AERONAUTICAL TELECOMMUNICATION NETWORK PANEL

WORKING GROUP 3 (APPLICATIONS AND UPPER LAYERS)

Honolulu, USA, 19 - 22 January 1999

ATN Upper Layer Naming and Addressing - Change Pages and Examples

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SUMMARY
WG3 has previously endorsed a set of enhancements to the naming and addressing provisions in the ATN upper layers which solve a number of foreseen problems. This paper proposes detailed changes to Sub-Volume 4 of the ATN Technical Provisions in order to realise the enhancements. It also provides some scenarios showing some practical applications of the enhancements. The paper was reviewed by WG3/SG3 at its January 1999 meeting.

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1. INTRODUCTION

ATNP WG3 has previously endorsed a set of enhancements to the naming and addressing provisions in the ATN upper layers which solve a number of foreseen problems (ref. [1]). This paper proposed ("Package 2") changes to Sub-Volume 4 of the ATN Technical Provisions in order to realise the enhancements. It also provides some scenarios illustrating some practical applications of the enhancements.

The ongoing development of ATN application concepts and implementation programmes have highlighted a number of restrictions in the upper layer naming and addressing provisions in ICAO Doc. 9705 edition 1, which may cause problems in future ATN applications and implementation architectures.

These restrictions have been signalled to the ATNP CCB in PDR 97120001, which was Forwarded by the ATNP CCB to WG3 and thence to SG3 for resolution. WG3/SG3 considered these problems at its meeting in Bracknell in April 1998, and arrived at the proposed solutions documented in [1], which were endorsed by WG3 at its fourteenth meeting in Bordeaux, France in October 1998.

The present paper, agreed by WG3/SG3 at its meeting in Toulouse in January 1999, takes the solutions as documented in [1] and presents them, with minor enhancements, in the form of revisions to Doc. 9705 edition 1. These revisions are now presented to the Working Group for consideration for forwarding to ATNP/3 for inclusion in the ATN technical provisions.

1.1. References

[1] ATNP/WG3/WP 14-11 Proposed ATN Upper Layer Naming and Addressing Extensions.

2. PROPOSED CHANGES TO ICAO DOC. 9705

2.1. General Description

The Dialogue Service as currently specified in Doc 9705 requires that the peer communicating end systems be identified by either an ICAO facility designator or a 24-bit aircraft identifier. There are some cases where the entity to be addressed does not fit into this scheme.

As a consequence it is proposed to enhance the ATN upper layer naming requirements:

a) to add an additional arc to the ATN naming hierarchy to further qualify a given application type at a given location with the addition of a system identifier,

b) to add a new optional parameter to the D-START service to allow the new Sys-ID parameter to be specified,

c) to extend the addressing parameters in D-START primitives to allow a full presentation address to be optionally specified.

The proposed changes are detailed in the following paragraphs.

2.2.   Detailed Modifications to Sub-Volume 4

Paragraph 4.2.2.1, Table 4.2-2

Add four new parameters to D-START, as shown underlined:

Service	Parameters
D-START	Called Peer ID Called Sys-ID Called Presentation Address Calling Peer ID Calling Sys-ID Calling Presentation Address DS-User Version Number Security Requirements Quality-of-Service Result Reject Source User Data

Paragraph 4.2.3.2.1, Note 2, Table 4.2-4

Original text:

Parameter Name	Req	Ind	Rsp	Cnf
Called Peer ID	M			
Calling Peer ID	U	C(=)		

Replacement text:

Parameter Name	Req	Ind	Rsp	Cnf
Called Peer ID	U			
Called Sys-ID	C			
Called Presentation Address	U			
Calling Peer ID	U	C(=)		
Calling Sys-ID	C	C(=)		
Calling Presentation Address	U	C(=)		

Paragraph 4.2.3.2.1, Notes 3 and 4

Original text:

Note 3.— The Called Peer Id parameter is used in the D-START service to specify the name of the intended peer DS-User, and takes an abstract value corresponding to either a 24-bit ICAO aircraft-id or an ICAO facility designator.

