INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

ASIA/PACIFIC
INTERFACE CONTROL DOCUMENT
FOR AERONAUTICAL TELECOMMUNICATION NETWORK
GROUND-GROUND ROUTER
ISO/IEC 8208 SUB-NETWORK

First Edition – April 2005

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EXECUTIVE SUMMARY

The Aeronautical Telecommunication Network (ATN) is a global inter-network that provides digital communications to satisfy the increasing telecommunication demands of air traffic service communication, aeronautical operational control, aeronautical administrative communication, and aeronautical passenger communication.

The ATN is composed of a network infrastructure and applications that provide the global communication for ground-ground (G/G) and air-ground services. The ATN network infrastructure includes ATN backbone communication links, ATN routers, and end systems. The ATN applications include among others context management (CM), controller-pilot data link communication (CPDLC) and air traffic service message handling service (ATSMHS).

The Asia/Pacific region is implementing an ATN network to support regional and global ATN services. This Interface Control Document (ICD) specifies the ISO/IEC 8208 sub-network interface requirements for of ATN G/G Boundary Intermediate Systems that form nodes of the Asia/Pacific ATN regional backbone network and/or have inter-State connectivity, to ensure interoperability between States. This ICD applies to point-to-point ISO/IEC 8208 connections between Boundary Intermediate Systems.

1.0 Introduction

1.1 Purpose and Scope

This document provides Interface Control Document guidelines for ISO/IEC 8208 sub-network connections used to communicate between the boundary intermediate systems that form nodes of the Asia/Pacific regional network Backbone and/or have inter-State/organization connectivity within the Asia/Pacific region, to assure interoperability.

The scope of this ICD and its relationship to the ATN router ICD is shown in Figure 1-1. This ICD addresses the physical, data link and sub-network layers of the ATN G/G router ISO/IEC 8208 sub-network using the International Organization for Standardization (ISO) Information Processing Systems Open Systems Interconnection (OSI) Basic Reference Model. These ICD guideline provisions include:

1. ISO layer 1 to layer 3 interface requirements between G/G routers;

2. G/G router functional requirements associated with ATN Protocol Requirements Lists (APRLs) relevant to support layer 1 to layer 3 interface requirements.

This ICD applies to the ISO/IEC 8208 connections over point-to-point circuits.

This document is based on ICAO Doc. 9705 Edition 2. The paragraph numbers in the APRLs are referred to ICAO Doc. 9705 Edition 3.

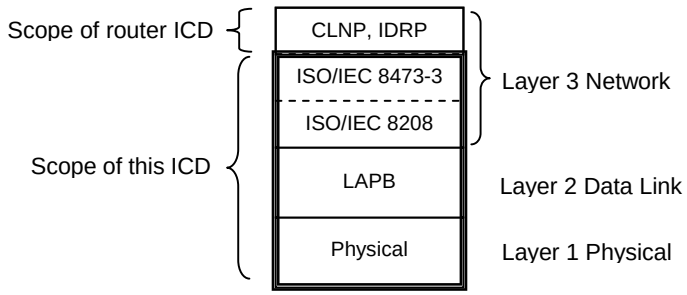

Figure 1-1: BIS Protocol Stack and Scope of this Document

1.2 Organization

This document is organised as follows:

- **Section 1, INTRODUCTION,** summarises the contents of this document and reference documents.
- **Section 2, PHYSICAL LAYER,** provides the physical interface requirements for a point-to-point circuit.
- **Section 3, DATA LINK LAYER,** provides the data link layer interface requirements using link access procedure balanced (LAPB) to support the interface between G/G routers.
- **Section 4, NETWORK LAYER,** provides the interface requirements to support the sub-network and sub-network dependent convergence function (SNDCF) for ISO/IEC 8208 sub-networks.

1.3 ATN Documentation Tree and Reference Documents

1.3.1 ATN Documentation Tree

Figure 1-2 shows the ATN documentation tree for the Asia/Pacific ATN documents. This figure provides a hierarchical representation of the relationship between the various ICAO ATN documents and Asia/Pacific regional ATN router ICD and router sub-network ICDs. From this documentation tree, the relationship between this ICD and other documents is clearly defined.

