



AMHS/SWIM Gateway Specification

AMHS/SWIM Gateway	
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DOCUMENT CHANGE RECORD

The following table records the history of successive versions of the present document.

Version	Date	Modifications	Affected Sections
0.9	14/06/2023	Initial version for presentation to AST TF/04	All
0.9.1	13/10/2023	Comments by Peter Rudolph incorporated	All
1.0	10/11/2023	Comments by Anna Rapti and AST PG incorporated. Overall review for submission to EASPG.	All
1.1	03/04/2024	Incorporation of CP-ASGS-24-001 Editorial amendments in several sections of EUR Doc 047 to enhance the readability and comprehension of the relevant content. Typos in some references of sections inside the document were corrected. Application properties names underscore was used instead of hyphens. Amendments in generation of ia5-text-body-part types. file transfer body part parameters added in Tables 7 and 12	
2.0	20/06/2024	Adopted version (AST TF/05)	
2.1	12/03/2025	Incorporation of CP-ASGS-24-002 Specific topics of EUR Doc 047 version 2.0 were reviewed by SWAMWAY SG. More specifically, the application properties 'amhs_registered_identifier' and 'amhs_user_visible_string' were introduced. Sections describing the handling of these fields in both directions (AMHS to SWIM and SWIM to AMHS) were introduced. Amendments were proposed in several sections to enhance the readability and comprehension of the relevant content. Finally, limited typos that were recognized in some references in Tables 8, 12 and 13 were corrected.	All
3.0	06/05/2025	Adopted version (AST TF/06)	
3.1	07/04/2026	Incorporation of CP-ASGS-25-003 and CP-ASGS-26-001	Table 2, section 4.4 and Annex A
4.0	12/05/2026	Adopted version (AST TF/07)	

Acronyms

The acronyms used in this manual are defined as follows:

AFS	Aeronautical Fixed Service
AFTN	Aeronautical Fixed Telecommunication Network
AIS	Aeronautical Information Services
AMHS	ATS Message Handling System
AMQP	Advanced Message Queuing Protocol
API	Application Programming Interface
ASN.1	Abstract Syntax Notation One
AST	AFS To SWIM Transition
AST TF	AFS To SWIM Transition Task Force
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSMHS	ATS message handling service
AU	Access Unit
AUP	Acceptable Use Policy
DIR	ATN Directory Service
DL	Distribution List
DN	Distinguished Name
DSA	Directory System Agent
DUA	Directory User Agent
EAD	European AIS Database
EACP	European Aviation Common PKI
EDS	European Directory Service
FTBP	File transfer body part
FPL	Flight Plan
HTTPS	Hypertext Transfer Protocol Secure
ICAO	International Civil Aviation Organization
ICC	Inter Center Communication
IEC	International Electrotechnical Commission
IHE	IPM Heading Extension
IPM	Interpersonal Message
ISO	International Standardization Organization
ISP	International Standardized Profile
ITCU	Information Transfer and Control Unit
JMS	Java Message Service
MD	Management Domain
MHS	Message Handling System
MTA	Message transfer agent
MEP	Message Exchange Pattern
MTA	Message Transfer Agent

MTS	Message Transfer System
NM	Network Manager
OHI	Optional Heading Information
OID	Object Identifier
OSI	Open System Interconnection
PKI	Public Key Infrastructure
REST	Representational State Transfer
RFC	Request For Comments
SOAP	Simple Object Access Protocol
SWIM	System wide information management
SWIM TI	System wide information management Technical Infrastructure
SWIM TI YP	System wide information management Technical Infrastructure Yellow Profile
TLS	Transport Layer Security
WS	Web Services
YP	Yellow Profile

Foreword

This document is a result of the activities performed by the AMHS/SWIM Gateway Study Group, (SWAMWAY SG) during the last years in support of a smooth transition from the Aeronautical Fixed Service (AFS)¹ to System Wide Information Management (SWIM), as well as a successful and safe technical parallel operation of AMHS and SWIM.

SWAMWAY SG is a joint initiative undertaken by a group of organisations including several ANSPs and industries with a deep expertise in both, AMHS and SWIM. Austro Control, Copperchase, Enaire, Frequentis Comsoft, Indra Avitech, Telefónica and Thales joined forces in the SWAMWAY SG without economic interests in the spirit of working together on a Gateway specification between AMHS and SWIM, the AMHS/SWIM Gateway, to facilitate the aforementioned transition from AFS to SWIM.

The content of this manual has been shared for consultation with AMHS and SWIM experts and their feedback has been appropriately considered. SWAMWAY SG has closely collaborated with the AFS To SWIM Transition Planning Group (AST PG) and has also duly reported the progress of its activities to the AFS To SWIM Transition Task Force (AST TF) to provide up-to-date information on a timely basis and to incorporate potential inputs from the AST TF.

This manual contains the technical specifications for the AMHS/SWIM Gateway based on established standards and protocols established for open systems interconnection (OSI) by the International Organization for Standardization (ISO), ICAO Doc. 9880 being the SARPs for AMHS the Telecommunication Standardization Sector of the International Telecommunication Union (ITU-T), the technical specification for SWIM Technical Infrastructure Yellow Profile by EUROCONTROL, and the AMQP standards by OASIS group.

It is important to notice that SWAMWAY SG does neither suggest nor recommend any specific way to implement the AMHS/SWIM Gateway described in this manual. This manual is intended to provide guidance to implementers so that they can build their own AMHS/SWIM Gateways ensuring interoperability as well as a specific determined behaviour according to the requirements gathered in this technical specification.

This technical specification has been widely shared and consulted within ICAO asking for comments to the different AMHS and SWIM experts from the ICAO Regional Offices. The valuable inputs and feedback from these organizations have been duly considered and have certainly enriched this manual in the shape of a technical specification. SWAMWAY SG would like to thank AST PG members who have actively contributed to the enrichment of this technical specification. SWAMWAY SG would also like to mention, especially, the help and contribution by Peter Rudolph who has always provided a useful technical support

This technical specification is not prescriptive, and implementers are free to design and make their own implementations.

Editorial practices in this manual are as follows:

- The specifications that include the verb “shall” are essential to be implemented to secure proper operation of the AMHS/SWIM Gateway.
- The specifications that include the verb “should” are recommended for implementation in the AMHS/SWIM Gateway.
- The specifications that include the verb “may” are optional.

The technical specification for the AMHS/SWIM Gateway is structured as follows:

Chapter 1 Introduction, contains an overview to allow the readers to understand the context of and the need for the AMHS/SWIM Gateway. It also includes some important definitions, the references and an exhaustive list of the different terms and acronyms used along the technical specification.

Chapter 2 System Level Provisions, provides a high-level specification of the AMHS/SWIM Gateway and the environment in which it operates. This chapter addresses the functional, information, security, and management

¹ SWAMWAY SG recognizes that AFS consists of: ATS direct speech circuits, Meteorological operational channels and meteorological operational telecommunication networks, AFTN, CIDIN, ATSMHS and ICC. Please, consider that within the framework of this specification and when talking about the transition from AFS to SWIM, SWAMWAY SG just refers, basically, to ATSMHS.

models. Finally, it also includes sections specifying how the information will be conveyed from AMHS to SWIM and from SWIM to AMHS.

Chapter 3 Configurations and Parameters, summarises several configurations and parameters of the AMHS/SWIM Gateway that allow adaption to the needs of organisations and integration with existing environments. This chapter includes important aspects that the AMHS/SWIM Gateway will take care of such as potential message constraints (size, maximum number of recipients, etc.), security, authorisation and optional directory services.

Chapter 4 AMHS/SWIM Gateway Specification details, describes the architecture and building blocks of the AMHS/SWIM Gateway and provides the detailed specification of this gateway and of the related functional requirements such as conversion of messages from AMHS to SWIM and from SWIM to AMHS.

Annex A outlines the concept of the SWIM Access Point as a component that groups essential technical capabilities to support AMHS/SWIM Gateway operations and interaction with legacy systems. Furthermore, it summarizes the mandatory and optional capabilities of the SWIM Access Point, explains how it simplifies migration to SWIM by avoiding direct legacy protocol implementation, and positions the AMHS/SWIM Gateway as a transitional mechanism designed to reduce complexity while ensuring interoperability during the transition to SWIM.

Attachment A describes the Change Control Mechanism of EUR Doc 047, providing the relevant Templates for Change Proposals or Defect Reports.

Appendix A defines the functional requirements for AMHS/SWIM Gateway testing procedures. It defines the scope of the functions to be tested, the scope of the test environment and describes tests of gateway operations converting a message from AMHS to SWIM and vice versa. It is an integral part of Doc 047, but provided in the form of an Appendix for maintenance reasons.

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Appendix A: AMHS/SWIM Gateway Testing Plan

1 INTRODUCTION

1.1 OVERVIEW

1.1.1 As already mentioned in the Foreword, Chapter 1 introduces the AMHS/SWIM Gateway specification giving the context and the general framework to the readers of this document. All the requirements and the specifications that define how the AMHS/SWIM Gateway shall behave are gathered in chapter 4.

1.1.2 The AMHS application, known as the ATS message handling service allows ATS messages to be exchanged between service users as specified in ICAO Doc. 9880, Part II [1], Chapter 4.

1.1.3 The AMHS is provided by the implementation over the ATN Internet communication services of the message handling systems specified in ISO/IEC 10021 and ITU-T X.400.

1.1.4 SWIM information is exchanged between SWIM producers and SWIM consumers following the appropriate mechanisms available today in SWIM (e.g., SWIM TI Profiles and Message Exchange Patterns)

1.1.5 SWIM TI specifies interface binding requirements and infrastructure capabilities. They depend on the specific SWIM TI Profile SWIM users utilize to exchange information. AMQP is the protocol that has been chosen for the proposed AMHS/SWIM Gateway. SWIM Access Point can provide access to the AMHS/SWIM Gateway following any SWIM TI YP compliant interfaces (mainly AMQP and REST).

1.1.6 Among the different SWIM profiles published by EUROCONTROL, the SWIM Yellow profile is the best suited based on the type of information that the AMHS/SWIM Gateway will exchange and the communications networks that will support them. The SWIM Yellow Profile [3] offers four different types of service interface bindings: WS Light, WS SOAP, WS-N SOAP and AMQP messaging [3].

1.1.7 Analysis of the different service bindings and their capabilities [3] showed that AMQP is the best in terms of performance and offers a wide range of MEP and security options. AMQP offers high performance, reliability, decoupling, and is a consumer-driven binary wire-level protocol appropriate for the transmission of file transfer body parts. On top of that, AMQP offers interoperability, that is the key concept of the SWIM paradigm.

1.1.8 The SWIM Component enables access to SWIM in accordance with the EUROCONTROL SWIM Technical Infrastructure (TI) Yellow Profile [3] using the Advanced Message Queuing Protocol (AMQP).

1.1.9 There is a need to exchange information between AMHS users and SWIM users, both providers and consumers depending on the direction of the information flow. This information exchange may be bi-directional.

1.1.10 This bilateral exchange is not completely symmetrical and that shall be appropriately considered in order to understand what information is needed to be conveyed from AMHS to SWIM and vice versa.

1.1.11 Because of this need to exchange information between AMHS and SWIM domains and because of the use of different protocols, a mechanism shall be implemented making possible the exchange of information between the two domains.

1.1.12 This mechanism shall not only make possible the exchange of information between AMHS and SWIM but shall also adapt the format of the information to make it understandable for the users, either human beings or software applications, in each domain.

1.1.13 The proposed mechanism shall be an AMHS/SWIM Gateway following a similar approach to the one defined in ICAO Doc. 9880, Part II [1], Chapter 4, for the transition from AFTN to AMHS.

1.1.14 The AMHS/SWIM Gateway shall guarantee the interoperability between AMHS and SWIM users and the continuous and steady transition from AMHS to SWIM always ensuring the minimum impact on the end users.

1.1.15 The transition from AMHS to SWIM shall occur and shall take the required time to ensure a smooth migration between these two technologies minimizing the impact on the end users.

1.1.16 Although the AFTN/AMHS Gateway is taken as a reference, some important aspects have to be considered.

1.1.17 First of all, it has to be considered that AMHS and SWIM are associated to completely different sets of communication protocols and for the purpose of the AMHS/SWIM Gateway, those differences need to be reconciled somehow.

1.1.18 The way information is sent and received is completely different. Indeed, when talking about message conveyance in the AMHS domain, the mechanism and the communication protocols that are followed have usually nothing to do with those used in the SWIM domain.

1.1.19 In the SWIM domain, the information flows follow a different approach than in AMHS. In SWIM, information producers are those SWIM actors who want to share some specific information with the whole community. On the contrary, information consumers are those who need some specific information that other SWIM actors may share with the whole community.

1.1.20 Therefore, there are substantial differences in terms of routing to convey the messages or the information from the sender to the recipients or from the producers to the consumers.

1.1.21 AMHS has predefined routes that have been nationally and internationally agreed. These predefined routes are logical routes by default according to the current AFTN, CIDIN and X.400 routing tables, which are regularly updated based on the routing availability information. These logical routes also have back-up routes in case the route by default is not available.

1.1.22 On the contrary, SWIM does not have predefined routes because the underlying concept of exchanging information does not follow the same approach as in AMHS. SWIM producers and consumers do not necessarily know each other beforehand. SWIM producers will publish the services they can provide using the SWIM Registry². SWIM consumers look up in the SWIM Registry what SWIM services are available and what are the pre-requisites to consume those services.

Note.— Producers of SWIM information do not necessarily need to be the ones also providing the service via which information is exchanged. It could be, for instance, that an ANSP is using a service implemented and hosted by a different provider to share its ATM information with the SWIM consumers. Other examples are NM and EAD. Any ANSP publishes AUP/UUP to NM and NM shares via NM B2B, similarly with EAD.

1.1.23 In any case, it is clear as mentioned before that SWIM producers or consumers can need information that is only available within the AMHS domain, and the other way around, AMHS senders and recipients can also need information that is only available within the SWIM domain.

1.2 END SYSTEMS

1.2.1 The term End systems shall refer to the users of the AMHS/SWIM Gateway, either from the AMHS side (accessing the ATS Message server) or from the SWIM side (accessing the SWIM Access Point). Please, see chapter 2 for further details.

1.2.2 The users of the AMHS/SWIM Gateway shall be the AMHS users, as well as the SWIM users, either SWIM information producers or SWIM information consumers.

1.2.3 The communication between these end users shall be according to the following possibilities:

- a) AMHS users with SWIM information producers through the AMHS/SWIM Gateway;
- b) AMHS users with SWIM information consumers through the AMHS/SWIM Gateway and vice versa; and
- c) AMHS users with the SWIM Access Point embedded inside the AMHS/SWIM Gateway.

² The "SWIM Registry" mentioned here should be understood as a SWIM-TI Common Design-time Registry where information and available SWIM services is available. This Common Design-time Registry facilitates handling and provisioning the information about operational services from known providers who are already SWIM compliant.

1.2.4 AMHS and SWIM users may use functionalities, indicators and parameters, such as, priority, time stamp, information type, ACK request/confirmation, etc. All these parameters and indicators shall be properly addressed in the AMHS/SWIM Gateway so that the contextual conditions are absolutely clear for both AMHS and SWIM users.

1.2.5 The end users of the AMHS/SWIM Gateway shall duly consider the following aspects:

1.2.5.1 SWIM users do not know upfront the capabilities of AMHS users. That shall be the responsibility of the AMHS/SWIM Gateway.

1.2.5.2 SWIM users submitting information do not know if the sent information is received by the destinations or not (information is considered just delivered by the SWIM users).

1.2.5.3 SWIM users shall communicate with the AMHS/SWIM Gateway through a set of known communication protocols. For the time being, the technical specification for the AMHS/SWIM Gateway, this document, refers to the use of AMQP on the SWIM side.

1.2.5.4 It shall be ensured that SWIM information upon being submitted, contains the mandatory fields fulfilled to guarantee the translation to extended AMHS.

1.2.5.5 The AMHS/SWIM Gateway shall accept messages in support of both Basic and Extended AMHS for transfer into the SWIM domain.

1.2.6 At the time of writing of this Technical Specification, the vast majority of AMHS messages exchanged adhere to Basic AMHS.

1.3 AMHS/SWIM GATEWAY IMPLEMENTATION

1.3.1 This manual shall be considered the technical specification that gathers the requirements for the AMHS/SWIM Gateway.

1.3.2 The requirements included in this technical specification ensure that the AMHS/SWIM Gateway shall be able to exchange information between AMHS users and SWIM users, either SWIM information producers or SWIM information consumers.

1.3.3 This technical specification does neither mandate nor recommend any specific implementation to build the AMHS/SWIM Gateway.

1.3.4 The authors of this technical specification, i.e., SWAMWAY SG members, understand that it is up to industrial organizations or implementers to build an AMHS/SWIM Gateway following the technical specifications herein.

1.3.5 This technical specification has been developed with the intention that any implementer meeting the described requirements shall be able to guarantee the information exchange between AMHS and SWIM. But it does not preclude implementers from adding additional features that may add other ancillary functionalities.

1.4 REFERENCES

1.4.1 This specification makes references to the following documents:

- [1] ICAO Doc 9880, 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 EUR AFS to SWIM Transition Task Force, 1st Meeting (AST TF/01), Working Paper 6 (WP/06), Update of AMHS Security Requirements
- [3] EUROCONTROL SWIM Technical Infrastructure (TI) Yellow Profile, SPEC-170, edition 1.1, 5th of July of 2020.

- [4] ISO/IEC 10021-4:2003, Information technology — Message Handling Systems (MHS): Message transfer system — Abstract service definition and procedures — Part 4, edition 2003.
- [5] ISO/IEC 10021-7:2003, Information technology — Message Handling Systems (MHS): Interpersonal messaging system — Part 7, edition 2003.
- [6] 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)
- [7] ISO/IEC 646:1991, Information technology — ISO 7-bit coded character set for information interchange
- [8] ISO 8859-1:1987, Information processing — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1
- [9] ICAO EUR AMHS Manual, Appendix B - European ATS Messaging Service Profile

Note.— The team that has drafted this specification is aware of the upcoming publication for SWIM within ICAO framework, namely, Manual on System Wide Information Management, Volume 2: SWIM implementation, expected by the end of 2023 and ICAO SWIM Provisions: PANS-IM Vol 1 – SWIM, expected by the end of 2024. The drafting team understands that these two future documents can impact on this specification. At the time of writing this specification, the drafting team has not decided yet the next steps assuming there is an impact on the concepts and approach described in this document. In any case and as a consequence of maintaining this document, this will be considered and assessed at the right time.

