Aeronautical Telecommunication Network Panel (ATNP)
Applications and Upper Layer Work Group (WG3)
Seventh Meeting
Munich, Germany
24-29 June 1996

Draft WG3 Rapporteur's Report to ATNP/2

Presented by the WG3 Rapporteur

Attached is a draft report from the WG3 Rapporteur to ATNP/2. The purpose of this report is to summarize the activities and progress of ATNP WG3 since ATNP/1 .

AERONAUTICAL TELECOMMUNICATION NETWORK PANEL (ATNP)

SECOND MEETING

Montreal, 4 to 15 November 1996

Agenda Item 3: Development of the CNS/ATM-1 Package SARPs and Guidance Material

ATNP WG3 Rapporteur's Report

(Presented by Mr. Ron Jones)

INFORMATION PAPER

Summary

This information paper provides a summary of the activities and progress of the Applications and Upper Layer Work Group (WG3) of ATNP

_____

References

Report of the first meeting of the ICAO Aeronautical Telecommunication Network Panel, June 1994

1.   INTRODUCTION

1.1   The Applications and Upper Layer Work Group (WG3) of ATNP held its first meeting subsequent to ATNP/1 in San Diego, California USA. Three subgroups were formed and their work programs were approved at this initial meeting of WG3. The three subgroups were formed to develop draft SARPs and Guidance Material for:
    SG1 - Ground-Ground Applications
    SG2 - Air-Ground Applications
    SG3 - Upper Layer Communication Services

A total of eight meetings of WG3 were convened since ATNP/1. The location and dates for these meetings were:

    24-28 October 1994 - San Diego, California USA
    13-17 March 1995 - Toulouse, France
    15-19 May 1995 - Fairfax, Virginia USA
    16-20 October 1995 - Banff, Canada
    5-14 February 1996 - South Brisbane, Australia
    15-26 April 1996 - Brussels, Belgium
    24-29 June 1996 - Munich, Germany
    7-15 October 1996 - Virginia, USA

The WG3 work program, as defined in 7.3.4.1 of the report of ATNP/1, was the basis for the activities of WG3. The efforts of the working group have concentrated on completing the development of the draft SARPs and as a consequence the draft guidance material is less mature.

2.   DISCUSSION

2.1   WG1 had been tasked by ATNP/1 (7.3.2.1 of the report of ATNP/1) to define the initial set of ATM applications. Operational requirements for these were received from the ADS Panel and subsequent to review by WG1 were forwarded to WG3. These operational requirements were used as the basis for development of the SARPs for the initial set of applications and upper layer communication services. The following paragraphs address the progress that has been made against each of the items on the WG3 work program, as defined in 7.3.4.1 of the report of ATNP/1.

2.1.1   activity a): "development of draft SARPs and guidance material for applications, including both fixed and mobile applications in field of ATM applications as well as system applications (e.g. directory service)."

WG3 formed subgroup 1 to develop the draft SARPs and guidance material for the ground-ground ATN applications and subgroup 2 to develop the draft SARPs and guidance material for the air-ground ATN applications.   Since the air-ground applications include requirements for ground-ground message exchanges in support of the air-ground application, these ground-ground aspects were incorporated directly into the air-ground applications draft SARPs.

2.1.1.1   The development of the ground-ground application SARPs and guidance material was based, in part, on the inputs received from the ADS Panel and ATNP WG1 as well as specific tasking at ATNP/1. The ATS Message Handling Service is based on work initiated under the former ICAO ASP Panel and represents a refinement of draft SARPs material reviewed at ATNP/1. The ICAO ADS Panel provided drafts of the "ICAO Manual on Air Traffic Services Data Link Applications" which has subsequently been approved at ADSP/4.   This ADSP document defines operational requirements applicable to the ATS Interfacility Data Communication (AIDC) application that is included in the draft Intre-Center Communications (ICC) SARPs. The following draft ATN SARPs and guidance material have been developed for the initial two ground-ground ATN applications:

- ATS Message Handling Service (MHS) over the ATN - . The ATS Message Handling Service allows ATS Messages to be exchanged between service users, using the ATN communication services, to provide the media and lower layer protocols to conduct these exchanges. The draft SARPs includes the definition of an ATN pass-through service including the definition of a AFTN/ATN Type A gateway. The draft SARPs also define an ATS message service including a AFTN/AMHS gateway (i.e. Type B gateway).

