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 7: Develop IP routing policy, review addressing plan

ASIA/PACIFIC IPV6 ADDRESSING PLAN PROPOSAL

(Presented by Mark Brown (Japan))

SUMMARY

This paper proposes IPv6 address assignment conventions for use in the Asia/Pacific regional ATN/IPS network.

1. Introduction

1.1 Overview

1.1.1 This information paper proposes IPv6 address assignment conventions for use in the Asia/Pacific regional ATN/IPS network.

1.1.2 This IP was originally presented as a working paper to the Fifth Meeting of the ATNICG in Kuala Lumpur. It was decided at that meeting to propose the IPv6 address plan to the Aeronautical Communications Panel, as adopted in Draft Conclusion 5/1, in order to seek clarification of the IPv6 addressing scheme to be used in ground-ground communication. This was reflected in Draft Conclusion 14/2 at the CNS/MET-SG/14 meeting. The addressing plan proposal is again presented to the ATNICG Working Group for information.

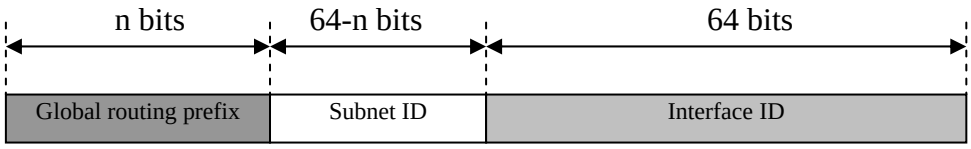
1.2 References

[1] ICAO Doc 9896 *Manual for the ATN using IPS Standards and Protocols*, Edition 1.
[2] RFC 4291 *IP Version 6 Addressing Architecture*.
[3] RFC 3177, *IAB/IESG Recommendations on IPv6 Address Allocation to Sites*.
[4] ICAO Doc 9880 *Manual on Detailed Technical Specifications for the Aeronautical Telecommunication Network (ATN) using ISO/OSI standards and protocols*, Edition 1.
[5] ACP-WG I-07/WP-02 *Draft ICAO IPv6 Addressing Plan*.
[6] *Asia/Pacific ATN Network Service Access Point (NSAP) Addressing Plan*, Second Edition, March 2004.

2. Basic Address Format

2.1 Global Unicast IPv6 Address Format

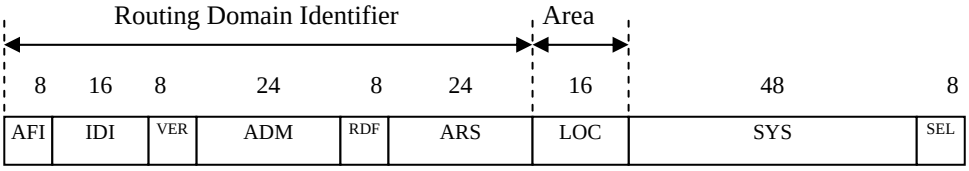
2.1.1 ICAO Doc 9896 [1] §2.3.3.1 stipulates that IPS nodes shall implement the IP Version 6 Addressing Architecture as specified in RFC 4291 [2]. The global unicast IPv6 address format has three fields: a Global Routing Prefix, a Subnet ID and an Interface ID, as shown below.



- The Global Routeing Prefix is allocated by the RIRs (Regional Internet Registry) and ISPs (Internet Service Provider). RFC 3177 recommends that the prefix allocated to a site/organisation by a provider should be at least a /48 prefix [3].
- The Subnet ID is the identifier of the subnet within the site/organization
- The Interface ID is a modified EUI-64 format that identifies the interface on a host.

2.2 ATN NSAP/NET Address

2.2.1 The format of the ATN NSAP/NET address is defined in ICAO Doc 9880 Part II Chapter 3 [4]. The NSAP/NET address has a total length of 20 octets as shown below.