1.5 DEFINITIONS

1.5.1 The following terminology shall apply:

Data format. A structure of data elements, records and files arranged to meet standards, specifications or data quality requirements.

Direct AMHS user. An AMHS user who engages in the AMHS at an ATS message user agent. A direct AMHS user may belong to two subgroups as follows:

Human users who interact with the AMHS by means of an ATS message user agent connected to an ATS message server.

Host users which are computer applications running on ATN end systems and interacting with the AMHS by means of application programme interfaces.

Exchange Schema. Formal description of the data involved in an information exchange, in particular including the encodings and other applicable constraints. An exchange schema assists information service consumers in understanding the syntax of the data delivered by the information service, and the technologies required for locally processing the data received. An exchange schema is based on a data exchange language which is standardized. For example, XML Schema is a W3C data exchange language used to define XML encoded messages.

Indirect AMHS user. An AMHS user at an AFTN station using an AFTN/AMHS gateway to communicate with other AMHS users.

Information exchange model. A document in a formal language identifying the information that is agreed to be shared between two or more organisations or groups and includes at least one exchange schema for the associated data. An information exchange model is normally defined for a specific information domain, such as aeronautical information, meteorological information or flight information. This typically includes the definition of information entities and their relationships.

Information Consumer. The person, application or system consuming an information service. Also called consumer.

Information Provider. Information service provider. Also called provider.

Information Service. A type of service in a service-oriented architecture that provides an ATM information sharing capability.

Information Service Consumer. A service consumer receiving information from information service providers using information services. The information service consumer role and the information consumer role may be allocated to different parties.

Information Service Provider. A service provider making information available to information service consumers using information services.

Interface binding. Specification of the protocols and data formats to be used in transmitting messages defined by the associated interface. Two systems that implement the same interface binding are considered technically interoperable and are able to connect to each other and exchange information. There are two types of interface bindings to be distinguished based on their position in the TCP/IP protocol: service bindings and network bindings. Service bindings specify the service interface protocols (e.g., protocols to interface with the applications, such as HTTPS and AMQP). Network bindings specify the transport and network related protocols that will be used to exchange data over the network (e.g., TCP, IP v4/v6).

Message exchange pattern. A template that describes relationships of multiple messages exchanged between interacting components to accomplish a single complete information exchange.

Reference model. An abstract framework for understanding significant relationships among the entities of some environment.

Semantic interoperability. The ability of computer systems and organisations to exchange information with unambiguous, shared meaning.

Service (SWIM Context). A mechanism to enable access to one or more capabilities using a prescribed interface. In the context of SWIM, the notion of service addresses machine-to-machine interaction based on service-oriented architecture principles, and is not to be confused with the notion of service as used in ICAO provisions referring to business services such as AIS, ATS, etc.

Service consumer. An entity which seeks to satisfy a particular need through the use of capabilities offered by means of a service.

Service definition. A document, issued by a community of interest, used to harmonize service implementations.

Service description. Information needed in order to use, or consider using, a service.

Service instance. The service deployed into a running ICT system.

Service operation. Specification of a transformation or query that an object may be called to execute.

Service orientation. The designing of systems in terms of services and service-based development.

Service-oriented architecture. Architectural style that supports service orientation.

Service provider. An entity (person or organisation) that offers the use of capabilities by means of a service.

SWIM Access Point. As per ICAO Doc. 10039, A SWIM Access Point is a logical entity which bundles a number of technical capabilities (e.g., messaging, security, logging, interface management, etc.).

SWIM region. A geographical area in which a group of States and/or ATM stakeholders has agreed upon common regional governance in support of system wide information management implementation. A SWIM region can be an ICAO Region or any other area in which a community of interest has agreed on common governance.

SWIM service registry. A directory containing entries with the information necessary to discover and access SWIM services.

SWIM standard(s). The set of technology standards and specifications selected by SWIM Governance for use in a SWIM implementation.

SWIM Technical infrastructure. The assembly of software and hardware used to enable the provision of information services within SWIM.

SWIM Technical infrastructure management capability. The SWIM technical infrastructure capability enabling the monitoring of the performance of the technical infrastructure.

System Wide Information Management (SWIM). SWIM consists of standards, infrastructure and governance enabling the management of ATM related information and its exchange between qualified parties via interoperable services.

1.5.2 The following level of mandatory accomplishment of the requirements shall apply:

- mandatory (full) support (M);
- mandatory minimal support (M-);
- mandatory O/R name minimal support (M1) (see ISO/IEC ISP 12062-2);
- optional support (O);
- conditional support I;
- out of scope (I), and;
- not applicable (-).

1.5.3 The following classification shall apply for expressing behaviour requirements related to parameters or elements included in Chapter 4 for the specification of the AMHS/SWIM Gateway:

- a) **Generated (G)**: used to describe the generation of an X.400 or AMQP information object. It means that the element is generated by the AMHS/SWIM Gateway. The value of the element is based on parameters related to the AMHS/SWIM Gateway itself or takes a pre-determined value and does not depend on the value of an element of the information object received by the AMHS/SWIM Gateway which caused the current generation of an information object. If an element comprises several components, then the element is classified as generated if at least one of its components is generated, and the others are either generated or excluded. The generation of message handling system parameters applies to abstract-values and does not constrain the ASN.1 encoding. In particular, elements generated with ASN.1 DEFAULT abstract-values may, but need not, be encoded;
- b) **Optionally generated (G1)**: used with the same meaning as generated (G), with the exception that the generation of the element is optional, the decision being a matter of policy local to the management domain operating the AMHS/SWIM Gateway;
- c) **Conditionally generated (G2)**: used only to describe the generation of an AMHS report or RN element. It means, for a report generation, that the element is generated in the report or RN based on some condition related to the subject AMHS message being true. If the element is generated, it takes a value derived from elements present in the received AMHS information object which caused the generation of the report or RN;
- d) **Translated (T)**: used to describe either the generation of an X.400 or AMQP information object or the use of a received information object. It means that the element is translated by the AMHS/SWIM Gateway, using a dependence relationship between the value of an element of the received information object and the value of the translated element in the generated information object. If an element comprises several components, then the element is classified as translated if at least one of its components is translated, and the others are either generated or excluded in generation, discarded or out of scope in reception;
- e) **Conditionally translated (T1)**: used with the same meaning as translated (T), with the exception that the translation of the element is subject to some condition being true, e.g., the presence of an optional element in the received information object;
- f) **Discarded (D)**: used to describe the use of a received X.400 or AMQP information object. It means that the value of the element is not used by the message transfer and control unit when generating the elements of the information object converted from the received information object, and that the semantic information conveyed in the element is discarded during the process of conversion in the AMHS/SWIM Gateway. However, the presence or value of the element may be used by the message transfer and control unit for purposes other than conversion, such as report generation and logging;
- g) **Excluded (X)**: used to describe either the generation of an X.400 or AMQP information object or the use of a received information object. Upon generation of an information object, it means that the element is not used or present in the generated information object. Upon reception of an AMHS information object, it means that the presence of the element causes rejection of the information object I and generation of an AMHS non-delivery report;
- h) **Out of scope (I) or not-applicable (-)**: used to describe the use of a received information object, when the element is either a format element which cannot be processed in any way or an element which is not in the scope of the section, but which presence is included in the ISPICS serving as a basis for the mapping specification.

2 SYSTEM LEVEL PROVISIONS

2.1 INTRODUCTION

2.1.1 System level provisions specify general requirements using abstract models and based on basic prerequisites. These general requirements are further refined by subsequent chapters of this specification.

2.2 FUNCTIONAL MODEL

2.2.1 General

2.2.1.1 The functional model covers functional aspects of the AMHS/SWIM Gateway related to X.400/AMHS and SWIM.

2.2.1.2 The AMHS/SWIM Gateway shall consist of following functional building blocks:

- d) AMHS Component;
- e) Information Transfer and Control Unit (ITCU);
- f) SWIM Component;
- g) Control Position (CP); and
- h) Directory User Agent (DUA).

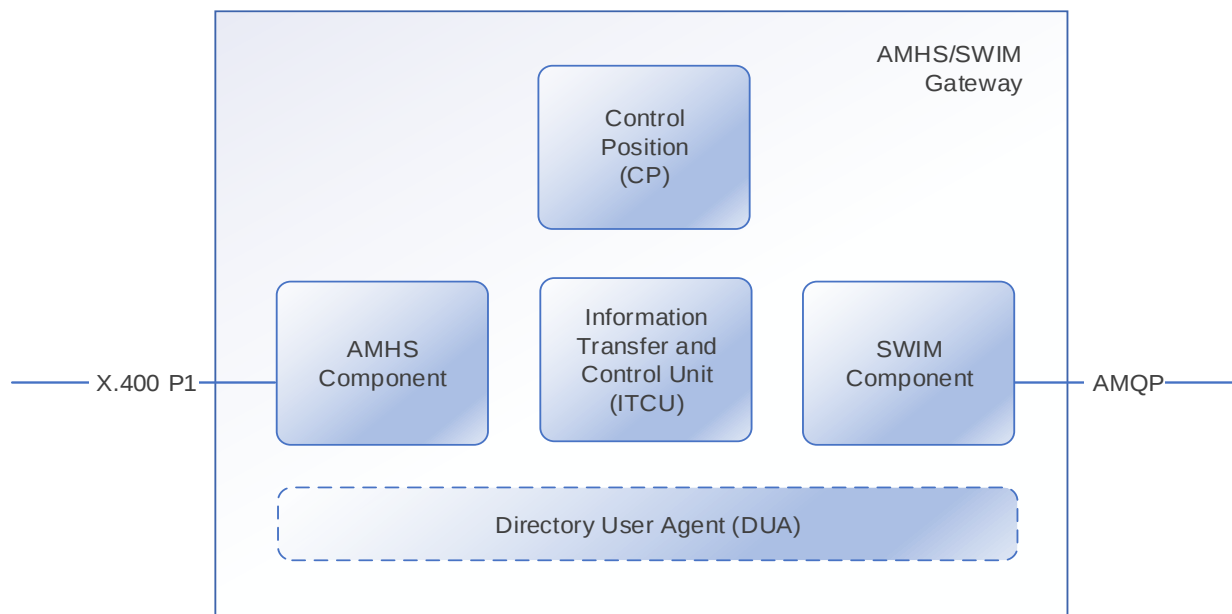


Figure 1. Building Blocks

2.2.1.3 The AMHS Component shall interface with AMHS for exchange of aeronautical information with AMHS users. Internally, it shall interface with the Information Transfer and Control Unit, the Control Position, and optionally the Directory User Agent.

2.2.1.4 The Information Transfer and Control Unit shall convert and transfer information and control the flow of information. Internally, it shall interface with the AMHS Component, the SWIM Component, the Control Position, and optionally the Directory User Agent.

2.2.1.5 The SWIM Component shall interface with SWIM for exchange of aeronautical information with SWIM information providers and consumers. Internally, it shall interface with the Information Transfer and Control Unit, the Control Position, and optionally the Directory User Agent.

2.2.1.6 The Control Position shall receive reports on issues occurred during the automated processing by the other components of the AMHS/SWIM Gateway for appropriate action. Internally it shall interface with the AMHS Component, the Information Transfer and Control Unit, the SWIM Component, and optionally the Directory User Agent.

2.2.1.7 The optional Directory User Agent shall interface with the ATN Directory. Internally it shall interface with the AMHS Component, the Information Transfer and Control Unit, the SWIM Component, and the Control Position.

2.2.1.8 The interfaces between the functional building blocks of the AMHS/SWIM Gateway are considered out of scope of this specification.

2.2.2 AMHS

2.2.2.1 The AMHS Component shall include an X.400 message transfer agent (MTA) which integrates with the AMHS becoming a part of it as per ICAO Doc 9880 Part II [1].

2.2.2.2 The Information Transfer and Control Unit shall include an X.400 access unit (AU).

2.2.2.3 The AMHS/SWIM Gateway may include an X.500 Directory User Agent (DUA).

2.2.3 SWIM

2.2.3.1 The SWIM Component shall integrate with the SWIM and make use of the SWIM Technical Infrastructure (TI).

2.2.3.2 The SWIM Component shall include at least one SWIM Access Point.

2.2.3.3 The SWIM Component shall support at least one of the following message exchange patterns (MEPs):

- a) Fire and Forget (FF)
- b) Request/Reply (R/R)
- c) Publish/Subscribe (P/S)

2.2.3.4 The SWIM Component shall support the following profile in accordance with the SWIM Technical Infrastructure (TI) Yellow Profile [3]:

- a) Service Interface Binding
 - 1) AMQP messaging
- b) Network Interface Bindings
 - 1) Ipv4 Unicast;
 - 2) Ipv4 Secure Unicast;
 - 3) Ipv6 Unicast;
 - 4) Ipv6 Secure Unicast

2.2.3.5 The SWIM Component may support further service or network interface bindings.

Note.— This version of the specification does not establish requirements for further service or network interface bindings.

2.3 INFORMATION MODEL

2.3.1 General

2.3.1.1 The information model covers aspects related to representation of information in AMHS and SWIM as well as mapping of information and meta information.

Note.— The information model considered by this specification is limited to the data representation used for conveyance of aeronautical information, but does not address the data formats of aeronautical information such as FPL, MET or IWXXM.

2.3.2 AMHS

2.3.2.1 The AMHS/SWIM Gateway shall support reception of following classes of X.400 information objects:

- a) message taking the form of
 - 1) an interpersonal message (IPM); or
 - 2) an interpersonal notification (IPN);
- b) report; and
- c) probe.

2.3.2.2 The AMHS/SWIM Gateway shall support generation of following classes of X.400 information objects:

- a) message taking the form of
 - 1) an interpersonal message; or
- b) report.

Note.— The AMHS/SWIM Gateway does not generate X.400 information objects of class message taking the form of an interpersonal notification, or of X.400 information objects of class probe.

2.3.3 SWIM

2.3.3.1 The SWIM Component shall support the AMQP bare message conveying properties and application-properties.

2.3.4 Mapping

2.3.4.1 The Information Transfer and Control Unit shall determine fields of the AMQP bare message for conveyance of information from AMHS to SWIM in the following order:

- a) from X.400 message attributes;
- b) by default values given by configuration; or
- c) by static values given by this or other relevant specifications.

2.3.4.2 The Information Transfer and Control Unit shall determine X.400 message attributes for conveyance of information from SWIM to AMHS in the following order:

- a) from AMQP annotated message;
- b) by default values given by configuration; or
- c) by static values given by this or other relevant specifications.

2.4 SECURITY MODEL

2.4.1 General

2.4.1.1 The security model addresses security aspects of the AMHS/SWIM Gateway.

Note.— AMHS and SWIM provide different means for establishing security. This difference prevents from achieving end-to-end security throughout the full path from provider to consumer. However, the AMHS/SWIM Gateway can benefit from trust frameworks such as the European Aviation Common Public Key Infrastructure (EACP).

2.4.2 AMHS

2.4.2.1 Use of AMHS security services applies to communications between the AMHS/SWIM Gateway and direct AMHS users, taking either the role of an information provider (originator) or consumer (recipient).

2.4.2.2 The AMHS/SWIM Gateway should support the AMHS functional group security (AMHS SEC) as per ICAO Doc 9880 Part II.

2.4.2.3 The AMHS/SWIM Gateway should support the updated AMHS security requirements as per Working Paper 6 presented to the 1st meeting of the ICAO EUR AFS to SWIM Transition Task Force (AST TF/01 WP/06) [2].

2.4.2.4 The AMHS/SWIM Gateway shall provide following security services in accordance with the general AMHS security policy, if AMHS SEC is supported:

- a) message origin authentication; and
- b) content integrity.

2.4.2.5 The AMHS/SWIM Gateway may receive and process X.400 messages not complying with the AMHS SEC functional group depending on the local policy as specified in subsequent chapters 3 and 4.

2.4.3 SWIM

2.4.3.1 Use of security services in SWIM applies to communications between the AMHS/SWIM Gateway and the SWIM Technical Infrastructure.

2.4.3.2 The SWIM Component shall support following security services according to the SWIM Technical Infrastructure (TI) Yellow Profile [3]:

- a) AMQP Transport Security Authentication;
- b) Simple Authentication and Security Layer (SASL);
- c) AMQP over TLS (AMQPS); and
- d) Transport Layer Security (TLS).

Note.— the specification of the SWIM Technical Infrastructure (TI) [3] refers to IETF RFC 4422 for Simple Authentication and Security Layer SASL and to IETF RFC 5246 (Protocol Version 1.2) for Transport Layer Security (TLS).

2.4.3.3 The SWIM Component may support further SWIM profiles.

Note.— This version of the specification does not establish requirements for further SWIM profiles.

2.5 MANAGEMENT MODEL

2.5.1 General

2.5.1.1 The management model covers aspects related to management capabilities of the AMHS/SWIM Gateway.

2.5.2 AMHS

2.5.2.1 General

2.5.2.1.1 The AMHS Component shall support associations to at least one peer ATS Message Server (MTA) implementation.

2.5.2.1.2 The AMHS Component should support simultaneous associations per peer ATS Message Server (MTA) implementation.

2.5.2.1.3 The AMHS/SWIM Gateway shall provide its service only to authorised AMHS users taking either the role of an information provider (originator) or consumer (recipient).

2.5.2.2 Logging

2.5.2.2.1 The AMHS/SWIM Gateway shall perform long-term logging of all messages, reports and probes generated or received.

2.5.2.2.2 The AMHS/SWIM Gateway shall record all actions related to messages, reports and probes.

2.5.2.2.3 The AMHS/SWIM Gateway shall retain logged messages, reports and probes as well as related actions for a period of at least thirty days.

