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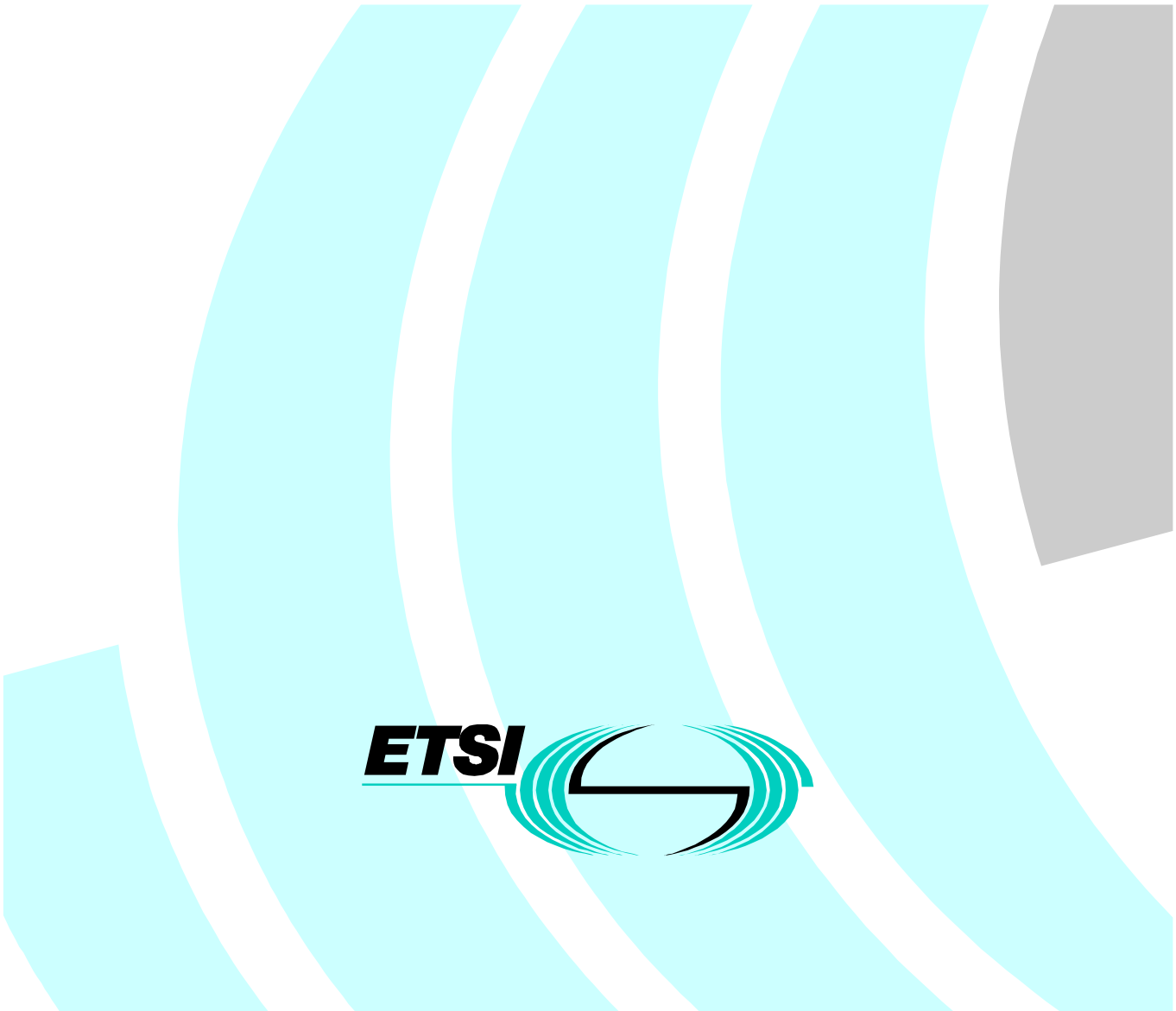
ETSI Guide

Broadband Integrated Services Digital Network (B-ISDN); General terminal requirements for the support of applications by B-ISDN access to B-ISDN at 155 520 kbit/s and 622 080 kbit/s



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Contents

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Foreword

This ETSI Guide (EG) has been produced by ETSI Project Digital Terminals and Access (DTA) as the group responsible for Integrated Services Digital Network (ISDN) Terminal Equipment (TE) in liaison with ETSI WGs NA 3, SPS 5, TM 3 and ITU-T SG 11 and SG 13.

Introduction

The present document is a selection of the parts of relevant standards which apply to Broadband Integrated Services Digital Network (B-ISDN) terminal access. It is produced with the intention of providing design guidance to terminal manufacturers who intend to produce terminals for connection to B-ISDN. It is fully aligned with the relevant standards and Recommendations which are available and does not introduce new requirements.

All sources are cited in tables of references. These tables of references indicate the relation between the paragraphs of the present document and the paragraphs in the base standard and show whether the referenced clause in the Base Standard is applicable to terminals or for general information.

A: applicable to terminals

I: general information

These are explained in subclause 3.2, Definitions.

Presentation of the references:

In some cases the referenced standard does not explicitly specify the requirements of terminals and has been modified. In these cases there is new wording under the reference table that should replace the wording of the Base standard.

Clauses 1 to 3 consist of the Scope, References and Definitions. Clause 4 contains a description of the reference configuration, UNI specification, functional groups, service and layering aspects of the B-ISDN terminal. Clauses 5 to 9 consist only of tables of references and notes when useful.

1 Scope

The present document specifies the access features of Technical Equipment (TE) which are used to connect applications at the S_B- and T_B-reference points of the B-ISDN User Network Interface (UNI) at 155 520 kbit/s and 622 080 kbit/s.

NOTE 1: Other bitrates may be included at a later date when the base standards for those rates become stable. These will cause changes in the Scope for which appropriate approval from ETSI will be sought.

The present document contains access requirements for connection to a public B-ISDN, taken from the relevant standards produced by ETSI and other standardization bodies. It covers the terminal aspects of the user part of the physical layer, the Asynchronous Transfer Mode (ATM)-layer, the ATM Adaptation Layer (AAL) layer including the Service Access Points (SAP), signalling, Operation And Maintenance (OAM) flows and provides information on the traffic profiles to be used. The present document does not contain any application specific terminal requirements.

NOTE 2: The selection of the Physical Medium (PM) for the interfaces at the S_B and T_B reference points should take into account that optical fibre is agreed as the preferred medium to be used to cable customer equipment. However, in order to accommodate existing cabling of customer equipment, other transmission media (e.g. coaxial cables) should not be precluded.

The present document is produced with the intention of providing design guidance to terminal manufacturers who intend to produce terminals for connection to B-ISDN. The present document is not intended for regulatory applications such as type approval.

Figure 1 shows the location of the present document in the B-ISDN Protocol Reference Model (PRM) [1]. The functions of Physical Layer, ATM Layer and AAL are described in the references quoted in clause 2.

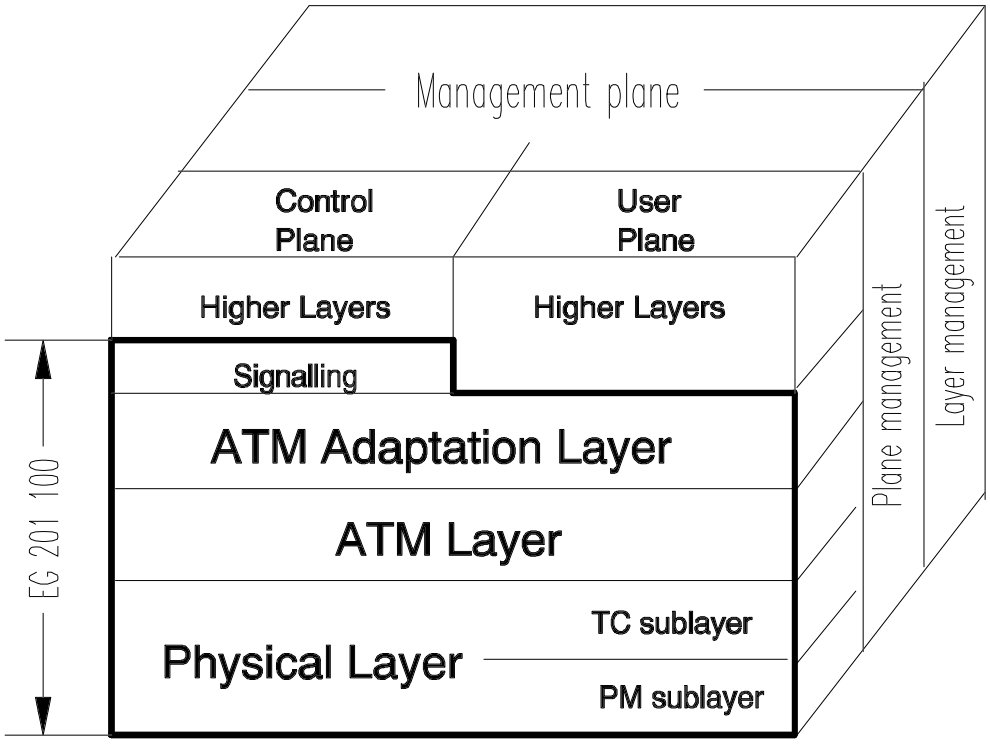


Figure 1: Location of EG in ATM reference model [1]

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, subsequent revisions do apply.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ETS 300 298-1: "Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM); Basic characteristics and functional specification of ATM; Part 1: B-ISDN ATM functional specification".

[2] ETS 300 298-2: "Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM); Basic characteristics and functional specification of ATM; Part 2: B-ISDN ATM layer specification".

[3] ETS 300 299: "Broadband Integrated Services Digital Network (B-ISDN); Cell based user network access; Physical layer interfaces for B-ISDN applications".

[4] ETS 300 300: "Broadband Integrated Services Digital Network (B-ISDN); Synchronous Digital Hierarchy (SDH) user network access; Physical layer interfaces for B-ISDN applications".

[5] ETS 300 301: "Broadband Integrated Services Digital Network (B-ISDN); Traffic control and congestion control in B-ISDN".

[6] ETS 300 349: "Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM); Adaptation Layer (AAL) specification - type 3/4".

[7] I-ETS 300 353: "Broadband Integrated Services Digital Network(B-ISDN); Asynchronous Transfer Mode (ATM); Adaptation Layer (AAL) specification - type 1".

[8] ETS 300 404: "Broadband Integrated Services Digital Network (B-ISDN); B-ISDN Operation And Maintenance (OAM) principles and functions".

[9] ETS 300 428: "Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM); Adaptation Layer (AAL) specification - type 5".

[10] ETS 300 436-1: "Broadband Integrated Services Digital Network (B-ISDN); Signalling ATM Adaptation Layer (SAAL); Service Specific Connection Oriented Protocol (SSCOP); Part 1: Protocol specification [ITU-T Recommendation Q.2110 (1995), modified]".

[11] ETS 300 437-1: "Broadband Integrated Services Digital Network (B-ISDN); Signalling ATM Adaptation Layer (SAAL); Service Specific Co-ordination Function (SSCF) for support of signalling at the User-Network-Interface (UNI); Part 1: Specification of SSCF at UNI [ITU-T Recommendation Q.2130 (1995), modified]".

[12] ETS 300 443-1: "Broadband Integrated Services Digital Network (B-ISDN); Digital Subscriber Signalling System No. two (DSS2) protocol; B-ISDN user-network-interface layer 3 specification for basis call/bearer control; Part 1: Protocol specification [ITU-T Recommendation Q.2931 (1995), modified]".

[13] 91/263/EEC: Council Directive of 29 April 1991 on the approximation of the laws of 91/263/EEC the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity.

[14] 73/23/EEC: Council Directive of 19 February 1973 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

[15] 89/336/EEC: Council Directive of 3 May 1989 on the approximation of the laws of the Member States relating to Electromagnetic Compatibility.

[16] ITU-T Recommendation G.711: "Pulse code modulation (PCM) of voice frequencies".

[17] ITU-T Recommendation I.211: "B-ISDN service aspects".

[18] CCITT Recommendation I.321: "B-ISDN protocol reference model and its applications".

[19] ITU-T Recommendation I.361: "B-ISDN ATM layer specification".

[20] ITU-T Recommendation I.363: "B-ISDN ATM adaptation layer (AAL) specification".

[21] ITU-T Recommendation I.371: "Traffic control and congestion control in B-ISDN".

[22] ITU-T Recommendation I.411: "ISDN user-network interfaces - references configurations".

[23] ITU-T Recommendation I.580: "General arrangements for interworking between B-ISDN and 64 kbit/s based ISDN".

[24] ITU-T Recommendation I.610: "B-ISDN operation and maintenance principles and functions".

[25] ITU-T Recommendation Q.931: "Digital Subscriber Signalling System No. 1 (DSS 1) - ISDN user-network interface layer 3 specification for basic call control".

[26] ITU-T Recommendation Q.2100: "B-ISDN signalling ATM adaptation layer (SAAL) overview description".

[27] ITU-T Recommendation X.200: "Information technology - Open Systems Interconnection - Basic reference model: The basic model".

3 Notations, definitions and abbreviations

3.1 Notations

For the purposes of the present document, the following notations apply:

A: applicable. Clauses marked as "A" may have an impact upon the implementation of a Broadband TE (B-TE). The relevant items may be mandatory or optional in accordance with the base standard. Further information on the status of each individual requirement may be found in the Protocol Implementation Conformance Statement (PICS) tables (where included) in the base standard.

I: general information. "I" is background information. The relevant items do not directly impact upon the implementation of a B-TE.

Modified Text: Modified Text is text from base standard as modified for the purposes of the present document.

NOTE: NOTE is used as helpful remark.

3.2 Definitions

For the purposes of the present document, the following definitions apply:

Broadband Network Termination (B-NT): An equipment providing interface Ib. This term is used in the present document to indicate network-terminating aspects of B-NT1 and B-NT2 functional groups where these have an Ib interface (for definition of Ib see subclause 4.4.1).

Network Termination type 1 (B-NT1): This functional group includes functions broadly equivalent to layer 1 (physical) of the Open Systems Interconnection (OSI) reference model.

Network Termination type 2 (B-NT2): This functional group includes functions broadly equivalent to layer 1 and higher layers of the ITU-T Recommendation X.200 [27] reference model.

Terminal Equipment (B-TE): An equipment with interface Ia and consisting of one or more functional blocks. This functional group complies at the Ia reference point with the B-ISDN UNI recommendations.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AAL	ATM Adaptation Layer
ABR	Available Bit Rate
AIS	Alarm Indication Signal
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband Integrated Services Digital Network
BR	Backward Reporting
B-NT	Broadband Network Termination
B-TE	Broadband Terminal Equipment
CAC	Call Admission Control
CAC	Connection Admission Control
CBR	Constant Bit Rate
CDV	Cell Delay Variation
CC	Continuing Check
CI	Congestion Indication/Customer Installation
CLP	Cell Loss Priority
CPCS	Common Part Convergence Sublayer
CPI	Common Part Indicator
CPID	Connection Point Identifier
CS	Convergence Sublayer
EMC	ElectroMagnetic Compatibility
FM	Forward Monitoring
GFC	Generic Flow Control
HEC	Header Error Control
ISDN	Integrated Services Digital Network
LI	Length Indicator
LSB	Least Significant Bit
MM	Message Mode
MSB	Most Significant Bit
NNI	Network Node Interface
NRZ	Non Return to Zero
OAM	Operation And Maintenance
OSI	Open Systems Interconnection
PCR	Peak Cell Rate
Ph-SAP	Physical layer - Service Access Point
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
PM	Physical Medium
PRM	Protocol Reference Model
PT	Payload Type

PTI	Payload Type Identifier
PTR	Pointer
QoS	Quality of Service
RDI	Remote Defect Indication
RTS	Residual Time Stamp
SAP	Service Access Point
SAR	Segmentation And Reassembly (sublayer)
SC	Sequence Count
SDH	Synchronous Digital Hierarchy
SDL	Specification and Description Language
SDT	Structured Data Transfer
SDU	Service Data Unit
SN	Sequence Number
SNP	Sequence Number Protection
SSCOP	Service Specific Connection Oriented Protocol
SSCS	Service Specific CS
STM	Synchronous Transport Module
SVC	Signalling Virtual Channel
TC	Transmission Convergence
TE	Terminal Equipment
UNI	User Network Interface
VBR	Variable Bit Rate
VC	Virtual Channel
VCC	Virtual Channel Connection
VCI	Virtual Channel Identifier
VP	Virtual Path
VPC	Virtual Path Connection
VPI	Virtual Path Identifier

4 General characteristics

4.1 Reference configuration at the user-network interface

reference:	ETS 300 299 [3]	clause	4	relevant	I
	ETS 300 300 [4]	clause	4	relevant	I

4.1.1 Functional groups and reference points

reference:	ETS 300 299 [3]	clause	4.1	relevant	N
	ETS 300 300 [4]	clause	4.1	relevant	N
	ETS 300 299 [3]	clause	4.2	relevant	I
	ETS 300 300 [4]	clause	4.2	relevant	I

NOTE: Figure 2 shows the B-ISDN reference configurations which contain the following:

- functional groups: B-NT1; B-NT2 and Broadband-Terminal Equipment (B-TE);
- reference points: T_B and S_B.

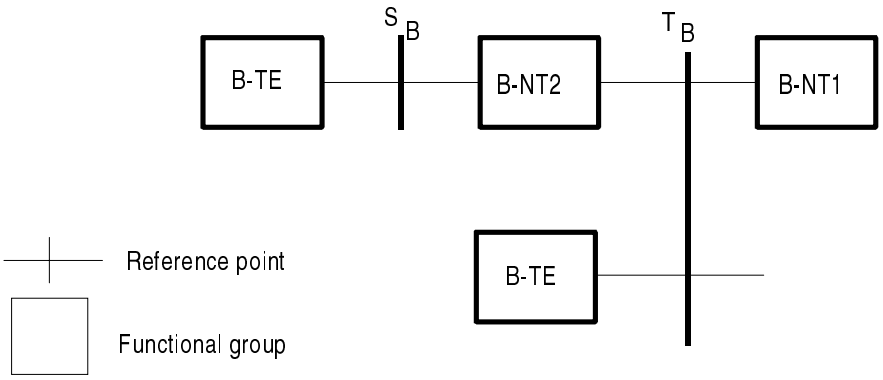


Figure 2: B-ISDN reference configuration

4.2 Basic characteristics of the interfaces at T_B and S_B reference points

4.2.1 Interface at T_B reference point

reference:	ETS 300 299 [3]	clause	4.3.1.1	relevant	N
	ETS 300 300 [4]	clause	4.3.1.1	relevant	N

NOTE: There is only one interface per B-NT1 at the T_B reference point. The operation of the PM is point-to-point in the sense that there is only one sink (receiver) in front of one source (transmitter).

4.2.2 Interface at the S_B reference point

reference:	ETS 300 299 [3]	clause	4.3.1.2	relevant	N
	ETS 300 300 [4]	clause	4.3.1.2	relevant	N

NOTE: One or more S_B interfaces per B-NT2 are present. The interface at the S_B reference point is point-to-point at the physical layer in the sense that there is only one sink (receiver) in front of one source (transmitter) and may be point to multipoint at the other layers.

4.2.3 Relationship between interfaces at S_B and T_B

reference:	ETS 300 299 [3]	clause	4.3.1.3	relevant	N
	ETS 300 300 [4]	clause	4.3.1.3	relevant	N

NOTE: Possible different configurations of the interfaces require that the interface specifications at T_B and S_B should have a high degree of commonalty, in order to ensure that a simple broadband terminal may be connected directly to the T_B interface.

4.3 Functional group characteristics

reference:	ETS 300 299 [3]	clause	4.5	relevant	N
	ETS 300 300 [4]	clause	4.5	relevant	N

4.3.1 Network termination 1 for B-ISDN (B-NT1)

reference:	ETS 300 299 [3]	clause	4.5.1	relevant	N
	ETS 300 300 [4]	clause	4.5.1	relevant	N

NOTE: This functional group includes functions broadly equivalent to layer 1 of the OSI reference model. Examples of B-NT1 functions are:

- line transmission termination;
- transmission interface handling;
- OAM functions.

4.3.2 Network termination 2 for B-ISDN (B-NT2)

reference:	ETS 300 299 [3]	clause	4.5.2	relevant	N
	ETS 300 300 [4]	clause	4.5.2	relevant	N

NOTE: This functional group includes functions broadly equivalent to layer 1 and higher layers of the ITU-T Recommendation X.200 [27] reference model. B-NT2 can be null in the case of commonality between T_B and S_B. B-NT2 implementations may be concentrated or distributed. In a specific access arrangement, the B-NT2 may consist only of physical connections. When present, implementations of the B-NT2 are locally powered.

4.3.3 TE for B-ISDN (B-TE)

reference:	ETS 300 299 [3]	clause	4.5.3	relevant	N
	ETS 300 300 [4]	clause	4.5.3	relevant	N

NOTE: This functional group includes functions broadly belonging to layer 1 and higher layers of the ITU-T Recommendation X.200 [27] reference model.

4.4 UNI Specifications

reference:	ETS 300 299 [3]	clause	5	relevant	N
	ETS 300 300 [4]	clause	5	relevant	N

4.4.1 Interface location with respect to the reference configuration

reference:	ETS 300 299 [3]	clause	5.1	relevant	N
	ETS 300 300 [4]	clause	5.1	relevant	N

NOTE: An interface point I_a is adjacent to the B-TE or the B-NT2 on their network side; interface point I_b is adjacent to the B-NT2 and to the B-NT1 on their user sides (see figure 3).

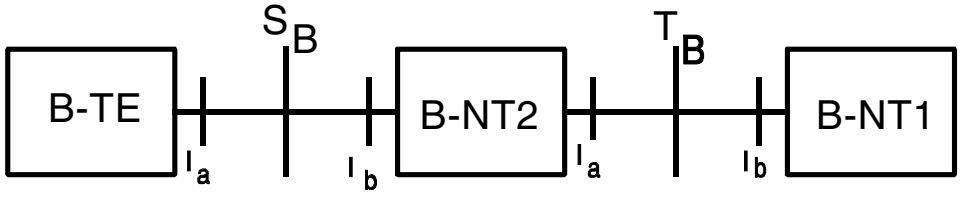


Figure 3: Reference configuration at reference point S_B/T_B

4.4.2 Interface location with respect to the wiring configuration

reference:	ETS 300 299 [3]	clause	5.2	relevant	N
	ETS 300 300 [4]	clause	5.2	relevant	N

NOTE: The interface points are located between the socket and the plug of the connector attached to the B-TE, B-NT2 or B-NT1. The location of the Interface point is shown in figure 4.

The length of the connecting cord can be zero.

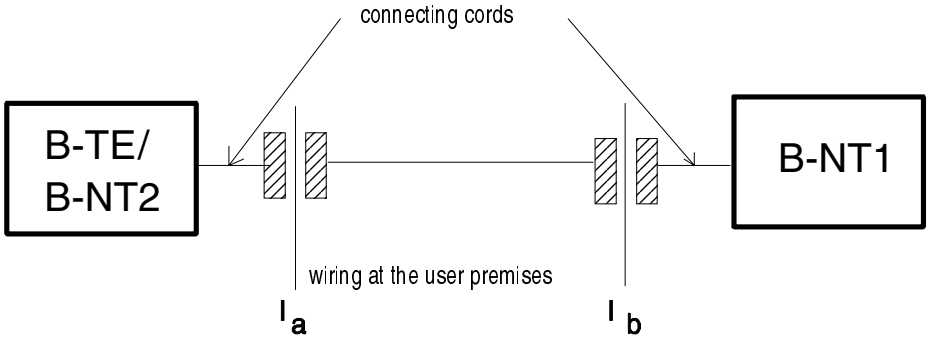


Figure 4: Wiring configuration

4.5 Service and layering aspects of the physical layer

4.5.1 Services provided to the ATM-layer

reference:	ETS 300 299 [3]	clause	6.1	relevant	N
	ETS 300 300 [4]	clause	6.1	relevant	N

NOTE: The physical layer provides for the transparent transmission of ATM-Protocol Data Units (PDUs) between Physical layer - Service Access Points (Ph-SAPs). The ATM-PDU is called an ATM cell. The ATM cell is defined in ITU-T Recommendation I.361 [19]. As no addressing is implemented in the physical layer only a single Ph-SAP can exist at the boundary between physical layer and ATM layer. The inter-arrival time between cells passed to the ATM layer is not defined (asynchronous transmission). The physical layer provides the ATM layer with timing information.

