ATNP/2 WP____
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Aeronautical Telecommunication Network Panel (ATNP)
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Agenda Item 3: Development of the CNS/ATM-1 Package SARPs and Guidance Material

Proposed ATN SARPs

Presented by the ATNP WG Rapporteurs

Summary

Three working groups were formed by ATNP/1. These working groups were tasked with the development of CNS/ATMM-1 Package (ATN) SARPs and Guidance Material for review at ATNP/2. ATNP/1 also tasked the working groups with reporting the results of activities to validate these proposed SARPs. This working paper summarizes the methodology adopted by the ATNP working groups and the member organizations conducting validation programs for the proposed ATN SARPs. The successful validation of the proposed ATN SARPs is reported and it is proposed that ATNP/2 approve the proposed ATN SARPs based on the positive results from the validation activities.

References

1. Report of the first meeting of the Aeronautical Telecommunication Panel.
2. Proposed ATN SARPs

Attachments:

Appendices A through J (providing details of ATN SARPs Validation Activities)

1.0 Background

Three working groups were formed by ATNP/1. These working groups were tasked with the development of ATN SARPs and Guidance Material (previously referred to as CNS/ATM-1 Package SARPs and GM) for review/approval at ATNP/2. ATNP/1 also tasked the working groups with reporting the results of activities to validate these proposed SARPs.

This working paper summarizes the methodology adopted by the ATNP working groups and the member organizations conducting validation projects against the proposed ATN SARPs.

2.0 Discussion

The three working groups of ATNP adopted the approach described below for the validation of the ATN SARPs.

In order to undertake an cooperative international program for the validation of the ATN SARPs, a common operational scenario was defined. The working groups endorsed a common system-level scenario that was used by the States and organizations participating in the ATNP working groups as a common basis to validate the CNS/ATM-1 functionality. In some cases, these States and organizations also employed additional operational scenarios representative of the application of the ATN SARPs within their operational domains. The common operational scenario evaluated the use of the ATN applications, upper layers, and internetwork services in test environments. Sub-Volume 1 of the ATN SARPs provides the tracability from the functional requirements, defined in Sub-Volumes 2 through 5 of the ATN SARPs, to the system level requirements and from the system level requirements to the operational and institutional requirements. These five sub-volumes collectively constitute Part 2 of the ATN SARPs. This document forms the appendix to Part 1 of the ATN SARPs. Part 1 provides an introduction and a statement of the system-level and high-level functional requirements that are defined in greater detail within Part 2. Therefore no validation activities were required specifically against Part 1 as no requirements are present in Part 1 beyond those contained in Part 2.

2.1 Define validation objectives and means

The objective of the validation tests and simulations were to validate the technical and functional requirements of the proposed SARPs (Sub-Volumes 2 through 5) and to validate the system level requirements (Sub-Volume 1) that were derived directly from the operational and institutional requirements. With this approach the ability of ATN SARPs to satisfy the operational and instructional requirements has been successfully demonstrated.

The objectives of SARPs validation are to ensure that the draft ATN SARPs are:

a) Complete and self-consistent;

b) Unambiguous;
c) Mutually consistent, and
d) that they achieve the declared operational and/or institutional requirement.

Validation Objectives (VOs) have been defined for each SARPs Sub-Volume. Each VO corresponds to a specific validation activity (e.g., test, simulation exercise, analysis, etc.) intended to validate a specific functional requirement, for SARPs Sub-Volumes 2 through 5, or a system level requirement, for SARPs Sub-Volume 1.. A functional requirement is supported by a collection of one or more lower-level technical requirements (expressed as 'shall' statements). The term "requirement" in the following material refers to an ICAO standard or recommended practice (i.e., "shall" or "should" statement). The SARPs requirements have been defined in a hierarchical structure consisting of the following from highest-level to lowest-level:

a) System-level requirement

A system level requirement is considered to be validated when it has been examined and preferably tested to determine that:

- the collection of functional requirements supporting that system level requirement do in fact collectively provide the specified system capability; and

