AERONAUTICAL TELECOMMUNICATION NETWORK (ATN)

WG3 - ATN Applications and Upper Layers

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System Management Application (SMA) - The Fast MIP Option

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Summary

This IP contains inputs to the feasibility study performed by ATNP WG1/SG2 and WG3/SG3 on the Fast MIP option. The Fast MIP option identifies the System Management Application (SMA) run over the ATN Upper Layer (the "Fast Byte" stack).

This IP discusses the following topics:

- Which upper layer stack for an SM application based on CMISE and ROSE (full stack vs. fast byte stack) ?
- What is the impact of PER if used for CMISE and ROSE APDUs ?
- What has to be done when porting a SM application from a full stack to fast byte stack ?

The annexes contain:

- a comparison between the ATN upper layer profile (SARPs SV4) and the upper layer profile required by ISO to support the ISO SM application (ISP 11183-1)
- a discussion on the alternative internal architectures for the ATN SM application.

1 INTRODUCTION

ICAO is being standardised the ATN System Management Application (SMA) based on the OSI System Management Framework. The SM application allows remote management of resources of all kinds. The SM application provides the manager system with the capability to communicate with a managed system in order to manage a resource that is contained in or controlled by the managed system.

The SARPs for System Management in the ATN produced by ICAO will cover on one hand the interface between manager and agent and on the other hand the identification of the managed object mandated to be accessible via System Management on the ATN Intermediate Systems and End Systems.

In the OSI SM framework, manager and agent systems communicate with one another, using an OSI protocol stack and the application layer protocol CMIP. The protocol stack is denoted "Full-stack", in that the full functionality of both Session and Presentation protocols are assumed to be implemented.

In the ATN environment, the identification of the upper layers services required by the air-ground applications and the consideration of the constraints of the air-ground communication segment has led to the selection of a minimum upper layer stack, the "Fast Byte" stack, included as a base component of the ATN Upper Layer Architecture (ULA).

From this situation emerged the idea to specify the ATN SM application composed of the OSI service elements responsible for handling the application protocol (CMISE, ROSE and ACSE) and relying on the ATN upper layer stack (Fast Byte).

The different aspects of this option - identified as the Fast MIP solution - are discussed in this document:
- Chapter 2 explains why the Full Stack is not appropriate for supporting the communications of the ATN SM application,
- Chapter 3 recalls the main characteristics of the ATN ULA. The objective is to check that the SM application is compatible with this architecture,
- Chapter 4 identifies the most important tasks needed to port a Full Stack based SM application onto a Fast Byte stack.

Annex A contains a comparison between the upper layer communication profile required by the full stack based SM application (ISP 11183-1) compared to the upper layer communication services effectively provided by the ATN upper layers.

Annex B analyses the possible internal architectures of the SM Application Entity.

2 RATIONALE FOR IMPLEMENTING THE SMA ON A "LIGHT" UPPER LAYER STACK

The OSI Network Management framework has been chosen by ICAO to standardise the ATN SM application. The OSI SMA based on the OSI Basic Reference Model is conceptualised by an application entity relying on the connection-oriented communication service offered by the OSI presentation service provider. The System Management Application Entity (SMAE) is the component of the SM Application carrying out the communication activities between remote SM entities.

The SMAE comprises three ISO-specified ASEs: the ACSE for the establishment and the control of the application-associations, the CMISE providing the basic SM operations for handling remotely managed objects and the ROSE supporting the concept of remote operations. Other ASEs may be included to support the protocols related to specific SM Functions.

The SM Application operates in the connection-oriented mode, i.e. the application-association established by the CMIS-users is mapped onto a Presentation connection before that any management activity occurs.

Actually, the SMAE makes use of a limited set of Presentation services in order to open a connection and send data on this connection:

- The CMIS-user use the A-ASSOCIATE, A-RELEASE and A-ABORT services from ACSE,
- The CMISE requires services from the ROSE only. It does not use Presentation services directly,
- The ACSE uses the P-CONNECT, P-U-ABORT, and P-P-ABORT services, whilst the ROSE uses the P-DATA service only.

Therefore, it is not necessary to implement the full presentation and session functions in the systems supporting the SM application. In particular, all the traditional Session services managing the synchronisation, the activities, the expedited data, etc… are not used. These functions have been designed by ISO to support upper layer communication functionality for general-purpose applications (e.g. X.400, FTAM, etc). The already-defined ATN applications do not require these powerful functions (e.g. the session synchronisation and activity services or the presentation re-negotiation of presentation contexts). The integration of the SM application in the ATN routers and ES does not justify by itself the provision of the full presentation and session services. The additional services would lead to the installation of a dual-stack (full stack and fast byte stack) in the ESs and of a full stack in the ISs whereas the services of the full stack actually used for SM activities are limited to the services provided by the Fast Byte stack.

It should be noted that the SM application is unlike operational applications, in that the SM application is required to operate in degraded situations, i.e. when the use of certain resources becomes critical. Complex operations as those provided by the full OSI session are not required during these periods of time. The establishment of the connection between the agent and the manager and the transmission of the data should be as efficient as possible. This is precisely the service offered by the ATN Upper Layer Stack.

In addition to these technical reasons which show that the full upper layer stack is not required by the OSI-based SM application[1], some considerations specific to the aeronautical environment shall be addressed.

The first issue is the problem of the certification of on-board systems. A full stack implemented for supporting the communication activities of the SM application would require to go through the complex and costly process of certification. Knowing that most of the implemented functions would not be used by the avionics, the effort needed for the certification does not seem justified.

The second issue is the ICAO normalisation process through which the OSI full stack would need to go. Although the full stack has been endorsed by ICAO for the AMHS application, the Upper Layers SARPs would need to be upgraded to include references to it. Profiles would be required to specify precisely the nature of the services and the protocols expected to be provided by such an upper layer stack. Interfaces should have to be specified. Transition and co-habitation aspects with the current Fast Byte stack should be considered. It is likely that the publication of a new set of upper layer protocols will require several months in the best case.

3 THE ATN UPPER LAYER STACK

This section revisits the main characteristics of the ATN Upper Layer architecture. *Comments in italics evaluate the impact of these characteristics on the ATN SM Application.*

3.1 ATN Upper Layer Architecture (ULA)

The ATN ULA provides a framework for the standardisation of ATN applications. This framework is based on the concept that a set of common communication services are provided by the "Upper Layer" on which ATN application protocols can be developed. The ATN ULA conforms to the OSI XALS architecture ISO 9545.

[1] The use of a depreciated upper layer stack for SM was already recognised in 1988. In the attempt to use the OSI network management protocol and framework to manage TCP/IP based internets, a "Lightweight Presentation Protocol" was specified in order for systems to be able to run the CMIP protocol over a transport service without implementing the full upper layer stack. It was recognised that the session service was superfluous for the SMAE and that the presentation protocol could be limited to the negotiation of the presentation context for ACSE and ROSE. The Fast Byte option of the Presentation and the Session protocol may be considered as a variant of the LPP.

The ATN SM application shall be considered as a particular air-ground ATN application. There is no reason for which the methodology used for specifying the CNS/ATM-1 applications could not be used for the ATN SM application.

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The task of the "Upper Layer" services is two-fold: to compensate the deficiency of the transport service provided by the ATN Internet to its users and to provide high-level services required by the applications to carry out the application protocols.

Compensate the transport service. For instance, the ATN Transport Service Provider does not guarantee the delivery of all submitted data in case of connection release. Neither it allows its users to reject a connection release requested by the peer. It is up to the applications to control the reception of all data before to request the connection release and to implement an application-level protocol handling the release negotiation.

Enhance the transport service. The ATN transport service is used to send unstructured data over the ATN. The applications using this service need to negotiate to some extent the nature of the data exchanged in terms of data types and encoding rules. The data flow on the connection need to be structured as a dialogue for which the rules of establishment, release and data transfer should be defined and controlled.

The SM Application need the following Upper Layer services:

- *the graceful release,*
- *the optimisation of the use of the Transport service (use of the T-CONNECT user data),*
- *the negotiation of the encoding rules used during the communication,*
- *the PDU delivery to the relevant ASE, and*
- *the management of the release collision situations.*

ISO has recognised that the two categories of functions listed above have to be implemented by any transport service user, whatever the operational purpose of the application is. Layers 5 to 7 of the Basic Reference Model (Session, Presentation and Application) have been designed to implement the protocols needed to provide these functions in a consistent and efficient way. These layers prevent the applications from bothering with these functions. Implementing an application directly onto the transport service is possible but this would mean to implement in the application some of the upper layer services.

Porting an OSI SM Application over the ATN Transport would force to develop a "glue" between the TSP and the SM Application. This glue is functionally equivalent to the ATN Upper Layers (i.e. Fast Byte Session and Presentation, and the CF). It is logical to use them instead of developing a specific interface module.

A SARPs-conformant ATN application is composed of the functional elements illustrated in Figure-1:

- The *Application Process* (AP) is the element in a real Open System which performs the processing for a particular application.
- The *Application Entity* (AE) is that part of the AP which performs the communication functions needed by the application using defined application protocols and the underlying presentation service.
- The *Application Service Element* (ASE) provides a set of communication functions for a particular purpose. Some ASEs have been defined by ICAO to handle ATN-specific protocols. Some others - more generic, useful for a number of applications - have been specified by ISO.
- The *Control Function* (CF) exists within the AE to co-ordinate the use of the different services provided in the constituent ASEs and the use or the provision of the external services (AE service and presentation service).

An abstract service has been "artificially" defined in the middle of the ATN AE. The Dialogue service provides a simplified connection-oriented communication service to the ASE hiding to them the complexity of the ACSE and the Presentation service primitives and parameters. The specification of the protocol handled by the ASEs is made simpler. There is no requirements for a SARPs-conformant product to implement a concrete dialogue interface (i.e. an Application Programmatic Interface, API). This approach has been chosen for the CNS/ATM-1 air-ground applications. For the AIDC application, the dialogue service has been replaced by a connectionless communication service, making the AIDC protocol a step ahead simpler.

