EUROCONTROL

AERONAUTICAL TELECOMMUNICATION NETWORK PANEL

WORKING GROUP 3 (APPLICATIONS AND UPPER LAYERS)
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Validation Tool Descriptions for ATN Applications

INFORMATION PAPER

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SUMMARY

This information paper contains the validation tool descriptions for the Eurocontrol air-ground SARPs validation activities. The descriptions are made using the tool description template distributed to atn-internet-technical-list in November 95 (see ATNP/WG2-WP/203).

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1. INTRODUCTION

This paper contains validation tool descriptions for the Eurocontrol air-ground SARPs validation activities. The descriptions are made using the tool description template distributed to atn-internet-technical-list in November 95 (see ATNP/WG2-WP/203).

2. COMMENTS ON DESCRIPTION TEMPLATE

It has been necessary to modify the original WG2 template to make it applicable to ATN upper layers and applications. The modifications are in the following fields:

- Protocols (modified for Session, Presentation and ACSE standards);

- CNS/ATM-1 Specifics (modified for ATN Applications);

- Connectivity Information (replaced with "Other Information").

Tool Identification

Name	**TES Simulation**
Full Name	Eurocontrol Trials End System project, GEODE model
Category	FORMAL MODELLING
Description	The ADS application and the Upper Layer draft SARPs are being modelled using the GEODE tool from Verilog. This will validate the protocol specifications to ensure that: • the SARPs text allows all acceptable behaviour (as defined by the service definition and the sequence diagrams); • the SARPs text disallows all unacceptable behaviour; • there are no states that the protocol machine can get into, but not get out of (deadlocks); • there are no groups of states that the protocol machine can get into, but cannot get out of into the other states (livelocks).
Contact Point and/or Supplier	EUROCONTROL, Danny Van Roosbroek tel: +32 2 729 3471 e-mail: van-roosbroek.danny@eurocontrol.be
Tool Version and Date	GEODE
Supporting Hardware	Hewlett-Packard 9000 series
Supporting Operating System and/or Software	HP-UX 9.0

CNS/ATM-1 SARPs Scope

ATN Systems	☒ End System ☐ Intra-domain Intermediate System ☐ Ground-ground BIS ☐ Air-ground BIS ☐ Airborne BIS ☐ Not Applicable
Protocols (Upper Layers)	Session ☐ ITU-T X.215 (1994)	ISO/IEC 8326:1994 ☐ ITU-T X.215 Adm 1 (1995) ☐ ISO/IEC 8326:1995/PDAM 2 ☐ ITU-T X.225	ISO/IEC 8327-1:1994 ☐ ITU-T X.225 Adm 1 (1995) ☐ ISO/IEC 8327-1:1995/PDAM 2 Presentation ☐ ITU-T X.216 (1994)	ISO/IEC 8822:1994 ☐ ITU-T X.216 Adm 1 (1995) ☐ ISO/IEC 8822:1994/PDAM 2 ☐ ITU-T-X.226 (1994)	ISO/IEC 8823-1:1994 ☐ ITU-T-X.226 Adm 1 (1995) ☐ ISO/IEC 8823-1:1994/PDAM 2 ACSE edition 2 ☒ ITU-T X.217 (1992)	ISO/IEC 8649:1994 ☐ ISO/IEC 8649:1995/DAM 1 (Fast associate mechanism)

	☒ ITU-T X.227 (1994) | ISO/IEC 8650-1:1996 ☐ ISO/IEC 8650-1:1995/DAM 2 (Fast associate mechanism) ☐ ISO/IEC 8650-1:1995/DAM 1 (Incorporation of extensibility markers) Encoding Rules ☐ ITU-T X.690 (1994) | ISO/IEC 8825-1 (BER) ☐ ITU-T X.691 (1993) | ISO/IEC 8825-2 (PER) Other:
CNS/ATM-1 Specifics	☒ ULA SARPs (version 2.0) ☐ CM SARPs (version 2.0) ☒ ADS SARPs (version 2.0) ☐ CPDLC SARPs (version 2.0) ☐ FIS SARPs (version 2.0) Other:

Other Information

Notes

The Eurocontrol Trials End System (TES) is a validation project which offers a number of validation tools. One of the activity threads involves a modelling activity using the GEODE tool from Verilog.