- the specification of the system level requirement is true and accurate, unambiguous and not in conflict with any other system level requirements.

b) Functional requirement

A functional requirement is considered to be validated when it has been examined and preferably tested to determine that:

- the collection of technical requirements supporting that functional requirement do in fact collectively provide the specified functional capability; and

- the specification of the function is true and accurate, unambiguous and not in conflict with any other technical function.

c) Technical requirement

Technical requirements represent the lowest level requirements of the ATN SARPs. Such requirements are associated with "shall" and "should" statements in Sub-Volumes 2 through 5 of the ATN SARPs. A technical requirement is considered to be validated when it has been examined and preferably tested to

determine that it is a true and accurate specification, unambiguous and not in conflict with any other technical requirement.

An operational or institutional requirement is considered to be satisfied when it has been examined to determine that the collection of validated supporting system level requirements do in fact provide the stated operational capability to the extend that is within the scope of the ATN SARPs.

2.2 Create a Validation Data Base tracing requirements at the level necessary to achieve the validation objective

The ATNP working groups recommended the development of Validation Data Base (VDB) for each SARPs Sub-Volume, or each major part within a given SARPs Sub-Volume . States and organizations participating in the validation activities developed these VDBs and the ATNP working groups used these VDBs as tools for tracking the status and results of the validation activities.

For Part 1 and Sub-Volume 1 the VDB comprises the VOs and the following two levels of requirements:

. . . . General requirements
. . . . System level requirements

For Sub-Volumes 2 through 4 the VDB comprises the VOs and the following two levels of requirements:

Functional Requirements
Technical Requirements

For Sub-Volume 5 the VDB comprises the VOs and the following level of requirements:

Functional Requirements

Note. - for Sub-Volumes 2 through 5 the VDB also includes tracability to the Sub-Volume 1/Part 1 system level requirements

2.3 Define requirements for validation tools

A combination of inspection, analysis, simulation and laboratory test tools were used to validate the ATN SARPs. The validation tools were defined as appropriate to support the intended level of validation. A common approach was adopted by the ATNP working groups to provide a

uniform method of defining the validation tools. At the most comprehensive level of validation, test bed implementations of ATN end systems supporting ATN applications, upper layer and internetwork communications services were interconnected through real ATN intermediate systems (i.e., routers) and real (and emulated) ATN subnetworks. The limited use of test aircraft also provided an increased level of fidelity for the validation tests.

2.4 Prepare a validation specification to meet objectives

The ATNP working groups identified the levels of acceptable validation methods in descending order of preference. For validation methods a) through e) below, simulation, analysis and/or inspection were used in combination validation tests using the identified level of implementation.

a) Two or more independently developed interoperating implementations validated by two or more states/organizations.

b) Two or more independently developed interoperating implementations validated by one state/organization.

c) One implementation validated by more than one state/organization.

d) One implementation validated by one state/organization

e) Partial implementation validated by one or more state/organization

f) Simulation, analysis and inspection only (e.g., verify the ASN.1 compiles correctly, the use of modeling tools, etc.)

g) Analysis and/or Inspection only

Note: - items a) through e) above involve prototype implementations.

The minimum acceptable validation method applicable to a given VO varied depending on the criticality and technical risk of the requirements associated with the VO.

2.5 Conduct validation exercise

Hierarchical validation was used. For example, technical functions were first validated then the functional requirements, that were supported by these lower level technical requirements, were validated.

2.6 Perform analysis and report results

A joint validation subgroup was formed composed of ATNP WG1/WG2/WG3 members. This joint validation subgroup was responsible for ensuring consistent and complete identification of the VOs. Validation subgroups were also formed within each working group. The results of the overall validation activities was reviewed and approved by a joint meeting of the three ATNP working groups.

3.0 Recommended Action by the Meeting

Based on the comprehensive and successful validation of the ATN SARPs as documented in Appendices A through J, it is recommended that the ATN Panel:

a) approve the ATN SARPs; and
b) recommend the ATN SARPs for inclusion in Annex 10.