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ATN Connectionless Upper Layer Communication Service

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Summary
Further to its action in support of a multicast service, SG3 has formulated the draft SARPs for the connectionless upper layer communication service.

CONNECTIONLESS UPPER LAYER ARCHITECTURE

Add to list of references:

ITU-T Rec. X.235:1994 | ISO/IEC 9548-1:1995, Information Technology - Open Systems Interconnection - Connectionless Session Protocol - Part 1: Protocol Specification

ITU-T Rec. X.236:1994 | ISO/IEC 9576-1:1995, Information Technology - Open Systems Interconnection - CL Presentation Protocol Specification, Edition 2

ITU-T Rec. X.237:1994 | ISO/IEC 10035-1:1995, Information Technology - Open Systems Interconnection - Connectionless Protocol for the Association Control Service Element (ACSE), Part 1: Protocol Specification

ISO/IEC ISP 11188-4:1996, Information Technology -- International Standardized Profile -- Common Upper Layer Requirements -- Part 4: Connectionless OSI upper layer facilities

<ed> FB CL base standards?

4.1.4.1 Upper Layer Profile Overview

4.1.4.1.1 A profile is specified for both connection-oriented and connectionless protocols of Session layer, Presentation layer and the Association Control Service Element (ACSE).

4.2.2 Service Primitives

Table 4.2-1. Summary of Dialogue Service primitives

Service	Description
D-UNITDATA	This unconfirmed service is used by a DS-User to send a datagram from that DS-User to the peer DS-User

Table 4.4-2. Parameters of the Dialogue Service primitives

Service	Parameters
D-UNITDATA	Called Peer ID Calling Peer ID DS-User Version Number Security Requirements Quality-of-Service User Data

4.2.3.1 Sequence of Primitives

<ed>

4.2.3.1.1 Implementations which claim to support the DS functionality shall exhibit behaviour allowing two communicating DS-Users to:

a)   …
b)   exchange user data on a dialogue;
c)   …
d)   … , and
e)   exchange datagrams,

consistent with the appropriate use of the corresponding service primitives.

<ed>

Table 4.2.3. Sequence of DS primitives for one Dialogue at one DS-User

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
14 D-UNITDATA req															
15 D-UNITDATA ind															

4.2.3.7 The D-UNITDATA service

4.2.3.7.1 The behaviour defined by the D-UNITDATA service primitive shall be provided to enable the exchange of datagrams between two DS-Users.

Note 1. -- D-UNITDATA is an unconfirmed service which is invoked by a DS-User to send data to a peer DS-User. D-UNITDATA request and indication primitives are defined, as illustrated in Figure 4.2-7
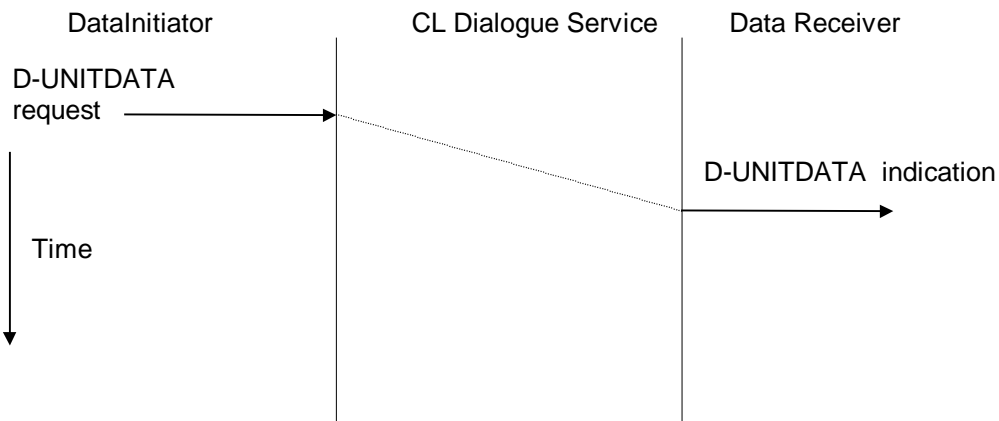
Figure 4.2-7. D-UNITDATA sequence diagram

Note 2. -- The initiating DS-User issues a D-UNITDATA request primitive. The parameters of the D-UNITDATA primitives are specified in Table 4.2-8.

