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AERONAUTICAL TELECOMMUNICATIONS NETWORK PANEL WORKING GROUP 2

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Draft Defect Reports and Change Proposals

Related to ATN Addressing

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SUMMARY

This paper presents three draft defect reports and change proposals to the current version of the ATN draft SARPs related to ATN Addressing.

1. Introduction

During the first meeting of ATNP WG2 the working group agreed on two actions with respect to ATN addressing (WG2-12 and WG2-13). During the review of the existing ATN Draft SARPs material on ATN addressing in response to these actions, several deficiencies have been identified and change proposals are made. These are proposed as draft defect reports and not as formal defect reports in order to allow a broader recognition and greater discussion prior to be raised in the formal CCB process.

2. Draft Defect Report on Section 7.2.4 "Reference Publication Format"

2.1. Problem Description

The current text in section 7.2.4 "Reference Publication Format" is taken from ISO 8348, Annex A, clause A7 but without an example given. It describes the Reference Publication Format (RPF) for OSI NSAP addresses in general, i.e. also for non-ATN NSAP addresses. The description of those cases, where the DSP part is null, is not relevant for the ATN and should be deleted. An example of an RPF for an ATN NSAP address should be included to make the whole para conceivable.

If the current text in section 7.2.4 is followed, an example for an RPF of an ATN NSAP address would be:

470027+8144455501465241445300000A12C3701

This does really not look very suitable. An unstructured sequence of 34 hexadecimal digits to represent the 17 octets DSP provokes misunderstandings and typing errors. Remember: The RPF *exists to facilitate* unambiguous representation of NSAP addresses in both written and oral communication!

2.2. Change Proposal

It is proposed to have a more structured Reference Publication Format for ATN NSAP addresses and to separate each address filed of the IDP and the DSP by a slash. It is therefore proposed to modify section 7.2.4 as follows:

Note: The following text parts are taken from ATN Manual version 2 files. Modifications are indicated by a vertical line on the left hand side. Replaced text is struck off. Added text is underlined.

-- *editor's note: begin of proposed text* --

7.2.4 Reference Publication Format

The Reference Publication Format (RPF) has been defined to facilitate unambiguous representation of NSAP Addresses in both written and oral communication. According to ISO 8348 Annex A, the RPF It consists of a string of decimal digits which is the direct representation of the IDP, followed by the symbol "+", followed by a string of hexadecimal digits in which a pair of hexadecimal digits is used to represent the numeric value of each binary octet in the preferred binary encoding of the DSP. In the case in which the DSP part of the NSAP Address is null, the RPF consists only of the string of decimal digits representing the IDP; the symbol "+" is not present. For the representation of ATN NSAP addresses, each address field of the IDI and each address field of the DSP is separated by a slash.

For example, the written inscription of the RPF for an ATN NSAP address with an AFI value of 47, an IDI value of 0027, and a binary-syntax DSP value of 1000 0001 0100 0100 0100 0101 0101 0101 0000 0001 0100 0110 0101 0010 0100 0001 0100 0100 0101 0011 0000 0000 0000 0000 0000 0000 1010 0001 0010 1100 0011 0111 0000 0001 would be:

47/0027+81/444555/01/465241/4453/000000A12C37/01

-- *editor's note: end of proposed text* --

3. Draft Defect Report on Appendix 7 "NSAP Address Format and Address Fields"

3.1. Problem Description

The current specification of the NSAP structure in Appendix 7 does not allow to build a common NSAP address prefix for the Fixed ATN RDC. However, a major design objective of the fixed ATN RDC *is* the use of a common NSAP address prefix for route advertisement to mobile systems, as may be recalled from section 6.7.5 and A6.2.2.3 (see below):

< Note in A6.2.2.3: The fixed ATN RDC enables a ground BIS to advertise a route to a mobile, the destination of which is the entire fixed ATN, without having to enumerate the RDIs of all ATN RDs.>

< 6.7.5, last para, 4th phrase: The Fixed ATN RDC exists to ensure that only minimal path information is sent to Mobile RDs over limited-throughput subnetworks. >

In the current ATN NSAP structure a fixed ATN RD is identified by the RDF field value "01". Unfortunately, this field is preceded by the VER field (1octet) and the ADM field (3 octets). There may be at least two different values in the VER field for AISC and ATSC NSAP address versions and probably a very large number of different values in the ADM field, e.g. one value for each airline and each national CAA!

