网络新技术系列丛书 影印版

XDSL Architecture

XDSL体系结构

Padmanand Warrier
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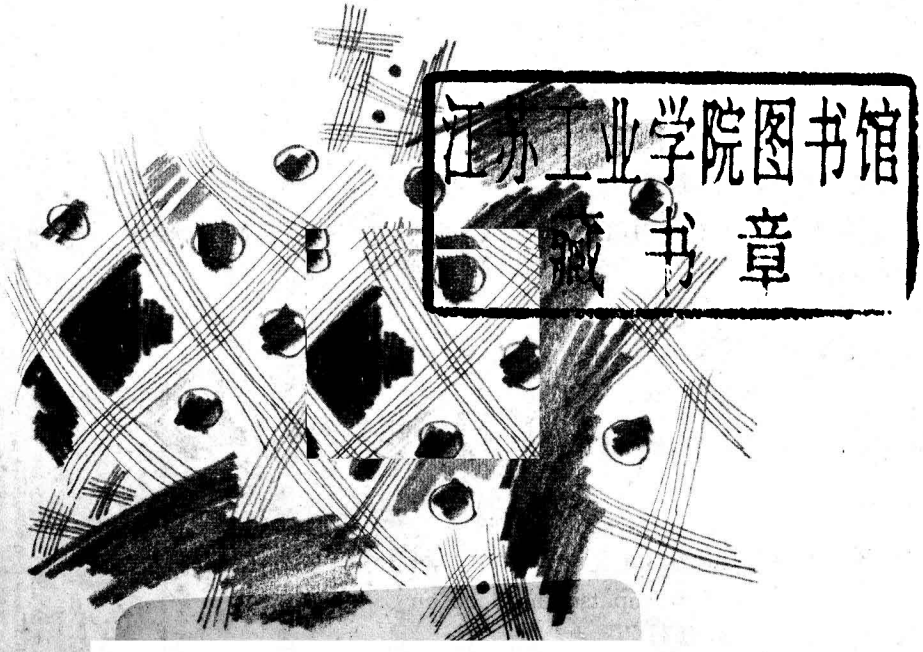

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出版前言

21世纪人类面对的将是一个网络化的新时代，网络化程度的高低将是衡量一个国家现代化水平和综合国力的重要标志。考虑到我国广大科技工作者面临着网络技术飞速发展的挑战，我们精选了一些反映网络技术最新发展的、且具有权威性的图书，组成“网络新技术系列丛书(影印版)”，奉献给广大读者。既表达对我国广大科技工作者的一种支持，也是我社为我国实施“科教兴国”的战略应尽的义务。

这套丛书包括：千兆以太网、移动IP、虚拟局域网、交换式局域网、IP组播技术、虚拟专用网、网络安全技术以及目录使能的网络等一系列先进技术。由于我们水平有限，希望各界专家和广大读者提出建议和要求，促使这套丛书出得更好。

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Introduction

The 1990s have inaugurated the second revolution of telecommunications—high-speed access. Changes have already occurred so rapidly in the telecommunications and computer environment that it is hard to believe more is to come during this decade. This book gives the reader a detailed look at DSL technologies and architectures that will enable the future of high-speed access.

The primary objective of this book is to present a comprehensive view of one aspect of DSL technologies and architectures, which encompasses multimedia applications where voice, video, and data are integrated. The reader will learn the various flavors of DSL technologies and its applicable services and architectures. Among the different DSL technologies mentioned, the most important, ADSL, is covered in detail. Other DSL flavors such as HDSL, HDSL2, VDSL, etc. are also covered.

Details are given on DSL network design aspects with respect to providing an integrated access network environment. This book provides additional information on the Internet resources that provide up-to-date information on the DSL offering in the market place.

Targeted Audience

The target audience for this book is professionals and advanced students. This is designed as a handbook addressing all the pertinent issues related to XDSL from technology capability to its limitation in real-world deployment covering all aspects (technology, architecture, and network design).

This book is a valuable asset for professionals in the telecommunication and computer industry who are involved in understanding the systems-level issues, it will facilitate their designing and implementing DSL-based networks.

Benefits for the Reader

1. Readers can gain a comprehensive, systematic understanding of XDSL technologies and architectures

2. Readers can gain practical knowledge on development of copper-based technologies and their deployment.
3. Readers can have an overall view of copper-based access network architecture from basic technologies to network architecture design.

Readers can use this as a reference book for copper-based networks.

Organization of the Book

This book is organized into three parts.

