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Broadband Integrated Services Digital Network (B-ISDN); B-ISDN Protocol Reference Model (PRM)

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunication Standards Institute (ETSI).

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Introduction

This ETS is based on the Broadband Integrated Services Digital Network (B-ISDN) Protocol Reference Model (PRM) as defined in ITU-T Recommendation I.320 [**Error! Bookmark not defined.**]. The purpose of this ETS is to take into account the functionalities of B-ISDN, in order to enhance the existing ISDN PRM. The PRM in this ETS will be referred to as the B-ISDN PRM.

The B-ISDN layered model reflects the principles of layered communication defined in ITU-T Recommendation X.200 [6].

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Open Systems Interconnection (OSI) is a logical architecture and, as such, defines a set of principles including protocol layering, layer service definition, service primitives, modularity and independence. In general, these principles have been followed in the definition of the B-ISDN PRM. However, the principle of layer independence has not been fully applied in this B-ISDN PRM.

The OSI reference model has seven layers, each with specific functions and offering defined services to the layer above and utilizing services of the layer below. This logical architecture seems applicable also to the B-ISDN.

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1 Scope

This European Telecommunication Standard (ETS) addresses the Broadband Integrated Services Digital Network (B-ISDN) Protocol Reference Model (PRM) and its applications. It is an extension of the CCITT Recommendation I.321 [**Error! Bookmark not defined.**], including also a description of the Physical Layer (PL) and Asynchronous Transfer Mode (ATM) layer internal structure, as well as the primitives between these two layers, and towards the Layer Management Entities (LME), and the primitives between the ATM layer and the ATM Adaptation Layer (AAL).

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

[1]   ITU-T Recommendation I.320 (1993): "ISDN protocol reference model".

[2]   CCITT Recommendation I.321 (1991): "B-ISDN protocol reference model and its applications".

[3]   ITU-T Recommendation I.361 (1993): "B-ISDN ATM layer specification".

[4]   ITU-T Recommendation I.432 (1993): "B-ISDN user-network interface - Physical layer specification".

[5]   ITU-T Recommendation I.610 (1993): "B-ISDN operation and maintenance principles and functions".

[6]   ITU-T Recommendation X.200 (1994): "Information technology - Open systems interconnection - Basic reference model: The basic model".

[7]   CCITT Recommendation Q.940 (1988): "ISDN user-network interface protocol for management - General aspects".

[8]   CCITT Recommendation G.703 (1991): "Physical/Electrical characteristics of hierarchical digital interfaces".

3 Definitions and abbreviations

3.1 Definitions

idle cell (physical layer): Cell which is inserted/extracted by the PL in order to adapt the cell flow rate at the boundary between the ATM layer and the PL to the available payload capacity of the transmission system used.

valid cell (physical layer): Cell whose header has no errors or has been modified by the cell Header Error Control (HEC) verification process.

invalid cell (physical layer): Cell whose header has errors and has not been modified by the cell HEC verification process (discarded at the PL).

assigned cell (ATM layer): Cell which provides a service to an application using the ATM layer service.

unassigned cell (ATM layer): ATM layer cell which is not an assigned cell.

(N)-Service Access Point (SAP): The point at which (N)-services are provided by an (N)-entity to an (N+1)-entity (ITU-T Recommendation X.200 [6]).

In this ETS the above definition is used for the term SAP. In this ETS, (N) is the PL or the ATM layer.

3.2 Abbreviations

For the purposes of this ETS the following abbreviations apply:

AAL	ATM Adaptation Layer
ATM	Asynchronous Transfer Mode
ATMM	ATM layer Management
B-ISDN	Broadband Integrated Services Digital Network
CE	Connection End-point
CEI	Connection End-point Identifier
CES	Connection End-point Suffix
CLP	Cell Loss Priority
CME	Connection Management Entity
CRC	Cyclic Redundancy Check
CS	Convergence Sublayer
DSS	Distributed Sample Scrambler
EBCN	Explicit Backward Congestion Notification
EC	Error Correction
ED	Error Detection
EFCN	Explicit Forward Congestion Notification
GFC	Generic Flow Control
GME	Global Management Entity
HEC	Header Error Control
LE	Layer Entity
LI	Link Identifier
LME	Layer Management Entity
NNI	Network Node Interface
NPC	Network Parameter Control
OAM	Operation and Maintenance
OSI	Open Systems Interconnection
PCI	Protocol Control Information
PDH	Plesiochronous Digital Hierarchy
PDU	Protocol Data Unit
PL	Physical Layer
PM	Physical Medium
PRM	Protocol Reference Model
PT	Payload Type
QoS	Quality of Service
SAP	Service Access Point
SAPI	Service Access Point Identifier
SAR	Segmentation and Reassembly
SDH	Synchronous Digital Hierarchy
SDU	Service Data Unit
SLE	Sub-Layer Entity
TC	Transmission Convergence
UNI	User-Network Interface
UPC	Usage Parameter Control
VC	Virtual Channel
VCC	Virtual Channel Connection
VCI	Virtual Channel Identifier
VP	Virtual Path
VPC	Virtual Path Connection
VPI	Virtual Path Identifier

4 The B-ISDN PRM

The B-ISDN PRM is shown in figure 1; it is composed of a user plane, a control plane, and a management plane.

Above the PL, the ATM layer provides for the transport of data for all services. The service provided by the AAL to the layer above depends on the service class to be supported.