4.5.2 Service primitives exchanged with the ATM layer

reference:	ETS 300 299 [3]	clause	6.2	relevant	N
	ETS 300 300 [4]	clause	6.2	relevant	N

NOTE: The service primitives between physical layer and ATM-layer are defined in ITU-T Recommendation I.361 [19] subclause 3.2.

4.5.3 Sublayering of the physical layer

reference:	ETS 300 299 [3]	clause	6.3	relevant	N
	ETS 300 300 [4]	clause	6.3	relevant	N

NOTE: The physical layer is subdivided into two sublayers:

- the PM sublayer;
- the Transmission Convergence (TC) sublayer.

No SAP and service primitives are defined between the PM and the TC sublayers. The functions of the individual sublayer are defined in ITU-T Recommendation I.321 [18].

4.6 Service and layering aspects of the ATM layer

4.6.1 Basic principles of ATM

reference:	ETS 300 298-1 [1]	clause	4	relevant	I

Modified Text: ATM is used in the present document for addressing a specific packet oriented transfer mode which uses asynchronous time division multiplexing techniques. The multiplexed information flow is organized into blocks of fixed size called cells. A cell consists of an information field and a header. The primary role of the header is to identify cells belonging to the same Virtual Path(VP) and/or Virtual Channel (VC) within the asynchronous time division multiplex. Transfer capacity is assigned by negotiation and is based on the source requirements and the available capacity. Cell sequence integrity on a Virtual Path Connection (VPC) and/or Virtual Channel Connection (VCC) is preserved by the ATM layer.

ATM is a connection oriented technique. Connection identifiers (VPI/VCI) are assigned to each link of a connection when required and released when the connection is no longer needed. In general, signalling and user information are carried on separate ATM connections.

ATM offers a flexible transfer capability common to all services. Additional functionality's above the ATM layer (e.g. in the AAL) are provided to accommodate various services. The boundary between the ATM layer and the AAL corresponds to the boundary between functions supported by the contents of the cell header and functions supported by AAL specific information. The AAL specific information is contained in the information field of the ATM cell.

The information field is transported transparently by the ATM layer. No processing, e.g. error control, is performed on the information field at the ATM layer.

The header and information field each consist of a fixed integer number of octets. The header size, (5 octets), and the information field size, (48 octets), remain constant at all reference points, including the User-Network Interface (UNI) and the Network Node Interface (NNI), where the ATM technique is applied.

4.6.2 Operation and Maintenance (OAM)

reference:	ITU-T Recommendation I.610 [24]	clause	4.2	relevant	I

Modified Text: General principles and functions for B-ISDN OAM are defined in ITU-T Recommendation I.610 [24] and amended by ETS 300 404 [8].

Subclause 6.7 deals with the application of these general principles to B-TEs. Two sorts of OAM are considered:

- VP OAM flows (F4 flows); and
- VC OAM flows (F5 flows).

They include maintenance and performance monitoring features which can be related to end to end connections or segments of the connections that is a maintenance entity specific to the ATM layer.

4.7 Service and layering aspects of the AAL

reference:	I-ETS 300 353 [7]	clause	4	relevant	I

Modified Text: The AAL enhances the service provided by the ATM layer to support functions required by the next higher layer. The AAL performs functions required by the user, control and management planes and supports the mapping between the ATM layer and the next higher layer. The functions performed in the AAL depend upon the higher layer requirements.

The AAL supports multiple protocols to fit the needs of the different AAL service users. The AAL receives from and passes to the ATM layer the information in the form of a 48 octet ATM Service Data Unit (SDU). Different types of AALs are defined according to the services provided.

The AAL functions are organized into two logical sublayers, the

- Convergence Sublayer (CS) and the;
- Segmentation And Reassembly (SAR) sublayer.

The CS provides AAL service at the AAL SAP. The SAR functions are the segmentation of higher layer information into a size suitable for the information field of the ATM cell and the reassembly of the contents of ATM cell information fields into higher layer information.

The ATM layer only deals with the functions of the cell header regardless of the information carried in the payload. There is in particular no:

- information about the service clock;
- discarding of misinserted cells;
- detection and localization of lost cells;
- means to handle Cell Delay Variations (CDVs).

The reason for that is that not all of these services are required by every application. Thus the adaptation layer is used to handle service dependencies.

These services can be classified based on 3 parameters:

- timing relationship between source and destination (required vs. not required);
- bit rate profile (constant vs. variable);
- connection mode (connection oriented vs. connectionless).

Real-time services such as voice and video require timing relationship between communicating applications. This arises from the fact that the receiver needs to receive voice and video frames at the same rate as they are transmitted. On the other hand, non-real-time services, e.g. a file transfer, have no such requirements for end-to-end timing. Traffic generated from a source can be submitted to the network either at a Constant Bit Rate (CBR) or at Variable Bit Rate (VBR). The former is the case in circuit switched telephony networks i.e. 64 kbps voice, the latter in packet networks.

CBR services require a timing relationship between the source and the destination. VBR services can be classified in those requiring end-to-end timing relationship (VBR audio and VBR video) and those requiring no timing relationship (most data communication applications). Real-time applications and some data services require resource reservation to avoid degradation by data streams coming from other sources.

Today the following AAL types are defined:

AAL type 1 (as defined in ITU-T Recommendation I.363.1) is used for:

- the transfer of SDUs with a constant source bit rate and the delivery of it with the same bit rate;
- the transfer of timing information between source and destination.

AAL type 2 (I.363.2, not taken into account in the present document) is going to be used for:

- the transfer of timing information;
- multiplexing of multiple signals in a single VC.

AAL type 3/4 (as defined in ITU-T Recommendation I.363.3) is used for the transfer of data.

- This AAL type may be used for transfer of data in the connection mode of operation as well in the connectionless mode of operation.
- Every ATM SDU has its own Frame check sequence for error detection.
- Multiple streams of data may be multiplexed on the same VC.

AAL type 5 (as defined in ITU-T Recommendation I.363.5) is derived from AAL type 3/4.

- It is also used for data transfer.
- Error detection is accomplished by adding a trailer to every SDU.
- Cells containing the trailer are indicated in the ATM Header by the ATM-layer-user to ATM-layer-user indication.

For signalling purposes the AAL 5 is enhanced by the Service Specific Connection Oriented Protocol (SSCOP) to guaranty assured operation between the signalling entities, and the SSCF to map the service of the SSCOP to the needs of layer 3 protocols. This AAL is called the SAAL.

4.8 Service and layering aspects of the Traffic profiles

reference:	[ITU-T Recommendation I.371 [21] as endorsed by ETS 300 301 [5]	clause	1	relevant	I

According to the functions and design of the equipment, the profiles of the transmitted cells are different and may fit with different traffic services offered by the public networks. The manufacturer should design the equipment for the transmitted traffic point of view in accordance with parameters and traffic features specified in ITU-T Recommendation I.371 [21] as endorsed by ETS 300 301 [5].

The newest edition of ETS 300 301 [5] consists only of an endorsement notice saying that the text of ITU-T Recommendation I.371 [21] (1996) was approved by ETSI as an ETS without any modification.

4.9 Service and layering aspects of the Signalling plane

Signalling is an exchange of messages between the network and the user equipment. Therefore a message transmitted by one side needs to be received and according to the equipment features, processed by the other side. Some of the base standards are mainly devoted to the network specification. In the case when the base standard only specifies the behaviour of the network (reception or transmission of messages) the relevant item is considered to be applicable to the TE. In this case of transmission of messages the terminal should be able to transmit or receive these messages and process them if supported.

4.9.1 Signalling AAL

reference:	ITU-T Recommendation Q.2100 [26] ITU-T Recommendation Q.2100 [26]	clause clause	4 5	relevant "	I I

One particular type of AAL service user is the signalling entity wishing to communicate with a peer entity. Any such entity would require that functions are provided above the common part of the AAL specifically designed to facilitate this task.

The information transfer between the SAAL user and the SAAL is performed in Message Mode (MM). Two peer-to-peer operational procedures may be offered: Unassured or Assured operation.

The complete specification of the SAAL is indicated in figure 5. The SAAL makes use of the service provided by the Common Part Convergence Sublayer (CPCS) and Segmentation and Reassambly (SAR) which form the common part of AAL type 5. The Service Specific Convergence Sublayer (SSCP) part of AAL type 5 is performed by a combination of the SSCOP and one of several types of Service Specific Co-ordination Function (SSCF), two of which are currently defined and shown in the figure 5. The function of the SSCOP is such as to make it equally well suited for use by the user plane.

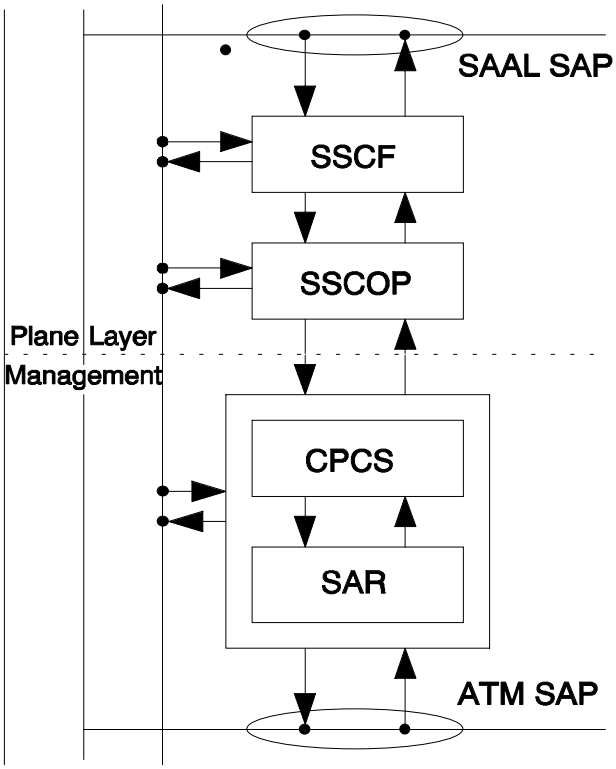


Figure 5: Complete AAL structure for signalling applications

4.9.2 DSS 2

reference:	ITU-T Recommendation Q.2931 [12]	clause	1	relevant	I

Modified Text: Clause 9 of the present document (based on ITU-T Recommendation Q.2931 [12]) specifies the procedures for the establishing, maintaining and clearing of network connections at the B-ISDN user-network interface. The procedures are defined in terms of messages exchanged.

It is intended to specify the essential features, procedures and messages required for call/connection control.

ITU-T Recommendation Q.2931 [12] specifies the layer 3 call/connection states, messages, Information elements, timers and procedures used for the control of B-ISDN point-to-point on-demand calls on VCs within the overall scope of Release 1 of B-ISDN as specified in ITU-T Recommendation Q.2010 [10].

The procedures specified by this Recommendation are applied at the interface between a B-ISDN TE and a B-ISDN public network (reference point S_B and T_B, see subclause 4.4.1)

4.9.3 Service and layering aspects of the Traffic profiles

reference:	[ITU-T Recommendation I.371 [21] as endorsed by ETS 300 301 [5]	clause	1	relevant	I

According to the functions and design of the equipment, the profiles of the transmitted cells are different and may fit with different traffic services offered by the public networks. The manufacturer should design the equipment for the transmitted traffic point of view in accordance with parameters and traffic features specified in ITU-T Recommendation I.371 [21] as endorsed by ETS 300 301 [5].

The newest edition of ETS 300 301 [5] consists only of an endorsement notice that the text of ITU-T Recommendation I.371 [21] (1996) was approved by ETSI as an ETS without any modification.

4.10 Electrical safety

reference:	Council Directive 73/23/EEC [14] Council Directive 91/263/EEC [13]	clause		relevant	I I

In general safety requirements are imposed under the Low Voltage Directive (73/23/EEC [14]) and articles 4 (a) and 4 (b) of the Directive 91/263/EEC [13].

4.11 ElectroMagnetic Compatibility (EMC) advice

reference:	Council Directive 89/336/EEC [15]	clause		relevant	I

In general EMC requirements are imposed under the EMC Directive (89/336/EEC [15]).

5 Physical Layer

5.1 PM Sublayer

5.1.1 Characteristics of the terminal interface at 155 520 kbit/s

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7 7	relevant	I

5.1.1.1 Bit rate and interface symmetry

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.1 7.1.1	relevant	A

5.1.1.2 Physical characteristics

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2 7.1.2	relevant	I

5.1.1.2.1 Electrical interface

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.1 7.1.2.1	relevant	I

5.1.1.2.1.1 Transmission medium

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.1.2 7.1.2.1.2	relevant	A

5.1.1.2.1.2 Electrical parameters at interface points I_a and I_b

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.1.3 7.1.2.1.3	relevant	A

5.1.1.2.1.3 Electrical connectors

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.1.4 7.1.2.1.4	relevant	A

5.1.1.2.1.4 Line coding

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.1.5 7.1.2.1.5	relevant	A

5.1.1.2.2 Optical interface

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.2 7.1.2.2	relevant	A

5.1.1.2.2.1 Transmission medium

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.2.2 7.1.2.2.2	relevant	A

5.1.1.2.2.2 Line coding

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.2.3.1 7.1.2.2.3.1	relevant	A

5.1.1.2.2.3 Operating wavelength

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.2.3.2 7.1.2.2.3.2	relevant	A

5.1.1.2.2.4 Input and output port characteristics

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.2.3.3 7.1.2.2.3.3	relevant	A

5.1.1.2.2.5 Optical connectors

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.2.4 7.1.2.2.4	relevant	A

5.1.1.2.3 Jitter and Wander

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	7.1.2.3 7.1.3	relevant	A

5.1.2 Characteristics of the terminal interface at 622 080 kbit/s

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	8.1 8.1	relevant	I

5.1.2.1 Bit rate and interface symmetry

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	8.1.1 8.1.1	relevant	A

5.1.2.2 Physical characteristics

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	8.1.2 8.1.2	relevant	A

5.1.2.2.1 Transmission medium

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	8.1.2.2 8.1.2.2	relevant	A

5.1.2.2.2 Line coding

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	8.1.2.3.1 8.1.2.3.1	relevant	A

5.1.2.2.3 Operating wavelength

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	8.1.2.3.2 8.1.2.3.2	relevant	A

5.1.2.2.4 Input and output port characteristics

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	8.1.2.3.3 8.1.2.3.3	relevant	A

5.1.2.2.5 Optical connectors

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	8.1.2.4 8.1.2.4	relevant	A

5.1.2.3 Jitter and Wander

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	8.1.2.6 8.1.3	relevant	A

5.1.3 Power feeding

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	9	relevant	A (note)
NOTE: Applicable if the power is provided via the UNI					

5.1.3.1 Provision of power

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	9.1	relevant	A (note)
NOTE: Applicable if the power is provided via the UNI					

5.1.3.2 Power available at B-NT1

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	9.2	relevant	A (note)
NOTE: Applicable if the power is provided via the UNI					

5.1.3.3 Feeding voltage

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	9.3	relevant	A (note)
NOTE: Applicable if the power is provided via the UNI					

5.2 Functions provided by the TC sublayer

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10 10	relevant	I

5.2.1 Transfer capability

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10.1 10.1	relevant	I

5.2.1.1 Interface at 155 520 kbit/s

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10.1.1 10.1.1	relevant	A

5.2.1.2 Interface at 622 080 kbit/s

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10.1.2 10.1.2	relevant	A

5.2.2 Physical Layer aspects

5.2.2.1 Physical Layer aspects for Synchronous Digital Hierarchy (SDH) based UNI

reference:	ETS 300 300 [4]	clause	10.2	relevant	A

5.2.2.2 Physical Layer aspects for cell based UNI

reference:	ETS 300 299 [3]	clause	10.2	relevant	A

5.2.2.3 Timing for SDH based UNI

reference:	ETS 300 300 [4]	clause	10.2.1	relevant	A

5.2.2.4 Timing for cell based UNI

reference:	ETS 300 299 [3]	clause	10.2.1	relevant	A

5.2.3 Interface structure for 155 520 kbit/s and 622 080 kbit/s

5.2.3.1 Interface structure for 155 520 kbit/s, SDH-based

reference:	ETS 300 300 [4]	clause	10.2.2	relevant	A

5.2.3.2 Interface structure for 622 080 kbit/s, SDH based

reference:	ETS 300 300 [4]	clause	10.2.3	relevant	A

5.2.3.3 Interface structure for 155 520 kbit/s and 622 080 kbit/s, Cell-based

reference:	ETS 300 299 [3]	clause	10.2.2	relevant	A

5.2.4 Header Error Control (HEC)

5.2.4.1 HEC functions

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10.3.1 10.3.1	relevant	A

5.2.4.2 HEC sequence generation

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10.3.2 10.3.2	relevant	A

5.2.5 Idle cells

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10.4 10.4	relevant	I

5.2.6 Cell delineation and scrambling

5.2.6.1 Cell delineation and scrambling objectives

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10.5.1 10.5.1	relevant	A

5.2.6.1.1 Cell delineation algorithm

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10.5.1.1 10.5.1.1	relevant	A

5.2.6.2 Cell delineation performance

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	10.5.2 10.5.2	relevant	I

5.2.6.3 Scrambler operation for SDH-based UNI

reference:	ETS 300 299 [3]	clause	10.5.3	relevant	A

5.2.6.4 Scrambler operation for Cell-based UNI

reference:	ETS 300 299 [3]	clause	10.5.3	relevant	A

5.2.6.4.1 Distributed sample scrambler (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	10.5.3.1	relevant	A

5.2.6.4.2 Transmitter operation (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	10.5.32	relevant	A

5.2.6.4.3 Receiver operation (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	10.5.3.3	relevant	A

5.2.6.4.4 State transition diagram and mechanism (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	10.5.3.4	relevant	A

5.3 UNI related OAM functions

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	11 11	relevant	I

5.3.1 Transmission overhead allocation

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	11.1	relevant	I

5.3.1.1 Transmission overhead allocation (SDH-based UNI)

reference:	ETS 300 300 [4]	clause	11.1	relevant	A

5.3.1.2 Transmission overhead allocation (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	11.1	relevant	A

5.3.2 OAM cell identification (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	11.2	relevant	A

5.3.3 Allocation of OAM functions in information field (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	11.3	relevant	A

5.3.4 Maintenance signals

5.3.4.1 Maintenance signals (SDH-based UNI)

reference:	ETS 300 300 [4]	clause	11.2	relevant	A

5.3.4.2 Maintenance signals (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	11.4	relevant	A

5.3.5 Transmission performance monitoring

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	11.5 11.3	relevant	I

5.3.5.1 Transmission performance monitoring (SDH-based UNI)

reference:	ETS 300 300 [4]	clause	11.3	relevant	A

5.3.5.2 Transmission performance monitoring (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	11.5	relevant	A

5.4 Operational functions

5.4.1 Definition of signals at the interface

5.4.1.1 Definition of signals at the interface (SDH-based UNI)

reference:	ETS 300 300 [4]	clause	12.1	relevant	A

5.4.1.2 Definition of signals at the interface (Cell-based UNI)

reference:	ETS 300 299 [3]	clause	12.1	relevant	A

5.4.2 Definitions of state tables at network and user sides

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	12.2	relevant	I

5.4.2.1 Layer 1 states on the user side of the interface

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	12.2.1 12.2.1	relevant	A

5.4.2.2 Definition of primitives

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	12.2.3 12.2.3	relevant	I

5.4.2.3 State tables

reference:	ETS 300 299 [3] ETS 300 300 [4]	clause clause	12.2.4 12.2.4	relevant	A

6 ATM layer

6.1 ATM layer connections

6.1.1 Connection definition

reference:	ETS 300 298-1 [1]	clause	5.1.1	relevant	I

6.1.2 Connection identifiers

reference:	ETS 300 298-1 [1]	clause	5.1.2	relevant	I

6.1.2.1 Virtual Path Identifiers (VPIs) and Virtual Channel Identifiers (VCIs)

reference:	ETS 300 298-1 [1]	clause	5.1.2.1	relevant	I

6.1.2.2 VPI - VCI relationships

reference:	ETS 300 298-1 [1]	clause	5.1.2.2	relevant	I

6.1.2.3 Number of active connections at the UNI

reference:	ETS 300 298-1 [1]	clause	5.1.2.3	relevant	A

6.1.3 Aspects of VCCs

6.1.3.1 General characteristics of VCCs

reference:	ETS 300 298-1 [1]	clause	5.1.3.1	relevant	I

6.1.3.2 Establishment/release of a VCC at the UNI

reference:	ETS 300 298-1 [1]	clause	5.1.3.2.1	relevant	I

NOTE: Four different methods are allowed.

6.1.3.3 Pre-assigned VCIs

reference:	ETS 300 298-1 [1]	clause	5.1.3.3	relevant	I

6.1.3.4 Signalling VCs

reference:	ETS 300 298-1 [1]	clause	5.1.3.4	relevant	I

6.1.3.5 OAM VCs

reference:	ETS 300 298-1 [1]	clause	5.1.3.5	relevant	I

6.1.4 Aspects of VPCs

6.1.4.1 General characteristics of VPCs

reference:	ETS 300 298-1 [1]	clause	5.1.4.1	relevant	I

6.1.4.2 Establishment and release of a VPC

reference:	ETS 300 298-1 [1]	clause	5.1.4.2	relevant	I

6.1.4.3 Pre-assigned VPIs

reference:	ETS 300 298-1 [1]	clause	5.1.4.3	relevant	I

6.1.5 Pre-assigned cell header values

reference:	ETS 300 298-1 [1]	clause	5.1.5	relevant	I

6.2 Management plane interactions

reference:	ETS 300 298-1 [1]	clause	5.3	relevant	I

6.3 Functions of the ATM layer

6.3.1 Cell multiplexing and switching

reference:	ETS 300 298-1 [1]	clause	5.4.1	relevant	I

6.3.2 Quality of Service (QoS) provided by the ATM layer

6.3.2.1 QoS related to VCCs

reference:	ETS 300 298-1 [1]	clause	5.4.2.1	relevant	I

6.3.2.2 QoS related to VPCs

reference:	ETS 300 298-1 [1]	clause	5.4.2.2	relevant	I

6.3.2.3 QoS related to Cell Loss Priority (CLP)

reference:	ETS 300 298-1 [1]	clause	5.4.2.3	relevant	I

6.3.2.3.1 General

reference:	ETS 300 298-1 [1]	clause	5.4.2.3.1	relevant	I

6.3.2.3.2 CLP Indicator

reference:	ETS 300 298-1 [1]	clause	5.4.2.3.2	relevant	I

6.3.3 Payload Type (PT) functions

reference:	ETS 300 298-1 [1]	clause	5.4.3	relevant	I

6.3.4 Generic Flow Control (GFC) at the UNI

reference:	ETS 300 298-1 [1]	clause	5.4.4	relevant	I

6.4 Cell structure coding

reference:	ETS 300 298-2 [2]	clause	4	relevant	I

NOTE: UNI format only.

6.4.1 Cell structure

reference:	ETS 300 298-2 [2]	clause	4.1	relevant	A

6.4.2 Cell header format and coding at UNI

reference:	ETS 300 298-2 [2]	clause	4.2	relevant	A

6.4.2.1 Pre-assigned values of the cell header reserved for use by the physical layer

reference:	ETS 300 298-2 [2]	clause	4.2.1	relevant	A

6.4.2.2 GFC field

reference:	ETS 300 298-2 [2]	clause	4.2.2	relevant	A

6.4.2.3 Routing field VPI/VCI

reference:	ETS 300 298-2 [2]	clause	4.2.3	relevant	A

6.4.2.4 PT field

reference:	ETS 300 298-2 [2]	clause	4.2.4	relevant	I

6.4.2.5 CLP field

reference:	ETS 300 298-2 [2]	clause	4.2.5	relevant	I

6.4.2.6 HEC field

reference:	ETS 300 298-2 [2]	clause	4.2.6	relevant	I

6.5 Service primitives

reference:	ETS 300 298-2 [2]	clause	5	relevant	I

6.6 ATM protocol procedures

reference:	ETS 300 298-2 [2]	clause	6	relevant	I

6.6.1 GFC protocol

reference:	ETS 300 298-2 [2]	clause	6.1	relevant	A

6.6.2 Layer management communication

reference:	ETS 300 298-2 [2]	clause	6.2	relevant	I

6.6.3 Layer management

reference:	ETS 300 298-2 [2]	clause	6.3	relevant	I

6.6.3.1 Meta-signalling

reference:	ETS 300 298-2 [2]	clause	6.3.1	relevant	I

6.6.3.2 Fault management, functions

reference:	ETS 300 298-2 [2]	clause	6.3.2	relevant	I

6.6.3.3 Performance management, functions

reference:	ETS 300 298-2 [2]	clause	6.3.3	relevant	I

6.6.3.4 Configuration management, functions

reference:	ETS 300 298-2 [2]	clause	6.3.4	relevant	I

6.6.3.5 Resource management, functions

reference:	ETS 300 298-2 [2]	clause	6.3.5	relevant	I

6.7 B-ISDN OAM

6.7.1 B-ISDN OAM principles and functions

6.7.2 OAM principles

reference:	ITU-T Recommendation I.610 [24]	clause	2	relevant	I

6.7.2.1 Network configuration for maintenance activities

reference:	ITU-T Recommendation I.610 [24]	clause	2.1	relevant	I

6.7.2.2 Relation with the Telecommunication Management Network (TMN)

reference:	ITU-T Recommendation I.610 [24]	clause	2.2	relevant	I

6.7.3 OAM Levels and Flows

6.7.3.1 OAM levels in the B-ISDN

reference:	ITU-T Recommendation I.610 [24]	clause	3.1	relevant	I

6.7.3.2 Relationship of OAM functions with the B-ISDN models

6.7.3.2.1 B-ISDN Protocol Reference Model (PRM)

reference:	ITU-T Recommendation I.610 [24]	clause	3.2.1	relevant	I

6.7.3.2.2 ATM transport network model

reference:	ITU-T Recommendation I.610 [24]	clause	3.2.2	relevant	I

6.7.4 Mechanisms to provide OAM flows

6.7.4.1 ATM layer mechanism

reference:	ITU-T Recommendation I.610 [24]	clause	4.2	relevant	I

6.7.4.1.1 F4 flow mechanism

reference:	ITU-T Recommendation I.610 [24] as amended in ETS 300 404 [8]	clause clause	4.2.1 5	relevant	A

Modified Text: The F4 flow is bi-directional. OAM cells for the F4 flow have the same VPI value as the user cells of the VPC and are identified by one or more pre-assigned VCI values. The same pre-assigned VCI value shall be used for both directions of the F4 flow. The OAM cells for both directions of the F4 flow must follow the same physical route so that any connecting points supporting that connection can correlate the fault and performance information from both directions.