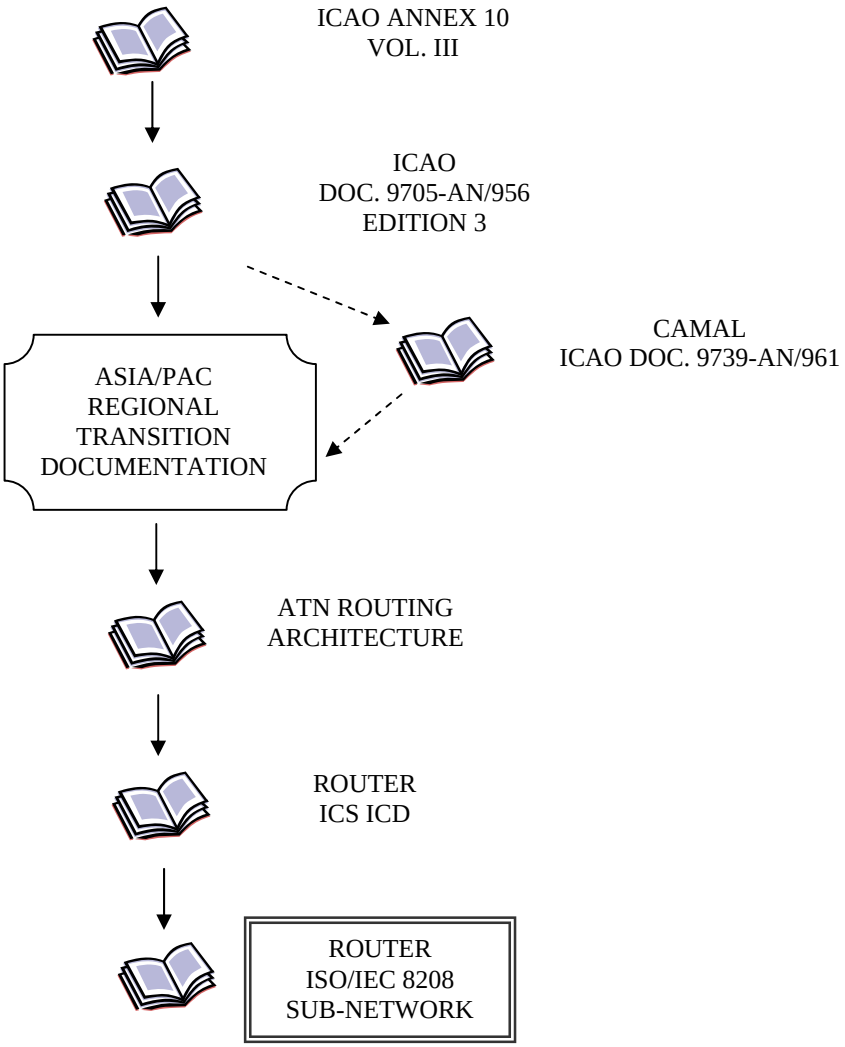

Figure 1-2: ATN Documentation Tree

1.3.2 Documents

1.3.2.1 Applicable Documents

The following documents, with specific editions and/or versions, contain requirements which, through reference in this text, constitute requirements of this document. The requirements for the Asia/Pacific Regional Router ICD for ATN G/G Router are found in the following documents:

1. ITU-T Rec. X.25, (1984), Interface Between Data Terminal Equipment (DTE) and Data Circuit-terminating equipment (DCE) for Terminals Operating in the Packet Mode and Connected to Public Data Networks by Dedicated Circuit, Section 2, 3 and 4.
2. ISO/IEC 8208: 1995, Information Technology – Data Communications – X.25 Packet Level Protocol for Data Terminal Equipment (Revision of ISO/IEC 8208:1990).
3. ICAO Doc. 9705-AN/956. Manual of Technical Provisions for the Aeronautical Telecommunication Network, Edition 3 – 2001, sub-volume V.
4. ISO/IEC 8473-3: 1995 Information Technology – Protocol for providing the connectionless-mode network service Part 3 – Provision of the underlying service by an X.25 sub-network.
5. Asia/Pacific Interface Control Document for Aeronautical Telecommunication Network Ground-Ground Router
6. Asia/Pacific ATN Addressing Plan.
7. Table CNS-1B of the Asia/Pacific FASID.

1.3.2.2 Supporting Documents

The following documents are supporting documents applicable to the Asia/Pacific Regional Router ICD for ATN G/G Router. These documents do not form a part of this ICD and are not referenced within the document, however, these documents provide supporting background information for better understanding of this ICD.

1. ICAO Annex 10 - Volumes I and II, Fifth Edition, Incorporating Amendment 70.
2. ISO/IEC TR 9575:1995 Information Technology – Telecommunications and Information Exchange between Systems — OSI Routing Framework.
3. Asia/Pacific ATN Routing Architecture.

1.4 APRL Nomenclature

The APRLs in this document use the following conventions and symbols:

M	[M]andatory - the capability must be supported
MO	Mandatory to implement but optional for use
O	[O]ptional - The capability may optionally be supported
O.<n>	[O]ptional, but support of at least one of the group of options labelled by the numeral <n> is required
X or P	prohibited/precluded - i.e. the capability must not be supported.
OX or OP	Optional to implement but precluded for use
<pred>:	Condition item symbol, including predicate identification
^	Logical negation, applied to a condition item's predicate
<r>	Receive aspects of an item
<s>	Send aspects of an item
Y	[Y]es, indicates that an implementation must support the item
N	[N]o, indicates that there is no requirement for the an implementation

2.0 Physical Layer (Layer 1)

The physical layer of the G/G router in this document supports the connection of a point-to-point circuit. The physical layer characteristics are based on mutual agreement between States and service providers.

3.0 Data Link Layer (Layer 2)

The data link layer of ATN G/G router defined in this document uses Link Access Procedure Balanced (LAPB). The following sections provide the requirements for LAPB. LAPB shall comply with ITU X.25, 1984.

3.1 Procedures

3.1.1 Link-level control procedures between the routers shall comply with LAPB procedure.

3.1.2 Link-level control procedures between the routers shall be configured in an Asynchronous Balanced Mode (ABM) defined in ITU X.25, section 2.3 and 2.4.

3.1.3 The router shall be as a logical Data Terminal Equipment (DTE) or Data Communication Equipment (DCE), as specified in ITU X.25 for a point-to-point circuit or under mutual agreements between States/organisations.

3.2 Frame Structure

The unit of transmission is the frame that shall comply with the LAPB frame structure as defined in ITU X.25, section 2.2.

3.3 Link Control Parameter Setup

Table A-1 in Appendix A defines the recommended X.25 data link layer level parameter values, which are highlighted in the following paragraphs.

3.3.1 Time-out functions are necessary to ensure recovery action is taken by a combined station to respond to I-frames, S-frames, and U-frames that require acknowledgment. Timers shall be adjustable in one-second increments within a range of 2 to 120 seconds.

3.3.2 The retransmission attempts parameter shall indicate the maximum number of unsuccessful transmission attempts to complete successful transmission. A value in the range 3 to 7 is recommended for private interfaces for low to medium circuit speeds.

3.3.3 The maximum number of sequentially numbered outstanding I frames shall be seven for private terrestrial interfaces.

3.3.4 The DTE and DCE shall use the same value for maximum number of sequentially numbered outstanding I frames in all cases.

3.3.5 Interfaces operating over satellite circuits shall use modulo 128 numbering for the maximum number of sequentially numbered outstanding I frames, and select a value appropriate for the frame size and signalling speed.

4.0 Network Layer (Layer 3)

The first sub-layer is the sub-network, which is X.25 PLP layer complying with ISO/IEC 8208. The second sub-layer is SNDCF complying with ISO/IEC 8473-3.

The third sub-layer includes CLNP and IDRP, which respectively comply with ISO/IEC 8473-1 and 10747 with specific requirements defined by ICAO Doc. 9705. The third sub-layer is beyond the scope of this document, but is addressed by the Asia/Pacific Interface Control Document for Aeronautical Telecommunication Network Ground-Ground Router.

