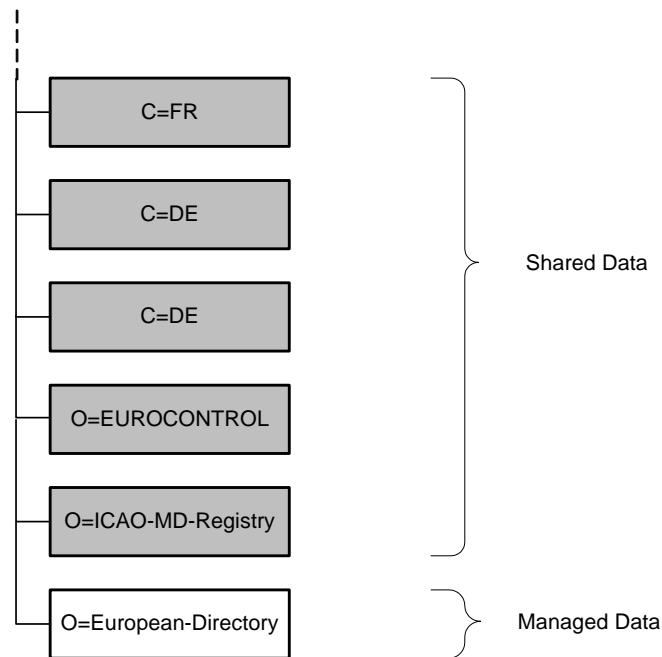
**Figure 10: Adapted DIT structure for EDS**

6.2.4 The AMHS MD Register is represented by the object class `atn-amhsMD` allocated below the superior object class `organization`. The CAAS mapping information is represented by the object class `atn-organization` allocated below the superior object class `country` or `organization`. The User address information and the AMHS user capabilities are represented by the object class `atn-organizational-role` complemented by the auxiliary object class `eds-amhs-user` allocated below the object class `atn-organization`.

*Note.— The object class `eds-amhs-user` provides the attribute types for the AMHS user related information, however due to its auxiliary character it is not considered suitable to structure the DIT. The object class `atn-organizational-role` is used to structure the DIT instead.*

6.2.5 Support of further applications is added by extension of the DIT structure as necessary.

6.2.6 In the DIB, the shared data consists of the top-level entries of the States and Organisations as specified by ICAO Doc 9880 Part IV [8] and is replicated from the States and Organisations.



**Figure 11: DIT extension for Managed Data**

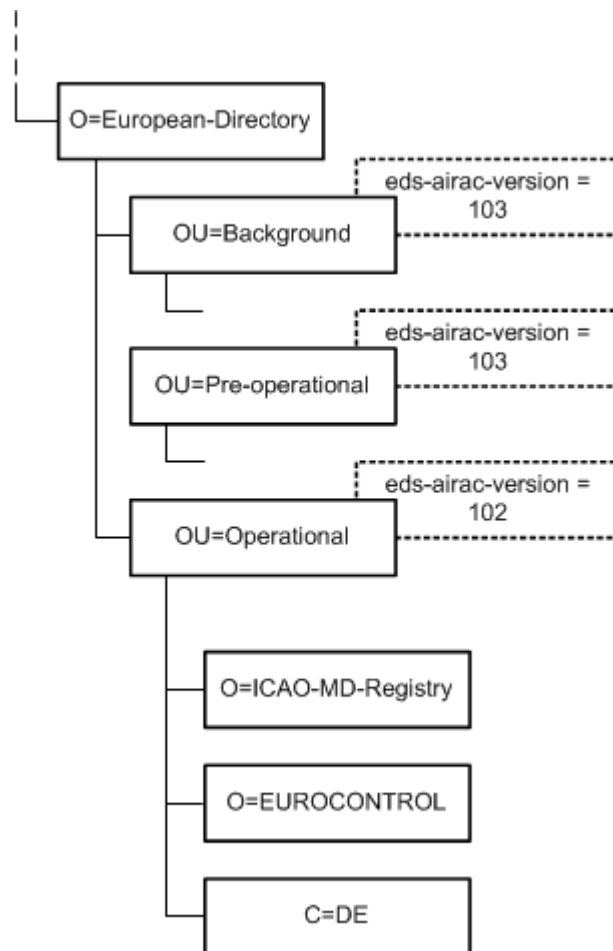
6.2.7 The naming attribute `organizationName` of the object class `organization` representing the Managed Data shall take the value of *European-Directory*.

6.2.8 Within that sub-tree the background, pre-operational and operational areas are represented by entries of object class `organizationalUnit`. The naming attribute `organizationalUnitName` shall take the value of the respective area of the Managed Data (*Background, Pre-operational, Operational*).

6.2.9 Managed Data is subject to workflow mechanisms and supports different sets of data (versions). Different versions of data are stored in different sub-trees of the DIT.

6.2.10 The information located in each sub-tree of the EDS DIT refers to a unique AIRAC cycle within the AMC as specified by the ATS Messaging Management Manual [3]. The version information is made available by an auxiliary object class associated with the respective area's object class `organizationalUnit`.

6.2.11 The following example gives the situation for operational cycle 102, whereas information for cycle 103 is already available in the background and pre-operational areas.



**Figure 12: Example of information for operational cycle 102 and cycle 103**

6.2.12 The data in the DIB of the EDS will initially be based on data currently maintained in the AMC. Sections 5.3.5 and 5.3.6 list the information elements maintained as tables in the AMC.

6.2.13 The object classes and attribute types used to structure the DIT and to hold this data are described in Appendix G-B.

## **7 Transition**

### **7.1 General Considerations**

7.1.1 Seamless operation of ATN applications needs to be ensured during the transition from current environment to European Directory Service (EDS).

7.1.2 Additional means are essential to allow for a smooth introduction of the European Directory Service and to assure continuous operation of ATN applications using other methods of data management.

### **7.2 Deployment of EDS**

#### **7.2.1 Starting point**

7.2.1.1 The EDS Operational Concept adopts, for the Managed Data, the AIRAC cycle including duration and phases as specified by the ATS Messaging Management Manual [3] to limit changes in existing procedures and to ease transition. Since in the initial step (see section 7.2.2) the Central European DSA creates or modifies no data, no activities are associated with the Acknowledgement and Acknowledgement Processing Phases. The initial duration of a cycle for Managed Data is aligned to the ATS Messaging Manual process and takes 28 days. Given the fact that no activities are associated with the Acknowledgement and Acknowledgement Processing Phases it may be possible to reduce the duration to take less than 28 days if considered necessary at a later stage.

7.2.1.2 At the time of development of the EDS Operational Concept some of the information intended to be held by the European Directory Service (EDS) is managed and distributed using the ATS Messaging Management Centre (AMC). Within the AMHS address management, the AMC maintains the AMHS MD Register, CAAS tables and user address lookup tables and provides exports of this information available in comma separated value (CSV) files. The management and distribution of AMHS addresses through AMC is provided by EUROCONTROL on behalf of ICAO Headquarters as published by State Letter in April 2009.

7.2.1.3 Furthermore the AMC implements AMHS user capabilities management. The AMC provides exports of this information available in comma separated value (CSV) files.

