

AERONAUTICAL TELECOMMUNICATIONS NETWORK PANEL

ATN Internet Working Group (WG2)

(Limited Scope)

4rd Meeting

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Comments on Appendices A & B to ATNP/1-WP59
Requirements and Desirable Features for a Future ATS Air-Ground
Communications System; VHF Digital Link (VDL) Design Guidelines

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1. Introduction

The ATNP has been requested to comment on material produced by the AMCP. This material was first presented to ATNP/1 as ATNP/1-WP/59. This paper contains the results of reviewing the material contained therein.

2. Proposal

The WG is invited to review, amend where necessary and finally agree the comments on the VDL material as contained in this WP so that they may be forwarded to the Panel Secretary as requested along with the results of the review of WG2/WP119.

Comments on ATNP/1-WP59 - Requirements and Desirable Features for a Future ATS Air-Ground Communications System; VHF Digital Link (VDL) Design Guidelines

1. Introduction

1.1 The ATN Panel is currently adopting a phased approach to the development of the ATN SARPs, the first phase will result in the SARPs for the “CNS/ATM-1 Package” which are scheduled to be presented to ATNP/2 in late 1996.

1.2 The CNS/ATM-1 Package SARPs will include provisions for the “internet” (i.e. network and transport layers), the upper layers and the technical aspects for a limited number of applications.

1.3 ATNP/1 created three Working Groups as follows:

- WG1 - Systems Planning and Concept WG
- WG2 - ATN Internet WG
- WG3 - Applications and Upper Layers WG

1.4 WG1 is responsible for, inter alia, definition of end-to-end performance requirements for the CNS/ATM-1 applications. WG2 is responsible for the development of the CNS/ATM-1 SARPs and guidance material for the internet based on the ATN Manual. WG3 is responsible for the development of CNS/ATM-1 SARPs for the Upper Layers and technical aspects of the CNS/ATM-1 applications.

1.5 The applications to be included in the CNS/ATM-1 Package are:

- Air/Ground Applications
 - Automatic Dependent Surveillance (ADS)
 - Controller Pilot Data Link Communications (CPDLC)
 - Flight Information Services (FIS - ATIS)
 - Context Management (CM)
- Ground/Ground Applications
 - Inter Centre Communications (ICC)
 - Message Handling

1.6 It is intended that the “internet” component of this package will essentially be a sub-set of the requirements defined in the ATN Manual, Second Edition, which was developed to specify the “End State” operation of the internet. However, there will be additional requirements in CNS/ATM-1 to those specified in the ATN Manual e.g. requirements related to the mechanisms to support the optional non-use of the inter domain routing protocol (IDRP) over the air/ground link, requirements related to the specification of which air/ground data link is to be used for an instance of communication known as “traffic type policy requirements”.

1.7 It is not envisaged that any of these additional CNS/ATM-1 requirements will have any impact on the VDL definition. However, where it is necessary to modify subnetwork requirements within the frame of the CNS/ATM-1 Package these will be brought to the attention of the AMCP as appropriate.

2. Comments on Appendix A to ATNP/1-WP/59 “Requirements and Desirable Features for a Future ATS Air-Ground Communications System”

The following paragraphs of Appendix A are considered to be directly applicable to the ATNP:

Para. Ref.	Title	Comment
1.1.1	No degradation in safety	Agree
1.1.2	Communications Capacity	Agree
1.1.3	Low Cost of Airborne Equipment	Agree
1.1.4	Ground Infrastructure	Agree
1.1.5	Human/machine interface	Agree
1.1.6	Minimisation of Workload	Agree
1.1.7	Aircraft Speed	Not relevant to ATNP
1.1.8	Radio station range	Not relevant to ATNP
1.1.9	Area Coverage	Not relevant to ATNP
1.1.10	Limiting of accidental contention	Not relevant to ATNP
1.1.11	Direction Finding	Not relevant to ATNP
1.1.12	Security	Agree
1.1.13	Increased radio frequency interference protection	Not relevant to ATNP
1.1.14	Operation of multiple channels	Not relevant to ATNP
1.1.15	Transition and backward compatibility	Agree
1.1.16	Co-existence between present and future VHF air-ground communications systems	Not relevant to ATNP
1.1.17	Automatic channel management	Not relevant to ATNP
1.1.18	Selective addressing	Not relevant to ATNP
1.1.19	Service availability	TBD
1.2	Voice requirements	Not relevant to ATNP
1.2.1	Party line functional capability	Not relevant to ATNP
1.2.2	Direct air-to-air communications	Not relevant to ATNP
1.2.3	Quality	Not relevant to ATNP