To advertise a route to the fixed ATN RDC comprising all fixed RDs would impose to aggregate NSAP prefixes with every existing value in the VER field and every existing value in the ADM field (assuming that "wild cards" are not possible in NSAP address fields). This could rather be a large number of NSAP prefixes, which would all have to be sent via air-ground data link just to inform a mobile system where the ground ATN is!

3.2. Change Proposal

Modify the NSAP structure to enable common NSAP prefixes to be built for the fixed ATN RDC:

1. Replace the RDF field (1 octet)
2. Modify the value ranges in the VER field as follows:

01	version 1 of **AISC** NSAP address for **fixed** RDs
02-3F	future versions of **AISC** NSAP address for **fixed** RDs
41	version 1 of **AISC** NSAP address for **mobile** RDs
42-7F	future versions of **AISC** NSAP address for **mobile** RDs
81	version 1 of **ATSC** NSAP address for **fixed** RDs
82-BF	future versions of **ATSC** NSAP address for **fixed** RDs
C1	version 1 of **ATSC** NSAP address for **mobile** RDs
C2-FF	future versions of **ATSC** NSAP address for **mobile** RDs

3. Specify 3 octets (instead of 2 octets) for the LOC field to keep the total 20 octets NSAP length

Note: A three octets LOC field would have the advantage that ICAO and IATA location indicators could be used as routing area identifiers. LOC field values could be derived from the IA5 encoded 3 character IATA or ICAO location designator, in the same way like recommended for the ARS field.

Note: With the proposed solution two NSAP prefixes would be sufficient (assuming that only one NSAP version exists) to advertise a route to

- *the fixed ATN comprising all fixed RDs,*
- *the ATSC RDC comprising all ATSC RDs,*
- *the AISC RDC comprising all AISC RDs.*

3.3. Impacts

If this change proposal is adopted and the NSAP structure is modified, the address compression algorithm specified in Chapter and Appendix 10 must be revised accordingly.

4. Draft Defect Report: Consolidation of Section 5.5 and Chapter 7

4.1. Problem Description

There is a big overlap between current text in Section 5.5 "Naming and Addressing Model" and Chapter 7! Besides that, there is no requirement specification in appendix 5 which would correspond to the guidance text in section 5.5.

The following technical items are addressed in both section 5.5 and chapter 7:

technical item	*section 5.5 reference*	*chapter 7 reference*
TSAP selector	5.5.1.1	7.8
NSAP address	5.5.1.2	7.1.1, 3rd para and 7.1.2
NSAP address assignment, addressing domains and authorities	5.5.1.3	7.1.3 and 7.2 and 7.5 and 7.6
NSAP address prefixes	5.5.1.4	7.6
Network Entity Title (NET)	5.5.2	7.1.1, last para
Routing Domain Identifier (RDI)	5.5.3	7.1.1, last para
SNPA address	5.5.4	7.1.1, 4th para

4.2. Change Proposal

It is proposed to reduce the guidance text of section 5.5 to a minimum, i.e. that only general aspects of the ATN addressing model and in particular the text concerning the presentation address remains there and to move all guidance material concerned with network and transport layer addressing to chapter 7. Furthermore, it is proposed to consolidate the text moved from section 5.5 with the chapter 7 text, where the same technical item is addressed. The proposed modifications are summarised in the table below and described in the following:

technical items	*section 5.5 reference*	*chapter 7 reference*	*change proposal*
NSAP address, NSAP address prefixes, Network Entity Title, Routing Domain Identifier, SNPA Address	5.5.1.2 / 5.5.1.4 / 5.5.2 / 5.5.3 / 5.5.4	7.1.1 / 7.1.2	Remove section 5.5.1.2, section 5.5.1.4, section 5.5.2, section 5.5.3 and section 5.5.4 and modify section 7.1.1 and 7.1.2 as proposed hereafter
NSAP address assignment, addressing domains and authorities	5.5.1.3	7.1.3	Remove section 5.5.1.3 and modify section 7.1.3 as proposed hereafter
TSAP Selector	5.5.1.1	7.8	Remove section 5.5.1.1 and modify section 7.8 as proposed hereafter

Note: The following text parts are taken from ATN Manual version 2 files. Modifications are indicated by a vertical line on the left hand side. Replaced text is struck off. Added text (most of it is taken from original section 5.5 text) is underlined.