4.1 ISO/IEC 8208 Sub-Network

The router is capable of establishing one or more connections to other ATN routers via an ISO/IEC 8208 point-to-point circuit. For such circuits, the sub-network layer shall use ISO/IEC 8208 to access the services of the data link layer.

4.1.1 Procedures

Packet level procedures between the sub-networks are described herein and in accordance with ISO/IEC 8208, section 4 through section 11.

4.1.2 Packet Structure

The packet structure shall comply with the packet structure described in ISO/IEC 8208 section 12.

4.1.3 Functionality and Specific Setup

The sub-network layer shall support the functions defined in ISO/IEC 8208. The functions and specific setup are highlighted as follows.

4.1.3.1 Each router shall be capable of initiating an ISO/IEC 8208 sub-network connection.

4.1.3.2 The usage of diagnostic codes shall be established by mutual agreement between States/organisations.

4.1.3.3 Tables in Appendix A provide ISO/IEC 8208 recommended interface parameters for a point-to-point circuit.

The values of parameters in Appendix A are recommended values only for guidance. However, the actual values used for the circuit shall be defined by mutual agreement between States/organisations.

4.1.3.4 When connectivity is provided by a point-to-point circuit, the DTE addresses shall be 10 decimal digits and be agreed between States/organizations during the implementation planning.

4.1.3.5 Each router shall be capable of terminating a sub-network connection.

4.1.3.6 The M-bit shall be supported to indicate a message transfer that consists of more than one packet.

4.1.3.7 Q-bit and D-bit shall be both set to 0.

4.1.4 Use of Switched Virtual Circuits

The use of Switched Virtual Circuits (SVCs) is preferred. The use of Permanent Virtual Circuits (PVCs) shall be taken into the consideration of the service availability.

4.1.4.1 CR Packet Transmission at Call

1. In the case that two-way virtual circuit is an SVC, although not essential it is desirable to tune the transmission of CR packets when call are made between two peers for the following reasons:
   - To avoid collisions between transmitted and received calls, avoiding excessive protocol exchanges;
   - To make for more easily comprehensible communications logs.
2. In the case of PVCs, calls are made directly without the transmission of CRV packets.

4.2 Sub-Network Dependent Convergence Functions (SNDCF)

Sub-Network Dependent Convergence Functions (SNDCF) must be implemented in the router for each type of underlying sub-network. The purpose of a SNDCF is to provide the connectionless sub-network service assumed by the ATN Internet Protocol over real sub-network.

When a G/G router interfaces with another G/G router via a point-to-point circuit, the SNDCF shall comply with the following requirements:

1. The SNDCF shall provide byte- and code-independent service to the CLNP as specified in ICAO Doc. 9705, section 5.7.2;
2. The SNDCF that is used with the ISO 8208 sub-network for the G/G router shall comply with the APRLs given in Appendix B.

APPENDIX A - X.25 RECOMMENDED INTERFACE PARAMETERS FOR POINT-TO-POINT CIRCUIT

A.0 X.25 Minimum Recommended Interface Parameters for a Point-to-Point Circuit

This appendix provides the X.25 minimum recommended interface parameters for point-to-point circuit. Other values may be established by mutual agreement

A.1 Data Link Layer Interface Parameters

Table A-1 provides the data link layer (LAPB) interface parameters.

A.2 Packet Layer Interface Parameters

Tables A-2.1 through A-2.21 provide the packet layer protocol (PLP) interface parameters.

Table A-1: Data link Layer (LAPB) Interface Parameters

Parameter	Range of Values	G/G Router Recommended Value	Comments
Max Outstanding Frames (k)	Normal Mode: 1-7 Extended Mode: 1-127	7	
ACK Receipt Timer (T1)	Packet Size T1 0-896 3 897-1536 6 1537-2048 9 above 2048 14	1 second	Based on 9.6Kbps
ACK Send Timer (T2)	1 – 3000 milliseconds	700 milliseconds	T2 < T1
ACK Delay	Disable or 1– 300 milliseconds	400 milliseconds	Delay before transmitting a delayed RR. ACK Delay << T1
REJ Timer	.1 – 100 seconds	2.5 seconds	Time LABP expects to receive reply to sent REJ TPDU
Idle Channel State Timer (T3)	.1 – 320 seconds	25 seconds	T3 > T4
Idle Probe Timer (T4)	Disable or .1 – 300 seconds	10 seconds	
Maximum Number Bits in I-Frame (N1)	261–263 517–519 1029–1031 2053–2055 4101–4103	2053	N1 = X.25 data size+ X.25 protocol length + LAPB protocol length
Frame Retry Counter (N2)	1–255	10	
Frame Sequence	Modulo 8 or Modulo 128	Modulo 8	Modulo 128 should be used for Satellite

A.2 Packet Layer Interface Parameters

Table A-2.1 General DTE Characteristics

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
Vs	Virtual Call	3.4, 3.7	Y
Vp	Permanent Virtual Circuit	3.4, 3.7	N
Ec/8	DTE/DCE (1988) environment	3.1.1	N
Ec/4	DTE/DCE (1984) environment	3.1.2	Y
Ec/0	DTE/DCE (1980) environment	3.1.3	N
Et/t	DTE/DTE in fixed role as DTE	3.3	Y
Et/d	DTE/DTE with dynamic role selection	4.5	N
M8	Packet sequence numbering modulo 8	13.2, 12.1.1	Y
M128	Packet sequence numbering modulo 128 (extended)	13.2, 12.1.1	N, O (Note 1)
Rna	Is the Reference Number optional user facility supported (DTE/DTE only)?	13.29	N

Note 1: To be used if Satellite links are being used within the network path.

