



**TENTH WORKING GROUP MEETING OF
AERONAUTICAL TELECOMMUNICATION NETWORK
IMPLEMENTATION CO-ORDINATION GROUP
(ATNICG WG/10)**



Jaipur, India, 26 - 29 September 2011

Agenda Item 5: IP Implementation Documents

**AISA/PAC ICD FOR
ATN GROUND-GROUND ROUTER**

IP SNDCF

(Presented by USA)

SUMMARY

This Working Paper presents the Draft ATN Ground-Ground Router Internet Protocol (IP) Sub-Network Dependent Convergence Function (SND CF) Interface Control Document (ICD).

This paper relates to:

Strategic Objectives:

A – Safety

C – Environmental Protection and Sustainable Development of Air Transport

Global Plan Initiatives:

GPI 22 – Communication Infrastructure

1. Introduction

1.1 The *Strategy for Implementation of ATN in the ASIA/PAC Region* calls for initially implementing AMHS Message Transfer Systems over an ATN/OSI network, which is running them over CLNP as the internetworking layer and X.25 point-to-point links as the sub-network layer.

1.2 The next step in the strategy is to begin deployment of an ATN/IPS network. In this step ATN/OSI router connections (running CLNP/IDRP) will be migrated from X.25 to IP sub-network connectivity. It is important to note that in this phase X.25 point-to-point connections will be migrated to IP point-to-point connections.

1.3 In the future, the plan is to eventually phase out the ATN ICS, at least for AMHS. In this case an AMHS MTA will operate using the ATN/IPS as specified in ICAO Doc 9880 section 3.2.2.2.3.

2. Discussion

2.1 ICAO has defined an Internet Protocol (IP) Sub-Network Dependent Convergence Function (SNDCF) in ICAO Doc 9880 which specifies provisions for running CLNP/IDRP over IPv4 or IPv6. But in the ICAO environment a fully meshed IP sub-network is assumed which includes support to carry parameters from the CLNP internetwork to the IP sub-network. The ASIA/PAC environment being initially point-to-point does not need to support internetworking parameters such as Priority, QOS, etc. at the sub-network layer.

2.2 The IP SNDCF ICD presented in this Working Paper is based on the ICAO defined IP SNDCF; however, parameters which do not apply on a point-to-point basis are profiled out which permits a simpler implementation until ASIA/PAC migrates to a fully meshed IP Internetwork running TCP over IP.

3. Action Taken by the Meeting

3.1 The meeting is invited to review and provide comments on the attached draft document.



International Civil Aviation Organization

Asia and Pacific Office

ASIA/PACIFIC

INTERFACE CONTROL DOCUMENT

FOR

**AERONAUTICAL TELECOMMUNICATION NETWORK
GROUND-GROUND ROUTER**

IP SNDCE

Draft First Edition – September 2011

EXECUTIVE SUMMARY

The Aeronautical Telecommunication Network (ATN) is a global inter-network that provides digital communications to satisfy the increasing telecommunication demands of air traffic service communication, aeronautical operational control, aeronautical administrative communication, and aeronautical passenger communication.

The ATN is composed of a network infrastructure and applications that provide the global communication for ground-ground (G/G) and air-ground services. The ATN network infrastructure includes ATN backbone communication links, ATN routers, and end systems. The ATN applications include among others context management (CM), controller-pilot data link communication (CPDLC) and air traffic service message handling service (ATSMHS).

The Asia/Pacific region is implementing an ATN network to support regional and global ATN services. This Interface Control Document (ICD) specifies the IP sub-network interface requirements for ATN G/G Boundary Intermediate Systems that form nodes of the Asia/Pacific ATN regional backbone network and/or have inter-State connectivity, to ensure interoperability between States. This ICD applies to point-to-point IP sub-network connections between Boundary Intermediate Systems.

1.0 Introduction

1.1 Purpose and Scope

This document provides Interface Control Document guidelines for IP sub-network connections used to communicate between the ATN Ground-Ground Routers that form nodes of the Asia/Pacific regional network Backbone and/or have inter-State/Organization connectivity within the Asia/Pacific region, to assure interoperability.

The scope of this ICD and its relationship to the ATN Router ICD and IP ICD is shown in Figure 1-1. This ICD addresses the sub-network layer of the ATN G/G router using the IP SNDCF specified in ICAO Doc 9880.