Note 4.— The Calling Peer Id parameter is optionally used in the D-START service to specify the name of the initiating DS-User, and is either absent or takes an abstract value corresponding to either a 24-bit ICAO aircraft-id or an ICAO facility designator. Its presence in the indication primitive is conditional upon it being specified by the DS-User in the request primitive.

Replacement text:

Note 3.— Called Peer identification. The DS-User identifies the intended peer DS-User by specifying either a name or an address in the D-START request primitive. The DS-User therefore specifies a value for one, and only one, of the Called Peer ID and Called Presentation Address parameters in the D-START request. The Called Peer ID parameter is optionally used in the D-START service to specify the name of the intended peer DS-User, and takes an abstract value corresponding to either a 24-bit ICAO aircraft-id or an ICAO facility designator. The Called Presentation Address parameter is optionally used in the D-START service to specify the address of the intended peer DS-User, and takes the value of an ATN PSAP address (equivalent to an ATN TSAP address as defined in 5.4.2, since Session and Presentation selectors are NULL). If the Called Peer ID parameter is used, then the DS-User may additionally specify the Called Sys-ID parameter to explicitly refer to a specific instance of the peer DS-User at the remote location. If the Called Sys-ID parameter is absent, then ANY instance of the DS-User process at the identified location is being addressed. The syntax of the Called Sys-ID is an 8-octet identifier corresponding to the LOC + SYS fields of the ATN TSAP address, as defined in 5.4.3.8.

Note 4.— Calling Peer identification. The DS-User may optionally request that the name or address of the initiating DS-User be conveyed to the peer DS-User in the D-START service. The DS-User therefore specifies a value for neither or one of the Calling Peer ID and Calling Presentation Address parameters in the D-START request. If the Calling Peer ID parameter is used, then the DS-User may additionally specify the Calling Sys-ID parameter to explicitly refer to a specific instance of the local DS-User. If the Calling Sys-ID parameter is absent, then ANY instance of the DS-User process at the local location is being referenced. The presence of each of Calling Peer ID and Calling Sys-ID parameters in the D-START indication primitive is conditional upon them being specified by the DS-User in the D-START request primitive. If the Calling Peer ID is not specified in the D-START request, then the Calling Presentation Address will be present in the D-START indication, regardless of whether it was specified in the D-START request. The syntax of the Calling Peer ID, Calling Sys-ID and Calling Presentation Address parameters is identical to the corresponding Called parameters described above.
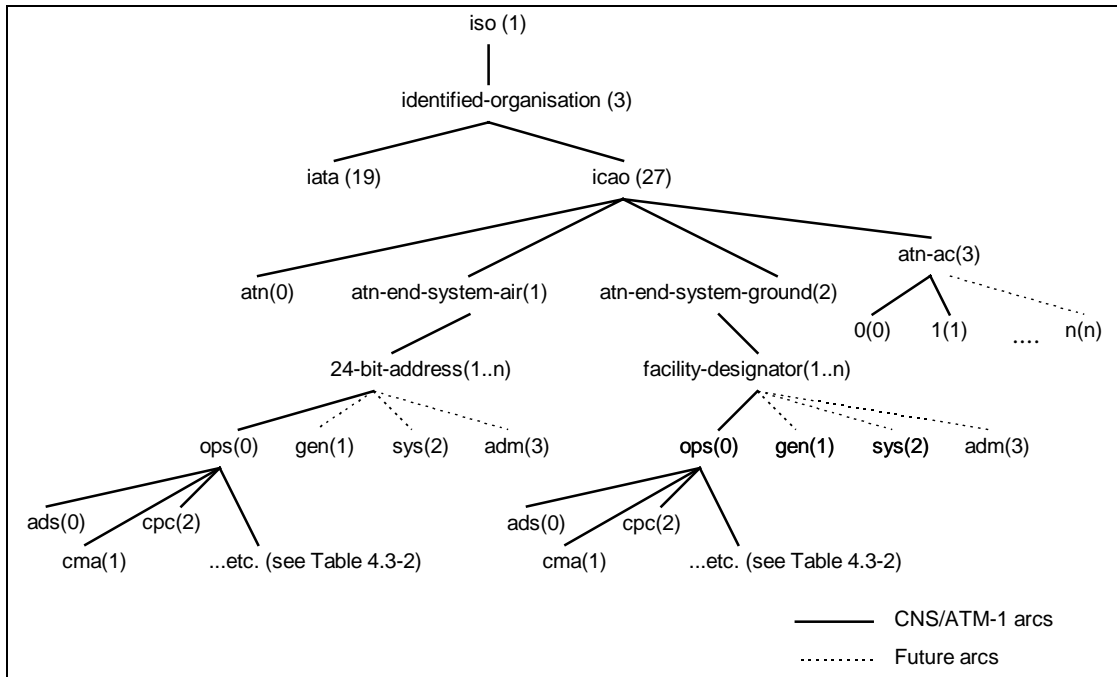
Paragraph 4.3.2.1.1, Figure 4.3-2