> *The SM Application Entity contains ISO-defined ASEs which have been designed in the initial ALS structure. The underlying service of these ASEs is directly the service of another ASE (ROSE service for CMIP) or the Presentation service itself (Presentation service for ACSE and ROSE protocols). These ASEs will be integrated in the ATN SM AE as standardised by ISO. Three types of internal structure may be envisaged for the SM AE:*
> – *the dialogue service is used by the ASE,*
> – *the dialogue service is not used at all by the ASE,*
> – *the dialogue service is enhanced to provide the CMIS service.*
>
> *The three structures are discussed in Annex B of this document. It concludes that the dialogue approach is the more appropriate for the SM application.*

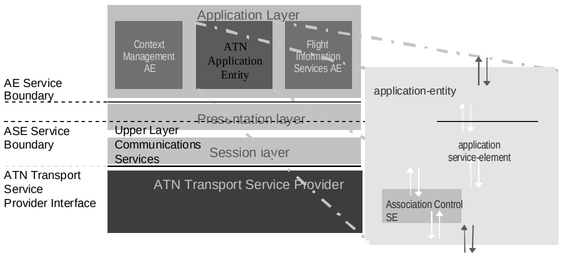


Figure 1: The ATN Upper Layer Architecture

An ATN application entity is fully designed when the constituent ASEs and the Control Function are specified. The AEs specified in the scope of the CNS/ATM-1 Package include at least the Association Control Service Element - Edition 2 and an application-specific ASE. ACSE is used to create and maintain an *application-association* between the communicating AEs. The rules of use of the associations are defined in the *application context*. It defines the communications behaviour, how the ASE association can be started and finished and a set of rules and state information.

> *The ATN SM Application shall rely on ACSE Edition 2, and CMISE combined with ROSE. Other ASEs may be added (SMASEs) do handle specific SM functions. The application-context defined in the OSI standard for the SM application is not valid any more. A new application-context shall be modified to support PER as encoding rules.*

In addition, the ATN Upper Layer Architecture provides a global naming scheme used to identify unambiguously any ATN application in any End System. A unique name can be built from the type of the AE (System Management is a specific type) and the location of the ES where the application is run (either an aircraft or a ICAO ground facility).

> *The ATN Naming scheme allows for the identification of a single application of the same type within an aircraft or a ground system. There is a potential problem here if two instances of the SM application should be identifiable (for instance, in an aircraft, one SM application in the ES and one SM application in the IS). <note: check that the naming tree apply to applications hosted in IS>.*

3.2 "Fast Byte" Stack

The "Fast Byte" concept designates the efficiency option of the session and the presentation protocols. This option allows the service users to negotiate in a very efficient way the non-use of the protocol during the data transfer phase and the connection release phase but to use the connection establishment phase to negotiate some communication parameters. In addition, the fast byte session optimise the use of the transport service by sending user data directly in the T-CONNECT request when the data size allows for it.

The following assumptions are made on the applications using the "Fast Byte" option (*comments in italics* *check the applicability of each assumption in the SM application)*:

– the applications are identified within the ES by the Transport selector. Both session and presentation selector are null.

  The SM Application does not need Session and Presentation selector. ATN addresses need to be assigned to SM applications hosted in ESs and in ISs.

– the applications do not invoke other presentation services than the P-CONNECT, P-DATA and P-ABORT services. If the constituent ASEs make use of other services (e.g. P-RELEASE), the CF is responsible for mapping them onto available services. The P-ABORT service shall be invoked without user data.

  CMISE assumes the use of the A-RELEASE of the ACSE. The CF for the CM application shall provide the mapping mechanism P-RELEASE/P-DATA+P-ABORT. The P-ABORT is invoked by ACSE to abort the connection and send the ABRT APDU. The CF for the CM application shall provide the mapping mechanism P-ABORT(data)/P-DATA(data)+P-ABORT.

– the orderly release function provided by the basic session protocol is not available any more to the session service users. This orderly release capacity has to be handled by an application level component. Actually, the CF specified in the ULA SARPs is supporting this functionality in co-operation with ACSE.

  The mapping mechanism A-RELEASE/P-DATA(RLRQ)+P-DATA(RLRE)+P-ABORT performed by the CF guarantees the graceful release.

– an ATN application supports a single abstract syntax indirectly identified by the type and the version number of the application. Actually, this "unique" abstract syntax is the collection of the abstract syntaxes of the constituent ASEs. The implicit identification avoids the initiator presentation entity to send the AS reference to the receptor and subsequently to identify for each data sent the presentation context the data refer to. The drawback is that the receiving AE is not able anymore to deduce (from the presentation context) which ASE is the actual recipient of the PDU. A PCI data is sent by the initiator CF to receptor CF to identify recipient ASE.

  It should be assumed that ACSE, ROSE and CMISE ASN.1 specifications are part of the same abstract syntax. The CF shall be able to send PDUs to the relevant ASE (ACSE or ROSE)

– As a consequence of the "unique" abstract syntax, all the PDUs generated by the AE are encoded using the same set of encoding rules. The connection establishment phase is used by the peers to negotiate the actual encoding rules.

  This means that the user data of CMIS shall be encoded in PER. CMIS user data are the arguments of the CMIS operations.

3.3 The Control Function

The "Fast Byte" stack provides the minimum protocol offering a limited presentation transfer-syntax negotiation and session no-orderly statement.

As indicated above, some useful functions previously provided by the OSI upper layers have been allocated to the Control Function of the AE:
- identification of the recipient of the received PDU,
- mapping of the presentation service expected by the constituent ASEs onto the "Fast Byte" presentation service", in particular the P-RELEASE and the P-ABORT with user data,

in addition to standard CF functions:
- management of the release collision situation,
- transfer of the ASE version number.

All these functions are actually performed by the CNS/ATM-1 Package CF.

3.4 The ATN specific parameters

The upper layers make use of the connection-oriented Transport service provided by the ATN Internet. This service has been enhanced to provide the applications with the visibility of parameters used by the Internet for the data routing and depending directly of the type of application and the quality of service requirements of the communication service users. In addition to the usual QOS transport service parameters (Transport checksum, priority), an ATN specific parameter has been defined at the transport interface level (Security Label). All these parameters have to be handled by the AE.

Use of the Transport checksum

The application specifies whether the transport checksum is required on a particular instance of communication by specifying the required residual error rate in the T-CONNECT quality of service parameter. The residual error rate parameter is set by the Dialogue Service user.

> *As for the other air-ground applications, the residual error rate requested for the SM application will be "low", meaning that the transport checksum mechanism is to be operated.*

Transport connection priority

The application belongs to an application category to which a priority is assigned. The value of the priority parameter is therefore not given by the application user but is a given per application.

> *The priority value assigned to the SM Application is "Network/Systems Administration".*

ATN Security Label

The TS-user is responsible for passing the ATN security label parameter to the TS-provider with the format specified in the ATN Internet SARPs. It defines for an instance of communication the traffic type (ATSC, AOC) and the category (class 'A' to 'H') representing the requested transit delay. The value of the traffic type is given per application (e.g. the CNS/ATM-1 applications are ATSC applications). The category is provided by the application user through the 'Class of Communication" parameter.

> *The SM Application will be assigned a traffic type dedicated to system management exchanges "ATN SM Communications: No Traffic Type Policy Preference". There is no category for this traffic type.*

4 PORTING THE OSI SM PROTOCOLE SUITS FROM THE OSI FULL STACK TO THE ATN UPPER LAYER ENVIRONMENT

4.1 Porting CMISE, ROSE and ACSE on a Fast Byte Stack

The International Profiles AOM11 (or AOM12) specifies how CMISE combined with ROSE and based upon ACSE, Presentation layer protocol and Session layer protocol shall be used to provide a basic subset (or an enhanced subset) of operation and notification services to the CMSIE-service users of the two end systems.

Both profiles comprise the support of part 1 of ISO/IEC ISP 11183 (specification of ACSE, presentation and session protocols for the use by ROSE and CMISE).

Annex A compares the upper layer services required by ISP 11183-1 to support the operation of a CMISE/ROSE AE to the upper layers services effectively provided a "Fast Byte" ATN stack. The following table highlights the main differences and identifies what has to be done when porting the CMISE/ROSE AE over the ATN stack to compensate these differences (in addition to the development of a CF).

Full Stack	ATN Stack	What has to be done to port a full stack-based SMA to a fast byte-based SMA
ACSE		
Includes ACSE edition 1 and Amd1 (authentication)	Includes ACSE edition 2	*The main difference comes from additional fields in the ACSE ASN.1 (e.g. application-context-name-list), new PER-visible constraints and extensibility markers[2]. The minimum task is an re-compilation of the ACSE ASN.1*
A conformant implementation shall support both roles (initiator and responder)	A conformant implementation shall support at least one role (initiator or responder)	
A conformant implementation shall encode ACSE PDUs in BER	A conformant implementation shall encode ACSE PDUs in PER	*An analysis of the Full Stack SMA should be carried out to determine how easy/difficult it is to switch from the BER encoder to the PER encoder.*
If the Authentication FU is supported, the "authentication-mechanism name" parameter shall be supported in the AARQ	The "authentication-mechanism-name" parameter of the AARQ is not supported	*An analysis of the Full Stack SMA should be carried out to determine whether the field "authentication mechanism name" is used when building the AARQ.[3]*
The "implementation information" parameter shall be supported in the AARQ for the receiver	The "implementation information" parameter is optionally supported in the AARQ for the receiver (PDR?)	*An analysis of the ATN Stack SMA should be carried out to check that the field "Implementation information" is supported by the receiver.*
The Form1 (Directory Name) shall be supported by a conformant implementation	The Directory Name form is not supported at all by the ATN stack	*There is a potential blocking problem here if the Full Stack SMA supports uniquely this form of AE Title[4]*
The "other" Authentication Value Form shall be supported by any receiving conformant implementation	The "other" Authentication Value Form is not supported for receiving	*An analysis of the Full Stack SMA should be carried out to check that the authentication value can not take the form "other"[5].*

CMISE/ROSE		
A conformant implementation shall encode CMISE/ROSE PDUs in BER	A conformant implementation shall encode CMISE/ROSE PDUs in PER	*An analysis of the Full Stack SMA should be carried out to determine how easy/difficult it is to switch from the BER encoder to the PER encoder. See section 4.2.*

PRESENTATION		
	A conformant implementation shall implement the short-connect and the null-encoding options	*The SMA shall be able to select these options.*
A conformant implementation shall	An ATN conformant	*The management of the presentation*

[2] A detailed discussion of differences in ACSE editions is available in the CAMAL - Part IV - ATN Communication Services - Section 2.6.2. The discussion indicates that the initial version of ATN ULA requires none of the changes that distinguish ACSE edition 1 from ACSE edition 2, apart from, optionally, authentication fields and extensibility markers ("…").