Table 4.2-8 D-UNITDATA parameters

Parameter Name	Req	Ind
Called Peer ID	M	
Calling Peer ID	U	C(=)
DS-User Version Number	U	C(=)
Security Requirements	U	C(=)
Quality Of Service	M	M(=)
User Data	M	M(=)

Note 3. -- The Called Peer ID parameter is used in the D-UNITDATA 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.

<ed> Multicast Addressing (Moulton)

Note 4. -- The Calling Peer Id parameter is optionally used in the D-UNITDATA 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.

Note 5. – The DS-User Version Number allows peer DS-Users to exchange version information. The parameter is optional in the request and response primitives. Its presence in the indication primitive is conditional upon it being specified by the DS-User in the request primitive . If present, it may take any abstract value in the range 1 to 255.

Note 6. – The Security Requirements parameter allows the DS-Users to exchange requirements for security. The parameter is optional in the request and response primitives. Its presence in the indication primitive is conditional upon it being specified by the DS-User in the request primitive .

Note 7. – The Quality Of Service parameter allows the initiating DS-User to specify in the request primitive its requirements for the quality of service (QOS) to be provided for the dialogue. For ATN, the parameter is not modified by the DS-provider, so the value in the indication primitive is equal to the value in the request. The following QOS parameters may be specified:

a) Routing Class – valid values are defined in Table 5.6-1
b) Priority – valid values are defined in Table 1-2.
c) Residual Error Rate – valid values are "low" and "high"

Note 8. -- If the Routing Class parameter is not provided by the DS-User in the D-UNITDATA Request primitive, and the DS-User is an ATS application as specified in 2.1-2.4, then the default value "ATSC: No Traffic Type Policy Preference" is assumed. If the DS-User is not an ATS application as specified in 2.1-2.4, then the default traffic type "General Communications" is assumed.

Note 9. -- If a Priority value is not provided by the DS-User in the D-UNITDATA Request primitive, then the default value "network/systems administration" is assumed.

Note 10. – For the RER parameter, "low" means a low error rate, i.e. a high quality connection, and "high" means a higher error rate, i.e. a lower quality connection. The high RER allows non-use of the transport checksum in the ATN.

Note 11. – The User Data parameter allows the peer DS-Users to exchange data during the D-UNITDATA service invocation.

4.3.3.1 ATN-App CF State Definitions

4.3.3.1.1 The ATN-App AE shall behave as if it has a Control Function which can exist only in one of the following states:

Table 4.3-4. ATN-App CF State Table

Event Source	State Event	STA0	STA1	STA2	STA3	STA4
From ATN-App ASE(lower)	D-DATAUNIT req	A-UNITDATA req				
From ACSE (uppur)	A-UNIT-DATA ind	D-DATAUNIT ind				
From ACSE (lower)	P-UNIT-DATA req	P-UNIT-DATA req				
From supporting service	P-UNIT-DATA ind	P-UNIT-DATA ind				

Table 4.3-6. Incoming Event List

Abbreviated name	Source	Description
D-DATAUNIT req	ATN-App ASE (lower service boundary)	D-DATAUNIT Request primitive issued by DS-User
A-UNIT-DATA ind	ACSE (upper service boundary)	A-UNIT-DATA Indication primitive issued by ACSE service
P-UNIT-DATA req	ACSE (lower service boundary)	P-UNIT-DATA Request primitive issued by ACSE Protocol Machine (ACPM)
P-UNIT-DATA ind	Supporting service	P-UNIT-DATA Indication primitive issued by presentation service provider

Table 4.3-7. Outgoing Event List

Abbreviated name	Target	Description
D-DATAUNIT ind	DS-User	D-DATAUNIT Indication primitive issued.
A-UNIT-DATA req	ACSE service provider	A-UNIT-DATA Request primitive issued.
P-UNIT-DATA ind	Lower ACSE service boundary	P-UNIT-DATA Indication primitive invoked.
P-UNIT-DATA-req	Supporting service	P-DATA-UNI Request primitive issued.

4.3.3.3.8   D-UNITDATA Request primitive

4.3.3.3.8.1 When Invoked

4.3.3.3.8.1.1 The D-UNITDATA Request primitive may be validly invoked by the ATN-App ASE when the CF is in the NULL state

4.3.3.3.8.2 Action Upon Invocation

4.3.3.3.8.2.1 When the D-UNITDATA 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)   <ed> Ctxt-ID Base Standards (AOM12)

   d) Retrieve the calling Presentation address.