Original figure:

Figure 4.3-2. ATN Naming Hierarchy
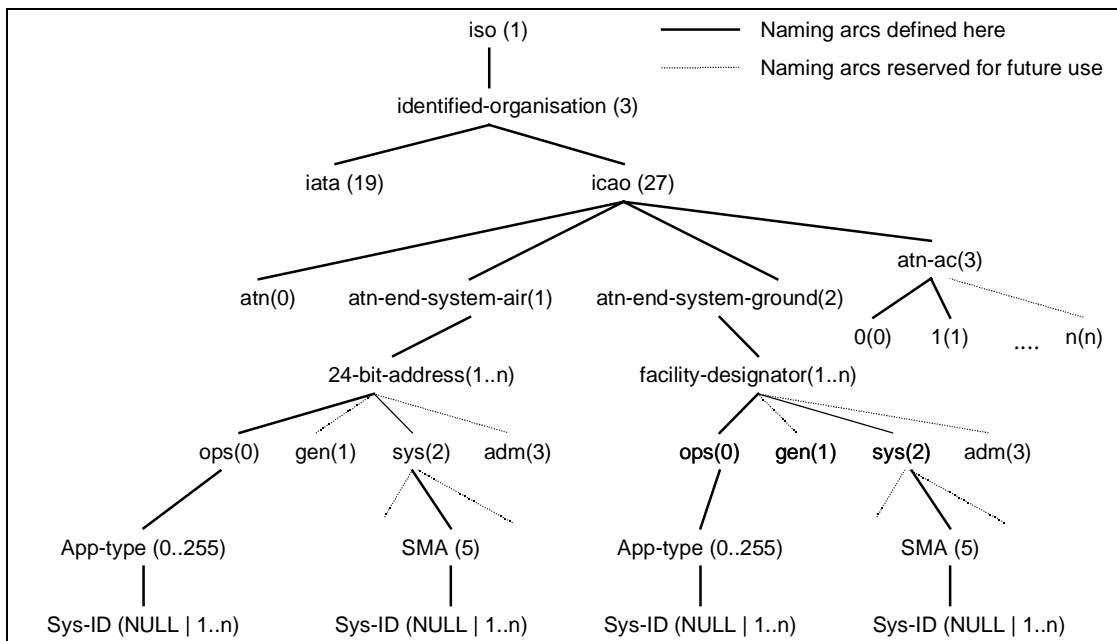
Replacement figure:

Figure 4.3-2. ATN Naming Hierarchy

Paragraph 4.3.2.2, Note

Original text:

Note. — Application process titles are allocated underneath either of the Object Identifier arcs:

    { atn-end-system-air (1) } or { atn-end-system-ground (2) }.

Immediately subordinate to this arc is an arc whose value is an INTEGER derived from either the 24-bit ICAO aircraft address or the ICAO facility designator, as described in 4.3.2.4. Immediately beneath that arc is an arc whose value is determined by the category of the ATN application. For the present, only the following name and value are defined for the application category:

    { operational (0) }.

Replacement text:

Note. — Application process titles are allocated underneath either of the Object Identifier arcs:

    { atn-end-system-air (1) } or { atn-end-system-ground (2) }.

Immediately subordinate to this arc is an arc whose value is an INTEGER derived from either the 24-bit ICAO aircraft address or the ICAO facility designator, as described in 4.3.2.4. Immediately beneath that arc is an arc whose value is determined by the category of the ATN application. For the present, only the following names and values are defined for the application category:

    { ops (0) } - for operational applications, and

    { sys (2) } - for system management applications.