2.5.3 SWIM

2.5.3.1 General

2.5.3.1.1 The SWIM Component shall support connections to at least one SWIM Technical Infrastructure implementation.

2.5.3.1.2 The SWIM Component shall support at least one AMQP message queue per SWIM Technical Infrastructure implementation for conveyance of information from AMHS to SWIM.

2.5.3.1.3 The SWIM Component may have the capability to subscribe to one or more AMQP message queues.

2.5.3.1.4 The AMHS/SWIM Gateway shall provide its service only to authorised information providers and consumers.

2.5.3.2 Logging

2.5.3.2.1 The AMHS/SWIM Gateway shall perform logging of all AMQP messages provided or consumed.

2.5.3.2.2 The AMHS/SWIM Gateway shall record all actions related to AMQP messages provided or consumed.

2.5.3.2.3 The AMHS/SWIM Gateway shall retain logged AMQP messages as well as related actions for a period of at least thirty days.

2.6 NAMING AND ADDRESSING

Note.— With regard to AMHS and SWIM, the AMHS/SWIM Gateway acts as an endpoint in exchange of information.

2.6.1 Conveyance of information from AMHS to SWIM

Note.— From an AMHS point of view the AMHS/SWIM Gateway acts similar to an AMHS message recipient. From a SWIM point of view the AMHS/SWIM Gateway acts similar to an information service provider.

2.6.1.1 The AMHS/SWIM Gateway shall provide the capability to determine target AMQP message queues from AMHS recipient addresses of a received X.400 message.

2.6.1.2 The AMHS/SWIM Gateway may provide the capability to determine target AMQP message queues from X.400 message attributes other than AMHS recipient addresses or from a combination of X.400 message attributes.

Note.— Such capabilities can be based on mechanisms like filtering and routing.

2.6.2 Conveyance of information from SWIM to AMHS

Note.— From a SWIM point of view the AMHS/SWIM Gateway acts similar to a consumer of information services. From an AMHS point of view the AMHS/SWIM Gateway acts similar to an AMHS message originator.

2.6.2.1 The AMHS/SWIM Gateway shall determine the AMHS originator address of a generated AMHS message from fields of the AMQP annotated message.

2.6.2.2 The AMHS/SWIM Gateway shall apply its default X.400 originator address in case the originator address of a generated AMHS message cannot be determined by means given in this specification.

2.6.2.3 The AMHS/SWIM Gateway shall ensure that originator addresses of generated AMHS messages have been authorised for use by the AMHS/SWIM Gateway.

2.6.2.4 The AMHS/SWIM Gateway shall determine one or more recipient addresses of a generated AMHS message from one or more fields of the AMQP annotated message or from meta information or a combination of both.

2.6.2.5 Meta information originate from the context such as parameters of the AQMP message queue. Such capabilities can be based on mechanisms like filtering and routing. The AMHS/SWIM Gateway may provide for conveyance of information from SWIM to AMHS the capability to determine AMHS recipient addresses from fields of the AMQP bare message.

2.6.2.6 The AMHS/SWIM Gateway shall log the situation and report to the Control Position in case no recipient addresses of the AMHS message can be determined.

2.6.3 Representation of AMHS users in SWIM

2.6.3.1 The AMHS/SWIM Gateway shall make use of AFTN addresses for representation of AMHS users in SWIM.

2.6.3.2 For mapping of X.400 O/R addresses onto AFTN addresses and vice versa the AMHS/SWIM Gateway shall apply the algorithms specified by ICAO Doc 9880 Part II [1].

2.7 LEVEL OF SUPPORT

2.7.1 AMHS

2.7.1.1 Due to the general nature of gateways the support of ATSMHS by the AMHS/SWIM Gateway has some limitations.

2.7.1.2 Subsequent table outlines the level of support by the AMHS/SWIM Gateway with regard to the ATSMHS Functional Groups and subsets defined by section 3.4 of ICAO Doc 9880, Part II [1].

Table 1. Level of ATSMHS support

ATSMHS subsets	AMHS to SWIM	SWIM to AMHS	Limitations
I. Basic ATSMHS (basic)	M	O	(1)
II. Basic + FTBP	M	M	(2)
III. Basic + IHE	M	O	(3)
IV. Basic + DIR	C.1	C.2	(1)
V. Basic + FTBP + IHE	M	M	(4)
VI. Basic + DIR + FTBP	C.1	C.1	(2)
VII. Basic + DIR + IHE	C.1	C.2	(3)
VIII. Basic + DIR + SEC	C.3	C.4	(1)
- Basic + FTBP + DIR + SEC	C.3	C.3	(2)
IX. Basic + IHE + DIR + SEC	C.3	C.4	(3)
X. Basic + IHE + DIR + FTBP	C.1	C.1	(4)
XI. Basic + IHE + DIR + FTBP + SEC	C.3	C.3	(4)
O Optional support M Mandatory support X No Support (excluded) C.1 Conditional support; M if DIR is supported, X otherwise C.2 Conditional support; O if DIR is supported, X otherwise C.3 Conditional support, M if DIR and SEC are supported, X otherwise C.4 Conditional support, O if DIR and SEC are supported, X otherwise (1) Support is limited to one text body part. (2) Support is limited to two body parts; one text body part comprising an ATS message header and one FTBP. The ATS message text in the text body part is discarded, if available. (3) Support is limited to one text body part with the ATS message header being discarded, if available, respectively being absent/empty. (4) Support is limited to one FTBP. <i>Note.— ICAO Doc 9880, Part II [1] does not consider the ATSMHS subset Basic + FTBP + DIR + SEC. As a consequence there is no reference number for identification of the subset.</i>			

2.7.2 SWIM

2.7.2.1 This technical specification considers two service levels for the exchange of AMHS-related meta information with SWIM information providers and consumers:

- a) AMHS-unaware
- b) AMHS-aware

2.7.2.2 The AMHS/SWIM Gateway shall support the AMHS-unaware service level which limits the exchange of AMHS-related meta information with SWIM information providers and consumers to a minimum.

Note.— The AMHS-unaware service level is intended for SWIM information providers and consumer not being aware of the exchange of aeronautical information with AMHS users by means of the AMHS/SWIM Gateway.

2.7.2.3 The AMHS/SWIM Gateway may support the AMHS-aware service level which incorporates an extensive set of AMHS-related meta information in the exchange of aeronautical information with SWIM information producers and consumers.

Note.— The AMHS-aware service level is intended for SWIM information providers and consumers being aware of the exchange of aeronautical information with AMHS users by means of the AMHS/SWIM Gateway.

Through AMHS-related meta information a SWIM information provider controls the behaviour of the AMHS/SWIM Gateway.

3 CONFIGURATIONS AND PARAMETERS

3.1 OVERVIEW

This section summarizes the different configurations parameters that the AMHS/SWIM Gateway shall allow to be configurable by the administrator.

3.2 GATEWAY CONVERSION DIRECTION

3.2.1 Conversion Direction

3.2.1.1 The “*Conversion Direction*” parameter provides a way to configure in which directions the AMHS/SWIM Gateway converts message.

3.2.1.2 These shall be the possible options for the parameter:

1. Allow only the conversion of AMHS messages to SWIM, and not from SWIM to AMHS.
2. Allow only the conversion of SWIM messages to AMHS, and not from AMHS to SWIM.
3. Allow both the conversion of AMHS messages to SWIM and from SWIM to AMHS.
This shall be the default value.

3.3 MESSAGE CONSTRAINTS

3.3.1 Maximum message data size

3.3.1.1 The integer parameter “*Maximum message data size*” provides a way to configure a maximum size for both AMHS messages and SWIM messages.

3.3.1.2 AMHS Messages that have a payload larger than the configured maximum number of bytes shall not be converted to SWIM, as specified in 4.4.2.6

3.3.1.3 SWIM Messages that have a payload larger than the configured maximum number of bytes shall not be converted to AMHS, as specified in 4.5.1.7.

3.3.1.4 The absence of the parameter, or a value of zero, means that there is no maximum value. This is the default value.

3.3.2 Maximum message number of recipients

3.3.2.1 The integer parameter “*Maximum message number of recipients*” provides a way to configure a maximum number of recipients for both AMHS messages and SWIM messages.

3.3.2.2 AMHS Messages that have a larger number of recipients than the configured maximum which the ITCU is responsible for shall not be converted to SWIM, as specified in 4.4.2.7.

3.3.2.3 SWIM Messages that have larger number of recipients than the configured maximum shall not be converted to AMHS, as specified in 4.5.1.8.

3.3.2.4 The absence of the parameter, or a value of zero, means that there is no maximum value. This is the default value.

3.3.3 ATSMHS Service Level

3.3.3.1 The enumerated parameter “ATSMHS Service Level” provides a way to configure the type of AMHS encoding that the AMHS/SWIM Gateway will use in generation of AMHS messages.

3.3.3.2 These shall be the possible options for the parameter: “extended”, “basic”, “content-based”, and “recipients-based”.

3.3.3.3 When set to “extended”, then AMQP elements susceptible to being translated using extended or basic ATSMHS service level will be mapped to extended service level.

3.3.3.4 When set to “basic”, then AMQP elements susceptible to being translated using extended or basic ATSMHS service level will be mapped to basic service level. If an AMQP message with binary content is received, then it will be rejected.

3.3.3.5 When set to “content-based”, then, if the content-type element of the properties section is set to <application/octet-stream>, AMQP elements susceptible to being translated using extended or basic ATSMHS service level will be mapped to extended service level. Otherwise, AMQP fields susceptible to being translated using extended and basic ATSMHS service level will be mapped to basic service level.

3.3.3.6 When set to “recipients-based”, then, if all the recipients of the converted AMHS message support the extended ATSMHS, AMQP elements susceptible to being translated using extended or basic ATSMHS service level will be mapped to extended service level. Otherwise, AMQP fields susceptible to being translated using extended or basic ATSMHS service level will be mapped to basic service level.

3.4 AMHS SECURITY

3.4.1 The AMHS Security parameters control the setting of PKIs that the AMHS/SWIM Gateway requires to both generate signed AMHS messages and to validate the received signed AMHS messages.

3.4.2 AMHS Security Trusted Certificate Authorities

3.4.2.1 The certificate parameter "*AMHS Security Trusted Certificate Authorities*" is used to represent the certificates of the Certificate Authorities that are to be trusted when performing AMHS Security validations. This parameter shall be optional. If absent, the AMHS Security features shall not be enabled.

3.4.3 AMHS/SWIM Gateway own Certificate file

3.4.3.1 The certificate parameter "*AMHS/SWIM Gateway own Certificate file*" is used by the AMHS/SWIM Gateway to sign AMHS messages. This parameter shall be optional. If absent, the AMHS Security features shall not be enabled.

3.4.4 AMHS/SWIM Gateway own Certificate passphrase

3.4.4.1 The String parameter "*AMHS/SWIM Gateway own Certificate passphrase*" is used as a passphrase that is often required to use the AMHS/SWIM Gateway's own certificate. This parameter shall be optional.

3.4.5 Digitally sign all AMHS messages

3.4.5.1 The Boolean parameter "*Digitally sign all AMHS messages*" is used to control the generation of AMHS signatures

3.4.5.2 If the value is True, all AMHS messages created by the AMHS/SWIM Gateway shall be signed according to the AMHS SEC Functional Group.

3.4.5.3 The default value shall be False.

3.4.6 Action to take on reception of unsigned AMHS messages

3.4.6.1 The parameter "*Action to take on reception of unsigned AMHS messages*" is used to decide how to process the reception of an AMHS message that is not digitally signed.

3.4.6.2 These shall be the possible options for the parameter:

1. Convert the message to SWIM. This shall be the default value.
2. Reject the message with an NDR, log the incident and move the message to the Control Position.
3. Convert the message to SWIM and mark it as "*Unsigned*"

3.4.7 Action to take on reception of signed AMHS messages that fails validation

3.4.7.1 The parameter "*Action to take on reception of signed AMHS messages that fails validation*" is used to decide how to process the reception of an AMHS message that is digitally signed but the validation fails.

3.4.7.2 These shall be the possible options for the parameter:

1. Reject the message with an NDR, log the incident and move the message to the Control Position. This shall be the default value.
2. Convert the message to SWIM and mark it as "*Invalid Signature*"

3.5 AUTHORIZATION

3.5.1 The Authorization parameters control which messages are deemed to be authorized to be converted from AMHS to SWIM and vice versa.

3.5.2 By default, there shall be no authorization restrictions, all messages that can be converted by the AMHS/SWIM Gateway shall be converted.

3.5.3 Authorized AMHS Users

3.5.3.1 The “*Authorized AMHS Users*” parameter controls which AMHS users are allowed to use the AMHS/SWIM Gateway. In this context, AMHS users are defined by the originator O/R address of a message.

3.5.3.2 These shall be the possible options for the parameter:

1. All AMHS users that can reach the AMHS/SWIM Gateway are authorized. This is the default value.
2. All AMHS users whose O/R addresses match a set of authorized PRMDs are authorized.
3. Only AMHS users whose O/R addresses belong to a set of authorized O/R addresses are authorized

3.5.3.3 The configuration of the authorized user is beyond the scope of this specification.

3.5.4 Authorized SWIM Users and SWIM Enterprises

3.5.4.1 The “*Authorized SWIM Users*” parameter controls which SWIM users are allowed to use the AMHS/SWIM Gateway.

3.5.4.2 These shall be the possible options for the parameter:

1. All SWIM users and SWIM Enterprises that can reach the AMHS/SWIM Gateway are authorized. This is the default value.
2. Only the SWIM users that belong to a set of authorized SWIM users are authorized.
3. Only the SWIM Enterprises that belong to a set of authorized SWIM Enterprises are authorized.

3.5.4.3 The configuration of the authorized user is beyond the scope of this specification.

3.6 DIRECTORY SERVICES

3.6.1 Directory Services (an X.500 DSA) can be optionally used by the AMHS/SWIM Gateway to perform the conversion of AFTN addresses to AMHS and vice-versa. One such example of a Directory Service is EDS.

3.6.2 The DSA parameters control the configuration of the DSA and the ICAO MD Registry data.

3.6.3 Directory Service Presentation Address

3.6.3.1 The “Directory Service Presentation Address” parameter is used as the Presentation Address of the DSA, in String format.

3.6.3.2 The absence of this parameter indicates that the Directory Services will not be used by the AMHS/SWIM Gateway.

3.6.4 Directory Service User DN

3.6.4.1 The directory-name parameter “*Directory Service User DN*” is used to represent the DN of the DSA user, in String format.

3.6.4.2 The “*Directory Service User DN*” parameter shall be used by the AMHS/SWIM Gateway to attempt to perform a Simple Bind to the DSA.

3.6.4.3 In absence of this parameter, the AMHS/SWIM Gateway may attempt an anonymous bind to the DSA.

3.6.5 Directory Service User password

3.6.5.1 The String parameter “*Directory Service User Password*” is used to represent the password associated to the Directory Service User DN.

3.6.5.2 In the absence of this parameter, the AMHS/SWIM Gateway may attempt an anonymous bind to the DSA.

3.6.5.3 When this parameter is set, the AMHS/SWIM Gateway shall attempt a simple bind to the DSA using the parameter “*Directory Service User DN*” and the parameter “*Directory Service User Password*”.

3.6.6 ICAO MD Registry DN

3.6.6.1 The directory-name parameter “*ICAO MD Registry DN*” is used to represent the DN of the ICAO MD Registry of the place in the DIT where the mapping information resides.

3.6.6.2 If the value is empty, the Directory Services will not be used by the AMHS/SWIM Gateway.

3.6.6.3 If the value is set, the DN shall be used as the place in the DIT from where to obtain the data for the address conversion.

4 DETAILED AMHS/SWIM GATEWAY SPECIFICATION

4.1 GENERAL

- 4.1.1 An AMHS/SWIM Gateway shall provide for interworking between the SWIM and the AMHS.
- 4.1.2 An AMHS/SWIM Gateway shall consist of the logical components described on 2.2.1.2.
- 4.1.3 This division into logical components is a convenient way of specifying functions of a gateway. There is no requirement for an AMHS/SWIM Gateway to be implemented according to this structure.
- 4.1.4 An AMHS/SWIM Gateway shall be able to perform actions upon receipt of any category of AMHS information object by its AMHS component.
- 4.1.5 An AMHS/SWIM Gateway shall be able to perform actions upon receipt of any type of AMQP message by its SWIM component.
- 4.1.6 An AMHS/SWIM Gateway shall support extended ATSMHS service level from both directions. It shall support the reception of basic ATSMHS service level messages from AMHS to SWIM. The support of the generation of basic ATSMHS service level messages from SWIM to AMHS is optional. The detailed level of support is provided in Table 1.

4.2 GATEWAY COMPONENTS

4.2.1 AMHS component

- 4.2.1.1 The AMHS component shall allow the AMHS/SWIM Gateway to function as an end system on the ATN.
- 4.2.1.2 The AMHS component shall handle the interface to AMHS and provide an interface to the ITCU.
- 4.2.1.3 The AMHS component consists of an X.400 Message Transfer Agent (MTA) exchanging messages with the AMHS using the X.400 Message Transfer Protocol (P1). An implementation of the AMHS/SWIM Gateway may incorporate an MTA or share an already existing MTA. MTA implementation shall comply with the service level specifications included in ICAO Doc 9880 Part II [1].

4.2.2 SWIM component

- 4.2.2.1 An implementation of the AMHS/SWIM Gateway may incorporate a SWIM Access Point or share capabilities of an already existing SWIM infrastructure.
- 4.2.2.2 The SWIM component shall perform long-term retention of the heading, address and origin parts of all information objects received from the SWIM, with the message receipt-time and the action taken thereon, for a period of at least thirty days.
- 4.2.2.3 The SWIM component shall perform long-term retention of all SWIM information objects that it generates, in their entirety, for a period of at least thirty days.
- 4.2.2.4 The SWIM component shall perform long-term retention of all messages received from the ITCU as detailed on 4.3.1.
- 4.2.2.5 If, for any reason, the ITCU is unable to accept SWIM information objects passed by the SWIM component, the SWIM component shall handle this situation notifying to the Control Position.

