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WORKING GROUP 2

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Proposal for the Progression of the ATN Draft SARPs and Guidance Material

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SUMMARY

Version 2.1 of the ATN Draft SARPs and Guidance Material is an intermediate stage in the mutation of the ATN Manual into SARPs, and incorporates new material on features agreed for CNS/ATM-1 Package. However, this work has been done by separate editors, with limited co-ordination and with the expectation that editorial differences will be resolved in the next editing stage, when the structure will be revised. There are thus many internal inconsistencies in version 2.1 that prevent it from being more than a working draft. This working paper provides proposals on resolving these inconsistencies and for migrating the document from its current structure to a structure appropriate for the ICAO ATN SARPs.

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1. Introduction

1.1 Scope

This paper provides an analysis of the weaknesses and inconsistencies in the present version 2.1 of the ATN Draft SARPs and Guidance Material, and discusses a revised structure more in line with the requirements of the perceived users of the SARPs.

1.2 Purpose of Document

This paper has been prepared for consideration by ATNP/WG2 and provides recommendations on the next stage in the progression of the ATN Draft SARPs and Guidance Material.

2. Analysis of Problems with Version 2.1

Version 2.1 is the result of editing activities undertaken by the WG2 CISEC. Each Chapter/Appendix of Version 2.0 was assigned to a different editor with instructions to implement the agreed modifications including the support for the optional non-use of IDRP over Air-Ground Data Links and "Option 4 lite", the strategy agreed in Washington for supporting application specific routing policies. The limited co-ordination and review possible in the short time before the Rome meeting has resulted in a document which has internal inconsistencies between the appendices of which the most significant are documented below in 2.1.

Furthermore, the document still contains the weaknesses that have been inherited from the 2nd edition of the ATN Manual, in terms of its lack of targeting on specific user needs. These are discussed in 2.2.

There was also an intention behind the development of CNS/ATM-1 Package, that the requirements were to be reduced in order to make for a manageable validation process, and which would be completed in time for the second meeting of the ATN Panel in late 1996. This objective now seems to have been lost (or at least overlooked), with the current version once again growing in complexity. This problem is discussed in 2.3.

2.1 Inconsistencies in Version 2.1

1. Appendices 5 and 6 both provide protocol support for requirements for ATN Routers and define Administrative and Routing Domains.

2. Appendices 9 and 10 both provide APRLs for the ISO 8208 SNDCF. They are not the same APRLs.

3. Appendices 5 and 10 still include references to ISO 10589 even though this has now been removed from other appendices.

4. Appendix 10 includes material previously in appendix 6 on route initiation, but which does not refer to the optional non-use of IDRP. Appendix 6 contains updated material on route initiation including the support of the optional non-use of IDRP.

5. Appendix 10 defines procedures for management of subnetwork priority in the SNDCF for ISO 8208 without distinguishing this as a new SNDCF. It is also unclear whether such an SNDCF is required. Where there is a clear requirement for management of

subnetwork priority (i.e. in the mobile SNDCF), the specification is incomplete and it has to be assumed that the earlier material on subnetwork priority applies.

6. In appendix 7, the RDF field has been removed from the address syntax. However, there has been no corresponding change to the specification of the ACA algorithm in appendix 10.

7. Appendix 5 now notes that there are no requirements for Systems Management in CNS/ATM-1 Package, and yet there are still 48 pages of requirements for the implementation of Systems Management in appendix 12.

8. Both appendices 8 and 9 still refer to the old definition of “Security Types” rather then the revised approach consequential on the acceptance of “Option 4 lite” and specified in appendices 6 and 11.

2.2 Structural Weaknesses

The structure of the ATN SARPs should enable its users to readily gain access to the information they require. However, the approach taken by version 2.1 and the ATN Manual before it, is to present the ATN Specification as a layered protocol architecture derived directly from the OSI Reference Model. There is a small “architecture” section that is appendix 5, and which identifies the protocols that an End System must support and the mapping of application to internet priority. Appendix 6 then identifies the other architectural components of the ATN i.e. the Routers, Routing Domains and RDCs, and the protocols that an ATN Router must support. It also specifies how an ATN Router uses routing information provided by IDRP to route packets in line with the semantics of the application’s routing policy requirements as expressed in the CLNP Header, and the ATN strategy for supporting mobile routing in the ATN Ground Environment.

Appendix 7 then provides the ATN NSAP Addressing Plan, and the remaining appendices provide a procession through the transport and network protocol layers, concluding with a detailed set of requirements on Systems Management.

