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AERONAUTICAL TELECOMMUNICATIONS NETWORK PANEL

Working Group 2

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ATN Internet User Requirements

Prepared by Henk J. Hof

SUMMARY

This document contains ATN internet user requirements derived form different sources. The requirements are categorised and a status of acceptance is given. On a per requirement basis references to the ATN internet SARPs are provided to indicate how and where a requirement is fulfilled. This document provides the basis for the User Requirements traceability process.

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1 Background

The ATN Manual Version 2.0 has been produced in the absence of explicit user requirements but on the basis of operational assumptions. In order to be able to validate the draft ATN SARPs on “fit to purpose” (see WG2 validation strategy), clear and unambiguous ATN Internet user requirements should be agreed. Besides for validation these user requirements are also needed to develop SARPs in not yet fully explored ATN areas.

2 Scope

The objective of this document is to capture all ATN internet user requirements. Requirements can come from different sources and may have different levels of acceptance. Furthermore, requirements may be based on assumed operating concepts. This requirements document will provide a complete classified requirements list which, on a per requirement basis, includes the source, status and information how the requirement has been fulfilled by the draft standards.

3 Approach

The requirements are derived from different sources. One of the sources is the ATN Manual Version 2. This document includes the requirements from WP 2-27 which were derived from the analysis of the ATN Manual.

Another source of requirements will be the Network Operating Concept. This document is not yet available. However, Network Operating requirements have been identified and are included in this document.

The attached requirements list includes per requirement the following information:

- Unique number
- Source
- Date
- Requirement category
- Package number
- Requirement
- Status
- Reference to draft ATN SARPs

The following **sources** of requirements have been identified:

⇒ Document (e.g. ATN Manual)

⇒ Organisation/State

⇒ Working Group

The **date** of the requirement is the date on which the requirement has been entered into this document.

The **requirement category** states the type of requirement. Until now the following requirements categories have been identified:

⇒ Transport Layer Service requirements : TLS

⇒ Network Operating requirements: NOC

⇒ Institutional requirements: INS

⇒ General requirements: GEN

The **package number** gives the package in which the requirement should be met. If a requirement also applies to subsequent packages this is indicated with a "+" sign. For example package 1+ means package 1 and all following packages.

The **requirement** column states the requirement and includes, when relevant, necessary background information.

The **status** of a requirement can be the following:

⇒ Accepted: ACC (requirement is not endorsed by all ATNP States/organisations but there are no objections)

⇒ Agreed : AGR (requirement is endorsed by all States/Organisations)

⇒ Pending: PEN

⇒ Rejected: REJ

⇒ Modified: MOD (the implementation column lists the number of the new or modified requirement)

⇒ Not Applicable: NA (requirement is not applicable to the ATN internet)

The **implementation** column explains where and how the requirement is satisfied. No entry means that the requirement has not yet been fulfilled. When a requirement is a subset of another requirement or has been replaced the parent or new requirement is listed in the implementation column.

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Issue 1.0

Nr.	Source	Date	Category	Pck	User Requirement	Status	SARPs reference
1	ATN Manual	7/3/95			In order to fully utilise automated air traffic management (ATM) systems, a global data networking infrastructure shall be implemented in order to support the internetworking of computer systems operating in fixed ground-based and mobile aircraft-based locations.	NA	
2	ATN Manual	7/3/95			The operational requirements for a future ATS system should be developed on the basis of a framework of an operational ATS concept. The operational requirements will allow the definition of a detailed functional specification of the ATC system, identifying the necessary ATS functions with related aeronautical applications.	NA	
3	ATN Manual	7/3/95	NOC		Four aeronautical user groups shall be supported by the ATN: Administrative Users, Operational Users, Airline Passengers and Network Managers.		
4	ATN Manual	7/3/95	INS		Administrative and technical provisions shall be provided to inhibit one or more user groups from gaining access to certain subnetworks. For example, the SSR Mode S subnetwork will only carry communications related to safety and regularity of flight.		
5	ATN Manual	7/3/95	INS		The international aviation community shall adhere to the separation of communication functions as specified in the Open Systems Interconnection (OSI) Reference Model developed by the International Organisation for Standardisation (ISO).		
6	ATN Manual	7/3/95	NOC		The ATN shall ensure interoperability and support the exchange of data between users while preserving the semantics of the data.		
7	ATN Manual	7/3/95	NOC		The various ATC components of the over-all systems shall be designed to work together effectively to ensure a homogeneous, continuous and efficient service to the user from take-off to landing, by implementing ICAO and other International standards in order to provide for interoperability and consistency in operations across national boundaries.		