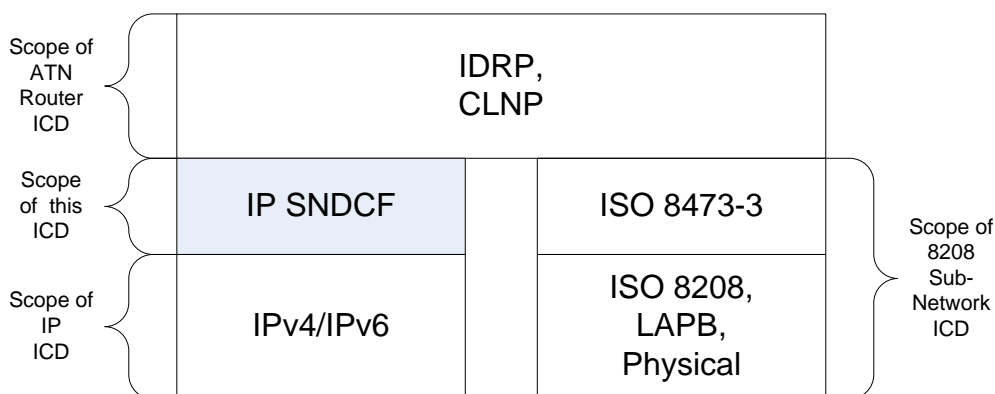


Figure 1-1: ATN Router Protocol Stack and Scope of this Document

1.3 Reference Documents

1.3.1 ICAO

[1] ICAO Doc 9880-AN/466 – Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols, Part III Chapter 3 – Internet Communications Service

1.3.2 ASIA/PAC

[2] ASIA/PAC Interface Control Document for Aeronautical Telecommunication Network Ground-Ground Router, Second Edition, April 2005

[3] ASIA/PAC Interface Control Document for Aeronautical Telecommunication Network Ground-Ground Router ISO/IEC 8208 Sub-Network, First Edition, April 2005

[4] ASIA/PAC Interface Control Document for the Internet Protocol, To Be Developed (TBD)

1.3.3 IETF

[5] RFC 1791, Internet Protocol – DARPA Internet Program Protocol Specification, September 1981

[6] RFC 2460, Internet Protocol, Version 6 (IPv6) Specification, December 1998

[7] RFC 2474, Definition of Differentiated Services Field (DS Field) in IPv4 and IPv6 Headers, December 1998

1.3.4 ISO/IEC

[8] ISO/IEC 8473-1, Information Technology – Protocol for providing the connectionless-mode network service: Protocol specification, 1994

[9] ISO/IEC 9542, Information processing systems – Telecommunications and information exchange between systems – End system to Intermediate system routing exchange protocol for use in conjunction with the Protocol for providing the connectionless-mode network service (ISO/IEC 8473), 1988

[10] ISO/IEC 10747, Information processing systems – Telecommunications and information exchange between systems – Protocol for exchange of inter-domain routing information among intermediate systems to support forwarding of ISO 8473 PDUs, 1994

2.0 IP SNDCF

The purpose of a Subnetwork Dependent Convergence Function (SNDCF) is to provide the connectionless SN-Service assumed by the ATN Internet Protocols over real sub-networks.

The ATN Internet Protocols which use the Subnetwork Service (SN-Service) provided by an SNDCF are the ISO/IEC 8473 Internetwork Protocol [8] and the ISO/IEC 9542 End System to Intermediate System Protocol [9] entities.

The Subnetwork Service (SN-Service) provided by an SNDCF as specified in this ICD is provided directly to the ISO/IEC 8473 Internetwork Protocol entity and indirectly to the ISO/IEC 10747 Inter-Domain Routing Protocol [10] entity.

Table 2-1 identifies the Subnetwork Services and Associated Parameters used Asia/Pac entities.

Table 2-1 SN-Services and Associated Parameters

Parameter	SN-UNITDATA Request	SN-UNITDATA Indication
SN-Source-Address	Mandatory	Mandatory
SN-Destination-Address	Mandatory	Mandatory
SN-Priority	Optional	Optional
SN-Quality-of-Service	Optional	Optional
SNS-Userdata	Mandatory	Mandatory

Asia/Pac is planning to use the IP SNDCF on a point-to-point basis and so requirement that might otherwise apply to an IP sub-network such as Priority and QOS do not apply. Table 2-2 contains a Point-to-Point Profile for the IP SNDCF.