Table A-2.2 Link Layer Interactions

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
L1a	Restarting of the packet layer initiated (in the DTE) on completion of link layer initialization	3.10	Y
L1b	Restarting of the packet layer initiated (in the DTE) on recovery from failure of the link layer	10	Y
L2	Can packets consisting of a non-integral number of octets be received from the link layer	12	N

Table A-2.3 General Packet Formatting

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
P2	Do all (DTE) transmitted packets consist of an integral number of octets?	12.1	Y
P3a	Do all (DTE) transmitted packets contain General Format Identifier?	12.1.1	Y
P3b	Do all (DTE) transmitted packets contain Logical Channel Identifier	12.1.2	Y
P3c	Do all (DTE) transmitted packets contain Packet Type Identifier?	12.1.3	Y
P4	Are all (DTE) received packets that do not contain valid GFI, LCI and PTI fields treated as erroneous?	12.1.1 table 3, 12.1.3, 12.1.2, table 6, tables 31–36	Y

Table A-2.4 Packet Layer Functions Independent of Logical Channels

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
Z1i	DTE restarts the packet layer as initiator	12.6.1	Y
Z1r	DTE restarts the packet layer as responder	12.6.1	Y
Z2r	DTE receives DIAGNOSTIC packet	11.1, 12.7	Y
Z2s	DTE sends DIAGNOSTIC packet	12.7, table 24	Y
Z3	DISCARD, or ERROR restart, on erroneous received packets not assignable to a logical channel and not covered by item Z2s	11.1, tables 31-32	Y
Z4i	DTE initiating On-line Facility Registration	13.1, 12.9.1	N

Table A-2.5 Call Setup

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
S1a	Outgoing Virtual Calls support Fast Select, no restriction on response	5.2.4, 13.16	N
S1b	Outgoing Virtual Calls support Fast Select with restricted response	13.16	N
S1c	Outgoing Virtual Calls support non-Fast-Select	5.2.4	Y
SP1b	DTE sends CALL REQUEST, basic format	12.2.3.1	Y
SP1e	DTE sends CALL REQUEST, extended format	12.2.3.1, 12.2.3.2	N
SP2b	DTE receives CALL CONNECTED, basic format	12.2.4.1	Y
SP2e	DTE receives CALL CONNECTED, extended format	12.2.4.1, 12.2.4.2	N
S2a	Incoming Virtual Calls support Fast Select with acceptance possible	5.2.3, 13.17	N
S2b	Incoming Virtual Calls support Fast Select, always cleared	13.17	Y
S2c	Incoming Virtual Calls support non-Fast-Select with acceptance possible	5.2.3	N
S2d	Incoming Virtual Calls support non-Fast-Select, always cleared	5.2.3	N
SP3b	DTE receives INCOMING CALL, basic format	12.2.3.1	Y
SP3e	DTE receives INCOMING CALL, extended format	12.2.3.1, 12.2.3.2	N
SP4b	DTE sends CALL ACCEPTED, basic format	12.2.4.1	Y
SP4e	DTE sends CALL ACCEPTED, extended format	12.2.4.1, 12.2.4.2	N
DN1	D-bit negotiation is supported for outgoing Virtual Calls	6.3	N
DN2	D-bit negotiation is supported for incoming Virtual Calls	6.3	N

Table A-2.6 Call Clearing

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
C1	Call clearing is supported to respond to an indication of Clearing	5.5.2	Y
C2a	Call clearing is supported to abort an outgoing Virtual Call attempt	5.4, 5.5.1, 5.5.3	Y
C2b	Call clearing is supported to reject an incoming Virtual Call	5.3, 5.5.1, 5.5.3	Y
C2c	Call clearing is supported to clear an established Virtual Call	5.5.1, 5.5.3	Y
CP1b	DTE receives CLEAR INDICATION, basic format	12.2.5.1	Y
CP1e	DTE receives CLEAR INDICATION, extended format	12.2.5.1, 12.2.5.2	N
CP2b	DTE sends CLEAR CONFIRMATION, basic format	12.2.6.1	Y
CP2e	DTE sends CLEAR CONFIRMATION, extended format	12.2.6.1, 12.2.6.2	N
CP3b	DTE sends CLEAR REQUEST, basic format	12.2.5.1	Y
CP3e	DTE sends CLEAR REQUEST, extended format	12.2.5.1, 12.2.5.2	N
CP4b	DTE receives CLEAR CONFIRMATION, basic format	12.2.6.1	Y
CP4e	DTE receives CLEAR CONFIRMATION, extended format	12.2.6.1, 12.2.6.2	N

Table A-2.7 Resetting of Logical Channels

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
Rsi	Resetting is supported when DTE is an initiator	12.5.1, 12.5.2	Y
RSr	Resetting is supported when DTE is a responder	12.5.1, 12.5.2	Y

Table A-2.8 Interrupt Transfer

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
Ls	Sending Interrupts	6.8, 12.3	Y
Lr	Receiving Interrupts	6.8, 12.3	Y

Table A-2.9 Sending Data

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
DS1	Sending of DATA packets is supported	6, 6.1, 6.2, 7.1, 12.3	Y
DS2	Send-window rotation on receiving updated P(R) values	7.1, 7.1.2, 7.1.3	Y
DS3	Response to flow control by received RNR and RR packets	7.1.5, 7.1.6, 12.4.1, 12.4.2	Y
DS4a	Sending M=0 in DATA packets	6.4, 6.5, 6.7	Y
DS4b	Sending M=1 in DATA packets	6.4, 6.5, 6.7	Y
DS5a	Sending Q=0 in DATA packets	6.6	Y
DS5b	Sending Q=1 in DATA packets	6.6	N

Table A-2.10 Receiving Data

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
DR1	Receiving DATA packets	6, 6.1, 6.2, 7.1.1, 7.1.2, 7.1.3, 12.3.1	Y
DR2	Receive-window rotation by sending updated P(R) Values	7.1.2, 7.1.3	Y
DR3	Flow control by sending RNR and RR packets	7.1.5, 7.1.6, 12.4.1, 12.4.2	Y
DR4a	Receiving M=0 in DATA packets	6.4, 6.5, 6.7	Y
DR4b	Receiving M=1 in DATA packets	6.4, 6.5, 6.7	Y
DR5a	Receiving Q=0 in DATA packets	6.6	Y
DR5b	Receiving Q=1 in DATA packets	6.6	N
DR6	Requesting packet retransmission by sending REJECT packets	13.4.1, 12.8	N
DR7a	Recovery from receipt of DATA packets containing invalid P(S), by ERROR-R Action.	11.3(a)	Y (Note 1)
DR7b	Recovery from receipt of DATA packets containing invalid P(S), by: requesting packet retransmission	11.3(b)	Y (Note 1)
DR7c	Recovery from receipt of DATA packets containing invalid P(S), by: ignoring the packet and waiting for a correct retransmitted packet.	11.3(c)	N
DR8a	Recovery from receipt of DATA packets with invalid User Data field, by: ERROR-R Action	11.3(a)	Y (Note 2)
DR8b	Recovery from receipt of DATA packets with invalid User Data field, by: requesting packet retransmission	11.3(b)	Y (Note 2)
DR8c	Recovery from receipt of DATA packets with invalid User Data field, by: ignoring the packet and waiting for a correct retransmitted packet.	11.3(c)	N
DR9	Window Status Transmission Timer Procedure	11.2.2	Y

Note 1: Since DR7a and DR7b are mutually exclusive in a DTE receiving DATA packets, DTEs will be provisioned to support one or the other depending on their location in the network.

