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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Operator requirements for full-service VDSL in ITU-T Recommendations H.610 and H.611

ITU-T H-series Recommendations – Supplement 3

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Supplement 3 to ITU-T H-series Recommendations

Operator requirements for full-service VDSL in ITU-T Recommendations H.610 and H.611

Summary

This Supplement is based on the Full-Service VDSL Focus Group Technical Specification (FGTS) – Part 1 "FS-VDSL Operators Requirements" and complements the specifications found in ITU-T Recs H.610 and H.611.

Source

Supplement 3 to ITU-T H-series Recommendations was agreed by ITU-T Study Group 16 (2001-2004) on 30 May 2003.

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.

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Supplement 3 to ITU-T H-series Recommendations

Operator requirements for full-service VDSL in ITU-T Recommendations H.610 and H.611

1 Scope

ITU-T Recs H.610 and H.611 define the architecture and operations, administration monitoring and provisioning (OAMP) requirements for the delivery of video, data and voice services across a VDSL access network to an in-home environment, known as a Full-Service VDSL (FS-VDSL) network.

This Supplement provides the operator requirements for services and infrastructure deployment upon which these Recommendations were based. The intent was to maximize commonality of the operators' requirements to help vendors to implement common products, which can then be offered in all international markets thereby achieving economies of scale.

The Recommendations aim to enable the provisioning of a bundle of triple-play services in a reliable way, with minimal user intervention, respecting the key requirements of security and conditional access to the content and at a cost compatible with mass market deployment. Only the elements that need to be specified to achieve an interoperable low-cost platform are included in these specifications. It is intended that each service provider can define and evolve a distinct portfolio of competitive services using the 'bricks' defined in the Recommendations with downloadable software configuration.

VDSL is referenced throughout the Supplement as the physical layer technology; however, the architectural specifications contained herein could be equally applicable to CPE and Access Networks employing other broadband physical layer technologies.

2 References

The following references are provided for information. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this Supplement are therefore encouraged to investigate the most recent edition of the references listed below.

- [1] Committee T1, T1.424-Trial Use, *Interface Between Networks and Customer Installations – Very-high Speed Digital Subscriber Lines (VDSL) Metallic Interface (Trial-use Standard): March 2002 – Part 1 – Functional Requirements and Common Specification*.
- [2] Committee T1, T1.424-Trial Use, *Interface Between Networks and Customer Installations – Very-high Speed Digital Subscriber Lines (VDSL) Metallic Interface (Trial-use standard): March 2002 – Part 2 – Technical Specification for Single-Carrier Modulation (SCM) Transceivers*.
- [3] Committee T1, T1.424-Trial Use, *Interface Between Networks and Customer Installations – Very-high Speed Digital Subscriber Lines (VDSL) Metallic Interface (Trial-use standard): March 2002 – Part 3 – Technical Specification for Multi-Carrier (MCM) Transceivers*.
- [4] ETSI TS 101 270-1 V1.2.1 (1999-10), *Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Very-high Speed Digital Subscriber Lines (VDSL); Part 1: Functional requirements*.
- [5] ETSI TS 101 270-2 V1.1.1 (2001-02), *Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Very-high Speed Digital Subscriber Lines (VDSL); Part 2: Transceiver requirements*.

- [6] ITU-T Recommendation H.610 (2003), *Full-Service VDSL – System architecture and customer premises equipment*.
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- [9] ETS 300 019-1-3, *Equipment Engineering (EE); Environmental conditions and environmental test for telecommunications equipment; Part 1-3: Classification of environmental conditions – Stationary use at weatherprotected locations*.
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- [15] ITU-T Recommendation K.46 (2003), *Protection of telecommunication lines using metallic symmetric conductors against lightning-induced surges*.
- [16] ITU-T Recommendation K.50 (2000), *Safe limits of operating voltages and currents for telecommunication systems powered over the network*.
- [17] EURESCOM Project P917 BOBAN (08, Jan. 01), *Broadband cabinet survey, specification and demonstration*.
- [18] CISPR 22 (2003), *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*.
- [19] CISPR 24 (1997), *Information technology equipment – Immunity characteristics – Limits and methods of measurement*.
- [20] Telcordia Technologies GR-1089-CORE (2002), *Electromagnetic Compatibility and Electrical Safety – Generic Criteria for Network Telecommunications Equipment*.
- [21] Telcordia Technologies GR-487 (2000), *Generic Requirements for Electronic Equipment Cabinets*.
- [22] ETSI EN 302 099, *Environmental Engineering (EE); Powering of equipment in access network*.
- [23] ITU-T Recommendation G.993.1 (2001), *Very high speed digital subscriber line foundation*.

3 Definitions

This Supplement defines the following term:

3.1 optical network unit (ONU): Normally the ONU would designate only the optical termination. However in this Supplement the term "ONU" is used as an overall concept that includes the switching matrix, VDSL line terminations, powering circuitry, and it may also include POTS/ISDN splitters, environmental sensors, back-up batteries and wire cross-connection jumpers.

