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ATN PROJECT

Proposed Outline for ATN SARPs Sub-Volume 6 - ATN Systems Management

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6.1. Introduction

WG3/SG3 was tasked with producing validated SARPs and Guidance for ATN Systems Management before ATNP/3. Discussions in WG1 and WG3 sub-groups have identified the need for a separate SARPs Sub-Volume dedicated to Systems Management provisions.

This document proposes an outline for the ATN Systems Management material to be developed as Sub-Volume 6 of the ICAO/ATNP SARPs.

Comments in italics indicate the nature of the proposed content and would be replaced by the actual provisions as they are developed.

Chapter 1 will contain introductory material and an overview of the Sub-Volume structure. There will be no requirements statements (shalls or shoulds) in this chapter. Only a bare minimum of guidance, essential to understand the rest of the Sub-Volume will be given here - the main Guidance Material for ATN Systems Management will be developed in parallel as a separate document.

6.1.1 Scope and Objectives

The minimum requirements for ATN systems management are specified here.

6.1.2 Structure of ATN Systems Management Specification

There are several distinct aspects to the ATN systems management requirements specified here. This specification is structured as follows:

a) Introduction (6.1) describes the purpose and structure of the ATN Systems Management specification, and the background to the functionality defined herein.

b) Naming and Addressing Provisions (6.2) specifies the requirements for navigating the Management Information Base and identifying particular attributes within individual Managed Object (MO) instances, or groups of MOs. It also assigns Application Entity Qualifiers to systems management applications.

c) ATN Systems Management Communication Profile (6.3) specifies provisions for an efficient profile for general ATN systems management (Manager to Agent) communications, using the ULCS and ICS communication services.

d) Manager-to-Manager Communications Profile (6.4) specifies the architecture and provisions for peer to peer Manager to Manager communications including "bulk or file transfer".

e) Systems Management Profiles for Management Functions (6.5) specifies the provisions for Systems Management Application functionality required in ATN systems to support Performance assessment, Accounting information and Fault detection (with Configuration and Security support as needed). The scope includes secure systems management application exchanges and access control to systems management resources.

f) Interworking Provisions (6.6) specifies the provisions for accommodating and interworking with various other systems management approaches that may be adopted internally within management domains. One aspect of this is the specification of standard APIs which are independent of any particular technology.

g) Managed Objects for Systems Management Applications (6.7) specifies the provisions for MOs for ATN systems management applications (CMIP).

h) Managed Objects for ATN Applications (6.8) specifies the provisions for MOs for ATN Applications for ground-ground and air-ground communications.

i) Managed Objects for ATN Upper Layers (6.9) specifies the provisions for MOs for ATN upper layers (Session, Presentation, ACSE, ATN-App-AE).

j) Managed Objects for ATN ICS (6.10) specifies the provisions for the set of MOs required for management of the ATN Internet Communications Service.

Note that MO specifications may move to the Sub-Volume which specifies the relevant functionality, i.e. ICS MOs would belong in Sub-Volume 5, but for now they are specified here as a convenient repository which does not destabilise existing SARPs. The MOs will be documented in tabular format where ISO standard MOs are analysed to identify the minimum set needed for ATN operation. ATN specific MOs will also be required. The set of tabulated MOs may be classified by "M" for mandatory or "O" for optional.

6.1.3 Systems Management Functionality

ATN systems management is based on the ISO/IEC and ITU-T international standards for OSI management.

This section will provide an overview of ATN systems management functionality, i.e. the management framework and what can be exchanged between Manager and Agent Processes.

6.2. Naming and Addressing Provisions

This chapter will contain SARPs text on Managed Object addressing and registration requirements. It will specify the requirements for navigating the Management Information Base and identifying particular attributes within individual Managed Object (MO) instances, or groups of MOs. It also assigns Application Entity Qualifiers to systems management applications.

6.3. ATN Systems Management Communication Profile

This chapter will specify requirements for an efficient CMIP profile for general ATN systems management (Manager to Agent) communications.

It will reference the international standardised profile (ISPs) AOM 12.

However, there is a requirement to avoid multiple protocol stacks on ATN systems, therefore a CMIP profile which is based on the ULCS SARPs is required. The ISP requirements therefore need to be modified to take account of the null-encoding session and presentation layer protocols, and ACSE APDUs encoded for transfer using the Packed Encoding Rules of ASN.1.

The CMIP APDUs will need to be augmented with PER-visible constraints and extensibility markers; the resulting abstract syntax should be input to the ISO/IEC and ITU standardisation process.