The layer above the AAL in the control plane provides call control and connection control. The management plane provides network supervision functions. Functional description of the PL, the ATM layer, and the AAL are given in the following sections. Further study is required on the layers above the AAL.
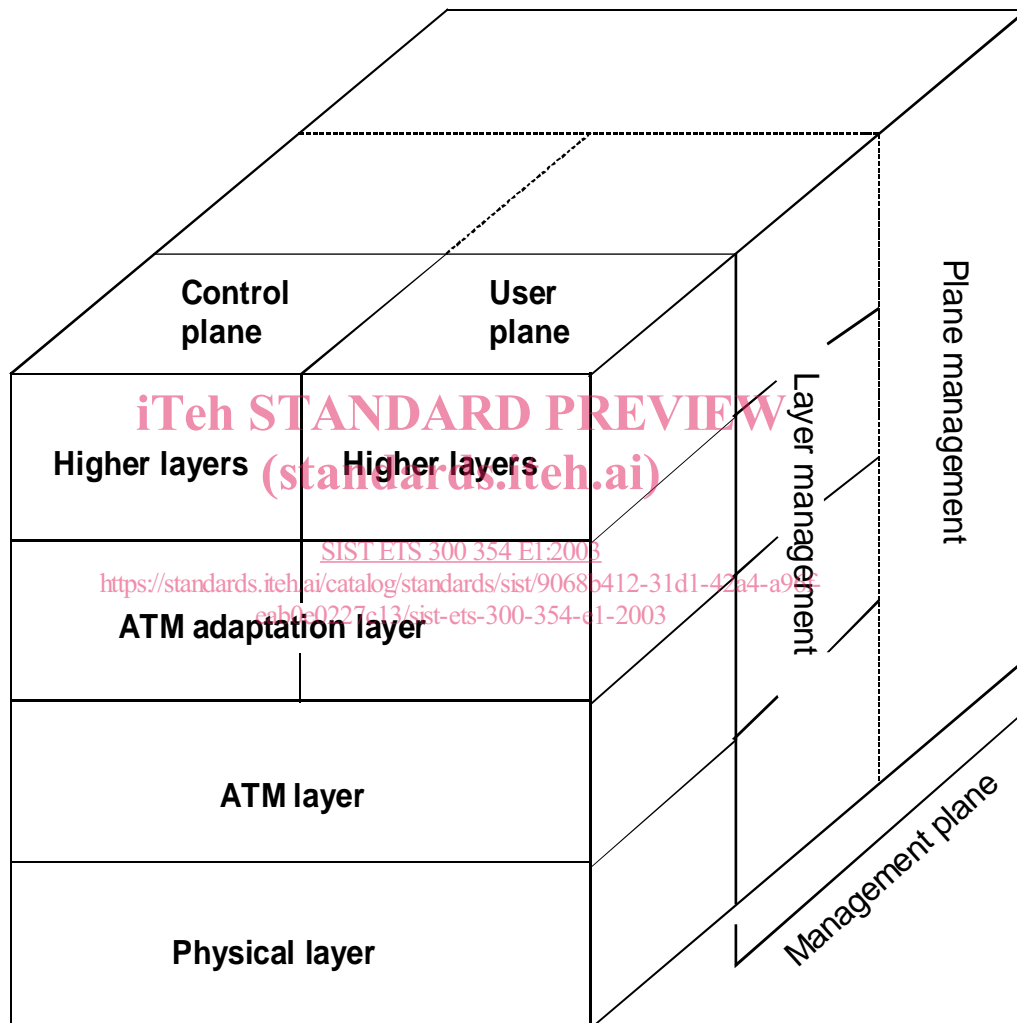

Figure 1: B-ISDN PRM

5 Description of the planes

5.1 User plane

The user plane, with its layered structure, provides for user information transfer, along with associated controls (e.g. flow control, recovery from errors, etc.).

5.2 Control plane

This plane has a layered structure and performs the call control and connection control functions; it deals with the signalling necessary to set up, supervise, and release calls and connections.

5.3 Management plane

The management plane provides two types of functions, namely layer management and plane management functions.

5.3.1 Plane management function

The plane management performs management functions related to a system as a whole and provides co-ordination between all planes. Plane management has no layered structure.

5.3.2 Layer management functions

Layer management performs management functions (e.g. metasignalling) relating to resources and parameters related to the protocol entities within the layer. Layer management handles the Operation and Maintenance (OAM) information flows specific to the layer concerned. Additional details are provided in CCITT Recommendation Q.940 [7].

6 Functions of the individual layers of the B -ISDN PRM

The functions of each layer, the primitives exchanged between layers, and primitives exchanged between the layers and the management plane are described below. The information flows described do not imply a specific physical realization. Figure 2 illustrates the layers of the PRM, and identifies the functions of the PL, the ATM layer, and the AAL.

	Higher layer functions		Higher layers	
L a y e r	Convergence		C S	A A L
	Segmentation and reassembly		S A R	
m a n a g e m e n t	Generic Flow Control Cell Header generation/extraction Cell VPI/VCI translation Cell multiplex and demultiplex		A T M	
	Cell rate decoupling HEC header sequence generation/verification Cell delineation Transmission frame adaptation Transmission frame generation recovery		T C	P h y s i c a l
	Bit timing Physical medium		P M	l a y e r

Figure 2: Functions of the B -ISDN in relation to the PRM