1.2.4	Prevention of audio clipping	Not relevant to ATNP
1.2.5	User-to-user throughput delay	Not relevant to ATNP
1.2.6	User capacity	Not relevant to ATNP
1.2.7	Easy entry into the air-ground system	Not relevant to ATNP
1.2.8	Broadcast capability	Not relevant to ATNP
1.2.9	Urgent communications	Not relevant to ATNP
1.2.10	Dedicated functional voice channel for each air traffic controller	Not relevant to ATNP
1.3	Data link requirements	Agree
1.3.1	ATN Compatibility	Agree - Requirements for ATN/mobile subnetwork compatibility are documented in Appendix 10 of the ATN Manual, 19th November 1993.
1.3.2	Prioritization	Agree, however it is noted that the current definition of the VDL subnetwork draft SARPs do not support priority handling.
1.3.3	Dedicated ATS and AOC RF channels	Not relevant to ATNP - requirement is subnetwork specific
1.3.4	Message delivery time by VHF air-ground subnetwork	Requirement contains "TBD" for application layer data link messages. ATNP/WG1 is currently defining end-to-end performance requirements for presentation to ATNP/2. Last sentence of 1.3.4 refers to outstanding work with respect to the definition of "Specific message delivery requirements for the VHF air-ground data link subnetwork".
1.4	Desirable system features	
1.4.1	An all digital system	Agree
1.4.2	The capability to provide voice and data communications from the same avionics unit	Not relevant to ATNP - Implementation Issue
1.4.3	A full digital system with voice and data on the same RF channel	Not relevant to ATNP - However, it should be noted that the ATN has not been designed to transmit voice.
1.4.4	The capability to provide functionally simultaneous access to voice and data link communications from the same avionics unit.	Not relevant to ATNP - Implementation Issue

1.4.5	Call queuing capability	Not relevant to ATNP - Again, it is noted that the current VDL SARPs do not support any priority mechanisms.
1.4.6	Periodic end-to-end checking	Agree - At the ATN Internet level this is achieved through use of the ISO Transport Protocol.
1.4.7	Urgency messages override	Not relevant to ATNP - Voice related.

3. Comments on Appendix B to ATNP/1-WP/59 “VHF Digital Link (VDL) Design Guidelines”

Para. Ref.	Title	Comment
1.	Introduction	Noted
1.1	Configuration Control	Noted
2.	Underlying Assumptions	
2.1	Physical Medium	Not relevant to ATNP
2.2	ATN/OSI/ISO conformance	Agree ATN mobile subnetwork service requirements are specified in the ATN Manual, Dated 19th November 1993.
2.3	Fielding Schedule	Not relevant to ATNP
2.4	Provisions for future development	To date, the definition of the ATN internet requirements have not taken into account the need to transmit packet voice. Due to the connectionless nature of the ATN internet it is questionable whether it will be a suitable for the transmission of such data. This, however, does not preclude the definition of circuit digital voice as a VDL Specific Service (i.e. through direct access to the VDL instead of via an ATN Router).
3.	System Architecture	
3.1	General Provisions	TBD
3.2	VDL subnetwork access protocol	Agree

<p>3.3</p>	<p>VDL subnetwork and interface provisions to the router (IS-SME)</p>	<p>Agree with following proposed clarification changes:</p> <div style="border: 1px solid black; padding: 5px;"> <p>3.3 VDL subnetwork and interface provisions to the router (IS-SME)</p> <p>Requirement:</p> <p>The VDL subnetwork shall indicate to the airborne router IS-SME routing process:</p> <ul style="list-style-type: none"> a) a <u>join routing initiation</u> event; <p>and</p> <ul style="list-style-type: none"> b) a 'leave' event <u>router unreachable</u> <p>along with the <u>SNPA (i.e. DTE)</u> address of the associated peer <u>ground</u> router.</p> <p>Rationale:</p> <p>The link layer shall report connectivity to the ATN Router. This is to aid initiation of routing data transfer between ground and airborne router and routing updates <u>through</u> operation of the IDRP protocol.</p> </div>
<p>3.4</p>	<p>VDL sub-system specific services (VSP) access</p>	<p>It is unclear as to why there is any reference to ATN if what is being describe here is indeed a "VDL Specific Service". A "subnetwork specific service" is understood to be one where the service is provided via direct access to the subnetwork and not through the ATN (i.e. the ATN Router and/or ATN End System). Where is the broadcast protocol to be housed ?? Being VDL specific one assumes that it will be in the subnetwork but then reference is made to CLNP routing, CLNP being an ISO protocol (ISO 8473) that will be implemented in ATN Routers and End Systems. It is not quite true that broadcast is not supported by OSI - it is not at the network level but is possible at the application level.</p>
<p>3.5</p>	<p>Addressing</p>	<p>Agree</p>
<p>3.6</p>	<p>Common signalling channel</p>	<p>Not relevant to ATNP</p>
<p>4.</p>	<p>SYSTEM CAPABILITIES AND VDL SUB-SYSTEM SERVICES</p>	