8	ATN Manual	7/3/95			The realisation of a system shall include the adaptation of existing procedures and facilities as well as the development of new ones.	NA	
9	ATN Manual	7/3/95			In the ground environment, the ATN shall support improved handling and transfer of information between operators, aircraft and ATC centres	NA	
10	ATN Manual	7/3/95			In the ground environment, the ATN shall support improved and more accurate planning, including use of improved weather information;	NA	
11	ATN Manual	7/3/95			In the ground environment, the ATN shall support an improvement in conflict detection and resolution;	NA	
12	ATN Manual	7/3/95			In the ground environment, the ATN shall support an improvement in the ability to take advantage of the improved navigation accuracy in four dimensions of modern aircraft;	NA	
13	ATN Manual	7/3/95			In the ground environment, the ATN shall support improved accommodation of a flight's preferred profile in all phases of flight, based on operator's objectives.	NA	
14	ATN Manual	7/3/95	INS		The ATN shall be implemented by means of an evolutionary process;		
15	ATN Manual	7/3/95			Pilots and air traffic controllers shall be kept involved in the ATC process;	NA	
16	ATN Manual	7/3/95			The new system should not be overly sensitive to random disturbances, such as outages, emergencies, errors in forecasting, etc.;	NA	
17	ATN Manual	7/3/95			Improvements in weather forecasting should not themselves delay other improvements in over-all system performance;	NA	
18	ATN Manual	7/3/95	GEN		The ATN shall be designed to accommodate normal peak traffic demands		
19	ATN Manual	7/3/95	GEN		The ATN should be easily expanded to meet anticipated future growth		
20	ATN Manual	7/3/95			Because of the differences in the level of air traffic	NA	

					management in the various parts of the world, and the variety of factors that influence transition to the future CNS system, an evolutionary development of air navigation for international civil aviation should be planned for implementation over the next 25 years.		
21	ATN Manual	7/3/95			AOC functions shall interface with the aircraft via adequate air-ground communications (voice and data), either through cockpit crew intervention or directly with some airborne sensors and systems (after data verification by the cockpit crew) such as flight management systems (FMS) or digital flight data acquisition unit (DFDAU) for functions such as: a) FMS operational data base update on: 1) flight plan data; 2) load and balance data; 3) certain weather data; and b) DFDAU recording of/reporting on: 1) engine health monitoring; 2) fuel flow/status/requirements; etc.	NA	
22	ATN Manual	7/3/95	NOC		The ATN shall provide the same standardised set of rules to applications, in order to ensure that all messages are delivered as efficiently as possible and in the correct order of priority.		
23	ATN Manual	7/3/95	NOC		The ATN shall determine the transfer sequence of the provided end-user messages/files, on the basis of required priority (QOS parameter).		
24	ATN Manual	7/3/95	NOC		Data Transfer Priority shall be specified on a per transport connection basis and determined during the connection establishment phase.		
25	ATN Manual	7/3/95	NOC		Two types of priorities shall be distinguished: static priority and dynamic priority		
26	ATN Manual	7/3/95	NOC		Static priority shall be related to the type of information that has to be transferred via the ATN, and shall have the same		

					semantics as with other communications networks. Article 51 of the ITU Radio Regulations gives the order of priority for ten information categories in the aeronautical mobile service and aeronautical mobile satellite service as follows: 1 Distress calls, distress messages and distress traffic. 2 Communications preceded by the urgency signal 3 Communications relating to radio direction-finding 4 Flight safety message. 5 Meteorological messages. 6 Flight regularity messages. 7 Messages relating to the application of the United Nations Charter. 8 Government messages for which priority has been expressly requested. 9 Service communication relating to the working of the telecommunication service or to communications previously exchanged. 10 Other aeronautical communications.		
27	ATN Manual	7/3/95	NOC		Dynamic priority shall be related to the context in which information is transferred. For example, it is possible that in a short term conflict alert situation a heading instruction message (if that results in better resolution) has a higher priority than in a normal situation.		
28	ATN Manual	7/3/95	NOC		All the links in the communication network shall be able to determine and to provide the communication service related to the required priority.		
29	ATN Manual	7/3/95	NOC		The use of the QOS parameters plus the network operating assumptions listed below shall permit the end user to be unaware of the particular delivery method(s) used by the ATN		