7.2.1.4 It is proposed to transfer management and distribution of this information in three steps to the EDS.

#### **7.2.2 Initial Step**

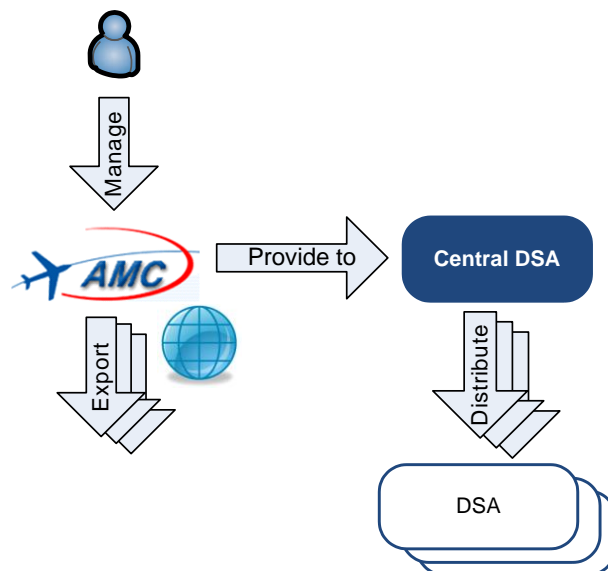
7.2.2.1 In the first, initial step, the information is still maintained and stored using the AMC.

7.2.2.2 The AMC is the single, authoritative source of the information. In addition to the AMC export functions, the information is made available by the EDS. Depending on local requirements Regions, States and Organisations decide on the services to be used.

7.2.2.3 The AMC provides information to the Central European DSA using the Lightweight Directory Access Protocol (LDAP) Data Interchange Format (LDIF) [12]. The EDS is used



for distribution of information, but not for collection and management. No workflow mechanism is implemented by the Central European DSA, since this task is still performed by the AMC. With respect to the description of procedures in section 5.4, only phases 3 (acknowledgment) and 5 (data distribution and implementation) are implemented by the EDS. In the acknowledgment phase, data is made available in the pre-operational area. In the data distribution and implementation phase, data is made available in the operational area.



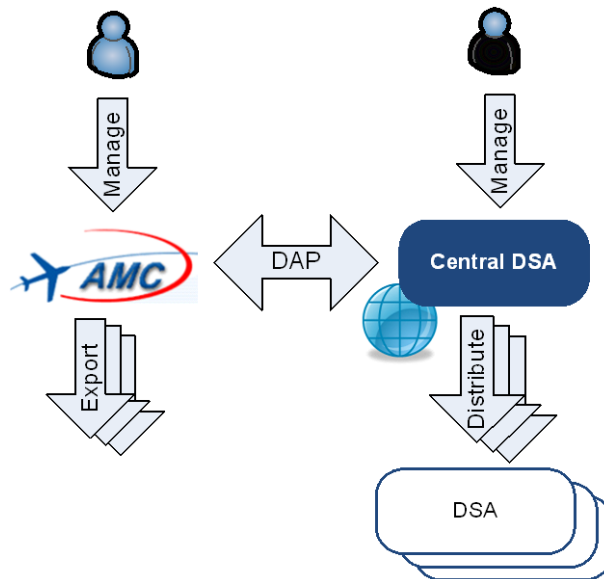
*Figure 13: Interaction AMC – EDS (Initial step)*

7.2.2.4 In this step, the AMC still performs all known functions. The EDS distributes information in addition to distribution means provided by the AMC. No transitional aids are required in this step since the range of AMC functions is fully maintained in this step.

### **7.2.3 Intermediate Step**

7.2.3.1 In the intermediate step, storage of relevant information currently held by the AMC database is moved from AMC to the European Directory Service (EDS). At this stage depending on the requirements of the users, the EDS might include additional data besides the information held in AMC. The EDS becomes the single, authoritative source of information. The AMC is equipped with access to EDS in order to allow AMC users to view and manage information, which is now stored in the EDS. Through the Central European DSA implements the workflow mechanism as given by the ATS Messaging Management Manual.

7.2.3.2 The AMC and EDS are available in parallel. States and Organisations decide whether they use AMC or EDS for management of information depending on their needs and availability of local Directory services. When the AMC is used for management of information, it will access the Central European DSA. AMC exports and distribution of information by EDS could be used simultaneously serving different needs of applications. With respect to the description of procedures in section 5.4, all phases are now implemented by EDS.

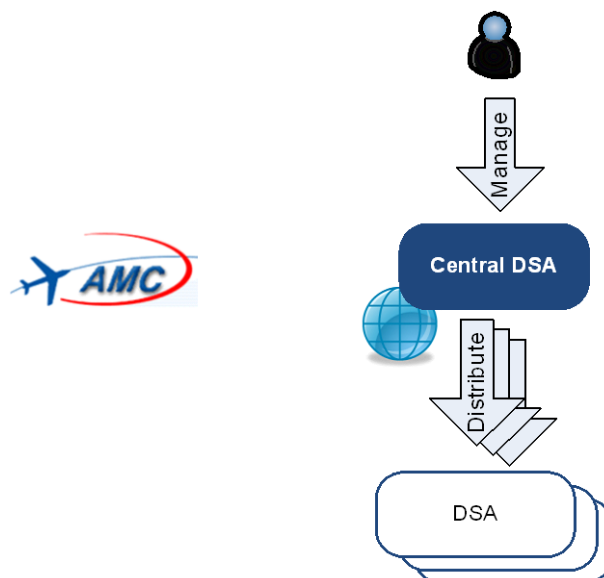


**Figure 14: Interaction AMC – EDS (Intermediate step)**

7.2.3.3 Implementation of the intermediate step is transparent to end users and has no impact to systems using the information. In this step, AMC workflow is transferred to the Central European DSA. However the AMC export functions are available in addition to distribution of information by EDS. Transitional aids might be provided in order support migration from AMC to EDS. Details on transitional aids are provided in section 7.3.

## **7.2.4 Final Step**

7.2.4.1 In the final step the AMHS common functions now reside within EDS and thus are disabled in the AMC. The AMC no longer accesses the European Directory Service (EDS).



**Figure 15: Interaction AMC – EDS (Final step)**

7.2.4.2 In the beginning of the final step, some States and Organisations might not implement Directory services and might not contribute to the overall function of EDS. Transitional aids

as outlined below are essential means for States and Organisations who do not directly participate in EDS and operate legacy applications without means to access the EDS.

## 7.3 Transitional Aids and Aspects

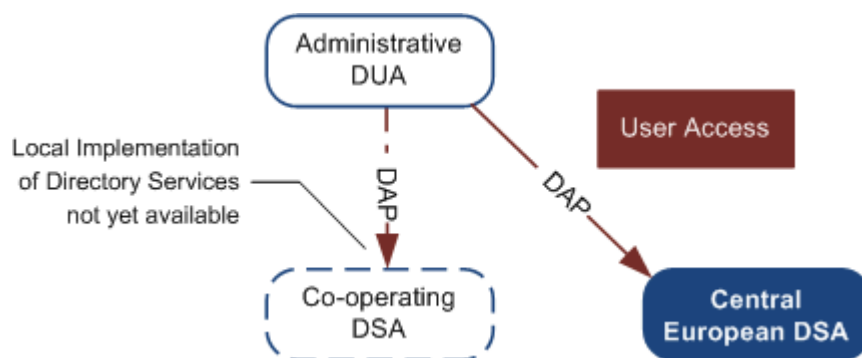
### 7.3.1 Need of Transitional Aids

7.3.1.1 Transitional aids may be required by States and Organisations that have not yet implemented Directory services or are operating legacy application without access to Directory services by protocol. Several means can be made available in support of transition to Directory services. During step 1 (initial) and step 2 (intermediate), transitional aids could be useful to support early introduction of Directory services at the local level. Those transitional aids become essential in step 3 (final) when AMC no longer provides management and distribution of AMHS address information.

