*International Civil Aviation Organization*

**AERONAUTICAL TELECOMMUNICATION NETWORK IMPLEMENTATION COORDINATION GROUP – EIGHTH WORKING GROUP MEETING (ATNICG WG/8)**

Christchurch New Zealand
28 September – 1 October 2010

**Agenda Item 14: Other technical issues related to TCP/IP and ATN/OSI Interface**

# ASIA/PACIFIC ATN IPS ROUTER ICD DRAFT PROPOSAL

(Presented by Mark Brown (Japan))

**SUMMARY**

This working paper presents the framework of an Interface Control Document (ICD) for Internet Protocol Suite (IPS) routers in the Asia/Pacific ATN IPS backbone network. This paper was previously presented to the ATNICG/5 meeting in Kuala Lumpur, Malaysia, and is submitted to the ATNICG Working Group for its consideration.

## 1. Introduction

1.1 The Asia/Pacific Region is planning to establish an Internet Protocol Suite (IPS) ATN backbone network to support the ATS Message Handling System (AMHS) and future ground data communication applications. Each State or Organization in the ATN IPS backbone network (administrative domain) will operate one or more Autonomous Systems (AS) connected by IPS routers. In order to ensure interoperability, it is necessary to have a common standard for the interface between IPS routers. This working paper proposes the framework of an ICD for IPS routers with connections between administrative domains the Asia/Pacific ATN.

## 2. Interface Control Document

2.1 The attachment to this working paper is intended as a framework for an IPS router ICD. It is simply developed from the existing ATN OSI router ICDs, with interface requirements for layer 1, 2 and 3 of the OSI Basic Reference Model, and also references the Asia/Pacific ATN ICD Addressing Plan for AS Numbers and address prefixes. The format of prescriptive material is based on ICAO Doc 9880, with “shall” statements with which compliance is necessary to ensure interoperability, recommendations and notes.

2.2 The content of the ICD should be considered as tentative since it is incomplete and may need revision as operational experience is gained. Missing are recommended parameter values: e.g. PPP and BGP parameter values (including perhaps hop limit based on RFC 3682 *Generalised TTL Security Mechanism*), and an explicit functional requirements list (i.e. specification of which protocols and protocol options IPS routers should implement).

## 3. Recommendations and Conclusions

3.1 The meeting is invited to consider the attachment as a framework for the Asia/Pacific ATN IPS router ICD.

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**Attachment to ATNICG WG/8-WP/7**

# Asia/Pacific Interface Control Document for Aeronautical Telecommunication Network (ATN) IPS Routers

DRAFT

## EXECUTIVE SUMMARY

The Aeronautical Telecommunication Network (ATN) is a global inter-network that is being established to provide digital communications to satisfy the increasing telecommunication demands of air traffic service communication (ATSC).

The ATN is composed of a network infrastructure and applications that will provide global communication for ground-ground (G/G) and air-ground services. The ATN is based on two network protocol families: the International Organisation for Standardisation (ISO) Information Processing Systems Open Systems Interconnection (OSI) and the Internet Engineering Task Force (IETF) Internet Protocol Suite (IPS). The ATN OSI is used predominantly for air-ground applications, while the ATN IPS is used predominantly for ground-ground applications. The ATN network infrastructure includes backbone communication links, routers, and hosts/end systems. The ATN applications include *inter alia* context management (CM), controller-pilot data link communication (CPDLC) and air traffic service message handling system (AMHS).

The Asia/Pacific region is implementing ATN network services for both OSI and IPS to support regional and global ATS data communication services. This Interface Control Document (ICD) specifies the interface requirements for the sub-network, routed and routeing protocols of the IPS routers that form nodes of the Asia/Pacific regional ATN IPS backbone network and/or have inter-State connectivity, to ensure interoperability between States.

# 1. INTRODUCTION

## 1.1 Purpose and Scope

This document provides interface control guidelines and requirements for IPS routers that form nodes of the Asia/Pacific regional ATN IPS backbone network and/or have inter-State/organisation connectivity within the Asia/Pacific region to ensure interoperability.

The scope of this ICD is shown in Figure 1-1. This ICD addresses the network layer of the IPS router using the ISO OSI Basic Reference Model. These ICD guideline provisions comprise IPS router functional requirements relevant to the ATN IPS routed protocol (IETF RFC 2460 IPv6) and routeing protocol (IETF RFC 4760 Multiprotocol Extensions for BGP-4, also referred to as BGP4+). This document is based on ICAO Doc. 9896 Edition 1.

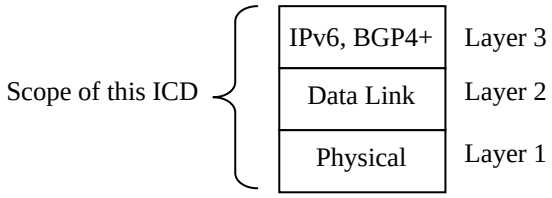


*Figure 1-1 IPS Router Protocol Stack and Scope of this Document*

## 1.2 Document Structure

This document is structured as follows:

- **Section 1, Introduction**, summarises the contents of this document and reference documents.
- **Section 2, Autonomous System Number and IP Addresses**, specifies the AS number and IP address allocation for the autonomous systems.
- **Section 3, Network Description**, provides the layer 1, 2 and 3 requirements for interface between IPS routers.

The format of sections 2 and 3 is modelled on ICAO Doc 9880. These sections comprise numbered “shall” statements with which compliance is necessary to ensure interoperability and the security of the IPS network, recommendation statements and notes.