Note 2: Since DR8a and DR8b are mutually exclusive in a DTE receiving DATA packets, DTEs will be provisioned to support one or the other depending on their location in the network.

Table A-2.11 Delivery Confirmation

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
DC	Support of Delivery Confirmation	6.3, 6.5, 6.7,	N

		7.1.4	

Table A-2.12 Values of Cause Codes and Diagnostic Fields

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
Y1a	In RESTART REQUEST packets sent (by DTE), when Cause equals 0, Diagnostic Codes equal specific codes	12.6.1.1, 12.6.1.2, tables 24 -25	Y
Y1b	In RESTART REQUEST packets sent (by DTE), when Cause equals 0, Diagnostic Codes equal generic codes (including 0)	12.6.1.1, 12.6.1.2, tables 24 -25	Y
Y1c	In RESTART REQUEST packets sent (by DTE), when Cause equals 0, Diagnostic Codes equal 0, always	12.6.1.1, 12.6.1.2, tables 24 -25	N
Y1d	In RESTART REQUEST packets sent (by DTE), when Cause equals 128, private Diagnostic Codes are specified	12.6.1.1, 12.6.1.2, tables 24 -25	N
Y1e	In RESTART REQUEST packets sent (by DTE) Causes and Diagnostic Codes other than in items Y1a and Y1b	12.6.1.1, 12.6.1.2, tables 24 -25	N
Y2a	In RESTART INDICATION packets received (by DTE), Cause = 0 or 128, any diagnostic code value	12.6.1.1, table 9, 12.6.1.2	Y
Y2b	In RESTART INDICATION packets received (by DTE), Cause is not equal to 0 or 128, any diagnostic code value	12.6.1.1, table 9, 12.6.1.2	Y
Y3a	In CLEAR REQUEST packets sent (by DTE), when Cause equals 0, Diagnostic Codes equal specific codes	12.2.3.1.1, 1.2.2.3.2 tables 24 –25	Y
Y3b	In CLEAR REQUEST packets sent (by DTE), when Cause equals 0, Diagnostic Codes equal generic codes (including 0)	12.2.3.1.1, 12.2.3.1.2, tables 24 -25	Y
Y3c	In CLEAR REQUEST packets sent (by DTE), when Cause equals 0, Diagnostic Codes equal 0, always	12.2.3.1.1, 12.2.3.1.2, tables 24 –25	N
Y3d	In CLEAR REQUEST packets sent (by DTE), when Cause equals 128, Diagnostic Codes equal private diagnostic codes	12.2.3.1.1, 12.2.3.1.2, tables 24 –25	Y
Y3e	In CLEAR REQUEST packets sent (by DTE) Causes and Diagnostic Codes other than in items Y3a and Y3b	12.2.3.1.1, 12.2.3.1.2, tables 24 –25	N
Y4a	In CLEAR INDICATION packets received (by DTE), Cause equals 0 or 128, any diagnostic code values	12.2.3.1.1, table 7, 12.2.3.1.2	Y
Y4b	In CLEAR INDICATION packets received (by DTE), Cause is not equal to 0 or 128, any diagnostic code value	12.2.3.1.1, table 7, 12.2.3.1.2	Y
Y5a	In RESET REQUEST packets sent (by DTE), when Cause equals 0, Diagnostic Codes equal specific Diagnostic codes	12.5.1.1, 12.5.1.2, tables 24 –25	Y
Y5b	In RESET REQUEST packets sent (by DTE), when Cause equals 0, Diagnostic Codes equal generic diagnostic codes (including 0)	12.5.1.1, 12.5.1.2, tables 24 –25	Y
Y5c	In RESET REQUEST packets sent (by DTE), when Cause equals 0, Diagnostic Codes equal 0, always	12.5.1.1, 12.5.1.2, tables 24 –25	N
Y5d	In RESET REQUEST packets sent (by DTE), when Cause equals 128, Diagnostic Codes equal private Diagnostic codes	12.5.1.1, 12.5.1.2, tables 24 –25	N
Y5e	In RESET REQUEST packets sent (by DTE) Causes and Diagnostic Codes other than in items Y5a and Y5b	12.5.1.1, 12.5.1.2, tables 24 –25	N
Y6a	In RESET INDICATION packets received (by DTE), Cause equals 0 or 128, any diagnostic code value	12.5.1.1, table 8, 12.5.1.2	Y

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
Y6b	In RESET INDICATION packets received (by DTE), Cause is not equal to 0 or 128, any diagnostic code value	12.5.1.1, table 8, 12.5.1.2	Y