For the purpose of subclause 6.7 of the present document, at F4 level, the term 'user cell' is used for OAM according to the VCI values as shown in table 1/I.610.

There are two kinds of F4 flows, which can simultaneously exist in a VPC. These are:

- *End-to-end F4 flow* – This flow, identified by a standardized VCI (see ITU-T Recommendation I.361 [19]), is used for end-to-end VPC operations communications;

- *Segment F4 flow* – This flow, identified by a standardized VCI (see ITU-T Recommendation I.361 [19]), is used for communicating operations information within the bounds of one VPC link or multiple inter-connected VPC links. Such a concatenation of VPC links is called a VPC Segment;

The definition of the span of a managed segment is not necessarily fixed for the duration of a connection, i.e., the managed segment may be re-configured as required.

End-to-end and segment F4 flows must be terminated in a B-TE. The F4 flow will be initiated at or after connection set-up either by the TMN or by OAM function dependent activation procedures.

It shall be possible for a B-TE to be configured as a source/sink of a VPC segment.

Table 1/I.610: "User cells" at F4 level

VCI	Interpretation	Category
0	Unassigned cell (VPI = 0)	Non-user cell
0	Unused (VPI > 0)	
1	Meta-signalling cell (UNI)	User cell
2	General broadcast signalling cell (UNI)	
3	Segment OAM F4 flow cell	Non-user cell
4	End-to-end OAM F4 flow cell	
5	Point-to-point signalling cell	User cell
6	Resource management cell	Non-user cell
7-15	Reserved for future standardized functions	
16-31	Reserved for future standardized functions	User cell
VCI>31	Available for user data transmission	

6.7.4.1.2 F5 flow mechanism

reference:	ITU-T Recommendation I.610 [24]	clause	4.2.2	relevant	A

Modified Text: The F5 flow is bi-directional. OAM cells for the F5 flow have the same VCI/VPI values as the user cells of the VCC and are identified by the Payload Type Identifier (PTI). The same PTI value shall be used for both directions of the F5 flow. The OAM cells for both directions of the F5 flow must follow the same physical route so that any connecting points supporting that connection can correlate the fault and performance information from both directions.

For the purpose of subclause 6.7 of the present document, at F5 level, the term 'user cell' is used for OAM according to the PTI values as shown in table 2/I.610.

There are two kinds of F5 flows, which can simultaneously exist in a VCC. These are:

- *End-to-end F5 flow* – This flow, identified by a standardized PTI (see ITU-T Recommendation I.361 [19]), is used for end-to-end VCC operations communications.

- *Segment F5 flow* – This flow, identified by a standardized PTI (see ITU-T Recommendation I.361 [19]), is used for communicating operations information within the bounds of one VCC link or multiple inter-connected VCC links. Such a concatenation of VCC links is called a VCC Segment.

- The definition of the span of a managed segment is not necessarily fixed for the duration of a connection, i.e., the managed segment may be re-configured as required.

End-to-end and segment F5 flows must be terminated in the B-TE. The F5 flow will be initiated at or after connection set-up either by the TMN or by OAM function dependent activation procedures.

It shall be possible for a B-TE to be configured as a source/sink of a VCC segment.

Table 2/I.610: "User cells" at F5 level

PTI code	Interpretation	Category
000	User data cell, congestion not experienced	User cells
001		
010	User data cell, congestion experienced	
011		
100	Segment OAM F5 flow cell	Non-user cells
101	End-to-end OAM F5 flow cell	
110	Resource management cell	
111	Reserved for future standardized functions	

6.7.4.2 Association of the OAM mechanisms with the transport functions

reference:	ITU-T Recommendation I.610 [24]	clause	4.3	relevant	I

6.7.5 OAM functions of the ATM layer

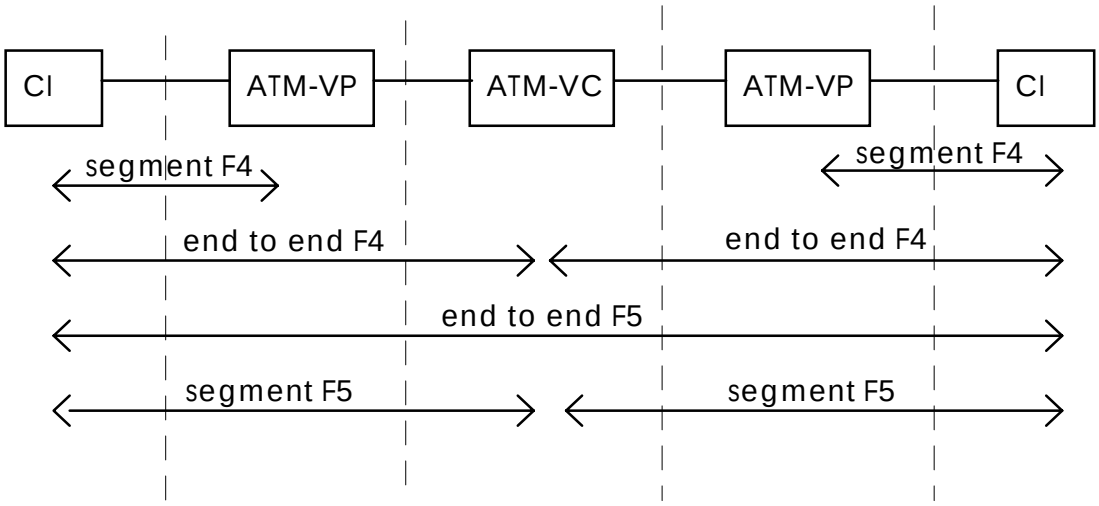
reference:	ITU-T Recommendation I.610 [24]	clause	6	relevant	I

6.7.5.1 OAM flows in some physical configurations

reference:	ITU-T Recommendation I.610 [24]	clause	6.1	relevant	I

Modified Text: Figure 5/I.610 illustrates some examples for the implementation of the OAM flows in some physical configurations for the B-TEs.

The arrow heads show possible flow termination points.



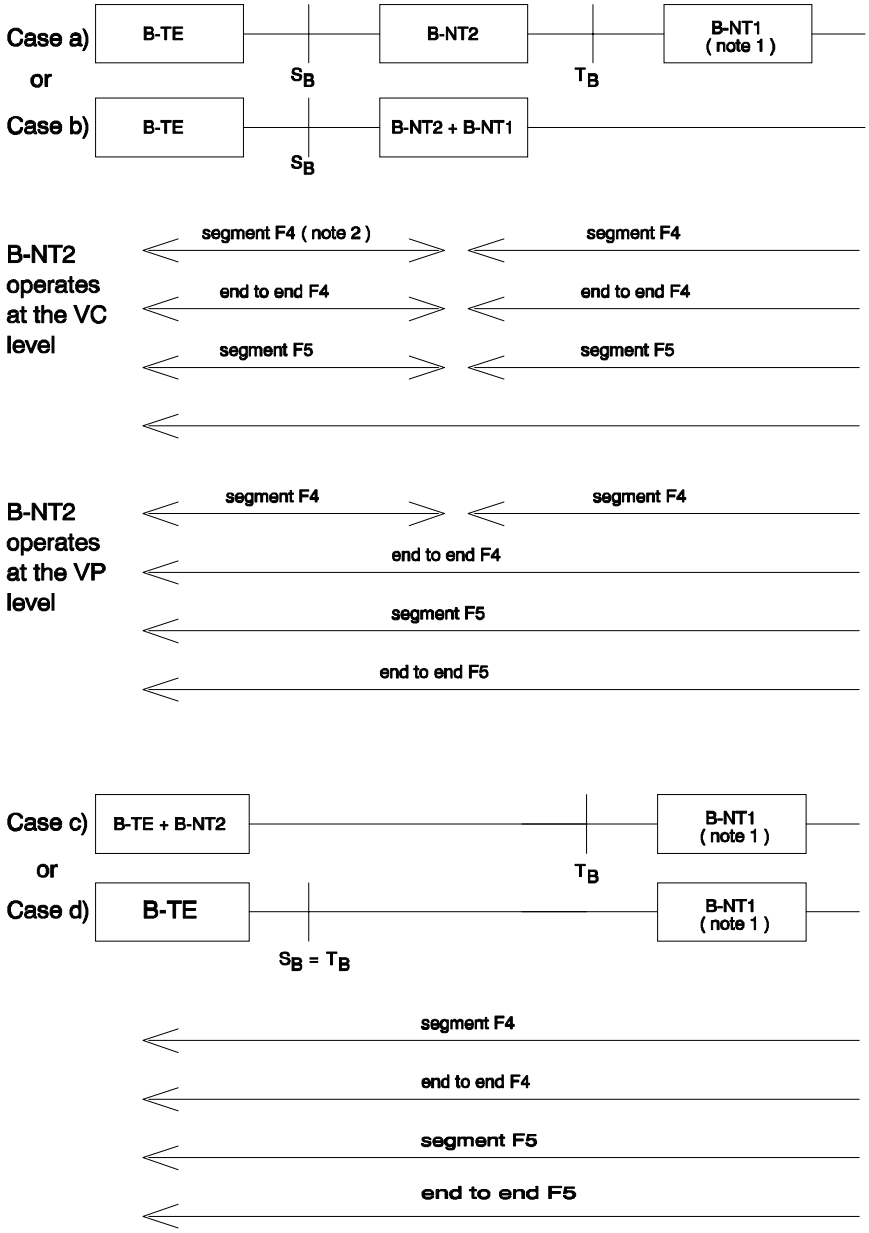
CI = Customer Installation (includes terminal and B-NT2 equipment)

ATM-VP = any ATM equipment working at VP level (i.e. without VP termination)

ATM-VC = any ATM equipment working at VC level (i.e. with VP termination)

Figure 5/I.610: Modified to show examples of physical configurations and OAM flows at the ATM Layer, applicable to B-TEs

Figure 7 illustrates some additional examples for the OAM flows when the CI is considered in some more detail. The different scenarios have been taken from ITU-T Recommendation I.411 [22].



NOTE 1: It is assumed that the B_NT1 does not include ATM layer functions.
NOTE 2: As an example, this Segment could be defined in the case where the B_NT2 is composed of several ATM nodes.

Figure 7/I.411: Examples of the extent of OAM flows within the Customer Installation

6.7.5.2 OAM functions

reference:	ITU-T Recommendation I.610 [24]	clause	6.2	relevant	I

Modified Text: Table 5/I.610 gives an overview of the OAM functions of the ATM Layer applicable to B-TEs. Additional functions for testing, fault localization and performance measurement are for further study. Means to detect OAM procedure failures are for further study.

The use of the OAM mechanisms for VP/VC status monitoring (i.e., available or unavailable) is outlined in annex A of ITU-T Recommendation I.610 [24].

When a B-TE requires bandwidth for a connection, it is necessary to require sufficient bandwidth for the OAM cells in that connection as described in ITU-T Recommendation I.371 [21].

Table 5/I.610: OAM functions of the ATM Layer applicable to TE

OAM Function	Main Application
Alarm Indication Signal (AIS)	For identifying defect indications in the forward direction (i.e. what could be observed on the incoming signal)
Remote Defect Indication (RDI)	For reporting RDIs in the backward direction (outgoing signal)
Continuity Check (CC)	For continuously monitoring continuity
Loopback	For on-demand connectivity monitoring For fault localization For pre-service connectivity verification
Forward Performance Monitoring	For estimating performance
Backward Performance Monitoring	For reporting performance estimations in the backward direction
Activation/Deactivation	For activating/deactivating Performance Monitoring and CC
System Management	For use by end-systems only (e.g. B-TEs)

6.7.5.2.1 OAM functions for VPC (F4 flow)

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.1	relevant	I

Modified Text: This subclause addresses VP-level Fault Management and Performance Management functions applicable to B-TE. As a general guidance, all the functions indicated for VPC endpoints and also for VPC segment end-points are applicable.

6.7.5.2.1.1 VP Fault Management Functions

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.1.1	relevant	A

Modified Text: The following Fault Management functions are applicable to B-TEs.

6.7.5.2.1.1.1 VP-Alarm Indication Signal (AIS) and VP-Remote Defect Indication (RDI) Defect Indications

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.1.1.1	relevant	A

Modified Text: VP-AIS and VP-RDI defect indications shall be used for respectively identifying and reporting VPC defects end-to-end. Segment VP-AIS and VP-RDI cells are for further study. As described in figure 6, B-TEs always represent a connection end-point for OAM flows. They may also act as a segment end-point and process segment OAM cells. B-TEs are not allowed to generate VP-AIS but they can manage the VP-AIS state as indicated in subclause 6.7.5.2.1.1.1.1.

6.7.5.2.1.1.1.1 VP-AIS

reference:	ITU-T Recommendation I.610 [24] as amended by ETS 300 404 [8]	clause clause	6.2.1.1.1.1 5	relevant	A

Modified Text: *VP-AIS Cell Detection* – VP-AIS cells are detected at the VPC end-point (e.g. in the B-TE).

VP-AIS state declaration and release conditions – VP-AIS state is declared at the VPC end-point (e.g. in the B-TE) as soon as a VP-AIS cell is received, a transmission path-AIS defect (see note) or a VPC defect (e.g., loss of VPC continuity) is detected at this end-point. The VP-AIS state is released when a user cell (see table 1/I.610) or CC cell is received. If CC is not activated the VP-AIS state is also released if VP-AIS cells are absent for nominally 2,5 s, with a margin of +/- 0,5 s.

NOTE: A transmission path AIS defect indication results from defects observed at the regenerator section, multiplex section or transmission path level as mentioned in tables 3 and 4/I.610.

6.7.5.2.1.1.1.2 VP-RDI

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.1.1.1.2	relevant	A

Modified Text: VP-RDI is sent to the far-end from a VPC end-point as soon as it has declared a VP-AIS state.

VP-RDI Cell Generation condition – VP-RDI cells are generated and transmitted periodically while the VP-AIS state persists in order to indicate in the backward (i.e. outgoing) direction an interruption of the cell transfer capability at the VP level in the forward (i.e. incoming) direction. Generation frequency of VP-RDI cells is nominally one cell per s and shall be the same for all VPCs concerned.

VP-RDI cell generation shall be stopped as soon as the VP-AIS state is released.

VP-RDI Cell Detection – VP-RDI cells are detected at the VPC end-point (e.g. in the B-TE) and VP-RDI state is declared after the reception of one VP-RDI cell.

VP-RDI state declaration and release conditions – VP-RDI state is declared at the VPC end-point (e.g. in the B-TE) as soon as a VP-RDI cell is received at this point. The VP-RDI state is released at the VPC end-point when no VP-RDI cell is received during a nominally 2,5 s period, with a margin of +/-0,5 s.

6.7.5.2.1.1.2 VPC CC

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.1.1.2	relevant	A

Modified Text: CC can be simultaneously carried out end-to-end or at Segment level by a B-TE on a certain number of selected active VPCs in each direction. The value of this number is outside the scope of the present document.

CC can be activated either during connection establishment or at any time after the connection has been established. The activation within the domain controlled by customers, depends on the customer equipment capability and is under customer responsibility.

Procedures for activation (and associated deactivation) are described in subclause 6.7.5.2.3. The possibility to activate the CC on all active VPCs and VPC Segments terminated in a B-TE remains as an option.

Between the two alternative mechanisms proposed in ITU-T Recommendation I.610 [24], subclause 6.2.1.1.2, only the following mechanism (option 1) is retained for B-TEs

1) A CC cell is sent downstream by a VPC source-point or a VPC Segment source-point when no user cell has been sent for a period of nominally 1 s.

When the VPC end-point with CC activated does not receive any user cell or CC cell within a time interval of 3,5 s, with a margin of +/-0,5 s, it will declare the VP-AIS state due to a Loss of Continuity (LOC) defect.

When the VPC Segment end-point does not receive any user cell or CC cell within a time interval of 3,5 s, with a margin of +/-0,5 s, it will declare a Loss of Continuity (LOC) defect. Since in this case the segment end-point coincides with the VPC end-point in the B-TE, the LOC defect will be notified internally and, therefore, the VPC end-point will declare also the VP-AIS state.

6.7.5.2.1.1.3 VP Loopback Capability

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.1.1.3	relevant	A

6.7.5.2.1.1.3.1 General Description

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.1.1.3.1	relevant	I

Modified Text: The ATM Layer loopback capability allows for operations related information to be inserted at one location along a VPC and returned (or looped back) at a different location, without having to take the connection out-of-service. This capability is performed by non-intrusively inserting a loopback OAM cell at an accessible point along the VPC (i.e., at an end-point such as B-TE or any connecting point). This cell is looped back at a downstream point following either an instruction from the System Management, or the information contained in its information field.

6.7.5.2.1.1.3.2 Principles of Operation

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.1.1.3.2	relevant	A

Modified Text: 1) End to end and segment loopback cells can be inserted at B-TE. The possibility to analyse the content of the LLID field of segment loopback cells shall be provided so as to verify that the loopback action can be performed.

2) Segment Loopback cells can be looped back at B-TEs. The possibility to analyze the content of the LLID field of segment loopback cells shall be provided so as to verify that the loopback action can be performed.

3) The waiting time between the transmission of successive loopbacks on a connection shall be 5 s. The loopback shall be considered unsuccessful if the loopback cell is not returned to the originating point within 5 s.

4) A means to confirm that loopback is performed at the ATM Layer, rather than at the Physical Layer, is provided by requiring the loopback point to change a field (the Loopback Indication Field - described in ITU-T Recommendation I.610 [24], subclause 7.2.4) within the Loopback cell payload. This principle is illustrated in figure 6/I.610. The requirement for the loopback point to change the Loopback indication, also overcomes the problem of infinite loopback that would otherwise occur with the use of the default (all 1's) Loopback Location Identifier.

5) Subclause 6.7.9 of the present document shows the detailed procedures which should be performed when a loopback cell is received by a B-TE.

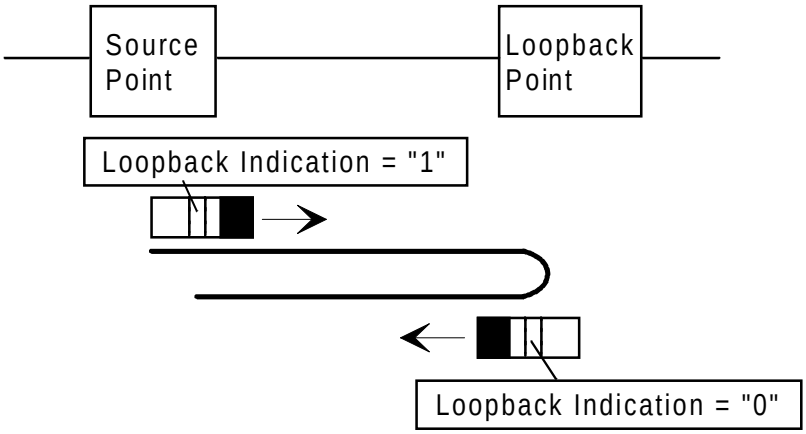


Figure 6/I.610: The Loopback Indication Function

6.7.5.2.1.1.3.3 Loopback Applications

reference:	ITU-T Recommendation I.610 [24] as amended in ETS 300 404 [8]	clause clause	6.2.1.1.3.3 5	relevant	A

Modified Text: The loopback capability supports the applications shown in figure 7/I.610). The applications, in case of B-TEs, are limited to the four following cases:

a) End-to-End Loopback: A VP end-to-end loopback cell is inserted by a VP end-point, and looped back by the corresponding far-end VP end-point.

b) Access Line Loopback: A VP segment loopback cell is inserted by the customer or the network, and looped back by the first ATM node in the network or customer equipment respectively. For this application, the segment is defined by mutual agreement.

c) Network-to-End-point Loopback: A VP end-to-end loopback cell is inserted by one network operator, and looped back by the VPC end-point in another domain.

d) Intra-Domain loopback: A VP segment loopback cell is inserted by a VP connection/segment end-point , and looped back by a VP segment or a VP connecting point. For this application, the use of the Loopback Location Identifier is optional. Note that the segment has to be previously agreed between the customer and the network. The TE can act as a segment end-point. This loopback application could be used in case of several ATM nodes exist in the CI.

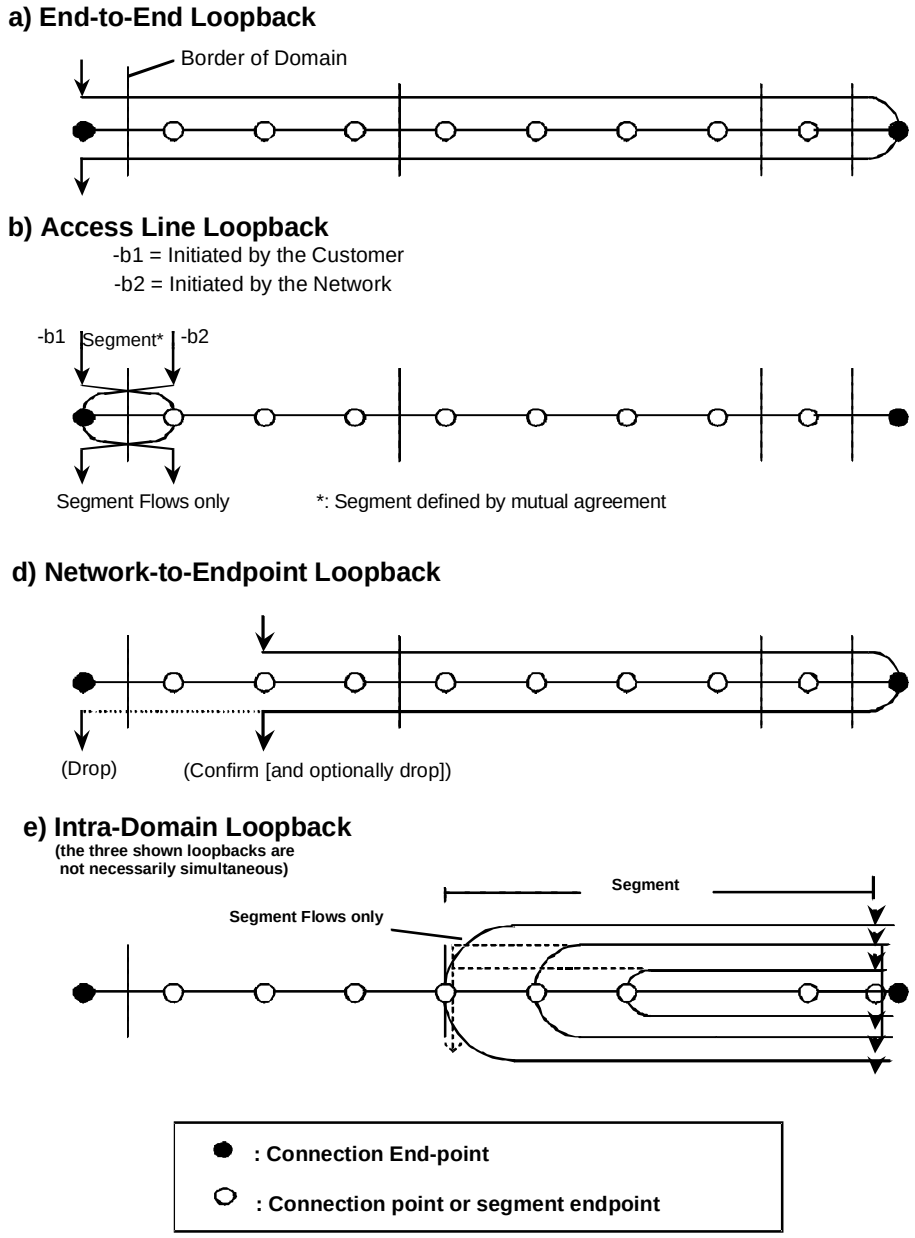


Figure 7/I.610 (part of): Loopback applications

6.7.5.2.1.2 VP Performance Management Functions

reference:	ITU-T Recommendation I.610 [24] as amended in ETS 300 404 [8]	clause clause	6.2.1.2 5	relevant	A

6.7.5.2.1.3 VP System Management

reference:	ITU-T Recommendation I.610 [24] as amended in ETS 300 404 [8]	clause clause	6.2.1.3 5	relevant	I

6.7.5.2.2 OAM functions for the VCC (F5 flow)

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.2	relevant	I

Modified Text: This subclause addresses VC-level Fault Management and Performance Management functions applicable to B-TE. As a general guidance, all the functions indicated for VCC end-points and also for VCC segment end-points are applicable.