Part 1 provides the background to broadband communications and its evolution. We then introduce the various broadband access technology options available. Part 2 describes the different DSL technologies. Here, HDSL, HDSL2, ADSL, ADSL lite, and VDSL broadband access technologies are covered. Part 3 discusses the DSL-based access architecture with respect to the physical architecture, service architecture and the design of both physical and service architectures. Figure 1 illustrates the organization of the book.

Authors' Disclaimer

Every effort has been made to include the latest information available at the time of writing. Much of the information, which was at a draft stage at the time of writing, may have become standard by the time of publication. We have made every effort to write in a way that includes the reader who has little background knowledge. Also, please excuse any personal biases, which may have crept into the text because of our background or our work environment.

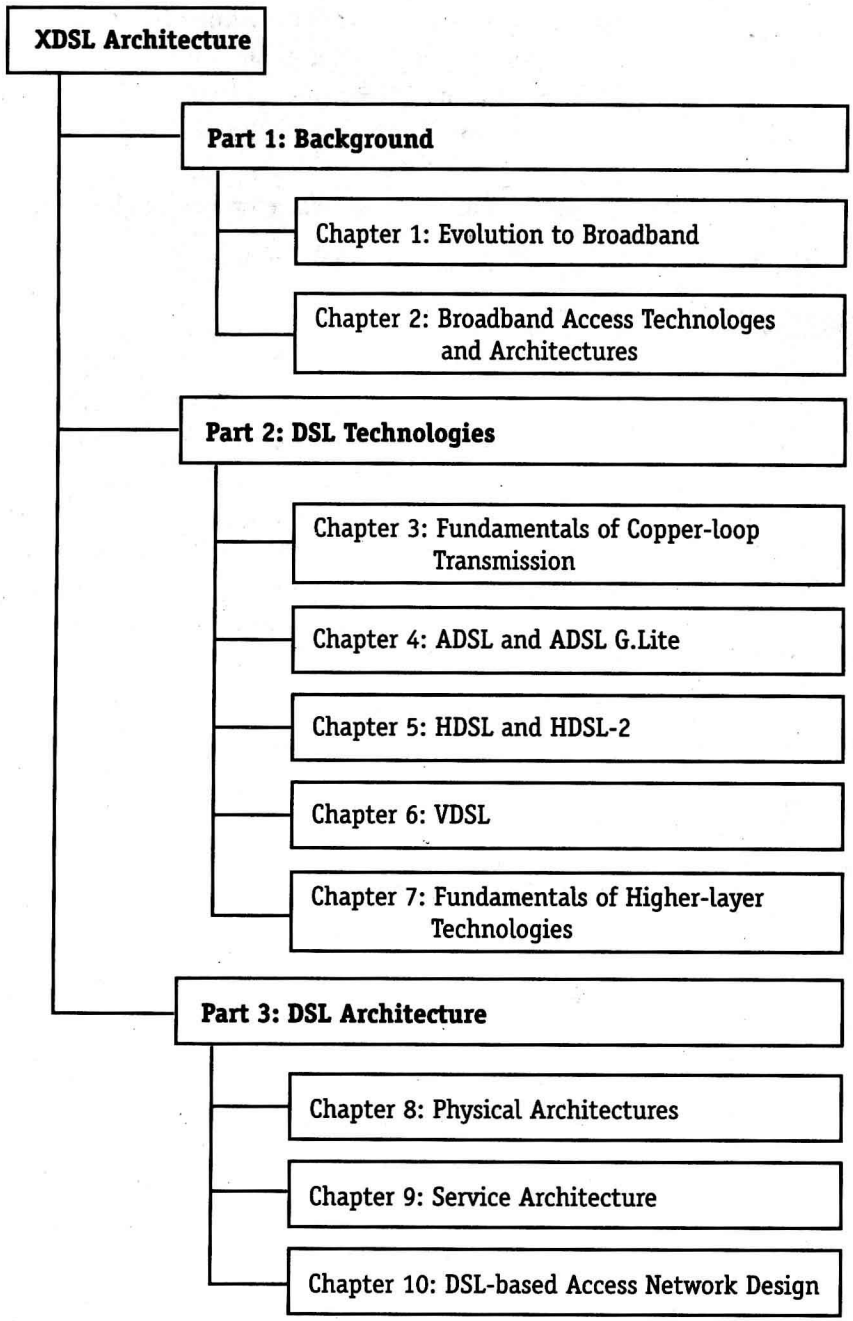

Figure 1
Organization of the Book

Acronyms and Abbreviations

2B1Q	2 Binary, 1 Quaternary
AAL	ATM Adaptation Layer
ADSL	Asymmetric Digital Subscriber Line
CDV	Cell Delay Variation
CLR	Cell Loss Ratio
IDLC	Integrated Digital Loop Carrier
AD-PCM	Adaptive Differential Pulse Code Modulation
AM	Amplitude Modulation
AMI	Alternate Mark Inversion
AN	Access Node
ANSI	American National Standards Institute
APS	Automatic Protection Switching
ARQ	Automatic Repeat reQuest
AT&T	American Telephone & Telegraph
ATM	Asynchronous Transfer Mode
ATU	ADSL Termination Unit
AWG	American Wire Gauge
BECN	Backward Explicit Congestion Notification
BER	Bit-Error Rate
BH	Busy Hour
BISDN	Broadband Integrated Services Digital Network
BOM	Beginning Of Message
BRI	Basic Rate Interface
CAC	Connection Admission Control
CAD	Computer-aided Design
CAE	Computer-aided Engineering
CAM	Computer-aided Manufacturing
CAP	Carrierless Amplitude Modulation
CATV	Cable Television or Community Antenna Television
CBDS	Constant Bit Rate Data Service
CBR	Continuous Bit Rate, or Constant Bit Rate
CCITT	Consultative Committee on International Telegraph and Telephone
CFM	Configuration Management
CIR	Committed Information Rate
CLEC	Competitive Local Exchange Carrier