Table 2-2 Point-to-Point Profile for the IP SNDCEF

Item	Function	Doc 9880 Reference	G-G Router Support
Title	Provision of the SN-UNITDATA.Request Service Element	3.7.10.3	
Title	Service Element Parameters	3.7.10.3.1	
	For IPv4, the SN-Source-Address and SN-Destination-Address parameters shall be 32-bit IP Addresses.	3.7.10.3.1.1	Yes
	For IPv6, the SN-Source-Address and SN-Destination-Address parameters shall be 16-octet IP Addresses.	3.7.10.3.1.2	Yes
	As a local matter, the SN-Source-Address shall either be used to indicate the SNPA from which the encapsulated PDU is to be sent, or set to a null value.	3.7.10.3.1.3	Either
	As a local matter, the SN-Quality-of-Service subparameters, if present, other than priority shall either be ignored by the IP SNDCEF, or used to determine the Differential Service Requirements for the encapsulating IP Packet header.	3.7.10.3.1.4	Ignored
	The priority subparameter of the SN-Quality-of-Service service parameter shall be used to determine the value of the Differentiated Service field indicated in the encapsulating IP Packet header as described in the procedures below.	3.7.10.3.1.5	No
	The SN-Userdata shall be an unconstrained octet-string (e.g. an encoded CLNP PDU including the CLNP header and user data).	3.7.10.3.1.6	Yes
Title	Procedures	3.7.10.3.2	N/A
Title	IPv4 Subnetworks	3.7.10.3.2.1	N/A
	When the IP SNDCEF SN-UNITDATA.Request service element is invoked, an IPv4 datagram shall be constructed with the SN-Userdata as the data portion of the datagram (the payload).	3.7.10.3.2.1.1	Yes
	The IP datagram header shall be constructed according to RFC 1791 [5]	3.7.10.3.2.1.2	Yes
	The protocol shall be set to decimal 80	3.7.10.3.2.1.2.a	Yes
	The source address shall be the IP Address assigned to	3.7.10.3.2.1.2.b	Yes

	the interface from which the packet is sent.																				
	The destination address shall be the SN-Destination-Address.	3.7.10.3.2.1.2.c	Yes																		
	The Time to Live shall be set to a locally specified value, which shall be configurable.	3.7.10.3.2.1.2.d	No																		
	The 3 topmost bits of the Differentiated Service Code Point (DSCP, former precedence subfield) of the Type of Service (TOS) field shall be set depending on the value of the priority subparameter of the SN-Quality-of-Service service parameter, as follows: <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">IP Precedence</td> <td style="width: 50%;">CLNP Priority</td> </tr> <tr> <td>000</td> <td>0,1,2,3,4,5</td> </tr> <tr> <td>001</td> <td>6,7</td> </tr> <tr> <td>010</td> <td>8,9</td> </tr> <tr> <td>011</td> <td>10</td> </tr> <tr> <td>100</td> <td>11,12,13</td> </tr> <tr> <td>101</td> <td>14</td> </tr> <tr> <td>110</td> <td>N/A</td> </tr> <tr> <td>111</td> <td>N/A</td> </tr> </table>	IP Precedence	CLNP Priority	000	0,1,2,3,4,5	001	6,7	010	8,9	011	10	100	11,12,13	101	14	110	N/A	111	N/A	3.7.10.3.2.1.2.e	No
IP Precedence	CLNP Priority																				
000	0,1,2,3,4,5																				
001	6,7																				
010	8,9																				
011	10																				
100	11,12,13																				
101	14																				
110	N/A																				
111	N/A																				
	As a local matter, the remaining Differentiated Service bits shall be set to correspond to the SN-Quality-of-Service parameter or to a locally specified default value.	3.7.10.3.2.1.2.f	No																		
	The last two bits of the TOS field (i.e. bits 6 and 7), shall be set to zero.	3.7.10.3.2.1.2.g	No																		
	The resulting IP datagram shall be forwarded to its addressed destination on the IP Network.	3.7.10.3.2.1.3	Yes																		
Title	IPv6 Subnetworks	3.7.10.3.2.2																			
	When the IP SNDCF SN-UNITDATA.Request service element is invoked, an IPv6 header shall be constructed with the SN-Userdata as the payload of the complete datagram.	3.7.10.3.2.2.1	Yes																		
	The IP datagram header shall be constructed according to RFC 2460 [6]	3.7.10.3.2.2.2	Yes																		
	The Next Header field shall be set to decimal 80 unless extension headers are present, when the Next Header field of the final header shall be set to decimal 80.	3.7.10.3.2.2.2.a	Yes																		
	The source address shall be the IP Address assigned to	3.7.10.3.2.2.2.b	Yes																		