6.7.5.2.2.1 Virtual Channel Fault Management Functions

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.2.1	relevant	A

Modified Text: The following Fault Management functions are applicable to B-TEs.

6.7.5.2.2.1.1 VC-AIS and VC-RDI Defect Indications

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.2.1.1	relevant	A

Modified Text: VC-AIS and VC-RDI defect indications shall be used for respectively identifying and reporting VCC defects end-to-end. Segment VC-AIS and VC-RDI cells are for further study. As described in figure 6, B-TEs always represent a connection end-point for OAM flows. They may also act as a segment end-point and process segment OAM cells. B-TEs are not allowed to generate VC-AIS but they can manage the VC-AIS state as indicated in the subclause 6.7.5.2.2.1.1.1.

6.7.5.2.2.1.1.1 VC-AIS

reference:	ITU-T Recommendation I.610 [24] as amended by ETS 300 404 [8]	clause clause	6.2.2.1.1.1 5	relevant	A

Modified Text: *VC-AIS Cell Detection* – VC-AIS cells are detected at the VCC end-point (e.g. in the B-TE).

VC-AIS state declaration and release conditions – VC-AIS state is declared at the VCC end-point (e.g. in the B-TE) as soon as a VC-AIS cell is received, a transmission path-AIS defect (see note) or a VCC defect (e.g., loss of VCC continuity) is detected at this end-point. The VC-AIS state is released when a user cell (see table 1/I.610) or CC cell is received. If CC is not activated the VC-AIS state is also released if VC-AIS cells are absent for nominally 2.5 s, with a margin of +/-0.5 s.

NOTE: A transmission channel AIS defect indication results from defects observed at the regenerator section, multiplex section or transmission path level as mentioned in tables 3 and 4/I.610.

6.7.5.2.2.1.1.2 VC-RDI

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.2.1.1.2	relevant	A

Modified Text: VC-RDI is sent to the far-end from a VCC end-point as soon as it has declared a VC-AIS state.

VC-RDI Cell Generation condition – VC-RDI cells are generated and transmitted periodically while the VC-AIS state persists in order to indicate in the backward (i.e. outgoing) direction an interruption of the cell transfer capability at the VC level in the forward (i.e. incoming) direction. Generation frequency of VC-RDI cells is nominally one cell per s and shall be the same for all VCCs concerned.

VC-RDI cell generation shall be stopped as soon as the VC-AIS state is released.

VC-RDI Cell Detection – VC-RDI cells are detected at the VCC end-point (e.g. in the B-TE) and VC-RDI state is declared after the reception of one VC-RDI cell.

VC-RDI state declaration and release conditions – VC-RDI state is declared at the VCC end-point (e.g. in the B-TE) as soon as a VC-RDI cell is received at this point. The VC-RDI state is released at the VCC end-point when no VC-RDI cell is received during a nominally 2,5 s period, with a margin of +/-0,5 s.

6.7.5.2.2.1.2 VCC CC

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.2.1.2	relevant	A

Modified Text: CC can be simultaneously carried out end-to-end or at Segment level by a B-TE on a certain number of selected active VCCs in each direction. The value of this number is outside the scope of the present document.

CC can be activated either during connection establishment or at any time after the connection has been established. The activation within the domain controlled by customers, depends on the customer equipment capability and is under customer responsibility.

Procedures for activation (and associated deactivation) are described in subclause 6.7.5.2.3. The possibility to activate the CC on all active VCCs and VCC Segments terminated in a B-TE remains as an option.

Between the two alternative mechanisms proposed in ITU-T Recommendation I.610 [24], subclause 6.2.1.1.2, only the following mechanism (option 1) is retained for B-TEs.

1) A CC cell is sent downstream by a VCC source-point or a VCC Segment source-point when no user cell has been sent for a period of nominally 1 s.

When the VCC end-point with CC activated does not receive any user cell or CC cell within a time interval of 3,5 s, with a margin of +/-0,5 s, it will declare the VC-AIS state due to a Loss of Continuity (LOC) defect.

When the VCC Segment end-point does not receive any user cell or CC cell within a time interval of 3,5 s, with a margin of +/-0,5 s, it will declare a Loss of Continuity (LOC) defect. Since in this case the segment end-point coincides with the VCC end-point in the B-TE, the LOC defect will be notified internally and, therefore, the VCC end-point will declare also the VC-AIS state.

6.7.5.2.2.1.3 VC Loopback Capability

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.2.1.3	relevant	A

6.7.5.2.2.1.3.1 General Description

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.2.1.3.1	relevant	I

Modified Text: The ATM Layer loopback capability allows for operations related information to be inserted at one location along a VCC and returned (or looped back) at a different location, without having to take the connection out-of-service. This capability is performed by non-intrusively inserting a loopback OAM cell at an accessible point along the VCC (i.e., at an end-point such as B-TE or any connecting point). This cell is looped back at a downstream point following either an instruction from the System Management, or the information contained in its information field.

6.7.5.2.2.1.3.2 Principles of Operation

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.2.1.3.2	relevant	A

Modified Text:

1) End to end and segment loopback cells can be inserted at B-TE The possibility to analyse the content of the LLID field of segment loopback cells shall be provided so as to verify that the loopback action can be performed.

2) Segment Loopback cells can be looped back at B-TEs. The possibility to analyse the content of the LLID field of segment loopback cells shall be provided so as to verify that the loopback action can be performed.

3) The waiting time between the transmission of successive loopbacks on a connection shall be 5 s. The loopback shall be considered unsuccessful if the loopback cell is not returned to the originating point within 5 s.

4) A means to confirm that loopback is performed at the ATM Layer, rather than at the Physical Layer, is provided by requiring the loopback point to change a field (the Loopback Indication Field - described in subclause 7.2.4/I.610) within the Loopback cell payload. This principle is illustrated in figure 6/I.610. The requirement for the loopback point to change the Loopback indication, also overcomes the problem of infinite loopback that would otherwise occur with the use of the default (all 1's) Loopback Location Identifier.

5) Subclause 6.7.9 of the present document shows the detailed procedures which should be performed when a loopback cell is received by a B-TE.

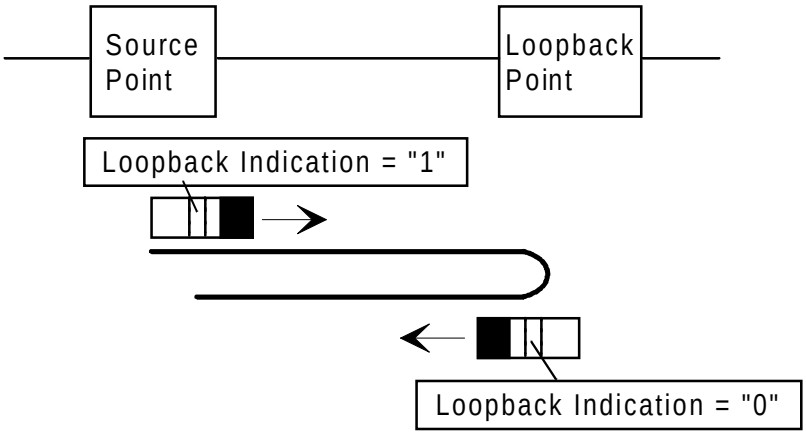


Figure 6/I.610: The Loopback Indication Function

6.7.5.2.2.1.3.3 Loopback Applications

reference:	ITU-T Recommendation I.610 [24] as amended in ETS 300 404 [8]	clause clause	6.2.2.1.3.3 5	relevant	A

Modified Text: The loopback capability supports the applications shown in figure 7/I.610. The applications, in case of B-TEs, are limited to the four following cases:

a) End-to-End Loopback: A VC end-to-end loopback cell is inserted by a VC end-point, and looped back by the corresponding far-end VC end-point.

b) Access Line Loopback: A VC segment loopback cell is inserted by the customer or the network, and looped back by the first ATM node in the network or customer equipment respectively. For this application, the segment is defined by mutual agreement.

c) Network-to-End-point Loopback: A VC end-to-end loopback cell is inserted by one network operator, and looped back by the VCC end-point in another domain.

d) Intra-Domain loopback: A VC segment loopback cell is inserted by a VC connection/segment end-point , and looped back by a VC segment or a VC connecting point. For this application, the use of the Loopback Location Identifier is optional. Note that the segment has to be previously agreed between the customer and the network. The TE can act as a segment end-point. This loopback application could be used in case of several ATM nodes exist in the CI.

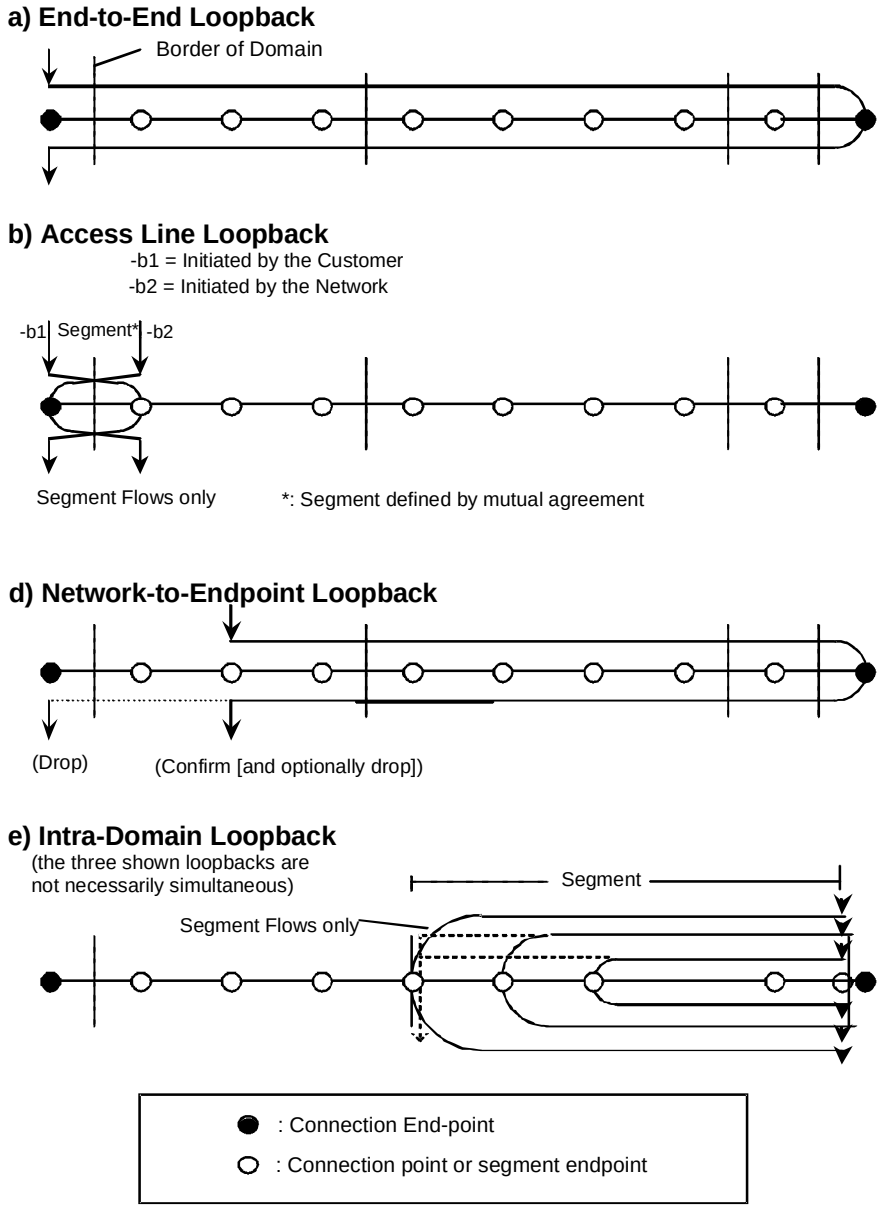


Figure 7/I.610 (part of): Loopback applications

6.7.5.2.2.2 VC Performance Management Functions

reference:	ITU-T Recommendation I.610 [24] as amended in ETS 300 404 [8]	clause clause	6.2.2.2 5	relevant	A

6.7.5.2.2.3 VC System Management

reference:	ITU-T Recommendation I.610 [24] as amended in ETS 300 404 [8]	clause clause	6.2.2.3 5	relevant	I

6.7.5.2.3 Activation/Deactivation Procedures

reference:	ITU-T Recommendation I.610 [24]	clause	6.2.3	relevant	I

Modified Text: The following text should appear in the next version of ITU-T Recommendation I.610

The following procedures are identical at both the VP and VC level. Performance monitoring and CC can be activated either during connection/segment establishment or at any time after the connection/segment has been established. Such activation (and associated deactivation) is initiated by the TMN or by the end-user (e.g. B-TE). After the TMN or the end-user has requested activation/deactivation of performance monitoring or CC, an initialization procedure is needed between the two end-points of the connection (or connection segment) to properly initialize the OAM process. Specifically, this initialization procedure serves the following purposes:

- to co-ordinate the beginning or end of the transmission and downstream reception of OAM cells used to monitor performance or check continuity;
- to establish agreement on the type of monitoring to be performed (i.e. Forward Monitoring (FM) only or both FM and the associated Backward Reporting (BR)), Block Size and the direction of transmission for performance monitoring activation requests.

The initialization procedure is performed by either: (a) using Activation/Deactivation OAM cells as illustrated in figures 8/I.610 and 9/I.610 for activation and deactivation, respectively, or (b) entirely via TMN as described below. The detailed specification of the Activation/Deactivation OAM procedure (a) is given in annex B/I.610.

The possibility of activation/deactivation performed via the Xu interface is not precluded for the customer. In this case, the procedure is similar to the one proposed for activation/deactivation via TMN, as it is described below.

For the case where performance monitoring or CC is to be established on a connection or connection segment with end-points contained in a single administrative domain, the OAM function activation and deactivation may be also entirely carried out by the TMN. In this case the following information is necessary from the TMN:

1) Identification of the specific connection or connection segment on which performance monitoring or CC activation/deactivation is desired;
2) The direction of action;
3) For performance monitoring activation requests, one (and only one) Block Size must be specified for the FM direction. No Block Size is reported for the BR direction.

For the case where the connection or connection segment crosses an administrative boundary, performance monitoring or CC activation and deactivation may in special cases be also entirely carried out by the TMN. This, however, requires mutual agreement and TMN co-ordination among network providers and end-users as applicable.

In both cases above, the TMN is responsible for co-ordinating the connection or connection segment end-points' activities. Therefore, it is necessary that actions be completed one direction at a time.

As an example of this procedure, activation of a bi-directional performance monitoring on connection A-B may be carried out by the following four steps:

In the A to B direction:

1) End-point B is commanded to activate the sink-process of the performance monitoring function;

2) End-point A is commanded to activate the source-process of the performance monitoring function.

In the B to A direction:

3) End-point A is commanded to activate the sink-process of the performance monitoring function;

4) End-point B is commanded to activate the source-process of the performance monitoring function.

Deactivation of the performance monitoring function for connection A-B would follow these steps in reverse order.

As another example of this procedure, activation of a bi-directional CC on connection A-B may be carried out by the following four steps:

In the A to B direction:

1) End-point A is commanded to activate the source-process of the CC function;

2) End-point B is commanded to activate the sink-process of the CC function.

In the B to A direction:

3) End-point B is commanded to activate the source-process of the CC function;

4) End-point A is commanded to activate the sink-process of the CC function.

Deactivation of the CC function for connection A-B would follow these steps in reverse order.

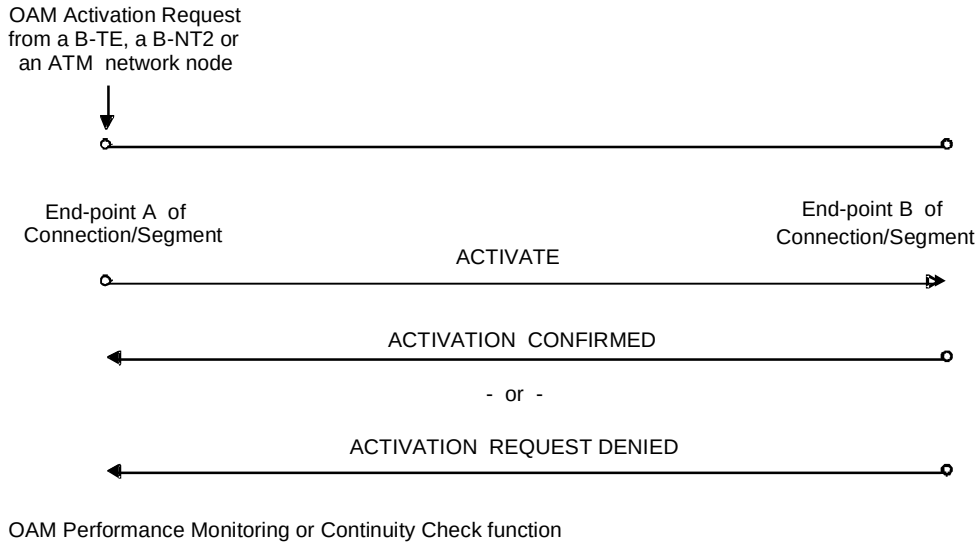


Figure 8/I.610: Initialization procedure for PM or CC activation via Activation OAM cells

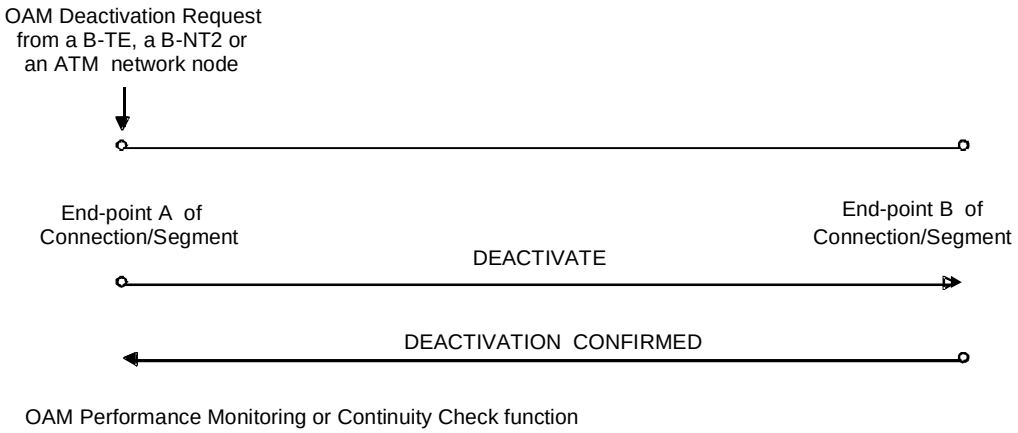


Figure 9/I.610: Initialization procedure for PM or CC deactivation via Deactivation OAM cells

6.7.6 ATM Layer OAM Cell Format

reference:	ITU-T Recommendation I.610 [24]	clause	7	relevant	A

Modified Text: The ATM Layer OAM cells contain fields common to all types of OAM cells (see table 6/I.610) as well as specific fields for each type of OAM cell. The coding principles for unused common and specific fields are:

Unused OAM cell information field octets are coded 0110 1010 (6AH);

Unused OAM cell information field bits (incomplete octets) are coded all zero.

The unused octets and unused bits are not to be checked by the receiver for conformance to this coding rule. A connecting point (which is not also a Segment end-point) shall transparently transfer all OAM cells regardless the encoding within a given field (except possibly for the case of loopback cells, see subclause 6.2.1.1.3.2 and subclause 6.2.2.1.3.2/I.610).

Further enhancements to ITU-T Recommendation I.610 [24] should ensure that equipment supporting lower versions has no compatibility problems related to the content of OAM cells. That is functions and encodings of defined fields shall not be redefined in the future.

However, unused fields and unused code-points may be defined in future releases of ITU-T Recommendation I.610 [24] and are therefore reserved.

For the purpose of ITU-T Recommendation I.610 [24] the leftmost bit is the Most Significant Bit (MSB) and transmitted first.

Table 6/I.610: OAM Type and Function Type Identifiers

OAM Type	Coding	Function Type	Coding
Fault Management	0001	AIS	0000
	0001	RDI	0001
	0001	CC	0100
	0001	Loopback	1000
Performance Management	0010	FM	0000
	0010	BR	0001
Activation/Deactivation	1000	FM and the associated BR	0000
	1000	CC	0001
	1000	FM	0010
System Management	1111	(see note)	(see note)
NOTE: Not to be standardized by ITU-T Recommendation I.610 [24].			

6.7.6.1 Common OAM Cell Fields

reference:	ITU-T Recommendation I.610 [24]	clause	7.1	relevant	A

6.7.6.2 Specific Fields for Fault Management Cell

reference:	ITU-T Recommendation I.610 [24] as amended in ETS 300 404 [8]	clause	7.2	relevant	A

6.7.6.2.1 AIS/RDI Fault management Cell

reference:	ITU-T Recommendation I.610 [24] as amended in ETS 300 404 [8]	clause	7.2.1	relevant	A

6.7.6.2.2 CC Fault Management Cell

reference:	ITU-T Recommendation I.610 [24] as amended by ETS 300 404 [8]	clause clause	7.2.3 5	relevant	A

6.7.6.2.3 Loopback Cell

reference:	ITU-T Recommendation I.610 [24] as amended by ETS 300 404 [8]	clause clause	7.2.4 5	relevant	A

Modified Text: The following text shall replace the text of subclause 7.2.4/I.610. It should be noted that the first sentence and first bullet item remain unchanged in this subclause. Figure 12/I.610 - not reproduced here - is unchanged and should be also retained.

The OAM cell format for VP/VC end-to-end and segment level loopback is provided in figure 12/I.610. The function specific fields consist of:

- Loopback Indication Field (1 octet). The Least Significant Bit (LSB) of this field provides a Boolean indication as to whether or not the cell has already been looped back. The field confirms that the loopback has occurred at the ATM Layer and avoids the problem of infinite loopback that would otherwise occur when the default (all 1's) Loopback Location ID field is used. The source point encodes this field as 00000001. The loop back point changes the encoding to 00000000.

- Correlation Tag Field. (4 octets) This field is used to correlate the transmitted OAM cell with the received OAM cell. Consecutively generated Correlation Tag should be different in order to verify that the received LB cell actually corresponds to the one which was forwarded and successfully Loopbacked.

- Loopback Location ID Field (16 octets). This field identifies the CP along the virtual connection or connection segment, where the loopback is to occur.
  For end-to-end Loopback cells, the default value all 1's represents the connection end-point.
  For Segment Loopback cells, the default value all 1's represents:
  - the connection segment end-point;
  - and any other intermediate CP within the Segment, for which the LLID option is enabled by the TMN.

- Source ID Field (16 octets) The content of this field shall be fixed to the default value all 1's.

Subclause 6.7.9 of the present document shows the detailed procedures which should be performed when a loopback cell is received by a network element.