The CNS/ATM-1 Package protocols are described in the draft SARPs in textual form (the functionality is also represented in general as a set of state tables). Based on the text in the draft SARPs, the functionality is re-written in the formal definition language SDL (Specification and Design Language), which is then read and processed by the modelling tool GEODE.

Having developed the model, simulation activities can begin. Each of the valid sequences of events will be simulated individually, to ensure that they are all possible. Then random, and finally exhaustive simulation will be performed to ensure that no problems occur when the valid sequences of events are mixed. Exhaustive simulation will ensure that all possible scenarios are tested.

Modelling the application protocol using SDL and the GEODE tool allows the sections in the draft SARPs that describe the protocol machine to be validated.

Eurocontrol will validate the ADS, CM, CPDLC and upper layer protocol definitions in this manner. The results of the simulation work will be made available to ATNP/WG3 and the relevant subgroups to assist with the validation effort.

Tool Identification

Name	**TES Prototyping**
Full Name	Eurocontrol Trials End System Prototyping project
Category	PROTOTYPE IMPLEMENTATION
Description	The prototyping activity involves implementing the ADS, CM and CPDLC applications (both air and ground components), together with supporting upper layers. A major goal is to identify any problems in the draft SARPs during the analysis, design and implementation of the prototypes. The applications will then be available for interoperability testing with other, independent implementations.
Contact Point and/or Supplier	EUROCONTROL, Danny Van Roosbroek tel: +32 2 729 3471 e-mail: van-roosbroek.danny@eurocontrol.be
Tool Version and Date	Not yet available (April 1996)
Supporting Hardware	Hewlett-Packard 9000-series
Supporting Operating System and/or Software	HP-UX 9.0

CNS/ATM-1 SARPs Scope

ATN Systems	☒ End System ☐ Intra-domain Intermediate System ☐ Ground-ground BIS ☐ Air-ground BIS ☐ Airborne BIS ☐ Not Applicable
Protocols (Upper Layers)	Session ☒ ITU-T X.215 (1994) | ISO/IEC 8326:1994 ☐ ITU-T X.215 Adm 1 (1995) ☒ ISO/IEC 8326:1995/DAM 1 ☐ ITU-T X.225 | ISO/IEC 8327-1:1994 ☐ ITU-T X.225 Adm 1 (1995) ☒ ISO/IEC 8327-1:1995/DAM 1 Presentation ☒ ITU-T X.216 (1994) | ISO/IEC 8822:1994 ☐ ITU-T X.216 Adm 1 (1995) ☒ ISO/IEC 8822:1994/DAM 1 ☐ ITU-T-X.226 (1994) | ISO/IEC 8823-1:1994 ☐ ITU-T-X.226 Adm 1 (1995) ☒ ISO/IEC 8823-1:1994/DAM 1 ACSE edition 2 ☒ ITU-T X.217 (1992) | ISO/IEC 8649:1994 ☐ ISO/IEC 8649:1995/DAM 1 (Fast associate mechanism) ☒ ITU-T X.227 (1994) | ISO/IEC 8650-1:1996 ☐ ISO/IEC 8650-1:1995/DAM 2 (Fast associate mechanism) ☒ ISO/IEC 8650-1:1995/DAM 1 (Incorporation of extensibility markers) Encoding Rules

	☐ ITU-T X.690 (1994) | ISO/IEC 8825-1 (BER) ☒ ITU-T X.691 (1993) | ISO/IEC 8825-2 (PER) Other:		
CNS/ATM-1 Specifics	☒ ULA SARPs (version 2.0) ☒ CM SARPs (version 2.0) ☒ ADS SARPs (version 2.0) ☒ CPDLC SARPs (version 2.0) ☐ FIS SARPs (version 2.0) Other:		

Other Information

Notes

Eurocontrol is developing the Trials End System (TES) prototype applications to assist in the validation of draft SARPs for the CNS/ATM-1 Package. The objectives of the overall TES project are: the validation of the ATN draft SARPs for air-ground applications and supporting upper layer, the production of corresponding prototypes and simulation models, and free issue of the software to Eurocontrol member Administrations.

