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AERONAUTICAL TELECOMMUNICATION NETWORK PANEL (ATNP)

WORKING GROUP 3 - APPLICATIONS AND UPPER LAYERS (WG3)

ATN - AIDC Draft SARPs Validation Objectives

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Summary

This paper describes the approach which is intended to be followed by Eurocontrol to validate the draft AIDC SARPs. WG3 is invited to note the information contained in this paper.

1. BACKGROUND

1.1 INTRODUCTION

Version 1.0 of the draft ICC SARPs, limited to the AIDC Application for the CNS/ATM-1 Package, has been issued at the Brussels WG3 meeting in April 1996.

At its fourth meeting (Banff, 16-20 October 1995), WG3 concluded that the SARPs Validation Framework as proposed in WG2/6 Flimsy 12 "ATN Draft SARPs Validation Approach" would be the basis for the validation of the draft SARPs for the CNS/ATM-1 Package.

During its fifth meeting (Brisbane, 5-14 February 1996), WG3 developed the recommendations for validation in WG3-5 Flimsy 10 "Ground Rules for Validation".

On the basis of the above, Eurocontrol has defined the following approach for the validation of the draft AIDC SARPs.

1.2 EXISTING APPLICATION ENVIRONMENT

The automatic exchange of coordination data between ATC computer systems (i.e. Flight Data Processing Systems) using electronic data transfer is in operation in Europe since a number of years. This exchange of data conforms to the Eurocontrol Standard for On-Line Data Interchange (OLDI) which covers the Notification and Co-ordination Phases of a given flight.

Extensions to this base-standard including dialogue procedure in the Co-ordination Phase and in the Transfer of Control Phase have been developed and extensively tested within a real-time simulated operational environment set up in the Eurocontrol Experimental Centre. The simulation environment was a representative part of four ATC Centres (a total of ten sectors) using representative traffic sample data.

The Eurocontrol OLDI Standard complemented with the above extensions (referred to as OLDI Edition 2) is now submitted to the formal approval of the Eurocontrol Member States.

It is assumed that the OLDI application conforming to OLDI Edition 2 can be considered as a regional implementation of the AIDC (ATS Interfacility Data Communication) application developed by the ADS Panel. This assumption is based on:

- the fact that a one-to-one relationship almost exists between the OLDI messages and the AIDC messages defined by the ADS Panel;

- the same message sequencing for the OLDI and AIDC applications.

2. OBJECTIVES OF THE VALIDATION

The objectives of the validation of the SARPs for the CNS/ATM-1 Package have been discussed at length during previous WG3 meetings and are therefore not repeated in this paper.

The functionality of the AIDC protocol is represented in the Draft SARPs as a set of state tables and sequence diagrams. The objectives of the validation will be to ensure that:

- the SARPs are complete, consistent, unambiguous and that they meet the defined user requirements;

- all acceptable events and actions as defined in the service definition and the sequence diagrams are allowed by the SARPs;

- unacceptable events and actions are not allowed by the SARPs;

- there are no deadlocks or livelocks.

- there are no occurences of invalid events (e.g. invalid event emission, etc.)

3. APPROACH OF THE VALIDATION

3.1 GENERAL

Taking into account of the similarities of the OLDI and AIDC applications, the validation of the Draft SARPs will concentrate on their functional validation. The contents of the AIDC APDUs need not to be validated since they are similar to that of the OLDI messages, which are used operationally. It is also assumed that the defined ULA will be validated as part of the validation of the Air/Ground application SARPs. Validation of the ULA as part of the validation of the AIDC SARPs is not considered, since these applications place more stringent performance requirements than AIDC.

Due to the very tight time constraints and the limited period of time up to ATNP/2, it is not considered feasible to develop a prototype implementation of the AIDC application.

The approach chosen by Eurocontrol to validate the AIDC Draft SARPs is based on the following:

- verification of the interoperability between OLDI user and AIDC user;

- verification of the formal definition of the AIDC messages.