Table A-2.13 Facilities Sent in Outgoing Call Request Packets

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
FS1pi	Flow Control Parameter Negotiation, packet size	13.12, 15.2.2.1.1	N
FS1wi	Flow Control Parameter Negotiation, window size	13.12, 15.2.2.1.2	N
FS2ib	Throughput Class Negotiation (basic)	13.13, 15.2.2.2.1	N
FS2ie	Throughput Class Negotiation (extended)	13.13, 15.2.2.2.2	N
FS3b	Closed User Group Selection, basic format	13.14.6, 15.2.2.3.1	N
FS3e	Closed User Group Selection, extended format	13.14.6, 15.2.2.3.2	N
FS4b	Closed User Group With Outgoing Access Selection, basic format	13.4.7, 15.2.2.4.1	N
FS4e	Closed User Group With Outgoing Access Selection, extended format	13.4.7, 15.2.2.4.2	N
FS5	Bilateral Closed User Group Selection	13.15, 15.2.2.5	N
FS6a	Fast Select	13.16, 15.2.2.6	N
FS6b	Reverse Charging	13.18, 15.2.2.6	N
FS7i	Network User Identification	13.21, 13.21.3, 15.2.2.	N
FS8i	Charging Information, requesting service	13.22, 15.2.2.8.1	N
FS9b	ROA Selection, basic format	13.23, 13.23.2, 15.2.2.9.1	N
FS9e	ROA Selection, extended format	13.23, 13.23.2, 15.2.2.9.2	N
FS12	Transit Delay Selection and Indication	13.27, 15.2.2.13	N
FS99i	Local non-X.25 facilities, following Facility Marker	15.1, table 18	N
FS98i	Remote non-X.25 facilities, following Facility Marker	15.1, table 18	N
FS20i	Facility Marker, ITU-T-specified DTE facilities	15.1	N
FS21i	Calling Address Extension	14.1, 15.3.2.1	N
FS22i	Called Address Extension	14.2, 15.3.2.2	N
FS23i	Minimum Throughput Class Negotiation (basic)	14.3, 15.3.2.3.1, table 20a	N
FS23i	Minimum Throughput Class Negotiation (extended)	14.3, 15.3.2.2, Table 20b	N
FS24i	End-to-End Transit Delay Negotiation	14.4, 15.3.2.4	N
FS25i	Expedited Data Negotiation	14.7, 15.3.2.7	N
FS26i	Priority	14.5, 15.3.2.5	N
FS27i	Protection	14.6, 15.3.2.6	N

Table A-2.14 Facilities Sent in Outgoing Call Accept Packets

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
FS1pr	Flow Control Parameter Negotiation, packet size	13.12, 15.2.2.1.1, table 13	N
FS1wr	Flow Control Parameter Negotiation, window size	13.12, 15.2.2.1.2, table 13	N
FS2rb	Throughput Class Negotiation (basic)	13.13, 15.2.2.2.1, table 20a	N
FS2re	Throughput Class Negotiation (extended)	13.13, 15.2.2.2.2, table 20b	N
FS7r	Network User Identification	13.21, 13.21.3, 15.2.2.7	N
FS8r	Charging Information, requesting service	13.22, 15.2.2.8.1	N
FS10r	Called Line Address Modified Notification	13.26, 15.2.2.12	N
FS20r	Facility Marker, ITU-T-specified DTE facilities	15.1	N
FS22r	Called Address Extension	14.2, 15.3.2.2	N
FS24r	End-to-End Transit Delay Negotiation	14.4, 15.3.2.4	N
FS25r	Expedited Data Negotiation	14.7, 15.3.2.7	N
FS26r	Priority	14.5, 15.3.2.5	N
FS27r	Protection	14.6, 15.3.2.6	N
FS98r	Remote non-X.25 facilities, following Facility Marker	15.1, table 18	N
FS99r	Local non-X.25 facilities, following Facility Marker	15.1, table 18	N

Table A-2.15 Facilities Sent in Clear Request Packets

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
FS10d	Called Line Address Modified Notification	13.26, 15.2.2.12	N
FS13	Call Deflection Selection	13.25.2.2, 15.2.2.10	N
FS20d	Facility Marker, ITU-T-specified DTE facilities	15.1	N
FS22d	Called Address Extension	14.2, 15.3.2.2	N
FS98d	Remote non-X.25 facilities, following Facility Marker	15.1, table 18	N
FS99d	Local non-X.25 facilities, following Facility Marker	15.1, table 18	N

Table A-2.16 Facilities received in Incoming call Packets

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
FR1pi	Flow Control Parameter Negotiation, packet size (Note 1)	13.12, 15.2.2.1.1	N
FR1wi	Flow Control Parameter Negotiation, window size (Note 1)	13.12, 15.2.2.1.2	N
FR2ib	Throughput Class Negotiation (basic)	13.13, 15.2.2.2.1, table 20a	N
FR2ie	Throughput Class Negotiation (extended)	13.13, 15.2.2.2.2, table 20b	N
FR3b	Closed User Group Selection, basic format	13.14.6, 15.2.2.3.1	N
FR3e	Closed User Group Selection, extended format	13.14.6, 15.2.2.3.2	N
FR4b	Closed User Group With Outgoing Access Selection, basic format	13.4.7, 15.2.2.4.1	N
FR4e	Closed User Group With Outgoing Access Selection, extended format	13.4.7, 15.2.2.4.2	N
FR5	Bilateral Closed User Group Selection	13.15, 15.2.2.5	N
FR6a	Fast Select (Note 1)	13.16, 13.17, 15.2.2.	N
FR6b	Reverse Charging (Note 1)	13.18, 13.19, 15.2.2.	N
FR11	Call Redirection or Call Deflection Notification	13.25.3, 15.2.2.11	N
FR12i	Transit Delay Selection and Indication	13.27, 15.2.2.13	N
FR20i	Facility Marker, ITU-T-specified DTE facilities	15.1	N
FR21	Calling Address Extension	14.1, 15.3.2.1	N
FR22i	Called Address Extension	14.2, 15.3.2.2	N
FR23b	Minimum Throughput Class Negotiation (basic)	14.3, 5.3.2.3.1, table 20a	N
FR23e	Minimum Throughput Class Negotiation (extended)	14.3, 15.3.2.3.1, table 20b	N
FR24i	End-to-End Transit Delay Negotiation	14.4, 15.3.2.4	N
FR25i	Expedited Data Negotiation	14.7, 15.3.2.7	N
FR26i	Priority	14.5, 15.3.2.5	N
FR27i	Protection	14.6, 15.3.2.6	N
FR99i	Local non-X.25 facilities, following Facility Marker	15.1, table 18	N