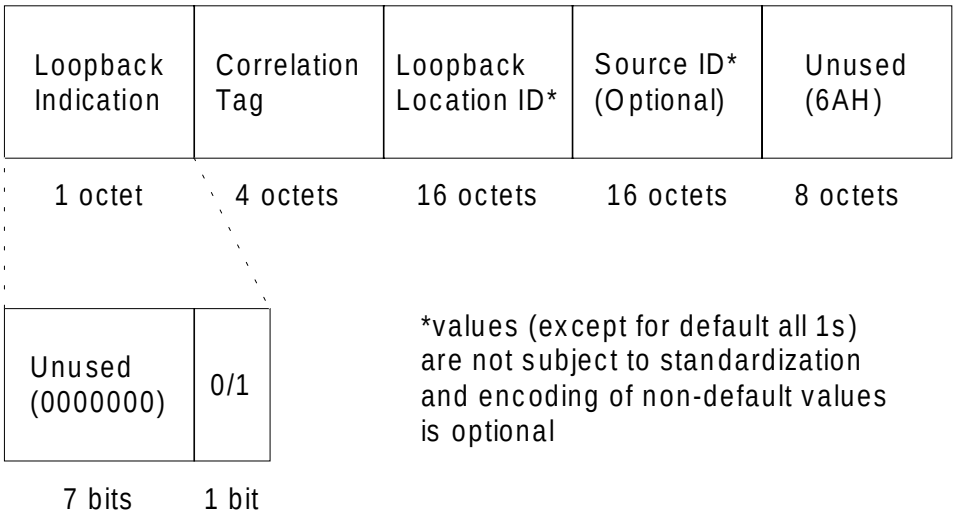


Figure 12/I.610 Specific Fields for Loopback Cell

6.7.6.3 Specific Fields for Performance Management Cell

reference:	ITU-T Recommendation I.610 [24] as amended by ETS 300 404 [8]	clause clause	7.3 5	relevant	A

Modified Text: The Function Type field for Performance Management applications will be used to identify the following possible functions: FM and BR. When FM and BR functions are both activated for a given connection, OAM information related to a given cell block -which is transmitted in the forward direction- has to be carried in both directions by corresponding Forward Monitoring and BR OAM cells referred to as 'paired' OAM cells, i.e., for each received Forward Monitoring OAM cell a corresponding BR cell shall be issued.

NOTE: In the case that the source cannot recognize the loss of FM cells the calculations of lost "user" cells can be erroneous. This may be observed in the case that two or more consecutive FM cells are lost while performance analysis is performed at the far end by using the content of BR cells.

The Performance Management Cell will have the following function specific fields:

MCSN	$TUC\text{-}0+1$	$BEDC\text{-}0+1$	$TUC\text{-}0$	TSTP (Optional)	Unused	$TRCC\text{-}0$	$BLER\text{-}0+1$	$TRCC\text{-}0+1$
8 bits	16 bits	16 bits	16 bits	32 bits	29 octets	16 bits	8 bits	16 bits

$BEDC\text{-}_{0+1}$ is only used for FM cells.

$TRCC\text{-}_0$, $BLER\text{-}_{0+1}$ and $TRCC\text{-}_{0+1}$ are only used for BR cells.

MCSN, $TUC\text{-}_0$, TSTP and $TUC\text{-}_{0+1}$ fields are used for both types of PM-OAM cells.

Figure 13/I.610: Specific Fields for the FM and the BR Performance Management Cell

6.7.6.4 Specific Fields for Activation/Deactivation Cell

reference:	ITU-T Recommendation I.610 [24]	clause	7.4	relevant	I

Modified Text: The Function Type field for Activation/Deactivation applications will be used to identify the following possible function:

– PM Activation/Deactivation; and

– *CC* Activation/Deactivation.

The Activation/Deactivation cell will have the following specific fields:

Message ID	Directions of Action	Correlation Tag	PM Block Size A-B	PM Block Size B-A	Unused octets (6AH)
6 bits	2 bits	8 bits	4 bits	4 bits	336 bits

Figure 14/I.610: Specific Fields for Activation/deactivation Cell

Table 7/I.610: Message ID Values

Message	Command/ Response	Coding
Activate	Command	000001
Activation Confirmed	Response	000010
Activation Request Denied	Response	000011
Deactivate	Command	000101
Deactivation Confirmed	Response	000110

1) *Message (6 bits)* – This field indicates the message ID for activating or deactivating specific VPC/VCC OAM functions. Code values for this field are shown in table 7/I.610.

2) *Correlation Tag (8 bits)* – A correlation tag is generated for each message so nodes can correlate commands with responses. That is, the correlation tag in a response must match the correlation tag in the associated command. Consecutively generated correlation tags should be different, in order to correctly correlate commands with responses.

3) *Direction(s) of Action (2 bits)* – This field identifies the direction(s) of transmission to activate/deactivate OAM function. The A-B and B-A notation is used to differentiate between the direction of transmission away or towards the activator/deactivator, respectively. This field value is used as a parameter for the ACTIVATE and DEACTIVATE messages. This field shall be encoded as 01 for B-A, 10 for A-B, 11 for two-way action, and 00 (default value) when not applicable.

4) *PM Block Size A-B (4 bits)* – This field specifies the A-B block size for FM required by the activator for the Performance Monitoring function. Currently defined code values for this field are shown in table 8. This field value is used as a parameter for the ACTIVATE and ACTIVATION CONFIRMED messages. The default value for this field shall be 0000 for all other messages and when activating/deactivating CC.

5) *PM Block Size B-A (4 bits)* – This field specifies the B-A block size required by the activator for the Performance Monitoring function. It is encoded and used in the same manner as the Block Size A-B field.

Table 8/I.610: PM Block Size Encodings

	PM Block Size	Coding
Other	unused	0000
ACTIVATE	1024	0001
and	512	0010
ACTIVATE CONFIRMED	256	0100
for performance monitoring	128	1000

6.7.6.5 Specific Fields for System Management Cell

reference:	ITU-T Recommendation I.610 [24]	clause	7.5	relevant	I

Modified Text: The use of the function specific fields is out of scope of the present document, but other standardization bodies, such as the ATM Forum might specify these fields.

6.7.7 VC/VP Status Monitoring

reference:	ITU-T Recommendation I.610 [24]	clause	annex A/I.610	relevant	A

6.7.8 Specification and Description Languages (SDLs) for activation/deactivation using OAM cells

reference:	ITU-T Recommendation I.610 [24]	clause	annex B/I.610	relevant	A

6.7.9 Procedures to be performed when receiving Loopback OAM cells

reference:	ITU-T Recommendation I.610 [24]	clause	annex C/I.610	relevant	I

Modified Text: The following diagram and text is informative material related to the way in which loopback procedures should be performed. It constitutes an enhancement of the current content of annex C/I.610.

Figure 7 provides the procedures to be performed when receiving end-to-end or Segment loopback OAM cells (referred to as end-to-end LB/Seg_LB cells) at a Segment end-point or a connection end-point within a B-TE. The procedure uses the concept of loopback state which is defined as follows:

- A segment or connection source end-point shall enter the loopback state as soon as either a Seg_LB or an end-to-end LB cell is forwarded from this segment or connection source end-point (cell sent with Length Indicator (LI) = 1);
- Exit from this state shall occur after a waiting time of (tbd, suggested: 6) seconds +/- (tbd, suggested: 1) second ;
- While in the loopback state, a segment or connection source end-point shall not initiate any other end-to-end or Seg_LB procedure;
- During the loopback state, "Returned" loopback cells (LI = 0) shall be further analysed.

The following requirements constitute the detailed procedure which applies to Segment Loopback (Seg_LB) and end-to-end Loopback cells.

The main features of the loopback procedure are the following:

C-1 Case of segment Loopback cells:

i) Bounds of a Segment shall be defined prior the use of any Seg_LB cells;

ii) Seg_LB cells can be issued from the Segment Source end-point;

iii) The content of the incoming Seg_LB cells shall be analysed at the Sink/Source Segment end-points (if defined in the B-TE). The following analysis shall be performed:

- if the Loopback Indication field (LI) of the incoming Seg_LB cell is equal to '1' (in which case this cell is referred to as a "parent cell") then two cases have to be considered:

- if the Loopback Location ID (LLID) value matches either the ID of the segment sink end-point (referred to as the CPID) or the default all '1's value, then a Seg_LB cell (referred to as the "returned" Seg_LB cell) shall be transmitted as soon as possible in the opposite direction within (tbd, suggested 1-3) seconds from the segment sink end-point which received the "parent" Seg_LB cell . The "parent" Seg_LB cell is extracted (see also item iv). The "returned" Seg_LB cell shall have its specific fields filled as follows:
  - LI is set to "0";
  - Correlation Tag is set to the value of the corresponding field of the "parent" Seg_LB cell;
  - Source ID is set to all '1's;
  - LLID is set to the value of the CPID (ID of the CP which returns the loopback cell);
  - Unused octets are set to 6AH.
- otherwise no "returned" Seg_LB cell is produced;
- if the LI field of the incoming Seg_LB cell is equal to '0', then two cases have to be considered:
  - the segment sink end-point is in the "Loopback state" in which case the Correlation Tag of the incoming Seg_LB cell shall be analysed so as to check whether the loopback was successful or not. If the loopback is successful (see note 2) then the value of the LLID field of the "returned" Seg_LB cell shall be stored in the B-TE for further processing. The "incoming" Seg_LB cell is removed at the Segment end-point;
  - otherwise no further analysis is performed and the segment loopback cell is discarded.

iv) All types of Seg_LB cells (LI = "1" or "0") shall be removed at the Segment Sink end-point.

C-2 Case of end-to-end Loopback cells :

i) End-to-end cells can be issued from a connection source end-point;

ii) The content of the incoming end-to-end LB cells shall be analysed at connection sink end-points. The following analysis shall be performed:

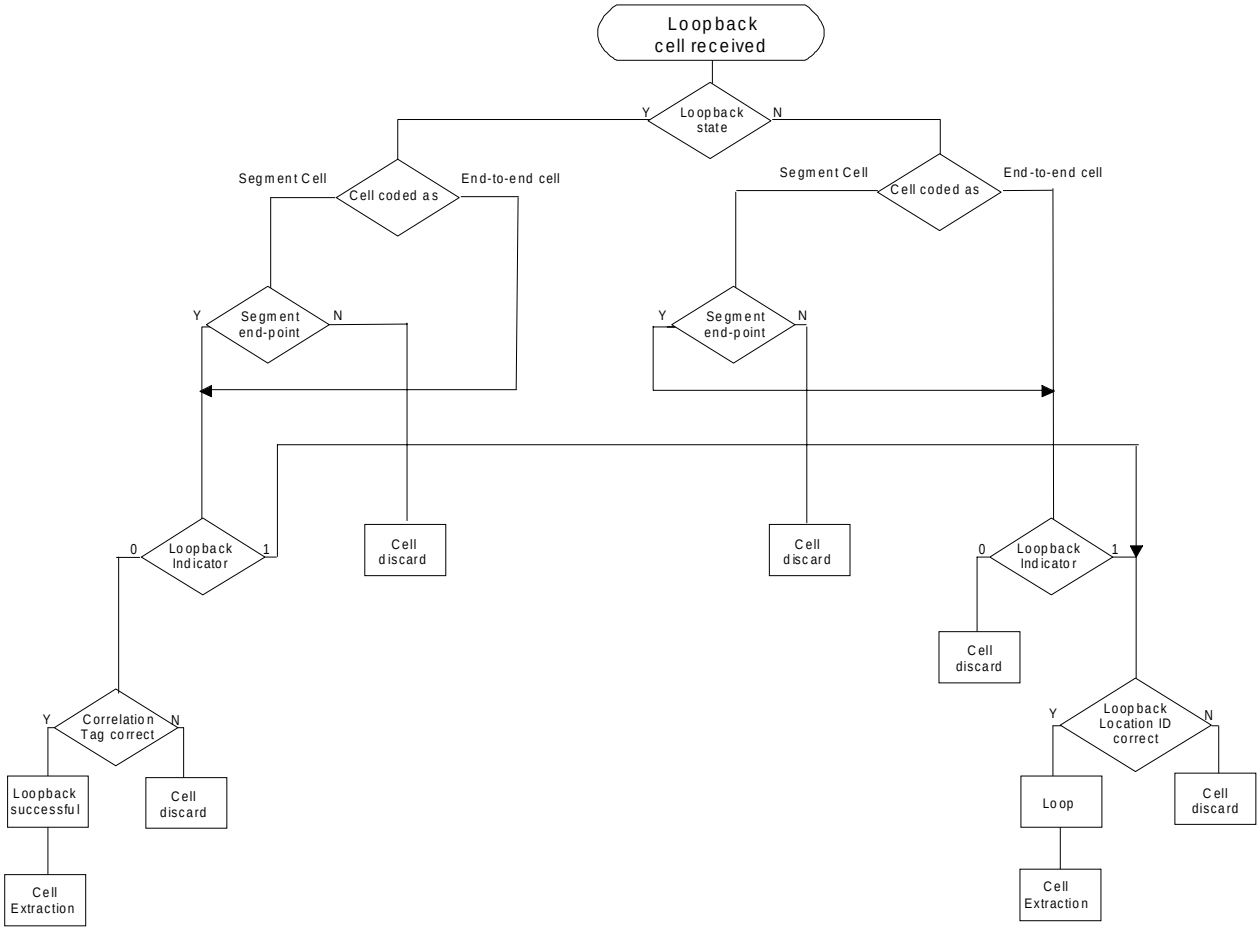
- if the Loopback Indication field (LI) of the incoming end-to-end LB cell is equal to '1' (in which case this cell is referred to as a "parent cell") then the cell has to be processed accordingly to the following procedure:
  - if the LLID value matches either the CPID of the connection end-point or the default all '1's value, then an end-to-end LB cell (referred to as the "returned" end-to-end LB cell) shall be transmitted as soon as possible in the opposite direction within (tbd, suggested 1-3) seconds from the connection end-point which received the "parent" end-to-end LB cell (see note 1). The "returned" end-to-end LB cell shall have its specific fields filled as follows:
  - LI is set to '0';
  - Correlation Tag is set to the value of the corresponding field of the "parent" end-to-end LB cell;
  - Source ID is set to all '1's;
  - LLID is set to the value of the CPID (ID of the CP which returns the loopback cell);
  - Unused octets are set to 6AH;
  - otherwise no "returned" end-to-end LB cell is produced.

- if the LI field of the incoming end-to-end LB cell is equal to '0', then two cases have to be considered:
- the connection end-point is in the "Loopback state" in which case the Correlation Tag of the incoming end-to-end LB cell shall be analysed so as to check whether the loopback was successful or not. If the loopback is successful (see note 2) then the value of the LLID field of the "returned" end-to-end LB cell shall be stored in the NE for further processing. The incoming end-to-end LB is removed at the connection end-point;
- otherwise no further analysis is performed and the incoming end-to-end LB cell is discarded.

iii) All types of end-to-end LB cells (LI = "1" or "0") shall be removed at the connection end-point.

NOTE 1: This corresponds to the "LOOP" action mentioned in the diagram provided in figure 7.

NOTE 2: This corresponds to the "LOOPBACK SUCCESSFUL" action mentioned in the diagram provided in figure 7.



Cell coded as:	Seg_LB or end-to-end LB cells are considered.
Loopback Indication:	LI = 1 or 0 in the case the cell was already looped back.
Correlation Tag correct:	This is obtained when the Correlation Tag value of the "returned" loopback cell (LI = 0) matches the Correlation Tag value of the "parent" loopback cell (i.e. forwarded from the CP with LI = 1).
Loopback Location ID correct:	This is obtained when the LLID value of the "parent" loopback cell matches either the CPID or the default all '1's value.
Loopback successful:	This is obtained when "returned" loopback cells are received with a correct Correlation Tag at a given CP while this CP is in the "loopback state". How to handle the resulting information requires further study.