Subordinate to the application category arc is an arc whose value is determined by the type of the ATN application process (e.g. ads (0), cma (1), etc.), as defined in Table 4.3-2.

Paragraph 4.3.2.2.1

Original text:

Each application category on each ATN end system shall be assigned an unambiguous application process title (AP-title).

Replacement text:

Each application process type on each ATN end system shall be assigned an unambiguous application process title (AP-title).

Paragraph 4.3.2.2.3

Original text:

Application Process titles shall be of the form:

either:

{ iso (1) identified-organisation (3) icao (27) atn-end-system-air (1) <end-system-id> (n) operational (0) }

or:

{ iso (1) identified-organisation (3) icao (27) atn-end-system-ground (2) <end-system-id> (n) operational (0) }

where:

<end-system-id> is the ICAO 24-bit address for aircraft end systems, or the ICAO facility designator for ground end systems.

(n) is an INTEGER value derived from the <end-system-id>.

Note. — The algorithm for deriving the INTEGER n from the <end-system-id> is defined in 4.3.2.4.

Replacement text:

Application Process titles shall be of the form either:

{ iso (1) identified-organisation (3) icao (27) atn-end-system-air (1) <end-system-id> (n) <category> (m) <app-type> (l) }

or:

{ iso (1) identified-organisation (3) icao (27) atn-end-system-ground (2) <end-system-id> (n) <category> (m) <app-type> (l) }

where:

<end-system-id>	is the ICAO 24-bit address for aircraft end systems, or the ICAO facility designator for ground end systems,
(n)	is an INTEGER value derived from the <end-system-id>,
	Note. — The algorithm for deriving the INTEGER n from the <end-system-id> is defined in 4.3.2.4.
<category>	is the application category, either ops (Operational) or sys (System Management),
(m)	is the INTEGER value corresponding to the application category, ops(0) or sys(2),
<app-type>	is the application type as specified in Table 4.3-2, and
(l)	is the INTEGER value corresponding to the application type, and takes one of the values specified in Table 4.3-2.

Insert new paragraph 4.3.2.2.4 after paragraph 4.3.2.2.3

New text:

The app-type arc of the Application Process title object identifier represents the ATN application type (e.g. "ADS" or "CMA"), and shall take one of the values specified in Table 4.3-2.

Note.— Table 4.3-2 is the global register of all standard ATN application types. The values defined in Table 4.3-2 may be used to identify application types, for example in the Context Management application Logon service.

Paragraph 4.3.2.3.4

Original text:

The AE-qualifier value arc of the AE Title object identifier represents the ATN application type (e.g. "ADS" or "CMA"), and shall take one of the values specified in Table 4.3-2.

Replacement text:

The AE-qualifier value arc of the AE Title object identifier shall be either NULL (i.e. absent) or an unambiguous system identifier, consisting of the binary value of the 8-octets comprising the LOC+SYS fields of the ATN NSAP address, expressed as an INTEGER in the range $0..(2^{64}-1)$ and encoded as an Object Identifier subidentifier as defined in ISO/IEC 8825-1.

Note.— The AE-qualifier further qualifies the Application Process title such that it identifies a given application type on a specific End System at a given location.

Paragraph 4.3.2.3.4, Table 4.3-2

Move Table 4.3-2 so that it is now associated with the new paragraph 4.3.2.2.4, and modify the table caption and header row as follows:

Original text:

Table 4.3-2. Assigned AE-Qualifier values

ATN ASE type	**ATN AE-Qualifier name and numeric value**
Automatic Dependent Surveillance	ADS (0)

Replacement text:

Table 4.3-2. Assigned app-types and values

ATN ASE type	**ATN app-type name and numeric value**
Automatic Dependent Surveillance	ADS (0)

Paragraph 4.3.2.3.5

Original text:

Thus, AE-titles conforming to this definition shall be of the form:

either:

{ iso (1) identified-organisation (3) icao (27) atn-end-system-air (1) <end-system-id> (n) operational (0) <ae-qualifier> (m) }

or

{ iso (1) identified-organisation (3) icao (27) atn-end-system-ground (2) <end-system-id> (n) operational (0) <ae-qualifier> (m) }

where:

<end-system-id> is the ICAO 24-bit address for aircraft end systems, or the ICAO facility designator for ground end systems.