[3] The ACSE module of the BULL ISM product does not support the authentication FU. The identified problem is not relevant.

[4] The ACSE module of the BULL ISM product does not support the Directory Name for AE Title Names.

[5] The ACSE module of the BULL ISM product does not support the authentication FU. The identified problem is not relevant.

be able to support at least 2 presentation contexts.	implementation does not handle more than one presentation context	*contexts shall be simplified (in particular the presentation context definition list shall not be used).*
	An ATN conformant implementation shall allow the presentation service user to select the session "no-orderly release" FU.	*The SMA shall be able to select this FU.*
	An ATN conformant implementation shall support the "Fast Byte" specific PDUs (SHORT-CP, SHORT-CPA, SHORT-CPR)	
A conformant implementation shall encode the presentation user data with the Fully Encoded option	An ATN implementation shall encode the presentation user data (not for the P-CONNECT) with the Fully Encoded option augmented of PER-visible constraints.	*The encoding of the presentation user data shall be performed in the CF of the SMA AE.*
A conformant implementation shall encode the EXTERNAL type with the choice "single-ASN.1-type"	An ATN conformant implementation shall encode the EXTERNAL type with the choice "arbitrary"	*?*

SESSION		
	An ATN conformant implementation shall support the "no-orderly release" FU.	*The "no-orderly release" functionality shall be implemented in the CF of the SMA*
	An ATN conformant implementation shall support the null-encoding and short-connect options	*The SMA shall be able to select these options.*
	An ATN conformant implementation shall support the "Fast Byte" specific PDUs (SCN, SAC, SRF, NL, …)	

This analysis shows that the Fast Byte stack can support the communication activities of an AE containing CMISE and ROSE. However, as for the other ATN applications, a SMA CF will have to be developed to identify the ASE within the AE source or destination of a AE PDU, to redirect non available P-services used by CMSIE/ROSE, to manage collision situations. It is very likely that the upper part of the CF specified in the CNS/ATM-1 Package is suitable for the SM AE.

4.2 PER encoding

4.2.1 PCI encoding

Annex B of ISO/IEC 9596-1 contains the expanded ASN.1 syntax of the combined CMISE and ROSE PDUs. Once encoded, these PDUs constitute the overhead generated by the CMISE and ROSE ASEs. As indicated above, the Upper Layer Architecture mandates the use of PER for the encoding of all the PDUs generated by an ATN application. At the association establishment time, the PER transfer syntax is negotiated by the AEs using the negotiation mechanisms of the "Fast Byte" Presentation.

4.2.1.1 Normalised ASN.1 for CMISE and ROSE

The first encoding approach is to keep the ASN.1 defined for the CMISE/ROSE APDUs.

4.2.1.2 Optimised ASN.1 for CMISE and ROSE

This section analyses how the ASN.1 can be modified in such a way the PER encoding is fully optimised. The principle is to add as much as possible PER-visible constraints. The information provided by the PER-visible constraints increase the a-priori knowledge of both the encoder and the decoder and reduce the amount of information to encode. PER-visible constraints usually affect the PER encoding of the value or the length of a data field.

Extensibility Markers

Extensibility markers may be used in an ASN.1 specification to allow future modifications of the data structure while keeping a certain level of compatibility between systems implementing the old and the new ASN.1.

The addition in the ASN.1 of extensibility markers does not impact the BER encoding. Such a modification can be proposed on the base standard without impacting the BER-based developed products.

As far as the SM application is concerned, it is likely that the base protocols (i.e. CMISE and ROSE) will not evolve. Modifications will probably be needed in the object definition (i.e. the MIB) when experience will be gained from the operational service of the ATN.

Value constraint on Integer types

Some ASN.1 types are defined as non-constrained length INTEGER. This results in PER in the coding of the length of the value on 1 octet (at least) in front of the coding of the value itself. When the range of the integer is known, the length of the value is forced to the number of bits needed to encode all the possible values. As this length can be deduced from the ASN.1 by both the encoder and the decoder, there is no need to encode it in the data flow.

InvokeIDType ::= INTEGER

The difficulty is to defined an upper bound to these types (e.g. INTEGER (0..256)). An extensibility marker may solve the problem (e.g. INTEGER(0..256,…)).

The addition in the ASN.1 of value constraints on integer types does not impact the BER encoding. Such a modification can be proposed on the base standard without impacting the BER-based developed products.

Redefinition of Integer types with Named values

Named values attached to Integers are given for information purpose only but do not impact at all the encoding (BER and PER). The encoding of such a type is strictly identical to the encoding of an integer without named values. Non identified values may be provided to the encoder without causing an encoding error.

Since a list of values is defined for these integers, a more efficient encoding would be possible by integrating the range of values in the encoding.

The following example illustrates the 2 alternate solutions:

```
GeneralProblem ::= INTEGER {  unrecognisedAPDU      (0),
                              mistypedAPDU          (1),
                              badlyStructuredAPDU   (2) }
```

This definition could be replaced by

```
GeneralProblem ::= INTEGER (0..2) {   unrecognisedAPDU      (0),
                                      mistypedAPDU          (1),
                                      badlyStructuredAPDU   (2) }
```

or

```
GeneralProblem ::= ENUMERATED {       unrecognisedAPDU      (0),
                                      mistypedAPDU          (1),
                                      badlyStructuredAPDU   (2) }
```

The advantage of the first solution is to keep the BER encoding unchanged since the data type remains the same (INTEGER) and the value constraint is not used by the BER encoders. The second solution is definitively more elegant but causes a compatibility problem with older stacks based on the previous ASN.1.

CMISE/ROSE integer types defined with named values are the following: GeneralProblem, InvokeProblem, ReturnResultProblem, ReturnErrorProblem

4.2.1.3 Conclusion

It seems from this analysis that the encoding of very few parameters could be optimised by upgrading the ASN.1 with PER-visible constraints. The compression between BER and PER will come from the non-encoding of the data types (the top level CHOICE (ROSEapdus) and for each ROSE operation the SEQUENCE of parameters) and from the encoding of some integers. It is questionable whether the data compression rate obtained is worthwhile or not compared to the problems raised (new version of the ASN.1, standardisation process required, compatibility not guaranteed, etc…).

4.2.2 CMISE User data encoding

The user data of the CMISE/ROSE PDUs contains the arguments of the CMISE operations (action, create, delete, get, cancel-get, event-report, linked-reply, set, etc.).

The ASN.1 definition of these arguments shall be known from the agent and the manager. The ASN.1 is usually generated by automatic tools making easier the specification of the managed objets and the corresponding ASN.1 definition (GDMO tools).

The user data of the CMISE/ROSE PDUs are defined as an "ANY DEFINED BY" ASN.1 type. This means that the contents is identified by another field closed to the user data field and that the contents is encoded with the same encoding rules than the PDUs themselves, i.e. PER. A more appropriate type would be the "EXTERNAL" ASN.1 type.

In order to increase as much as possible the compression rate of PER, it is necessary to impose on the GDMO tools (or on ASN.1 designers when the ASN.1 is generated manually) some composition rules of the ASN.1 texts, as for instance:

- SEQUENCE OF and SET OF should be defined with a size constraint,
- INTEGER should be defined with a value constraint,
- ENUMERATED should be preferred over INTEGER with Named Values,
- etc…

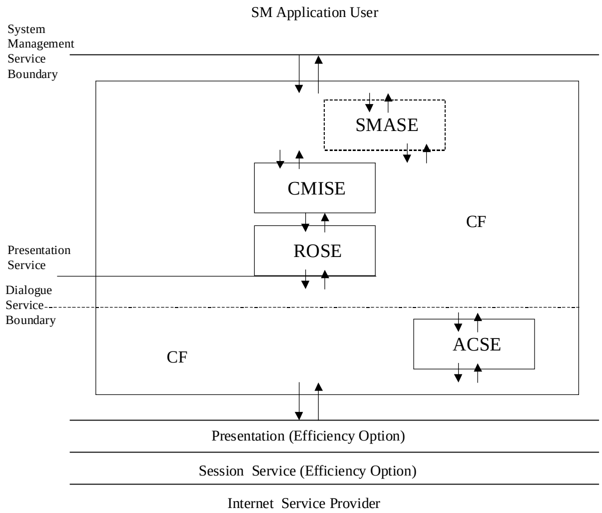
5 CONCLUSION AND RECOMMENDATIONS

The ATN SM application should be considered as the next application being designed within the CNS/ATM-1 Package Upper Layer Architecture. Unlike the other applications, all the ASEs (CMISE, ROSE and ACSE) are already fully specified over the full session and presentation OSI protocols. On the other hand, the SM AE should fit the ATN Upper Layer framework defined in the SARPs.

The migration of the SM application from the full stack to the ATN upper layer stack (Fast MIP)

- forces to specify a kind of "convergence function", the Control Function, between the existing ASEs and the ATN Presentation service.
- raises the problem of the data encoding since the encoding rules usually used up to now for SM data are replaced by the Packet Encoding Rules.

In order to take into account the existing implementations of CMISE products and ATN Upper Layers products, it is recommended to specify the SM AE with the air-ground application approach. The AE would be made of two parts. The AE lower part would be composed of ACSE edition 2 with the CF providing the dialogue service as specified in the ULA SARPs. The upper part would be composed of CMISE and ROSE with a CF using the dialogue service. The CMIS-user would use the D-START/END/ABORT services instead of the A-ASSOCIATE/RELEASE/ABORT services.



Given the poor compression rate obtained by adding PER-visible in the CMISE ASN.1, it is recommended to keep the CMISE and ROSE ASN.1 unchanged. The ASN.1 defining the managed object shall be optimised for PER.

ANNEX A

COMPARISON BETWEEN

ISP 11183-1
(ACSE, Presentation and Session profile for the use by CMISE/ROSE)

AND

THE ATN UPPER LAYER PROFILE
(ACSE, Presentation and Session provided by the ATN)

1 INTRODUCTION

ISO/IEC ISP 11183-1 - International Standardized Profiles AOM1n OSI Communication - Management Communications - Part1 specifies how the Association Control Service Element (ACSE), the Presentation layer and the Session layer shall be used to provide the required upper layer functions for the CMISE/ROSE functions. In addition, requirements for abstract and transfer syntax handling are specified.

The model used in the ISP is one of two end systems running an end-to-end association using the ACSE, Presentation and Session services and protocols as illustrated in Figure A-1.

