DOCSIS INTERFACE SPECIFICATIONS

ON WYRE NETWORK

Confidential

For Authorised Operators

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1. Introduction

The current document is provided to Wholesale Customers active on the Wyre HFC network following the BIPT Decision of 26 September 2023 regarding the identification of the network termination point for broadband services and TV services.
The current document only provides the interface specifications for the Wyre HFC network at the dedicated data RF interface. It is possible that following the services provided by the Wholesale Customers to the End Users additional specifications need to be added to the below specifications by the Wholesale Customers in order to comply with the obligations as mentioned in the BIPT Decision of 26 September 2023.
The BIPT Decision of 26 September 2023 is currently being appealed (Beroep van Orange Belgium tegen het besluit van de Raad van het BIPT van 26 september 2023 | BIPT). Should it appear that following the outcome of the appeal, the Decision of 26 September 2023 is annuled or needs to be amended, we preserve our rights to withdraw or amend the below specifications without prejudice.

1.1 Scope

This document describes the DOCSIS requirements for the Internet service over the Wyre HFC network at the dedicated data RF interface.

The interface specification does not apply under abnormal operating conditions such as:

- Operating conditions resulting from the use of services other than DOCSIS 3.1 over the dedicated data RF interface.
- Operating conditions arising from faults, maintenance, construction work, or efforts to minimize service interruptions.
- Operating conditions resulting from force majeure or third-party interference.
- Operating conditions during test signal injection governed by regulation.
- Instances of non-compliance with the relevant standards by a End User's installation, equipment, or technical requirements for connection, as established by this interface specification or public authorities, including the specified limits for electromagnetic compatibility.

The characteristics given in this interface specification are intended to be used to derive and specify requirements for equipment such as coaxial cables and cable modems to connect them to the dedicated data RF interface or Ethernet interface.

The values in this interface specification take precedence over requirements in equipment product standards and installation standards. The given characteristics are not intended to be used as electromagnetic compatibility levels or user emission limits in the Wyre network. This interface specification may be changed at any time and may break backward compatibility with previous versions.

1.2 Conventions

Throughout this document, the words that are used to define the significance of requirements are capitalized. These words are:

"**MUST, SHALL**”: This word means that the item is an absolute requirement of this specification.

"**MUST NOT**": This phrase means that the item is an absolute prohibition of this specification.

"**SHOULD**": This word means that there MAY exist valid reasons in particular circumstances to ignore this item, but the full implications SHOULD be understood, and the case carefully weighed before choosing a different course.

"**SHOULD NOT**": This phrase means that there MAY exist valid reasons in particular circumstances. When the listed behavior is acceptable or even useful, but the full implications SHOULD be understood, and the case carefully weighed before implementing any behavior described with this label.

"**MAY**": This word means that this item is truly optional.

1.3 Definitions

Cable Modem (CM)	modulator-demodulator at subscriber locations intended for use in conveying data Communications on a cable television system.
Cable Modem Termination System (CMTS)	cable modem termination system, located at the cable television system headend or distribution hub, which provides complementary functionality to the cable modem to enable data connectivity to a wide-area network.
Cable Network	coaxial-based broadband access network in the form of either an all-coax or Hybrid Fiber/Coax (HFC) network.
Customer	human being or organization that accesses the network to communicate via the services provided by the network.
Downstream	in cable television, the direction of transmission from the headend to the subscriber.
Dynamic range	ratio between the greatest signal power that can be transmitted over a multichannel analogue transmission system without exceeding distortion or other performance limits, and the least signal power that can be utilized without exceeding noise, error rate or other performance limits.
Group delay	difference in transmission time between the highest and lowest of several frequencies through a device, circuit, or system.
Hybrid Fiber/Coax (HFC) system	broadband bidirectional shared-media transmission system using fiber trunks between the headend and the fiber nodes, and coaxial distribution from the fiber nodes to the customer locations.
Impulse noise	noise characterized by non-overlapping transient disturbances.
Layer	subdivision of the Open System Interconnection (OSI) architecture, constituted by subsystems of the same rank.
Mid split	frequency division scheme that allows bi-directional traffic on a single coaxial cable.
Orthogonal Frequency Division Multiplexing	method of efficiently encoding digital data on multiple carrier frequencies.
PHYsical (PHY) layer	layer 1 in the Open System Interconnection (OSI) architecture; the layer that provides services to transmit bits or groups of bits over a transmission link between open systems and which entails electrical, mechanical and handshaking procedures.
Quadrature Amplitude Modulation (QAM)	method of modulating digital signals onto a radiofrequency carrier signal involving both amplitude and phase coding.
Radio Frequency (RF)	in cable television systems, this refers to electromagnetic signals in the range 5 MHz to 1.794 GHz.
Return loss (RL)	parameter describing the attenuation of a guided wave signal (e.g. via a coaxial cable) returned to a source by a device or medium resulting from reflections of the signal generated by the source.
Terminal	equipment connected to a telecommunication network to provide access to one or more specific services