(n) is an INTEGER value derived from the <end-system-id>

<ae-qualifier> is the name form of the AE qualifier from Table 4.3-2

(m) is the number form of the AE qualifier from Table 4.3-2.

Note. — The algorithm for deriving the INTEGER n from the <end-system-id> is defined in 4.3.2.4.

Replacement text:

Thus, AE-titles conforming to this definition shall be of the form either:

{ iso (1) identified-organisation (3) icao (27) atn-end-system-air (1) <end-system-id> (n) <category> (m) <app-type> (l) [<ae-qualifier> (k)] }

or

{ iso (1) identified-organisation (3) icao (27) atn-end-system-ground (2) <end-system-id> (n) <category> (m) <app-type> (l) [<ae-qualifier> (k)] }

where:

<end-system-id>	is the ICAO 24-bit address for aircraft end systems, or the ICAO facility designator for ground end systems,
(n)	is an INTEGER value derived from the <end-system-id>,
	Note. — The algorithm for deriving the INTEGER n from the <end-system-id> is defined in 4.3.2.4.
<category>	is the application category, either ops (Operational) or sys (System Management),
(m)	is the INTEGER value corresponding to the application category, ops(0) or sys(2),
<app-type>	is the name form application type as specified in Table 4.3-2,
(l)	is the INTEGER value corresponding to the application type, and takes one of the values specified in Table 4.3-2,
<ae-qualifier>	is the unambiguous system identifier, if present, and
(k)	is the INTEGER value corresponding to the 8-octet LOC+SYS fields from the ATN NSAP address, if present.

Paragraph 4.3.3.3.2.2.1

Original text:

When the D-START Request is validly invoked, the CF shall:

a) Retrieve the AE-qualifier as defined for the ATN-App AE,

b) Construct the Application Context name, with the value of the final arc set equal to the DS-User Version Number parameter if provided, and set to zero otherwise.

c) Retrieve the calling Presentation address

d) Look up the called Presentation address from the Called Peer Id parameter.

e) If the Calling Peer Id parameter is present, then retrieve the Calling AP Title and Calling AE-qualifier. If it is not present, then Calling AP Title and Calling AE-qualifier are not used in the A-ASSOCIATE request (and they will not then be included in the resulting A-ASSOCIATE-REQUEST (AARQ) APDU).

> *Note.— The way that the Calling AP Title and the Calling AE Qualifier are retrieved is a local implementation matter.*

Replacement text:

When the D-START Request is validly invoked, the CF shall:

a) Determine the app-type as defined for the ATN-App AE,

b) Construct the Application Context Name, with the value of the final arc set equal to the DS-User Version Number parameter if provided, and set to zero otherwise,

c) If not specified in the request primitive, retrieve the local Calling Presentation Address,

d) Determine the Called Presentation Address either directly from the Called Presentation Address parameter if present, or via look-up from the Called Peer ID and Called Sys-ID parameters,

e) If the Calling Peer ID parameter is present, then retrieve the corresponding Calling AP Title. If, in addition to Calling Peer ID, the optional Calling Sys-ID parameter is present, then retrieve the corresponding Calling AE-Qualifier. If Calling Peer ID is not present, then Calling AP Title and Calling AE-Qualifier are not used in the A-ASSOCIATE request (and they will not then be included in the resulting A-ASSOCIATE-REQUEST (AARQ) APDU),

> *Note.— The way that the Calling AP Title and the Calling AE Qualifier are retrieved is a local implementation matter.*

Paragraph 4.3.3.4.1.2.1

Original text:

When an A-ASSOCIATE Indication primitive is validly invoked, the CF shall:

a) If the final component of the Application Context Name parameter is non-zero, then use it as the DS-User Version Number in the D-START Indication primitive. If it has the value zero, then omit the DS-User Version Number parameter in the D-START Indication.

b) If the Calling AP Title parameter is present, extract the Calling Peer Id from it.

c) If the ACSE Requirements parameter is present, and it indicates that the authentication functional unit is requested, then extract the Authentication-value parameter.