4 Abbreviations

This Supplement uses the following abbreviations:

AAL	ATM Adaptation Layer
ADSL	Asymmetrical Digital Subscriber Line
ANSI	American National Standard Institute
ASP	Application Service Provider
ATM	Asynchronous Transfer Mode
BER	Bit Error Ratio
BLES	Broadband Loop Emulated Service
BRAS	Broadband Remote Access Server
CAM	Conditional Access Module
CBR	Constant Bit Rate
CCS7	Common Channel Signalling No. 7
CCTV	Closed Circuit Television
CLASS	Customer Local Area Signalling Services
CLEC	Competitor Local Exchange Carrier
CO	Central Office
CPCM	Copy Management and Copy Protection
CPE	Customer Premises Equipment
CSA	Carrier Serving Area
DAVIC	Digital Audio Visual Council
DBA	Dynamic Bandwidth Assignment
DBS	Direct Broadcast Satellite
DBTV	Digital Broadcast Television
DHCP	Dynamic Host Configuration Protocol
DLC	Digital Loop Carrier
DLEC	Distribution Local Exchange Carrier
DRM	Digital Rights Management
DSA	Distribution Serving Area
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer



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ECM	Entitlement Control Message
EMC	Electromagnetic Compatibility
EMS	Element Management System
EPG	Electronic Programme Guide
ETSI	European Telecommunications Standards Institute
FPD	Functional Processing and Decoding block
FSAN	Full-Service Access Network
FS-VDSL	Full-Service VDSL
FTTB	Fibre To The Building
FTTCab	Fibre To The Cabinet
FTTCurb	Fibre To The Curb
FTTEx	Fibre To The Exchange
FTTH	Fibre To The Home
GbE	Gigabit Ethernet
HDTV	High-Definition TV
HTML	Hypertext Markup Language
IAD	Integrated Access Device
IEEE	Institute of Electrical and Electronics Engineers
IGMP	Internet Group Management Protocol
ILEC	Incumbent Local Exchange Carrier
ILMI	Integrated Local Management Interface
IM	Instant Messaging
IoTV	Internet on TV
IP	Internet Protocol
IPSec	Internet Protocol Security
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
LAN	Local Area Network
MGCP	Media Gateway Control Protocol
MIB	Management Information Base
MPEG	Moving Picture Experts Group
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
NAT	Network Address Translation
NTSC	National Television Systems Committee
OAM	Operation, Administration and Maintenance
ODN	Optical Distribution Network

OLT	Optical Line Termination
ONU	Optical Network Unit
OPI	Optical Plant Interface
OTU-C	Optical Termination Unit – Central Office
OTU-R	Optical Termination Unit – Remote
PAL	Phase Alternation Line
PBX	Private Branch Exchange
PKI	Public Key Infrastructure
PON	Passive Optical Network
POTS	Plain Old Telephone Service
PPP	Point-to-Point Protocol
PPPoA	PPP over ATM
PPPoE	PPP over Ethernet
PPV	Pay Per View
PS	POTS or ISDN Splitter
PVR	Personal Video Recorder
QoS	Quality of Service
RFT-C	Remote Feeding Telecommunication circuit – Current limited
RFT-V	Remote Feeding Telecommunication circuit – Voltage limited
ROW	Right Of Way
SDH	Synchronous Digital Hierarchy
SECAM	Séquence Couleur Avec Mémoire (Sequential colour with memory)
SME	Small-Medium Enterprise
SNMP	Simple Network Management Protocol
SNR	Signal-to-Noise Ratio
SOHO	Small Office – Home Office
SONET	Synchronous Optical Network
STB	Set-Top Box
TDM	Time Division Multiplexing
VBI	Vertical Blanking Interval
VBR	Variable Bit Rate
VC	Virtual Connection
VDSL	Very high-speed Digital Subscriber Line
VLAN	Virtual Local Area Network
VoATM	Voice over ATM
VoD	Video on Demand
VoDSL	Voice over DSL



VoIP	Voice over IP
VP	Virtual Path
VPI	Virtual Path Identifier
VPN	Virtual Private Network
VTP	VDSL Termination Processing
VTP/D	VTP and/or VTPD
VTPD	VDSL Termination Processing and Decoding
VTU-C	VDSL Termination Unit – Central Office
VTU-R	VDSL Terminal Unit – Remote
WDM	Wavelength Division Multiplexing

5 Architecture and services

5.1 Introduction

This Supplement is focused on broadband access networks that use VDSL technology to reach the customers. This transmission technology can carry bandwidth-demanding services to both residential and business customers, exploiting the high-value existing telephone copper distribution network infrastructure.