7.3.1.2 Deployment of Operational Personnel DUAs and provision of web access to the European Directory Service (EDS) could provide appropriate means to serve Directory data to End Users without a local implementation of Directory services. Future Co-operating or Adjacent Operators may be equipped with an Administrative DUA to allow for management of data. Deviating from the policy given in this document, these users may, by means of their DUAs, directly access the Central European DSA for the purpose of data management and retrieval of information. Direct access of Autonomous Operational DUAs to EDS is strongly discouraged.

### 7.3.2 Administrative DUA

7.3.2.1 In the case where a State or Organisation does not participate in European Directory Service (EDS) through a Co-operating or Adjacent DSA, but has already implemented an administrative DUA, the Central European DSA grants direct access to Managed Data at the Central European DSA for the purpose of data management using that DUA.



**Figure 16: Direct access of DUA to Managed Data via DAP**

7.3.2.2 Furthermore, the Central European DSA might supply administrative DUAs to States and Organisations without local Directory infrastructure. This would allow States and Organisations to manage their data at the Central European DSA prior to implementation of local Directory services and full participation in EDS.

### **7.3.3 Operational Personnel DUA**

7.3.3.1 In the case where a State or Organisation does not participate in the European Directory Service (EDS) through a Co-operating or Adjacent DSA, but has already implemented an Operational Personnel DUA, the Central European DSA grants – similar to the situation above – direct access to Managed Data at the Central European DSA for the purpose of data retrieval using that DUA.

7.3.3.2 Using an Operational Personnel DUA, the Lightweight Directory Access Protocol (LDAP) Data Interchange Format (LDIF) [12] might be used to export data from EDS and to provide legacy systems without the capability to make use of Directory with required information.

7.3.3.3 Furthermore, EDS might supply Operational Personnel DUAs to States and Organisations without local Directory infrastructure. This would allow States and Organisations to retrieve data from the Central European DSA prior to implementation of local Directory services.

### **7.3.4 Web Access**

7.3.4.1 In addition, the Central European DSA might be enhanced by a web application that allows users representing future Co-operating or Adjacent Operators to manage data at the Central European DSA. Web access would make use of wide-spread Internet technology. On the back-end such a web application will have to implement access to the Central European DSA. Such a web service would have to provide an authentication and authorisation mechanism in order to establish a high level of security and to assign appropriate access rights to the user accessing the EDS at the Central European DSA.

7.3.4.2 In the case where the Central European DSA implements web access as a transitional or long-term means, States and Organisations can manage their data and access other data at the Central European DSA through the web interface.

7.3.4.3 During transition, the Central European DSA might on multilateral basis supply Adjacent DSAs with data regarding other Adjacent DSAs.

7.3.4.4 The introduction of the European Directory Service (EDS) significantly benefits from the existing European IP-based network infrastructure that connects the sites of Co-operating States and Organisations with the site of the Central European DSA. For the exchange of information with Adjacent DSAs, the Central European DSA depends on international network connectivity.

## **8 Capacity and Performance Considerations**

8.1 This chapter discusses capacity and performance considerations with respect to the implementation of the centralised European Directory Service (EDS).

8.2 In a fully distributed environment as anticipated by ICAO documentation there might be overall more than 200 communication partners in the ATN Directory service, about 50 of which belong to the European area. Such a large number of communication partners per entity would cause significant issues in configuration, management and operation for each individual DSA participating in ATN Directory services.

8.3 The implementation of the EDS considerably reduces the number of communication relationships per entity. However, for Regions, States and Organisations not participating in the concept, but implementing an Adjacent DSA, the Central European DSA acts on behalf of Co-operating States and Organisations.

8.4 Instead of up to about 50 individual communication relationships to every Co-operating State and Organisation, Adjacent DSAs have to establish and maintain exactly one communication relationship to the Central European DSA. For Co-operating DSAs the advantage is even more obvious. Instead of communication relationships to every other DSA, which can sum up to over 200, Co-Operating DSAs have to establish and maintain exactly one communication relationship to the Central European DSA.

8.5 The centralised EDS scales very well with regard to increase of Co-Operating States and Organisations. The increase of Adjacent DSAs remains widely transparent to Co-Operating States and Organisations.

8.6 Besides the advantages at the level of applications, the implementation of EDS would also have a positive impact to networking requirements reducing the need to establish an international fully meshed network.

8.7 The implementation of EDS with critical information being replicated periodically to other DSAs, reduces the need for a fast, high-performance underlying network. The quality of service requirements are lower compared to distributed environments; especially with regard to bandwidth and latency. However, implementation of the heartbeat as a safeguard for DSA-to-DSA communications adds a limited, basic load to the underlying network infrastructure.

8.8 In a distributed environment, every DSA would only hold the information related to the State or Organisation operating that DSA. For information related to other Regions, States, or Organisations the respective DSA of that Region, State or Organisation has to provide the information. With a centralised, replicated topology, all relevant information is replicated and locally available. The amount of information stored per DSA is higher in replicated environments; however, this is not expected to cause capacity issues.

## **9 Future Options**

9.1 This chapter outlines future options of the European Directory Service (EDS).

9.2 ICAO Doc 9880 Part I [5] already identifies some more ATN applications to make use of Directory services such the Context Management (CM) application. By means of the CM registration functions further ATN application such as the Controller-Pilot Data Link (CPDLC) application make indirect use of Directory services.

9.3 The EDS Operational Concept takes into account the requirements to support the ATSMHS, but is not limited to the ATSMHS or ground-ground applications in general. ICAO Doc 9880 Part IV [8] already defines additional ATN-specific attribute types and object classes beyond the scope of AMHS such as the object class atn-aircraft. As necessary, these attribute types and object classes may be added to the Directory scheme of EDS.

9.4 Security is a global field of interest with growing relevance to existing and future infrastructures and applications. The AMHS CS [1] already includes AMHS Security as an informative element as it was not yet considered as advanced as other elements of the Extended ATS Message Handling Service (ATSMHS). AMHS Security and security services in general are expected to be based on the establishment and use of a Public Key Infrastructure (PKI). Using certificates issued by certification authorities (CAs) enables protection against a multitude of threats such as masquerade, modification, replay, etc. To this end, ICAO Doc 9880 Part IV [8] defines the essential standard attributes types and mandatory objects classes, including, where relevant, attribute types to hold certificates in ATN-specific object classes. When security elements become subject to collection or distribution by EDS related attribute types and object classes may be added to the Directory schema of EDS.

9.5 The generic nature and openness of X.500 Directory services, which forms the base of EDS, facilitates support of future requirements to further extend the Directory schema by further attribute types, object classes, etc., to increase the amount of data and to expand the service to other applications as necessary.

9.6 As an example, in case a global information management system, such as the System Wide Information Management (SWIM) currently under development, implements tailored authentication and authorisation in order to manage access to distributed data, the schema definition of EDS could be expanded to meet its needs. Such an expansion could include the specification of additional application-specific attribute types and objects classes and the expansion of the Directory Information Tree in order to hold the respective data.

9.7 Even though the basic Directory schema definition needs to be shared between all involved DSAs and DUAs, the X.500 Directory standards also allows for regional, national and organisational extensions that are private and not shared on a global basis. Such extensions would allow to satisfy local needs and to implement dedicated added value services such as white pages, address books, registers, etc.

9.8 With the specification of EDS that also covers centralised management of data including a workflow mechanism, the EDS Operational Concept describes a way of how data can be collected, validated and distributed in a controlled way. The centralised management of data is given in a universal and generic way, which allows its application whenever considered useful.