1.4 Abbreviations

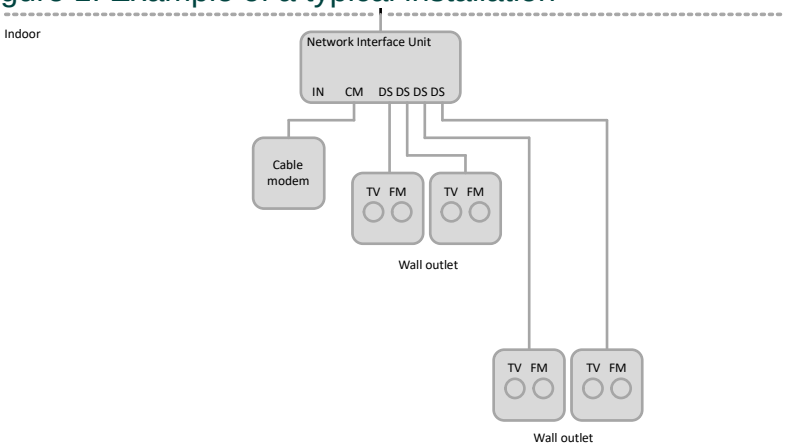
BER	Bit Error Rate
BPI+	Baseline Privacy Plus
CM	Cable Modem
CMCI	Cable Modem to CPE Interface
DHCP	Dynamic Host Configuration Protocol
DOCSIS	Data Over Cable Service Interface Specification
DS	Downstream
DS-Lite	Dual-Stack Lite
ERMI	European Retail Market Information
eRouter	embedded Router
FCC	Federal Communications Commission
FQDN	Fully Qualified Domain Name
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task ForceIP Internet Protocol
ITU	International Telecommunication Union
OSI	Open Systems Interconnection
MAC	Media Access Control
MER	Modulation Error Rate
MICE	Mechanical, Ingress, Climatic and Chemical, Electromagnetic
OFDM	Orthogonal Frequency-Division Multiplexing
QAM	Quadrature Amplitude Modulation
RCP	Receive Channel Profile
RF	Radio Frequency
SC	Single Carrier
SNMP	Simple Network Management Protocol
SNR	Signal to Noise Ratio
UGS	Unsolicited Grant Synchronization
US	Upstream
VAC	Volt Alternating Current
VDC	Volt Direct Current

2 Interface connectors

2.1 Demarcation point

The coax patch cable to connect the modem to the demarcation point, with either a clamp-type connector or a screw-type F-connector, needs to be certified and comply with the requirements stated in the document “Lastenkohier Wyre (Telenet-Interkabel)”. The demarcation point consists of an F connector, located on the NIU (Network Interface Unit).

Figure 1: Example of a typical installation



2.2 Modem interface description

The mechanical coaxial F connector on a modem device connected to the Wyre network must be according to the IEC 61169-24 standard as a “connector "F" type female socket (indoor)”.

3 DOCSIS 3.1 network RF characteristics

3.1 Downstream frequency range

The DOCSIS downstream frequency range according to CM-SP-PHYv3.1-I18-210125, B.6.3.2 shall be 108 to 1218MHz MHz (108 to 1794 MHz optional).

3.2 Downstream RF performance

Metric At CPE
SNR >=35dB
Rx -15dBmV < Rx <15dBmV Per 8MHz SC-QAM Channel
CER 0%

3.3 Upstream frequency range

The usable Frequency Range is 15MHz to 204MHz. Nominal minimum SC US channel count is 4.
The modem MUST support a frequency switchable split (upstream/downstream) at 65/85MHz and 204MHz (diplexer).