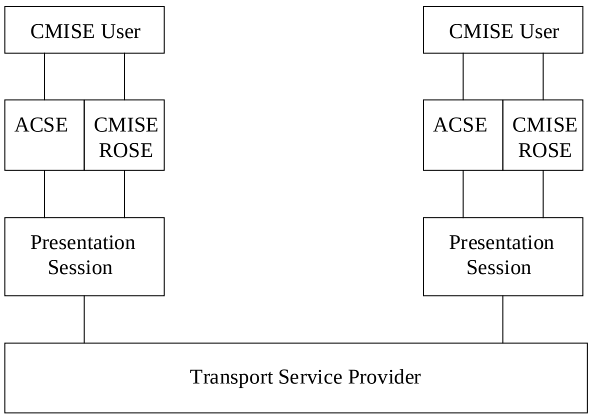


Figure A-1: ISP Communication Model for SM Applicaion

The model proposed in the ATN Upper Layer Architecture is compatible with the previous one but uses the concepts introduced in the extended application architecture (XALS) of the OSI Basic Reference Model, as illustrated in Figure A-2.

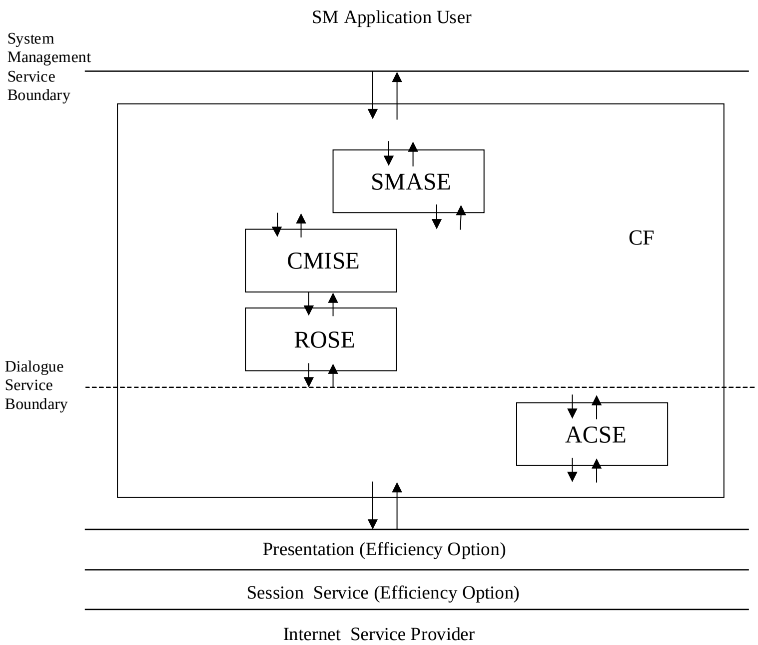


Figure A-2: ATN Communication Model for SM Application

ISP 11183-1 is based on a full OSI upper layer stack. It does not take into account the efficiency option of the presentation and the session protocols, nor it takes into account the second edition of the ACSE protocol. This document proposes an extension to the current ISP 11183-1 which would include these new protocol functionality.

This annex highlights the differences between the ATN upper layer profile and the ISP 11183-1 profile.

2 ACSE

Annex A of ISP 11183-1 specifies the ACSE profile required to support the operation of CMISE and ROSE.

2.1 Protocol details

The reference to ACSE protocol in ISP 11183-1 is ISO 8650:1988 - CCITT Recommendation X.227:1988 and ISO 8650/Amendment 1 (Authentication during association establishment). The ATN upper layer profile is based on the second edition of ACSE.

Table 2-1. Identification of ACSE Protocol Specification

Identification of Protocol Specification	ATN Support	ISP 11183-1
ISO/IEC 8650-1:1995 (note)	M	-

Note. — This is the second edition of the ACSE protocol specification.

The ATN specification is non-conformant to the ISP proforma, in that the version of ACSE required to be supported is ACSE edition 2.

2.2 Protocol versions

There is no explicit reference in the ISP to the ACSE protocol version. Based on the baseline ACSE document used for the ISP, it is assumed that version 1 is mandated.

Table 2-2. Identification of ACSE Protocol version

ISP Index	Version	ISP 11183-1 Status	ATN Support	Mnemonic
-	Version 1	M	M	A-V1
-	Version 2	-		

The ATN specification is aligned with the ISP 11183-1 for the ACSE protocol version.

2.3 Supported roles

2.3.1 Association establishment

Table 2-3. ACSE Roles for Association Establishment

ISP Index	Capability	ISP Status	ATN Support	Mnemonic
A.2.2/1	Association initiator	C(1)	C(2)	A-CON_initiator
A.2.2/2	Association responder	C(1)	C(2)	A-CON_responder

(1) The ISP requires a conforming implementation to support at least one of the roles.
(2) The ATN profile requires either one or both of the ACSE roles “Association initiator” or “Association responder” to be supported.

The ATN specification is aligned with the ISP 11183-1 for the role during association establishment.

2.3.2 Normal Release procedure

Table 2-4. ACSE Roles for Normal Release

ISP Index	Role	ISP 11183-1 Status	ATN Support	Mnemonic
6.2	Initiator	M	C(1)	A-REL_requestor
6.2	Responder	M	C(1)	A-REL_acceptor

(1) The ATN profile requires either one or both of the ACSE Normal Release roles “Initiator” or “Responder” to be supported. The ACSE Release Responder is allowed to give a negative response, despite the fact that the session Negotiated Release functional unit is not selected for the association.

An ISP conforming implementation shall be able to request and accept an orderly release of the association, whatever its role, initiator or responder. The ATN specification is less constraining since it allows that only one side be initiator of the association release.

2.3.3 Abnormal Release procedure

Table 2-5. ACSE Roles for Abnormal Release

ISP Index	Role	ISP Status	ATN Support	Mnemonic
-	Initiator	M	M	
-	Responder	M	M	

The ATN specification is aligned with the ISP 11183-1 for the role during abnormal release procedure.

2.4 Protocol mechanisms

Table 2-6. ACSE Protocol Mechanisms Supported

ISP Index	Protocol Mechanism	ISP Status	ATN Support	Mnemonic
A.2.1/1	Normal mode	M	M	
A.2.1/2	X.410-1984 mode	I	X	
A.2.1/3	Rules for extensibility	M	M	
A.2.1/4	Supports operation of Session version 2	M	M	S-O-SESS-V2

The ATN specification is aligned with the ISP 11183-1 for the protocol mechanisms to be supported by the ACSE PMs.

2.4.1 Extensibility and Encoding

The ATN profile requires the following features:

– For the purposes of this specification, the abstract syntax module defined in clause 9 of the ACSE protocol specification shall([167]) be augmented with the ASN.1 extensibility notation, as specified in ISO/IEC 8650-1 Amendment 2.
– The system shall([168]) support that encoding which results from applying the ASN.1 packed encoding rules (basic, unaligned variant), as specified in ISO/IEC 8825-2, to the abstract syntax module specified in ISO/IEC 8650-1 Amendment 2.
– Packed encoding (basic, unaligned) shall([169]) be used for encoding all ACSE Protocol Control Information (PCI) for interchange.

ISP 11183-1 section 8 requires ISP conforming systems to encode PDU with the Basic Encoding Rules. ISP 11183-1 does not require the compliance to ISO/IEC 8650-1 Amendment 2.

2.5 ACSE Functional units

Table 2-7. Selection of ACSE Functional Units

ISP Index	Role	ISP Status	ATN Support	Mnemonic
A.2.3/1	Normal mode	M	M	
A.2.3/2	Authentication	O	C(1)	A-FU(AU)

(1) If the Dialogue Service user requires the use of the Security Requirements parameter of the D-START primitives, then M, else O.

The ATN specification is aligned with the ISP 11183-1 for the functional units to be supported by the ACSE PMs.

2.6 Supported APDUs

Table 2-8. Supported ACSE Protocol Data Units

ISP Index	APDU	Sender		Receiver		Comment
		ISP Status	ATN Support	ISP Status	ATN Support	
A.3/1	AARQ	C(1)	M	M	M	
A.3/2	AARE	C(2)	M	M	M	
A.3/3	RLRQ	M	M	M	M	
A.3/4	RLRE	M	M	M	M	
A.3/5	ABRT	M	M	M	M	

(1) If [A-CON_initiator] then M else N/A
(2) If [A-CON_responder] then M else N/A

The ATN specification is aligned with the ISP 11183-1 for the protocol data units to be supported by the ACSE

PMs.

2.6.1 Supported APDU parameters

2.6.1.1 AARQ

Table 2-9. Supported AARQ Parameters

		Sender		Receiver	
ISP Index	**Parameter**	**ISP Status**	**ATN Support**	**ISP Status**	**ATN Support**
A.4.1/1	Protocol Version	C(1)	X	M	M
A.4.1/2	Application Context Name	M	M	M	M
A.4.1/3	Calling AP title	O	O	M	M
A.4.1/4	Calling AE qualifier	O	O	M	M
A.4.1/5	Calling AP invocation-identifier	O	O	M	M
A.4.1/6	Calling AE invocation-identifier	O	O	M	M
A.4.1/7	Called AP title	O	X	M	M
A.4.1/8	Called AE qualifier	O	X	M	M
A.4.1/9	Called AP invocation-identifier	O	X	M	C(6)
A.4.1/10	Called AE invocation-identifier	O	X	M	C(6)
A.4.1/11	ACSE-requirements	C(2)	C(4)	M(3)	M(5)
A.4.1/12	Authentication-mechanism name	C(2)	X	M(3)	N/A
A.4.1/13	Authentication-value	C(2)	C(4)	M(3)	M(5)
A.4.1/14	Implementation information	I	X	M	O
A.4.1/15	User information	O	M	M	M

(1) If ACSE version 2 or above is supported m else o
(2) If A-FU(AU) M else -
(3) If the authentication FU is not supported, based on the extensibility rules, these tagged values shall be received and ignored. The "Authentication-mechanism-name" and "Authentication-value" fiels shall only be present if the "ACSE requirements" field includes the authentication FU. The "Mechanism-name" field shall be present if "Authentication-value" is of type ANY DEFINED BY.
(4) The AARQ parameters “ACSE-Requirements” and “Authentication-value” shall([173]) be supported, for sending, only if the connection initiator role (A-CON_initiator) and the Authentication functional unit (A-FU(AU)) are supported.
(5) The AARQ parameters “ACSE-Requirements” and “Authentication-value” shall([174]) be supported for receiving if the connection responder role (A-CON_responder) is supported, but are ignored if the Authentication functional unit (A-FU(AU)) is not supported by the responder.
(6) The AARQ parameters “Called AP invocation-identifier” and “Called AE invocation-identifier” shall([175]) be supported, for receiving, if the Association Responder role is supported.