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7.1.1. Network Layer Naming and Addressing

The OSI model (ISO 7498-3) distinguishes the concepts of *Name* and *Address*.

A *Name* is something that uniquely and unambiguously identifies an object (primitive name), or a set of objects (descriptive name).

An *Address* is also a Name, but further identifies where an object is located in networking terms.

Although the term Network Address is used in this Manual as the address which identifies a Network Service User, this term is generally viewed as ambiguous, as it can mean either the address of the Network Service User in the OSI sense, or the Network Service User in the X.25 sense (i.e., a DTE Address). For such reasons, the term *NSAP Address* is used instead.

7.1.1.1 NSAP Address

The ISO Network service definition describes the point within the ISO Protocol Architecture at which global end-users may be uniquely addressed on an end-to-end basis. This point is referred to as the *Network Service Access Point* (NSAP). The ISO 8348 standard defines the associated addressing format as the *NSAP Address*.

The NSAP is the logical "socket" through which the OSI Network Service is made available to a Network Service user by a Network Service provider. An NSAP Address identifies a Network Service Access Point (NSAP), i.e. the NSAP address is the address of the Network Service User that accesses the OSI Network Service through that NSAP.

NSAP Addresses must be globally unique, if ESs are to be unambiguously located. NSAP Addresses are generally independent of subnetwork addresses such as X.25 DTE Addresses, Ethernet MAC Addresses etc., which have only significance within the subnetwork environment.

It is also worth noting that while NSAP Addresses may *influence* the route an NPDU addressed to the NSAP will take, the NSAP address cannot unequivocally *determine* the route. This is not to say that NSAP Addresses are not used by routing; however, the network layer relaying and routing functions are free to determine the most appropriate route to a given NSAP regardless of how the NSAP Address is expressed.

Network service users cannot derive routing information from an NSAP address. They cannot dictate any particular choice of route by means of the source and destination addresses specified in the protocol data unit. However, it is recognized that NSAP addresses should be constructed in such a way that routing through interconnected subnetworks is facilitated.

7.1.1.2 SNPA Address

~~On the other hand, t~~The term Subnetwork Point of Attachment (SNPA) Address is used for the address which identifies the user of a specific subnetwork. The *MAC Addresses* used by Ethernets, and the *X.25 DTE Address* are both examples of SNPA Addresses.

ATN systems make use of both NSAP and SNPA addresses during the process of routing NPDUs, performing address resolution among global NSAP addresses and local SNPA addresses using information stored in local routing tables. There is no uniform ATN SNPA address format. The SNPA addressing structure may be optimized for the particular subnetwork of interest, allowing a wide variety of subnetwork types to be accommodated within the ATN. ATN ISs are responsible for building and maintaining tables of correspondence between NSAP addresses and SNPA addresses within their local environment.

7.1.1.3 Network Entity Title

~~Finally, n~~Network layer entities need to have unique names, and these names are known as Network Entity Titles (NETs). The NET is the name of a Network Entity contained in an ES or IS, and is also its address. NETs are assigned from the same Addressing Domain as NSAP Addresses.

A system may comprise multiple Network Entities, in which case each will be identified by a unique NET. For example, a NET may be the name and the address of the IDRP protocol machine in a BIS and can thus be used to find the BIS.

7.1.1.4 Routing Domain Identifier

~~A Routing Domain Identifier (RDI) is an NET, as is the name of the IDRP protocol machine in a BIS. In the latter case, this NET is also an address, as it can be used to find the BIS. However, an RDI is never an address as, in general, a Routing Domain has no physical location.~~

Each Routing Domain or Routing Domain Confederation is unambiguously identified by a unique Routing Domain Identifier (RDI). An RDI is a generic NET as described in ISO 7498, and is assigned statically in accordance with ISO 8348. An RDI is never an address as, in general, a Routing Domain or Routing Domain Confederation has no physical location, and cannot be used as a valid destination of an ISO 8473 PDU. However, RDIs are, like ordinary NETs, assigned from the same Addressing Domain as NSAP Addresses

7.1.1.5 NSAP Address Prefix

In order to simplify the overhead of routing, OSI routing protocols typically communicate NSAP Address Prefixes rather than full NSAP Addresses or NETs. As the name implies, an NSAP Address Prefix consists of the first 'n' digits of an NSAP Address, and serves to identify all NSAP Addresses to which it is a prefix. A prefix may have a length that is either smaller than, or the same size as a NSAP full length address (in which case it identifies a single entity). The smaller the prefix, the larger the group of systems it identifies.