3.4 Upstream RF-performance

The reference channel bandwidth is 6.4MHz. Nominal values are valid for 99.5 % of the time.
Metric At CPE
Tx 25dBmV < Tx <51dBmV Per Channel
CER 0%

4 DOCSIS 3.1 physical interface requirements

The following table describes the DOCSIS physical interface requirements at the coaxial termination point based on and in line with CM-SP-PHYv3.1-I18-210125 (CM-SP-PHYv3.1-I18-210125.pdf).

CM-SP-PHYv3.1-I18-210125.pdf

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5 DOCSIS 3.1 upper layer requirements

5.1 MAC and upper layer

Where the NVT-ASCII character set is referenced in the CableLabs DHCP Options Registry, ASCII graphics characters (hexadecimal 20 through 7E) MUST be used. For DOCSIS 3.1, RMVI Sub-Options MUST be present.
The following minimum requirements are applicable: at least 8 upstream service flows MUST be supported, 4 of which can be UGS-only.
The following table describes the DOCSIS MULPI interface requirements and in line with spec CM-SP-MULPIv3.1-I25-230419. (CM-SP-MULPIv3.1-I25-230419.pdf)

CM-SP-MULPIv3.1-I25-230419.pdf

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	XII.2		Autonomous Load Balancing Example	x	x		
	XII.3		Downstream Profile Descriptor Change	x	x		
		XII.3.1	DPD Change to Profile A	x	x		
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5.2 Security layer

The requirements defined in EuroDOCSIS BPI+ requirements MUST be accomplished in compliance with CM-SP-SECv3.1-I11-230419.
Certificate requirements are defined in EuroDOCSIS BPI+. Requirements specified in this document take precedence over requirements in CM-SP-SECv3.1-I11-230419.
The following table describes the DOCSIS SEC interface requirements in line with CM-SP-SECv3.1-I11-230419. (CM-SP-SECv3.1-I11-230419.pdf)

CM-SP-SECv3.1-I11-230419.pdf

Index			Description	relevant for IF Spec	informative	mandatory	optional
1			**SCOPE**				
	1.1		Introduction and Purpose	x	x		
	1.2		Background	x	x		
		1.2.1	Broadband Access Network	x	x		
		1.2.2	Network and System Architecture	x	x		
		1.2.3	Service Goals	x	x		
		1.2.4	Statement of Compatibility	x	x		
		1.2.5	Reference Architecture	x	x		
		1.2.6	DOCSIS 3.1 Documents	x	x		
	1.3		Requirements	x	x		
	1.4		Conventions	x	x		
2			**REFERENCES**	**x**		**x**	
	2.1		Normative References	x		x	

Index			Description	relevant for IF Spec	informative	mandatory _	optional
	2.2		Informative References	x	x		
	2.3		Reference Acquisition	x		x	
3			**TERMS AND DEFINITIONS**	**x**		**x**	
4			**ABBREVIATIONS AND ACRONYMS**	**x**		**x**	
5			**OVERVIEW**	**x**		**x**	
	5.1		New DOCSIS 3.1 Security Features	x		x	
		5.1.1	BPI+ Architecture	x		x	
		5.1.2	Secure Provisioning	x		x	
	5.2		Operation	x		x	
		5.2.1	Cable Modem Initialization	x		x	
		5.2.2	Cable Modem Key Update Mechanism	x		x	
		5.2.3	Cable Modem Secure Software Download	x		x	
6			**ENCRYPTED DOCSIS MAC FRAME FORMATS**				
	6.1		CM Requirements	x		x	
	6.2		CMTS Requirements	x	x		
	6.3		Variable-Length PDU MAC Frame Format	x		x	
		6.3.1	Baseline Privacy Extended Header Formats	x		x	
	6.4		Fragmentation MAC Frame Format	x		x	
	6.5		Registration Request (REG-REQ-MP) MAC Management Messages	x		x	
	6.6		Use of the Baseline Privacy Extended Header in the MAC Header	x		x	
7			**BASELINE PRIVACY KEY MANAGEMENT (BPKM) PROTOCOL**				
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		7.1.1	Introduction	x		x	
		7.1.2	Encrypted Multicast	x		x	
		7.1.3	Selecting Cryptographic Suites	x		x	
		7.1.4	Authorization State Machine	x		x	
		7.1.5	TEK State Machine	x		x	
	7.2		Key Management Message Formats	x		x	
		7.2.1	Packet Formats	x		x	
		7.2.2	BPKM Attributes	x		x	
8			**EARLY AUTHENTICATION AND ENCRYPTION (EAE)**				
	8.1		Introduction	x		x	
	8.2		EAE Signaling	x		x	
	8.3		EAE Encryption	x		x	