					to effect data transfer. 1. messages of arbitrary length may be transferred by the ATN; 2. the ATN connection mode Transport Service delivers data in a reliable manner. The user can assume that once the data is accepted by the ATN it will be delivered, unless explicit connection loss is indicated 3. The ATN maintains dynamic routing tables which reflect the current connectivity status, and which it uses to determine the transfer route 4. the ATN only requires address information, the end-user data and the specified QOS parameters to perform its functions.		
30	ATN Manual	7/3/95	NOC		The user shall be informed if delivery of previously accepted data is not possible		
31	ATN Manual	7/3/95	GEN		In order to realise the advantages of an internetwork architecture, techniques for transfer of messages among participating subnetworks shall be independent of protocols and addressing schemes used by any one participating subnetwork.		
32	ATN Manual	7/3/95	GEN		ATN subnetworks shall be interconnected via internetwork routers observing common internetworking conventions and standards.		
33	ATN Manual	7/3/95	GEN		ATN routers shall utilise a common internetwork protocol standard, including a common definition of QOS parameters;		
34	ATN Manual	7/3/95	GEN		ATN routers shall exchange routing information using a common routing information exchange protocol standard;		
35	ATN Manual	7/3/95	GEN		ATN routers shall utilise a common global network addressing standard;		
36	ATN Manual	7/3/95	GEN		ATN subnetworks shall carry the internet protocol, routing protocol and global addressing formats between adjacent routers in a transparent fashion.		

37	ATN Manual	7/3/95	GEN		The ISOPA demands that a uniform level of network service be presented to all transport layer processes at this boundary; when applied to the ATN, this requires that a single network layer service interface shall be adopted throughout the ATN, supported by a common internetwork protocol.		
38	ATN Manual	7/3/95	GEN		The ATNPA shall be designed to employ any subnetwork technology capable of code and byte independent delivery of data as a constituent subnetwork.		
39	ATN Manual	7/3/95	GEN		ATN subnetworks shall provide, either the connectionless-mode subnetwork service, or a connection-mode subnetwork service, utilised through the implementation of the appropriate convergence function.		
40	ATN Manual	7/3/95	GEN		The interconnected ATN host computers and routers administered by international authorities for aeronautical data communication shall comprise the ATN common domain. The ATN common domain encompasses all data communication service end users associated with the international civil aviation environment.		
41	ATN Manual	7/3/95	GEN		The ATN shall provide for the minimisation of routing information transfer between administrative/routing domains at the inter-domain level, and between routing areas at the intra-domain level		
42	ATN Manual	7/3/95	GEN		The ATN subnetwork sublayer shall support the transparent transfer of NPDUs between adjacent internetwork entities. This includes the transparent transfer of global addresses and quality of service information, as well as user data.		
43	ATN Manual	7/3/95	GEN		The subnetwork interface to the internet (i.e. router) shall occur within the network layer; thus control information for the data link and physical layers is not passed from subnetwork to subnetwork. Hence, the subnetwork may utilise non-conforming protocols within these layers while maintaining ISOPA conformance within the network layer;		
44	ATN Manual	7/3/95	GEN		ATN subnetworks shall not place restrictions on the form or content of the higher layer headers, but shall simply transfer the		

					control information for these layers without modification;		
45	ATN Manual	7/3/95	GEN		ATN subnetworks shall be able to carry ISO networkPCI for evaluation by each intervening router (i.e. intermediate system);		
46	ATN Manual	7/3/95	GEN		ATN subnetworks shall transparently transfer standard global network address (i.e. ISO NSAP) and quality of service information, for evaluation by each intervening router.		
47	ATN Manual	7/3/95	INS		The ATN shall be able to function such that each participating administration and service provider can operate ATN Routing Domains, and interconnect, without requiring that some administrations and service providers are more special than others.		
48	ATN Manual	7/3/95	INS		There shall be no requirement for an ICAO operated core network or router.		
49	ATN Manual	7/3/95	GEN		High availability shall be assured with no single point of failure.		
50	ATN Manual	7/3/95	GEN		An ATN Inter-domain routing information protocol shall support the use of consistent distance metrics, QOS metrics and security information.		
51	ATN Manual	7/3/95	GEN		The ATN shall provide a common communications service for all ATSC and AISC applications that require either ground/ground or air/ground data communications services.		
52	ATN Manual	7/3/95	GEN		The ATN shall integrate and use existing communications networks and infrastructure wherever possible.		
53	ATN Manual	7/3/95	GEN		The ATN shall provide a communications service which meets the security and safety requirements of ATSC and AISC applications.		
54	ATN Manual	7/3/95	GEN		The ATN shall accommodate the different grades of service required by each ATSC and AISC application.		
55	ATN Manual	7/3/95	GEN		The ATN shall provide its users with a robust and reliable communications service, together with the option of a datagram service.		