**- END of Appendix G -**



# EUR AMHS Manual

## Appendix H

Application/Service oriented AMHS Profiles	
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## References

- [1] ICAO EUR Doc 033, Guidelines for the Implementation of OPMET Data Exchange using IWXXM in the EUR Region, Second Edition, 2016
- [2] ICAO EUR DOC 020, EUR AMHS Manual, latest version
- [3] EUR ATS Messaging Service Profile, EUR AMHS Manual Appendix B, latest version
- [4] ISO/IEC International Standardized Profile ISP 12062-2 (2003): AMH21 – IPM Content
- [5] (Advance Release) ICAO Doc 9880-AN/466, Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI Standards and Protocols, Part II – Ground-Ground Applications - Air Traffic Services Messaging Handling Services (ATSMHS), Second Edition, 2016
- [6] ISO/IEC 10021-7 (2003) / ITU-T X.420 (1999): Information technology – Message Handling Systems (MHS) – Interpersonal Messaging System
- [7] ICAO Annex 10 – Aeronautical Telecommunications, Volume II: Communication Procedures

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## **1. Introduction**

### **1.1 Purpose of the Document**

1.1.1 This document defines specific AMHS profiles for the support of given applications/services, acting in limited environments, using ATS Message Handling Service. Such profiles provide detailed specification of X.400 and AMHS parameters to be adopted depending on the needs of each identified application/service. The profiles are explicitly and exclusively applicable to the application/service which they have been defined to serve.

### **1.2 Structure of the Document**

1.2.1 The first chapter describes the purpose and the structure of the document.

1.2.2 The second chapter provides an overview concerning profiling in general and it presents the rationale for defining specific application/service oriented AMHS profiles.

1.2.3 The third chapter includes the detailed specification of these profiles. Currently it contains the AMHS Profile for OPMET IWXXM data exchange as well as guidance material for conducting conformance testing of the involved implementations.

1.2.4 Upon identification of similar profiling tasks for other applications/services chapter 3 will be updated accordingly.

## **2. Profiles and Requirement Lists**

### **2.1 Overview**

2.1.1 A number of standards have been established by ISO for Message Handling Systems. In order to describe which standards or group of standards, together with options and parameters, are needed to accomplish a function, it is necessary to specify a profile. Such profiles have been standardized by ISO and are known as International Standardized Profiles (ISPs). Profiles standardize the use of options and other variations in the base standards and deal primarily with the use of implemented capabilities in order to meet requirements for interoperability and efficient interworking.

2.1.2 ICAO Doc 9880, Part II (ref. [5]) contains the detailed technical specifications for ATSMHS based on a number of international standards and ISPs, complemented by additional requirements. The basic and the extended ATSMHS services meet the basic requirements of the respective ISPs but additional features and supplementary functions are incorporated as necessary in ICAO Doc 9880, Part II. In order to express conformance requirements, i.e. static capability, ICAO Doc 9880, Part II uses the classification defined in the ISPs to include different levels of support (mandatory, optional, etc.). These requirements, applying to the related parameters or elements are specified in the form of Profile requirement lists (PRLs). In a limited number of cases, the PRLs may also include dynamic behaviour requirements, using another classification also defined in the ISPs.

2.1.3 In the same spirit, Appendix B of the EUR AMHS Manual describes the ‘European ATS Messaging Service Profile’. Its purpose is to provide a single, relatively short specification of protocols and system capabilities and it is intended to ensure end-to-end message transfer between International COM Centres over AMHS.

### **2.2 Relation between AMHS specification and ISO/IEC ISPs**

2.2.1 It is noted that the classification of a feature as mandatory in the ISPs corresponds to a requirement regarding static capability, i.e. the ability to generate and/or receive, encode and/or decode a specific parameter, but not to use this parameter in every message sent or received. The same logic is applicable to ICAO Doc 9880, Part II and the EUR AMHS Manual.

2.2.2 Furthermore, it is recalled that in ICAO Doc 9880, Part II, for the Basic ATS Message Handling Service, the interface between the ATS Message User Agent and the ATS Message Server has been left open, since this is often an implementation matter local to each AMHS Management Domain. Conversely, for the Extended ATS Message Handling Service, implementation of a P2/P3 or P2/P7 profile compliant with the relevant MHS ISP (among ISP AMH23 to AMH26) is mandated. The main reason for this requirement was to enable reference to the Functional Group (FG) Security S0 defined in these ISPs, SEC S0 being the agreed solution for AMHS security.

2.2.3 The question of compliance with a P2/P3 or P2/P7 ISP for AMHS conformance has never been addressed in the context of an implementation making use of some functionalities

part of the Extended Service, but not of the whole of it. In particular, it is not specified whether a partial Extended Service implementation which does not include AMHS Security requires conformance with one of the AMH23 to AMH26 profiles or not.

## 2.3 Profiling per application/service

2.3.1 The European ATS Messaging Service Profile specifies a number of AMHS protocols and system capabilities for exchanging ATS messages between users through international Message Transfer Agents. It applies to Message Transfer Agents, Message Stores and User Agents. Dedicated sections of Appendix B include the requirements of each of the above mentioned AMHS System components.

2.3.2 The message categories handled by the AFS are defined by Annex 10, Volume II. The users of these message categories are the ATS as well as the AIS, ATFM, MET and SAR Services. Several ATM applications such as Digital NOTAM and Digital Flight Plan deploy new data requirements and information exchange models. These common information exchange models, i.e. AIXM and FIXM, are specifications designed to enable the encoding and the distribution of information in digital format, ensuring at the same time interoperability. These information exchange models make use of the Extensible Markup Language (XML) for encoding, representation and exchange of information. Similarly, ICAO Annex 3 foresees the exchange of OPMET data not only in the Traditional Alphanumeric Code format but also in the format defined by the ICAO Meteorological Information Exchange Model (IWXXM).

2.3.3 The ATS Message Handling Service already provides appropriate means for exchanging such data types. Furthermore, proper refinement of the specification has been foreseen and incorporated in Appendix B of this Manual, suitable for conveyance of known binary data formats.

2.3.4 However, it is obvious that a user agent in support of one of the above mentioned applications will not necessarily have to support the same set of features like a user agent in support of another application. On the contrary, implementing all of the requirements specified for UAs by ICAO Doc 9880, Part II, and Appendix B of the EUR AMHS Manual, independently of the served application/service and the type of the user agent, could be considered as an over-specification. For example it is not likely that a host user, which is a computer application running on ATN end systems and interacts with the ATS message service by means of APIs, would need to generate and submit probes.

2.3.5 Furthermore user agents may be implemented exclusively for the support of a specific application/service. Such dedicated user agents may not need to implement all the features defined by ICAO Doc 9880, Part II, and Appendix B of the EUR AMHS Manual. For example, dedicated user agents implemented for the exchange of OPMET data formatted based on the IWXXM model are not supposed to generate messages with SS priority. Similarly these user agents are not expected to receive messages with SS priority, although this could happen at the reception direction, at least by mistake.

2.3.6 Mandating implementation of features which are not required by the application/service served by certain user agents may generate additional complexity and impose implementation delay, effort and cost, without any operational benefit. In order to

eliminate such impediments and facilitate the adoption of the ATS Message Handling Service by end users, the need of defining application/service oriented AMHS profiles, which clarify requirements and may relax some of them by mandating less features than the current AMHS specification, has been recognized. These profiles are applicable to explicit, limited environments, e.g. submission of OPMET data, taking into consideration which features are useless for the specific application/service. The relaxed requirements concern message submission only.