All Systems within the same Routing Area have the same NSAP Address Prefix, with aliases permitted. This NSAP Address Prefix is known as the Area Address. Typically, the Area Addresses within the same Routing Domain also share a (shorter) NSAP Address Prefix, and hence all systems within a Routing Domain can have the same NSAP Address Prefix.

7.1.2. NSAP Address Hierarchy~~Network Service Access Point Addressing~~

~~The ISO Network service definition describes the point within the ISO Protocol Architecture at which global end-users may be uniquely addressed on an end-to-end basis. This point is referred to as the *Network Service Access Point* (NSAP). The ISO 8348 standard defines the associated addressing format as the *NSAP Address*.~~ The ISO NSAP Address is essentially a hierarchically organized global address, supporting international, geographical and telephony-oriented formats by way of an address format identifier located within the protocol header. Although the top level of the ISO NSAP address hierarchy is internationally administered by ISO, subordinate *address domains* are administered by the appropriate local organizations.

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7.1.3. NSAP Address Authorities and Domains

The ISO NSAP addressing plan is based on two important principles; co-operating address authorities and hierarchical address domains. An *address authority* defines formats and/or values of NSAP addresses within its jurisdiction. (Note that an address authority may be a document, an organization, or any other entity capable of address definition.) An *address domain* is a set of address formats and values administered by a single address authority. Under the ISO plan, any address authority may define *sub-domains* within its own domain, and delegate authority within those sub-domains.

In principle, all OSI NSAP Addresses and NETs are assigned from the same address space known as the *Global Network Addressing Domain*. They can thus be guaranteed unique in the OSI environment (OSIE). However, to simplify allocation, there is no single global OSI Addressing Authority. Instead, the standard partitions this single address space into a number of addressing sub-domains, each with an identified Addressing Authority. Each Addressing Authority is then responsible for their own addressing subdomain. This approach is reflected in the syntax of the NSAP Address.

A *'Network Addressing domain'* is a subset of the global addressing domain consisting of all the NSAP addresses that are assigned under the control of a single addressing authority. The uniqueness of NSAP Addresses within a network addressing domain is then ensured by an authority associated with that domain. A Network addressing domain is characterized by the addressing authority that administers the domain and the rules that are established by that authority for specifying identifiers and identifying sub-domains. The authority responsible for administrating a domain determines how NSAP Addresses will be assigned and interpreted within that domain, and how any further sub-domains will be created. Each Network Addressing domain may then, at the Addressing Authority's discretion, be further subdivided into addressing sub-domains, each with its own subordinate addressing authority.

Note that an Addressing Subdomain is not the same as a Routing Domain, Administrative Domain, Security Domain or Management Domain, although in many cases, it may coincide with one or more of these.

The conceptual structure of NSAP addresses follows the principle that, at any level of the hierarchy, an initial part of the address unambiguously identifies a subdomain, and the rest is allocated by the authority associated with that subdomain to unambiguously identify either a lower level subdomain or an NSAP within the domain.

ATN NSAP addresses are based on this concept of hierarchical addressing domains. The ATN Network Layer addressing scheme for the assignment of NSAP Addresses, is based on ISO 8348, which assigns all NSAP Addresses from the single 'global network addressing domain'.

Three levels of address domains are defined in ISO 8348, where the ISO global domain is denoted *Level 1*. Domains categorized as *Level 2* include:

Four PTT and RPOA domains (CCITT E.163, E.164, X.121, F.69)

ISO Geographic (ISO Data Country Code, or DCC)

ISO International (ISO International Code Designator, or ICD)

Local (i.e., non-standardized)

The representation of the Level 2 domain is expressed as two decimal digits, in the range **10-99**, allowing for considerable expansion. Codes **00-09** have been permanently reserved, and may not be used for NSAP addresses. These codes have been reserved to facilitate the transfer of non-NSAP addresses using protocol fields which normally carry NSAP addresses. This feature may also be used to transparently transfer a compressed NSAP address through a subnetwork. Each Level 2 domain is further divided into *Level 3* domains, as is appropriate. For example, Level 3 domains within the ISO DCC Level 2 domain represent individual countries, while Level 3 domains within the ISO ICD Level 2 domain represent international organizations (e.g., NATO, ICAO, etc.). The Network Addressing Domain Hierarchy is shown in Figure 7.2.