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

   f) If the Calling Peer Id parameter is present, retrieve the Calling AP Title and Calling AE-qualifier. If it is not present, then do not use these parameters in the A-UNIT-DATA request (they will not then be included in the resulting UD APDU).

   g) If the Security Requirements parameter is not present, make no use of the A-UNIT-DATA parameter "ACSE Requirements". If the Security Requirements parameter is present, set the ACSE Requirements parameter to the symbolic value "authentication"; and map the Security Requirements value to the A-UNIT-DATA Authentication-value parameter.

   h) Construct an A-UNIT-DATA Request primitive with the following parameters:

   i) *<ed> WARNING: the Transport CL user data is limited to 63488 octets per TSDU. How is this limit taken into account by the CL ULA ?*

A-UNIT-DATA Request parameter	ISO Status	ATN value
Application Context Name	M	As derived in b) above
Calling AP Title	U	As derived in e) above
Calling AE Qualifier	U	As derived in e) above
Calling AP Invocation-identifier	U	Not used
Calling AE Invocation-identifier	U	Not used
Called AP Title	U	Not used
Called AE Qualifier	U	Not used
Called AP Invocation-identifier	U	Not used
Called AE Invocation-identifier	U	Not used
Calling Presentation Address	P	Derived as in e) above
Called Presentation Address	P	Derived as in d) above
Presentation Context Definition List	P	Not used
Quality of Service	P	Not used
Implementation Information	U	Not used
Authentication-mechanism Name	U	Not used
Authentication-value	U	As derived in f) above
User Information	M	D-UNITDATA User Data parameter

    h)   Invoke the A-UNIT-DATA Request primitive.

4.3.3.3.8.2   Quality of Service parameter mappings

a) The use of the connectionless mode transport service provided by the ATN Internet, and specified in Sub-volume 5, clause 5.3 of the CNS/ATM-1 SARPs, shall be as specified in Clause 7.3 of ISO/IEC 9548-1, except as stated in this section.

b) The called and calling TSAP address shall be provided to the TS-Provider on a per Transport Connection basis, using the called and calling PSAP addresses as provided to ACSE in the A-unitdata request, with null presentation and session selectors.

c) The required residual error rate shall be provided to the TS-Provider on a per Transport Connection basis, using the residual error rate quality of service parameters. If the required residual error rate is set to the abstract value "low", then the TS-provider shall use best endeavours to obtain the lowest available residual error rate, including the use of the transport checksum in all TPDUs. If the required residual error rate is set to the abstract value "high", then the TS-provider shall select non-use of the transport checksum.

d) The ATN Security Label shall be provided to the TS-Provider on a per Transport Connection basis. The required ATN Security Label shall be conveyed by local means, using the encoding specified in 4.4.7.6. *<CO Security Label>*. The QOS parameter "Routing Class" shall be conveyed as the Security Tag field of the security tag set for Traffic Type and Associated Routing Policies within the ATN Security Label.

e) No Transport Service quality of service parameters other than those specified in the preceding subsections shall be specified when establishing a transport connection.

4.3.3.4.7 A-UNIT-DATA Indication primitive

4.3.3.4.7.1 When Invoked

4.3.3.4.7.1.1 The A-UNIT-DATA Indication primitive may be validly invoked by the ACSE Protocol Machine (ACPM) when the CF is in the NULL state ; if it is in any other state then appropriate error recovery action shall be taken.

4.3.3.4.7.2 Action Upon Invocation

4.3.3.4.7.2.1 When an A-UNIT-DATA Indication primitive is validly invoked, the CF shall:

<ed>
a)
b)
c)
d) extract the User Data from the User Information parameter
e) exract a D-UNITDATA Indication primitive, with the following parameter values:

<ed>Table X.X

D-UNITDATA 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	Derived as in d) above

f) invoke the D-UNITDATA Indication primitive.