The ATN specification is non-conformant to the ISP proforma, in that the "Authentication-mechanism-name" parameter is not supported for sending an AARQ.

The ATN specification is non-conformant to the ISP proforma, in that the "Implementation information" parameter is optionally supported for receiving (PDR ?) an AARQ.

2.6.1.2 AARE

Table 2-10. Supported AARE Parameters

		Sender		Receiver	
ISP Index	**Parameter**	**ISP Status**	**ATN Support**	**ISP Status**	**ATN Support**
A.4.2/1	Protocol Version	C(1)	X	M	M
A.4.2/2	Application Context Name	M	M	M	M
A.4.2/3	Responding AP title	O	X	M	M
A.4.2/4	Responding AE qualifier	O	X	M	M
A.4.2/5	Responding AP invocation-identifier	O	X	M	M
A.4.2/6	Responding AE invocation-identifier	O	X	M	M
A.4.2/7	Result	M	M	M	M
A.4.2/8	Result source - diagnostic	M	M	M	M
A.4.2/9	ACSE-requirements	C(2)	(4)	M(3)	(5)
A.4.2/10	Authentication-mechanism name	C(2)	X	M(3)	N/A
A.4.2/11	Authentication-value	C(2)	(4)	M(3)	(5)
A.4.2/12	Implementation information	I	X	M	O
A.4.2/13	User information	M	M	M	M

(1) If ACSE version 2 or above is supported m else o
(2) If A-FU(AU) M else -
(3) The "Authentication-mechanism-name" and "Authentication-value" fields shall only be present if the "ACSE-requirements" fields includes the authentication FU. The "Authentication-mechanism-name" shall be present if "Authentication-value" is of type ANY DEFINED BY.
(4) The AARE parameters “ACSE-Requirements”, Authentication-mechanism-name” and “Authentication-value” shall([177]) be supported, for sending, only if the connection responder role (A-CON_responder) and the Authentication functional unit (A-FU(AU)) are supported.
(5) The AARE parameters “ACSE-Requirements” and “Authentication-value” shall([178]) be supported, for receiving, only if the connection initiator role (A-CON_initiator) and the Authentication functional unit (A-FU(AU)) are supported.

The ATN specification is non-conformant to the ISP proforma, in that the "Authentication-mechanism-name" parameter is not supported for sending an AARE.

The ATN specification is non-conformant to the ISP proforma, in that the "Implementation information" parameter is optionally supported for receiving (PDR ?) an AARE.

2.6.1.3 RLRQ

Table 2-11. Supported RLRQ Parameters

		Sender		Receiver	
ISP Index	**Parameter**	**ISP Status**	**ATN Support**	**ISP Status**	**ATN Support**
A.4.3/1	Reason	O	M	M	M
A.4.3/2	User information	O	M	M	M

The ATN specification is aligned with the ISP 11183-1 for the parameters to be supported by the ACSE PMs in the RLRQ APDU.

2.6.1.4 RLRE

Table 2-12. Supported RLRE Parameters

		Sender		Receiver	
ISP Index	**Parameter**	**ISO Status**	**ATN Support**	**ISO Status**	**ATN Support**
A.4.4/1	Reason	O	M	M	M
A.4.4/2	User information	O	M	M	M

The ATN specification is aligned with the ISP 11183-1 for the parameters to be supported by the ACSE PMs in the RLRE APDU.

2.6.1.5 ABRT

Table 2-13. Supported ABRT Parameters

		Sender		Receiver	
ISP Index	**Parameter**	**ISP Status**	**ATN Support**	**ISP Status**	**ATN Support**
A.4/1	Abort source	M	M	M	M
A.4/2	Diagnostic	C1	M	C1	M
A.4/3	User information	M	M	M	M

(1) If [A-FU(AU)] then M else N/A

The ATN specification is aligned with the ISP 11183-1 for the parameters to be supported by the ACSE PMs in the ABRT APDU.

2.6.2 Supported parameter forms

2.6.2.1 AE Title Name Form

Table 2-14. AE Title Name Form

		Sender		Receiver	
ISP Index	**Syntax form**	**ISP Status**	**ATN Support**	**ISP Status**	**ATN Support**
A.5/1	Form 1 (Directory name)	M	X	M	O
A.5/2	Form 2 (Object identifier and integer)	M	M	M	M

The ATN specification is non-conformant to the ISP proforma, in that the "Form 1 (Directory name)" AE Title Name Form is not supported for sending and is optionally supported for receiving (PDR?).

2.6.2.2 Authentication Value Form

Table 2-15. Authentication Value Form

Prerequisite: A-FU(AU)

		Sender		Receiver	
ISP Index	**Authentication value form**	**ISP Status**	**ATN Support**	**ISP Status**	**ATN Support**
A.6/1	GraphicString	O	C(1)	M	M
A.6/2	BIT STRING	O	C(1)	M	M

A.6/3	EXTERNAL	O	C(1)	M	M
A.6/4	Other	O	X	M	N/A

(1) If the authentication functional unit is supported, at least one of the Authentication-value forms listed in Table 2-15 shall be implemented for sending.

The ATN specification is non-conformant to the ISP proforma, in that the "Other" Authentication Value Form is not supported for receiving.

2.7 Summary

The ATN ACSE is conformant to the part of the ISO/IEC ISP 11183 related to ACSE with the following exceptions:

- In AARQ/AARE, "Authentication-mechanism-name" and "Implementation information" are not supported as described in the ISO standard for ACSE and in the ISP.
- The "Directory Name" form is not supported for sending an AE Title.
- The "Other" form is not supported for receiving an "Authentication-value" parameter in AARQ and AARE APDUs.

These differences do not preclude the use of the ATN ACSE for supporting the communication protocols required for System Management.

3 PRESENTATION

Annex B of ISP 11183 specifies the Presentation profile required to support the operation of CMISE and ROSE. The ISP does not take into account the efficiency enhancements option of the Presentation protocol required by the ATN profile.

3.1 Protocol mechanisms

Table 3-1. Presentation Protocol Mechanisms Supported

ISP Index	Protocol Mechanism	ISO Status	ATN Support	Mnemonic
B.2.2/2	Normal mode	M	M	
B.2.2/1	X.410-1984 mode	I	X	
See note	Nominated context	-	N/A	
See note	Short encoding	-	N/A	
See note	Packed encoding rules	-	N/A	
See note	Short-connect	-	M	
See note	Null-encoding	-	M	

Note. — Optional protocol mechanisms defined in ISO/IEC 8823-1 Amendment 2.

It is proposed to align the ISP specification to the ATN profile.

3.2 Use of null-encoding and short-connect protocol options

The use of null-encoding and short-connect protocol options requires that some requirements be met. This section checks that these requirements are fulfilled in the System Management context.

Table 3-2. Use of the null encoding and short-connect Presentation protocol options

Ref.	Requirement	ATN Requirement	SM context
a	The presentation context definition list contains precisely one item in which the abstract syntax is known to the responding Presentation Protocol machine (PPM) by bilateral agreement.	N/A	C(1)

b	The presentation context definition list is empty and the default context is known by bilateral agreement	M	C(1)
c	The presentation context definition list is empty and the abstract syntax of the default context is known to the responding PPM by bilateral agreement and is specified in ASN.1	M	C(1)
d	The calling and called presentation selectors are null	M	C(2)
e	The presentation-requirements parameter in the P-CONNECT service includes the kernel functional unit only.	M	C(2)

(1) The null-encoding protocol option is available for use on an established connection only if at least one of the conditions a, b and c in Table 3-2 is true.

The ISP requires conforming implementation to support at least 2 simultaneous presentation contexts. The ATN specification is non-conformant to the ISP proforma, in that only one presentation context is supported. In the case of the System Management Application, the presentation context should identify a single abstract syntax formed by ACSE and ROSE/CMISE abstract syntaxes and a single transfer syntax.

(2) The short-connect protocol option is used only in connection establishment to establish a connection on which the null-encoding option will be used; it can only be used if both of the conditions d and e in Table 3-2 is true.

Conditions d and e are true for implementations conforming the ISP. ISP 11183-1 allows conforming implementation to request the short-connect option of the Presentation protocol.

	Requirement	SM Context
f	When initiating a connection, there shall be no parameters of the S-CONNECT request service primitive issued by the Presentation layer other than, optionally, user data.	To be checked

Note. — This enables the initiating Session Protocol Machine to use the short-connect protocol option.

	Requirement	SM Context
g	The user of the presentation service shall not issue any presentation primitives other than P-CONNECT request, P-CONNECT response, P-DATA request and P-U-ABORT request.	ok
h	When it is required to release the presentation connection, the presentation service user shall issue a P-U-ABORT request	The SM CF is responsible for mapping the P-RELEASE service onto the P-DATA and P-U-ABORT service
i	Any user data in a P-U-ABORT request shall([150]) be ignored by the presentation service provider.	The SM CF is responsible for first sending the data of a P-U-ABORT request with P-DATA and then to abort the connection

3.3 Functional units

ISP 11183 only requires the Kernel functional unit. The support of the Context Management and of the Context Restoration FUs is outside the scope of the ISP.

Table 3-3. Selection of Presentation functional units

ISP Index	Presentation functional unit	ISP Status	ATN Support	Mnemonic
B.2.3/1	Kernel	M	M	
B.2.3/2	Presentation Context Management	I	X	P-FU(CM)
B.2.3/3	Presentation Context Restoration	I	X	P-FU(CR)

The ATN specification is aligned with the ISP 11183-1 for the functional units to be supported by the Presentation PMs.