2.3.7 Implementations complying with an application/service oriented AMHS profile are accepted for connection to the AMHS, although possibly not fully compliant from a formal standpoint, provided that conformance to the profile is verified. For this purpose, UA conformance testing, as specified in Appendix D-UA, needs to be tailored according to the given profile specification.

### **3. Application/Service oriented AMHS Profiles**

#### **3.1 General**

3.1.1 The following sections present the AMHS profiles specified for implementations, for which support of all features mandated by ICAO Doc 9880 (ref. [5]) and Appendix B of the EUR AMHS Manual (ref. [3]) is not required.

3.1.2 The exchange of OPMET data based on IWXXM has been identified as the first application using AMHS, for which the definition of a profile would accommodate the implementation deployment.

3.1.3 This section needs to be updated each time a similar need appears for other applications/services.

#### **3.2 AMHS Profile for OPMET IWXXM data exchange**

##### **3.2.1 Introduction**

3.2.1.1 It has been commonly agreed by the MET and AFS ICAO EUR communities that AMHS is the intended communication means for MET IWXXM data exchanges in the EUR Region. More specifically, FTBP is to be used for IWXXM data. This agreement is reflected in the EUR Doc033 (ref. [1]).

3.2.1.2 UAs complying with ICAO Doc 9880, Part II, Second Edition (ref. [5]) and with the additional provisions of the EUR AMHS Manual (ref. [2]) and of the European ATS Messaging Service Profile (ref. [3]) are capable to originate and receive AMHS messages containing such data. The support by UAs of IPM Heading Extensions (IHE), defined in ICAO Doc 9880, Part II as part of the Extended ATS Message Handling Service, is additionally required but represents a minor upgrade already available in several UA implementations.

3.2.1.3 However, to ensure unambiguous interpretation of messages upon reception, and to facilitate their origination, it is necessary to establish a detailed specification of X.400 and AMHS parameters to be adopted for conveyance of such messages, including those associated with the AMHS file-transfer-body-parts (FTBP). This task is a typical profiling activity, which is preferably performed before implementation deployment is started.

##### **3.2.2 Scope of the profile**

3.2.2.1 This profile specification is established for application by AMHS UAs submitting and/or receiving OPMET data in IWXXM format through a P2/P3 or a P2/P7 interface, implemented as part of the following centres or systems (as defined in EUR Doc033 [1], section 2):

- National OPMET Centre (NOC)
- Regional OPMET Centre (ROC)



- Interregional OPMET Gateway (IROG)
- Regional OPMET Databank (RODB)
- any terminal or system receiving or requesting OPMET data in IWXXM format from one of the above centres/systems

3.2.2.2 This specification is based on the following assumptions, which identify topics out of scope of the AMHS profile, which are addressed in the MET domain:

- The MET domain may add further data types to the IWXXM without affecting the AMHS profile. It is assumed that irrespective of the data format (bulletin or report), the MET domain will always pass an unstructured binary file with a defined file-name to the AMHS.
- Data compression will always be performed in the MET domain. The AMHS will not perform compression.
- The MET Domain will define procedures for the submission of RQX messages to RODBs.

### **3.2.3 Definition of the profile**

#### **3.2.3.1 Level of service**

3.2.3.1.1 A profile based on the exclusive use of the Extended Service shall be used. As a result the IPM-Heading-extensions (IHE) need to be used to carry the ATS priority, Filing time and Optional Heading Information. However, only some of the functional groups which are part of the Extended Service are needed for the profile, namely FTBP and IHE. More specifically, the profile does not require support of AMHS security.

#### **3.2.3.2 Number of body parts**

3.2.3.2.1 The IPM body shall contain exactly one body-part which is an FTBP. This is compliant with the following text (EUR AMHS Manual, Appendix B, ref. [3], section 3.3.2, para 2):

“In case of one body-part only, the IPM contains either:

[...]

d) a single file-transfer body part in support of binary data exchange.”

3.2.3.2.2 The body part selection shall be as represented using the following tabular description.

**Table 1: Body part selection for the IWXXM profile  
(derived from ICAO Doc 9880 Part II Tables 3-1 and 3-2)**

<i>Ref</i>	<i>Element</i>	<i>Doc 9880 static support (Extended Service) Orig/Rec</i>	<i>Doc 9880 reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
<b>Part 2: AMH21/A.1.3 IPM body</b>					
1	ia5-text	O/M		X	
1.2	data	M/M	3.3.3	X	
10	bilaterally-defined	O/M	3.3.5	X	
<b>Part 3: AMH21/A.1.3.1 Extended body part support</b>					
1	ia5-text-body-part	O/M		X	
9	bilaterally-defined-body-part	O/M	3.3.5.1	X	
11	general-text-body-part	M/M	3.3.3 and Part 4, Table 3-1	X	
12	file-transfer-body-part	M/M	3.3.5.1 and 3.3.5.2	G	AMH21/ A.1.3.3
M = mandatory support (static support) O = optional support (static support) or optionally generated (dynamic behaviour) G = generated X = not used					

### 3.2.3.3 Selection of IPM heading parameters and parameter values

3.2.3.3.1 The IPM Heading parameter selection and values are listed in Table 2 below.

**Table 2: IPM Heading parameters for the IWXXM profile  
(derived from ICAO Doc 9880 Part II Table 3-2)**

<i>Ref</i>	<i>Element</i>	<i>Doc 9880 static support (Extended Service) Orig/Rec</i>	<i>Doc 9880 reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
<b>Part 1: AMH21/A.1.2 IPM heading fields</b>					
1	this-IPM	M/M	3.1.2.2.1, 3.1.4.2.1 (AMH21 support)	G	
2	originator	M/M		G	Address of the originating OPMET system (MET switch)
3	authorizing-users	O/M		X	
4	primary-recipients	M/M		G	Recipient addresses are populated by the MET switch based on its routing table (EUR Doc 033, ref. <a href="#">[1]</a> section 5.1.4)
5	copy-recipients	M/M		X	
6	blind-copy-recipients	O/M		X	
7	replied-to-IPM	M/M		X	
8	obsoleted-IPMs	O/M		X	

Ref	Element	Doc 9880 static support (Extended Service) Orig/Rec	Doc 9880 reference	Dynamic action upon generation of IWXXM message	Value and/or comments
9	related-IPMs	O/M		X	
10	subject	M/M		G	This field shall carry the TTAaiCCCCYYGGgBBB part of the filename of FTBP. It is assumed that the subject field is easier to access for human operators in case of retrieval or analysis of transferred messages
11	expiry-time	O/M		X	
12	reply-time	O/M		X	
13	reply-recipients	O/M		X	
14	importance	O/M		X	The receiving UA shall assume that this field takes its default value ("normal")
15	sensitivity	O/M		X	
16	auto-forwarded	O/M		X	
17	extensions	M/M	3.3.4.1	G	
17.6	authorization-time	M/M	3.3.4.2	G	Equivalent to filing time
17.12	originators-reference	M/M	3.3.4.3	X	To avoid confusion with the use of this field in the IHE context (where it is carrying data converted to/from AFTN OHI)
17.13	precedence-policy-identifier	M/M	3.3.4.5, 3.3.4.6 and 3.3.4.7	G	OID value {iso (1) identified-organisation (3) icao (27) atn-amhs (8) parameters (0) amhs-precedence-policy (0)} (see Doc 9880, ref. [5], 3.3.4.7)
Part 4: AMH21/A.1.5 common data types					
1	RecipientSpecifier				
1.2	notification-requests	M/M	3.3.6	X	
1.2.1	rn	M/M	3.3.6	X	IWXXM never use priority SS
1.2.2	nrn	M/M		X	Doc 9880 does not foresee the presence of nrn-request
1.4	recipient-extensions	M/M	3.3.4.1	G	
1.4.3	precedence	M/M	3.3.4.8	G	Equivalent to priority GG: precedence value = 28 (TAF, METAR/SPECI, and also in case of AMD, COR or RTD reports/bulletins) Equivalent to priority FF: precedence value = 57 (AIRMET, SIGMET, VAA, TCA)
2	ORDescriptor				
2.1	formal-name	M1/M1		G	used for originator-address and recipient-addresses
M = mandatory support (static support) M1 = mandatory O/R name minimal support (static support) O = optional support (static support) or optionally generated (dynamic behaviour)					