- Intre-Centre Communications (ICC) - The initial draft ICC SARPs is limited to the ATS Interfacility Data Communication (AIDC) application. The AIDC application exchanges information between ATS Units (ATSUs) for support of critical Air Traffic Control (ATC) functions, such as notification of flights approaching a Flight Information Region (FIR) boundary, coordination of boundary conditions and transfer of control or communication. AIDC is strictly an ATC application for exchanging tactical control information between ATS units, not with other offices or facilities.

2.1.1.2   The development of the air-ground application SARPs and guidance material was based, in a large part, on the inputs received from the ADS Panel and ATNP WG1. The ADSP provided drafts of the "ICAO Manual on Air Traffic Services Data Link Applications" which has subsequently been approved at ADSP/4. This ADSP document defines operational requirements applicable to the four air-ground applications that are included in the ATN SARPs. Therefore the draft guidance material developed by WG3 for the initial air-ground applications was kept brief given the existence of the draft ICAO Manual from the ADSP. The draft ATN air-ground application SARPs and guidance material includes the following four applications:

- Context Management (CM) - an ATN system application providing the capability to establish a log-on between ATC ground and aircraft systems via the ATN. Once the appropriate connection is established, CM provides data link application information (i.e. a from of directory service), the capability to log-on to another ground system via a ground forwarding function, and the capability to update log-on information. A successful CM log-on is required before any of the other air-ground applications can be initiated.

- Controller Pilot Data Link Communications (CPDLC) - an ATN application supporting the exchange of ATC instructions between air traffic controllers and pilots. The focus of the CPDLC message set is on data link messages that would directly replace controller-pilot voice exchanges, although the CPDLC message set also defines a limited number of messages appropriate for exchange between ground and airborne automation systems. A ground forwarding function is also defined to allow the ground ATC facility, that is responsible for operational control of the aircraft, to forward CPDLC messages to other ATC facilities. The CPDLC SARPs also defines a downstream clearance service to allow airborne users to obtain a clearance from a downstream ATC facility.

- Automatic Dependent Surveillance (ADS) - an ATN application allowing a ground user (e.g. ATC facility) to automatically obtain position and other information from participating aircraft on a system-to-system basis in a timely manner in accordance with their requirements. The ADS application is defined by the draft ATN SARPs to support demand contracts, periodic contracts, event contracts and emergency contracts. A ground forwarding function is also defined to allow a ground operational facility, that has an established ADS report contract with a given aircraft, to forward the ADS reports to other operational facilities.

- Flight Information Services (FIS) - the only FIS application included in the initial set of air-ground ATN applications is Automatic Terminal Information Service (ATIS). The ATIS application SARPs defines a airborne initiated service allowing an airborne user to request ATIS

service and the ground ATIS server application to provide the ATIS reports and updates, either as a single request or on a contract basis.

2.1.2 activity b): "development of draft SARPs and guidance material for the ATN upper layers (i.e. above the ATN internet) supporting applications both fixed and mobile aeronautical data communications."

At the first meeting of WG3 in October 1994, it was recognised that basing the ATN upper layer standards on internationally recognised base standards was preferred over ATN unique solutions. However the ISO and ITU upper layer standards that existed in 1994 were deem inappropriate for use over limited bandwidth subnetworks, as represented by the mobile subnetworks of the ATN. A number of the States and aeronautical organisations that are represented in ATNP subsequently undertook to support the appropriate ISO and ITU-T upper layer standards committees. These efforts have now succeeded in gaining approval for modifications to the base ISO and ITU-T upper layer standards to include the efficiency enhancements needed to make the upper layer architecture and protocols defined by these bodies applicable to the ATN. The ATN upper layer standard supports all of the initial package of ATN applications except the ATS MHS application where efficiency enhancements of the upper layers was not applicable. The ATN upper layer standards, based the ISO efficiency enhancements, is designed to optimise the use of communications bandwidth, and consequently restricts the functionality available from the OSI Session and Presentation layers. The ATS MHS application requires upper layer services not supported by the restricted upper layer functionality. As a result the ATS MHS application draft SARPs defines the upper layer standards based the ISO upper layer base standards without the efficiency enhancement options. The draft ATN upper layer SARPs and GM address the ATN requirements for Session Layer (Layer 5), Presentation Layer (Layer 6), and a part of the Application Layer (Layer 7) of the OSI reference model. The remaining part of the Application Layer is the province of the individual ATN application draft SARPs (i.e. the ADS, CM, CPDLC and FIS (ATIS) SARPs for air-ground applications, and the ICC (AIDC) SARPs for ground-ground applications).