## 1.3 ATN Documentation Tree and Reference Documents

### 1.3.1 ATN Documentation Tree

Insert ATN Documentation Tree with IPS documents here

### 1.3.2 Documents

#### 1.3.2.1 Applicable Documents

The following documents, with specific editions and/or versions, contain requirements which, through reference in this text, constitute requirements of this document. The requirements for the Asia/Pacific Regional Router ICD for ATN IPS Router are found in the following documents:

[1] ICAO Doc. 9896 Manual for the ATN Using IPS Standards and Protocols, 1st Edition.
[2] IETF RFC 1661 The Point-to-Point Protocol, July 1994.
[3] IETF RFC 1662 PPP in HDLC-like Framing, July 1994.
[4] IETF RFC 1994 PPP Challenge Handshake Authentication Protocol (CHAP), August 1996.
[5] IETF RFC 2385 Protection of BGP Sessions via the TCP MD5 Signature Option, August 1998.
[6] IETF RFC 2439 BGP Route Flap Damping, November 1998.
[7] IETF RFC 2460 IPv6, December 1998.
[8] IETF RFC 4760 Multiprotocol Extensions for BGP-4, January 2007.
[9] IETF RFC 5072 IP Version 6 over PPP, September 2007.
[10] Asia/Pacific ATN IPS Addressing Plan.
[11] Asia/Pacific ATN BGP Routing Policy.
[12] Table ??? of the Asia/Pacific FASID.

#### 1.3.2.2 Supporting Documents

The following documents are supporting documents applicable to the Asia/Pacific ICD for ATN IPS Router. These documents do not form a part of this ICD and are not referenced within the document; however, these documents provide supporting background information for better understanding of this ICD.
1. ICAO Annex 10 – Volumes I and II, ??? Edition.
2. Asia/Pacific ATN IPS Routing Architecture.

## 2. AUTONOMOUS SYSTEM NUMBER AND IP ADDRESSES

### 2.1 General

2.1.1 The AS numbers and IPv6 address prefixes for the Autonomous Systems (AS) administered by States and Organisations in the Asia/Pacific ATN IPS network shall comply with [10].

# 3. NETWORK DESCRIPTION

## 3.1 Physical Layer

### 3.1.1 General

3.1.1.1 Links between IPS routers shall use point-to-point communication circuits.

*Note: The physical interface layer characteristics between the IPS router and the telecommunication circuit are based on mutual agreement between the AS administrator and its service provider.*

3.1.1.2 The signalling speed of the circuit shall be at least the value specified in [12].

## 3.2 Data Link Layer

### 3.2.1 General

3.2.1.1 The link layer (encapsulation) protocol between IPS routers shall be determined by mutual agreement between the corresponding AS administrators.

*Note: Possible protocols include Cisco HDLC and Point-to-Point Protocol PPP (IETF RFC 1661).*

***Recommendation:*** Protocol-based authentication, if available, should be used to authenticate the peers before the data link is used for communication. Use of authentication is by mutual agreement between the corresponding AS administrators.

### 3.2.2 Point-to-Point Protocol

#### 3.2.2.1 General

*Note 1: Point-to-Point Protocol (IETF RFC 1661) can be used to encapsulate multiple routed protocols over a communication link, and can provide authentication and compression.*

*Note 2: The following are interface guidelines and requirements when PPP is used for the link between IPS routers.*

3.2.2.1 PPP used over a point-to-point link shall use HDLC-like framing in compliance with IETF RFC 1662 PPP in HDLC-like Framing.

***Recommendation:*** Recommended PPP parameters are given in Table ?.

Table ? PPP Interface Parameters

3.2.2.2 The routed protocol (IPv6) shall be encapsulated over PPP in compliance with IETF RFC 5072 IP Version 6 over PPP.

#### 3.2.2.2 Authentication

*Note: Use of link layer authentication is by mutual agreement between the corresponding AS administrators.*

3.3.2.2.1 Authentication for PPP shall use the Challenge Handshake Authentication Protocol (IETF RFC 1994).

3.3.2.2.2 Authentication failures shall be notified to a systems management function.

## 3.3 Network Layer

### 3.3.1 Routed Protocol

3.3.1.1 The network layer routed protocol shall be compliant with IETF RFC 2460 (IPv6).

### 3.3.2 Routeing Protocol

#### 3.3.2.1 General

3.3.2.1.1 Inter-domain routeing between Autonomous Systems shall use Multiprotocol Extensions for BGP-4 compliant with IETF RFC 4760 to communicate IPv6 network layer reachability information (NLRI).

**Recommendation:** *Recommended BGP timer values are given in Table ?.*

Table ? Recommended BGP Timer Values

#### 3.3.2.2 Security

##### 3.3.2.2.1 Prefix Filtering

3.3.2.2.1.1 BGP prefix filtering shall be used to restrict the length of advertised and accepted NLRI as detailed in [11].

##### 3.3.2.2.2 BGP TCP MD5 Signature Option

**Recommendation:** *The BGP TCP MD5 signature option (IETF RFC 2385) should be used to protect BGP sessions.*

*Note 1: The BGP TCP MD5 signature option provides protection against a number of vulnerabilities, such as message insertion, deletion, and modification attacks, as well as man-in-the-middle attacks by outsiders.*

*Note 2: Use of BGP TCP MD5 signature option is by mutual agreement between AS administrators.*

3.3.2.2.2.1 When the BGP TCP MD5 signature option is used, authentication failures shall be notified to systems management.

### 3.3.2.3 Routeing Information Stability

*Note: Links that fail intermittently may cause instability of routeing information and large volumes of routeing traffic since changes in link status cause routeing update messages to be propagated through the network. It is desirable to suppress this so-called "route flapping" due to data link instability.*

**3.3.2.3.1** BGP route flap damping (IETF RFC 2439) shall be used.

**Recommendation:** *Recommended route flap damping parameters are given in Table ?.*

Table ? Recommended BGP Route Flap Damping Parameters