2.2.2 The most significant 88 bits (11 octets) of the NSAP/NET (from the AFI to the ARS field) identify the routeing domain (RD) or routeing domain confederation (RDC). The LOC field identifies an area within an RD/RDC. The least significant 56 bits (7 octets) of the NSAP/NET (the SYS and SEL fields) serve to identify the system and an entity within the system. The SYS field corresponds roughly to the interface ID in the IPv6 address, while the SEL field is used to identify an Intermediate System (SEL=00) or a network service user within an End System. In the Internet Protocol Suite this corresponds to a UDP or TCP port number [5].

2.2.3 The values of the AFI, IDI, VER, RDF fields and the first octet of the ADM field are specified in Doc 9880. In the Asia/Pacific ATN, the allocation of the lower two octets of the ADM field, the ARS field and the LOC field are specified in the Asia/Pacific NSAP/NET Addressing Plan [6].

3. IPv6 Addressing Plan

3.1 Global Routeing Prefix

3.1.1 The first five octets of the NSAP/NET (AFI field to the first octet of the ADM field) can be considered as corresponding to the RIR-allocated Asia/Pacific regional global routing prefix in the IPv6 address. No special consideration is necessary for mobile users or non-ATSC users. Reasons are as below.

(i) The AFI and IDI fields of the NSAP/NET serve to identify the ICAO ATN address space.

(ii) The VER field of the NSAP/NET is used to discriminate fixed and mobile, ATSC and AINSC domains. In the IPv6 address architecture, we make the following two assumptions:

- In the IPv6 address plan in Doc 9896 §2.2.3, mobiles users make use of a /32 prefix allocated to mobility services providers (MSP), and therefore the distinction between fixed and mobile domains does not have to be considered in the Asia/Pacific IPv6 address architecture.
- AINSC organisations will obtain their own global routing prefixes, and so the distinction between ATSC and AINSC does not have to be considered in the Asia/Pacific IPv6 address architecture.

(iii) The first octet of the ADM field corresponds to the ICAO region for fixed ATSC domains.

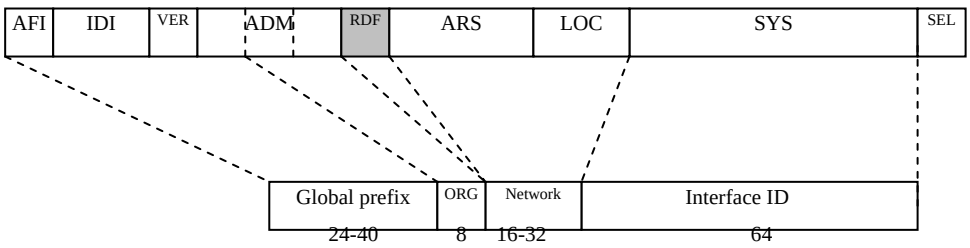
3. 2 Subnet ID

3.2.1 Subnet ID Field Allocation

3.2.1.1 The length of the Subnet ID of the Asia/Pacific IPv6 address will depend on the length of the global routeing prefix obtained from the RIR. It is supposed that this could range from a /24 prefix in the best case to a /40 in the worst case, giving a Subnet ID length of 3–5 octets.

3.2.1.2 The Subnet ID field maps to the lower two octets of the ADM field to the LOC field of the NSAP/NET address. The RDF field of the NSAP/NET is set to 00 and is unused, so this means that 7 octets in the NSAP/NET has to fulfil the same role as 3–5 octets in the IPv6 address.

3.2.1.3 It is recommended that the Subnet ID be divided into a State/Organisation ID (ORG) field and a Network ID field, as shown below.



3.2.2 State / Organisation ID

3.2.2.1 Each state/organization is a separate Autonomous System (AS) in the ATN/IPS network. In the Asia/Pacific NSAP/NET Addressing Plan, the state/organization is indicated by the lower two octets of the ADM field. However, this is inefficient use of address space, and it is recommended that eight bits be used for a State/Organization identifier (ORG) field to identify the state/organization administrative domain.