CLLM	Consolidated Link-Layer Management
CLP	Cell Loss Priority

CMT	Connection Management
CO	Central Office
COI	Community of Interest
COM	Continuation of Message
COMSAT	Communications Satellite Corporation
CPE	Customer Premise Equipment
CPN	Customer Premises Node
CRC	Cyclic Redundancy Check
CS	Convergence Sublayer
CSU	Channel Service Unit
DAS	Dual Attachment Stations
DBS	Direct Broadcast Satellite
DCC	Data Communications Channels
DCE	Data Communications Equipment
DE	Discard Eligibility
DLC	Digital Loop Carrier
DLCI	Data-Link Connection Identifier
DMT	Discrete Multitone
DOJ	Department Of Justice
DSLAM	DSL Access Multiplexer
DSP	Digital Signal Processor
DSU	Data Service Unit
DTE	Data Terminal Equipment
DTP	Data Transport Protocol
DTPM	Data Transport Protocol Machine
EA	Extended Address
ECM	Coordination Management
ECN	Explicit Congestion Notification
ECSA	Exchange Carriers Standards Association
EO	End Office
EOM	End of Message
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
FCS	Frame Check Sequence
FDM	Frequency Division Multiplexing
FEC	Forward Error Control
FECN	Forward Explicit Congestion Notification
FEP	Front-end Processor

FM	Frequency Modulation
FR	Frame Relay
FRI	Frame Relay Interface
FSK	Frequency Shift Keying
FSN	Full Service Network
FTAM	File Transfer Access and Management
FTTC	Fiber to the Curb
FTTN	Fiber to the Node
FTTH	Fiber to the Home
GAN	Global Area Network
GEOS	Geo-Synchronous Satellites
GFC	Generic Flow Control
HDLC	High-Level Data Link Control
HDSL	High-Speed Digital Subscriber Line
HDT	Host Digital Terminal
HDTV	High-Definition Television
HE	Header Extension
HEC	Header Error Control
HFC	Hybrid Fiber/Coax
HIPPI	High-Performance Parallel Interface
HOB	Head of Bus
HPNA	Home Phoneline Networking Alliance
HRC	Hybrid Ring Control
HSSI	High-Speed Serial Interface
HTU-C	HDSL Termination Unit–Central
HTU-R	HDSL Termination Unit–Remote
I/O	Input/Output
IAO	Intraoffice Optical Interface
IBM	International Business Machines
IC	Integrated Circuit
ICA	International Copper Association
ICI	Intercarrier Interface
ICIP	Intercarrier Interface Protocol
IDSL	ISDN Basic Access DSLs
IEC	Interexchange Carriers
IN	Intelligent Network
INTUG	International Trade and User Groups
IP	Intelligent Peripheral/Internet Protocol