4.2.3 Information transfer and control unit (ITCU)

- 4.2.3.1 The ITCU in an AMHS/SWIM Gateway shall provide a bi-directional conversion facility between the AMHS component and the SWIM component, consisting of:
- a) a set of general functions as specified in 4.3; and

- b) AMHS/SWIM conversion functions specified in 4.4 for the AMHS to SWIM conversion and in 4.5 for the SWIM to AMHS conversion, respectively.

4.2.3.2 The ITCU in an AMHS/SWIM Gateway shall pass all AMHS information objects which it constructs in application of 4.5 (SWIM to AMHS) to the AMHS component of the gateway, for further conveyance in the AMHS.

4.2.3.3 The ITCU in an AMHS/SWIM Gateway shall pass all SWIM information objects which it constructs in application of 4.4 (AMHS to SWIM) to the SWIM component of the AMHS/SWIM Gateway, for further conveyance in SWIM.

4.2.3.4 The ITCU shall handle the information objects specified in Chapter 2.

4.2.3.5 If the ITCU receives any report, the ITCU shall handle this situation notifying to a Control Position.

4.2.3.6 The ITCU shall ensure that all the AMHS information objects which it constructs comply with Section 7 (for IPMs) of ISO/IEC 10021-7 [5], complemented by the additional requirements included in Chapter 2, and with the Section 12.2.1.1 of ISO/IEC 10021-4 [4] (for messages) and Section 12.2.1.3 of ISO/IEC 10021-4 [4] (for reports).

4.2.3.7 If the DUA component is supported, the ITCU of an AMHS/SWIM Gateway shall interface with the DUA component of the gateway as detailed in 4.2.7.2.

4.2.3.8 For the generation of AMHS messages and reports and the processing of received AMHS messages, probes and reports, the Information Transfer and Control Unit shall have the capability to interpret the semantics and to perform actions related to the ISO/IEC 10021 elements of service which are part of the basic requirements of the MT service as specified in ISO/IEC ISP 12062-3:2003 [6] (or a later edition).

4.2.4 Interface between the AMHS component and the ITCU

4.2.4.1 The AMHS component shall exchange information objects with the ITCU via its MTA transfer port as specified in ISO/IEC 10021-4, Section 12.2 [4].

4.2.4.2 The AMHS component shall invoke the message-transfer, report-transfer and probe-transfer abstract operations, respectively, to pass AMHS messages, reports and probes to the ITCU.

4.2.4.3 The ITCU shall invoke the message-transfer and report-transfer abstract operations, respectively, to pass AMHS messages and reports to the AMHS component.

4.2.5 Interface between the SWIM component and the ITCU

4.2.5.1 The SWIM component shall exchange SWIM information objects with the ITCU using the message queue/s defined between them.

4.2.5.2 A SWIM information object passed by the SWIM component to the ITCU shall be formatted as an AMQP message using the application-properties section to include the relevant aeronautical information according to 4.5.2.

4.2.5.3 The SWIM component shall return to the ITCU, as the result of the transfer operation described in 4.4, the message-identifier, constructed by the SWIM component for the transmission of the message over the SWIM domain.

4.2.6 AMHS/SWIM Gateway Control Position

4.2.6.1 The AMHS/SWIM Gateway Control Position shall be used as the place where errors which occurred in the AMHS/SWIM Gateway and certain non-deliveries which occurred in the AMHS are reported for appropriate action.

4.2.6.2 The appropriate action to be undertaken on reporting of an error or a non-delivery to an AMHS/SWIM Gateway Control Position shall be either:

- a) a matter of policy which is local to the management domain operating the AMHS/SWIM Gateway; or
- b) subject to multilateral agreements.

For some categories of error situations, this manual specifies the actions to be taken. The specified actions aim to minimize the assistance of the Control Position. However, it may be a matter of policy local to the AMHS management domain operating the AMHS/SWIM Gateway to try to reduce the occurrence of information objects rejection with the assistance of the Control Position.

4.2.7 DUA component

4.2.7.1 The Directory User Agent component is optional.

4.2.7.2 If the DUA component is supported, the ITCU of the AMHS/SWIM Gateway shall interface with the DUA component of the gateway, for example to:

- a) determine the level of ATSMHS supported by the intended recipients of the AMHS IPMs which it constructs; or
- b) allow retrieval of security information from the ATN directory; or
- c) allow retrieval of address information from the ATN directory for the purpose of address conversion, if the DUA component is used for this purpose.

Note. If the implementation of the AMHS/SWIM Gateway does not use a DUA component it may incorporate any other mechanism for retrieval of address information for the purpose of address conversion.

4.2.7.3 The DUA component in an AMHS/SWIM Gateway shall comply with the DUA specification as included in ICAO Doc 9880 Part IV [1].

Note. The interface between the DUA component and other gateway components (AMHS component, ITCU, Control Position) is a matter of implementation outside of the scope of this specification.

4.3 GENERAL FUNCTIONS

4.3.1 Traffic logging

4.3.1.1 The ITCU shall perform long-term logging as specified in this section for a period of at least thirty days, of information related to the following exchanges of information objects with the AMHS component and the SWIM component:

- a) AMHS message transfer out (to the AMHS component);
- b) AMHS report transfer out (to the AMHS component);
- c) AMHS message transfer in (from the AMHS component);
- d) AMHS report transfer in (from the AMHS component);
- e) AMQP message conveyance out (to the SWIM component);
- f) AMQP message conveyance in (from the SWIM component);

4.3.1.2 For the long-term logging of information related to an AMHS message transfer in and AMQP message conveyance out, the following parameters relating to the messages shall be logged by the ITCU:

- a) MTS-Identifier;
- b) IPM-identifier, if any;
- c) common-fields and either receipt-fields or non-receipt-fields of the IPN, if any;
- d) action taken thereon (reject with non-delivery-reason-code and non-delivery-diagnostic-code, convert as AMQP message)
- e) event date/time;
- f) message-identifier property of the AMQP message, if any.

4.3.1.3 For the long-term logging of information related to AMQP message conveyance in and AMHS message transfer out, the following parameters relating to the messages shall be logged by the ITCU:

- a) message-identifier property of the AMQP message;
- b) originator address;
- c) action taken thereon (reject with rejection cause, convert as IPM);
- d) event date/time;
- e) MTS-identifier, if any; and
- f) IPM-identifier, if any.

4.3.1.4 For the long-term logging of information related to an AMHS message report in the following parameters relating to the report shall be logged by the ITCU:

- a) report-identifier (if report in);
- b) subject-mts-identifier (if report in);
- c) action taken thereon if report;
- d) event date/time;

4.3.2 Address look-up tables

The address look-up tables specified in ICAO Doc 9880 Part II [1] paragraph 4.3.2 for the AFTN/AMHS Gateway shall be used by the AMHS/SWIM Gateway for address conversion, unless the ATN Directory is used for this purpose.

4.4 AMHS TO SWIM CONVERSION

Note-. This section specifies the actions to be performed by an AMHS/SWIM Gateway upon reception of messages from AMHS for conveyance to SWIM.

4.4.1 Control Functions

4.4.1.1 Upon reception by the ITCU of an AMHS message passed by the AMHS component, the received message shall be processed in one of the following manners, depending on the abstract-value of the content-type element in the message transfer envelope:

- a) processing as specified in 4.4.1.2 if the abstract-value of the element is “interpersonal-messaging-1988”; or
- b) if the abstract-value of the element is not “interpersonal-messaging-1988”:
 - 1) rejection of the message for all the message recipients for which the responsibility element of the per-recipient-indicators has the abstract-value “responsible”; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “content-type-not-supported” for the non-delivery-diagnostic-code.

4.4.1.2 Upon reception by the ITCU of an AMHS message whose content-type is “interpersonal-messaging-1988” passed from the AMHS component, the message shall be processed for conversion into an AMQP message in one of the three following and mutual exclusive manners, depending on the nature of the content:

- a) processing for conversion into an AMQP message as specified in 4.4.2.1, if the content is an IPM; or
- b) processing as specified in 4.4.7, if the content is an IPN which is a RN; or
- c) otherwise, unsuccessful termination of the procedure resulting in:
 - 1) logging of the situation and reporting to a control position; and
 - 2) storage of the message for appropriate processing at the control position

4.4.1.3 Upon reception by the ITCU of an AMHS non-delivery report passed from the ATN component, this shall result in:

- 1) logging of the situation and reporting to a control position; and
- 2) storage of the report for appropriate processing at the control position

4.4.1.4 Upon reception by the ITCU of an AMHS probe passed by the AMHS component, the received probe shall be processed in one of the following manners, depending on the abstract-value of the content-type element in the probe transfer envelope:

- a) processing for conveyance test as specified in 4.4.6 if the abstract-value of the element is “interpersonal-messaging-1988”; or
- b) if the abstract-value of the element is not “interpersonal-messaging-1988”:
 - 1) rejection of the probe for all the probe recipients for which the responsibility element of the per-recipient-indicators had the abstract-value “responsible”; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “content-type-not-supported” for the non-delivery-diagnostic-code.

4.4.1.5 Upon completion by the ITCU of the processing specified in 4.4.1.1 to 4.4.1.2 above, the resulting AMQP message, if any, shall be passed to the SWIM component, for conveyance over the SWIM.

4.4.1.6 If the generation of a report is required in relation with the result of the processing specified in 4.4.1.1 to 4.4.1.4 above, due to message rejection by the ITCU, an appropriate AMHS report shall be generated as specified in 4.4.8.

4.4.2 Initial processing of AMHS messages

4.4.2.1 Upon reception by the ITCU of an IPM, the received message shall be processed in one of the following manners, depending on the abstract-value of the current encoded-information-types, determined as either the abstract-value of the latest converted-encoded-information-types, if existing, in the trace information element, or as the abstract-value of the original-encoded-information-types element if the latter does not exist:

- a) Processing as specified in 4.4.2.2 if the abstract-value of the current encoded-information-types is “unspecified” or includes exclusively one or several of the following values:
 - 1) Basic “ia5-text”
 - 2) externally-defined “ia5-text”, which corresponds to OID {id-eit-ia5-text} as specified in ISO/IEC 10021-4 Annex A [4];
 - 3) OID {id-cs-eit-authority 1}, identifying the C0 control character set ISO-IR 0, as described in ISO/IEC 10021-7 [5];
 - 4) OID {id-cs-eit-authority 2}, identifying the G0 graphical character set ISO-IR 2 (known as International Reference Version of ISO 646 [7]), as described in ISO/IEC 10021-7 [5];
 - 5) OID {id-cs-eit-authority 6}, identifying the G0 graphical character set ISO-IR 6 (known as US Version of ISO 646 [7]), as described in ISO/IEC 10021-7 [5]; or
 - 6) OID {id-cs-eit-authority 100}, identifying the G1 graphical character set ISO-IR 100 (ISO 8859-1, Latin Alphabet No. 1 [8]), as described in ISO/IEC 10021-7 [5];
 - 7) OID {id-eit-file-transfer 0}, identifying the file transfer body part, as described in ISO/IEC 10021-7 [5].
- b) if the abstract-value includes any value different from the values indicated in a) above:
 - 1) rejection of the message for all the message recipients; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “encoded-information-types-unsupported” for the non-delivery-diagnostic-code.

4.4.2.2 A message which was not rejected as the result of 4.4.2.1 shall be processed in one of the following manners:

- a) Processing as specified in 4.4.2.3 if there is a single body part in the IPM body; or
- b) Processing as specified in a)2)iii if there are two body parts in the IPM body; or
- c) if there are more than two body parts in the IPM body:
 - 1) rejection of the message for all the message recipients; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “content-syntax-error” for the non-delivery-diagnostic-code; and
 - iii. “unable to convert to AMQP due to multiple body parts” for the supplementary-information

4.4.2.3 A message which was not rejected as the result of 4.4.2.2 shall be processed in one of the following manners:

- a) Processing as specified in 4.4.2.5 if the body part type is one of the following:
 - 1) a basic body part type “ia5-text”;
 - 2) a standard extended body part type “ia5-text-body-part”;
 - 3) a standard extended body part type “general-text-body-part” of which the character set description is Basic (ISO 646 [7]); or
 - 4) a standard extended body part type “general-text-body-part” of which the character set description is Basic-1 (ISO 8859-1 [8]); or
 - 5) a standard extended body part type “file-transfer-body-part”
- b) if the body part type is different from the body part types 1) to 5) under a) above:
 - 1) rejection of the message for all the message recipients; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “content-syntax-error” for the non-delivery-diagnostic-code
 - iii. “unable to convert to AMQP due to unsupported body part type” for the supplementary-information, optionally followed by the unsupported bodypart type

4.4.2.4 A message which was not rejected as the result of 4.4.2.2 shall be processed in one of the following manners:

- a) Processing as specified in 4.4.2.5 if one of the body part types is a standard extended body part type “file-transfer-body-part” and the other is a text body part.
- b) Otherwise:
 - 1) rejection of the message for all the message recipients; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “content-syntax-error” for the non-delivery-diagnostic-code
 - iii. “unable to convert to AMQP due to unsupported combination of body part types” for the supplementary-information

Note. The ATS-message-Text of the text body part will be ignored.

4.4.2.5 A message which was not rejected as the result of 4.4.2.3 or iii shall be processed in one of the following manners:

- a) Processing as specified in 4.4.2.6 if the text body part includes an ATS-message-Header as specified in ICAO Doc 9880 Part II [1] paragraph 3.3.3, or if the IPM includes IPM heading fields and recipient extensions as specified in ICAO Doc 9880 Part II [1] paragraph 3.3.4; or:

Note. If both elements, ATS-message-Header and IPM heading fields and recipient extensions are present, then IPM heading fields and recipient extensions take precedence.

- b) if the text does not include an ATS message header as specified in ICAO Doc 9880 Part II [1] paragraph 3.3.3, and the IPM does not include IPM heading fields and recipient extensions as specified in ICAO Doc 9880 Part II [1] paragraph 3.3.4:
 - 1) rejection of the message for all the message recipients; and

- 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “content-syntax-error” for the non-delivery-diagnostic-code; and
 - iii. “unable to convert to AMQP due to ATS-message-Header or Heading Fields syntax error” for the supplementary-information

Note.- ICAO Doc 9880 Part II [1] paragraphs 4.5.2.1.5.1 and 4.5.2.1.5.1 here apply as well.

4.4.2.6 A message which was not rejected as the result of 4.4.2.5 shall be processed in one of the following mutually exclusive manners:

- a) Processing as specified in 4.4.2.7 if the size of the payload in bytes of the AMHS message does not exceed the maximum value specified in the AMHS/SWIM Gateway’s configuration parameter “Maximum message data size”;
- b) If the size of the payload in bytes of the AMHS message exceeds the maximum value in the AMHS/SWIM Gateway’s configuration parameter “Maximum message data size”:
 - 1) rejection of the message for all the message recipients; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “content-too-long” for the non-delivery-diagnostic-code; and
 - iii. “unable to convert to AMQP due to the content size” for the supplementary-information”

4.4.2.7 A message which was not rejected as the result of 4.4.2.6 shall be processed in one of the following mutually exclusive manners:

- a) Processing as specified in 4.4.3 to 4.4.5 if the number of message recipients which the ITCU is responsible for conveyance of the message does not exceed the maximum value defined for the SWIM component in the AMHS/SWIM Gateway’s configuration parameter “Maximum message number of recipients”;
- b) if this number exceeds the maximum value defined for the SWIM component:
 - 1) rejection of the message for all the message recipients; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “too-many-recipients” for the non-delivery-diagnostic-code; and
 - iii. “unable to convert to AMQP due to number of recipients” for the supplementary-information

4.4.3 Generation of AMQP message

4.4.3.1 Each message resulting from the processing specified in 4.4.2 shall be converted by the ITCU into an AMQP message composed of elements as specified in Table 2 AMQP message generation. Those elements, which are classified as “G”, “G1” or “G2” in the column “action”, shall be generated according to column “Details”. Elements which are classified as “T” or “T1” in the column “Action” shall be converted from the AMHS parameter specified in the column “AMHS original property” and according to the specification in the provision referred to in the column “Details”.

Table 2. AMQP message generation

I	Element	Action	AMHS original property	Details
Header	durable	G	-	See 4.4.3.2.1
Header	priority	T	ATS-message-priority or precedence	See 4.4.3.2.2
Header	ttl	X	-	-
Header	first-acquirer	X	-	
Header	delivery-count	X	-	
delivery annotations		X	-	
message annotations		X	-	
properties	message-id	G	-	See 4.4.3.3.1
properties	user-id	X	-	
properties	To	G	-	See 4.4.3.3.2
properties	subject	X	-	
properties	reply-to	X	-	
properties	correlation-id	X	-	
properties	content-type	G	-	See 4.4.3.3.3
properties	content-encoding	X	-	
properties	absolute-expiry-time	X	-	
properties	creation-time	G	-	See 4.4.3.3.4
properties	group-id	X	-	
properties	group-sequence	X	-	
properties	reply-to-group-id	X	-	
application properties	amhs_ipm_id	T	IPM identifier	See 4.4.3.4.1
application properties	amhs_ftbp_file_name	T1	FTBP- incomplete-pathname	See 4.4.3.4.2
application properties	amhs_ftbp_object_size	T1	FTBP- actual-values	See 4.4.3.4.2
application properties	amhs_ftbp_last_mod	T1	FTBP-date-and-time-of-last-modification	See 4.4.3.4.2
application properties	amhs_ats_pri	T	ATS-message-priority OR precedence	See 4.4.3.4.3
application properties	amhs_recipients	T	Recipient-name of per-recipient-fields (Envelope)	See 4.4.3.4.4

application properties	amhs_ats_ft	T	ATS-message-filing-time OR Authorization-time (IPM heading)	See 4.4.3.4.5
application properties	amhs_ats_ohi	T1	ATS-message-Optional-Heading-Info OR originators-reference (IPM heading)	See 4.4.3.4.6
application properties	amhs_originator	T	originator-name (envelope)	See 4.4.3.4.7
application properties	amhs_subject	T1	Subject (IPM heading)	See 4.4.3.4.8
application properties	amhs_bodypart_type	T	Body part type	See 4.4.3.4.9
application properties	amhs_content_encoding	T1	Repertoire	See 4.4.3.4.9
application properties	amhs_registered_identifier	T1	OID Value	See 4.4.3.4.10
application properties	amhs_user_visible_string	T1	Application Program	See 4.4.3.4.11
application properties	amhs_message_signed	T1		See 4.4.3.4.12
application data	data	T1	FTBP data	See 4.4.3.5.1
application data	amqp-sequence	X	-	
application data	amqp-value	T1	ATS-message-text	See 4.4.3.5.2
footer		X	-	
M = mandatory support O = optional support - = out of scope or not applicable G = generated G1 = optionally generated G2 = conditionally generated D = discarded X = excluded T = translated T1 = conditionally translated (See 1)				

Note. In AMQP, properties use hyphens (-) in their names. However, in application properties names, the use of hyphens could be restricted by APIs. Therefore, the names of application properties defined in this specification use underscores (_) instead of hyphens.