Table 3-4. Selection of Presentation pass-through Session functional units

ISP Index	Pass through to Session functional units	ISP Status	ATN Support	Mnemonic
C.2.1/2	Negotiated release	I	X	S-FU(NR)
C.2.1/3	Half Duplex	I	X	S-FU(HD)
C.2.1/4	Duplex	M	M	S-FU(FD)
C.2.1/5	Expedited Data	I	X	S-FU(EX)
C.2.1/6	Typed Data	I	X	S-FU(TD)
C.2.1/7	Capability Data Exchange	I	X	S-FU(CD)
C.2.1/8	Minor Synchronize	I	X	S-FU(SY)
C.2.1/9	Symmetric Synchronize	I	X	S-FU(SS)
	Data Separation		X	S-FU(DS)
C.2.1/10	Major Synchronize	I	X	S-FU(MA)
C.2.1/11	Resynchronise	I	X	S-FU(RESYNC)
C.2.1/12	Exceptions	I	X	S-FU(EXCEP)
C.2.1/13	Activity Management	I	X	S-FU(ACT)
See note	No-orderly release (NOR)	-	M	S-FU(NOR)

Note. — The NOR Session functional unit is defined in ISO/IEC 8326 Amendment 2.

It is proposed to align the ISP specification to the ATN profile.

3.4 Elements of procedure

3.4.1 Supported roles

3.4.1.1 Presentation Connection

Table 3-5. Presentation Connection roles

ISP Index	Role	ISP Status	ATN Support	Mnemonic
B.2.1/1	Initiator	C(1)	M	P-CON_initiator
B.2.1/2	Responder	C(1)	M	P-CON_responder

(1) The ISP requires a conforming implementation to support at least one of these roles.

The ATN specification is aligned with the ISP 11183-1 for the role of the PPMs during connection establishment.

3.4.2 Supported Presentation Protocol Data Units (PPDUs)

Note.— This section specifies the PPDUs associated with the supported Presentation functional units. There are no additional PPDUs or additional pass through functionality associated with the supported Session functional units.

3.4.2.1 Supported PPDUs associated with the Kernel services

Table 3-8. Supported Presentation Protocol Data Units

		Sender		Receiver		
ISP Index	PPDU	ISP Status	ATN Support	ISP Status	ATN Support	Mnemonics
B.3.1/1	Connect presentation (CP)	M	N/A (Note 2)	M	N/A (Note 2)	
B.3.1/2	CPtype	M	N/A (Note 2)	M	N/A (Note 2)	
B.3.1/3	CPCtype	I	N/A	I	N/A	
B.3.1/4	Connect presentation accept (CPA)	M	N/A (Note 2)	M	N/A (Note 2)	S-OA_SDR / S-OA_RCV
B.3.1/5	Connect presentation reject (CPR)	M	N/A (Note 2)	M	N/A (Note 2)	S-CDO_SDR / S-CDO_RCV

B.3.1/6	Abnormal release provider (ARP)	M	N/A (Note 2)	M	N/A (Note 2)	
B.3.1/7	Abnormal release user (ARU)	M	N/A (Note 2)	M	N/A (Note 2)	
B.3.1/8	Presentation Data (TD)	M	N/A (Note 2)	M	N/A (Note 2)	
Note 1	Short Connect (SHORT-CP)	?	M	?	M	
Note 1	Short Connect Accept (SHORT-CPA)	?	M	?	M	
Note 1	Short Connect Reject (SHORT-CPR)	?	M	?	M	

Note 1. — PDUs defined in efficiency enhancement ISO/IEC 8823-1 Amendment 2.
Note 2. — PPDUs not applicable, as the short-connect and null-encoding protocol options are selected.

It is proposed to align the ISP specification to the ATN profile.

3.5 Presentation Context Identifier

The ATN specification is non-conformant to the ISP proforma, in that it does not support at least 2 simultaneous presentation context and it uses the concept of default presentation context. However, in the ATN ULA, only one presentation context is required, even when several ASEs are included in the AE. It is assumed that the abstract syntaxes are identified in a single abstract syntax in the default presentation context and that all abstract syntaxes are encoded with the same transfer syntax identified in the default presentation context.

3.6 Encoding of User data parameter

The ISP mandates the "user data" value of each PPDU to be encoded as a "Fully-encoded-data" type. In addition, the "single-ASN.1-type" component has to be selected in the PDV-list and in all EXTERNAL fields.

The ATN specification is non-conformant to the ISP proforma, in that it assume the Fully Encoding option of the presentation protocol as required by the ISP but augmented with the PER-visible constraints defined in ISO/IEC 8823-1:1994/AM 2. In addition, the ATN profile mandates the selection of the "arbitrary" component.

3.7 Support of Syntaxes

3.7.1 Transfer Syntaxes Supported

The ATN specification is non-conformant to the ISP proforma, in that the transfer syntax selected for the System Management application is the Packet Encoding Rules (PER) instead of the Basic Encoding Rules (BER).
As a consequence, requirements specified in ISP chapter 8.1 to 8.7 are not applicable.

3.7.2 Abstract Syntaxes Supported

The abstract syntax is known by bilateral agreement and does not need to be exchanged and negotiated. It is specified in the application context defined for the System Management application.

3.8 Summary

The ATN profile for the presentation protocol and the support of the abstract and transfer syntaxes deviates from the requirements specified in the ISP. However, the ISP allows (see ISP sections 8.5 and 8.7) exceptions to these rules when clearly specified. When assuming the integration of CMISE and Rose in the ULCS architecture and the use of the efficiency enhancement option of the Presentation protocol, the requirements defined by the ISP being in conflict with the ATN profile are not valid any more. A new version of the ISP for this option should be released.

4 SESSION

Annex C of ISP 11183 specifies the Session profile required to support the operation of CMISE and ROSE. The ISP does not take into account the efficiency enhancements option of the Session protocol required by the ATN profile.

4.1 Protocol versions implemented

Table 4-1. Session Protocol Versions Supported

ISP Index	Version	ISP Status	ATN Support
	Version 1	-	-
9.2	Version 2 (use of unlimited user data)	M	M

The ATN specification is aligned with the ISP 11183-1 for the protocol version to be supported by the SPMs.

4.2 Session Functional units

Table 4-2. Selection of Session functional units

ISP Index	Functional unit	ISP Status	ATN Support
C.2.1/1	Kernel (K)	M	M
C.2.1/2	Negotiated release (NR)	I	X
C.2.1/3	Half Duplex (HD)	I	X
C.2.1/4	Duplex (FD)	M	M
C.2.1/5	Expedited Data (EX)	I	X
C.2.1/6	Typed Data (TD)	I	X
C.2.1/7	Capability Data Exchange (CD)	I	X
C.2.1/8	Minor Synchronize (SY)	I	X
C.2.1/9	Symmetric Synchronize (SS)	I	X
	Data Separation		X
C.2.1/10	Major Synchronize (MA)	I	X
C.2.1/11	Resynchronise (RESYN)	I	X
C.2.1/12	Exceptions (EXCEP)	I	X
C.2.1/13	Activity Management (ACT)	I	X
See note	No-orderly release (NOR)	?	M
See note	Special User-data	?	X

Note. — Functional units added by efficiency enhancement ISO/IEC 8327-1 Amendment 2.

The ATN specification is non-conformant to the ISP proforma, in that the No-Orderly release functional unit shall be selected in addition to the Kernel and Duplex FUs. It is proposed to align the ISP to the ATN profile.

4.3 Protocol mechanisms

Table 4-3. Session Protocol Mechanisms Supported

ISP Index	Mechanism	ISP Status	ATN Support	Associated mnemonic
C.2.2/1	Use of transport expedited data (Extended control Quality of Service)	I	X	S-EXP_T
C.2.2/2	Reuse of transport connection (sending)	I	O	S-REUSE_T
C.2.2/3	Reuse of transport connection (receiving)	I	O	S-REUSE_T
C.2.2/4	Basic concatenation	M	N/A (Note 2)	
C.2.2/5	Extended concatenation (sending)	I	X	
C.2.2/6	Extended concatenation (receiving)	I	X	S-XCONC_RCV
C.2.2/7	Segmenting (sending)	I	X	S-SEG_SDR
C.2.2/8	Segmenting (receiving)	I	X	S-SEG_RCV
	Max. size of SS-user-data (S-CONNECT) > 512		O	S-MAXSIZE_512
C.2.2/9&10 5.3	Max. size of SS-user-data (S-CONNECT) > 10240	I	O	S-MAXSIZE_10240
	Max. size of SS-user-data (S-ABORT) >9		X	S-MAXSIZE_9
See note 1	Null-encoding protocol option	-	M	
See note 1	Short-connect protocol option	-	M	
See note 1	Short-encoding protocol option	-	X	

Note 1. — Protocol options added by efficiency enhancement ISO/IEC 8327-1 Amendment 2.

Note 2.— Only Category 1 SPDUs are used for this ATN profile. By definition, these are never concatenated. Therefore, Basic concatenation is not applicable to this specification, but is supported to the extent necessary for compliance with the ISO PICS.

It is proposed to align the ISPO to the ATN profile.

4.4 Supported Roles

4.4.1 Session Connection

Table 4-4. Session Connection Roles Supported

ISP Index	Role	ISO Status	ATN Support	Mnemonic
C.2.3/1	Connection initiator	C(1)	M	S-CON_initiator
C.2.3/2	Connection responder	C(1)	M	S-CON_responder

(1) The ISP requires a conforming implementation to support at least one of these roles as required by the implementation.

The ATN specification is aligned with the ISP 11183-1 for the role of the SPMs during connection establishment.