56	ATN Manual	7/3/95	GEN		The ATN itself shall not make any demands on the syntax or semantics of the data carried in a CLNP packet.		
57	ATN Manual	7/3/95	GEN		For data conveyed by an ATN Transport Connection, the QoS requirements are: i. Transit Delay shall be better than *tba* ii. Throughput shall be better than *tba* iii. The residual error rate shall be better than *tba* iv. Availability shall be better than *tba*		
58	ATN Manual	7/3/95			ATN interconnections shall be coordinated on both a regional and worldwide basis, so that ATN backbones (of Routing Domains offering general transit facilities) may be created, with either a clear apportionment of costs, or a known tariff, for use of use of transit facilities.	NA	
59	ATN Manual	7/3/95	GEN		The ATN shall support 'mobile' subnetworks. Examples of such subnetworks include SSR Mode S, AMSS and VDL.		
60	ATN Manual	7/3/95	GEN		If an aircraft were to attach to one mobile subnetwork only and never to any other, then even though sometimes it may be attached and at other times not attached, this shall be of no consequence for the ATN.		
61	ATN Manual	7/3/95	GEN		The ATN shall support aircraft simultaneously attached to many different mobile subnetworks.		
62	ATN Manual	7/3/95	INS		The ATN shall be capable of operating in a multinational environment with different data communication service providers.		
63	ATN Manual	7/3/95	INS		The ATN shall be capable of supporting ATSC as well as AISC.		
64	ATN Manual	7/3/95	GEN		The ATN shall be capable of supporting the interconnection of End Systems and Intermediate Systems using a variety of subnetwork types.		
65	ATN Manual	7/3/95	GEN		The organisation of the ATN supported by system management shall aim for an optimisation of the communication resources		

					available.		
66	GER/WP1_REQ1	7/3/95	NOC		ATN NSAP addresses shall be globally unique.		
67	GER/WP1_REQ2		NOC		An ATN NSAP address shall unambiguously identify an ATN system and an ATN network service user within that system.		
68	GER/WP1_REQ3	7/3/95	NOC		An ATN TSAP address shall be composed of an ATN NSAP address and a TSAP selector.		
69	GER/WP1_REQ4	7/3/95	NOC		ATN TSAP selectors shall be unique within an ATN system.		
70	GER/WP1_REQ5	7/3/95	NOC		An ATN TSAP address shall unambiguously identify an ATN transport service user.		
71	GER/WP1_REQ6	7/3/95	NOC		It shall be possible to use the ATN TSAP address for the address of an application process.		
72	GER/WP1_REQ7	7/3/95	NOC		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.		
73	GER/WP1_REQ8	7/3/95	NOC		It shall be possible to assign a common NSAP address prefix for any ATN Routing Domain and any ATN Routing Area.		
74	GER/WP1_REQ9	7/3/95	NOC		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.		
75	GER/WP1_REQ10	7/3/95	NOC		It shall be possible that a single NSAP has two or more network addresses associated. These may either be individual or group network addresses.		
76	GER/WP1_REQ11	7/3/95	NOC		It shall be possible to temporarily assign individual and group network addresses to ATN systems.		

78	GER/WP1_REQ12	7/3/95	NOC		NSAP and TSAP addresses of airborne systems shall not change during flight.		
79	GER/WP1_REQ13	7/3/95	NOC		It shall be possible to operate the same NSAP and TSAP addresses, when a disabled endsystem is replaced by a stand-by endsystem.		
80	GER/WP1_REQ14	7/3/95	NOC		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.		
81	GER/WP1_REQ15	7/3/95	NOC		The number of NSAP addresses of ground ATN systems providing ATC services for aircraft during flight within a given regional area shall be limited.		
82	GER/WP1_REQ16	7/3/95	NOC		The ATN addressing plan shall allow ample space for future growth in the number of addressed entities.		
83	GER/WP1_REQ17	7/3/95	NOC		ATN NSAP addresses shall not determine nor preclude any particular route between source and destination.		
84	GER/WP1_REQ18	7/3/95	NOC		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.		
85	GER/WP1_REQ19	7/3/95	NOC		The ATN NSAP address format shall allow to use existing standard ICAO and IATA location identifiers for the identification of fixed ATN Routing Domains.		
86	GER/WP1_REQ20	7/3/95	NOC		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.		
87	GER/WP1_REQ21	7/3/95	NOC		The ATN addressing plan shall conform to ISO 8348 (Network Layer Service Definition and Network Layer Addressing Plan).		
88	GER/WP1_REQ22	7/3/95	NOC		The ATN NSAP address format shall support efficient operation of the ISO 9542, ISO 10589 and ISO 10747 routing protocols.		

89	US	7/3/95	INS		Safety related traffic shall be seperable from non-safety traffic over ITU restricted subnetworks.		
90	US	7/3/95	INS/NOC		It shall be possible to exchange information between aircraft and appropriate ground systems in all controlled airspace and during all phases of flight where data link communication is available.		