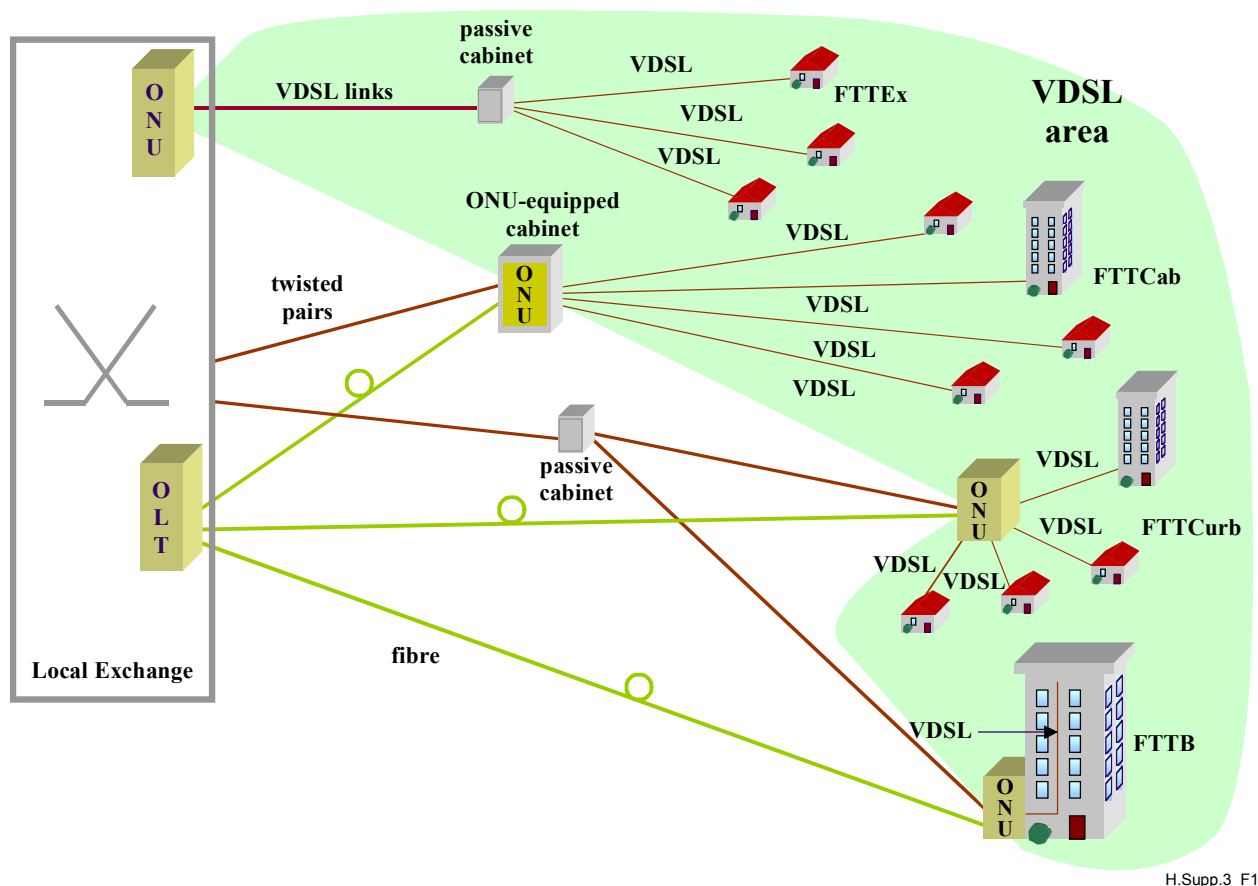
VDSL stands for Very high-speed Digital Subscribers Line. Like ADSL, VDSL capabilities are dependent on the distance between the end-customer and the operator equipment and the condition of the existing copper plant supporting the services. In all cases, as with ADSL, the idea is to use the telephone copper pairs to transport high bandwidth services to the customers.

In its design, VDSL is able to support various bit rates, in asymmetrical and symmetrical mode, depending upon loop conditions.

ITU-T Recs H.610 and H.611 are based on operator interest in both of the frequency plans defined in ITU-T Rec. G.993.1 Annex A (formerly known as plan 998) and Annex B (formerly known as plan 997) and the bit rates reported in Table 1.

Table 1 – Bit rates of interest for the Operators

	Asymmetric profiles	Symmetric profiles
North America	22 Mbit/s /3 Mbit/s 15 Mbit/s /1 Mbit/s	13 Mbit/s 6 Mbit/s
Europe	ETSI A4 (23 Mbit/s /4 Mbit/s) ETSI A3 (14 Mbit/s /3 Mbit/s)	ETSI S3 (14 Mbit/s) ETSI S1 (6.4 Mbit/s)



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Figure 1 – Architecture of the VDSL access system in the operator network

Both asymmetrical and symmetrical services are expected to be deployed in each market served. Asymmetrical services are typically focused on the residential market, whereas symmetrical services are typically targeted at the SME/SOHO markets.

In asymmetrical mode, the available bandwidth allows for the delivery of voice services, high-speed Internet, interactive applications and various video centric services to the end users, all this simultaneously on the same copper pair. This mode is well suited for the residential market.

The symmetrical mode, on the other hand, is well suited for the business market where flow of information is more than likely to be bidirectional for data and file transfers and web access.

5.2 The Full-Service VDSL platform architecture

Figure 2 gives a pictorial representation of the Full-Service VDSL network configuration. As shown, the various services (Internet, POTS/ISDN and video) are aggregated at the Optical Line Termination (OLT), which then distributes the content via a fibre link to the Optical Network Units (ONU) connected to it.