Index			Description	relevant for IF Spec	informative	mandatory _	optional
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		8.4.1	CMTS and CM Behaviors when EAE is Enabled	x		x	
		8.4.2	EAE Enforcement Determination	x		x	
		8.4.3	EAE Enforcement of DHCP Traffic	x		x	
		8.4.4	CMTS and CM Behavior when EAE is Disabled	x		x	
		8.4.5	EAE Exclusion List	x		x	
		8.4.6	Interoperability Issues	x		x	
	8.5		Authentication Reuse	x		x	
	8.6		BPI+ Control by Configuration File	x		x	
		8.6.1	EAE Enabled	x		x	
		8.6.2	EAE Disabled	x		x	
9			**SECURE PROVISIONING**				
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	9.2		Encryption of Provisioning Messages	x		x	
	9.3		Securing DHCP	x		x	
		9.3.1	Securing DHCP on the Cable Network Link	x		x	
		9.3.2	DHCPv6	x		x	
	9.4		TFTP Configuration File Security		x		
		9.4.1	Introduction		x		
		9.4.2	CMTS Security Features for Configuration File Download		x		
	9.5		Securing REG-REQ-MP Messages	x		x	
	9.6		Source Address Verification		x		
	9.7		Address Resolution Security Considerations	x	x		
10			**USING CRYPTOGRAPHIC KEYS**				
	10.1		CMTS	x	x		
	10.2		Cable Modem	x		x	
	10.3		Authentication of Dynamic Service Requests	x		x	
		10.3.1	CM	x		x	
		10.3.2	CMTS	x	x		
11			**CRYPTOGRAPHIC METHODS**				
	11.1		Packet Data Encryption	x		x	
	11.2		Encryption of the TEK	x		x	
	11.3		HMAC-Digest Algorithm	x		x	
	11.4		TEKs, KEKs, and Message Authentication Keys	x		x	
	11.5		Public-Key Encryption of Authorization Key	x		x	
	11.6		Digital Signatures	x		x	

Index			Description	relevant for IF Spec	informative	mandatory _	optional
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		11.7.2	Definition of MMH-MAC	x		x	
		11.7.3	Calculating the DOCSIS MMH-MAC	x		x	
		11.7.4	MMH Key Derivation for CMTS Extended MIC				
		11.7.5	Shared Secret Recommendations	x	x		
		11.7.6	Key Generation Function	x		x	
12			**PHYSICAL PROTECTION OF KEYS IN THE CM**	**x**		**x**	
13			**BPI+ X.509 CERTIFICATE PROFILE AND MANAGEMENT**	**x**		**x**	
	13.1		BPI+ Certificate Management Architecture Overview	x		x	
	13.2		Cable Modem Certificate Storage and Management in the CM	x		x	
	13.3		Certificate Processing and Management in the CMTS	x	x		
		13.3.1	CMTS Certificate Management Model	x	x		
		13.3.2	Certificate Validation	x	x		
	13.4		Certificate Revocation	x	x		
		13.4.1	Certificate Revocation Lists	x	x		
		13.4.2	Online Certificate Status Protocol	x	x		
14			**SECURE SOFTWARE DOWNLOAD (SSD)**	**x**	**x**		
	14.1		Introduction	x	x		
	14.2		Overview	x	x		
	14.3		Software Code Upgrade Requirements	x		x	
		14.3.1	Code File Processing Requirements	x		x	
		14.3.2	Code File Access Controls	x		x	
		14.3.3	Cable Modem Code Upgrade Initialization	x		x	
		14.3.4	Code Signing Guidelines	x		x	
		14.3.5	Code Verification Requirements	x		x	
		14.3.6	DOCSIS Interoperability	x		x	
		14.3.7	Error Codes	x		x	
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		A.1.1	Baseline Privacy Configuration Setting	x		x	
	A.2		Parameter Guidelines	x		x	
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Index			Description	relevant for IF Spec	informative	mandatory _	optional
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	C.2		Theory of Operation	x		x	
	C.3		SA Mapping State Model	x		x	
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		I.3.1	CM Device Certificate Details	x	x		
	I.4		Authorization Reply	x	x		
		I.4.1	Derivation of the Encryption Keys	x	x		
		I.4.2	Encryption of the Authorization Key	x	x		
		I.4.3	Hashing Details	x	x		
	I.5		Key Request	x	x		
		I.5.1	HMAC Digest Details	x	x		
	I.6		Key Reply	x	x		
		I.6.1	TEK Encryption Details	x	x		
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	I.7		Packet PDU Encryption (DES)	x	x		
		I.7.1	CBC Only	x	x		
		I.7.2	CBC with Residual Block Processing	x	x		
		I.7.3	Runt Frame	x	x		
		I.7.4	40-bit Key	x	x		
	I.8		Encryption of PDU with Payload Header Suppression (DES)	x	x		
		I.8.1	Downstream	x	x		
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	I.9		Fragmented Packet Encryption (DES)	x	x		
	I.10		Packet PDU Encryption (AES)	x	x		
		I.10.1	CBC Only	x	x		
		I.10.2	CBC with Residual Block Processing	x	x		