The prototype system is being procured by the TES project of the Eurocontrol ATN End Systems task (FCO.ET3.STO4). Initial tenders were received in November 1995, and negotiations for contract award are currently proceeding.

TES Architecture

The TES Prototype System comprises hardware platforms, base software and custom software, which will be used initially primarily for the validation of the ICAO draft SARPs for the ATN Upper Layers and Air-Ground ATM applications. The TES environment consists of two major components, the air-based end system and the ground-based end system. The ATN Upper Layers rely on the services provided by the ATN Internet, and provide communication services to the ATM applications. The ATN Upper Layers ensure the end-to-end communication between the two end systems over a number of ATN routers connected via ATN compatible subnetworks.

For the TES Prototype System, the air and ground end systems will communicate using a lower layer protocol stack which can be used in a variety of configurations, in place of the ATN Internet. This point is important, since the objective of the TES project is to validate the SARPs for ATM applications and ATN upper layers, and not the ATN Internet. The TES prototype software will use the X/Open transport service interface. Different communications infrastructure configurations can be "plugged in" beneath the transport interface.

SARPs Validation

The validation procedure will take place in the following stages:

* analysis of the draft SARPs requirements;

* production of functional specifications;

* production of design specifications;

* implementation;

* stand-alone tests;

- interoperability tests (using defined simulation scenarios).

Each of these stages will identify different types of errors or omissions in the draft SARPs, and will provide documented evidence in the form of reports on the completeness and accuracy of the draft SARPs, including any assumptions and interpretations which it was necessary to make.

The TES project will produce prototype software implementations of the following CNS/ATM-1 Package SARPs:

- Automatic Dependent Surveillance (ADS);

- Context Management (CM) Application;

- Controller-Pilot datalink communication (CPDLC);

- Common Upper Layer Architecture and protocols.

Each of the implementations will include both air and ground based end system components. (The TES project does not currently include the validation of the Flight Information Services SARPs in the CNS/ATM-1 Package).

The TES prototypes will be developed by the selected contractor, who will independently analyse the draft SARPs, produce functional and design specifications based on the draft SARPs and implement the software realisations. The TES prototype will then be used to test the functionality, interoperability and performance of the draft SARPs

The TES prototypes will implement application programming interfaces (APIs) which correspond closely to the upper abstract service interfaces (ASIs) specified in the draft air-ground application SARPs. These APIs provide a common interface which will allow simulation and test tools to be developed separately from the TES prototypes.

The TES prototypes will have a table-driven test interface. Where possible, the test data will be based on samples of real data. The test interface will be used to introduce both normal and abnormal events into the TES prototype. Test scenarios will be based upon real-life situations, including time based events, single instance of a flight and summation of all flights. These will be used to check the behaviour of the TES prototype and the draft SARPs.

The TES prototype system software is aimed at the validation of the SARPs and would not necessarily be used in an operational environment.

The TES and its components will support a number of configurations on the user side or Human Computer Interface (HCI), which will allow it to be used beyond the initial SARPs validation. These user configurations will include:

- the validation environment;

- a demonstration environment, with user interfaces possibly based on Eurocontrol Bretigny HCIs;

- future ADS Europe experiments based on CNS/ATM-1 Package SARPs;

- ADS Mediterranean Trials based on CNS/ATM-1 Package SARPs.

It is intended that the TES prototype system and its hosted applications will evolve into an ATN Application Reference System, providing a stable implementation of the CNS/ATM-1 Package SARPs once validation is complete, against which other implementations can be tested.