4.5 Supported SPDUs

4.5.1 Support for the SPDUs associated with the Kernel functional unit

Table 4-7. Supported Session Protocol Data Units

		Sender		Receiver		
ISP Index	SPDU	ISP Status	ATN Support	ISP Status	ATN Support	Mnemonics
C.3.1.1/1 C.3.1.2/1	Connect (CN)	M	N/A (Note 4)	M	N/A (Note 4)	
C.3.1.1/2 C.3.1.2/2	Overflow Accept (OA)	I	N/A (Note 4)	I	N/A (Note 4)	S-OA_SDR / S-OA_RCV
C.3.1.1/3 C.3.1.2/3	Connect Data Overflow (CDO)	I	N/A (Note 4)	I	N/A (Note 4)	S-CDO_SDR / S-CDO_RCV
C.3.1.1/4 C.3.1.2/4	Accept (AC)	M	N/A (Note 4)	M	N/A (Note 4)	
C.3.1.1/5 C.3.1.2/5	Refuse (RF)	M	N/A (Note 4)	M	N/A (Note 4)	
C.3.1.1/6 C.3.1.2/6	Finish (FN)	M	N/A (Note 2)	M	N/A (Note 2)	
C.3.1.1/7 C.3.1.2/7	Disconnect (DN)	M	N/A (Note 2)	M	N/A (Note 2)	
C.3.1.1/8 C.3.1.2/8	Abort (AB)	M	N/A (Note 3)	M	N/A (Note 3)	
C.3.1.1/9 C.3.1.2/9	Abort Accept (AA)	I	N/A (Note 3)	I	N/A (Note 3)	
C.3.1.1/10 C.3.1.2/10	Data Transfer (DT)	M	N/A (Note 3)	M	N/A (Note 3)	
C.3.1.1/11 C.3.1.2/11	Prepare (PR)	I	X	I	X	S-PR_SDR / S-PR_RCV
See note 1	Short Connect (SCN)	C(2)	M	C(2)	M	
See note 1	Short Accept (SAC)	C(2)	M	C(2)	M	
See note 1	Short Refuse (SRF)	C(2)	M	C(2)	M	
See note 1	Null (NL)	C(3)	M	C(3)	M	
See note 1	Short Connect Continue (SCNC)	C(1)	N/A	C(1)	N/A	
See note 1	Short Accept Continue (SACC)	C(2)	M	C(2)	M	

See note 1	Short Refuse Continue (SRFC)	C(2)	M	C(2)	M	
See note 1	Short Finish (SFN)	C(1)	N/A	C(1)	N/A	
See note 1	Short Disconnect (SDN)	C(1)	N/A	C(1)	N/A	
See note 1	Short Data Transfer (SDT)	C(1)	N/A	C(1)	N/A	
See note 1	Short Abort (SAB)	C(1)	N/A	C(1)	N/A	

Note 1. — PDUs defined in efficiency enhancement ISO/IEC 8327-1 Amendment 2.
Note 2. — Not applicable, as the no-orderly-release functional unit is selected.
Note 3. — Not applicable, as the null-encoding protocol option is selected.
Note 4. — Not applicable, as the short-connect protocol option is selected.

(1) Used only if the short-encoding protocol option is selected.
(2) Used if short-encoding or null-encoding is used.
(3) Used only if the null-encoding protocol option is supported.

SCN, SAC, SRF, SACC and SRFC SPDUs shall be encoded such that the parameter bit of the SI&P octet is set to the value 0, indicating that all following octets are User-information (i.e. no SPDU parameters are present).

Note. — This is a requirement of the null-encoding protocol option.

It is proposed to align the ISPO to the ATN profile.

4.6 Use of null-encoding and short-connect protocol options

The null-encoding and short-connect session protocol options shall be selected for use, with the requirements as specified in Table 4-9.

Table 4-9. Use of the null encoding and short-connect Session protocol options

Ref.	Requirement	ATN Requirement	SM context
A	The calling and called session selectors are null	M	ok
B	The session-requirements parameter in the S-CONNECT service includes the kernel, full-duplex and no-orderly-release functional units only.	M	ok

4.7 Summary

ISP 11183-1 specific does not apply to the ATN profile since it covers the full session presentation. However, once the ISP upgraded to take into account the efficiency option of the session protocol, there is nothing that makes the ATN session profile incompatible with of the use of the Session service by an Application Entity including CMISE and ROSE.

5 CONCLUSION

This analysis (which need to be confirmed) shows that there is no objection to the integration of the System Management Application (SMA) within the ICAO-specified ATN Upper Layer Architecture. ISP 11183-1 specifies the constraints put on the upper layer systems claiming the support of CMISE and ROSE communication requirements. The more restrictive constraints are placed on the Presentation layer to allow the handling of several ASEs within the Application Entity. The ATN ULA has been defined to handle such Application Entities (see air-ground and ground-ground applications). Therefore, these constraints are not relevant. The ISP should be reviewed to integrate the efficiency option of the Session and Presentation protocols.

ANNEX B

THE ALTERNATIVE INTERNAL ARCHITECTURES FOR THE SYSTEM MANAGEMENT APPLICATION

1 INTRODUCTION

The next ATN application being standardised by ICAO is the Systems Management (SM) Application. WG3/SG3 was tasked to produce SARPs material for this application necessary for implementors for developing independent and interoperable SM products.

The ATN ULA provides a framework for the specification of the applications based on the OSI extended application layer structure. However, the internal organisation of the application entities is not predefined. Thus, the air-ground CNS/ATM-1 applications (CM, ADS, CPDLC and FIS(ATIS)) are not structured the same way the AIDC application is. A third alternative is even suggested by the ULCS SARPs (Sub-Volume IV), which consists in inserting some new Application Service Elements (ASE) in the lower part of the AE enhancing the dialogue service.

This document reviews the generic ULCS framework applied to Systems Management and analysis the alternative solutions.

The assumptions made in this document are that SM exchanges are likely to occur during the flight between an airborne agent and a ground manager and that the ATN Upper Layer Architecture has been selected for hosting the SM Application. The selection of Systems Management Functions (SMF) and the definition of the Management Information Base (MIB) for the ATN environment is not taken into account in this document.

Note. The justification of these assumptions and the selection of the SMFs is out of the scope of this document and should be provided by WG1/SG3. The definition of the MO classes if under the responsibility of both WG2 and WG3.

2 DISCUSSION

2.1 Functional Model

The functional model used to represent the Systems Management Application and the supporting Upper Layers is depicted in Figure B-1. The functional modules are described below.

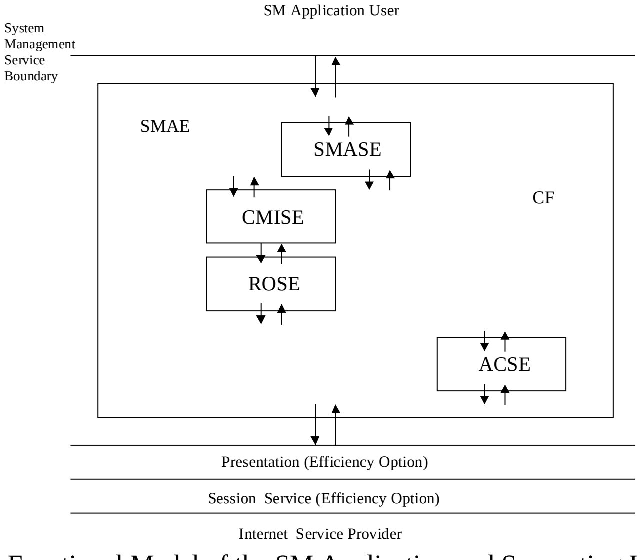


Figure B-1: Functional Model of the SM Application and Supporting Upper Layers

The SMAEs provide the OSI communication services required by the SM Agent and the SM Manager. The SM Agent is a specific SM-user taken the role in which it is capable of performing management operations on managed objects and emitting notifications on behalf of managed object. The SM Manager is a specific SM-user taken the role in which it is capable of issuing management operations and receiving notifications.

The ACSE provides services to establish, maintain and release application-association between application entities.

The CMISE negotiates with the peer the protocol version and the protocol functional units supported on the SM association. It provides CMIS-users with services handling Managed Objects (emission of notification, operation on MOs such as creation, operation, attributes setting or retrieval, etc…) and the actions of requesting filtering and scoping. CMISE is not aware of the availability of an association. The management of the association is outside the scope of the CMISE protocol and shall be handled by the CMISE service user, i.e. the SM-user (in mode "explicit") or the CF (in mode "implicit").

The ROSE materialises the concept of remote operations by defining a common notation between the system requesting a action and the system performing this action.

The SMASE provides service to the users of the Systems Management AE (SMAE). The SMASEs negotiate during the association establishment the SM Functions activated on this association.

Note: The SMF negotiation is defined in ISO/IEC 10040 as an optional procedure. This negotiation is usually not performed by the of-the-shelf SM products. An a-priori knowledge of the supported SMFs could be sufficient. It is proposed that the ATN SM AEs do not negotiate the SMFs.

As a consequence, the SMASE could be omitted in the SM ULA since it does not carried out actual protocol and only provides a pass-through service to CMIS and Dialogue services. However, if it is decided to implement a specific protocol for handling ATN dedicated SM functions (e.g. file transfer exchanges or the manager to manger communications), a SMASE could be useful.

The SMASE, CMISE and ROSE share a single abstract syntax. The merged abstract syntax {joint-iso-ccitt ms(9) cmip(1) cmip-pci(1) abstractSyntax(4)} is defined in ISO/IEC 9596-1.

The SM CF is responsible for the mapping of the service primitives issued/received by/from the SM Application User, the ASEs of the SMAE and the Presentation Service Provider. It is also responsible for initiating the association release when requested by the SM-users.

The SM CF provides CMISE and ROSE with the means to exchange data during association establishment and association abort:

- the initiator CMISE is requested to build the initial APDU sent to the peer to negotiate the protocol options ("CMIPUserInfo" type as defined in 9596-1). The initiator CF sends this APDU as an EXTERNAL element of the "user information" parameter of an A-ASSOCIATE. The responder CF makes available this APDU to the responder CMISE.
- likewise, CMISE is requested to build the abortive APDU sent to the peer when aborting the association. The CF sends this APDU as an EXTERNAL element of the "user information" of an A-ABORT.

2.2 The SM Abstract Service

The SM Abstract Service is the service provided by the SM AE to the SM-Users. This abstract service shall be described in SARPs Sub-Volume VI regardless of the selected architecture.

This section provides an example of what this abstract service could be. It is assumed that the "explicit" mode is selected for the AE, i.e. the SM-users are responsible for triggering the establishment and the release of the association with the peer.

2.2.1 SM Communication Management

SM-OPEN Service

Parameter Name	Req	Ind	Rsp	Cnf
SM Called Peer Id	M			
SM Calling Peer Id	U	C(=)		
CMISE Funtional Units				
AccessControl	U	C(=)	U	C(=)
UserInfo	U	C(=)	U	C(=)
Result			M	M(=)

Note 1. If the receiving CMISE rejects the association based on protocol version or access control check, there is no indication issued to nor response expected from the peer SM-user.
Note 2. No Class Of Communication parameter is defined since the value for the Routing Class is predefined for Systems Management communications.

SM-CLOSE Service

Parameter Name	Req	Ind	Rsp	Cnf
Result (?)			M	C(=)
SM-user data (?)	U	C(=)	U	C(=)

SM-ABORT

Parameter Name	Req	Ind
SM-User Data (?)	U	C(=)

SM-P-ABORT

Parameter Name	Ind
Reason	M

2.2.2 SM Information Exchange

The following services are deduced from the corresponding CMIS services:

- SM-CANCEL-GET service,
- SM-EVENT-REPORT service,
- SM-GET service,
- SM-SET service,
- SM-ACTION service,
- SM-CREATE service, and
- SM-DELETE service.