4.4.3.2 Header

4.4.3.2.1 Durable

This element shall be generated as “true”.

4.4.3.2.2 Priority

The value of the priority element of the header of the converted AMQP message shall be mapped and converted from:

- a) the highest precedence element of the recipient-extensions in any of the recipient-specifier elements included in the IPM, in compliance with the mapping specified in Table 3 if this element is present in at least one of the recipient-specifier elements included in the IPM; or
- b) the value of the priority-indicator of the ATS-message-priority element of the AMHS message, in compliance with the mapping specified in Table 3 if this element is present:

Note. The default AMQP priority is 4

Table 3. ATS Priority to AMQP Priority conversion

ATS-message-priority	IPM precedence	AMQP Priority
SS	107	6
DD	71	5
FF	57	4
GG	28	3
KK	14	2

4.4.3.3 Message properties

4.4.3.3.1 message-id

Globally unique message identifier. This element shall be:

- a) generated by the SWIM component rather than by the ITCU; and
- b) returned to the ITCU as the result of the operation transferring the generated AMQP message from the ITCU to the SWIM component

4.4.3.3.2 to

This element contains destination queue or topic. This element shall be generated by the SWIM component using the destination queue or topic in the message broker.

4.4.3.3.3 content-type

This element shall have either of the two following values:

<text/plain; charset="utf-8">
<application/octet-stream>

Different body part types will be mapped following mapping specified in additional application properties. See 4.4.3.4.

4.4.3.3.4 *creation-time*

This element shall be generated by the SWIM component with the time when the message is converted to AMQP.

4.4.3.4 **Application properties**

4.4.3.4.1 *amhs_ipm_id*

This property shall contain the IPM Identifier.

4.4.3.4.2 *amhs_ftbp_file_name, amhs_ftbp_object_size, amhs_ftbp_last_mod*

These elements will only be filled in case the AMHS message contains an FTBP. All of them are optional.

The SWIM application properties related to message file properties are translated in accordance with file transfer parameters as shown in Table 4.

Table 4. SWIM file related properties

SWIM-application	Parameter in FTBP
amhs_ftbp_file_name	incomplete-pathname
amhs_ftbp_object_size	actual-values (bytes)
amhs_ftbp_last_mod	date-and-time-of-last-modification (YYYYMMDDhhmmssZ or YYYYMMDDhhmmss+0000)

4.4.3.4.3 *amhs_ats_pri*

The value of the element of the application property *amhs_ats_pri* shall be mapped and converted from:

- the highest precedence element of the recipient-extensions of the recipient-specifier elements included in the IPM, in compliance with the mapping specified in Table 5 if this element is present in at least one of the RecipientSpecifier included in the IPM; or
- the value of the priority-indicator of the ATS-message-priority element of the AMHS message, in compliance with the mapping specified in Table 5 if this element is present;

Table 5. Amhs_ats_pri ATS-message-priority and IPM precedence equivalency

IPM precedence	ATS-message-priority	amhs_ats_pri
107	SS	SS
71	DD	DD
57	FF	FF
28	GG	GG
14	KK	KK

4.4.3.4.4 *amhs_recipients*

This element shall be composed by the different entries of the recipient-name in each of the per-recipient-fields that have the responsibility element set to “responsible”. If the message has just one such recipient, it will contain the AFTN address of the message recipient; and if there are more than one such recipients, it shall contain their AFTN addresses separated by “;”. The AFTN addresses shall be converted from an MF-address as specified in ICAO Doc 9880 Part II [1] paragraph 4.5.2.2.7.

The use of CC recipients and BCC recipients should be avoided. If these elements are present in an AMHS IPM, they shall be handled as primary recipients.

4.4.3.4.5 *amhs_ats_ft*

The value of the element of the application property *amhs_ats_ft* shall be mapped from:

- a) the value of the element Authorization-time if the message contains IHE and converted to format: DDhhmm; or
- b) the value of the ATS-message-Filing-Time if it uses the basic ATSMHS service level.

4.4.3.4.6 *amhs_ats_ohi*

The value of the element of the application property *amhs_ats_ohi* shall be mapped from:

- a) the value of the originators-reference if the message uses the extended ATSMHS; or
- b) the value of the ATS-message-Optional-Heading-Info if it uses the basic ATSMHS service level.

4.4.3.4.7 *amhs_originator*

It is the message originator AFTN address (8 letters), which shall be obtained by converting the envelope originator name element. The value of *amhs_originator* (AFTN address) shall be converted from an MF-address as specified in ICAO Doc 9880 Part II [1] paragraph 4.5.2.2.6.

4.4.3.4.8 *amhs_subject*

This element shall be mapped from the Subject (IPM heading) element.

4.4.3.4.9 *amhs_bodypart_type*, *amhs_content_encoding*

These elements will be mapped from AMHS body part types and repertoires using the following table:

Table 6. AMHS body part types translation to SWIM

AMHS Body part type	Repertoire	AMQP Message content-type	<i>amhs_bodypart_type</i>	<i>amhs_content_encoding</i>
ia5-text	ia5	<text/plain; charset="utf-8">	ia5-text	IA5
ia5-text-body-part	ia5	<text/plain; charset="utf-8">	ia5-text-body-part	IA5
general-text-body-part	Basic (ISO-646 [7])	<text/plain; charset="utf-8">	general-text-body-part	ISO-646
general-text-body-part	Basic-1 (ISO-8859-1 [8])	<text/plain; charset="utf-8">	general-text-body-part	ISO-8859-1
file-transfer-body-part	-	<application/octet-stream>	file-transfer-body-part	-

Upon reception of a message with two body parts, one file-transfer-body part and one text body part, the `amhs_bodypart_type` application property shall contain the value `file-transfer-body part`.

4.4.3.4.10 amhs_registered_identifier

The value of the element of the application property `amhs_registered_identifier` shall be mapped from the element `registered-identifier` if present; otherwise the element is absent:

4.4.3.4.11 amhs_user_visible_string

The value of the element of the application property `amhs_user_visible_string` shall be mapped from the element `user-visible-string` if present; otherwise the element is absent.

4.4.3.4.12 amhs_message_signed

This element is used to describe if the original AMHS message was signed.

The values of this parameter are determined as the result of the enforcement of the AMHS security policy (see 4.4.5.1 and 4.4.5.2)

Valid values are:

- a) `signed`
- b) `unsigned`
- c) `invalid-signature`

4.4.3.5 Application Data

4.4.3.5.1 data

For messages that contain an FTBP, the data of the FTBP shall be used. See Table 6 for encoding information.

4.4.3.5.2 amqp-value

When the message contains an ia5-text, an ia5-text-body-part, or a general-text-body-part, the amqp-value element shall be set with the IPM text, excluding the ATS-message-Header if present.

4.4.4 Use of IPM elements

4.4.4.1 Each of the elements of an IPM in an AMHS message to be converted into an AMQP message by the ITCU shall be processed as specified in the column “Action” of Table 7. The elements of the IPM shall be used according to the specification in the provision referred to in the column “Mapping”.

4.4.4.2 All body part types other than basic “ia5-text”, extended “ia5-text-body-part”, extended “general-text-body-part” and “file-transfer-body-part” are excluded as the result of 4.4.2.3.

4.4.4.3 The body parts may be either excluded or translated, depending on whether or not it is a standard extended body part type, and if so, depending on the type of extended body part type, as specified in Part 4 of the Table 7 and as the result of 4.4.2.3.

4.4.4.4 If the highest precedence element of the recipient-extensions of the recipient-specifier elements included in the IPM has the value 107 or the priority-indicator of a received AMHS message has the value “SS” and if the responsibility element of the corresponding per-recipient-fields of the message transfer envelope has the value “responsible”, then this situation shall be logged and reported to a control position for appropriate action, while the message shall be conveyed to SWIM.

4.4.4.5 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 [9] ICAO EUR AMHS Manual, Appendix B – paragraph A.2.4.2.6

4.4.4.6 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. 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 Table of registered sets of values in [9] ICAO EUR AMHS Manual, Appendix B - paragraph A.2.4.2.6. If value does not correspond to this table, then this situation shall be logged and reported to a control position for appropriate action, while the message shall be conveyed to SWIM using the corresponding value.

4.4.4.7 The components of a general-text body part shall be used as follows for the conversion of the IPM body into the text of the AMQP message:

- a) the parameters component identifies the repertoire used for the message, as specified in ISO/IEC 10021-7, E.2 [5]; and
- b) the data component of a general-text body part is used for the generation of the converted AMQP message as specified in Part 6 of Table 7.

Table 7. Use of IPM elements

Ref	Element	Reception Basic / extended ATSMHS Support	Action	Mapping
Part 1: AMH21/A.1.1 Supported information objects				
1	Interpersonal message (IPM)	M	T	see Part 1/1.1 and 1.2
1.1	heading	M	T	see Part 2
1.2	body	M	T	see Part 3
2	Interpersonal notification (IPN)	M	-	out of the scope of this provision
Part 2: AMH21/A.1.2 IPM heading fields				
1	this-IPM	M	D	-
2	originator	M	D	-
3	authorizing-users	M	D	-
4	primary-recipients	M	D	see Part 5/1
5	copy-recipients	M	D	see Part 5/1
6	blind-copy-recipients	M	D	see Part 5/1
7	replied-to-IPM	M	D	-
8	obsoleted-IPMs	M	D	-
9	related-IPMs	M	D	-
10	subject	M	T	see 4.4.3.4.8
11	expiry-time	M	D	-
12	reply-time	M	D	-
13	reply-recipients	M	D	-
14	importance	M	D	-
15	sensitivity	M	D	-
16	auto-forwarded	M	D	-
17	extensions	M	D	-
17.1	incomplete-copy	M	D	-
17.2	languages	M	D	-
17.3	auto-submitted	I	D	-
17.4*	body-part-signatures	O	D	-
17.5*	ipm-security-label	O	D	-
17.6*	authorization-time	M	T1	see 4.4.3.4.5
17.7*	circulation-list-recipients	M	D	-

17.8*	distribution-codes	M	D	-
17.9*	extended-subject	M	D	-
17.10*	information-category	M	D	-
17.11*	manual-handling-instructions	M	D	-
17.12*	originators-reference	M	T1	See 4.4.3.4.6
17.13*	precedence-policy-identifier	M	D	-
Part 3: AMH21/A.1.3 IPM body				
1	ia5-text	M	T	see Part 3/1.1 and Part 1.2
1.1	parameters	M	D	-
1.1.1	repertoire	M	T	see 4.4.3.4.9
1.2	data	M	T	see Part 6
2	voice	I	X	see 4.4.4.2
3	g3-facsimile	O	X	see 4.4.4.2
4	g4-class-1	O	X	see 4.4.4.2
5	teletex	O	X	see 4.4.4.2
6	videotex	O	X	see 4.4.4.2
7	encrypted	O	X	see 4.4.4.2
8	message	M	X	see 4.4.4.2
9	mixed-mode	O	X	see 4.4.4.2
10	bilaterally-defined	C1	X	see 4.4.4.2
11	nationally-defined	O	X	see 4.4.4.2
12	extended	M	X/T	Part 4
Part 4: AMH21/A.1.3.1 Extended body part support				
1	ia5-text-body-part	M	T	see Part 3/1
2	g3-facsimile-body-part	O	X	see 4.4.4.2
3	g4-class1-body-part	O	X	see 4.4.4.2
4	teletex-body-part	O	X	see 4.4.4.2
5	videotex-body-part	O	X	see 4.4.4.2
6	encrypted-body-part	O	X	see 4.4.4.2
7	message-body-part	M	X	see 4.4.4.2
8	mixed-mode-body-part	O	X	see 4.4.4.2
9	bilaterally-defined-body-part	O	X	see 4.4.4.2
10	nationally-defined-body-part	O	X	see 4.4.4.2
11	general-text-body-part	M	T/X	see 4.4.4.7 and Part 6
12	file-transfer-body-part	M	T	see Part 7
13	voice-body-part	O	X	see 4.4.4.2

14	oda-body-part	O	X	see 4.4.4.2
15*	report-body-part	M	X	see 4.4.4.2
16*	notification-body-part	M	X	see 4.4.4.2
17*	content-body-part	M	X	see 4.4.4.2
18*	pkcs7-body-part	O	X	see 4.4.4.2
Part 5: AMH21/A.1.5 Common data types				
1	RecipientSpecifier			
1.1	recipient	M	D	-
1.2	notification-requests	M	D	see Part 5/1.2.1-1.2.3
1.2.1	rn	O	D	see 4.4.4.4
1.2.2	nrn	M	D	-
1.2.3	ipm-return	O	D	-
1.3	reply-requested	M	D	-
1.4*	recipient-extensions	M	T1	see Part 5/1.4.3
1.4.1*	recipient-security-request	O	D	-
1.4.2*	circulation-list-indicator	O	D	-
1.4.3*	precedence	M	T1	see 4.4.3.4.3
Part 6: IPM support of the basic ATSMHS				
1	ATS-message-Header	M	T1	see Part 6/1.1-1.5
1.1	start-of-heading	M	-	-
1.2	ATS-message-Priority	M	T	see Part 6/1.2.1-1.2.3
1.2.1	priority-prompt	M	-	-
1.2.2	priority-indicator	M	T	see 4.4.3.4.3 and 4.4.4.4
1.2.3	priority-separator	M	-	-
1.3	ATS-message-Filing-Time	M	T	see Part 6/1.3.1-1.3.3
1.3.1	filing-time-prompt	M	-	-
1.3.2	filing-time	M	T	see 4.4.3.4.5
1.3.3	filing-time-separator	M	-	-
1.4	ATS-message-Optional-Heading-Info	M	T1	see Part 6/1.4.1-1.4.3
1.4.1	OHI-prompt	M	-	-
1.4.2	optional-heading-information	M	T	see 4.4.3.4.6
1.4.3	OHI-separator	M	-	-
1.5	start-of-text	M	-	-
2	ATS-message-Text	M	T	
Part 7: File Transfer Body Parts parameters				
1	related-stored-file			

2	contents-type			
2.1	document-type			
2.1.1	document-type-name	M	D	
3	environment			
3.1	application-reference			
3.1.1	registered-identifier	O	T1	See 4.4.4.5
3.4	user-visible-string	O	T1	See 4.4.4.6
4	compression	O	D	
5	file-attributes			
5.1	pathname			
5.1.1	incomplete-pathname	M	T	
5.5	date-and-time-of-last-modification	M	T	
5.13	object-size			
5.13.2	actual-values	M	T	
6	extensions	-		
D = discarded I = out of scope M = mandatory support O = optional support T = translated T1 = conditionally translated X = excluded (not used) * = requirement applicable only if the AMHS/SWIM Gateway supports the extended ATSMHS - = not applicable				

4.4.5 Use of message transfer envelope parameters

As specified in paragraph “Use of message transfer envelope parameters” of ICAO Doc 9880 Part II [1] paragraph 4.5.2.4, replacing AMHS/SWIM Gateway instead of AFTN/AMHS Gateway, Information Transfer Control Unit instead of message transfer and control unit, and AMQP instead of AFTN, adding these considerations.

4.4.5.1 If the AMHS message is not digitally signed, action taken will depend on the value of the configuration parameter “Action to take on reception of unsigned AMHS messages”, that is:

- a) If the value is “Convert the message to SWIM”, then the message shall be processed for further conveyance in the AMQP,
- b) The value “Reject the message with an NDR”, shall result in the rejection for all the message recipients, notification to the control position and generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - 1) “transfer-failure-for-security-reason” for the non-delivery-reason-code; and
 - 2) “secure-messaging-error” for the non-delivery-diagnostic-code; and

- 3) “unable to convert to AMQP due to missing a required message signature” for the supplementary-information
- c) If the value is “Convert the message to SWIM and mark it as Unsigned”, then the message shall be processed for further conveyance in the AMQP. The “amhs_message_signed” application-property in the AMQP message shall be set to “unsigned” (see 4.4.3.4.10).

4.4.5.2 If the AMHS message is digitally signed and verification of the signature/s is invalid, action taken will depend on the value of the configuration parameter “Action to take on reception of signed AMHS messages that fails validation”, that is:

- d) The value “Reject the message with an NDR” shall result in the rejection for all message recipients, notification to the control position and generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - 1) “transfer-failure-for-security-reason” for the non-delivery-reason-code; and
 - 2) “secure-messaging-error” for the non-delivery-diagnostic-code; and
 - 3) “unable to convert to AMQP due to invalid signature” for the supplementary-information
- e) If the value is “Convert the message to SWIM and mark it as *Invalid Signature*”, then the message shall be processed for further conveyance in the AMQP. The “amhs_message_signed” application-property in the AMQP message shall be set to “invalid-signature” (see 4.4.3.4.10).

4.4.5.3 If the AMHS message is digitally signed and verification of the signature/s is correct, then the message shall be processed for further conveyance in the AMQP, setting the “amhs_message_signed” element of application-properties section in the AMQP message mappings to “signed” (see 4.4.3.4.10).