The question is: does this structure readily meet the requirements of the users of the draft ATN SARPs? For example:

- Application Designers will need to consult the SARPs in order to identify and understand the end-to-end service provided by the ATN Internet. This information is implicit in appendix 8 for the basic transport service, but not explicitly brought out, or related to how user control over routing policy, priority or QoS is specified or the scope of each control (e.g. to a TSDU or connection). Appendix 5 describes the relationship between application, transport layer and network layer priority, while how application QoS and Routing Policy requirements are met, is not presented.

- The implementors of ATN End Systems will need to consult the SARPs in order to identify which protocols they must implement to access the ATN Internet. This information is contained in appendices 5, 8 and 9.

- The implementors of ATN Routers will need to consult the SARPs in order to identify which protocols they must implement to access the ATN Internet. This information is contained in appendices 6,9, 10 and 11.

- ATN Service Providers will need to consult the SARPs in order to determine the service requirements necessary for them to provide a compliant ATN routing service. There are two parts to this, as well as institutional issues. The two main parts are the interface specifications, and the service specifications. The interface specifications are the protocol profiles contained in appendices 9, 10 and 11, while the service specifications are concerned with how IDRP routing information provided by ATN users

is interpreted by ATN Service Providers in order to route CLNP packets according to the QoS and Security information contained in the CLNP Header. This information is contained in appendix 6.

- ATN Administrators will need to consult the SARPs in order to determine how ATN Addresses are allocated and how ATN RDs are to be interconnected. Administrators of ATN Service Providers will also need to determine how they must interconnect with other service providers in order to offer ATN compliant services (e.g. support for mobile routing). Addressing may be found in appendix 7 and interconnection in appendix 6.

- All ATN Users will need to be able to understand the ATN concept, and it is difficult to point to any part of the SARPs that adequately explains this.

The layered approach does not appear to address any particular user community and each user must search the SARPs for an apparently random distribution of requirements. At the very least a “roadmap” is necessary to show each user where the relevant requirements are.

2.3 CNS/ATM-1 Package Scope

The original idea behind CNS/ATM-1 Package, was that it would be a simple enough subset of the full ATN SARPs, such that validation by end 1996 would be realistic. However, the process that has gone on since San Diego last October, appears to have added as much complexity as it has removed:

- we tried to simplify the air-ground data link by not using IDRP over the air-ground data link in early implementations. Instead, we now have both use and non-use of IDRP air-ground, with conformant Air/Ground (ground based) routers required to support both modes of operation.

- We tried to remove the need for QoS and Security based routing, and while QoS based routing is no longer required, we now have even more complex routing requirements under the general heading of “security”.

There seems to be a risk that Package 1 is still not yet simple enough. The new security related requirements appear to be solid, but there still seems to be potential flexibility over the complexity of the ATN Ground Environment in initial ATN Implementations.

At the moment we have IDRP air-ground in Package 1. The justification for this is that the ground ATN Internet will be sufficient complex to require the dynamic availability of routing information to airborne routers. Consequently, we require Route Aggregation in order to minimise the routing information transferred over air-ground data links, and some kind of structuring of the ground environment in order to permit a scaleable internet that supports mobile routing. The assumed complexity of the ground ATN Internet is the key issue for Package 1. If we can assume a simple enough topology, then the number of requirements that need to be validated can be much reduced.

2.4 Conclusion

There is a need to remove the inconsistencies in the current SARPs text and to re-organise it so that the SARPs better addresses its target users, and to provide missing material. There is also a need to agree on how complex the initial ground ATN Internet will be, and therefore to reach agreement of further simplifications to the ATN SARPs.

3. Objectives for Draft ATN SARPs and Guidance Material

This section aims to identify the target ATN Users, and a structure that meets their needs.

3.1 Target Users

The Target Users of the ATN Internet SARPs are believed to comprise:

a) ATM Application Designers

b) End System Implementors

c) ATN Router Implementors

d) ATN Internet Service Providers

e) ATN Internet Administrators.

The SARPs need to readily enable each such user to determine where they fit in the ATN and how they relate to other ATN Users, and co-operate to provide the ATN.

3.2 ATN Architecture

The purpose of an ATN Architecture specification should be to define the building blocks or components of the ATN Internet, how they relate to each other, and where each user then fits in the scheme of things. The following appears to comprise the list of ATN components:

a) ATN End Systems

b) ATN Routers (including several different classes of router)

c) ATN Service Providers (realised as Administrative and Routing Domains)

d) Ground ATN User Organisations (realised as Administrative and Routing Domains)

e) Airborne Systems (realised as Administrative and Routing Domains)

There is of course a hierarchy to such an architecture. For example a Ground ATN User Organisation will comprise End Systems and Routers. Further, while the roles of ATN Service Provider and a Ground ATN User Organisation may be distinct, a real organisation may be both a user itself and a Service Provider to others.