Figure 7: Diagram notations

6.7.10 Examples of OAM Cell Error Detection Codes

reference:	ITU-T Recommendation I.610 [24]	clause	Appendix /I.610	relevant	I

7 Adaptation layer (AAL)

7.1 AAL TYPE 1

reference:	I-ETS 300 353 [7]	clause	4	relevant	I

7.1.1 Service primitives provided by AAL type 1

reference:	I-ETS 300 353 [7]	clause	4.1	relevant	I

7.1.1.1 AAL-UNIT DATA-REQUEST

reference:	I-ETS 300 353 [7]	clause	4.1.1	relevant	A

7.1.1.2 AAL-UNIT DATA-INDICATION

reference:	I-ETS 300 353 [7]	clause	4.1.2	relevant	A

7.1.1.3 Definition of parameters

reference:	I-ETS 300 353 [7]	clause	4.1.3	relevant	I

7.1.1.3.1 DATA parameter(Mandatory)

reference:	I-ETS 300 353 [7]	clause	4.1.3.1	relevant	I

7.1.1.3.2 STRUCTURE parameter (Optional use)

reference:	I-ETS 300 353 [7]	clause	4.1.3.2	relevant	I

7.1.1.3.3 STATUS parameter (Local optional use)

reference:	I-ETS 300 353 [7]	clause	4.1.3.3	relevant	I

7.1.2 Interaction with the management and control planes

7.1.2.1 Management plane

reference:	I-ETS 300 353 [7]	clause	4.2.1	relevant	I

7.1.2.2 Control plane

reference:	I-ETS 300 353 [7]	clause	4.2.2	relevant	I

7.1.3 Functions of AAL type 1

reference:	I-ETS 300 353 [7]	clause	4.3	relevant	I

7.1.4 SAR sublayer

7.1.4.1 Functions of the SAR sublayer

reference:	I-ETS 300 353 [7]	clause	4.4.1	relevant	I

7.1.4.2 SAR protocol

reference:	I-ETS 300 353 [7]	clause	4.4.2	relevant	A

7.1.4.2.1 Sequence Number (SN) field

reference:	I-ETS 300 353 [7]	clause	4.4.2.1	relevant	A

7.1.4.2.2 Sequence Number Protection (SNP) field

reference:	I-ETS 300 353 [7]	clause	4.4.2.2	relevant	A

7.1.5 CS

7.1.5.1 Functions of the CS

reference:	I-ETS 300 353 [7]	clause	4.5.1	relevant	I

7.1.5.1.1 Functions of the CS for circuit transport

reference:	I-ETS 300 353 [7]	clause	4.5.1.1	relevant	A

7.1.5.1.2 Functions of the CS for video signal transport

reference:	I-ETS 300 353 [7]	clause	4.5.1.2	relevant	A

7.1.5.1.3 Functions of the CS for voice-band signal transport

reference:	I-ETS 300 353 [7]	clause	4.5.1.3	relevant	A

7.1.5.2 CS protocol

reference:	I-ETS 300 353 [7]	clause	4.5.2	relevant	I

7.1.5.2.1 Sequence Count (SC) operations

reference:	I-ETS 300 353 [7]	clause	4.5.2.1	relevant	I

7.1.5.2.1.1 SC operations at the transmitting end

reference:	I-ETS 300 353 [7]	clause	4.5.2.1.1	relevant	A

7.1.5.2.1.2 SC operations at the receiving end

reference:	I-ETS 300 353 [7]	clause	4.5.2.1.2	relevant	A

7.1.5.2.2 Source clock frequency recovery method

reference:	I-ETS 300 353 [7]	clause	4.5.2.2	relevant	I

7.1.5.2.2.1 SRTS method

reference:	I-ETS 300 353 [7]	clause	4.5.2.2.1	relevant	I

7.1.5.2.2.1.1 General

reference:	I-ETS 300 353 [7]	clause	4.5.2.2.1.1	relevant	I

7.1.5.2.2.1.2 Choice of parameter

reference:	I-ETS 300 353 [7]	clause	4.5.2.2.1.2	relevant	I

7.1.5.2.2.1.3 Network clocks

reference:	I-ETS 300 353 [7]	clause	4.5.2.2.1.3	relevant	I

7.1.5.2.2.1.4 Transport of the Residual Time Stamp (RTS)

reference:	I-ETS 300 353 [7]	clause	4.5.2.2.1.4	relevant	A

7.1.5.2.2.1.5 Plesiochronous network operation

reference:	I-ETS 300 353 [7]	clause	4.5.2.2.1.5	relevant	I

7.1.5.2.2.2 Adaptive clock method

reference:	I-ETS 300 353 [7]	clause	4.5.2.2.2	relevant	I

7.1.5.2.2.3 Combination of SRTS and adaptive clock method

reference:	I-ETS 300 353 [7]	clause	4.5.2.2.3	relevant	I

7.1.5.2.3 Structured Data Transfer (SDT) method

reference:	I-ETS 300 353 [7]	clause	4.5.2.3	relevant	A

7.1.5.2.4 Correction method for bit errors and cell losses for unidirectional video services

reference:	I-ETS 300 353 [7]	clause	4.5.2.4	relevant	A

7.1.5.2.5 Partially filled cells

reference:	I-ETS 300 353 [7]	clause	4.5.2.5	relevant	I

7.2 AAL type 3/4

7.2.1 Framework of AAL type 3/4

reference:	ETS 300 349 [6]	clause	5.1	relevant	I

7.2.2 Information flow across the ATM-AAL type 3/4 boundary

reference:	ETS 300 349 [6]	clause	5.2	relevant	I

7.2.3 Service provided by the AAL type 3/4

reference:	ETS 300 349 [6]	clause	5.3	relevant	I

7.2.3.1 Description of AAL type 3/4 connections

reference:	ETS 300 349 [6]	clause	5.3.1	relevant	I

7.2.3.2 Primitives for the AAL type 3/4

reference:	ETS 300 349 [6]	clause	5.3.2	relevant	I

7.3 The common part of the AAL type 3/4

7.3.1 Services provided by the common part of the AAL type 3/4

reference:	ETS 300 349 [6]	clause	6.1	relevant	I

7.3.1.1 Primitives

reference:	ETS 300 349 [6]	clause	6.1.1	relevant	I

7.3.1.1.1 Primitives for the CPCS of the AAL type 3/4

reference:	ETS 300 349 [6]	clause	6.1.1.1	relevant	I

7.3.1.1.1.1 Primitives for the data transfer service

reference:	ETS 300 349 [6]	clause	6.1.1.1.1	relevant	A

7.3.1.1.1.2 Primitives for the abort service

reference:	ETS 300 349 [6]	clause	6.1.1.1.2	relevant	A

7.3.1.1.2 Service provided by the SAR sublayer

reference:	ETS 300 349 [6]	clause	6.1.1.2	relevant	I

7.3.1.1.3 Primitives for the SAR sublayer of the AAL type 3/4

reference:	ETS 300 349 [6]	clause	6.1.1.3	relevant	I

7.3.1.1.3.1 Primitives for the data transfer service

reference:	ETS 300 349 [6]	clause	6.1.1.3.1	relevant	A

7.3.1.1.3.2 Primitives for the abort service

reference:	ETS 300 349 [6]	clause	6.1.1.3.2	relevant	A

7.3.2 Interaction with the management and control plane

reference:	ETS 300 349 [6]	clause	6.2	relevant	A

7.3.3 Functions, structure and coding of AAL type 3/4

7.3.3.1 SAR sublayer

reference:	ETS 300 349 [6]	clause	6.3.1	relevant	I

7.3.3.1.1 Functions of the SAR sublayer

reference:	ETS 300 349 [6]	clause	6.3.1.1	relevant	A

7.3.3.1.2 SAR-PDU structure and coding

reference:	ETS 300 349 [6]	clause	6.3.1.2	relevant	A

7.3.3.1.2.1 Data-SAR-PDU coding

reference:	ETS 300 349 [6]	clause	6.3.1.2.1	relevant	A

7.3.3.1.2.2 Abort-SAR-PDU coding

reference:	ETS 300 349 [6]	clause	6.3.1.2.2	relevant	A

7.3.3.2 CS

reference:	ETS 300 349 [6]	clause	6.3.2	relevant	I

7.3.3.2.1 Functions, structure and coding for the CPCS

reference:	ETS 300 349 [6]	clause	6.3.2.1	relevant	I

7.3.3.2.1.1 Functions of the CPCS

reference:	ETS 300 349 [6]	clause	6.3.2.1.1	relevant	I

7.3.3.2.1.2 CPCS-PDU structure and coding

reference:	ETS 300 349 [6]	clause	6.3.2.1.2	relevant	A

7.3.4 Procedures

reference:	ETS 300 349 [6]	clause	6.4	relevant	A

7.3.4.1 Procedures of the SAR sublayer

reference:	ETS 300 349 [6]	clause	6.4.1	relevant	A

7.3.4.1.1 State variables of the SAR sublayer at the sender side

reference:	ETS 300 349 [6]	clause	6.4.1.1	relevant	A

7.3.4.1.2 Procedures of the SAR sublayer at the sender side

reference:	ETS 300 349 [6]	clause	6.4.1.2	relevant	A

7.3.4.1.3 State variables of the SAR sublayer at the receiver side

reference:	ETS 300 349 [6]	clause	6.4.1.3	relevant	A

7.3.4.1.4 Procedures of the SAR sublayer at the receiver side

reference:	ETS 300 349 [6]	clause	6.4.1.4	relevant	A

7.3.4.2 Procedures of the CPCS for the MM service

reference:	ETS 300 349 [6]	clause	6.4.2	relevant	I

7.3.4.2.1 State variables of the CPCS at the sender side

reference:	ETS 300 349 [6]	clause	6.4.2.1	relevant	I

7.3.4.2.2 Procedures of the CPCS at the sender side for the MM service

reference:	ETS 300 349 [6]	clause	6.4.2.2	relevant	A

7.3.4.2.3 State variables of the CPCS at the receiver side

reference:	ETS 300 349 [6]	clause	6.4.2.3	relevant	A

7.3.4.2.4 Procedures of the CPCS at the receiver side

reference:	ETS 300 349 [6]	clause	6.4.2.4	relevant	A

7.4 AAL type 5

7.4.1 Framework of AAL type 5

reference:	ETS 300 428 [9]	clause	5.1	relevant	I

7.4.2 Information flow across the AAL-ATM boundary

reference:	ETS 300 428 [9]	clause	5.2	relevant	I

7.4.3 Service provided by the AAL type 5

reference:	ETS 300 428 [9]	clause	5.3	relevant	I

7.4.3.1 Description of AAL type 5 connections

reference:	ETS 300 428 [9]	clause	5.3.1	relevant	I

7.4.3.2 Primitives for the AAL type 5

reference:	ETS 300 428 [9]	clause	5.3.2	relevant	I

7.5 The common part of the AAL type 5

7.5.1 Services provided by the common part of the AAL type 5

reference:	ETS 300 428 [9]	clause	6.1	relevant	I

7.5.1.1 Primitives

reference:	ETS 300 428 [9]	clause	6.1.1	relevant	I

7.5.1.1.1 Primitives for the CPCS of the AAL type 5

reference:	ETS 300 428 [9]	clause	6.1.1.1	relevant	I

7.5.1.1.1.1 Primitives for the data transfer service

reference:	ETS 300 428 [9]	clause	6.1.1.1.1	relevant	A

7.5.1.1.1.2 Primitives for the abort service

reference:	ETS 300 428 [9]	clause	6.1.1.1.2	relevant	I

7.5.1.1.2 Service provided by the SAR sublayer

reference:	ETS 300 428 [9]	clause	6.1.1.2	relevant	I

7.5.1.1.3 Primitives for the SAR sublayer of the AAL type 5

reference:	ETS 300 428 [9]	clause	6.1.1.3	relevant	I

7.5.1.1.3.1 Primitives for the data transfer service

reference:	ETS 300 428 [9]	clause	6.1.1.3.1	relevant	A

7.5.2 Interaction with the management and control plane

reference:	ETS 300 428 [9]	clause	6.2	relevant	I

7.5.3 Functions, structure, and coding of the AAL type 5

reference:	ETS 300 428 [9]	clause	6.3	relevant	I

7.5.3.1 SAR sublayer

reference:	ETS 300 428 [9]	clause	6.3.1	relevant	I

7.5.3.1.1 Functions of the SAR sublayer

reference:	ETS 300 428 [9]	clause	6.3.1.1	relevant	A

7.5.3.1.2 SAR-PDU structure and coding

reference:	ETS 300 428 [9]	clause	6.3.1.2	relevant	A

7.5.3.2 CS

reference:	ETS 300 428 [9]	clause	6.3.2	relevant	I

7.5.3.2.1 Functions, structure, and coding for the CPCS

reference:	ETS 300 428 [9]	clause	6.3.2.1	relevant	I

7.5.3.2.1.1 Functions of the CPCS

reference:	ETS 300 428 [9]	clause	6.3.2.1.1	relevant	I

7.5.3.2.1.2 CPCS structure and coding

reference:	ETS 300 428 [9]	clause	6.3.2.1.2	relevant	A

7.5.4 Procedures

reference:	ETS 300 428 [9]	clause	6.4	relevant	I

7.5.4.1 Procedures of the SAR sublayer

reference:	ETS 300 428 [9]	clause	6.4.1	relevant	A

7.5.4.1.1 State variables of the SAR sublayer at the sender side

reference:	ETS 300 428 [9]	clause	6.4.1.1	relevant	I

7.5.4.1.2 Procedures of the SAR sublayer at the sender side

reference:	ETS 300 428 [9]	clause	6.4.1.2	relevant	A

7.5.4.1.3 State variables of the SAR sublayer at the receiver side

reference:	ETS 300 428 [9]	clause	6.4.1.3	relevant	I

7.5.4.1.4 Procedures of the SAR sublayer at the receiver side

reference:	ETS 300 428 [9]	clause	6.4.1.4	relevant	A

7.5.4.2 Procedures of the CPCS for the MM service

reference:	ETS 300 428 [9]	clause	6.4.2	relevant	A

7.5.4.2.1 State variables of the CPCS at the sender side

reference:	ETS 300 428 [9]	clause	6.4.2.1	relevant	A

7.5.4.2.2 Procedures of the CPCS at the sender side

reference:	ETS 300 428 [9]	clause	6.4.2.2	relevant	A

7.5.4.2.3 State variables of the CPCS at the receiver side

reference:	ETS 300 428 [9]	clause	6.4.2.3	relevant	A

7.5.4.2.4 Procedures of the CPCS at the receiver side

reference:	ETS 300 428 [9]	clause	6.4.2.4	relevant	A

7.5.4.3 Summary of parameters and values for an AAL type 5 connection

reference:	ETS 300 428 [9]	clause	6.4.3	relevant	A

8 Transmitted traffic profiles of equipment

8.1 Traffic descriptors and parameters

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5	relevant	I

8.1.1 Definitions

8.1.1.1 Traffic parameters

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.1.1	relevant	I

8.1.1.2 Traffic descriptors

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.1.2	relevant	I

8.1.2 Requirements

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.2	relevant	I

8.1.3 Traffic contract

8.1.3.1 Traffic contract definition

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.3.1	relevant	I

8.1.3.2 Traffic contract and QoS

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.3.2	relevant	I

8.1.3.3 Traffic contract and CLP

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.3.3	relevant	I

8.1.3.4 Traffic contract and tagging option

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.3.4	relevant	I

8.1.3.5 Impact of CDV on UPC/NPC and resource allocation

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.3.5	relevant	I

8.1.4 Traffic parameter specifications

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.4	relevant	I

8.1.4.1 Peak Cell Rate (PCR)

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.4.1	relevant	I

8.1.4.1.1 PCR definition for a VPC/VCC

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.4.1.1	relevant	I

8.1.4.1.2 Specification of PCR

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.4.1.2	relevant	A

8.1.4.1.3 CDV tolerance specification for PCR

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.4.1.3	relevant	A

8.1.4.2 Sustainable cell rate

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.4.2	relevant	I

8.1.4.2.1 Sustainable cell rate for a VPC/VCC

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.4.2.1	relevant	I

8.1.4.2.2 Specification of the sustainable cell rate and intrinsic burst tolerance

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.4.2.2	relevant	A

8.1.4.2.3 CDV tolerance specification for sustainable cell rate

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.4.2.3	relevant	A

8.1.5 ATM transfer capabilities

8.1.5.1 General

8.1.5.1.1 Definition and requirements

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.1.1	relevant	I

8.1.5.1.2 Multiplexing and interaction of ATCs

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.1.2	relevant	I

8.1.5.2 Applicability of ATM transfer capabilities to application

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.2	relevant	I

8.1.5.3 Deterministic bit rate transfer capability (DBR)

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.3	relevant	I

8.1.5.3.1 Definition and service model

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.3.1	relevant	I

8.1.5.3.2 Source traffic descriptor and CDV tolerances

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.3.2	relevant	A

8.1.5.3.3 Conformance definition and QoS commitments

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.3.3	relevant	I

8.1.5.4 Statistical bit rate capability

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.4	relevant	I

8.1.5.4.1 Definition and service model

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.4.1	relevant	I

8.1.5.4.2 Source traffic descriptor and CDV tolerances

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.4.2	relevant	A

8.1.5.4.3 Conformance definition and QoS commitments

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.4.3	relevant	I

8.1.5.5 ATM block transfer capabilities (ABT)

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5	relevant	I

8.1.5.5.1 ABT with delayed transmission (ABT/DT)

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.1	relevant	I

8.1.5.5.1.1 Definition and service model

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.1.1	relevant	I

8.1.5.5.1.2 Source traffic descriptor and CDV tolerances

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.1.2	relevant	A

8.1.5.5.1.3 Dynamically changing traffic parameters and RM cell format for ABT/DT

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.1.3	relevant	A

8.1.5.5.1.4 Conformance definition and QoS commitments

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.1.4	relevant	I

8.1.5.5.2 ABT with immediate transmission (ABT/IT)

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.2	relevant	II

8.1.5.5.2.1 Definition and service model

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.2.1	relevant	I

8.1.5.5.2.2 Source traffic descriptor and CDV tolerances

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.2.2	relevant	A

8.1.5.5.2.3 Dynamically changing parameters and RM cell format for ABT/IT

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.2.3	relevant	A

8.1.5.5.2.4 Conformance definition and QoS commitments

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.5.2.4	relevant	I

8.1.5.6 Available Bit Rate transfer capability (ABR)

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.6	relevant	I

8.1.5.6.1 Definition and service model

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.6.1	relevant	I

8.1.5.6.2 Source traffic descriptor and CDV tolerances

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.6.2	relevant	A

8.1.5.6.3 Dynamically changing traffic parameters and RM cell format for ABR

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.6.3	relevant	A

8.1.5.6.3.1 Details on the fields

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.6.3.1	relevant	A

8.1.5.6.4 Conformance definition and QoS commitments

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	5.5.6.4	relevant	I

8.2 Functions for traffic control and congestion control

8.2.1 Traffic control and congestion control functions

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.1.1	relevant	I

8.2.2 Traffic control functions

8.2.2.1 Use of VPs for network recourse management

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.1	relevant	I

8.2.2.2 Connection Admission Control (CAC)

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.2	relevant	I

8.2.2.3 Usage parameter control and network parameter control

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3	relevant	I

8.2.2.3.1 UPC/NPC functions

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3.1	relevant	I

8.2.2.3.2 UPC/NPC requirements

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3.2	relevant	I

8.2.2.3.2.1 Performance of cell level UPC/NPC

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3.2.1	relevant	I

8.2.2.3.3 UPC location

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3.3	relevant	I

8.2.2.3.4 NPC location

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3.4	relevant	I

8.2.2.3.5 Traffic parameters subject to control at the UPC/NPC

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3.5	relevant	I

8.2.2.3.6 UPC/NPC actions

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3.6	relevant	I

8.2.2.3.7 Relationship between UPC/NPC, CLP and network performance

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3.7	relevant	I

8.2.2.3.8 ATM layer management functions associated with traffic control

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.3.8	relevant	I

8.2.2.4 Priority control

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.4	relevant	A

8.2.2.5 Traffic shaping

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.5	relevant	A

8.2.2.6 Fast resource management

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.2.6	relevant	I

8.2.3 Congestion control functions

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.3	relevant	I

8.2.3.1 Selective cell discard

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.3.1	relevant	I

8.2.3.2 Explicit forward congestion indication

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.3.2	relevant	I

8.2.3.3 Reaction to UPC/NPC failures

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.3.3	relevant	I

8.2.4 Traffic control interworking functions

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.4	relevant	I

8.2.4.1 Traffic control interworking with FMBS

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	6.4.1	relevant	I

8.3 Procedures for traffic control and congestion control

8.3.1 Recourse management cell format

reference:	ITU-T Recommendation I.371 [21] as endorsed in ETS 300 301 [5]	clause	7.1	relevant	A

9 Signalling

9.1 Signalling A ETS 300 436-1 TM adaptation layer (SAAL)

9.1.1 SSCOP

9.1.1.1 Scope

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	1	relevant	A

9.1.1.2 Normative references

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	2	relevant	A

9.1.1.3 Abbreviations and Acronyms used in ITU-T Recommendation Q.2130

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	3	relevant	A

9.1.1.4 General

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	4	relevant	A

9.1.1.5 Functions of the SSCOP

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	5	relevant	A

9.1.1.6 Elements for Layer to Layer Communication

9.1.1.6.1 Signals between SSCOP and SSCF, and SSCOP and Service Specific CS (SSCS) Layer Management

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	6.1	relevant	A

9.1.1.6.2 State transition diagram for sequences of signals

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	6.2	relevant	A

9.1.1.6.3 Signals between SSCOP and CPCS

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	6.3	relevant	A

9.1.1.7 Protocol elements for Peer-to-Peer Communications

9.1.1.7.1 SSCOP PDUs

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	7.1	relevant	A

9.1.1.7.2 SSCOP PDU formats

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	7.2	relevant	A

9.1.1.7.3 States of SSCOP Protocol Entity

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	7.3	relevant	A

9.1.1.7.4 SSCOP State Variables

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	7.4	relevant	A

9.1.1.7.5 SSCOP PDU Parameters

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	7.5	relevant	A

9.1.1.7.6 SSCOP Timers

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	7.6	relevant	A

9.1.1.7.7 SSCOP Parameters

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	7.7	relevant	A

9.1.1.7.8 SSCOP Credit and Flow Control

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	7.8	relevant	A

9.1.1.8 Specification of SSCOP

9.1.1.8.1 Overview

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	8.1	relevant	A

9.1.1.8.2 SDL Diagrams

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	8.1	relevant	A

9.1.1.9 Management Error Indications

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	annex A	relevant	A

9.1.1.10 Examples of SSCOP Operation

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	Appendix II	relevant	I

9.1.1.11 Summary of Buffer and State Variable Management

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	Appendix III	relevant	I

9.1.1.12 Default window size for SSCOP

reference:	ITU-T Recommendation Q.2110 [10], as modified by ETS 300 436-1 [10]	clause	Appendix IV	relevant	I

9.1.2 Service Specific Co-ordination Function at the user-to-network interface (SSCF at the UNI)

9.1.2.1 Scope

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	1	relevant	A

9.1.2.2 Normative references

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	2	relevant	A

9.1.2.3 Abbreviations and Acronyms used in ITU-T Recommendation Q.2130

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	3	relevant	A

9.1.2.4 General

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	4	relevant	A

9.1.2.5 Services of the SAAL at the UNI

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	5	relevant	A

9.1.2.6 Functions of the SSCF at the UNI and signalling protocol stack

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	6	relevant	A

9.1.2.7 Definition of the boundary of SSCF with Layer 3 at the UNI

9.1.2.7.1 Primitives

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	7.1	relevant	A

9.1.2.7.2 State Transition Diagrams

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	7.2	relevant	A

9.1.2.8 Definition of the boundary of SSCF with SSCOP

9.1.2.8.1 Signals

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	8.1	relevant	A

9.1.2.8.2 Parameters

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	8.2	relevant	A

9.1.2.8.3 Sequences of Signals between SSCF and SSCOP

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	8.3	relevant	A

9.1.2.9 State transition table of SSCF for supporting signalling at the UNI

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	9	relevant	A

9.1.2.10 Boundary to layer management

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	10	relevant	A

9.1.2.11 Applicability of SSCOP parameters and timers to signalling at the UNI

reference:	ITU-T Recommendation Q.2130 [11], as modified by ETS 300 437-1 [11]	clause	11	relevant	A

9.2 DSS2 - Basic call/connection control

9.2.1 Capabilities supported by this Recommendation

9.2.1.1 Support of demand (switched) channel connections

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.1	relevant	I

9.2.1.2 Support of point-to-point connections

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.2	relevant	I

9.2.1.3 Support of connections with symmetric or asymmetric bandwidth

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.3	relevant	I

9.2.1.4 Support of a single connection per call

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.4	relevant	I

9.2.1.5 Protocol support for basic signalling functions

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.5	relevant	I

9.2.1.6 Support of Class A, Class C, and Class X (see ITU-T Recommendation I.211)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.6	relevant	I

9.2.1.7 Support of signalling parameter request and indication

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.7	relevant	I

9.2.1.8 VPCI/VCI support

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.8	relevant	I

9.2.1.9 Out-of-band signalling

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.9	relevant	I

9.2.1.10 Support of error recovery

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.10	relevant	I

9.2.1.11 Support of public UNI ATM addressing

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.11	relevant	I

9.2.1.12 Support of end-to-end compatibility parameter identification

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.12	relevant	I

9.2.1.13 Signalling interworking with N-ISDN and provision of N-ISDN services

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.13	relevant	I

9.2.1.14 Forward compatibility

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	1.3.14	relevant	I

9.2.2 Overview of Call/Connection control

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2	relevant	A

9.2.2.1 B-ISDN Call/connection states at the user side of the interface

9.2.2.1.1 Null (U0)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.1	relevant	A

9.2.2.1.2 Call Initiated (U1)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.2	relevant	A

9.2.2.1.3 Outgoing Call Proceeding (U3)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.3	relevant	A

9.2.2.1.4 Call Delivered (U4)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.4	relevant	A

9.2.2.1.5 Call Present (U6)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.5	relevant	A

9.2.2.1.6 Call Received (U7)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.6	relevant	A

9.2.2.1.7 Connect Request (U8)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.7	relevant	A

9.2.2.1.8 Incoming Call Proceeding (U9)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.8	relevant	A

9.2.2.1.9 Active (U10)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.9	relevant	A

9.2.2.1.10 Release Request (U11)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.10	relevant	A

9.2.2.1.11 Release Indication (U12)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.1.1.11	relevant	A

9.2.2.2 Additional B-ISDN Call/connection states relating to interworking requirements at the user side of the interface

9.2.2.2.1 Overlap receiving (U25)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.2.1.2	relevant	A

9.2.2.3 B-ISDN Call/Connection states for global call reference at the user side of the interface

9.2.2.3.1 Null (Rest 0)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.3.1.1	relevant	A

9.2.2.3.2 Restart request (Rest 1)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.3.1.2	relevant	A

9.2.2.3.3 Restart (Rest 2)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	2.3.1.3	relevant	A

9.2.3 Message functional definitions and content

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.	relevant	A

9.2.3.1 Messages for B-ISDN call and connection control

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1	relevant	A

9.2.3.1.1 ALERTING

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.1	relevant	A

9.2.3.1.2 CALL PROCEEDING

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.2	relevant	A

9.2.3.1.3 CONNECT

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.3	relevant	A

9.2.3.1.4 CONNECT ACKNOWLEDGE

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.4	relevant	A

9.2.3.1.5 RELEASE

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.5	relevant	A

9.2.3.1.6 RELEASE COMPLETE

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.6	relevant	A

9.2.3.1.7 SETUP

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.7	relevant	A

9.2.3.1.8 STATUS

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.8	relevant	A

9.2.3.1.9 STATUS ENQUIRY

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.9	relevant	A

9.2.3.1.10 NOTIFY

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.1.10	relevant	A

9.2.3.2 Additional or modified messages related for the support of 64 kbit/s based ISDN circuit-mode services

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.2	relevant	A

9.2.3.2.1 ALERTING

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.2.1	relevant	A

9.2.3.2.2 CALL PROCEEDING

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.2.2	relevant	A

9.2.3.2.3 CONNECT

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.2.3	relevant	A

9.2.3.2.4 INFORMATION

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.2.4	relevant	A

9.2.3.2.5 PROGRESS

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.2.5	relevant	A

9.2.3.2.6 RELEASE

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.2.6	relevant	A

9.2.3.2.7 SETUP

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.2.7	relevant	A

9.2.3.2.8 SETUP ACKNOWLEDGE

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.2.8	relevant	A

9.2.3.3 Messages used with the global call reference

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.3	relevant	A

9.2.3.3.1 RESTART

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.3.1	relevant	A

9.2.3.3.2 RESTART ACKNOWLEDGE

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	3.3.2	relevant	A

9.2.4 General message format and information elements coding

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4	relevant	A

9.2.4.1 Overview

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.1	relevant	A

9.2.4.2 Protocol discriminator

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.2	relevant	A

9.2.4.3 Call reference

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.3	relevant	A

9.2.4.4 Message type (including message compatibility instruction indicator)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.4.1	relevant	A

9.2.4.5 Message length

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.4.2	relevant	A

9.2.4.6 Variable length information elements for B-ISDN - Coding rules

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.1	relevant	A

9.2.4.7 Variable length information elements for B-ISDN- Extensions of code set

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.2	relevant	A

9.2.4.8 Broadband-locking shift procedure

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.3	relevant	A

9.2.4.9 Broadband-non-locking shift procedure

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.4	relevant	A

9.2.4.10 AAL parameters

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.5	relevant	A

9.2.4.11 ATM traffic descriptor

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.6	relevant	A

9.2.4.12 Broadband bearer capability

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.7	relevant	A

9.2.4.13 Broadband high layer information (B-HLI)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.8	relevant	A

9.2.4.14 Broadband low layer information (B-LLI)

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.9	relevant	A

9.2.4.15 Call state

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.10	relevant	A

9.2.4.16 Called party number

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.11	relevant	A

9.2.4.17 Called party subaddress

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.12	relevant	A

9.2.4.18 Calling party number

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.13	relevant	A

9.2.4.19 Calling party subaddress

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.14	relevant	A

9.2.4.20 Cause

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.15	relevant	A

9.2.4.21 Connection identifier

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.16	relevant	A

9.2.4.22 End-to-end transit delay

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.17	relevant	A

9.2.4.23 QOS parameter

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.18	relevant	A

9.2.4.24 Broadband repeat indicator

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.19	relevant	A

9.2.4.25 Restart indicator

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.20	relevant	A

9.2.4.26 Broadband sending complete

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.21	relevant	A

9.2.4.27 Transit network selection

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.22	relevant	A

9.2.4.28 Notification indicator

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.23	relevant	A

9.2.4.29 OAM traffic descriptor

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.5.24	relevant	A

9.2.4.30 Information elements for the support of 64 kbit/s based ISDN circuit mode services - Coding rules

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.6.1	relevant	A

9.2.4.31 Narrow-band bearer capability

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.6.2	relevant	A

9.2.4.32 Narrow-band high layer compatibility

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.6.3	relevant	A

9.2.4.33 Narrow-band low layer compatibility

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.6.4	relevant	A

9.2.4.34 Progress indicator

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	4.6.5	relevant	A

9.2.5 B-ISDN Call/Connection Control Procedures

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5	relevant	A

Modified Text: This clause describes the general procedures for call/connection control in B-ISDN. Clause 6 specifies the particular features required to provide 64 kbit/s based circuit-mode ISDN services in B-ISDN.

These procedures apply only to the point-to-point access configuration. For point-to-point access configurations, VCI = 5 is used as the signalling channel.

ITU-T Recommendation Q.2931 [12] procedures are used to establish B-ISDN connections over a signalling VC that has already been established. Subsequent connections controlled by the same signalling VC, are distinguished through different call reference values.

For call/connection to be established it must satisfy the following general criteria determined by the network and end systems:

- Basic service support;
- VC availability;
- Physical and virtual network resource availability to provide QoS requested;
- End system resource availability to provide QoS requested;
- End-to-end compatibility.

The call states referred to in this subclause cover the states perceived by the user

Detailed SDL diagrams for the procedures specified in this subclause are contained in annex A of ITU-T Recommendation Q.2931 [12]. When there is an ambiguity in the narrative text, the user side SDL diagrams should be used to resolve the conflict. Where the text and the SDL are in disagreement, the text should be used as the prime source.

9.2.5.1 Call/Connection establishment at the originating interface

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1	relevant	A

9.2.5.1.1 Call/Connection request

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.1	relevant	A

9.2.5.1.2 Connection identifier (VPCI/VCI) allocation/selection - origination

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.2	relevant	A

Modified Text: Two cases exist:

i) Associated Signalling

The layer 3 signalling entity exclusively controls the VCs in the VPC which carries its signalling VC.

ii) Non-Associated Signalling

The layer 3 signalling entity controls the VCs in the VPC which carries its signalling VC and may control VCs in other VPCs.

The user shall support the non-associated signalling procedures and may as an option support the associated signalling procedures. The associated signalling procedures are used only by bilateral agreement between the user and the network.

If the user sends a connection identifier information element with the VP-associated signalling field (see table 4-16/Q.2931) coded with a value not supported by the network, the call will be rejected with cause #36, "VPCI/VCI assignment failure".

9.2.5.1.2.1 Associated signalling

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.2.1	relevant	A

Modified Text: For associated signalling, the user requests a VC in the VPC carrying the signalling VC. The VPC carrying the signalling VC is implicitly indicated.