2.2.3 SM File Transfer

Additional services could be added to the SM service if they can't be provided through existing SM services and the definition of MOs. The corresponding protocol is carried out by the ATN SMASE. For instance, if it is decided to not use the CMIS stack to transfer log or configuration files, the following services could be defined as part of the SM service:

SM-GETFILE
SM-PUTFILE

2.3

The SM AE Architecture

The functional model described above can fit in the Upper Layer Architecture described in SARPs Sub-Volume IV as one of the three following options:

- architecture #1 is based on the ATN air-ground application model. The Dialogue service is "used" in the AE to communicate with the peer.
- architecture #2 is based on the AIDC application model. The CF manages the association on behalf of the App-ASE. The App-ASE simply sends data without knowledge of the status of the association.
- architecture #3 defines a new concept, the "managed dialogue service". This architecture is a variant of Architecture #1 where the dialogue service provided to the App-ASE includes also SM services.

These 3 architectures are discussed below.

2.3.1 Architecture #1: The ATN Air-Ground Application model

The Dialogue Service defined in the CNS/ATM-1 ULA is provided unchanged. Likewise the CNS/ATM-1 ATN applications were designed, the lower part of the SMAE CF hides the ACSE and Presentation services by providing the Dialogue service. The Dialogue service identifies the artificial boundary between the "Upper CF" and the "Lower CF". The "Lower CF" is fully specified in the SARPs Sub-Volume IV. A SMASE is present if required. In the following, it is assumed that there is no SMASE.

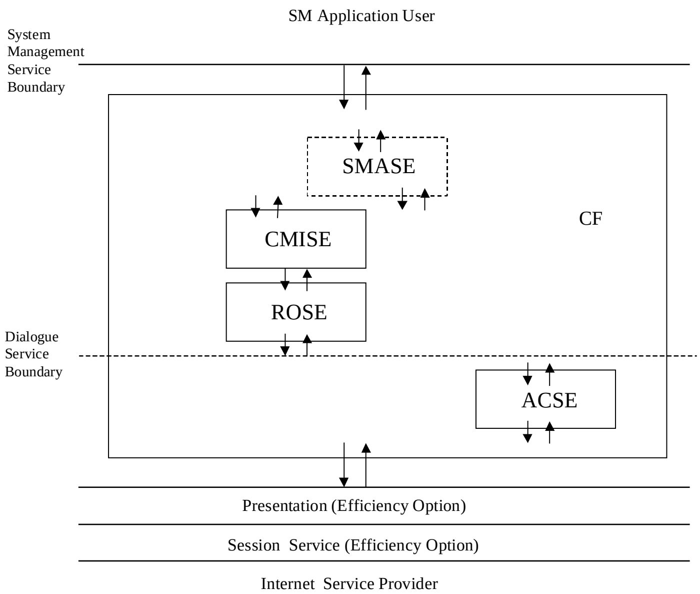


Figure 2: Architecture #1 - Use of the CNS/ATM-1 Dialogue Service

The "Upper CF" uses the Dialogue service to establish, release and abort the application-association with the peer SMAE and to exchange SM information when requested by CMISE and ROSE. The CMIS service is provided unchanged to the SM-users as part of the SM service.

The actions of the "Upper CF" shall be specified in the SARPs Sub-Volume VI, in particular the actions to handle the primitive exchanges between the SM-users and CMISE, between the SM-users and the DSP and between ROSE and DSP. In particular, the CF is responsible for mapping the Presentation service primitives (P-DATA request and indication) used by ROSE at its lower interface to the Dialogue service interface.

Note. The "Upper CF" was empty in the specification of the air-ground applications since the ASE service and the AE service were identical and since the ASEs were designed to use directly the Dialogue service. This is not the case here since CMSE/ROSE expects from the communication service provider a Presentation service.

The "Dialogue Abstract Service" and the "Lower CF" specified for the CNS/ATM-1 ULA remain unchanged. The Sub-Volume IV sections describing the "Upper CF" (e.g. 4.3.3.2 "Services Invoked by the Application User") shall be made "non-effective".

This approach permits to not touch the ULA SARPs. The Sub-Volume 6 section describing the SM Application could be based on the Sub-Volume II layout (introduction, abstract service description, ASN.1 description, protocol specification, communication requirements, user requirements) with an additional section for the "Upper CF".

Note. The main problem of this architecture when used for the ATN air-ground application was the induced complexity of the App-ASE protocol, because the states of the underlying dialogue (e.g. pending establishment, established, pending release, collision) should be handled by the ASE protocol itself. For the SMAE, CMISE and ROSE assume the association established and invoke only a data transfer primitive. This problem will therefore not be encountered for the specification of the SM application.

2.3.2 Architecture #2: The AIDC Application model

The Dialogue Service defined in the CNS/ATM-1 ULA is not used as such in the SMAE specification. Likewise the CNS/ATM-1 AIDC application were designed, the entire SM CF is fully specified. An SMASE is present if required. In the following, it is assumed that there is no SMASE.

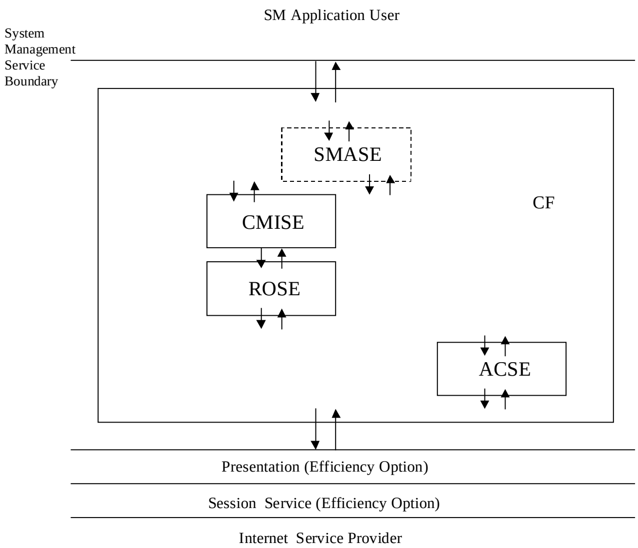


Figure 3: Architecture #2 - AIDC Model

In this architecture, the CF uses the ACSE Service to establish, release and abort the association with the peer SM and the Presentation service to exchange SM information when requested by CMISE and ROSE. The CMIS service is provided unchanged to the SM-users.

The main interest of this architecture is the simplification of the ASE protocol since the ASE is not responsible for tracking the state of the underlying association (the drawback being the inverse complexity added to the CF specification…). This is the case for the SM application, since CMISE and ROSE assume the presence of an association.

This approach permits to not touch the ULA SARPs. Sub-Volume 6 will include the specification of the SM abstract service and the specification of the full CF. However, this implies a duplication of specification for the generic functions provided by the DSP as the mapping of the P-RELEASE and P-ABORT primitives onto the Dialogue primitives or the CF APDU management. This duplication not justified and potential source of errors could be avoided by using the Dialogue service, i.e. selecting the architecture #1 described above. It is therefore proposed to not choose this architecture.

2.3.3 Architecture #3: "Managed Dialogue Service"

This architecture is identified in SARPs Sub-Volume IV section 4.3.1.1 as a possible evolution of the current ULA. This evolution consists in the addition of new ASE ("Future ASE") in the Dialogue Service Provider. The proposed architecture is to combine CMISE/ROSE with ACSE in the lower part of the AE. The CMIS service becomes part of the provided Dialogue service. An SMASE is present if required. In the following, it is assumed that there is a SMASE.

The rationale for proposing this approach is that the CMIS service can be viewed as a generic service which should be made available to a large number of SM applications: configuration, performance, accounting and security related applications are candidates for using the CMIS service.

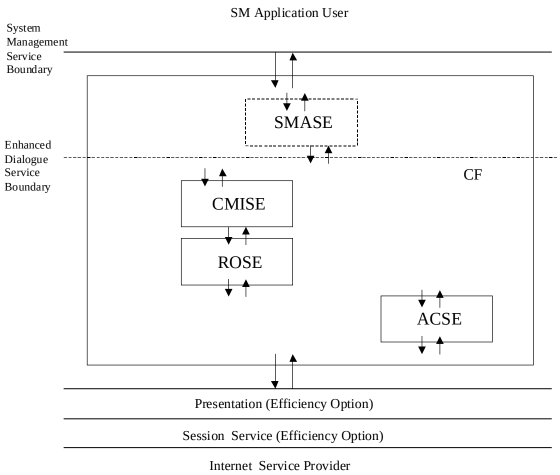


Figure 3: Architecture #3 - Managed Dialogue Service

In this architecture, the SMASE uses the Dialogue Service for both dialogue establishment and SM data communication.

The "Upper CF" provides a pass-through service between the SM AE service and the SMASE service. Depending on the lower interface defined for the SMASEs (i.e. does the SMASE use the Dialogue service?), the "Upper CF" is empty or not. The specification of the "Upper CF" is therefore straightforward.

The following additional service primitives shall be added to the Dialogue Abstract Service:

- D-CANCEL-GET service,
- D-EVENT-REPORT service,
- D-GET service,
- D-SET service,
- D-ACTION service,
- D-CREATE service, and
- D-DELETE service.

The "Lower CF" described in the SARPs Sub-Volume IV shall be upgraded as follows:

- The START and ABORT actions performed by the CF shall be slightly modified in order to include CMISE initial/abortive data in the user data of the A-ASSOCIATE and A-ABORT service primitives.
- The new Dialogue request/response primitives shall be mapped to the peer CMIS request/response primitives. CMISE indication/confirmation primitives shall be mapped to the peer new Dialogue indication/confirmation primitives.
- A Presentation Context identifier shall be assigned to ROSE/CMISE APDUs (e.g. the reserved value "2").

Attention shall be given to the backward compatibility. A ULA stack providing the managed dialogue service shall be able to interact with a remote ULA stack providing the basic dialogue service, given that none of the SM services is used.

Attention shall also be given to keep the Dialogue Service Provider as generic as possible. In particular, the CF should not perform actions specific to a given ASE (here CMISE/ROSE).

2.3.4 Conclusion

Architectures 1 and 3 are the most serious candidates for SM Application. However, architecture 3 impacts much more the existing SARPs than architecture 1, since the CF specified in SARPs Sub-Volume IV is modified. Architecture 1 is therefore the preferred solution.