These architectural components can, however, be seen to relate to the target users identified above, as illustrated in the figure below. SARPs that take as their focus such architectural components should address the target users' needs.

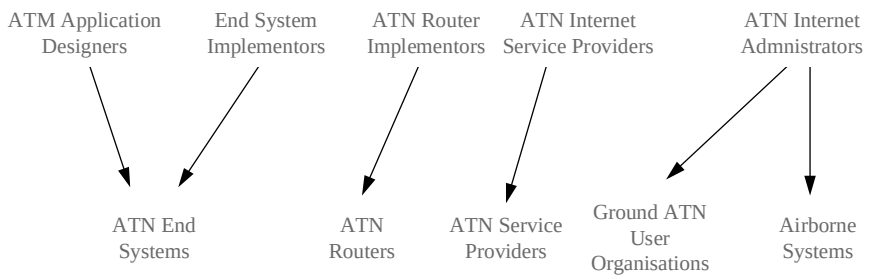

Figure 1 ATN Target Users and Architectural Components

The ATN is, of course, a communications network, and the other major part of the architecture is the ATN Protocol Architecture. This is crucial to defining how the ATN Components relate to each other and interconnect, either directly, or indirectly via other ATN components.

3.3 ATN Services and Interfaces (Reference Points)

However, the problem in defining how the architectural components of the ATN relate to each other is that there are two distinct concepts involved, and which are readily confused. Firstly, there are the interfaces - the protocol stacks that enable two ATN Components to interconnect and exchange meaningful information. Secondly, there are the services that ATN components provide to each other. For example, the service provided by an ATN Service Provider is accessed through the interface to it in an essentially identical fashion to the way a packet switching service is accessed through an interface according to ITU-T X.25. We need to bring out where both service boundaries and interfaces exist in the ATN Architecture, and define each one that is appropriate for SARPs.

The ATN Manual has already introduced the notion of ATN Reference Points, where a reference point denotes an interface or service boundary. It is proposed to develop this concept and introduce it formally into the SARPs, where the definition of each Reference Point provides to “road map” for the related requirements. It is believed that we need the following reference points:

Reference Point 1 The Transport Service Boundary.

This reference point defines the service made available by the ATN Internet to ATM Applications via upper layer protocols.

Reference Point 2 The interface between an ATN End System and an ATN Router.

This interface is outside of the scope of the ATN SARPs, and the main purpose of this reference point is to identify the interface and to indicate that is a local matter. Guidance Material may discuss how it is realised.

Reference Point 3 The interface between an ATN Ground Routing Domain and an ATN Service Provider.

This is the CLNP and IDRP profile for interconnection between a Service Provider and an ATN RD using its services for its own use.

Reference Point 4 The Interface between an ATN Airborne Routing Domain and an

ATN Service Provider, or an ATN Ground Routing Domain.

This is the CLNP and Mobile SNDCF Profile, together with the Route Initiation Procedures and IDRP profile when IDRP is being used air-ground.

Reference Point 5 The Service Provided by an ATN Service Provider

This is the specification of the service accessed through reference points 3 and 4. It defines how ATN Service Providers make use of routing information supplied by their users using IDRP, in order to route CLNP packets, and how routing information provided by ATN Service Providers should be interpreted (e.g. to choose between the service offered by two different service providers).

Reference Point 6 The interface between two ATN Service Providers.

This is a variation of reference point 3 but, while reference point 3 is inherently an interface to support an asymmetric relationship (c.f. X.25), reference point 6 is an interface that is there to support a symmetric relationship (c.f. X.75).

These reference points also appear to be well related to the ATN Target Users, as illustrated in the figure below.