3.2 VERIFICATION OF THE INTEROPERABILITY BETWEEN OLDI AND AIDC

Eurocontrol has contracted the company Verilog to develop the following models using the GEODE tool:

- model an OLDI Edition 2 implementation;

- model an AIDC implementation;

- model the mapping between OLDI messages and AIDC service primitives.

Various WG3 papers [1] have already described the static and dynamic verification steps involved in such a model using the GEODE tool. They are therefore not repeated in this paper.

The OLDI model will implement the OLDI message sequencing defined in the corresponding Eurocontrol Standard and used in the operational environment. The AIDC model will implement the sequencing defined by the Draft SARPs. Finally the modelisation of the mapping between OLDI messages and AIDC service primitives will enable to verify the correct sequencing of the AIDC protocol machine and will demonstrate the interoperability between the OLDI and AIDC applications.

An example of the mapping between OLDI messages and AIDC service primitives is shown in the following figure.

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[1] For example: Verification of the FIS Protocol - Approach and Results - R. Beaulieu & F. Picard, WG3/IP5-27 of the WG3 Brisbane meeting, 5-14 February 1996
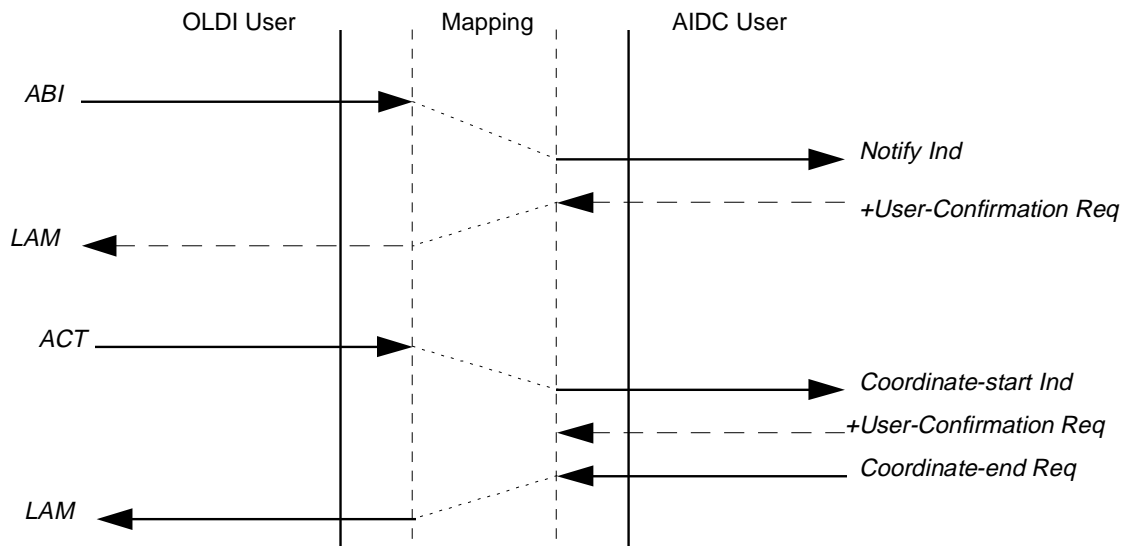
Example of mapping of OLDI Messages to AIDC Service Primitives

3.3 ASN.1 VALIDATION

Although it is not planned to validate the contents of the AIDC APDUs, the formal definition of the AIDC service primitives need to be validated in order to verify that the ASN.1 is valid and to determine if unambiguous provision has been made for the ASN.1 encoding.

4. STATUS OF THE VALIDATION

Modelisation work of the OLDI and AIDC protocol machines has started, that is the definition of the models which will be used later for the simulation.

In parallel, the test cases which will be used during the simulation are being defined.

It is anticipated that final results of the AIDC SARPs validation will be available by mid-August 1996.

5. CONCLUSION

The validation approach of the Draft AIDC SARPs planned by Eurocontrol will be a functional validation against a similar operational application, namely OLDI, complemented by a validation of the corresponding ASN.1.

WG3 is invited to note the information contained in this paper.