<i>Ref</i>	<i>Element</i>	<i>Doc 9880 static support (Extended Service) Orig/Rec</i>	<i>Doc 9880 reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
G = generated X = not used					

### 3.2.3.4 Content of body parts

3.2.3.4.1 The parameters composing the FTBP shall be in line with the specification of EUR ATS Messaging Profile, Appendix B to EUR AMHS Manual (ref. [\[3\]](#)), section A.2.4.2, and complemented with the details provided in Table 3 below.

**Table 3: File Transfer parameters for the IWXXM profile  
(derived from European ATS Messaging Service Profile, section A.2.4.2)**

<i>Ref</i>	<i>Element</i>	<i>European ATS Messaging Service Profile - static support Orig/Rec</i>	<i>European ATS Messaging Service Profile - reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
1	related-stored-file	-			
2	contents-type				
2.1	document-type				
2.1.1	document-type-name	M/M	A.2.4.2.1	G	default OID value: 1.0.8571.5.3 {iso(1) standard(0) 8571(8571) document- type(5) unstructured- binary(3)}
3	environment				
3.1	application-reference				
3.1.1	registered-identifier	O/M	A.2.4.2.2 and A.2.4.2.6	G	OID value: 1.3.27.8.1.2 {iso (1) identified- organisation (3) icao (27) atn-amhs (8) application (1) digital-met (2)}
3.4	user-visible-string	O/M	A.2.4.2.6	G	“Digital MET”
4	compression	-			See para 3.2.3.4.2 below
5	file-attributes				
5.1	pathname				
5.1.1	incomplete-pathname	O/M	A.2.4.2.3	G	bulletin file name as specified in EUR Doc 033, ref. <a href="#">[1]</a> , section 5.1.4
5.5	date-and-time-of-last-modification	O/M	A.2.4.2.4	O	

<i>Ref</i>	<i>Element</i>	<i>European ATS Messaging Service Profile - static support  Orig/Rec</i>	<i>European ATS Messaging Service Profile - reference</i>	<i>Dynamic action upon generation of IWXXM message</i>	<i>Value and/or comments</i>
5.13	object-size				
5.13. 2	actual-values	O/M	A.2.4.2.5	O	
6	extensions	-			
M = mandatory support (static support) O = optional support (static support) or optionally generated (dynamic behaviour) G = generated X = not used					

3.2.3.4.2 Compression of the data to be transferred, if needed, shall be performed in the MET domain before creating the FTBP, as assumed in section 3.2.2.2 above. This avoids using the “compression” field of FTBP, reduces the UA complexity and limits the FTBP functionality to message exchange mechanisms.

3.2.3.4.3 The IWXXM data itself shall be included in the FileTransferData element of the file-transfer-body-part. It should be noted that ISO/IEC 10021-7 / ITU-T X.420 (section 7.4.12) specifies the ASN.1 encoding to be used, and that ISO/IEC ISP 12062-2 (section A.1.3.1) expresses additional recommendations regarding this encoding, which should be “octet-aligned EXTERNAL”. Only one EXTERNAL component should be used.

### 3.2.3.5 Selection of used P3/P1 envelope parameter values

3.2.3.5.1 The mapping of P2 parameters onto P3 envelope parameters shall be as specified in ICAO Doc 9880 (ref. [\[5\]](#)) and X.420 (ref. [\[6\]](#)).

3.2.3.5.2 IPMs with a precedence value of 28 shall use the priority abstract-value “non-urgent”. IPMs with a precedence value of 57 shall use the priority abstract-value “normal”.

3.2.3.5.3 The encoded-information-types in the P3 submission-envelope shall be limited to the OID value specified for FTBP (see ITU-T X.420:1999 7.4.12.8, 20.4.c and Annex C), i.e. OID {joint-iso-itu-t(2) mhs(6) ipms(1) eit(12) file-transfer(0)}.

### 3.2.3.6 Relaxed requirements from complete AMHS specification

3.2.3.6.1 Implementers must be aware that due to the “relaxed” status of the requirements above, any of these requirements may be reverted back to a “mandatory” status in a future profile version, as soon as the need for the corresponding missing feature(s) appears operationally. Conformance with the profile implies a commitment to support such evolutions in the profile, which may be considered as “return-to-normal” in terms of AMHS conformance.

### 3.2.4 Proposed Conformance Tests

#### 3.2.4.1 General description

3.2.4.1.1 This section proposes a list of functional tests that allows verification of conformance of UA implementations dedicated for OPMET IWXXM data exchange. UA conformance testing, as specified in Appendix D-UA, for such implementations needs to be adapted based on the profile specification defined in section 3.2.3.

3.2.4.1.2 The proposed conformance tests are divided to three categories:

- profile specific submission tests;
- profile specific delivery tests; and
- submission and delivery tests according to Appendix D-UA.

3.2.4.1.3 The scope of the profile specific submission and delivery tests is to ensure conformance of UA implementations specifically deployed for the conveyance of OPMET IWXXM data to the respective profile. A test identification scheme of the form WXM<sub>x</sub>nn has been used, where x=1 is used for submission tests and x=2 for delivery tests. Wherever applicable, reference to the respective Appendix D-UA test is made.

3.2.4.1.4 Reference to specific UA conformance tests as specified in Appendix D-UA is included in section 3.2.4.4, especially for the reception direction. The scope of these tests is to ensure that UA implementations dedicated for OPMET IWXXM data exchange will not malfunction upon reception of a field or element not defined by the specific profile, but classified as mandatory in the ISPs and thus also mandatory in AMHS.