3.2.2.2 Each state/organization will also require an Autonomous System Number (ASN). It is recommended that the ASNs published in ICAO Doc 9896 Edition 1 be used for ICAO contracting states.

2.3.3.3 It is proposed that the ICAO regional office should be allocated a separate State/Organization ID since it may host resources on behalf of the region. A separate ASN number will have to be acquired for the Asia/Pacific regional office domain. This should be coordinated through ICAO headquarters.

3.2.2.4 Table 1 is a list of proposed ORG field values, the corresponding State/Organization and the ASN numbers. Only six bits are required to serve the needs of ATSC users. It is recommended that the top two bits be reserved, e.g. for discriminating between ATSC and non-ATSC domains or fixed and mobile domains if it becomes necessary.

3.2.3 Network ID

3.2.3.1 The Network ID is used for subnetting within the State/Organization. The length of this field will vary from 2 to 4 octets depending on the length of the regional global routing prefix.

3.2.3.2 The assignment of the Network ID field is the responsibility of the State/Organization identified by the ORG field. The Network ID field shall be assigned in a manner that simplifies the routing of data and makes provision for any potential lower level organizational units that could, in the future, operate an ATN IPS Routing Domain. The assignment of the Network ID field could follow the recommendations for the ARS and LOC fields in the Asia/Pacific NSAP Addressing Plan.

3.3 Assignment Authority

3.3.1 The responsibility for the assignment of values to each of the IPv6 address fields is held by only one organization. This is to ensure that each IPv6 address is unique within the ATN. Table 2 identifies which organization is responsible for the assignment of each field.

Table 1 Proposed State/Organization-ID and ASN

ORG (hex)	Country / Organization	ASN
00	Reserved	-
01	ICAO Asia/Pacific regional office	TBD
02	American Samoa	64513
03	Australia	64520
04	Bangladesh	64522
05	Bhutan	64527
06	Brunei Darussalam	64533
07	Cambodia	64536
08	China	64544
09	Cook Islands	64547
0A	Democratic People's Republic of Korea	64551
0B	Democratic Republic of Timor-Leste	64553
0C	Easter Island (Chile)	64557
0D	Guam (U.S.)	64570
0E	Hong Kong Special Administrative Region of China	64578
0F	Iles Wallis Et Futuna (France)	64579
10	India	64580
11	Indonesia	64581
12	Japan	64586
13	Johnston I. (U.S.)	64587
14	Kingman Reef (U.S.)	64591
15	Kiribati	64592
16	Lao People's Democratic Republic	64595
17	Macao Special Administrative Region of China	64600
18	Malaysia	64603
19	Maldives	64604
1A	Mariana Is. (U.S.)	64606
1B	Marshall Islands	64607
1C	Micronesia, Federated States of	65240
1D	Midway Is. (U.S.)	65241
1E	Mongolia	65242
1F	Myanmar	65245
20	Nauru	65247
21	Nepal	65248
22	New Caledonia	65250
23	New Zealand	65251
24	Niue Island (New Zealand)	65255
25	Palau	65258
26	Palmyra Is. (U.S.)	65260
27	Papua New Guinea	65262
28	Philippines	65265
29	Pitcairn Island (U.K.)	65266
2A	Polynesie Francaise	65267
2B	Republic of Korea	65270
2C	Republic of the Fiji Islands	65271
2D	Samoa	65276
2E	Singapore	65282

2F	Solomon Islands	65283
30	Sri Lanka	65286
31	Thailand	65291
32	Tonga	65293
33	Tuvalu	65296
34	Vanuatu	65303
35	Viet Nam	65304
36	Wake I. (U.S.)	65307
37-3F	Unallocated	-
40-FF	Reserved	-

Table 2 IPv6 Address Field Assignment Responsibility

IPv6 Address Field		Assignment Authority
Global routeing prefix		IANA / RIR
Subnet ID	ORG	ICAO Asia/Pacific regional office
	Network ID	States or Organizations identified by the ORG field.
Interface ID		States or Organizations

– – – – – – – – – –