	the interface from which the packet is sent.		
	The destination address shall be the SN-Destination-Address.	3.7.10.3.2.2.2.c	Yes
	The Hop Limit shall be set to a locally specified value, which shall be configurable.	3.7.10.3.2.2.2.d	No
	The Flow Label shall be set to zeroes.	3.7.10.3.2.2.2.e	Yes
	The Traffic Class shall be set according to RFC 2474 [7]. The value of the first six bits (the DSCP) shall be set to the value xxx000, where the bits 'xxx' are set depending on the value of the priority subparameter of the SN-Quality-of-Service service parameter and according to Doc 9880 (i.e. they are set to the value of the precedence bits in Doc 9880).	3.7.10.3.2.2.2.f	No
	The last two bits of the Traffic class shall be set to zero.	3.7.10.3.2.2.2.g	No
Title	SN-UNITDATA.Indication Service Element	3.7.10.4	
Title	IPv4 Subnetworks	3.7.10.4.1	
	The system shall be configured such that IP packets with a protocol id of 80 are passed to the IP SND CF.	3.7.10.4.1.1	Yes
	All IP Datagrams passed to the IPv4 SND CF by the IP Network Service provider shall result in an SN-UNITDATA.Indication, constructed as follows	3.7.10.4.1.2	Yes
	The SN-Source-Address shall be set to the value of the source address field of the IP Datagram header.	3.7.10.4.1.2.a	Yes
	The SN-Destination-Address shall be set to the value of the destination address field of the IP Datagram header.	3.7.10.4.1.2.b	Yes
	The SN-Userdata shall be the data portion of the IP datagram.	3.7.10.4.1.2.c	Yes
	No SN-Quality-of-service parameter shall be present.	3.7.10.4.1.2.d	No
Title	IPv6 Subnetworks	3.7.10.4.2	
	The system shall be configured such that IP packets with a next header byte for the payload set to 80 are passed to the IP SND CF.	3.7.10.4.2.1	Yes
	All IP Datagrams passed to the IPv6 SND CF by the IP Network Service provider shall result in an SN-UNITDATA.Indication, constructed as follows	3.7.10.4.2.2	Yes
	The SN-Source-Address shall be set to the value of the	3.7.10.4.2.2.a	Yes

	source address field of the IPDatagram header.		
	The SN-Destination-Address shall be set to the value of the destination address field of the IPDatagram header.	3.7.10.4.2.2.b	Yes
	The SN-Unitdata shall be the payload of the IP datagram.	3.7.10.4.2.2.c	Yes
	No SN-Quality-of-service parameter shall be present.	3.7.10.4.2.2.d	No
Title	ICMP Message Handling	3.7.10.5	
	If a “Destination Unreachable” or “Time Exceeded” ICMP message is received by the IP SNDCEF, this should be reported to a layer management function indicating the destination IP Address for which the problem is reported, so that appropriate action may taken.	3.7.10.5.1.1	Yes
	An ICMP message indicating a “Parameter Problem” may indicate a software or configuration error and this should be notified to layer management so that the error is noted and fixed by a network manager.	3.7.10.5.1.2	Yes
Title	Resilient Operation	3.7.10.6	
	When it has more than one interface to an IP network, an ATN system implementing the IP SNDCEF shall rely upon the configuration, topology and management of an underlying IP Subnetwork, including IP functions implemented by the ATN system itself, in order to support resilient operation.	3.7.10.6.1	Yes
	Even if the ATN system has more than one interface to the IP network, a single IP address shall be used to support an adjacency with a given remote BIS.	3.7.10.6.2	Yes