In the Connection identifier information element, the VP associated signalling field is coded as "VP associated signalling" in the Connection identifier information element and one of the following values is indicated in the Preferred/exclusive field:

a) Exclusive VPCI; any VCI; or,

b) Exclusive VPCI; exclusive VCI.

The selected VCI value is indicated in the Connection identifier information element in the first message returned by the network in response to the SETUP message (e.g., CALL PROCEEDING message). The VP associated signalling field is coded as "VP associated signalling". The Preferred/exclusive field is coded as "Exclusive VPCI; exclusive VCI".

In case a), if the user receives a RELEASE COMPLETE message with cause #45, "no VPCI/VCI available", this means that no VCI is available.

In case b), if the user receives a RELEASE COMPLETE message with the cause #35, "requested VPCI/VCI not available", this means that the indicated VCI is not available.

9.2.5.1.2.2 Non-associated signalling

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.2.2	relevant	A

Modified Text: In the user's request for a VC in the SETUP message, the user shall indicate one of the following:

a) Exclusive VPCI; any VCI;

b) Exclusive VPCI; exclusive VCI; or,

c) No indication is included (i.e., the Connection identifier information element is not included in the SETUP message).

In cases a) and b), the VP associated signalling field is coded as "explicit indication of VPCI" in the Connection identifier information element.

The selected VPCI/VCI value is indicated in the Connection identifier information element in the first message returned by the network in response to the SETUP message (e.g., CALL PROCEEDING message). The VP associated signalling field is coded as "explicit indication of VPCI". The Preferred/exclusive field is coded as "exclusive VPCI; exclusive VCI".

In cases a), if the user receives a RELEASE COMPLETE message with cause #35, "requested VPCI/VCI not available", this means that the VPCI specified by the user is not available.

In case a), if the user receives a RELEASE COMPLETE message with cause #45, "no VPCI/VCI available", this means that no VCI is available.

In case b), if the user receives a RELEASE COMPLETE message with cause #35, "requested VPCI/VCI not available", this means either that the VPCI specified by the user is not available or that the VCI in the indicated VPCI is not available,

In case c), if the user receives a RELEASE COMPLETE message with cause #45, "no VPCI/VCI available", this means that the network is not able to allocate a VCI in any VPCI.

In case a), if the VPCI values in the first response message is not the VPCI value indicated by the user, a RELEASE message with cause #36 "VPCI/VCI assignment failure", shall be sent to the network.

In case b), if the VPCI and VCI values in the first response message are not the VPCI and VCI values indicated by the user, a RELEASE message with cause #36 "VPCI/VCI assignment failure", shall be sent to the network.

9.2.5.1.2.3 Use of VPCIs

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.2.3	relevant	A

Modified Text: The Connection identifier information element is used in signalling messages to identify the corresponding user information flow. The Connection identifier information element contains the Virtual Path Connection Identifier (VPCI) and the VCI. The VPCI is used instead of the VPI since Virtual Path Cross Connects may be used in the access and multiple interfaces could be controlled by the Signalling Virtual Channel (SVC).

The user must understand the relationship between the VPCI used in the signalling protocol and the actual VPI used for the user information flow. VPCIs only have significance with regard to a given SVC.

If the SVC only controls a single interface at the user side, the VPI and the VPCI have the same numerical value at the user side. The following figure illustrates this.

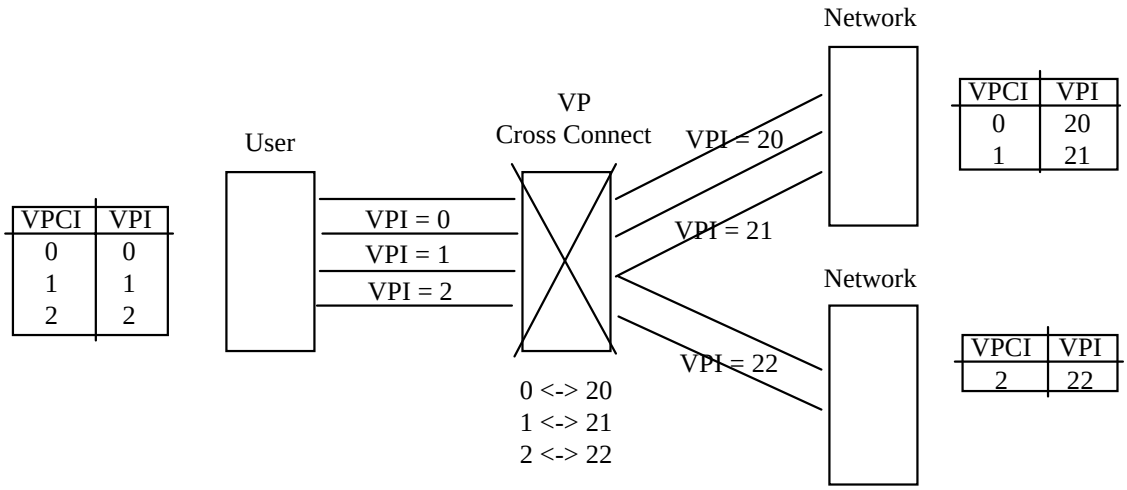


Figure 5-1/Q.2931: Single interface controlled by SVC

If the signalling channel controls multiple interfaces at the user side, the VPCI corresponds to both the interface and a VPI on the interface.

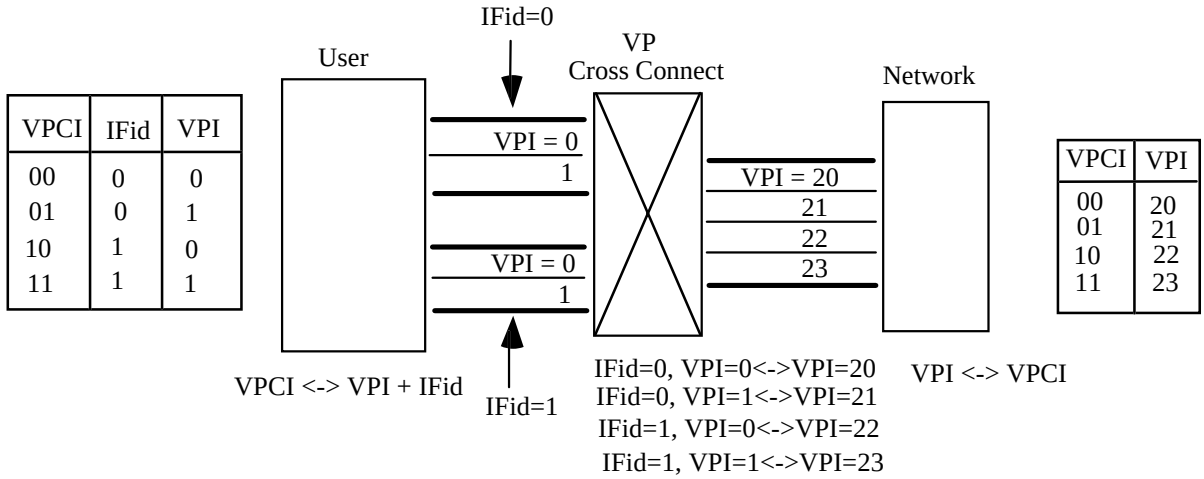


Figure 5-2/Q.2931: Multiple interfaces controlled by SVC

9.2.5.1.2.4 VCI range

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.2.4?	relevant	A

9.2.5.1.3 QOS and traffic parameters selection procedures

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.3	relevant	A

Modified Text: The user shall indicate the QOS class in the QoS parameter information element.

If the user receives a RELEASE COMPLETE message with cause #49, "QoS unavailable", this means that the network is not able to provide the requested QOS class.

The user shall indicate the requested PCR in the ATM user cell rate information element.

If the user receives a RELEASE COMPLETE message with cause #37, "user cell rate unavailable", this means that the network is not able to provide the requested PCR.

9.2.5.1.4 Invalid call/connection control information

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.4	relevant	A

Modified Text: If the user receives a RELEASE COMPLETE message with a cause such as the following:

- No. 1 "unassigned (unallocated) number";
- No. 3 "no route to destination";
- No. 22 "number changed"; or
- No. 28 "invalid number format (address incomplete)".

This means that upon receiving the SETUP message, the network has determined that the call information received from the calling user is invalid (e.g. invalid number).

9.2.5.1.5 Call/connection proceeding

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.5	relevant	A

Text of base standard

If the user receives a CALL PROCEEDING message, this means that the network has determined that access to the requested service is authorized and available and that the call is being processed. When the user receives the CALL PROCEEDING message, the user shall stop timer T303, start timer T310, and enter the Outgoing Call Proceeding state.

If the user receives a RELEASE COMPLETE message with one of the following causes:

- #57 bearer capability not authorized;
- #58 bearer capability not presently available;
- #63 service or option not available, unspecified; or
- #65 bearer service not implemented;

this means that the network has determined that the requested service is not authorized or is not available.

If the user has received a CALL PROCEEDING message, but does not receive an ALERTING, CONNECT, or RELEASE message prior to the expiration of timer T310, then the user shall: initiate clearing procedures towards the network with cause #102, "recovery on timer expiry".

9.2.5.1.6 Call/connection confirmation indication

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.6	relevant	A

Modified Text: If the calling user receives an ALERTING message, this means that user alerting has been initiated at the called address.. When the user receives the ALERTING message, the user may begin an internally-generated alerting indication; stop T310 and shall enter the Call Delivered state.

9.2.5.1.7 Call/connection acceptance

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.7	relevant	A

Modified Text: If the user receives a CONNECT message, this means that the call has been accepted.

This CONNECT message indicates to the calling user that a connection has been established through the network and stops a possible local indication of alerting.

On receipt of the CONNECT message, the calling user shall: stop timer T310 (if running); stop any user-generated alerting indication; attach to the user plane VC if not already done; send a CONNECT ACKNOWLEDGE message; and enter the Active state.

At this point an end-to-end connection is established.

9.2.5.1.8 Call/connection rejection

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.8	relevant	A

Modified Text: If the calling user receives a RELEASE message as described in 5.4, this is an indication that the network or the called user is unable to accept the call, the cause for the rejection being indicated in the RELEASE message.

9.2.5.1.9 Transit network selection

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.1.9	relevant	A

Modified Text: The use of the Transit network selection information element is described in annex D/Q.2931 as modified by the present document.

9.2.5.2 Call/Connection establishment at the destination interface -- point-to-point access configuration call offering

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2	relevant	A

9.2.5.2.1 Incoming Call/Connection request

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.1	relevant	A

Modified Text: Upon receipt of a SETUP message indicating the arrival of a call, the user shall enter the Call Present state.

If the SETUP message includes the Broadband sending complete information element, en-bloc receiving procedure shall be followed. Therefore, on its receipt, the user shall apply the en bloc receiving procedure.

9.2.5.2.2 Address and compatibility check

9.2.5.2.2.1 Address check

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.2.1	relevant	A

9.2.5.2.2.2 Compatibility check- General principles

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.2.2.1	relevant	A

Modified Text: The user shall perform the compatibility check based on the compatibility information received in the SETUP message. In B-ISDN, there are two categories of compatibility information:

Broadband category 1 compatibility information is provided for both the network and the user to determine the attributes of the ATM connection. The broadband category 1 compatibility information is:

- broadband bearer capability information;
- end-to-end transit delay information;
- ATM traffic descriptor;
- QoS parameter; and
- OAM traffic descriptor.

Broadband category 1 compatibility information is always checked by the called user; if the compatibility check fails, the user is incompatible.

Broadband category 2 compatibility information is provided for the called user. The broadband category 2 compatibility information is:

- AAL parameter information (describing the user plane AAL);
- optional Broadband low layer information; and
- optional Broadband high layer information.

NOTE: In this subclause the term "called user" is the endpoint entity which is explicitly addressed. Broadband category 2 compatibility information is always checked by the called user; if the compatibility check fails, the user is incompatible.

9.2.5.2.2.3 Compatibility check- Point-to-point call/connection offering

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.2.2.2	relevant	A

Modified Text: A user receiving a SETUP message shall perform compatibility checking before responding to that SETUP message. Any reference to "user" in subclauses 5.2.3 through 5.2.8 implicitly refers to a compatible user equipment. annex B/Q.2931 defines compatibility checking to be performed by users upon receiving a SETUP message.

An incompatible user shall respond with a RELEASE COMPLETE message with cause #88, "incompatible destination", and enter the Null state.

9.2.5.2.3 Connection identifier (VPCI/VCI) allocation/selection - destination

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.3	relevant	A

Modified Text: Two cases exist:

1) Associated Signalling

The layer 3 signalling entity exclusively controls the VCs in the VPC which carries its signalling VC.

2) Non-Associated Signalling

The layer 3 entity controls the VCs in the VPC which carries its signalling VC and may control VCs in other VPCs.

The user shall support the non-associated signalling procedures and may as an option support the associated signalling procedures. A subscription option is necessary if the network supports both non-associated and associated signalling.

When the user sends a Connection identifier information element with the VP-associated signalling field (see table 4-16/Q.2931) coded with a value not supported by the user, the call will be rejected with cause #36, "VPCI/VCI assignment failure".

9.2.5.2.3.1 Associated signalling

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.3.1	relevant	A

9.2.5.2.3.2 Non-Associated signalling

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.3.2	relevant	A

Modified Text: For non-associated signalling, the user shall receive one of the following indication in the SETUP message:

a) Exclusive VPCI; any VCI;

b) Exclusive VPCI; exclusive VCI; or,

c) No indication is included (i.e., the Connection identifier information element is not included in the SETUP message).

In cases a) and b), if the indicated VPCI is available, the user selects it for the call. In case a), the user selects any available VCI in the VPCI. In case b), if the indicated VCI is available within the VPCI, the user selects it for the call. In case c), the user selects any available VPCI and VCI.

In cases a) and c), the selected VPCI/VCI value is indicated in the Connection identifier information element in the first message returned by the user in response to the SETUP message (e.g., CALL PROCEEDING message). The VP associated signalling field is coded as "explicit indication of VPCI". The Preferred/exclusive field is coded as "exclusive VPCI; exclusive VCI".

In case b), if the Connection identifier information element is not present in the first response message, the connection identifier in the SETUP message shall be assumed.

In cases a) and b), if the specified VPCI is not available, a RELEASE COMPLETE message with cause #35, "requested VPCI/VCI not available", is sent by the user.

In case a), if no VCI is available, a RELEASE COMPLETE message with cause #45, "no VPCI/VCI available", is sent by the user.

In case b), if the VCI in the indicated VPCI is not available, a RELEASE COMPLETE message with cause #35, "requested VPCI/VCI not available", is sent by the user.

In case c), if the user is not able to allocate a VCI in any VPCI, a RELEASE COMPLETE message with cause #45, "no VPCI/VCI available", is sent by the user.

In case a), if the VPCI value in the first response message sent by the user is not the VPCI value indicated by the network, the user will receive a RELEASE message with cause #36 "VPCI/VCI assignment failure".

In case b), if the VPCI and VCI values in the first response message sent by the user are not the VPCI and VCI values indicated by the network, the user will receive a RELEASE message with cause #36 "VPCI/VCI assignment failure".

9.2.5.2.4 QOS and traffic parameter selection procedures

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.4	relevant	A

Modified Text: If the user is not able to provide the requested QOS class, the user shall reject the call, returning a RELEASE COMPLETE message with cause #49, "QoS unavailable".

The cumulative end-to-end transit delay is indicated in the End-to-end transit delay information element. If the user is not able to accept the indicated end-to-end transit delay, the user shall reject the call, returning a RELEASE COMPLETE message with cause #49, "QoS unavailable"

If the user is not able to provide the indicated PCR, the user shall reject the call, returning a RELEASE COMPLETE message with cause #47, "resources unavailable, unspecified".

9.2.5.2.5 Call/Connection confirmation

9.2.5.2.5.1 Response to en-bloc SETUP or completion of overlap receiving

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.5.1	relevant	A

Text of base standard

When the user determines that sufficient call setup information has been received and compatibility requirements (see annex B) have been satisfied, the user responds with either a CALL PROCEEDING, ALERTING, or CONNECT message (see note), and enters the Incoming Call Proceeding, Call Received, or Connect Request state, respectively.

NOTE: The CALL PROCEEDING message may be sent by the user that cannot respond to a SETUP message with an ALERTING, CONNECT, or RELEASE COMPLETE message before expiry of timer T303.

An incompatible user shall respond by sending a RELEASE COMPLETE message with a cause value as specified in annex B, and enter the Null state.

A busy user that satisfies the compatibility requirements indicated in the SETUP message shall normally respond with a RELEASE COMPLETE message with a cause #17, "user busy".

If the user wishes to refuse the call, a RELEASE COMPLETE message shall be sent with cause #21, "call rejected", and the user returns to the Null state.

9.2.5.2.6 Call/Connection acceptance

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.6	relevant	A

9.2.5.2.7 Active indication

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.2.7	relevant	A

Modified Text: The CONNECT ACKNOWLEDGE message indicates completion of the connection establishment procedures. There is no guarantee of an end-to-end connection until a CONNECT message is received at the calling user. Upon receipt of the CONNECT ACKNOWLEDGE message the called user shall: stop timer T313; attach to the user plane VC and enter the Active state.

When timer T313 expires prior to receipt of a CONNECT ACKNOWLEDGE message, the called user shall initiate clearing with cause #102, "recovery on timer expiry", in accordance with subclause 5.4.3.

9.2.5.3 Call/Connection clearing

9.2.5.3.1 Terminology

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.4.1	relevant	A

9.2.5.3.2 Exception conditions

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.4.2	relevant	A

Text of base standard

Under normal conditions, call clearing is usually initiated when the user sends or receives a RELEASE message and follows the procedures defined in 5.4.3 and 5.4.4 respectively. The only exception to the above rule are:

- In response to a received SETUP message, the user can reject a call/connection (e.g. because of the unavailability of a suitable VC) by sending a RELEASE COMPLETE message provided no other response has previously been sent; releasing the call reference; and entering the Null state.
- In response to a SETUP message sent by the user, the user receives as a first response, a RELEASE COMPLETE message from the network rejecting the call/connection (e.g. because of the unavailability of a suitable VC).

9.2.5.3.3 Clearing initiated by the user

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.4.3	relevant	A

Modified Text: Apart from the exceptions identified in subclauses 5.4.2 and 5.6, the user shall initiate clearing by: sending a RELEASE message; starting timer T308 ; disconnecting the VC; and entering the Release Request state.

NOTE: The RELEASE COMPLETE message has only local significance and does not imply an acknowledgement of clearing from the remote user.

On receipt of the RELEASE COMPLETE message the user shall: stop timer T308; release the VC; release the call reference; and return to the Null state.

If timer T308 expires for the first time, the user shall: retransmit a RELEASE message to the network with the cause number originally contained in the first RELEASE message; restart timer T308 and remain in the Release Request state. In addition, the user may indicate a second cause information element with cause #102, "recovery on timer expiry". If no RELEASE COMPLETE message is received from the network before timer T308 expires a second time, the user shall: place the VC in a maintenance condition; release the call reference; and return to the Null state. Equipment shall perform implementation dependent recovery, such as initiating restart procedures.

When user initiates normal call/connection clearing, cause #16, "normal clearing" is used in the first clearing message.

9.2.5.3.4 Clearing initiated by the network

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.4.4	relevant	A

Modified Text: The user shall enter the Release Indication state upon receipt of a RELEASE message. Once the VC used for the call has been disconnected, the user shall: send a RELEASE COMPLETE message to the network; release both its call reference and the VC; and return to the Null state.

9.2.5.3.5 Clear collision

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.4.5	relevant	A

Modified Text: Clear collision can occur when both sides simultaneously transfer RELEASE messages related to the same call reference value. If the user receives a RELEASE message while in the Release Request state, the user shall: stop timer T308; release the call reference and VC; and enter the Null state (without sending or receiving a RELEASE COMPLETE message).

9.2.5.4 Restart procedure

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.5	relevant	A

9.2.5.4.1 Sending RESTART - Normal procedures

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.5.1.1	relevant	A

Modified Text: A RESTART message is sent by the user equipment in order to return VCs to the idle condition. The Restart indicator information element shall be present in the RESTART message to indicate whether an "indicated virtual channel", "all user plane VCs in the indicated VPC controlled via SVC in which the RESTART message is sent", or "all VCs controlled by the layer 3 entity" are to be restarted. If the Restart indicator information element is coded as "indicated virtual channel" or "all user plane VCs in the indicated VPC controlled via SVC in which the RESTART message is sent", then the Connection identifier information element shall be present to indicate which VC or VP is to be returned to the idle condition. If the Restart indicator information element is coded as "all VCs controlled by layer 3 entity which sends the RESTART message", then the Connection identifier information element shall not be included.

Upon transmitting the RESTART message the sender enters the Restart Request state, starts timer T316, and waits for a RESTART ACKNOWLEDGE message. Also, no further RESTART messages shall be sent until a RESTART ACKNOWLEDGE is received or timer T316 expires. Receipt of a RESTART ACKNOWLEDGE message stops timer T316 and indicates that the virtual channel(s) and associated resources (e.g., call reference value(s)) can be freed for re-use. The Null state shall be entered after the VC and call reference value are released.

The RESTART and RESTART ACKNOWLEDGE message shall contain the global call reference value (all zeros) to which the Restart Request state is associated. These messages are transferred using the AAL-DATA request primitive.

Calls associated with restart user plane VCs shall be cleared towards the remote parties using cause #41, "temporary failure".

9.2.5.4.2 Sending RESTART - Exceptional procedures

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.5.1.2	relevant	A

9.2.5.4.3 Receipt of RESTART - Normal procedures

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.5.2.1	relevant	A

9.2.5.4.4 Receipt of RESTART - Exceptional procedures

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.5.2.2	relevant	A

9.2.5.5 Handling of error conditions

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6	relevant	A

9.2.5.5.1 Protocol discrimination error

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.1	relevant	A

9.2.5.5.2 Message too short

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.2	relevant	A

9.2.5.5.3 Call reference error

9.2.5.5.3.1 Invalid call reference format

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.3.1	relevant	A

9.2.5.5.3.2 Call reference procedural errors

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.3.2	relevant	A

9.2.5.5.4 Message type or message sequence errors

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.4	relevant	A

Modified Text: The error procedures in this subclause apply only if the flag in the message compatibility instruction indicator is set to "message instruction field not significant". If it is set to "follow explicit instructions", the procedures in subclause 5.7 take precedence.

Whenever an unexpected message, except RELEASE, RELEASE COMPLETE, or an unrecognized message is received in any state other than the Null state, no state change shall occur and a STATUS message shall be returned with one of the following causes:

a) cause #97, message type non-existent or not implemented; or,

b) cause #101, message not compatible with call state.

However, two exceptions to this procedure exist. The first exception is when the user receives an unexpected RELEASE message in response to a SETUP message. In this case no STATUS or STATUS ENQUIRY message is sent. Whenever the user receives an unexpected RELEASE message, the user shall: release the VC; return a RELEASE COMPLETE message to the network; release the call reference; stop all timers; and enter the Null state.

The second exception is when the user receives an unexpected RELEASE COMPLETE message. Whenever the user receives an unexpected RELEASE COMPLETE message, the user shall: disconnect and release the VC; release the call reference; stop all timers; and enter the Null state.

9.2.5.5.5 Message length error

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.5	relevant	A

9.2.5.5.6 General information element errors

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.6	relevant	A

9.2.5.5.6.1 Information element sequence

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.6.1	relevant	A

9.2.5.5.6.2 Duplicated information elements

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.6.2	relevant	A

9.2.5.5.6.3 Coding standard error

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.6.3	relevant	A

Text of base standard

If the user receives an information element with the coding standard field indicating a coding standard which the user does not support, this information element shall be treated as an information element with a content error. Depending on the information element, the procedures as described in subclause 5.6.7.2 or subclause 5.6.8.2 shall be followed.

9.2.5.5.7 Mandatory information element error

9.2.5.5.7.1 Mandatory information element missing

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.7.1	relevant	A

9.2.5.5.7.2 Mandatory information element content error

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.7.2	relevant	A

9.2.5.5.8 Non-mandatory information element errors

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.8	relevant	A

9.2.5.5.8.1 Unrecognized information element

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.8.1	relevant	A

9.2.5.5.8.2 Unexpected recognized information element

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.8.3	relevant	A

9.2.5.5.9 Signalling AAL connection reset

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.9	relevant	A

Modified Text: Whenever a Q.2931 entity is informed of a spontaneous Signalling AAL reset by means of the AAL-ESTABLISH indication primitive, the following procedures apply:

a) For calls in the clearing phase (states U11, and U12), no action shall be taken.

b) For calls in the establishment phase (states U1, U3, U4, U6, U7, U8 and U9) shall be maintained. Optionally the status enquiry procedure may be invoked.

c) Calls in the Active state shall be maintained, and the entity shall invoke the status enquiry procedures described in subclause 5.6.11.