Table A-2.17 Facilities Received in Incoming call Connect Packets

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
FR1pr	Flow Control Parameter Negotiation, packet size (Note 1)	13.12, 15.2.2.1.1, table 14	N
FR1wr	Flow Control Parameter Negotiation, window size (Note 1)	13.12, 15.2.2.1.2, table 14	N
FR2rb	Throughput Class Negotiation (basic)	13.13, 15.2.2.2.1, table 20a	N
FR2re	Throughput Class Negotiation (extended)	13.13, 15.2.2.2.2, table 20b	N
FR10r	Called Line Address Modified Notification	13.26, 15.2.2.12	N
FR12r	Transit Delay Selection And Indication	13.27, 15.2.2.13	N
FR20r	Facility Marker, ITU-T-specified DTE facilities	15.1	N
FR22r	Called Address Extension	14.2, 15.3.2.2	N
FR24r	End-to-End Transit Delay Negotiation	14.4, 15.3.2.4	N
FR25r	Expedited Data Negotiation	14.7, 15.3.2.7	N
FR26r	Priority	14.5, 15.3.2.5	N
FR27r	Protection	14.6, 15.3.2.6	N
FR99r	Local non-X.25 facilities, following Facility Marker	15.1, table 18	N

Table A-2.18 Facilities Received in Clear Indication Packets

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
FR8ad	Charging Information, monetary unit	13.22, 15.2.2.8.2	N
FR8bd	Charging Information, segment count	13.22, 15.2.2.8.3	N
FR8cd	Charging Information, call duration	13.22, 15.2.2.8.4	N
FR10d	Called Line Address Modified Notification	13.26, 15.2.2.12	N
FR99d	Local non-X.25 facilities, following Facility Marker	15.1, table 18	N
FR20d	Facility Marker, ITUT-specified DTE facilities	15.	N
FS22d	Called Address Extension	14.2, 15.3.2.2	N

Table A-2.19 Facilities Received in Clear Confirmation Packets

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
FR8af	Charging Information, monetary unit	13.22, 15.2.2.8.2	N
FR8bf	Charging Information, segment count	13.22, 15.2.2.8.3	N
FR8cf	Charging Information, call duration	13.22, 15.2.2.8.4	N

Table A-2.20 Values for Flow Control Parameters and Throughput Class, Virtual Call Service

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
V1s	What values are supported for default packet sizes, sending (octets)? (Notes 1 and 5)	16.2.2.5	Shall support a default of one or more of these values: 16, 32, 64, 128, 256, 512, 1024, 2048, 4096
V1r	What values are supported for default packet sizes, receiving (octets)? (Notes 1 and 5)	16.2.2.5	Shall support a default of one or more of these values: 16, 32, 64, 128, 256, 512, 1024, 2048, 4096
V2s	What values are supported for default window sizes, sending? (Note 6)	16.2.2.6	1 -127
V2r	What values are supported for default window sizes, receiving? (Note 6)	16.2.2.6	1 -127
V3s	What values are supported for default throughput classes, sending (bps)? (Note 7)	16.2.2.7, tables 20a and 20b	Shall support a default of one or more of these values: 75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 48000, 64000
V3r	What values are supported for default throughput classes, receiving (bps)? (Note 7)	16.2.2.7, tables 20a and 20b	Shall support a default of one or more of these values: 75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 48000, 64000
V5	Can different default packet sizes be set for sending and receiving? (Notes 1 and 5)	13.9	N
V7	Can different window sizes be set for sending and receiving? (Note 6)	13.10	N
V8	Can different default throughput classes be set for sending and receiving?	13.11	N
V9s	What values are supported in flow control parameter negotiation for packet sizes, sending (octets)? (Note 1)	15.2.2.1.1	16, 32, 64, 128, 256, 512, 1024, 2048, 4096
V9r	What values are supported in flow control parameter negotiation for packet sizes, receiving (octets) (Note 1)	15.2.2.1.1	16, 32, 64, 128, 256, 512, 1024, 2048, 4096
V10s	What values are supported in flow control parameter negotiation for window sizes, sending (octets)?	15.2.2.1.2	1-127
V10r	What values are supported in flow control parameter Negotiation for window sizes, receiving (octets)?	15.2.2.1.2	1-127
V11s	What values are supported in flow control parameter negotiation for throughput class, sending (bps)?	15.2.2.2, tables 20a and 20b	N
V11r	What values are supported in flow control parameter	15.2.2.2,	N

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
	negotiation for throughput class, receiving (bps)?	tables 20a and 20b	
V12	Is the packet size of 128 octets supported for sending and receiving?	15.2.2.1.1	Y
V13	Is the window size of 2 supported for sending and receiving?	15.2.2.1.2	Y

Note 1: V1s, V1r, V9s, V9r. The term "packet size" refers to the maximum length of the User Data Field in a DATA packet.

Note 5: The Non-standard Default Packet Size will be manually provisionable. A value of 128 is the standard default per ISO/IEC 8208. Support for the Online Facility Registration is not required.

Note 6: The Non-standard Default Window Size will be manually provisionable. A value of 2 is the standard default per ISO/IEC 8208. Support for the Online Facility Registration is not required.

Note 7: the non-standard default throughput will be manually provisionable. The non-support for the Online Registration Facility is not required.

Table A-2.21 Timers, Retransmission Counts and Logical Channel Ranges

Item	Function	ISO/IEC 8208 Reference	G-G Router Support
	(Note 1)		
T20	Restart Request Response Timer Y Y	18, table 26	Y
T21	Call Request Response Timer Y Y	18, table 26	Y
T22	Reset Request Response Timer	18, table 26	Y
T23	Clear Request Response Timer	18, table 26	Y
T24	Window Status Transmission Timer	18, table 26	Y
T25	Window Rotation Timer	18, table 26	Y
T26	Interrupt Response Timer	18, table 26	Y
T27	Reject Response Timer	18, table 26	N
T28	Registration Request Response Timer	18, table 26	N
LC8	Maximum number of active SVCs (Switched Virtual Circuits)	3.7	Local choice for DTE/DCE

Note 1: All timers use ISO/IEC 8208 default values.

APPENDIX B- SNDCF (ISO/IEC 8473-3) APRLS

B.0 SNDCF (ISO/IEC 8473-3) APRLs

An implementation of the SNDCF for ISO/IEC 8208 sub-networks shall be used in ATN G/G router and the SNDCF implementation shall be in compliance with the ATN Protocol Requirements Lists (APRLs) given in this appendix.

