AERONAUTICAL TELECOMMUNICATIONS NETWORK PANEL
WORKING GROUP 2

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Operational Requirements
Related to
ATN Network Layer and Transport Layer Addressing

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SUMMARY

This paper presents a list of operational requirements related to ATN Network and Transport Layer Addressing.

1. Introduction

At the first meeting of ATN Panel WG-2, an action item (WG2-13) has been identified to review, modify and enhance, where appropriate, operational requirements with respect to ATN Addressing. This paper complements and details the set of operational requirements presented in [REF_3], which have been derived from section 3 of [REF_4].

In addition, this paper contains operational requirements related to ATN addressing that are implicitly given in chapter 7 of the current version of the ATN draft SARPs. These requirements have been extracted and rephrased in order to give a precise and explicit expression of those requirements and are proposed for inclusion in the existing compilation of ATN User Requirements.

2. References

[REF_1]   ISO 8348, Draft Amendment 5: Group Network Addressing, 1993

[REF_2]   EUROCONTROL: ATC Radar Tracker and Server (ARTAS) Specification, version 2.2, 19 May 1993

[REF_3]   ATNP WG2 - WP69: Status Report on Progress of Actions, A. Herber, 20 January 1995

[REF_4]   ATNP WG2 - WP42: ATN Addressing, K. Platz, 30 September 1994

3. Definitions

Group Network Address: A Group Network Address is an address that identifies a set of zero or more NSAPs; these may belong to multiple network entities, in different endsystems [REF_1].

Individual Network Address: An Individual Network Address is an address that identifies a single NSAP [REF_1].

User Requirements: What users expect to obtain from the system (not how the system should do it).

Operational Requirements: What is required from the system in order to fulfil its foreseen role in the operational environment, which it shall support.

4. Additional Operational Requirements Related to ATN Addressing

[REQ 1]:   ATN NSAP addresses shall be globally unique.

[NOTE]: This is assumed in various parts of the ATN Draft SARPs (e.g. in section 7.1.3, 2nd para), but not explicitly stated as a requirement.

[REQ 2]:   An ATN NSAP address shall unambiguously identify an ATN system and an ATN network service user within that system.

[REQ 3]:   An ATN TSAP address shall be composed of an ATN NSAP address and a TSAP selector.

[REQ 4]:   ATN TSAP selectors shall be unique within an ATN system.

[REQ 5]:   An ATN TSAP address shall unambiguously identify an ATN transport service user.

[REQ 6]:   It shall be possible to use the ATN TSAP address for the address of an application process.

[NOTE]: ATN end systems may implement a hierarchical presentation address with null session and presentation selectors. In this case, the presentation address is equivalent to the TSAP address. The TSAP address must then be sufficient to address an application entity and its associated application process.

[NOTE]: ATN end systems may implement an application process, which directly interfaces to the transport layer, i.e. no session and presentation protocol is used. In this case, the TSAP address must be used to address the application process.

[REQ 7]:   The ATN NSAP address structure shall allow to build common NSAP prefixes in order to minimise the amount of data to be exchanged for route advertisement, in particular via air-ground data links.

[REQ 8]:   It shall be possible to assign a common NSAP address prefix for any ATN Routing Domain and any ATN Routing Area.

[REQ 9]:   It shall be possible to use Group Network Addresses for multicast transmission in the ATN. A Group Network Address shall identify a group of ATN systems that are either attached to a single subnetwork or to several subnetworks.

[NOTE]: During the analysis of the ATC Radar Tracker and Server (ARTAS) specification [REF_2] a requirement has been identified for the underlying communication protocols to support both the point-to-point and multicast mode.

[NOTE]: ATN multicast services may be used for many purposes, like Air Traffic Control (ATC), Air Traffic Flow Management (ATFM), Aeronautical Information Services (AIS) and Meteorological Services (MET) and Systems Management (SM) applications:

- *ATC: Distribution of radar data from Radar Data Processing System (RDPS) to ATC Centres (ATCCs);*

- *ATFM: Distribution of ATFM messages from the CFMU Data Base Europe (DBE) to Aircraft Operators (AO), Aeronautical Reporting Offices (ARO), ATCCs and Air Traffic Service Units (ATS);*

- *ATFM: Distribution of Repetitive Flight Plans (RPLs) from the CFMU Initial Flight Plan Processing System (IFPS) to en-route ATCCs;*

- *AIS: Distribution of NOTAM messages from ATCC to aircraft;*

- *AIS: Distribution of NOTAM messages from European AIS Database (EAD) to National AIS System Centres (NASC), AOs, and ATCCs;*

- *MET: Distribution of weather reports, meteorological forecasts and warnings from Aeronautical Meteorological Offices (AMET offices) or Meteorological Watch Offices (MWOs) to ATCCs, AOs, AROs, national MET service authorities or aircraft;*

- *Systems Management: Distribution of management information from a management centre to a number of agent systems, e.g. for polling managed objects throughout the network;*

- *Systems Management: Distribution of management notifications from an agent system belonging to several management domains to all responsible management centres.*

[REQ 10]: It shall be possible that a single NSAP has two or more network addresses associated. These may either be individual or group network addresses.