9.2.5.5.10 Signalling AAL connection release

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.10	relevant	A

Modified Text: Whenever a Q.2931 entity is notified by its Signalling AAL connection release by means of the AAL-RELEASE indication primitive , the following procedure shall apply:

a) Any calls not in the Active state shall be cleared locally.

b) If there is at least one call in the Active state controlled by the released Signalling AAL connection, then timer T309 shall be started. If timer T309 is already running, it shall not be restarted.

The Q.2931 entity shall request Signalling AAL re-establishment by sending an AAL-ESTABLISH request primitive .

When informed of signalling AAL re-establishment by means of the AAL-ESTABLISH.confirm primitive, the following procedure shall apply:

- Stop timer T309; and,
- Perform the status enquiry procedure according to subclause 5.6.11 to verify the call state of the peer entity per each call/connection.

If timer T309 expires prior to Signalling AAL re-establishment, the user shall: disconnect and release the VC; release the call reference; and enter the Null state. The user may clear the attached internal connection (if any) with cause #27, "destination out of order".

9.2.5.5.11 Status enquiry procedure

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.11	relevant	A

Modified Text: To check the correctness of a call state at a peer entity, a STATUS ENQUIRY message may be sent requesting the call state. This may, in particular, apply to procedural error conditions described in subclauses 5.6.9 and 5.6.10.

In addition whenever indication is received from the Signalling AAL that a disruption has occurred at the data link layer, a STATUS ENQUIRY message shall be sent to check the correctness of the call state at the peer entity.

Upon sending the STATUS ENQUIRY message, timer T322 shall be started in anticipation of receiving a STATUS message. While timer T322 is running, only one outstanding request for call state information shall exist. Therefore, if timer T322 is already running, it shall not be restarted. If a clearing message is received before timer T322 expires, timer T322 shall be stopped and call clearing shall continue.

Upon receipt of a STATUS ENQUIRY message, the receiver shall respond with a STATUS message, reporting the current call state (the current state of an active call or a call in progress, or the Null state if the call reference does not relate to an active call or to a call in progress) and cause #30, "response to STATUS ENQUIRY" (see subclause 5.6.4). Receipt of the STATUS ENQUIRY message does not result in a state change.

The sending or receipt of the STATUS message in such a situation will not directly affect the call state of either the sender or receiver. The side having received the STATUS message shall inspect the Cause information element. If a STATUS message is received that contains cause #30, "response to STATUS ENQUIRY", timer T322 shall be stopped and the appropriate action taken, based on the information in that STATUS message, relative to the current state of the receiver.

If timer T322 expires, and no STATUS message was received, the STATUS ENQUIRY message may be retransmitted one or more times until a response is received. The number of times the STATUS ENQUIRY message is retransmitted is an implementation dependent value. If following the maximum number of retransmissions of the STATUS ENQUIRY message, no STATUS message is received before expiry of T322 for the last time, the call shall be cleared to the local interface with cause #41, "temporary failure".

9.2.5.5.12 Receiving a STATUS message

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.6.12	relevant	A

9.2.5.6 Error procedures with explicit action indication

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.7	relevant	A

9.2.5.6.1 Unexpected or unrecognized message type

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.7.1	relevant	A

9.2.5.7 Information element errors

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.7.2	relevant	A

9.2.5.8 Notification procedures

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	5.9	relevant	A

Modified Text: The delivery of bearer-related notifications shall use an active call reference of the call/connection the notification is associated with. In this context, a call reference shall be active from the initiation of call establishment (i.e., the SETUP message) to the initiation of call clearing (i.e., the RELEASE message).

If the delivery of the notification coincides with call/connection establishment or clearing procedures, the notification information can be carried in the associated call control messages. In all other cases, the notification information shall be delivered in a NOTIFY message. In addition a NOTIFY message may be sent or received by the user only after the first response to a SETUP message has been sent or received and before clearing of the call reference is initiated.

No call state change shall occur at either side of the interface following the sending or receipt of a NOTIFY message.

9.2.6 Procedures for the support of 64 kbit/s based circuit-mode lSDN services in B-ISDN

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6	relevant	A

Modified Text: This subclause specifies the particular features required to provide 64 kbit/s based circuit-mode ISDN services in B-ISDN. For the 64 kbit/s based circuit-mode ISDN services also the term "N-ISDN services" is used. This term includes the circuit-mode services described in the I.200-series of Recommendations and supported by the DSS 1 signalling protocol. For these services interworking with N-ISDN is possible.

The description of service provision and interworking in this subclause assumes the communication scenario B as defined in annex A of ITU-T Recommendation I.580 [23].

9.2.6.1 Introduction

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.1	relevant	A

9.2.6.2 Information elements for N-ISDN services in B-ISDN -General aspects

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.2.1	relevant	A

9.2.6.2.1 Bearer service related information

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.2.2	relevant	A

9.2.6.2.2 Low layer related information

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.2.3	relevant	A

Modified Text: If required for the description of a particular N-ISDN service, the N-LLC information element is included in the SETUP message.

The B-LLI information element is only used for B-ISDN specific services.

The N-LLC and the B-LLI information elements shall be used according to the following rules:

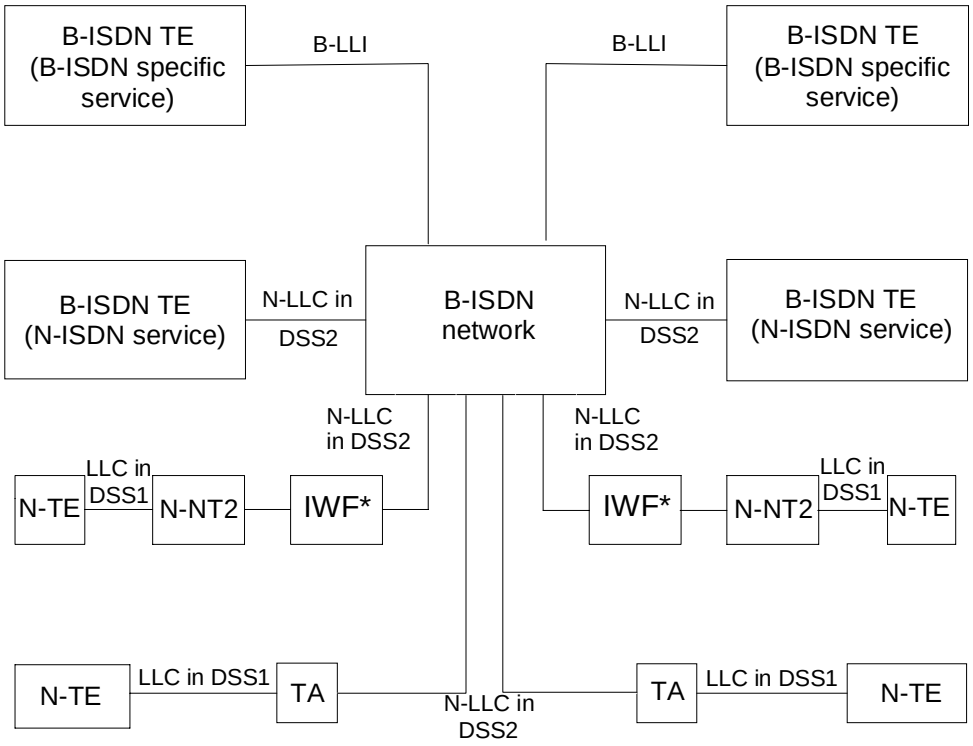
1) The N-LLC information element is used to describe end-to-end attributes of N-ISDN circuit-mode services supported in B-ISDN. This information element shall not be used for B-ISDN specific services. In particular, this information element is used by a B-ISDN terminal emulating a N-ISDN service.

2) For B-ISDN specific services, the B-LLI information element is used as described in the main part of this Recommendation.

3) Either the N-LLC or the B-LLI information element can be used in a call, not both.

4) If B-ISDN specific user equipment are connected to B-ISDN which do not support emulation of N-ISDN services, only the B-LLI information element is to be used (not the N-LLC information element).

The use of the N-LLC and B-LLI information elements is illustrated in figure 6-1/Q.2931.



* The LLC information is transferred transparently across the Terminal Adapter (TA) or Interworking Function (IWF), except for the changes required by the different coding rules.

Figure 6-1/Q.2931: Illustration of the use of the N-LLC and B-LLI information elements in ITU-T Recommendation Q.2931

The N-LLC information element is transported transparently through the B-ISDN.

The destination user shall ignore the conflicting information in the N-LLC information element if it detects a contradiction between the N-BC information element and N-LLC information element.

NOTE: It is expected that some B-ISDNs will support only A-law and some others only µ-law coding; with conversion provided by the µ-law network (see ITU-T Recommendation G.711 [16]) for the provision of emulated N-ISDN services. If the encoding scheme is specified in both the N-BC information element and the N-LLC information element, interworking between two B-ISDNs might require a change of the user information layer 1 protocol in the N-BC information element (e.g. from A-law to µ-law), while the encoding scheme specified in the N-LLC information element would presumably be forwarded unchanged to the destination. Since, to determine compatibility, the destination terminal examines both the N-BC information element and the N-LLC information element, it would receive conflicting information regarding the encoding scheme used.

For the provision of N-ISDN services, the inclusion of the AAL parameters information element in the SETUP message is required, specifying either AAL type 1 or the AAL for voice.

9.2.6.2.3 High layer related information

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.2.4	relevant	A

9.2.6.3 Overlap sending and receiving - Objectives

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.5.1	relevant	A

Modified Text: B-ISDN terminal equipment (B-TE) shall use en-bloc sending in B-ISDN. This implies, from the B-TE perspective, the mandatory inclusion of the Broadband sending complete information element in the SETUP message.

Since overlap receiving is an allowed procedure in N-ISDN, this procedure is also supported in B-ISDN for incoming calls originating in the N-ISDN.

The procedures of DSS 2 for overlap receiving is specified in subclause 6.5.3.

9.2.6.3.1 Overlap receiving

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.5.3	relevant	A

Modified Text: When a user determines that a received message contains either:

a) no called number information, or

b) incomplete called number information, or

c) called number information which the user cannot determine to be complete;

and when the user:

- is compatible with the other call characteristics (see annex B of ITU-T Recommendation Q.2931 [12]); and,

- implements overlap receiving.

The user shall: start timer T302; send a SETUP ACKNOWLEDGE message to the network; and enter the Overlap Receiving state.

The user shall start timer T302 on receipt of every INFORMATION message not containing a sending complete indication.

Following the receipt of a sending complete indication, or the determination that sufficient call information has been received, the user shall stop timer T302 (if implemented) and send a CALL PROCEEDING message to the network. Alternatively, depending on internal events, the user may send an ALERTING or CONNECT message to the network.

At the expiration of timer T302 the user shall either:

a) send a CALL PROCEEDING, ALERTING or CONNECT message as appropriate if sufficient information has been received, or

b) initiate clearing in accordance with subclause 5.4 with cause #28 *invalid number format (incomplete number)* if it determines that the call information is definitely incomplete.

If, following the receipt of a SETUP message or during overlap receiving, the user determines that the received call information is invalid (e.g. invalid called party number), it shall initiate call clearing in accordance with subclause 5.4 with a cause such as one of the following:

No. l *unassigned (unallocated) number*;

No. 3 *no route to destination*;

No. 22 *no route to destination*;

No. 28 *invalid number format (incomplete number)*.

Upon receipt of the complete call information the user may further perform compatibility checking functions, as outlined in annex B of ITU-T Recommendation Q.2931 [12].

9.2.6.4 Notification of interworking

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.6	relevant	A

Modified Text: Interworking of B-ISDN with N-ISDN requires the support of the Progress Indicator values specified in ITU-T Recommendation Q.931 [25] by the B-ISDN.

The following principles shall apply:

Interworking with a non-ISDN may occur in the case where an emulated N-ISDN service is requested and interworking with N-ISDN has occurred. In this case all progress Indicator values applying for N-ISDN interworking with non-ISDN shall be relayed to B-ISDN, transported transparently through the B-ISDN and then be indicated to the calling user.

9.2.6.4.1 Notification of interworking at the originating interface

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.6.1	relevant	A

Modified Text: If the Progress Indicator information element is included in a call control message, the procedures as described in subclause 5.1 apply. If the Progress Indicator information element is included in the PROGRESS message, no state change will occur. In both cases, if indicated by the Progress Indicator information element, the user shall connect to (if not connected already) and then monitor the user VC for further in-band information.

9.2.6.4.2 Notification of interworking at the terminating interface

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.6.2	relevant	A

Modified Text: If the Progress Indicator information element is included in a call control message, the procedures as described in subclause 5.2 apply. If the Progress Indicator information element is included in the PROGRESS message, no state change will occur.

9.2.6.5 Tones and announcements - General principle

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.7.1.1	relevant	A

9.2.6.5.1 Provision of tones at call establishment

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.7.1.2	relevant	A

Modified Text: The user need not attach to the VC until receiving a CALL PROCEEDING/SETUP ACKNOWLEDGE/PROGRESS/ALERTING message with the Progress Indicator No. 8 *in-band information or appropriate pattern now available* or Progress Indicator No. l *call is not end-to-end ISDN; further call progress information may be available in-band*. After this time, the user shall be connected to the VC, provided the equipment does not generate the tone locally. Upon receipt of the CONNECT message the user shall attach to the VC (if it has not already done so).

9.2.6.5.2 Clearing when tones and announcements are provided

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.7.1.3	relevant	A

Modified Text: On receipt of the RELEASE message with Progress Indicator No. 8, the user may connect (if not already connected) to the VC to receive the in-band tone/announcement; and enter the Release Indication state. Alternatively, to continue clearing without connecting to the in-band tone/announcement, the user shall: release the VC and the call reference; send a RELEASE COMPLETE message; and return to the Null state.

If the user connects to the in-band tone/announcement, the user may subsequently continue clearing (before receipt of a RELEASE COMPLETE message from the network) by: releasing the user VC and the call reference; sending a RELEASE COMPLETE message and returning to the Null state.

9.2.6.6 Fall-back procedure

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	6.7.2	relevant	A

9.2.7 Timers in the user side

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	7.2	relevant	A

9.2.8 Primitives

9.2.8.1 Introduction

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	8.1	relevant	A

9.2.8.2 Description of the primitives

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	8.2	relevant	A

9.2.9 Compatibility checking

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex B.1	relevant	A

Modified Text: This annex describes the various compatibility and address checks which should be carried out to ensure that the best match of user and network capabilities is achieved on a Broadband ISDN call.

For 64 kbit/s based circuit mode ISDN services, the compatibility checking procedures of annex B of ITU-T Recommendation Q.931 [25] shall apply for N-BC, N-HLC, and N-LLC.

Two different processes of checking shall be performed:

- at the network-to-user interface on the called side (see subclause B.3.2/Q.2931), and,
- user-to-user (see subclause B.3.3/Q.2931).

NOTE: In this context and throughout this annex the term "called user" is the endpoint entity which is explicitly addressed. This may be an addressed interworking unit (IWU); see the ITU-T Recommendation I.500 series.

9.2.9.1 Called side compatibility and address checking

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex B.3	relevant	A

9.2.9.1.1 Checking of addressing information

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex B.3.1	relevant	A

9.2.9.1.2 Network-to-user compatibility checking

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex B.3.2	relevant	A

9.2.9.1.3 User-to-user compatibility checking

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex B.3.3	relevant	A

9.2.10.1 Low layer compatibility notification to the called user

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex C.2	relevant	A

Modified Text: When the calling user wishes to notify the called user of its low layer protocols above the AAL (i.e., as identified in octets 6 to 7 of the B-LLI information element) to be used during the call, then the calling user shall include a B-LLI information element in the SETUP message; this element is conveyed by the network and delivered to the called user.

9.2.10.2 B-LLI negotiation between users

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex C.3	relevant	A

Modified Text: The B-LLI supports the indication of certain parameters of acknowledged mode HDLC elements of procedures. If they are included, parameter(s) may be negotiated. In this case, the called user accepting the call may include a B-LLI information element in the CONNECT message. This element will be conveyed transparently by the network and delivered to the calling user in the CONNECT message. If the calling user can not support the parameters in the CONNECT message, the calling user shall initiate call clearing procedures as described in subclause 5.4.3.

NOTE: The lower layer protocol parameters which may be negotiated by this capability are: mode (octet 6a), window size (octet 6b), User specified layer 2 information (octet 6a), default packet size (octet 7b), and packet window size (octet 7c).

If the calling user rejects the B-LLI information element contents in the CONNECT message, the calling user shall initiate clearing with cause #100, "invalid information element contents".

9.2.10.3 Alternate requested values

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex C.4	relevant	A

Modified Text: If the calling user wishes to indicate alternative values of B-LLI parameters (e.g., alternative protocol suites or protocol parameters), the B-LLI information element is repeated in the SETUP message. Up to three B-LLI information elements may be included in a SETUP message. The first B-LLI information element in the message is preceded by the Broadband repeat indicator information element specifying "priority list for selecting one possibility (descending order of priority)". The order of appearance of the B-LLI information elements indicates the order of preference of end-to-end low layer parameters.

If the called user does not support repeating of the B-LLI information element, and therefore discards the Broadband repeat indicator information element and the subsequent B-LLI information elements, only the first B-LLI information element is used in the negotiation.

The called user indicates a single choice from among the options offered in the SETUP message by including the B-LLI information element in the CONNECT message. Absence of a B-LLI information element in the CONNECT message indicates acceptance of the first B-LLI information element in the SETUP message.

If the calling user rejects the B-LLI information element contents in the CONNECT message, the calling user shall initiate clearing with cause #100, "invalid information element contents".

9.2.11 Transit network selection supported

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex D.2	relevant	A

Modified Text: When transit network selection is supported, the user identifies the selected transit network(s) in the SETUP message. One Transit network selection information element is used to convey a single network identification.

The user may specify more than one transit network. Each identification is placed in a separate information element. The call would then be routed through the specified transit networks in the order listed in the SETUP. For example, a user lists networks A and B, in that order, in two Transit network selection information elements within a SETUP message. The call is first routed to network A (either directly or indirectly), and then to network B (either directly or indirectly), before being delivered.

As the call is delivered to each selected network, the corresponding transit selection may be stripped from the call establishment signalling, in accordance with the relevant inter network signalling arrangement. The Transit network selection information element(s) is/are not delivered to the called user.

No more than four Transit network selection information elements may be used in a single SETUP message.

When a user includes the Transit network selection information element, pre subscribed default Transit network selection information (if any) is overridden.

9.2.12 Codepoint values of information elements to support 64 kbit/s based circuit-mode ISDN services in B-ISDN

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex E.4.1	relevant	A

Modified Text: This subclause provides the codepoint values of B-ISDN specific information elements to support 64 kbit/s based circuit-mode ISDN services in B-ISDN. The codepoints shall be used by TE connected to the B-ISDN if it requests an N-ISDN service.

9.2.12.1 Codepoint of information elements used for emulated N-ISDN services

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex E.4.2	relevant	A

9.2.13 AAL parameters indication and negotiation

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex F.1	relevant	A

9.2.13.1 AAL parameter indication in the SETUP message

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex F.2	relevant	A

9.2.13.2 Maximum CPCS-SDU size negotiation

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex F.3	relevant	A

9.2.13.3 MID range negotiation

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex F.4	relevant	A

9.2.13.4 Use of forward and backward maximum CPCS-SDU size by the AAL entity in the user plane

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex F.5	relevant	A

9.2.14 Use of the OAM traffic descriptor information element

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex I.1	relevant	A

Modified Text: The OAM traffic descriptor information element is included by the calling user in the SETUP message to provide a specification of the end-to-end OAM flow as a fraction of the aggregate of the user and end-to-end F5 OAM flow.

The OAM Traffic descriptor information element defined in subclause 4.5.24 may, optionally, be included in the SETUP message by the calling user; however, its absence does not in itself mean that no OAM flow will be used within this call (see subclause 3.1.7). The support of this information element is network dependent.

If the user does not support this information element, it shall be treated as an unrecognized information element according to the procedures defined in subclause 5.6

9.2.14.1 Handling of the OAM traffic descriptor information element in the SETUP message

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex I.2	relevant	A

Modified Text: Once the call and the connection are established and the CONNECT message has been received by the calling user, the calling user and the called user will negotiate the use of the end-to-end F5 OAM information flow according to the procedures defined by ITU-T Recommendation I.610 [24].

The handling of the ATM traffic descriptor information element in conjunction with the OAM Traffic descriptor information element, when supported, for the purpose of Call Admission Control (CAC), Usage or Network Parameter Control (UPC and NPC) and Traffic shaping shall be performed according to ITU-T Recommendation I.371 [21].

9.2.14.2 Procedure at the destination user-network interface

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex I.3	relevant	A

Modified Text: The called user shall, if it supports the OAM traffic descriptor information element and the specified OAM traffic descriptor, include the corresponding OAM traffic descriptor information element in the CONNECT message returned to the network.

The calling user shall interpret the absence of the OAM traffic descriptor in the received CONNECT message as an indication that the end-to-end OAM F5 flow is not available.

NOTE: In the case of interworking with non-B-ISDN, the Interworking function may discard the OAM traffic descriptor information element and continue the establishment of the call. therefore the calling user should interpret the absence of the OAM traffic descriptor information element in the received CONNECT message as an indication that the end-to-end OAM F5 flow is not available even if the compliance indicator was set to "mandatory" in the SETUP message.

9.2.15 Handling of the End-to-end transit delay information element

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex K.1	relevant	A

Modified Text: This annex describes the use of the End-to-end transit delay information element.

The support of the End-to-end transit delay information element and the procedures described in this annex is mandatory for the network and optional for the user.

The purpose of the End-to-end transit delay information element is to indicate the maximum end-to-end transit delay acceptable for a call, and to indicate the cumulative transit delay to be expected for a VCC.

The calling user may indicate a maximum end-to-end transit delay value to specify end-to-end transit delay requirements for a given call or indicate that any end-to-end transit delay is acceptable.

The cumulative transit delay expected for the transmission of user data from the calling TE to the network boundary may be indicated by the calling user.

It is recommended that the called user updates the cumulative transit delay value received from the network.

NOTE: This is particularly important if the transmission line between the network boundary and the called TE causes substantial further delay (e.g. a satellite link).

If a maximum end-to-end transit delay value is specified, it is recommended that the called user takes appropriate action (e.g. call rejection) when the cumulative transit delay value exceeds the specified maximum end-to-end transit delay value.

If the called user accepts the call, it is recommended that the called user includes an End-to-end transit delay information element in the CONNECT message specifying the final cumulative transit delay value for the call.

Further details about the handling of the End-to-end transit delay information element are given below.

9.2.15.1 Handling of the end-to-end transit delay information element in the SETUP message at the originating UNI

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex K.2	relevant	A

Modified Text: The inclusion of the End-to-end transit delay information element in the SETUP message by the calling user is optional.

If the calling user includes an End-to-end transit delay information element in the SETUP message, both the cumulative transit delay subfield and the maximum end-to-end transit delay subfield shall be present. The user may set the maximum end-to-end transit delay subfield to *any end-to-end transit delay value acceptable, deliver cumulative end-to-end transit delay value to the called user* if any end-to-end transit delay is acceptable.

9.2.15.2 Handling of the end-to-end transit delay information element by the called user

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex K.4	relevant	A

9.2.15.3 Handling of the end-to-end transit delay information element in the CONNECT message at the destination UNI

reference:	ITU-T Recommendation Q.2931 [12], as modified by ETS 300 443-1 [12]	clause	annex K.5	relevant	A

Modified Text: If the SETUP message sent to the called user included an End-to-end transit delay information element, the called user may include an End-to-end transit delay information element in the CONNECT message specifying the final cumulative transit delay value for the call. No maximum end-to-end transit delay subfield shall be included.

Bibliography

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- ETS 300 354: "Broadband Integrated Services Digital Network (B-ISDN); B-ISDN Protocol Reference Model (PRM)".

- ETS 300 437-2: "Broadband Integrated Services Digital Network (B-ISDN); Signalling ATM Adaptation Layer (SAAL); Service Specific Co-ordination Function (SSCF) for support of signalling at the User-Network-Interface (UNI); Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification".

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- ITU-T Recommendation I.113: "Vocabulary of terms for broadband aspects of ISDN".

- ITU-T Recommendation I.320: "ISDN protocol reference model".

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- ITU-T Recommendation I.413: "B-ISDN user-network interface".

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