4.4.6 Action upon reception of AMHS probe

4.4.6.1 Upon reception by the ITCU of an AMHS probe for which content type is “interpersonal-messaging-1988”, the received probe shall be processed in one of the following manners, depending on the abstract-value of the current-encoded-information-types, determined as either the abstract-value of the latest converted-encoded-information-types, if existing, in the trace-information element, or as the abstract-value of the original-encoded-information-types element in the probe transfer envelope if the former does not exist:

- a) Processing as specified in 4.4.6.2 if the abstract-value of the current encoded-information-types is “unspecified” or includes exclusively one of the following values
 - 1) Basic “ia5-text”
 - 2) externally-defined “ia5-text”, which corresponds to OID {id-eit-ia5-text} as specified in ISO/IEC 10021-4 Annex A [4];
 - 3) OID {id-cs-eit-authority 1}, identifying the C0 control character set ISO-IR 0, as described in ISO/IEC 10021-7 [5];
 - 4) OID {id-cs-eit-authority 2}, identifying the G0 graphical character set ISO-IR 2 (known as International Reference Version of ISO 646 [7]), as described in ISO/IEC 10021-7 [5];
 - 5) OID {id-cs-eit-authority 6}, identifying the G0 graphical character set ISO-IR 6 (known as US Version of ISO 646 [7]), as described in ISO/IEC 10021-7 [5]; or
 - 6) OID {id-cs-eit-authority 100}, identifying the G1 graphical character set ISO-IR 100 (ISO 8859-1, Latin Alphabet No. 1 [8]), as described in ISO/IEC 10021-7 [5];
 - 7) OID {id-eit-file-transfer 0}, identifying the file transfer, as described in ISO/IEC 10021-7 [5].
- b) if the abstract-value includes any value different from the values indicated in a) above:
 - 1) rejection of the message for all the message recipients; and

- 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “encoded-information-types-unsupported” for the non-delivery-diagnostic-code.

4.4.6.2 A probe which was not rejected as the result of 4.4.6.1 shall be processed in one of the following mutually exclusive manners:

- a) Processing as specified in 4.4.6.3 if the length of the element content-length in the probe transfer envelope does not exceed the maximum value defined for the SWIM component in the AMHS/SWIM Gateway’s configuration parameter “Maximum message data size”;
- b) If the length of the element content-length in the probe transfer envelope exceeds the maximum value defined for the SWIM component:
 - 1) rejection of the probe for all the probe recipients; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “content-too-long” for the non-delivery-diagnostic-code; and
 - iii. “unable to convert to AMQP due to the content size” for the supplementary-information”

4.4.6.3 A probe which was not rejected as the result of 4.4.6.2 shall be processed in one of the following mutually exclusive manners:

- a) Processing as specified in 4.4.6.4 if the number of probe recipients towards which the ITCU is responsible for conveyance of the probe does not exceed the maximum value defined for the SWIM component in the AMHS/SWIM Gateway’s configuration parameter “Maximum message number of recipients”;
- b) if this number exceeds the maximum value defined for the SWIM component:
 - 1) rejection of the probe for all the probe recipients; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “too-many-recipients” for the non-delivery-diagnostic-code; and
 - iii. “unable to convert to AMQP due to number of recipients” for the supplementary-information

4.4.6.4 A probe which was not rejected as the result of 4.4.6.3 shall be processed in one of the following manners, depending on the ability of the ITCU to translate the originator-name element of the probe transfer envelope into an AF-address:

- a) processing as specified in 4.4.6.5 if address conversion into an AF-address as specified in ICAO Doc 9880 Part II [1] paragraph 4.5.2.2.6 a), b) or c) can be achieved; or
- b) if address conversion into an AF-address as specified in ICAO Doc 9880 Part II [1] paragraph 4.5.2.2.6 a), b) and c) cannot be achieved, then:
 - 1) rejection of the probe for all the probe recipients; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in all the per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “invalid-arguments” for the non-delivery-diagnostic-code; and

- iii. “unable to convert to AMQP due to unrecognized originator O/R address” for the supplementary-information.

4.4.6.5 For each probe recipient, a probe which was not rejected as the result of 4.4.6.4 shall be processed in one of the following manners, depending on the ability of the ITCU to translate the considered recipient-name element of the probe transfer envelope into an AF-address:

- a) processing as specified in 4.4.6.6 if address conversion into an AF-address as specified in ICAO Doc 9880 Part II [1] paragraph 4.5.2.2.7 a), b) or c) can be achieved, or
- b) if address conversion into an AF-address as specified in ICAO Doc 9880 Part II [1] paragraph 4.5.2.2.7 a), b) and c) cannot be achieved, then:
 - 1) rejection of the probe for the considered recipient; and
 - 2) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values in the corresponding per-recipient-fields of the report:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “unrecognised-OR-name” for the non-delivery-diagnostic-code.

4.4.6.6 For the probe recipients which were not rejected as the result of 4.4.6.5, a delivery-report shall be generated as specified in 4.4.8, if requested, to indicate the successful result of the probe conveyance test.

4.4.7 Action upon reception of AMHS RN

4.4.7.1 Upon reception by the Information Transfer and Control Unit of an RN passed from the AMHS component, the received RN shall be processed in one of the following manners:

- a) processing as specified in 4.4.7.2 if the subject IPM has been previously generated by the information transfer and control unit; or
- b) unsuccessful termination of the procedure if the subject IPM has not been previously generated by the information transfer and control unit, resulting in:
 - 1) logging of the error situation and reporting to the control position;
 - 2) storage of the RN for appropriate action at the control position; and
 - 3) generation of a non-delivery report as specified in 4.4.8 with the following elements taking the following abstract-values:
 - i. “unable-to-transfer” for the non-delivery-reason-code; and
 - ii. “invalid-arguments” for the non-delivery-diagnostic-code; and
 - iii. “unable to notify RN to SWIM due to misrouted RN” for the supplementary-information.

4.4.7.2 For an AMHS RN passed from the AMHS component to the information transfer and control unit and not rejected as the result of 4.4.7.1, the received RN shall be processed in one of the following manners:

- a) processing as specified in 4.4.7.3 if the value of the priority indicator of the subject SWIM message was “SS”; or
- b) unsuccessful termination of the procedure if the value of the priority indicator was different from “SS”, resulting in:
 - 1) logging of the error situation and reporting to a control position; and
 - 2) storage of the RN for appropriate action at the control position.

4.4.7.3 An AMHS RN passed from the AMHS component to the information transfer and control unit and not rejected as the result of 4.4.7.2 shall be logged and reported to the Control Position.

4.4.8 Generation of AMHS reports

As specified in ICAO Doc 9880 Part II [1] paragraph 4.5.6, replacing the following:

- a) AFTN/AMHS Gateway with AMHS/SWIM Gateway,
- b) Message Transfer and Control Unit with Information Transfer and Control Unit,
- c) AFTN component with SWIM component, and
- d) AFTN with AMQP.

4.4.9 Error management

Any error situation shall be logged and reported to the Control Position.

4.5 SWIM TO AMHS CONVERSION

For AMHS unaware service level, the minimum information necessary to transfer SWIM Information Objects to AMHS is:

- a) priority element in header section;
- b) message-id element in properties section;
- c) creation-time element in properties section
- d) data or amqp-value element in application data section;
- e) amhs_recipients in application properties section; and
- f) content-type element in properties section;

4.5.1 Control Functions

4.5.1.1 Upon reception by the ITCU of an AMQP message passed from the SWIM component to be conveyed to the AMHS, the received message shall be processed in one of the following manners, depending on the value of the priority in the header section:

- a) processing as specified in 4.5.1.2 if the value of the element priority is present; or
- b) if the value of the element priority is not present then the AMQP message shall be rejected, logged and reported to the Control Position.

4.5.1.2 A message which was not rejected as the result of 4.5.1.1 shall be processed in one of the following manners:

- a) processing as specified in 4.5.1.3 if the value of the element message-id is present; or
- b) if the value of the element message-id is not present then the AMQP message shall be rejected, logged and reported to the Control Position.

4.5.1.3 A message which was not rejected as the result of 4.5.1.2 shall be processed in one of the following manners:

- a) processing as specified in 4.5.1.4 if the value of the element creation-time is present; or
- b) if the value of the element creation-time is not present then the AMQP message shall be rejected, logged and reported to the Control Position.

4.5.1.4 A message which was not rejected as the result of 4.5.1.3 shall be processed in one of the following manners:

- a) processing as specified in 4.5.1.5 if the value of the element data or the value of the amqp-value element is present; or
- b) if the value of the element data and the value of the amqp-value are not present then the AMQP message shall be rejected, logged and reported to the Control Position.

4.5.1.5 A message which was not rejected as the result of 4.5.1.4 shall be processed in one of the following manners:

- a) processing as specified in 4.5.1.6 if the value of the application property amhs_recipients is present; or
- b) if the value of the application property amhs_recipients is not present then the AMQP message shall be rejected, logged and reported to the Control Position.

4.5.1.6 A message which was not rejected as the result of 4.5.1.5 shall be processed in one of the following manners:

- a) processing as specified in 4.5.1.7 if the value of the property content-type contains the value "<application/octet-stream>", the data element is present and the amqp-value element is not present; or
- b) processing as specified in 4.5.1.7 if the value of the property content-type contains the value "<text/plain; charset=utf-8>", the amqp-value element is present and the data element is not present; or
- c) otherwise the AMQP message shall be rejected, logged and reported to the Control Position.

4.5.1.7 A message which was not rejected as the result of 4.5.1.6 shall be processed in one of the following mutually exclusive manners:

- a) Processing as specified in 4.5.1.8 if the size of the payload in bytes of the AMQP message does not exceed the maximum value in the AMHS/SWIM Gateway's configuration parameter "Maximum message data size"; or
- b) If the size of the payload in bytes of the AMQP message exceeds the maximum value specified in the AMHS/SWIM Gateway's configuration parameter "Maximum message data size", then the AMQP message shall be rejected, logged and reported to the Control Position.

4.5.1.8 A message which was not rejected as the result of 4.5.1.7 shall be processed in one of the following mutually exclusive manners:

- a) Processing as specified in 4.5.1.9 if the number of recipients specified in the application property amhs_recipients of the AMQP message does not exceed the maximum value in the AMHS/SWIM Gateway's configuration parameter "Maximum message number of recipients";
- b) If the number of recipients specified in the application property amhs_recipients of the AMQP message exceeds the maximum value specified in the AMHS/SWIM Gateway's configuration parameter "Maximum message number of recipients", the AMQP message shall be rejected, logged and reported to the Control Position.

4.5.1.9 Upon reception by the ITCU of an AMQP message passed from the SWIM component to be conveyed to the AMHS, this AMQP message shall be converted into an AMHS message for transfer by the AMHS component in accordance with the following:

- a) The specification of how the elements of the AMQP message are used for mapping onto the AMHS message parameters, as specified in paragraph 4.5.2.
- b) Generation of the IPM as specified in 4.5.3.
- c) Generation of the message transfer envelope as specified in 4.5.4.

4.5.2 Use of AMQP message elements

4.5.2.1 Each element of an AMQP message shall be processed as specified in the column "action" of Table 8. These elements which are classified as "T" or "T1" in the column action shall be translated into the AMHS parameter specified in the column "Generated AMHS property" and according to the specification in the provision referred to in the column "Mapping".

Table 8. Use of AMQP message elements

AMQP message section	Element	Action	Generated AMHS property	Mapping
Header	durable	D	-	
Header	priority	T	X.400 priority (envelope) or ATS-message-priority or precedence	see 4.5.2.2
Header	ttl	D	-	
Header	first-acquirer	D	-	
Header	delivery-count	D	-	
delivery annotations		D	-	
message annotations		D	-	
Properties	message-id	D	Message-identifier (envelope) user-relative-identifier (IPM heading elements)	
Properties	user-id	D	-	
Properties	to	D	-	
Properties	subject	T1	Subject (IPM heading elements)	see 4.5.2.3
Properties	reply-to	D	-	
Properties	correlation-id	D	-	
Properties	content-type	T1	Body part type and repertoire	see 4.5.2.4
Properties	content-encoding	D	-	
Properties	absolute-expiry-time	D	-	
Properties	creation-time	T1	ATS-message-Filing-Time AND/OR authorization-time (IPM heading)	see 4.5.2.10
Properties	group-id	-	-	
Properties	group-sequence	-	-	
Properties	reply-to-group-id	-	-	
application properties	amhs_ipm_id	-	-	
application properties	amhs_ftbp_file_name	T1	FTBP-pathname	see 4.5.2.5
application properties	amhs_ftbp_object_size	T1	FTBP- object-size	see 4.5.2.7
application properties	amhs_ftbp_last_mod	T1	FTBP-date-and-time-of-last-modification	see 4.5.2.8
application properties	amhs_ats_pri	T1	ATS-message-priority AND/OR precedence	see 4.5.2.2
application properties	amhs_recipients	T	Recipient-name of per-recipient-fields (envelope)	see 4.5.2.9
application properties	amhs_ats_ft	T1	ATS-message-Filing-Time AND/OR Authorization-time (IPM heading)	see 4.5.2.10
application properties	amhs_ats_ohi	T1	ATS-message-Optional-Heading-Info AND/OR originators-reference (IPM heading)	see 4.5.2.11
application properties	amhs_originator	T	originator-name (envelope)	see 4.5.2.12

application properties	amhs_subject	T1	Subject (IPM heading)	see 4.5.2.3
application properties	amhs_bodypart_type	T1	Body part type	see 4.5.2.4
application properties	amhs_content_encoding	T1	Repertoire	see 4.5.2.4
application properties	amhs_registered_identifier	T1	Registered Identifier	see 4.5.2.13
application properties	amhs_user_visible_string	T1	User visible String	see 4.5.2.14
application properties	amhs_message_signed	-		
application properties	swim_compression	D		
application data	data	T1	ATS-message-text (IPM heading) OR FTBP data	see 4.5.2.15
application data	amqp-sequence	-	-	
application data	amqp-value	T1	ATS-message-text (IPM heading)	see 4.5.2.16
Footer		-	-	
D = discarded T = translated T1 = conditionally translated - = not applicable				

Note. In AMQP, properties use hyphens (-) in their names. However, in application properties names, the use of hyphens could be restricted by APIs. Therefore, the names of application properties defined in this specification use underscores (_) instead of hyphens..

4.5.2.2 The element to be used for the determination of the AMHS priority shall be:

- the application property amhs_ats_pri if it is present and valid in the AMQP message; if it is not present, then
- the priority in the AMQP message header.

4.5.2.2.1 As a result of 4.5.2.2 the element to be used shall:

- be mapped into the abstract-value of the priority element of the message transfer envelope of the converted AMHS message as specified in the third column of Table 9; and
- be converted into the value of the priority indicator in the ATS-message-Priority element of the ATS message text of the AMHS message as specified in the fourth column of Table 9 (Basic ATSMHS), if AMHS/SWIM Gateway's configuration parameter ATSMHS-service-level makes the AMHS message to be conveyed using basic ATSMHS service level; or
- be mapped into one of the authorized values of the precedence element of the recipient extensions of the recipient-specifier, as specified in the fifth column of Table 9 (Extended ATSMHS), if AMHS/SWIM Gateway's configuration parameter ATSMHS-service-level makes the AMHS message to be conveyed using extended ATSMHS service level.

Table 9. Mapping of AMQP priority

AMQP Priority	amhs_ats_pri	AMHS message transfer envelope priority	ATS-message-priority	IPM precedence
---------------	--------------	---	----------------------	----------------

>=6	SS	Urgent	SS	107
5	DD	Normal	DD	71
4	FF	Normal	FF	57
3	GG	Non-urgent	GG	28
<=2	KK	Non-urgent	KK	14

4.5.2.3 The value of the application property `amhs_subject` is used for the mapping into the AMHS subject if the element is present on the AMQP message. If the application property `amhs_subject` is not present on the AMQP message, then the property subject of the AMQP message is used for the mapping. The selected property shall:

- be trimmed if the size of the value exceeds 128 characters.
- be mapped into the subject field of the IPM heading fields of the AMHS message.
- be omitted in the AMHS message resulting from the conversion if the property subject and the `amhs_subject` application property are not present in the AMQP message.

4.5.2.4 The property content-type of the AMQP Message and application properties `amhs_bodypart_type` and `amhs_content_encoding` shall be converted into the AMHS body part type and repertoire elements of the IPM as follows:

- In case `amhs_bodypart_type` and `amhs_content_encoding` application properties are present:

Table 10. Mapping of AMQP Message (AMHS aware)

AMQP Message content-type	<code>amhs_bodypart_type</code>	<code>amhs_content_encoding</code>	AMHS Body part type	Repertoire
<text/plain; charset="utf-8">	ia5-text	IA5	ia5-text	ia5
<text/plain; charset="utf-8">	ia5-text-body-part	IA5	ia5-text-body-part (1)	ia5
<text/plain; charset="utf-8">	general-text-body-part	ISO-646	general-text-body-part	Basic (ISO-646 [7])
<text/plain; charset="utf-8">	general-text-body-part	ISO-8859-1	general-text-body-part	Basic-1 (ISO-8859-1 [8])
<application/octet-stream>	file-transfer-body-part	-	file-transfer-body-part	-

Note (1) – Generation of ia5-text-body-part by the AMHS/SWIM Gateway is considered optional, since the generation of such body part type is optional.

- In case neither application properties are present, the property content-type of the AMQP message shall:
 - be mapped as a general-text-body-part Basic-1 (ISO-8859-1 [8]) if the value of the content-type is <text/plain; charset="utf-8"> or
 - be mapped as a file-transfer-body-part if the value of the content-type is <application/octet-stream>

Table 11. Mapping of AMQP Message (AMHS unaware)

AMQP Message content-type	<code>amhs_bodypart_type</code>	<code>amhs_content_encoding</code>	AMHS Body part type	Repertoire
<text/plain; charset="utf-8">	-	-	general-text-body-part	(ISO-8859-1 [8])

<application/octet-stream>	-	-	file-transfer-body-part	-
----------------------------	---	---	-------------------------	---

4.5.2.5 When generation of standard extended body part type “ia5-text-body-part” is not supported by the AMHS/SWIM Gateway and `amhs_bodypart_type` application property is received with value `ia5-text-body-part`, then the AMHS/SWIM Gateway shall generate a basic body part type “ia5-text”.

4.5.2.6 The application property `amhs_ftbp_file_name` of the AMQP message shall be conveyed as the value of the `incomplete-pathname` element of the file transfer parameters of the AMHS message, if the `amhs_ftbp_file_name` is present in the AMQP message. Otherwise, the element `pathname` shall not be present at the generated IPM.

