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SERIES I: INTEGRATED SERVICES DIGITAL
NETWORK

B-ISDN equipment aspects – ATM equipment

Types and general characteristics of ATM equipment

ITU-T Recommendation I.731

(Formerly CCITT Recommendation)

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ITU-T Recommendation I.731

Types and general characteristics of ATM equipment

Summary

This Recommendation describes the types and characteristics of ATM Network Elements (NE) in terms of functional requirements.

Source

ITU-T Recommendation I.731 was revised by ITU-T Study Group 15 (1997-2000) and approved by the World Telecommunication Standardization Assembly (Montreal, 27 September – 6 October 2000).

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Introduction

This Recommendation gives an overview of the functions of ATM equipment, examples of overall characteristics and objectives for ATM network elements.

The general characteristics of ATM equipment may be described by using the functional partitioning of the network element into logical functions linked by internal communications between the functions. A general methodology which may be used to clarify the different types of ATM equipment is also contained in ITU-T I.732.

The grouping of functional functions in accordance with the B-ISDN Protocol Reference Model and the detailed modelling methodology of ITU-T I.326 enables the description of any ATM equipment to the required level of detail.

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ITU-T Recommendation I.731

Types and general characteristics of ATM equipment

1 Scope

The purpose of ITU-T I.731 and I.732 is to describe the functional requirements to enable the interoperability between ATM network elements. The detailed functional characteristics of ATM equipment are contained in ITU-T I.732. ITU-T I.731 is more generalized, providing introductions and covering terms and concepts that did not easily fit into the structure of ITU-T I.732. ITU-T I.731 introduces the functional model used in ITU-T I.732 and in other technologies such as SDH and provides an overview of ATM equipment. ITU-T I.731 describes how the functional model can be used to model multipoint communications. This includes how to handle the so-called "channel merging" without corrupting the traffic and without requiring special functions. ITU-T I.731 also provides modelling for OAM applications showing how the various functions in the library can be joined together in different network elements to form an OAM application such as AIS. ITU-T I.731 also describes protection switching of ITU-T I.630 using the functional modelling technique.

This Recommendation is an update to ITU-T I.731/1995 which was the overview companion to ITU-T I.732/1995. This update has resulted in some sections moving from ITU-T I.732.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T G.703 (1998), *Physical/electrical characteristics of hierarchical digital interfaces*.
- [2] ITU-T G.704 (1998), *Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels*.
- [3] ITU-T G.707/Y.1322 (2000), *Network node interface for the Synchronous Digital Hierarchy (SDH)*.
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- [5] ITU-T G.781 (1999), *Synchronization layer functions*.
- [6] ITU-T G.783 (2000), *Characteristics of Synchronous Digital Hierarchy (SDH) equipment functional blocks*.
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- [8] ITU-T G.804 (1998), *ATM cell mapping into Plesiochronous Digital Hierarchy (PDH)*.
- [9] ITU-T G.805 (2000), *Generic functional architecture of transport networks*.
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- [11] ITU-T G.832 (1998), *Transport of SDH elements on PDH networks – Frame and multiplexing structures*.