ISDN	Integrate Services Digital Network
ISO	International Organization for Standardization
ISP	Internet Service Provider
ISSI	Inter-switching System Interface
ITFS	Instructional Television Fixed Service
ITU	International Telecommunications Union
IWU	Internetworking Unit
IXC	Interexchange Carrier
JPEG	Joint Photographic Experts Group
LAN	Local Area Network
LAP-B	Link Access Protocol–B
LATA	Local Access Transport Area
LEA	Line Extender Amplifier
LEC	Local Exchange Carrier
LED	Light-Emitting Diodes
LEOS	Low Earth Orbiting Satellite
LLC	Logical Link Control
LMDS	Local Multipoint Distribution Service
LME	Layer Management Entity
LMP	Layer Management Protocol
LOH	Line Overhead
LTE	Line Terminating Equipment
LTU	Line Termination Unit
MAC	Media Access Control
MAN	Metropolitan Area Network
MDF	Main Distribution Frame
MDS	Multipoint Distribution Service
MDSL	Medium-Speed Digital Subscriber Line
MEOS	Medium Earth-Orbiting Satellite
MFJ	Modified Final Judgment
MHS	Message-Handling System
MIB	Management Information Base
MMDS	Multichannel Multipoint Distribution Service
MMF	Multimode Fiber
MPEG	Motion Picture Experts Group
MSO	Multi-System Operator
NAP	Network Access Provider
NID	Network Interface Device

NIF	Neighborhood Information Frame
N-ISDN	Narrowband ISDN
NIUF	North American ISDN User's Forum
NME	Network Management Entity
NNI	Network-Network Interface
NSAP	Network Source Access Point
NTIA	National Telecommunications and Information Administration
NTP	Network Transport Provider
NTSC	National Television System Committee
NTU	Network Termination Unit
NVOD	Near Video On Demand
O/E	Optical to Electrical
OAM	Operations, Administration And Maintenance
OAM&P	Operations, Administration, Maintenance and Provisioning
OC	Optical Carrier
OCI	Optical Carrier Interface
ONI	Optical Network Interface
ONU	Optical Network Unit
OS	Operations System
OSI	Open Systems Interconnection
OSS	Operations Systems
OTA	Office of Technology Assessment
PA	Prearbitrated
PCS	Personal Communications Services
PDH	Plesiochronous Digital Hierarchy
PDU	Protocol Data Unit
PES	Packetized Elementary Stream
PFM	Parameter Frame Management
PHY	Physical Layer Protocol
PLPC	Physical Layer Convergence Protocol
PM	Phase Modulation
PMD	Physical Layer Medium Dependent
POH	Path Overhead
PON	Passive Optical Network
POP	Point of Presence
POTS	Plain Old Telephone Service

PPL	Phase Locked Loop
PPV	Pay Per View
PPP	Point-to-Point Protocol
PRI	Primary Rate Interface
PRM	Protocol Reference Model
PS	Program Stream
PSTN	Public Switched Telephone Network
PT	Payload Type
PTE	Path-Terminating Equipment
PTM	Packet Transfer Mode
PTT	Post, Telephone and Telegraph
PVC	Permanent Virtual Circuit
QA	Queued Arbitrated
QAM	Quadrature Amplitude Modulation
QoS	Quality of Service
RBOC	Regional Bell Operating Company
RME	Routing Management Entity
RMN	Remote Multiplexer Node
RMP	Routing Management Protocol
RMS	Root Mean Square
RMT	Ring Management
SAP	Service Access Point
SAR	Segmentation and Reassembly Sublayer
SAS	Single Attachment Stations
SCP	Service Control Point
SDLC	Synchronous Data Link Control
SDM	Space Division Multiplexing
SDMT	Synchronized DMT
SDSL	Symmetric Digital Subscriber Line
SDU	Service Data Unit
SIF	Status Information Frame
SMF	Single Mode Fiber
SMS	Service Management System
SMT	Station Management
SNA	System Network Architecture
SNI	Subscriber Network Interface
SRF	Status Report Frame
SS7	Signaling System Number 7

SSP	Service Switching Point
STB	Set-Top Box
STP	Shielded Twisted Pair
STV	Sprint Telecommunications Venture
SVC	Switched Virtual Circuit or Signaling Virtual Circuit
TA	Trunk Amplifier
TA 1996	Telecommunications Act of 1996
TC	Transmission Convergence
TDD	Time Division Duplexing
TDMA	Time Division Multiple Access
TP	Transaction Processing
TRT	Token Rotation Timer
TS	Transport Stream
TTRT	Target Token Rotation Time
TVX	Valid Transmission Timer
UAWG	Universal ADSL Working Group
UNI	User-Network Interface
UTOPIA	Universal Test and Operations Physical Interface for ATM
UTP	Unshielded Twisted Pair
VBR	Variable Bit Rate
VCI	Virtual Channel Identifier
VDSL	Very High-Bit Rate Digital Subscriber Line
VDT	Video Dial Tone
VIP	Video Information Provider
VoD	Video on Demand
VPI	Virtual Path Identifier
WAN	Wide Area Network
WCA	Wireless Cable Association
WDM	Wavelength Division Multiplexing
XC	Cross Connect

Contents