d) Construct a D-START Indication primitive, with the following parameter values:

Table 4.3-14

D-START Indication parameter	Value
Calling Peer ID	Derived as in b) above
DS-User Version Number	Derived as in a) above
Security Requirements	Derived as in c) above
Quality Of Service	See following subsection
User Data	A-ASSOCIATE User Information parameter

Replacement text:

When an A-ASSOCIATE Indication primitive is validly invoked, the CF shall:

a) If the final component of the Application Context Name parameter is non-zero, then use it as the DS-User Version Number in the D-START Indication primitive. If it has the value zero, then omit the DS-User Version Number parameter in the D-START Indication,

b) If the Calling AP Title parameter is present, extract the Calling Peer ID from it, and if the Calling AE Qualifier parameter is present, extract the Calling Sys-ID from it. If the Calling AP Title parameter is not present, extract the Calling Presentation Address.

c) If the ACSE Requirements parameter is present, and it indicates that the authentication functional unit is requested, then extract the Authentication-value parameter,

d) Construct a D-START Indication primitive, with the following parameter values:

Table 4.3-14

D-START Indication parameter	Value
Calling Peer ID	Derived as in b) above
Calling Sys-ID	Derived as in b) above
Calling Presentation Address	Derived as in b) above
DS-User Version Number	Derived as in a) above
Security Requirements	Derived as in c) above
Quality Of Service	See following subsection
User Data	A-ASSOCIATE User Information parameter

Paragraph 4.6.6.2.1.1, Table 4.6-9

Original text:

		Sender		Receiver	
Ref.	Parameter	ISO Status	ATN Support	ISO Status	ATN Support
A.A.10.1/3	Calling AP title	C6	O	C2	M
A.A.10.1/4	Calling AE qualifier	C6	O	C2	M
A.A.10.1/5	Calling AP invocation-identifier	C6	O	C2	M
A.A.10.1/6	Calling AE invocation-identifier	C6	O	C2	M

Replacement text:

		Sender		Receiver	
Ref.	Parameter	ISO Status	ATN Support	ISO Status	ATN Support
A.A.10.1/3	Calling AP title	C6	M	C2	M
A.A.10.1/4	Calling AE qualifier	C6	M	C2	M
A.A.10.1/5	Calling AP invocation-identifier	C6	X	C2	M
A.A.10.1/6	Calling AE invocation-identifier	C6	X	C2	M

2.3.   Detailed Modifications to Sub-Volume 2

<u>Changes to the CM Provisions</u>

The above enhancements introduce an inconsistency between Doc. 9705 Sub-Volumes 4 and 2. The CM ASN.1 definitions (and the text) uses the AE-Qualifier to identify the application type. Now the AE-qualifier has another meaning and syntax, it contains the System ID. A change is therefore required to CM.

<u><Details to be provided></u>

3. SCENARIOS

3.1. Multiple System Management Agents

One of the goals of the UL naming and addressing enhancements was to allow multiple System Management Agent ASEs at the same physical location to be unambiguously addressed. The situation is illustrated in the following diagram.

ICAO aircraft id = 0x1A2B3C
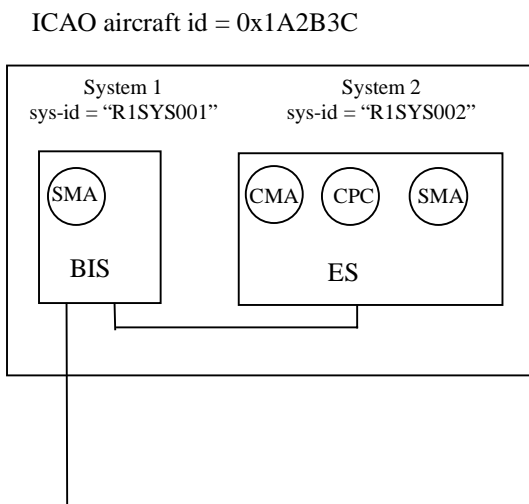
Here, two ATN systems are present at the airborne location identified by its ICAO 24-bit aircraft-id (Hex 1A2B3C); an ATN Router (BIS) and an ATN End System (ES). Both contain a System Management Agent (SMA) ASE and the ES also contains CM (CMA) and CPDLC (CPC) ASEs.