4.1	Data Transfer	Agree
4.2	Connection-oriented mode	<p>The requirement and note are correct. However, the rationale is not, indeed almost the opposite is true. Firstly there is no subnetwork dependent convergence “protocol” as such - the term should be subnetwork dependent convergence function (SNDCF). Secondly, the local reference compression algorithm as defined in the SNDCF was developed to take advantage of the fact that the underlying air/ground subnetwork was based connection oriented. The SICASP/4 meeting agreed that all air/ground subnetworks of the ATN shall provide access via the ISO 8208 protocol in order to simplify the ATN Router specification and allow a common ATN Router specification for all air/ground subnetworks.</p>
4.3	Router Identification	This is duplicating the requirement in 3.5.
4.4	Connectivity change	<p>It needs to be clearly specified whether the leave event is provided to the airborne router by the airborne component of the subnetwork, to the ground router by the ground component of the subnetwork or to both. The rationale needs to be expanded to make reference to termination of routing information exchange as well as the initiation. Also see Comment on para. 3.3 of the Design Guidelines, in fact para. 3.3 and 4.4 duplicate each other to a some extent.</p>
4.5	SEGMENTATION OF DATA UNITS	<p>Agree with the requirement and supporting note. However, whilst m-bit sequencing is required this cannot preclude CLNP segmentation from occurring.</p> <p>The ATN Manual (Clause A10.4.5) specifies that “The underlying subnetwork shall support a SDU size of a minimum of 1068 octets”. This figure includes 6 octets for the “segmentation part”.</p>
4.6	Priority	<p>To state that the VDL subnetwork will not support priority is sufficient. The first paragraph of the rationale should be deleted since it is out of scope. Note 1 under the rationale should also be deleted. The handling of application specified priority within the internet (i.e. network and transport layers) is currently under discussion in the ATNP and as yet no final agreement has been concluded as to how priority should be handled in these layers.</p>
4.7	Quality of service	<p>What is meant by “classes of ATN traffic”, is it the 4 traffic types defined in the ATN Manual i.e. - ATN Operational Communications, ATN Administrative Communications, ATN System Management Communications and ATN General Communications ?</p>

5.	SUBNETWORK PERFORMANCE CHARACTERISTICS	
5.1	Coverage and connectivity	Agree
5.2	Throughput	Agree - Replace “transport” with “network” in Note 1. Rationale: ATNP/WG1 is defining end-to-end performance requirements for the CNS/ATM-1 Package applications.
5.3	Residual Error Rate	Noted.
5.4	Congestion Control	The last sentence of the Recommendation para. states that : “When congestion occurs and the additional facilities are not available, data traffic should be reduced by restricting lower priority traffic.” This implies some level of priority handling in VDL which is apparently in conflict with the statement in para. 4.6 (“The basic VDL subnetwork, as detailed in VDL draft SARPs, Version 1, will not invoke subnetwork priority or any other pre-emption mechanism”). Optimal Congestion mechanisms at the network/transport layer are currently under discussion in ATNP\WG2.
5.5	Availability	Noted.
5.6	System Recovery	Noted. The VDL subnetwork needs to define a period of time after which it considers a break in service to be permanent so that it may generate a “leave” event to the ATN Router.
6.	TRANSITION	
6.1	Implementation of new systems	Agreed - However, The requirement/rationale is considered to be outside the scope of this document.
6.2	Use of data link systems	Agreed - However, The requirement/rationale is considered to be outside the scope of this document
6.3	Use of frequencies	Not relevant to ATNP.
6.4	APPENDIX C SUMMARY OF VDL MODE 2 PERFORMANCE CHARACTERISTICS	The 5th row from the bottom of the table states: “Delivery Reliability - Dependent on ATN implementation”. It is believed that the delivery reliability of the subnetwork (i.e. VDL) should be specified and this is independent of any additional reliability provided by the ATN protocols that operate on an end-to-end basis.