[NOTE]: Two or more individual network addresses associated with a single NSAP allows flexible system configuration and resource sharing, e.g. different network service users which are known to the ATN world under different addresses can share the same system and the same NSAP.

[NOTE]: Multicasting requires that at least one individual network address and one group network address is associated with a single NSAP. A system may also belong to several groups and have more than one group network address associated with a single NSAP.

[REQ 11]: It shall be possible to temporarily assign individual and group network addresses to ATN systems.

[NOTE]: This allows for example a stand-by system to take the role of a disabled system without network address modification

[NOTE]: This allows an endsystem to be a group member only for a certain time period.

[REQ 12]:   NSAP and TSAP addresses of airborne systems shall not change during flight.

[NOTE]: Derived from user requirement for aircraft movement/sector transition [REF_3]: Air-ground data communication shall be maintained during flight and the network behaviour shall be transparent to any ATN user.

[NOTE]: This requirement basically implies that NSAP addresses for airborne systems must be independent from any geographical location or physical network topology.

[REQ 13]:   It shall be possible to operate the same NSAP and TSAP addresses, when a disabled endsystem is replaced by a stand-by endsystem.

[NOTE]: Derived from user requirement for replacement of equipment [REF_3]: Stand by systems replacing operational equipment should be transparent to ATN users. System replacement should not enforce a remote user to use a new address to continue or resume communication.

[REQ 14]:   It shall be possible to operate the same NSAP and TSAP addresses, when a ground based application process is temporarily switched from one endsystem to another or even from one subnetwork to another.

[NOTE]: Derived from user requirement for flexible sectorisation in ATC centres [REF_3]: ATC operation demands a variable and flexible ATC sectorisation. This means that adjacent control sectors may be merged together temporarily, or control sectors may be temporarily split into separate control areas based on the actual traffic flow and ATC system capacity. This implies that a ground based application processes may be temporarily switched from one ES to another or even from one local area network to another.

[REQ 15]:   The number of NSAP addresses of ground ATN systems providing ATC services for aircraft during flight within a given regional area shall be limited.

[NOTE]: Derived from user requirement for number of ground ATC communication systems [REF_3]: For ATC communications from air to ground only a fixed, limited set of ground systems should be the addressee of the communications within a given regional area.

5. Reformulated Operational Requirements Related to ATN Addressing

This section links to user requirements that have been identified in chapter 7 of the ATN draft SARPs.

[REQ 16]: The ATN addressing plan shall allow ample space for future growth in the number of addressed entities.

[NOTE]:This operational requirement is implicitly given in section 7.7.3.1, 3rd bullet.

[REQ 17]: ATN NSAP addresses shall not determine nor preclude any particular route between source and destination.

[NOTE]: This operational requirement is implicitly given in section 7.7.3, last bullet.

[REQ 18]: The ATN addressing plan shall satisfy the requirements of ATSC and AISC service users and providers. It shall be useful for both uplink and downlink data transfer and shall serve both the mobile and fixed communication environment.

[NOTE]: This operational requirement is implicitly given in section 7.7.3.1 (2nd bullet) and in section 7.7.3.2 (1st bullet).

[REQ 19]: The ATN NSAP address format shall allow to use existing standard ICAO and IATA location identifiers for the identification of fixed ATN Routing Domains.

[NOTE]: This operational requirement is implicitly given in section 7.7.4, 2nd and 3rd bullet.

[REQ 20]: The ATN NSAP address format shall allow to use the ICAO aircraft identifier (i.e. 24 bit ICAO aircraft address) for the identification of mobile ATN Routing Domains.

[NOTE]: This operational requirement is implicitly given in section 7.7.4, 4th bullet.

[REQ 21]: The ATN addressing plan shall conform to ISO 8348 (Network Layer Service Definition and Network Layer Addressing Plan).

[NOTE]: This operational requirement is implicitly given in section 7.7.4, 5th and 6th bullet.

[REQ 22]: The ATN NSAP address format shall support efficient operation of the ISO 9542, ISO 10589 and ISO 10747 routing protocols.

[NOTE]: This operational requirement is implicitly given in section 7.7.4, 7th bullet.

6. Recommendation

It is recommended that

- the Operational Requirements listed in section 4 and 5 be reviewed by WG-2 and a decision be made as to their correctness and appropriateness,

- the Operational Requirements listed in section 4 and 5 be added to the existing compilation of ATN User Requirements,

- the Operational Requirements listed in section 4 and 5 be used for the validation process when determining the fitness for purpose of the ATN internet.