#### 3.2.4.2 Profile specific submission tests

<b>WXM101</b>	<b>Submission of an IPM including a bulletin consisting of METAR</b>
<b>Test criteria</b>	The test is successful if the UA submits an IPM including a bulletin consisting of METAR according to the profile defined in section 3.2.3.
<b>Scenario description</b>	<p>Submit from the UA under test an IPM including a bulletin consisting of METAR.</p> <p>Check that:</p> <ul style="list-style-type: none"> <li>- the P3 submission-envelope includes the following parameters with the correct values: <ul style="list-style-type: none"> <li>○ <i>originator-name</i>: OR-name of the originator</li> <li>○ <i>recipient-name</i>: OR-name of each recipient of the message</li> <li>○ <i>content-type</i>: 22</li> <li>○ <i>encoded-information-types</i>: OID 2.6.1.12.0</li> <li>○ <i>priority</i>: non urgent</li> </ul> </li> <li>- the following IPM heading fields are present with the correct values: <ul style="list-style-type: none"> <li>○ <i>originator</i>: address of the originating OPMET system (MET switch)</li> <li>○ <i>primary-recipients</i>: recipient addresses as populated by the MET switch</li> <li>○ <i>subject</i>: TTAAiiCCCCYYGGgBBB part of the filename of FTBP</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ <i>importance</i>: normal, if present</li> <li>○ <i>authorization-time</i> of the IPM heading extensions field: equivalent to filing time</li> <li>○ <i>precedence-policy-identifier</i> of the IPM heading extensions field: OID 1.3.27.8.0.0</li> <li>○ <i>originators-reference</i> of the IPM heading extensions field: absent</li> <li>- the following elements in the common data types are present with the corresponding values: <ul style="list-style-type: none"> <li>○ <i>precedence</i>: 28</li> <li>○ <i>formal-name</i>: originator address and recipient addresses</li> </ul> </li> <li>- the elements <i>rn</i> and <i>nrn</i> in the common data types are absent</li> <li>- the message has exactly one file-transfer-body-part</li> <li>- the parameters composing FTBP are according to section A.2.4.2 of the EUR AMHS Manual Appendix B and the following elements are present with the correct values: <ul style="list-style-type: none"> <li>○ <i>document-type-name</i>: OID 1.0.8571.5.3</li> <li>○ <i>registered-identifier</i>: OID 1.3.27.8.1.2</li> <li>○ <i>user-visible-string</i>: 'Digital MET'</li> <li>○ <i>incomplete-pathname</i>: bulletin file name as specified in section 5.1.4 of EUR Doc 033, for example: A_LAFR31LFPW171500_C_LFPW_20151117150010.xml.[compression_suffix]</li> <li>○ If generated, check the element <i>date-and-time-of-last-modification</i></li> <li>○ If generated, check the element <i>actual-values</i>, the value of which represents the size of the Attachment data in bytes</li> </ul> </li> <li>- the elements <i>related-stored-file</i>, <i>compression</i> and <i>extensions</i> of the FTBP parameters are absent</li> <li>- The IWXXM data itself are included in the FileTransferData element of the file-transfer-body-part; the octet-aligned encoding should be used.</li> </ul>
<b>Appendix D-UA ref:</b>	CTUA1501, FTBP Capability

<b>WXM102</b>	<b>Submission of IPMs including bulletins of different file size consisting of METAR</b>
<b>Test criteria</b>	The test is successful if the UA submits several IPMs including bulletins of different file size consisting of METAR according to the profile defined in section 3.2.3.
<b>Scenario description</b>	<p>Submit from the UA under test a sequence of several IPMs including each time a bulletin of different file size consisting of METAR.</p> <p>The size of the message should not exceed the limit defined in Appendix B, F.2.4.3</p> <p>Check all parameters listed in test case WXM101, with the corresponding values.</p> <p>If the element <i>actual-values</i> is generated check each time the respective value, which represents the size of the Attachment data in bytes.</p>
<b>Appendix D-UA ref:</b>	CTUA1501, FTBP Capability with different body-part size

<b>WXM103</b>	<b>Submission of an IPM including a bulletin consisting of SPECI or TAF</b>
<b>Test criteria</b>	The test is successful if the UA submits an IPM including a bulletin consisting of SPECI or TAF according to the profile defined in section 3.2.3.
<b>Scenario description</b>	<p>Submit from the UA under test an IPM including a bulletin consisting of SPECI.</p> <p>Check that all parameters and their respective values are in accordance to test case WXM101, except that the value of the element <i>incomplete-pathname</i> is according to the bulletin file name as specified in section 5.1.4 of EUR Doc 033.</p> <p>The test is repeated with the submission of an IPM including bulletin consisting of TAF.</p>
<b>Appendix D-UA ref:</b>	CTUA1501, FTBP Capability

<b>WXM104</b>	<b>Submission of an IPM including a bulletin consisting of AIRMET</b>
<b>Test criteria</b>	The test is successful if the UA submits an IPM including a bulletin consisting of AIRMET according to the profile defined in section 3.2.3.
<b>Scenario description</b>	<p>Submit from the UA under test an IPM including a bulletin consisting of AIRMET.</p> <p>Check that all parameters and their respective values are in accordance to test case WXM101, except that:</p> <ul style="list-style-type: none"> <li>- the <i>priority</i> abstract value of the P3 submission-envelope is normal</li> <li>- the value of the element <i>precedence</i> is 57</li> <li>- the value of the element <i>incomplete-pathname</i> is according to the bulletin file name as specified in section 5.1.4 of EUR Doc 033.</li> </ul>
<b>Appendix D-UA ref:</b>	CTUA1501, FTBP Capability

<b>WXM105</b>	<b>Submission of an IPM including a bulletin consisting of SIGMET or VAA or TCA</b>
<b>Test criteria</b>	The test is successful if the UA submits an IPM including bulletin consisting of SIGMET or VAA or TCA according to the profile defined in section 3.2.3.
<b>Scenario description</b>	<p>Submit from the UA under test an IPM including a bulletin consisting of SIGMET.</p> <p>Check that all parameters and their respective values are in accordance to test case WXM101, except that:</p> <ul style="list-style-type: none"> <li>- the <i>priority</i> abstract value of the P3 submission-envelope is normal</li> <li>- the value of the element <i>precedence</i> is 57</li> <li>- the value of the element <i>incomplete-pathname</i> is according to the bulletin file name as specified in section 5.1.4 of EUR Doc 033.</li> </ul> <p>The test is repeated with the submission of an IPM including bulletin consisting of VAA.</p>



	The test is repeated with the submission of an IPM including bulletin consisting of TCA.
<b>Appendix D-UA ref:</b>	CTUA1501, FTBP Capability

### 3.2.4.3 Profile specific delivery tests

<b>WXM201</b>	<b>Delivery of an IPM including a bulletin consisting of METAR</b>
<b>Test criteria</b>	The test is successful if an IPM, including a bulletin consisting of METAR, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in section 3.2.3 are properly received.
<b>Scenario description</b>	<p>The MTA sends an IPM including a bulletin consisting of METAR.</p> <p>Check that the UA under test receives the IPM with the following parameters:</p> <ul style="list-style-type: none"> <li>- the message delivery envelope includes the following parameters with the correct values: <ul style="list-style-type: none"> <li>○ <i>originator-name</i>: OR-name of the originator</li> <li>○ <i>this-recipient-name</i>: OR-name of the recipient to whom the message is delivered</li> <li>○ <i>content-type</i>: 22</li> <li>○ <i>encoded-information-types</i>: OID 2.6.1.12.0</li> <li>○ <i>priority</i>: non urgent</li> <li>○ <i>message-delivery-identifier</i>: it shall have the same value as the message-submission-identifier supplied to the originator of the message when the message was submitted (X.411, section 8.3.1.1.1.1)</li> <li>○ <i>message-delivery-time</i>: it contains the time at which delivery occurs and at which the MTS is relinquishing responsibility for the message (X.411, section 8.3.1.1.1.2)</li> </ul> </li> <li>- the following IPM heading fields are present with the correct values: <ul style="list-style-type: none"> <li>○ <i>originator</i></li> <li>○ <i>primary-recipients</i></li> <li>○ <i>subject</i>: TTAAiiCCCCYYGGggBBB part of the filename of FTBP</li> <li>○ <i>importance</i>: normal, if present</li> <li>○ <i>authorization-time</i> of the IPM heading extensions field: equivalent to filing time</li> <li>○ <i>precedence-policy-identifier</i> of the IPM heading extensions field: OID 1.3.27.8.0.0</li> <li>○ <i>originators-reference</i> of the IPM heading extensions field: absent</li> </ul> </li> <li>- the following parameters in the common data types are present with the corresponding values: <ul style="list-style-type: none"> <li>○ <i>precedence</i>: 28</li> </ul> </li> <li>- the elements <i>rn</i> and <i>nrn</i> in the common data types are absent</li> <li>- the message has exactly one file-transfer-body-part</li> <li>- the parameters composing the FTBP are according to section A.2.4.2 of the EUR AMHS Manual Appendix B and the following elements are present with the correct values: <ul style="list-style-type: none"> <li>○ <i>document-type-name</i>: OID 1.0.8571.5.3</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>○ <i>registered-identifier</i>: OID 1.3.27.8.1.2</li> <li>○ <i>user-visible-string</i>: ‘Digital MET’</li> <li>○ <i>incomplete-pathname</i>: bulletin file name as specified in section 5.1.4 IWXXM Guidelines, for example: A_LAFR31LFPW171500_C_LFPW_ 20151117150010.xml.[compression_suffix]</li> <li>○ If generated, check the element <i>date-and-time-of-last-modification</i></li> <li>○ If generated, check the element <i>actual-values</i>, the value of which represents the size of the Attachment data in bytes</li> <li>- the elements <i>related-stored-file</i>, <i>compression</i> and <i>extensions</i> of the FTBP parameters are absent</li> <li>- The IWXXM data itself are included in the FileTransferData element of the file-transfer-body-part; the octet-aligned encoding should be used.</li> </ul>
<b>Appendix D-UA ref:</b>	CTUA1601, FTBP Capability