- [12] ITU-T G.957 (1999), *Optical interfaces for equipments and systems relating to the synchronous digital hierarchy.*
- [13] ITU-T I.150 (1999), *B-ISDN asynchronous transfer mode functional characteristics.*
- [14] ITU-T I.211 (1993), *B-ISDN service aspects.*
- [15] ITU-T I.311 (1996), *B-ISDN general network aspects.*
- [16] ITU-T I.321 (1991), *B-ISDN protocol reference model and its application.*
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- [19] ITU-T I.356 (2000), *B-ISDN ATM layer cell transfer performance.*
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- [25] ITU-T I.555 (1997), *Frame Relaying Bearer Service interworking.*
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- [28] ITU-T I.732 (2000), *Functional characteristics of ATM equipment.*
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- [31] ITU-T Q.811 (1997), *Lower layer protocol profiles for the Q3 and X interfaces.*
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- [33] ITU-T Q.2100 (1994), *B-ISDN signalling ATM adaptation layer (SAAL) – Overview description.*
- [34] ITU-T Q.2144 (1995), *B-ISDN signalling ATM adaptation layer – Layer management for the SAAL at the network node interface.*
- [35] ITU-T Q.2761 (1999), *Functional description of the B-ISDN User Part (B-ISUP) of Signalling System No. 7.*
- [36] ITU-T Q.2762 (1999), *General functions of messages and signals of the B-ISDN User Part (B-ISUP) of Signalling System No. 7.*
- [37] ITU-T Q.2763 (1999), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Formats and codes.*
- [38] ITU-T Q.2764 (1999), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Basic call procedures.*
- [39] ITU-T Q.2931 (1995), *Digital Subscriber Signalling System No. 2 – User-Network Interface (UNI) layer 3 specification for basic call/connection control.*
- [40] ITU-T X.25 (1996), *Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit.*

3 Abbreviations

This Recommendation uses the following abbreviations:

AAL	ATM Adaptation Layer
ABR	Available Bit Rate
ACC	Accounting Management
AEMF	ATM Equipment Management Function
AIS	Alarm Indication Signal
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband Integrated Services Digital Network
B-UNI	Broadband User Network Interface
CAC	Connection Admission Control
CBR	Constant Bit Rate
CDV	Cell Delay Variation
CLR	Cell Loss Ratio
CoF	Coordination Function
CONFIG	Configuration
CTD	Cell Transfer Delay
DBR	Deterministic Bit Rate
ETPI	Equipment Timing Physical Interface
ETS	Equipment Timing Source
FM	Fault Management
FMBS	Frame Mode Bearer Service
HEC	Header Error Control
ISDN	Integrated Services Digital Network
IWF	InterWorking Function
LMI	Layer Management Indication
MCF	Message Communications Function
NE	Network Element
NNI	Network Node Interface
NPC	Network Parameter Control
OAM	Operations And Maintenance
PDH	Plesiochronous Digital Hierarchy
PDU	Protocol Data Unit
PM	Performance Management
QOS	Quality Of Service
RM	Resource Management
SAAL	B-ISDN signalling ATM Adaptation layer

SAP	Service Access Point
SBR	Statistical Bit Rate
SDH	Synchronous Digital Hierarchy
SDU	Service Data Unit
TM	Transmission Media
TMN	Telecommunications Management Network
TP	Transmission Path
UBR	Unspecified Bit Rate
UNI	User Network Interface
UPC	Usage Parameter Control
VBR	Variable Bit Rate
VC	Virtual Channel
VP	Virtual Path

4 Definitions

This Recommendation defines the following terms:

4.1 ATM resource request:

- request to establish or release a given VP or VC connection;
- request for modifying the traffic characteristics of an already established VP or VC connection.

4.2 PVC: traditional ATM Permanent Virtual Connection that is established/released upon a request initiated by a management request procedure (i.e. all nodes supporting the connections need to be instructed by the network management).

4.3 Soft PVC: soft PVC is a Permanent Virtual Connection where the establishment within the network is done by signalling. By configuration, the switching system at one end of the soft PVC (VPC or VCC) initiates the signalling for this.

In addition, this Recommendation uses definitions and terms defined in other ITU-T Recommendations.

5 ITU-T I.732 Annex D formal model

5.1 Symbols and diagrammatic conventions

For a description of the symbols and diagrammatic conventions used in this model refer to ITU-T G.805, G.806, I.322 and I.326.

5.2 Functional modelling rationale

A limited set of atomic functions has been derived by decomposing the digital transport hierarchies to form the library contained within Annex D/I.732 together with ITU-T G.783 for the atomic functions of the Physical Layers. The contents of this library are consistent with the definitions of functions contained in the main body text of ITU-T I.732. In order to be compliant with Annex D/I.732, equipment which contains functionality defined within the Annex D/I.732 should