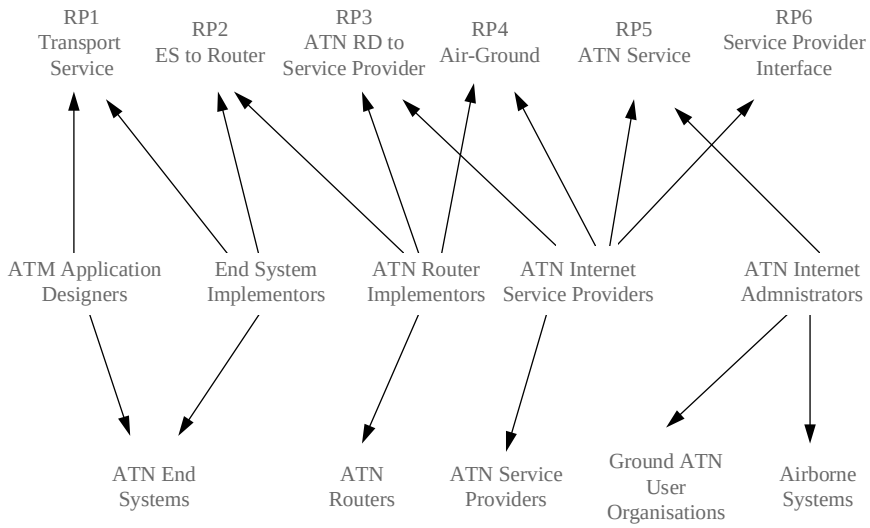

Figure 2 Relationship between target users and Reference Points

3.4 Addressing

The ATN Addressing Plan is also of interest to all target user groups and, in particular, to ATN Administrators. The ATN Addressing Plan should carry forward from the existing ATN Manual text, but it also needs to be related to the architectural components so that

administrators know how to apply it. At present, the addressing plan only defines syntax and semantics for an NSAP Address. It does properly identify how addresses are administered. Indeed, it can be read as implying a flat address structure where there is no relation between the RD topology and address assignment, thus defeating any attempt at route aggregation.

3.5 Support for Mobile Routing

A dominant feature of the ATN is the mobile routing concept and how the ATN Ground Environment supports routing to mobile systems. There appear to be three different cases to consider, and which are probably evolutionary stages. These are:

a) A single ATN Service Provider providing routing to mobile systems in a defined region.

b) Multiple ATN Service Providers co-operating together to provide routing to mobile systems in a defined region.

c) The interconnection of regional service providers to provide routing to mobile systems on a worldwide basis.

The first case is not really discussed in the ATN Manual, although it is not incompatible with the specification either. The second case is presented as the ATN Island, and the third is supported by the “home” concept.

There is no reason to suppose that all three of the above have to be validated before the ATN can start to be deployed. Indeed, ATN deployment can start with case (a) alone, with evolutionary development introducing first case (b) and then case (c).

3.6 What needs to be Defined

In order to realise the above, the SARPs need to:

a) define each of the architectural components discussed above

b) present the ATN Protocol Reference Model

c) define the ATN Reference Points and the conformance requirements at each such reference point

d) specify the ATN Addressing Plan

e) specify the requirements on ATN Service Providers when co-operating together to support Mobile Routing.

With (c) in particular, there are many common aspects to the conformance requirements at each reference point (e.g. Protocol APRLs). A hierarchical structure is therefore proposed, with each profile presented as a separate attachment to the main body of the SARPs, and called up from the conformance requirements at each reference point.

4. Simplifying Package 1

It is proposed that the CNS-ATM-1 Package ATN Internet is developed and validated in two stages, for the moment identified as ATN 97 and ATN 99, with ATN 99 upwards compatible with ATN 97. ATN 97 assumes a simple ground ATN Internet topology, with a consequent simplification of the requirements. ATN 99 assumes a more complex ground ATN Internet,

and hence includes the additional requirements necessary to cope with this. ATN 97 is targeted for validation in 1997, and ATN 99 is targeted for validation in 1999.

ATN 97 comprises SARPS in the following major areas:

a) CO and CL Transport

b) CLNP

c) Mobile SNDCF

d) IDRP without route aggregation

e) Non-use of IDRP air-ground

f) A single ATN Service Provider providing routing to mobile systems in each defined region.

ATN 99 comprises ATN 97 plus SARPs in the following areas

a) IDRP over the air-ground data link, and optional non-use

b) IDRP with route aggregation on the ground

c) ATN Islands and the “home” concept.

An evolutionary depolyment of ATN systems from ATN 97 to ATN 99 is expected, and, in particular, ATN 97 avionics must be able to interwork with ATN 99 Ground Systems. ATN 97 and ATN 99 represent validation dates, and the actual deployment is anticipated to take place over a much longer period starting from when ATN 97 becomes available.

5. Proposed Outline for the ATN Draft SARPs

The following is a proposed outline for the draft ATN SARPs for ATN 99. Some of the sections will be omitted, reduced or left as placeholders for ATN 97.