4.3.3.4.7.3 Quality of Service parameter mappings

a) The use of the connectionless mode transport service provided by the ATN Internet, and specified in Sub-volume 5, clause 5.3 of the CNS/ATM-1 SARPs, shall be as specified in Clause 7.3 of ISO/IEC 9548-1, except as stated in this section.

b) The called and calling TSAP address shall be provided to the TS-Provider on a per Transport Connection basis, using the called and calling PSAP addresses as provided to ACSE in the A-unitdata request, with null presentation and session selectors.

c) The required residual error rate shall be provided to the TS-Provider on a per Transport Connection basis, using the residual error rate quality of service parameters. If the required residual error rate is set to the abstract value "low", then the TS-provider shall use best endeavours to obtain the lowest available residual error rate, including the use of the transport checksum in all TPDUs. If the required residual error rate is set to the abstract value "high", then the TS-provider shall select non-use of the transport checksum.

d) The ATN Security Label shall be provided to the TS-Provider on a per Transport Connection basis. The required ATN Security Label shall be conveyed by local means, using the encoding specified in 4.4.7.6. *<CO Security Label>*. The QOS parameter "Routing Class" shall be conveyed as the Security Tag field of the security tag set for Traffic Type and Associated Routing Policies within the ATN Security Label.

e) No Transport Service quality of service parameters other than those specified in the preceding subsections shall be specified when establishing a transport connection.

4.3.3.5.6   P-UNIT-DATA Request primitive

4.3.3.5.6.1   When Invoked

4.3.3.5.6.1.1   The P-UNIT-DATA Request primitive may be validly invoked by the ACPM when the CF is in the NULL state; if it is in any other state then appropriate error recovery action shall be taken.

4.3.3.5.6.2   Action Upon Invocation

4.3.3.5.6.2.1   When a P-UNIT-DATA Request primitive is validly invoked, and the CF is in the NULL state, the CF shall:

a) transparently invoke the equivalent presentation service primitive.

4.3.3.6.6 P-UNIT-DATA Indication primitive

4.3.3.6.6.1 When Invoked

4.3.3.6.6.1.1 When the P-UNIT-DATA Indication primitive is invoked by the supporting service, a new instance of communication shall be created, with its CF initially in the NULL state

4.3.3.6.6.2 Action Upon Invocation

4.3.3.6.6.2.1 When a P-UNIT-DATA Indication primitive is validly invoked, the CF shall:

a)   transparently invoke the equivalent presentation service primitive at the lower ACSE service boundary.

APRL for Connectionless ACSE Protocol
In the text below, M means P2CL:M

B.1 Support for UD PPDU

ISO Note -- *This clause is used to declare if the system is capable of initiating a UD APDU or reacting to a UD APDU or both. No association connection exists and there is no response to a UD PPDU.*

		ISO Status	ATN Support	Mnemonic
1	Sender	O.1	O	ACNLS-UD-Sdr
2	Receiver	O.1	M	ACLNS-UD-Rcv

ISO Note: **O.1 a conforming implementation shall support at least one of the roles**

B.2 Supported parameters

B.2.1 UD APDU sender

Prerequisite: ACNLS-UD-Sdr

	ACSE PDU parameter	ISO Status	ATN Support	Mnemonic
1	Protocol version	O	X	
2	Application Context Name	M	M	
3	Called AP title	O	X	
4	Called AE title	O	X	
5	Called AP invocation-identifier	O	X	
6	Called AE invocation-identifier	O	X	
7	Calling AP title	O	M	
8	Calling AE title	O	M	
9	Calling AP invocation-identifier	O	O	
10	Calling AE invocation-identifier	O	O	
11	Implementation information	O	X	
12	User information	M	M	
13	Authentication Mechanism Name	O	O	
14	Authentication value	O	O	

B.2.2 UD APDU receiver

Prerequisite: ACNLS-UD-Rcv

	ACSE PDU parameter	ISO Status	ATN Support	Mnemonic
1	Protocol version	M	M	
2	Application Context Name	M	M	
3	Called AP title	O	M	
4	Called AE title	O	M	
5	Called AP invocation-identifier	O	X	
6	Called AE invocation-identifier	O	X	
7	Calling AP title	O	M	
8	Calling AE title	O	M	
9	Calling AP invocation-identifier	O	M	
10	Calling AE invocation-identifier	O	M	
11	Implementation information	O	X	
12	User information	M	M	
13	Authentication mechanism name	O	O	
14	Authentication value	O	O	

APRL for Connectionless Presentation Protocol

C.1 Support for UD PPDU

ISO Note -- This clause is used to declare if the system is capable of initiating a UD PPDU or reacting to a UD PPDU or both. No presentation connection exists and there is no response to a UD PPDU.