The transfer syntax of CMIP APDUs using PER encoding needs to be specified.

Presentation context identifiers need to be assigned.

Provisions for encoding MO attributes in PER need to be considered. Potentially all MOs need to be augmented with PER-visible constraints and extensibility markers.

The protocol profile will include Transport and lower layers, and this is required to be ICS SARPs compatible. ATN-specific transport layer parameters need to be specified (traffic type, communications class, transport priority and integrity requirements).

The existence of COTS products implementing the CMIP profile must be taken into consideration.

6.4. Manager-to-Manager Communications Profile

There are requirements for Manager applications in different management domains to be able to exchange management information on a peer-to-peer basis. This chapter will specify the architecture and requirements for peer to peer Manager to Manager communications including "bulk or file transfer" based on existing provisions for ULCS (4), ICS (5) and/or AMHS (2.3.2).

Manager-toManager communication would normally be acheived by one of the Managers adopting the Agent role for a particular interchange. Thus Manager implementations must always support both manager and Agent roles. It may be necessary to define additional "Manager" MOs to allow such management information to be exchanged.

The details of the format and content of the management information to be exchanged are not yet known, and in any case are likely to evolve over time. The requirement is therefore for a flexible, general-purpose interchange mechanism, which will allow manager

applications to identify the information content and take appropriate action depending upon procedures which will be defined as required.

The protocols and MOs used by commercial implementations (e.g. H-P OpenView and Bull ISM) which implement Manager to Manager communications should be investigated.

It may be that a more general-purpose peer-to-peer communication mechanism is required, to enable the transparent interchange of management (or other) information between systems.

The only general-purpose end-to-end interchange protocol in the current ATN SARPs is the AMHS application. However, this is a store-and-forward application, and is based on "full" OSI upper layers and Basic Encoding Rules.

There may therefore be a future requirement to specify an efficient lightweight protocol, making use of the efficient ULCS profile, for the interchange of management information. Indeed, the protocol would be general-purpose and not restricted to management operations.

Such a service could be based on the existing Dialogue Service specified in the ULCS SARPs. It would entail the specification of a simple pass-through ASE, and definition of the service offered to the AE-User.
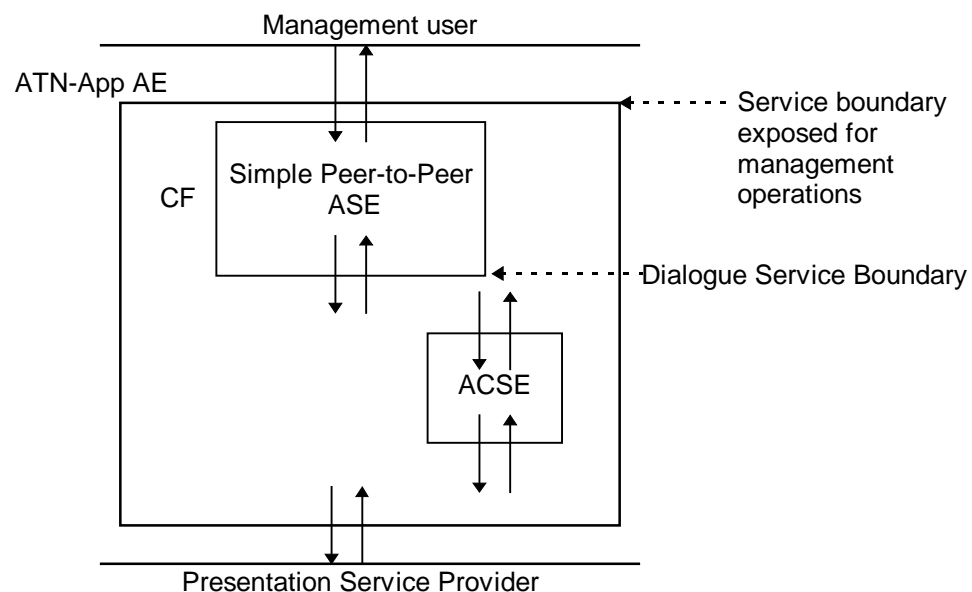

Figure 6.4-1. ASE for Peer-to-Peer Communications

Depending upon an analysis of detailed functional requirements, the simple management ASE and protocol could support a number of "value added" features, such as:

- *time-stamping of messages (allowing transit delays to be calculated)*

- *message sequence identification*

- *identification of linked messages / responses*

- *message type identification.*

There is also likely to be a requirement for a bulk transfer protocol, for example to transfer log files to a management application, or to download configuration files to a managed system. Such a protocol should be highly reliable, allow interruptions by users, and run in the background with priority such as not to interfere with other ATN usage (except in the case of management operations critical to the correct functioning of the ATN). Again, AMHS might provide the only solution required.