<b>WXM202</b>	<b>Delivery of IPMs including bulletins of different file size consisting of METAR</b>
<b>Test criteria</b>	The test is successful if several IPMs, including bulletins of different file size consisting of METAR, sent by an MTA are received by the UA under test and the parameters specified by the profile defined in section 3.2.3 are properly received.
<b>Scenario description</b>	<p>The MTA sends a sequence of several IPMs including each time a bulletin of different file size consisting of METAR.</p> <p>Check that the UA under test receives all IPMs and that the parameters described in test case WXM201 are received with the corresponding values.</p> <p>If the element <i>actual-values</i> is present check each time the respective value, which represents the size of the Attachment data in bytes.</p>
<b>Appendix D-UA ref:</b>	CTUA1601, FTBP Capability with different body-part size

<b>WXM203</b>	<b>Delivery of an IPM including a bulletin consisting of SPECI or TAF</b>
<b>Test criteria</b>	The test is successful if an IPM, including a bulletin consisting of SPECI or TAF, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in section 3.2.3 are properly received.
<b>Scenario description</b>	<p>The MTA sends an IPM including a bulletin consisting of SPECI.</p> <p>Check that the UA under test receives the IPM and the parameters described in test case WXM201 are received with the corresponding values, except the element <i>incomplete-pathname</i> which value is according to the bulletin file name as specified in section 5.1.4 of EUR Doc 033.</p> <p>The test is repeated with the delivery of an IPM including a bulletin consisting of TAF.</p>
<b>Appendix D-UA ref:</b>	CTUA1601, FTBP Capability

<b>WXM204</b>	<b>Delivery of an IPM including a bulletin consisting of AIRMET</b>
<b>Test criteria</b>	The test is successful if an IPM, including a bulletin consisting of AIRMET, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in section 3.2.3 are properly received.
<b>Scenario description</b>	<p>The MTA sends an IPM including a bulletin consisting of AIRMET.</p> <p>Check that the UA under test receives the IPM and the parameters described in test case WXM201 are received with the corresponding values, except that:</p> <ul style="list-style-type: none"> <li>- the <i>priority</i> abstract value of the P3 submission-envelope is normal</li> <li>- the value of the element <i>precedence</i> is 57</li> <li>- the value of the element incomplete-pathname is according to the bulletin file name as specified in section 5.1.4 of EUR Doc 033.</li> </ul>
<b>Appendix D-UA ref:</b>	CTUA1601, FTBP Capability

<b>WXM205</b>	<b>Delivery of an IPM including a bulletin consisting of SIGMET or VAA or TCA</b>
<b>Test criteria</b>	The test is successful if an IPM, including a bulletin consisting of SIGMET or VAA or TAF, sent by an MTA is received by the UA under test and the parameters specified by the profile defined in section 3.2.3 are properly received.
<b>Scenario description</b>	<p>The MTA sends an IPM including a bulletin consisting of SIGMET.</p> <p>Check that the UA under test receives the IPM and the parameters described in test case WXM201 are received with the corresponding values, except that:</p> <ul style="list-style-type: none"> <li>- the <i>priority</i> abstract value of the P3 submission-envelope is normal</li> <li>- the value of the element <i>precedence</i> is 57</li> <li>- the value of the element incomplete-pathname is according to the bulletin file name as specified in section 5.1.4 of EUR Doc 033.</li> </ul> <p>The test is repeated with the delivery of an IPM including a bulletin consisting of VAA.</p> <p>The test is repeated with the delivery of an IPM including a bulletin consisting of TCA.</p>
<b>Appendix D-UA ref:</b>	CTUA1601, FTBP Capability

### 3.2.4.4 Submission and delivery tests according to Appendix D-UA

3.2.4.4.1 The scope of the tests included in the following list is to ensure that UAs implemented for the sake of the exchange of OPMET IWXXM data will not malfunction upon reception of AMHS messages, fields or elements according to the standards but not defined by the profile specified in section 3.2.3. The main objective is to realize the behaviour of these specific UA implementations upon reception of such messages, fields or elements.

3.2.4.4.2 The execution of the delivery tests defined in Appendix D-UA is encouraged. However if this is not possible the following test list is suggested.

<b>Basic Delivery Operations (A2)</b>	
<b>CTUA201</b>	<b>Deliver an IPM to the IUT – basic capability (A2)</b>
<b>CTUA203</b>	<b>Deliver an IPM containing optional-heading-information in the ATS-message-header</b>
<b>CTUA204</b>	<b>Deliver an IPM containing different kinds of recipient addresses</b>
<b>CTUA206</b>	<b>Deliver an IPM with invalid originator address similar to CAAS</b>
<b>CTUA207</b>	<b>Deliver an IPM with invalid originator address similar to XF</b>

<b>Specific Delivery Operations</b>	
<b>CTUA401</b>	<b>Deliver a non-delivery report (NDR) to an AMHS user</b>

<b>Enhanced Delivery UA Capability</b>	
<b>CTUA601</b>	<b>Deliver an IPM with the implemented capability of one body-part</b>
<b>CTUA602</b>	<b>Deliver an IPM with the implemented capability of two body-parts</b>

<b>Delivery Operations (A2-IHE)</b>	
<b>CTUA1201</b>	<b>Deliver an IPM with IHE to the IUT – basic capability (A2-IHE)</b>
<b>CTUA1203</b>	<b>Deliver an IPM with IHE, containing optional heading information</b>
<b>CTUA1204</b>	<b>Deliver an IPM with IHE, containing different kinds of recipient address</b>

<b>Specific Submission Operations with IHE</b>	
<b>CTUA1303</b>	<b>Checking of default envelope elements (flag setting) in submitted IPMs with IHE</b>

<b>Specific Delivery Operations with IHE</b>	
<b>CTUA1401</b>	<b>Deliver a non-delivery report (NDR) to an AMHS user</b>

<b>Enhanced Delivery UA Capability with IHE</b>	
<b>CTUA1602</b>	<b>Deliver an IPM with IHE with the implemented capability of two body-parts</b>

**End of Appendix H**