4.5.2.7 The application property `amhs_ftbp_object_size` of the AMQP message shall be conveyed as the value of the `actual-values` element of the file transfer parameters of the AMHS message, if the `amhs_ftbp_object_size` is present in the AMQP message. Otherwise, the element `object size` shall not be present at the generated IPM.

4.5.2.8 The application property `amhs_ftbp_last_mod` of the AMQP message shall be conveyed as the value of the `date-and-time-of-last-modification` element of the file transfer parameters of the AMHS message, if the `amhs_ftbp_last_mod` is present in the AMQP message following the date format `YYYYMMDDhhmmssZ`. Otherwise, the element `date-and-time-of-last-modification` shall not be present at the generated IPM.

4.5.2.9 If the application property `amhs_recipients` contains addressee indicators of eight letters, where each indicator is separated by a “,”, then:

- a) Each addressee indicator in the application property `amhs_recipients` shall be translated into the MF-address included in a recipient-name of the resulting AMHS message (ICAO Doc 9880 Part II [1] paragraph 4.4.2.1.4).
- b) The unsuccessful termination for one or several addressee indicators results in the logging and reporting to the Control Position for these addressee indicators.
- c) If none of the recipient-names can be translated, then the AMQP message shall be rejected, logged and reported to the Control Position.

4.5.2.10 The element used for the mapping of the ATS-message-Filing-Time or the authorization-time shall be:

- a) The value of the application property `amhs_ats_ft` if the element is present in the AMQP message and it is a date-time group consisting of six numerical characters, the first two digits representing the day of the month and the last four digits the hours and minutes if AMHS/SWIM Gateway's configuration parameter `ATSMHS-service-level` makes the AMHS message to be conveyed using basic ATSMHS service level.
- b) If application property `amhs_ats_ft` has wrong format, isn't present or the `ATSMHS-service-level` makes the AMHS message to be conveyed using extended ATSMHS service level, then the property creation time of the AMQP message is used for the mapping.
- c) An error situation shall be logged and reported to the Control Position if the elements as in a) and b) are absent or have invalid values.

4.5.2.10.1 As a result of 4.5.2.10, the selected element shall:

- a) be converted as the value of the ATS-message-Filing-Time element of the IPM text of the converted AMHS message (Basic ATSMHS), if AMHS/SWIM Gateway's configuration parameter `ATSMHS-service-level` makes the AMHS message to be conveyed using basic ATSMHS service level; or
- b) be conveyed into the value of the authorization-time heading field extension of the IPM (Extended ATSMHS) as specified in ISO/IEC 10021-7:2003, Section A.1.6 [5], which is of ASN.1 type `GeneralizedTime`, if AMHS/SWIM Gateway's configuration parameter `ATSMHS-service-level` makes the AMHS message to be conveyed using extended ATSMHS service level.

4.5.2.11 The application property `amhs_ats_ohi` shall

- a) be conveyed as the value of the optional heading information element in the ATS-message-Optional-Heading-Info element of the IPM text of the converted AMHS message (Basic ATSMHS),

if AMHS/SWIM Gateway's configuration parameter ATSMHS-service-level makes the AMHS message to be conveyed using basic ATSMHS service level; or

- b) be conveyed as the value of the originators-reference of the IPM heading (Extended ATSMHS), if AMHS/SWIM Gateway's configuration parameter ATSMHS-service-level makes the AMHS message to be conveyed using extended ATSMHS service level; or
- c) be omitted if the property `amhs_ats_ohi` is not present in the AMQP message or it does not represent a character string; or
- d) be trimmed down to 53 characters if the property `amhs_ats_ohi` is a character string of a length greater than 53 characters if the AMQP message priority is less than "6"; or
- e) be trimmed down to 48 characters if the property `amhs_ats_ohi` is a character string of a length greater than 48 and the AMQP message priority is "6" or greater.

4.5.2.12 If the application property `amhs_originator` contains addressee indicator of eight letters, then:

- a) The value of the application property `amhs_originator` shall be converted into a MF-address following conversion of AFTN/AMHS addresses (ICAO Doc 9880 Part II [1] paragraph 4.4.2.1.4) into the value of the originator and this-IPM elements of the IPM and into the originator-name of the envelope of the AMHS message.
- b) Otherwise, the default originator shall be used and the AMQP message shall be logged and reported to the Control Position

4.5.2.13 The application property `amhs_registered_identifier` can be optionally generated by the originator and shall:

- a) be conveyed as the registered-identifier element when present taking one of the registered OID values listed in [9] ICAO EUR AMHS Manual, Appendix B – paragraph A.2.4.2.6,
- b) be conveyed as the registered-identifier element with 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} when not present,
- c) be conveyed as the registered-identifier element with default the OID value when present with value other than the listed in [9] ICAO EUR AMHS Manual, Appendix B – paragraph A.2.4.2.6. This situation shall be logged and reported to the Control Position.

4.5.2.14 The application property `amhs_user_visible_string` shall be present in cases where the element registered-identifier is present and set to an OID value other than the default one (see [9] ICAO EUR AMHS Manual, Appendix B – paragraph 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 table of registered sets of values in [9] ICAO EUR AMHS Manual, Appendix B – paragraph A.2.4.2.6. Otherwise, the situation shall be logged and reported to the Control Position, while the message shall be conveyed to AMHS using the corresponding value.

4.5.2.15 The data of the AMQP message shall:

- a) be conveyed in its entirety to the data element of the file transfer body part type if the data element is present on the AMQP message; or
- a) be omitted in the converted AMHS message if the data element is not present in the AMQP message.

4.5.2.16 The `amqp-value` of the AMQP message shall:

- a) be conveyed in its entirety to the data element of the possible text body part types detailed on 4.5.2.4, if the `amqp-value` element is present on the AMQP message; or
- b) be omitted in the converted AMHS message if the `amqp-value` element is not present in the AMQP message.

4.5.3 Generation of IPM

4.5.3.1 Each of the elements composing the IPM resulting from the conversion of an AMQP message in the ITCU shall be processed as specified in the column “action” of Table 12. These elements, which are classified as “G”, “G1”, “T” or “T1” in the column “action”, shall be either generated or translated according to the specification in the provision referred to in the column “mapping”.

Table 12. IPM Generation

Ref	Element	ATSMHS Origination	Action	Mapping/notes
Part 1: AMH21/A.1.1 Supported information objects				
1	Interpersonal message (IPM)	M	T	See Part 1/1.1 and 1.2
1.1	heading	M	T	See Part 2
1.2	body	M	T	See Part 3
2	Interpersonal notification (IPN)	M	-	Out of scope
Part 2: AMH21/A.1.2 IPM heading fields				
1	this-IPM	M	T	See Part 5/3
2	originator	M	T	See 4.5.3.2 and Part 5/2
3	authorizing-users	O	X	
4	primary-recipients	M	T	See 4.5.3.3 and Part 5/1
5	copy-recipients	M	X	
6	blind-copy-recipients	O	X	
7	replied-to-IPM	O	X	
8	obsoleted-IPMs	M	X	
9	related-IPMs	O	X	
10	subject	M	T1	
11	expiry-time	O	X	
12	reply-time	O	X	
13	reply-recipients	O	X	
14	importance	O	X	
15	sensitivity	O	X	
16	auto-forwarded	O	X	
17	extensions		T1	See 4.5.3.7
17.1	incomplete-copy	O	X	
17.2	languages	O	X	
17.3	auto-submitted	O	X	
17.4*	body-part-signatures	O	X	
17.5*	ipm-security-label	O	X	
17.6*	authorization-time	M	T1	See 4.5.2.10
17.7*	circulation-list-recipients	O	X	
17.8*	distribution-codes	O	X	
17.9*	extended-subject	M	X	
17.10*	information-category	O	X	

17.11*	manual-handling-instructions	O	X	
17.12*	originators-reference	M	T1	See 4.5.2.12
17.13*	precedence-policy-identifier	M	G2	See 4.5.3.8
Part 3: AMH21/A.1.3 IPM body				See 4.5.2.4
1	ia5-text	M	T1	
1.1	parameters	M	G2	
1.1.1	repertoire	O	G2	
1.2	data	M	T1	
2	voice	I	X	
3	g3-facsimile	O	X	
4	g4-class-1	O	X	
5	teletex	O	X	
6	videotex	O	X	
7	encrypted	O	X	
8	message	O	X	
9	mixed-mode	O	X	
10	bilaterally-defined	C1	X	
11	nationally-defined	O	X	
12	externally-defined/extended	M	X	
Part 4: AMH21/A.1.3.1 Extended body part support				See 4.5.2.4
1	ia5-text-body-part	O	T1	
2	g3-facsimile-body-part	O	X	
3	g4-class1-body-part	O	X	
4	teletex-body-part	O	X	
5	videotex-body-part	O	X	
6	encrypted-body-part	O	X	
7	message-body-part	O	X	
8	mixed-mode-body-part	O	X	
9	bilaterally-defined-body-part	O	X	
10	nationally-defined-body-part	O	X	
11	general-text-body-part	M	T1	
12	file-transfer-body-part	M	T1	
13	voice-body-part	O	X	
14	oda-body-part	O	X	
15*	report-body-part	O	X	
16*	notification-body-part	O	X	

17*	content-body-part	O	X	
18*	pkcs7-body-part	O	X	
Part 5: AMH21/A.1.5 Common data types				
1	RecipientSpecifier			
1.1	recipient	M	T	See 4.5.3.3 and Part 5/2
1.2	notification-requests	M	G2	See Part 5/1.2.1-1.2.3
1.2.1	rn	M	G2	see 4.5.3.4
1.2.2	nrn	M	G2	see 4.5.3.4
1.2.3	ipm-return	O	X	
1.3	reply-requested	O	X	
1.4*	recipient-extensions	M	T1	See 4.5.3.7
1.4.1*	recipient-security-request	O	X	
1.4.2*	circulation-list-indicator	O	X	
1.4.3*	precedence	M	T1	See 4.5.2.2
2	ORDescriptor			
2.1	formal-name	M	T	See 4.5.3.5
2.2	free-form-name	O	X	
2.3	telephone-number	O	X	
3	IPMIdentifier			
3.1	User	M	T	See 4.5.3.6
3.2	user-relative-identifier	M	G	
Part 6: IPM support of the basic ATSMHS				
1	ATS-message-Header	M	T1	See Part 6/1.1-1.5 and 4.5.3.9
1.1	start-of-heading	M	-	
1.2	ATS-message-Priority	M	T	See Part 6/1.2.1-1.2.3
1.2.1	priority-prompt	M	-	
1.2.2	priority-indicator	M	T	See 4.5.2.2
1.2.3	priority-separator	M	-	
1.3	ATS-message-Filing-Time	M	T	See Part 6/1.3.1-1.3.3
1.3.1	filing-time-prompt	M	-	
1.3.2	filing-time	M	T	See 4.5.2.10
1.3.3	filing-time-separator	M	-	
1.4	ATS-message-Optional-Heading-Info	M	T	See Part 6/1.4.1-1.4.3
1.4.1	OHI-prompt	M	-	
1.4.2	optional-heading-information	M	T	See 4.5.2.11

1.4.3	OHI-separator	M	-	
1.5	start-of-text	M	-	
2	ATS-message-Text	M	T	See 4.5.2.164.5.2.16
Part 7: File Transfer Body Parts parameters				
1	related-stored-file			
2	contents-type			
2.1	document-type			
2.1.1	document-type-name	M	G	See 4.5.3.10
3	environment			
3.1	application-reference			
3.1.1	registered-identifier	O	T1	See 4.5.2.13
3.4	user-visible-string	O	T1	See 4.5.2.14
4	compression	-		
5	file-attributes			
5.1	pathname			
5.1.1	incomplete-pathname	M	T	
5.5	date-and-time-of-last-modification	M	T	
5.13	object-size			
5.13.2	actual-values	M	T	
6	Extensions	-		
C1 = if the AMHS/SWIM Gateway supports the extended ATSMHS then M else O G = generated G2 = conditionally generated I = out of scope M = mandatory support M1 = mandatory O/R name minimal support O = optional support T = translated T1 = conditionally translated X = excluded (not used) * = requirement applicable only if the AMHS/SWIM Gateway supports the extended ATSMHS - = not applicable				

4.5.3.2 The originator heading field shall:

- a) identify the MF-address of the user who originated the AMQP message; and
- b) be structured as specified in Table 12/Part 5/2.

4.5.3.3 The element(s) recipient in the primary-recipients heading field shall:

- a) identify the MF-addresses of the recipient(s) of the AMQP message; and

- b) be structured as specified in Table 12/Part 5/1.
- 4.5.3.4 The values “rn” and “nrn” shall be taken simultaneously by the element notification-requests if, and only if the element priority-indicator included in the message, as specified Table 12/Part 5/1.2.2, has the value “SS”.
- 4.5.3.5 The element formal-name shall:
 - a) take the form of an MF-address; and
 - b) be converted as specified in ICAO Doc 9880 Part II [1] paragraph 4.4.2.1.4.
- 4.5.3.6 The element user in the this-IPM heading field shall:
 - a) be the MF-address of the user who originated the AMQP message; and
 - b) be converted as specified in ICAO Doc 9880 Part II [1] paragraph 4.4.2.1.4.1.
- 4.5.3.7 The IPM heading fields and recipient extensions (authorization-time, originators-reference, precedence-policy-identifier, precedence) shall be generated by translation of AMQP message elements, if AMHS/SWIM Gateway’s configuration parameter ATSMHS-service-level makes the AMHS message to be conveyed using extended ATSMHS service level.
- 4.5.3.8 The element precedence-policy-identifier of the IPM heading field extensions shall:
 - a) be generated if AMHS/SWIM Gateway’s configuration parameter ATSMHS-service-level makes the AMHS message to be conveyed using extended ATSMHS service level; and
 - b) take the object-identifier value specified in {iso (1) identified-organisation (3) icao (27) atn-amhs (8) parameters (0) amhs-precedence-policy (0)}.
- 4.5.3.9 The ATS-Message-Header shall be generated by translation of AMQP message elements, if AMHS/SWIM Gateway’s configuration parameter ATSMHS-service-level makes the AMHS message to be conveyed using basic ATSMHS service level.
- 4.5.3.10 The element document-type-name of the file transfer parameters shall:
 - a) be always generated
 - b) take its default value in conformance with ISO/IEC 10021-7:2003 clause 7.4.12 [5], which is the OID value {iso(1) standard(0) 8571(8571) document-type(5) unstructured-binary(3)}.

4.5.4 Generation of message transfer envelope

- 4.5.4.1 Each of the elements composing the message transfer envelope conveyed with an IPM resulting from the conversion of an AMQP message shall be processed as specified in the column “action” of Table 13. These elements, which are classified as “G”, “G1” and “T” in the column “action”, shall be handled according to the specification in the provision referred to in the column “mapping”.

Table 13. Message transfer conveyance of an IPM

Ref	Element	ATSMHS Origination	Action	Mapping/notes
Part 1: AMH11/A.1.4.2 Message transfer				
1	MessageTransferEnvelope	M	T	see Part 1/1.1 and 1.2
1.1	(per-message-fields)			
1.1.1	message-identifier	M	G	see Part 2/1
1.1.2	originator-name	M	T	see 4.5.4.6
1.1.3	original-encoded-information-types	M-	G	see 4.5.4.7 and Part 2/3
1.1.4	content-type	M-	G	see 4.5.4.8 and Part 2/8
1.1.5	content-identifier	M	G1	see 4.5.4.9
1.1.6	Priority	M	T	see 4.5.2.2
1.1.7	per-message-indicators	M	G	see Part 2/4
1.1.8	deferred-delivery-time	M-	X	-
1.1.9	per-domain-bilateral-information	M-	G1	see 4.5.4.10 and Part 2/5
1.1.10	trace-information	M	G	see Part 2/6
1.1.11	Extensions	M	G	see 4.5.4.11 and Part 3/1
1.1.11.1	recipient-reassignment-prohibited	M	X	-
1.1.11.2	dl-expansion-prohibited	M	X	-
1.1.11.3	conversion-with-loss-prohibited	M	X	-
1.1.11.4	latest-delivery-time	M-	X	-
1.1.11.5	originator-return-address	M-	X	-
1.1.11.6	originator-certificate	M-	G1	see 4.5.4.2
1.1.11.7	content-confidentiality-algorithm-identifier	M-	X	-
1.1.11.8	message-origin-authentication-check	M-	G1	see 4.5.4.2
1.1.11.9	message-security-label	M-	X	-
1.1.11.10	content-correlator	M	G1	see 4.5.4.9
1.1.11.11	dl-expansion-history	M-	X	see 4.5.4.12
1.1.11.12	internal-trace-information	M	G	see Part 3/5
1.1.11.13*	certificate-selector	M-	X	-
1.1.11.14*	multiple-originator-certificates	M-	X	-
1.1.11.15*	dl-exempted-recipients	M-	X	-
1.1.11.16*	PrivateExtensions	M-	X	-
1.2	per-recipient-fields	M	T	see Part 1/1.2.1-1.2.5
1.2.1	recipient-name	M	T	See 4.5.4.13
1.2.2	originally-specified-recipient-number	M	G	see 4.5.4.14
1.2.3	per-recipient-indicators	M	G	see 4.5.4.15