B.1 SNDCF for use with ISO 8208 Sub-networks - Function

Table B-1 provides the functions of SNDCF for use with ISO 8208 sub-network.

Table B-1: SNDCF for use with ISO 8208 Sub-networks - Function

Item	Function	ISO/IEC 8473-3 Reference	Status	ATN Support	G/G Router Support
XSNUD	Is Sub-network User Data of at least 512 octets transferred transparently by the SNDCF ?	5.2	M	M	Y
XSNTD	Is Transit Delay determined by the SNDCF prior to the processing of user data ?	5.2	M	M	Y
	Call Setup Considerations Is a new call setup:	5.3.1			
XCalla	a. when no suitable call exists ?	5.3.1 a.	O.3	O.3	Y
XCallb	b. when queue threshold reached ?	5.3.1 b.	O.3	O.3	N
XCallc	c. by systems management ?	5.3.1 c.	O.3	O.3	Y
XCalld	d. when queue threshold reached and timer expires ?	5.3.4	O.3	O.3	N
XCalle	e. by other local means?	5.3.1	O.3	O.3	N
	Call clearing considerations Are calls cleared:	5.3.2			
XClra	a. when idle timer expires	5.3.2 a., 5.3.4	O	O	Y
XClrb	b. when need to re-use circuit	5.3.2 b.	O	O	N
XClrc	c. by systems management	5.3.2 c.	O	O	Y
XClrd	d. by provider ?	5.3.2 d.	M	M	Y
XClrer	e. by other local means?	5.3.2	O	O	N
XPD	X.25 Protocol Discrimination	5.3.3	M	M	Y
XVCC	Resolution of VC collisions	5.3.5	M	M	Y
XMCR	Multiple VCs responding	5.3.6	M	M	Y
XMCI	Multiple VCs initiating	5.3.6	O	O	N
Xpri	X.25 Priority procedure	5.3.7	O	M	N

B.2 SNDCF for use with ISO 8208 Sub-networks - X.25 Call User Data

Table B-2 provides the X.25 call user data requirements of SNDCF for use with ISO 8208 sub-network.

Table B-2: SNDCF for use with ISO 8208 Sub-networks - X.25 call user data

Item	Parameter	ISO/IEC 8473-3 Reference	Status	ATN Support	G/G Router Support
PD-s	<s> Protocol Discriminator	5.3.3	M	M	Y
PD-r	<r> Protocol Discriminator	5.3.3	M	M	Y
LI-s	<s> Length Indication	5.3.6	XMCI:M	XMCI:M	N
LI-r	<r> Length Indication	5.3.6	M	M	Y
Ver-s	<s> SNCR Version	5.3.6	XMCI:M	XMCI:M	N
Ver-r	<r> SNCR Version	5.3.6	M	M	Y
SNCR-s	<s> SNCR Value	5.3.6	XMCI:M	XMCI:M	N
SNCR-r	<r> SNCR Value	5.3.6	M	M	Y

B.3 SNDCF for use with ISO 8208 Sub-networks - ISO 8208 SNDCF Timers

Table B-3 provides the timers of SNDCF for use with ISO 8208 sub-network.

Table B-3: SNDCF for use with ISO 8208 Sub-networks - ISO 8208 SNDCF Timers

Item	Timer	ISO/IEC 8473-3 Reference	Status	Values	ATN Support	G/G Router Support
XIDL	X25 VC Idle	5.3.4	XClra:O	Any	XClra:O	Y, 0 to 72000 sec.
XNVC	additional VC	5.3.4	O	Any	M	Y, 0 to 72000 sec.

B.4 SNDCF for use with ISO 8208 Sub-networks - Multi Layer Dependencies

Table B-4 provides multi layer dependency requirements of SNDCF for use with ISO 8208 sub-network.

Table B-4: SNDCF for use with ISO 8208 Sub-networks - Multi layer dependencies

Item	Dependency	ISO/IEC 8473-3 Reference	Status	ATN Support	G/G Router Support
XSSg-r	<r> Maximum SN data unit size (Rx)	5.2	>=512	>=512	>=512
XSSg-s	<s> Maximum SN data unit size (Tx)	5.2	>=512	>=512	>=512
Xvc	X.25 Virtual call service	5.3.8	M	M	Y
Xdt	X.25 Data transfer	5.3.8	M	M	Y
Xfc	X.25 flow control procedures	5.3.8	M	M	Y
Xfrp	X.25 flow control + reset packets	5.3.8	M	M	Y
Xccp	X.25 call setup and clear packets	5.3.8	M	M	Y
Xdp	X.25 DTE and DCE data packets	5.3.8	M	M	Y
Xrs	X.25 restart procedures	5.3.8	M	M	Y
XDct	X.25 DCE timeouts	5.3.8	M	M	Y
XDtT	X.25 time limits	5.3.8	M	M	Y
Xpco	X.25 network packet coding	5.3.8	M	M	Y
Xfcn	X.25 flow control parameter negotiation	5.3.8	O	O	Y
Xtd	X.25 transit delay selection and negotiation	5.3.8	O	O	Y
Xtc	X.25 throughput class negotiation	5.3.8	O	O	Y
Xoth	Other X.25 elements	5.3.8	O	O	N

APPENDIX C - ACRONYMS

C.0 Acronyms

This appendix defines the acronyms used in this document.

ABM	Asynchronous Balanced Mode
ATSMHS	ATS Message Handling System
APRLs	ATN Protocol Requirement Lists
ATN	Aeronautical Telecommunications Network
CLNP	Connectionless Network Protocol
CPDLC	Controller Pilot Data Link Communications
DCE	Data Circuit-terminating Equipment
DTE	Data Terminal Equipment
G-G(G/G)	Ground-Ground
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IDRP	Inter Domain Routing Protocol
IEC	International Electrotechnical Commission
ISO	International Standardization Organization
ITU	International Telecommunications Union
ITU-T	ITU Telecommunications Sector
LAPB	Link Access Procedure Balanced
OSI	Open Systems Interconnection
PICS	Protocol Implementation Compliance Statement
PVC	Permanent Virtual Circuit
QOS	Quality of Service
SNDCF	Sub Network Dependent Convergence Functions
SVC	Switched Virtual Circuit
TPDU	Transport Protocol Data Unit