	Section Title	**ATN Manual Source**
1.	**Introduction**	
1.1	Background	Preface & Chapter 1
1.2	Scope	
1.3	Purpose of Document	
2.	**ATN Architecture**	
2.1	ATN Components	
2.1.1	ATN End Systems	Appendix 5
2.1.2	ATN Routers	Appendix 6
2.1.3	ATN Ground User Organisations	
2.1.4	ATN Service Providers	
2.1.5	ATN Airborne Systems	
2.1.6	Interconnection of ATN Components	Appendix 6
3.	**The ATN Protocol Reference Model**	Chapter 5
3.1	End Systems Protocols	
3.2	Intermediate Systems	
3.3	Subnetworks	
3.4	Systems Management	
4.	**ATN Reference Points**	Chapter 5

	Section Title	**ATN Manual Source**
4.1	Reference Point 1	Appendix 8
4.2	Reference Point 2	
4.3	Reference Point 3	Appendix 6
4.4	Reference Point 4	Appendix 6
4.5	Reference Point 5	Appendix 6
4.6	Reference Point 6	Appendix 6
5.	**The ATN Addressing Plan**	Appendix 7
5.1	NSAP Address Syntax	Appendix 7
5.2	Address Allocation Procedures	
6.	**ATN Routing Control Functions**	
6.1	Quality of Service Maintenance	Chapter 5
6.2	Security	Chapter 5
6.3	Priority	Appendix 5
6.4	Congestion Management	Appendix 8
7.	**Mobile Routing**	
7.1	Classes of Service Provider	Appendix 6
7.2	RDCs Supporting Mobile Routing	Appendix 6
7.3	Routing Policies	Appendix 6

Attachments

A	Transport Protocol Requirements and APRL	Appendix 8
B	Internet Protocol Requirements and APRL	Appendix 9
C	Routing Protocol Requirements and APRL	Appendices 6 and 11
D	Mobile SNDCF Specification	Appendix 10

6. Proposed Outline for the ATN Draft Guidance Material

The proposed outline for Guidance Material to support these SARPs and to address issues relevant to target users and not suitable for SARPs is:

	Section Title	**ATN Manual Source**
1.	**Introduction**	
1.1	Background	Preface & Chapter 1
1.2	Scope	
1.3	Purpose of Document	
2.	**The ATN Concept**	
2.1	Background	
2.2	General Description	
2.3	ATN Architectural Components	
2.4	Rationale for ATN Protocol Architecture	
2.5	Routing in the ATN Ground Environment	
2.6	Mobile Routing Concept	
2.7	Route Initiation	
2.8	Quality of Service Maintenance	
2.9	Priority	
2.10	Security	

	Section Title	ATN Manual Source
3.	**Guidance for ATN Administrators**	
3.1	Areas of Responsibility	
3.2	Interconnection Strategies	
3.3	Address Allocation Strategies	
3.4	Systems Management Strategies	
3.5	Capacity Planning	
3.6	Route Planning	
3.7	Intra-Administrative Domain Communications	
4.	**Guidance for ATN System Implementors**	
4.1	Transport Protocol Considerations	
4.2	CLNP Implementation Considerations	
4.3	IDRP Implementation Considerations	
4.4	ES-IS Implementation Considerations	
4.5	Mobile SNDCF Implementation Considerations	
4.6	Congestion Management	
4.7	Priority Mapping	
5.	**Guidance for ATN Service Providers**	
5.1	The Role of an ATN Service Provider	
5.2	Interconnection with other ATN Service Providers	
5.3	Interconnection with Ground Based Service Users	
5.4	Interconnection with Mobile Users	
5.5	Allocation of Addresses to Service Users	
5.6	Provision of Default Routes to Mobile Systems	
6.	**Guidance for ATM Application Designers**	
6.1	The ATN Transport Service	
6.2	The Quality of Service Available	
6.3	Using Security, QoS Maintenance and Priority Parameters	

7. Recommendations

WG2 is invited to consider this paper and recommended to accept the following proposals:

1. The proposed outlines for the ATN Internet SARPs and Guidance Material are accepted.

2. An Editorial Committee is established with a single editor responsible for final preparation of the SARPs and Guidance Material, and tasked with preparing SARPs by end September 1995 and Guidance Material by end February 1996. The editor will be responsible for editing the current draft SARPs into the revised structure for review by the editorial committee before the Banff meeting. The editorial committee will then develop the Guidance Material in the outline defined above.

3. The Editorial Committee is required to resolve the inconsistencies identified in this paper.