1.2.4	explicit-conversion	M-	X	-
1.2.5	Extensions	M	X	-
1.2.5.1	originator-requested-alternate-recipient	M-	D	
1.2.5.2	requested-delivery-method	M-	D	
1.2.5.3	physical-forwarding-prohibited	M-	X	
1.2.5.4	physical-forwarding-address-request	M-	X	
1.2.5.5	physical-delivery-modes	M-	X	
1.2.5.6	registered-mail-type	M-	X	
1.2.5.7	recipient-number-for-advice	M-	X	
1.2.5.8	physical-rendition-attributes	M-	X	
1.2.5.9	physical-delivery-report-request	M-	X	
1.2.5.10	message-token	M-	G1	see 4.5.4.2
1.2.5.11	content-integrity-check	M-	G1	see 4.5.4.2
1.2.5.12	proof-of-delivery-request	M-	D/X	
1.2.5.13	redirection-history	M-	D	
2	Content	M	T	See 4.5.3
Part 2: AMH11/A.1.5 Common data types				
1	MTSIdentifier			
1.1	global-domain-identifier	M	G	see 4.5.4.16 and Part 2/2
1.2	local-identifier	M	G	see 4.5.4.17
2	GlobalDomainIdentifier			
2.1	country-name	M	G	see 4.5.4.18
2.2	administration-domain-name	M	G	see 4.5.4.19
2.3	private-domain-identifier	M	G	see 4.5.4.20
3	EncodedInformationTypes			-
3.1	built-in-encoded-information-types	M	G	see 4.5.4.7
3.2	(non basic parameters)	M-	X	-
3.3	extended-encoded-information-types	M	X	-
4	PermessageIndicators			
4.1	disclosure-of-other-recipients	M	G	see 4.5.4.21
4.2	implicit-conversion-prohibited	M	G	see 4.5.4.22
4.3	alternate-recipient-allowed	M	G	see 4.5.4.23
4.4	content-return-request	M-	X	see 4.5.4.24
4.5	Reserved	M-	X	-
4.6	bit-5	M-	X	-
4.7	bit-6	M-	X	-

4.8	service-message	M-	X	-
5	PerDomainBilateralInformation			
5.1	country-name	M-	G1	see 4.5.4.25
5.2	administration-domain-name	M-	G1	see 4.5.4.25
5.3	private-domain-identifier	M-	G1	see 4.5.4.25
5.4	bilateral-information	M-	G1	see 4.5.4.26
6	TraceInformation			
6.1	TraceInformationElement	M	G	see Part 2/6.1.1 and 6.1.2
6.1.1	global-domain-identifier	M	G	see 4.5.4.27 and Part 2/2
6.1.2	domain-supplied-information	M	G	see Part 2/6.1.2.1-6.1.2.4
6.1.2.1	arrival-time	M	G	see 4.5.4.28
6.1.2.2	routing-action	M	G	see Part 2/6.1.2.2.1 and 6.1.2.2.2
6.1.2.2.1	Relayed	M	G	see 4.5.4.29
6.1.2.2.2	Rerouted	C1	X	see 4.5.4.4
6.1.2.3	attempted-domain	C1	X	see 4.5.4.4
6.1.2.4	(additional actions)			
6.1.2.4.1	deferred-time	C2	X	-
6.1.2.4.2	converted-encoded-information-types	M-	X	-
6.1.2.4.3	other-actions	M-	X	-
6.1.2.4.3.1	Redirected	M-	X	see 4.5.4.5
6.1.2.4.3.2	dl-operation	M-	X	see 4.5.4.3
8	ContentType			
8.1	built-in	M-	G	See 4.5.4.8
8.2	Extended	M-	X	-
Part 3: AMH11/A.1.6 Extension data types				
1	ExtensionField			
1.1	Type	M	G	see Part 3/1.1.1 and 1.1.2
1.1.1	standard-extension	M	G	see 4.5.4.11
1.1.2	private-extension	M-	X	-
1.2	Criticality	M	G	see 4.5.4.11
1.3	Value	M	G	see 4.5.4.11
5	InternalTraceInformation			
5.1	global-domain-identifier	M	G	see 4.5.4.16 and Part 2/2
5.2	mta-name	M	G	see 4.5.4.30

5.3	mta-supplied-information	M	G	see Part 3/5.3.1-5.3.4
5.3.1	arrival-time	M	G	see 4.5.4.28
5.3.2	routing-action	M	G	see Part 3/5.3.2.1-5.3.2.2
5.3.2.1	Relayed	M	G	see 4.5.4.29
5.3.2.2	Rerouted	C1	X	see 4.5.4.4
5.3.3	attempted-domain	C1	X	see 4.5.4.4
5.3.4	(additional actions)			
5.3.4.1	deferred-time	C2	X	-
5.3.4.2	converted-encoded-information-types	M-	X	-
5.3.4.3	other-actions	M-	X	-
5.3.4.3.1	Redirected	M-	X	see 4.5.4.5
5.4.3.3.2	dl-operation	M-	X	See 4.5.4.3
C1 = if re-routing is supported then M else M- C2 = if deferred delivery is supported then M else M- G = generated G1 = optionally generated I = out of scope M = mandatory support M- = mandatory minimal support O = optional support 'T = translated X = excluded (not used) * = requirement applicable only if the AMHS/SWIM Gateway supports the extended ATSMHS - = not applicable				

4.5.4.2 If the parameter “Digitally sign all AMHS messages” has the value “true”, then all the messages by the generated gateway will be signed conforming to the AMHS SEC Functional Group, specified in Doc 9880, Part II.

4.5.4.3 The DL-expansion capability of an AMHS/SWIM Gateway is implemented in the AMHS component rather than in the ITCU.

4.5.4.4 The rerouting capability of an AMHS/SWIM Gateway, if any, is implemented in the AMHS component rather than in the ITCU.

4.5.4.5 The redirection capability of an AMHS/SWIM Gateway, if any, is implemented in the AMHS component rather than in the ITCU.

4.5.4.6 The value of the element originator-name shall:

- be the MF-address of the user who originated the AMQP message;
- take the form of an MF-address; and
- be converted as specified in ICAO Doc 9880 Part II [1] paragraph 4.4.2.1.4.1.

4.5.4.7 The element original-encoded-information-types shall:

- take one or several of the abstract values of the column Original Encoded Information Type, according to the AMHS body part types generated for the AMHS Message:

AMHS Body part type	Repertoire	Original Encoded Information Type
ia5-text	ia5	la5-text
ia5-text-body-part	ia5	id-eit-ia5-text
general-text-body-part	Basic (ISO-646 [7])	id-cs-eit-authority 1 id-cs-eit-authority 6
general-text-body-part	Basic-1 (ISO-8859-1 [8])	id-cs-eit-authority 1 id-cs-eit-authority 6 id-cs-eit-authority 100
file-transfer-body-part	-	id-eit-file-transfer(0)

b) be formed as specified in Table 13/Part 2/3.

4.5.4.8 The element content-type shall:

- a) take the abstract-value “interpersonal-messaging-1988”, which is a value of type BuiltInContentType; and
- b) be formed as specified in Table 13/Part 2/8.

4.5.4.9 The generation of content-identifier and content-correlator element shall be optional, as a matter of policy local to the AMHS management domain operating the AMHS/SWIM Gateway.

4.5.4.10 The element per-domain-bilateral-information shall be:

- a) optionally generated, as a matter of policy local to the AMHS management domain operating the AMHS/SWIM Gateway; and
- b) if present, structured as specified in Table 13/Part 2/5.

4.5.4.11 The only extensions used shall:

- a) belong to the type “standard-extension”;
- b) contain the following elements:
 - 1) content-correlator, if used; and
 - 2) internal-trace-information;
- c) take a criticality value as specified in ISO/IEC 10021-4 [4], Figure 2; and
- d) take values as specified in 4.5.4.9 and Table 13/Part 3/5, respectively.

4.5.4.12 The non-use of the elements recipient-reassignment-prohibited, dl-expansion-prohibited and conversion-with-loss-prohibited implies, in compliance with ISO/IEC 10021-4 [4], that they are assumed to take their default abstract-values, which are “recipient-reassignment allowed”, “DL-expansion-allowed” and “conversion-with-loss-allowed”, respectively.

4.5.4.13 The value of the element recipient-name in each of the per-recipient-fields elements shall:

- a) be the address of each addressee indicated in the AMQP message respectively;
- b) take the form of an MF-address; and
- c) be converted as specified in ICAO Doc 9880 Part II [1] paragraph 4.4.2.1.4.2.

4.5.4.14 The value of the element originally-specified-recipient-number in each of the per-recipient-fields elements shall be generated by the ITCU as specified in ISO/IEC 10021-4, 12.2.1.1.1.5 [4].

4.5.4.15 The components of the element per-recipient-indicators in each of the per-recipient-fields elements shall be generated taking the following abstract-values:

- a) “responsible” for the responsibility element;
- b) “non-delivery-report” for the originating-MTA-report-request element; and
- c) “non-delivery-report” for the originator-report-request element.

4.5.4.16 The element global-domain-identifier in the MTS-identifier shall:

- a) identify the AMHS management domain operating the AMHS/SWIM Gateway; and
- b) be composed as specified in Table 13/Part 2/2.

4.5.4.17 The element local-identifier in the MTS-identifier shall be generated locally so as to ensure that it distinguishes the message from all other messages, probes or reports generated in the AMHS management domain operating the AMHS/SWIM Gateway.

4.5.4.18 The element country-name in the global-domain-identifier element of the MTS-identifier and of the first trace-information element shall be the country-name element of the identifier of the AMHS management domain operating the AMHS/SWIM Gateway as specified in ICAO Doc 9880 Part II [1] paragraph 2.5.1.3.

4.5.4.19 The element administration-domain-name in the global-domain-identifier element of the MTS-identifier and of the first trace-information element shall be the administration-domain-name element of the identifier of the AMHS management domain operating the AMHS/SWIM Gateway as specified in ICAO Doc 9880 Part II [1] paragraph 2.5.1.3.

4.5.4.20 The element private-domain-identifier in the global-domain-identifier element of the MTS-identifier and of the first trace-information element shall be the private-domain-identifier element of the identifier part of the identification of the AMHS management domain operating the AMHS/SWIM Gateway as specified in ICAO Doc 9880 Part II [1] paragraph 2.5.1.3.

4.5.4.21 The element disclosure-of-other-recipients shall take its default abstract-value, which is “disclosure-of-other-recipients-prohibited”.

4.5.4.22 The element implicit-conversion-prohibited shall take its default abstract-value, which is “implicit-conversion-allowed”.

4.5.4.23 The element alternate-recipient-allowed shall take the abstract-value “alternate-recipient-allowed”.

4.5.4.24 The element content-return-request shall take its default abstract-value, which is “content-return-not-requested”.

4.5.4.25 The elements country-name, administration-domain-name and private-domain-identifier shall together identify the AMHS management domain for which the bilateral-information is intended if, and only if, the element bilateral-information as specified in 4.5.4.26 is present.

4.5.4.26 The generation of this element shall be optional, as a matter of bilateral agreement between the AMHS management domain operating the AMHS/SWIM Gateway and another AMHS management domain.

4.5.4.27 The element global-domain-identifier in the trace-information or in the internal-trace-information shall:

- a) identify the AMHS management domain operating the AMHS/SWIM Gateway; and
- b) be composed as specified in Table 13/Part 2/2.

4.5.4.28 The element arrival-time in the first element of trace-information or of internal-trace-information shall take the semantic value of the time when the message was received by the ITCU for conveyance in the AMHS.

4.5.4.29 The element routing-action in the first element of trace-information or of internal-trace-information shall take the abstract-value “relayed”.

4.5.4.30 The element mta-name in the first element of internal-trace-information shall be the mta-name assigned to the ITCU included in the AMHS/SWIM Gateway.

4.5.4.31 The structure of the mta-name of the ITCU included in an AMHS/SWIM Gateway within an AMHS management domain is a matter of policy internal to the AMHS management domain.

ANNEX A: SWIM ACCESS POINT

A SWIM Access Point is an architectural concept a logical entity which bundles a number of technical capabilities designed to enable service provision within SWIM-compliant environments. This concept is similar to the SWIM Node, more commonly used in other aeronautical domains, and both aim to conceptualize the set of functionalities required to offer services within the SWIM environment.

Exchange of information with legacy systems may still be required during the transition to SWIM. These communications can be effectively managed from a SWIM consumer/producer perspective, treating legacy systems as producers or consumers of information.

SWIM applications that need to interact with legacy systems can use SWIM consumers or producers to leverage data provided by those users. This approach eliminates the need to implement legacy protocols directly within SWIM applications, simplifying integration and reducing complexity.

The gap between the message-oriented paradigm of legacy systems and the consumer-oriented paradigm of SWIM can be bridged through the implementation of AMHS/SWIM Gateway solutions, as specified in this technical specification, and by using the SWIM Access Point concept with a minimum set of functionalities aligned with SWIM principles.

Mandatory Capabilities

The SWIM Access Point **shall** include the following core capabilities to support the AMHS/SWIM Gateway:

- a) Messaging: Ensures reliable exchange of information on SWIM systems, handling message delivery, queuing, and protocol translation as needed.
- b) Security: Provides mechanisms for authentication, authorization, data integrity, and confidentiality, ensuring secure communication across systems.
- c) Supervision: Enables monitoring and control of the Access Point's operational status, including health checks, logging, and alerting for fault detection and resolution.

Optional Capabilities

The SWIM Access Point may offer some additional capabilities depending on specific implementation needs in support of the AMHS/SWIM Gateway:

- a) Routing: Allows configuration of message routing logic based on content, origin, destination, or other criteria.
- b) Subscription Management: Supports subscribing to external SWIM services as a consumer and optionally allows external consumers to subscribe to services exposed by a gateway.
- c) Interface Management: Provides multiple endpoints with different interface types (e.g., AMQP, SOAP) to facilitate access to the AMHS/SWIM Gateway.
- d) Message Format Conversion: When format adaptation is required, it shall be the responsibility of the SWIM Access Point. This includes the adaptation of SWIM-compliant message formats into those used by legacy systems accessed through AMHS/SWIM Gateways, whenever such conversion is necessary to support the specific interactions with those legacy systems in each local deployment. It should also be noted that SWIM information models are generally richer and more detailed than those used in legacy environments; therefore, when converting to these more concise legacy formats, only the subset of information supported by the target systems can be included. Even so, keeping this transformation logic within the SWIM domain promotes architectural clarity and ensures proper encapsulation of conversion functions.

Additional Capabilities: Any other features required by the specific deployment context, such as load balancing, metrics, high availability, caching or integration with legacy systems, etc.

The access to SWIM information services is supported by the SWIM Technical Access Sublayer. This sublayer provides the necessary mechanisms for connectivity, security, and interoperability between SWIM-enabled applications and the underlying infrastructure. It acts as an abstraction layer that hides protocol complexity and ensures standardized access to SWIM services.

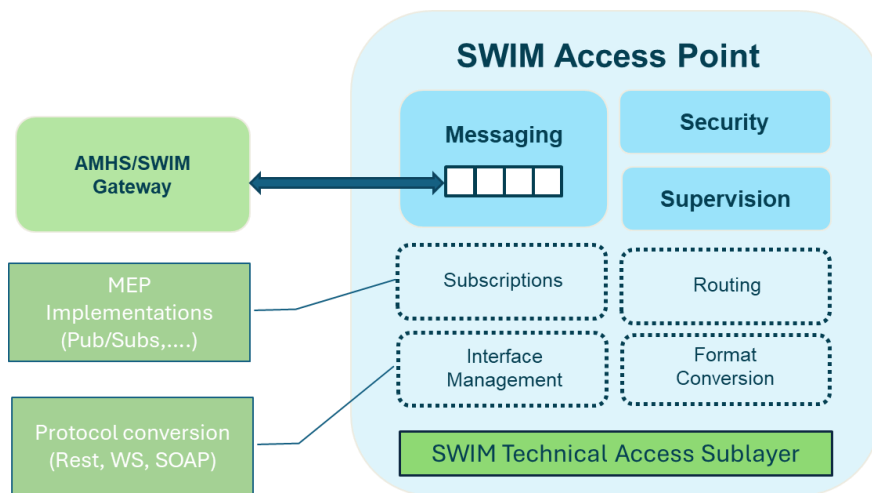


Figure 1. SWIM Access Point

The SWIM Access Point shall provide to the AMHS/SWIM Gateway the ability to work like an Information Service Producer or like an Information Service Consumer.

Facilitating Migration: The Role of AMHS/SWIM Gateways and SWIM Access Points

AMHS/SWIM Gateways act as enablers during the migration phase, facilitating the adoption of SWIM-native technologies while minimizing the technical debt associated with legacy systems. The intention is not to create permanent services, but rather to provide a transitional mechanism that allows applications to evolve without requiring specific implementations of legacy protocols.

The implementation scope of the SWIM Access Point should be understood as flexible, depending on local design choices, user requirements, native SWIM capabilities, or other contextual factors. It may even be hosted outside the gateway, using one provided by another SWIM-enabled system.

This flexibility allows the SWIM Access Point to be scoped strictly to the needs of the specific migration being supported, minimizing integration risks and operational disruptions, especially when interfacing with legacy infrastructures such as AMHS.

In all cases, the implementation should aim to be as lean and targeted as possible, aligned with the concrete migration scope, avoiding unnecessary complexity and promoting reuse of existing SWIM infrastructure where feasible.

ATTACHMENT A: CHANGE CONTROL MECHANISM OF THE AMHS/SWIM GATEWAY SPECIFICATION.

Proposals to introduce changes to the AMHS/SWIM Gateway Specification 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 Defect Report is a problem that is detected in the AMHS/SWIM Gateway Specification and may be attributed to implemented 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 and the SWAMWAY SG are assigned to the problem and milestone dates are set. Outside expertise may be invited to participate, as appropriate.
- f) The PG in cooperation with SWAMWAY SG 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 in cooperation with SWAMWAY SG drafts appropriate text for amendment of the AMHS/SWIM Gateway Specification 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 AMHS/SWIM Gateway Specification 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 or inconsistencies to the AMHS/SWIM Gateway Specification.

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.

TEMPLATE FOR DEFECT REPORTS / CHANGE PROPOSALS

DR-ASGS-yy-00x

/

CP-ASGS-yy-00x

Title:	Short, indicative textual name
Reference:	Number assigned by the PG Rapporteur
Originator reference:	Provided by the originator
Submission date:	
Submitting State/Organization:	
Author:	
Contact Information:	e-mail, fax, telephone and postal address
Experts involved:	
Status:	Assigned by the PG Rapporteur
Priority:	Assigned by the PG Rapporteur
Document reference:	Affected section(s) of the AMHS/SWIM Gateway Specification
Description of defect:	Nature of the problem in detail Reason(s) for requesting changes
Assigned expert(s):	
Task history:	Working Papers and Information Papers Produced on the subject
Proposed solution:	Including amendments to the text, if feasible

DR/CP STATUS control sheet				
Event	Date	Status		Remark
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 Specification				Responsible:
discussion at PG/		Set to approved		
presentation to AST TF/ ...		Set to approved for application		
Additional DATES and comments				