Alternatively, there are numerous standard bulk transfer mechanisms, including well-proven file transfer protocols such as FTAM and FTP. A profile to map one of these protocols to the ATN transport service could be developed. There are no plans to do this at present.

6.5. Systems Management Profiles for Management Functions

This chapter will contain SARPs for the Systems Management Application functionality required in ATN systems (standard ISO 10164 or other) required to support Performance assessment, Accounting and Fault detection (with Configuration and Security support as needed) in ATN systems for Manager to Manager and Manager to Agent.

International standardised profiles (ISPs) exist for OSI systems management functions. The AOM 2xx profiles should be analysed in the context of requirements (currently BIS/ES/Subnet). It is necessary to assess the suitability of these profiles to satisfy identified functional requirements for ATN systems management, and to select those profiles necessary to support such requirements.

It is also required to develop SARPs for secure Systems Management application exchanges and access control to Systems management resources (e.g. applicability of Access control 10164-9 Managed Objects for access control).

6.6. Interworking Provisions

Requirements have been expressed for a systems management architecture which will accommodate and facilitate interworking with other management technologies such as SNMP. This could involve the definition of Proxies and interworking units.

One aspect of this is the specification of standard APIs which are independent of any particular technology. Thus, requirements for standard Systems Management interfaces (APIs, Data Formats and Protocols) should be explored, and documented in this chapter (may be empty). Guidance should be developed on the implementation of a Systems Management API based on industry standards (e.g. X/Open).

6.7. Managed Objects for Systems Management Applications

ISO 10165-9, "Systems management protocol machine managed objects" is under development within ISO, and should be assessed for utility within the ATN architecture.

6.8. Managed Objects for ATN Applications

This chapter will contain SARPs for the set of managed objects (MOs) for all classes of ATN End Systems for Applications for ground-ground and air-ground communications.

Utilisation of systems management of ATN applications can be envisaged.

However, such work is at a very early stage. WG3/SG2 have stated that no requirements are foreseen for MOs for the air-ground applications.

Systems management in the applications could be useful:

   a)   *to monitor the quality of service available to end-users,*

   b)   *to convey alarms to notify equipment failures and other exception conditions*

It is necessary to analyse the applications to determine where systems management could be useful in monitoring the QoS as seen by end-users. For example, for ADS, statistical information could be gathered on the operation of ADS contracts (contract type, reporting rate, etc.) which would allow some optimisation of communications bandwidth. For CM, the response time to complete a Logon operation at various ground centres could be monitored, and any anomalies identified.

Systems management could be utilised to convey alarms to notify equipment failures and other exception conditions. For example. in ADS the validity and availability of data required in an ADS Report may be called into question if there is a failure after the contract has been agreed. Systems management notifications could report the failure, thus allowing remedial action to be taken.

6.9.   Managed Objects for ATN Upper Layers

This chapter will contain SARPs for the set of managed objects (MOs) for all classes of ATN End systems for Upper Layers for ground-ground and air-ground communications.

It is likely that, given the minimal session and presentation protocol requirements specified in the ULCS SARPs, there will be no requirement for specific management of the session and presentation entities or SAPs.

It can be envisaged that there will be requirements for monitoring of associations within ACSE. For example, logs of connection set-up delays and failure probabilities could be maintained.

ISO 10165-8 "Managed objects for supporting the upper layers" is under development within ISO, and will be assessed for utility within the ATN architecture.

Perhaps of more relevance to ATN operation would be monitoring within the ATN-App AE itself, rather than concentrating on ACSE. Thus, the Dialogue Service provided by the CF in the ULCS SARPs could be monitored to provide statistics not only on connection set-up but potentially also on throughput rates per traffic type and communications class, and even on transit delays.

Thus, WG3/SG3 should specify candidate MOs and their attributes at the level of the Dialogue Service.

6.10.   Managed Objects for ATN ICS

For OSI lower layers, there exist a number of international standards which specify MOs for layer management. Work is being done to adapt and extend these standardised MOs for ATN management.

The MOs defined here may move to the ICS Sub-Volume in due course, but for now this chapter serves as a "home" for these systems management requirements without disrupting the CNS/ATM-1 SARPs.