		ISO Status	ATN Support	Mnemonic
1	Sender	O.1	O	PCNLS-UD-Sdr
2	Receiver	O.1	M	PCLNS-UD-Rcv

ISO Note: **O.1 a conforming implementation shall support at least one of the roles**

C.2 Supported parameters

C.2.1 UD PPDU sender

Prerequisite: PCNLS-UD-Sdr

	Presentation PDU parameter	ISO Status	ATN Support	Mnemonic
1	Protocol version	O	X	
2	Calling presentation selector	O	X	
3	Called presentation selector	O	X	
4	Presentation context definition list	M	N/A	
5	User data	M	M	

	Session service parameter	ISO Status	ATN Support	Mnemonic
6	Calling session address	M	M	
7	Called session address	M	M	
8	Quality of Service	M	M	

C.2.2 UD PPDU receiver

Prerequisite: PCNLS-UD-Rcv

	Presentation PDU parameter	ISO Status	ATN Support	Mnemonic
1	Protocol version	M	O	
2	Calling presentation selector	O	X	
3	Called presentation selector	O	X	
4	Presentation context definition list	M	O	
5	User data	M	M	

	Session service parameter	ISO Status	ATN Support	Mnemonic
6	Calling session address	M	M	
7	Called session address	M	M	
8	Quality of Service	M	M	

C.3 Support of syntaxes

C.3.1 Transfer syntaxes supported

ISO Note -- This sub-clause shall be used to indicate which transfer syntaxes the implementation supports. For each transfer syntax supported a references to the definition of the transfer syntax shall be given. Implementation restrictions with respect to the encoding variations as offered by the transfer syntax shall be stated separately and referenced in the following table where applicable. If the number of transfer syntaxes supported by the implementation exceeds the space available in the table, then details of support shall be given in an appendix to the PICS using a table with the equivalent layout.

[ISO] NOTE - The definition of the ASN.1 basic encoding rules are [is] given in ITU-T Rec. X.209 | ISO/IEC 8825 [ISO/IEC 8825-1]. To complete the specification of a transfer syntax it is necessary to indicate the abstract syntax specification to which the encoding rules should be applied.

	Type	Detail	ATN Support	Reference to definition	Reference to restriction
1	**Object Identifier**	**{joint-iso-ccitt asn1(1) basic-encoding (1)}**	**O**		
2	**Object Identifier**	**{joint-iso-itu-t asn1(1) packed-encoding (3) basic (0) unaligned (1)}**	**M**	**N/A**	**N/A**

C.3.2 Abstract syntaxes supported

ISO Note -- This sub-clause shall be used to indicate which abstract syntaxes the implementation supports. If the number of abstract syntaxes supported by the implementation exceeds the space available in the table, then details of support shall be given in an appendix to the PICS using a table with the equivalent layout.

[ISO] NOTE - From the Presentation standard point of view, an implementation is required to support and [[<ed> any??]] standardised abstract syntax. However, for technical and economic reasons an implementation may only support a limited number of abstract syntaxes.

	Type	Detail	ATN Support
1	**Object identifier**	**{joint-iso-itut-t association control(2) abstract-syntax(1) clapdu(1) version1(1)}**	**M**

<ed> Managed Objects??
<ed> OID for transfer syntax required on every transmission??
<ed> Encode as ASN.1 EXTERNAL??

C.3.3 Use of ASN.1 basic encoding

Note -- Not applicable to ATN.

C.3.4 PDV structure of User Data parameters

Note -- Not applicable to ATN.

APRL for Connectionless Session Protocol

D.1 Support for UD SPDU

ISO Note -- *This clause is used to declare if the system is capable of initiating a UD SPDU or reacting to a UD SPDU or both. No session connection exists and there is no reponse to a UD SPDU.*

	Role	ISO Status	ATN Support	Mnemonic
1	Sender	O.1	M	SCNLS-UD-Sdr
2	Receiver	O.1	M	SCNLS-UD-Rcv

ISO Note - *O.1: a conforming implementation shall support at least one of the roles.*

D.2 Supported parameters

D.2.1 UD SPDU sender

Prerequisite: SCNLS-UD-Sdr

	Parameter	ISO Status	ATN Support	Mnemonic
1	Version number	O	X	
2	Calling session selector	O	X	
3	Called session selector	O	X	
4	User information field	M	M	

D.2.2 UD SPDU receiver

Prerequisite: SCNLS-UD-Rcv

	Parameter	ISO Status	ATN Support	Mnemonic
1	Protocol version	M	O	
2	Calling session selector	O	X	
3	Called session selector	O	X	
4	User information field	M	M	

Connectionless Upper Layer Communication Service

Guidance Material

<ed> Overhead Analysis (Picard)