2.1.3 activity c): "development of draft SARPs and guidance material for the ATN upper layers protocol stacks and upper layers managed objects within the framework of systems management concepts defined by Working Group 1."

The ATN upper layer protocols are based on ISO upper layer standards. As discussed above, all of the initial ATN applications, except for the ATS MHS application, will use the efficiency enhancements recently included in the ISO upper layer standards.

WG1 concluded that no formal system management mechanisms are to be included in the initial package of ATN services. However, local system management mechanisms may be implemented within a given administrative routing domain. Since this is a local implementation matter, it is outside the scope of the SARPs. Future additions to the ATN SARPs may define explicit system management mechanisms. This is viewed as an item for the future work program.

2.1.4 activity d): "development of draft SARPs and guidance material for the ATN upper layers and applications security features within a framework of security concepts defined by Working Group 1."

ATNP Working Group 1 concluded that no formal technical security mechanisms are to be included in the initial package of ATN services. In general, procedural means will be employed to minimize the security risk for initial implementations of ATN services. However, the Controller Pilot Data Link Communication (CPDLC) draft SARPs includes a mechanism for identifying the current data authority and the next data authority. This mechanism can be viewed as a technique for providing a modest measure of security. Future additions to the ATN SARPs may define explicit technical security mechanisms. This is viewed as an item for the future work program.

2.1.5   activity e): "over-all assessment of the on-going activities supporting the validation of the ATN upper layers and applications draft SARPs."

Working Group 3 developed the framework for the documentation of the validation results against the SARPs requirements. The development of a validation data base for each major section of the SARPs was coordinated by the working group. High level validation objectives were documented for each area of the SARPs and these were reviewed and approved by the working group. The individual SARPs 'shall' statements, at the most detailed levels, were traceable to one or more validation objective. States and organizations performing validation activities reported their results against these validation objectives and the results were documented in a common validation data base. The working group then reviewed the results of the validation efforts and documented their conclusions as to the adequacy and success of the validation activities against each functional area of the SARPs.

2.1.6   activity f): "development of SARPs and guidance material for messaging applications over the ATN and over-all assessment of on-going activities supporting validation on this matter."

This subject was discussed above under 2.1.1.1 and the validation aspects under 2.1.5.

2.1.7   activity g): "development and validation of draft SARPs for encoding rules and data compression functions."

The draft ATN upper layers SARPs define the use of Packed Encoding Rules (PER) for the message transfer syntax. The unaligned variant of the Packed Encoding Rules (PER) is specified for coding of both the upper layer headers and for the user data (i.e. application messages). PER is an ISO standard and provides for a very efficient, bit oriented, coding of protocol headers and application data.

2.2   Coordination between WG3 the other two ATNP working groups occurred through a combination of Joint Working Group (JWG) meetings and flimsies exchanged between the working groups. Coordination with WG1 was focused on aligning the application and upper layer requirements with the operational and system level requirements being defined and/or reviewed by WG1. Coordination with WG2 was focused on providing a well defined and consistent interface between the ATN upper layer and the internetwork communications services and ensuring that the internetwork communication services provided the functionality required by the applications and the upper layers.

3.   CONCLUSION

Extensive efforts have gone into the development of the application and upper layer areas of the draft ATN SARPs. Working group 3 has defined the framework for the validation of the application and upper layer areas of the ATN SARPs and has served as a coordination point for the efforts of the member States and organizations involved in ATN SARPs validation activities. Working group 3 has reviewed the results of the validation activities and has prepared a report to document the status of the validation activities against a set of validation objectives. Although less mature than the draft ATN SARPs, working group 3 has also developed draft guidance material corresponding to each major area of the draft application and upper layer SARPs.