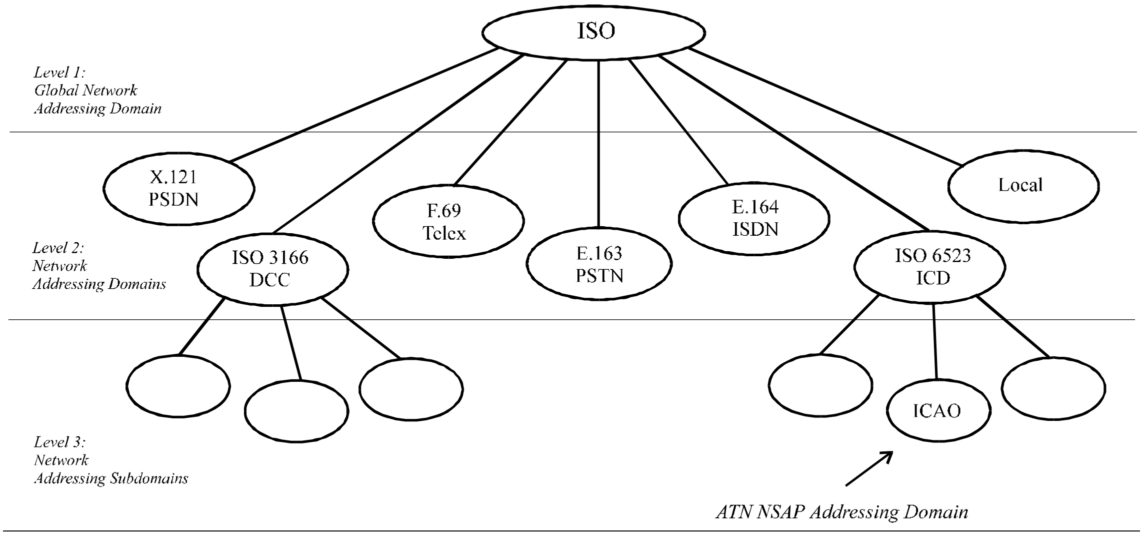

Figure 7.2: Network Address Domain Hierarchy

ICAO has registered with the relevant ISO authority and has been given a four digit *International Code Designator* (ICD). The ATN NSAP address is therefore of the ISO ICD format, and all ATN NSAP Addresses start with the six digit prefix which identifies ICAO as the addressing authority. The remainder of the NSAP Address is known as the *Domain Specific Part* (DSP). The syntax, semantics and rules for assignment of the fields of the ATN DSP are presented in the following sections.

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7.8. ATN ~~ISO OSI~~ Transport Layer Addressing

7.8.1. General

~~Note~~ This section provides guidance on the ATN ~~format of~~ transport service access point (TSAP) addresses~~s~~.

7.8.2. TSAP Address ~~Fields~~

In the ATN, a ~~A~~ TSAP address comprises two elements, the NSAP address and the TSAP selector. A TSAP address uniquely identifies a given transport user. The TSAP selector has a binary format, and supports a selector range of [0 - 65,535]. There is no standardised syntax or semantics associated with the value of a TSAP selector. ES Administrators may assign any convenient value.

Note 1. -- The TSAP selector field has local significance and uniquely identifies a transport user with respect to a particular transport protocol entity.

7.8.3. Transmission of TSAP Selectors

A TSAP Selector should be transmitted using the minimum number of octets required to represent the assigned value of the TSAP Selector. That is, a TSAP Selector in the range [0 - 255] should be transmitted using a single octet; a TSAP Selector in the range [256 - 65535] is transmitted using two octets.

Note.-- The TSAP Selectors are transmitted within the header of the CR and CC TPDUs for the connection mode transport protocol and within the header of the UD TPDU for the connectionless mode transport protocol.

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5. Recommendation

It is recommended that

- WG2 reviews and discusses the draft defect reports presented in section 2, 3 and 4 and makes a decision as to their correctness and appropriateness, and
- formal defect reports and change proposals are prepared as a result of the WG2 review.