When the aircraft comes within range of a ground station, it needs to exchange application addressing and version information with the ground, which it does via the CM Logon service. In this case the CM Logon request would include the following information:

aircraftFlightIdentification = flight identifier (text string 2 - 8 characters)

cMLongTSAP = local TSAP address (RDP, ARS, LOC, SYS, NSEL, TSEL), LOC+SYS = "R1SYS0002"
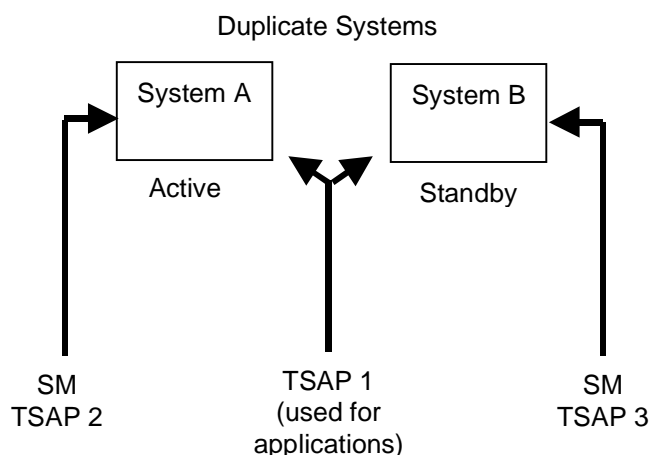
groundInitiatedApplications:

"AEQualifier" (= app-type)	Version	Address (longTSAP or shortTSAP)
CPC (2)	1	(LOC+SYS = "R1SYS002")
SMA (5)	1	(LOC+SYS = "R1SYS002")
SMA (5)	1	(LOC+SYS = "R1SYS001")

The ground-based manager application could then interrogate the resulting addressing database entries and individually address the two SMAs by specifying the (LOC+SYS) information at the Dialogue Service boundary.

3.2.   Redundant Systems

In this scenario, an ES has been implemented using a dual redundant architecture for resilience. In normal operation, a single address is used for both systems, and the address is dynamically assigned to the "active" system, the other system being in "standby" mode.

It is possible that a management application may wish to explicitly communicate with one or the other system, for example to determine the system status. In this case, the management application, unlike the operational ATM applications, would have to use a unique address for each of the redundant systems.

Duplicate Systems

In this case the CM Logon request could include the following information:

aircraftFlightIdentification = flight identifier (text string 2 - 8 characters)

cMLongTSAP = TSAP 1 address (RDP, ARS, LOC, SYS, NSEL, TSEL)

groundInitiatedApplications:

"AEQualifier" (= app-type)	Version	Address (longTSAP or shortTSAP)
CPC (2)	1	"generic" TSAP 1 address
SMA (5)	1	TSAP 2 (LOC+SYS = "R1SYS00A")
SMA (5)	1	TSAP 3 (LOC+SYS = "R1SYS00B")

In order to address the current active CPC or SMA application, the ground system could omit the Sys-ID field in the Dialogue Service parameters, and use TSAP 1. To specifically address a given physical system, a ground management application could interrogate the resulting addressing database entries and individually address the two SMAs by specifying the (LOC+SYS) information at the Dialogue Service boundary.

3.3.   Other Considerations

If it is required to use CM to exchange addressing information for other classes of application (such as AOC for example), then it is a pre-requisite that their app-type identifiers are registered in the global register which is currently contained in Sub-Volume 4.

4. CONCLUSION

This paper has presented the detailed modifications proposed for a future Amendment to Doc. 9705 in order to implement the approved naming and addressing extensions for the ATN Upper Layers.

It also presented in outline some scenarios illustrating the practical application of the extensions.

The WG is invited to:

- note that the proposed modifications have been designed to ensure backwards compatibility with existing implementations conforming to Doc 9705 edition 1;

- note that the Eurocontrol GACS project (described in a separate paper) is performing the validation of the revised technical provisions;

- endorse the modifications as presented and approve their presentation to ATNP/3 for inclusion in the "Package 2" technical provisions.