Index			Description	relevant for IF Spec	informative	mandatory	optional
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	I.11		Encryption of PDU with Payload Header Suppression (AES)	x	x		
		I.11.1	Downstream	x	x		
		I.11.2	Upstream	x	x		
	I.12		Fragmented Packet Encryption (AES)	x	x		
	I.13		Secure Software Download CM Code File	x	x		
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APPENDIX III			**CERTIFICATION AUTHORITY AND PROVISIONING GUIDELINES (INFORMATIVE)186**				
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	III.5		CableLabs DOCSIS CVC CA Certificate	x		x	
	III.6		Code Verification Certificate	x		x	
	III.7		Certificate Installation	x		x	
	III.8		CM Code File Signing Policy and Format	x		x	
		III.8.1	Manufacturer CM Code File Signing Policy	x		x	
		III.8.2	Operator CM Code File Signing Policy	x		x	
		III.8.3	CM Code File Format	x		x	
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5.3 OSS layer

Compliance with CM-SP-CM-OSSIv3.1-I25-231012 MUST be accomplished.
The following table describes the DOCSIS OSSI interface requirements and in line with CM-SP-CM-OSSIv3.1-I25-231012 (CM-SP-CM-OSSIv3.1-I25-231012.pdf).

CM-SP-CM-OSSIv3.1-I25-231012.pdf

Index			Description	relevant for IF Spec	informative	mandatory	optional
1			**SCOPE**				

Index			Description	relevant for IF Spec	informative	mandatory	optional
	1.1		Introduction and Purpose	x	x		
	1.2		Background	x	x		
		1.2.1	Broadband Access Network	x	x		
		1.2.2	Network and System Architecture	x	x		
		1.2.3	Service Goals	x	x		
		1.2.4	Statement of Compatibility	x	x		
		1.2.5	Reference Architecture	x	x		
		1.2.6	DOCSIS 3.1 Documents	x	x		
	1.3		Requirements	x	x		
	1.4		Conventions	x	x		
	1.5		Organization of Document	x	x		
		1.5.1	Annexes (Normative)	x	x		
		1.5.2	Appendices (Informative)	x	x		
2			**REFERENCES**				
	2.1		Normative References	x	x		
	2.2		Informative References	x	x		
	2.3		Reference Acquisition	x	x		
3			**TERMS AND DEFINITIONS**		**x**		
4			**ABBREVIATIONS AND ACRONYMS**		**x**		
5			**OVERVIEW**				
	5.1		DOCSIS 3.1 OSSI Key Features	x		x	
		5.1.1	Fault Management Features	x		x	
		5.1.2	Configuration Management Features	x		x	
		5.1.3	Performance Management Features	x		x	
		5.1.4	Security Management Features	x		x	
		5.1.5	Accounting Management Features		x		
	5.2		Technical Overview	x	x		
		5.2.1	Architectural Overview	x	x		
		5.2.2	Management Protocols	x		x	
		5.2.3	Information Models	x	x		
6			**OSSI MANAGEMENT PROTOCOLS**				
	6.1		SNMP Protocol	x		x	
		6.1.1	Requirements for IPv6	x		x	
7			**OSSI MANAGEMENT OBJECTS**	**x**			
	7.1		SNMP Management Information Bases (MIBS)	x		x	
		7.1.1	CableLabs MIB Modules	x		x	
		7.1.2	IETF RFC MIB Modules	x		x	

Index			Description	relevant for IF Spec	informative	mandatory	optional
		7.1.3	Managed objects requirements	x	x		
8			**OSSI FOR PHY, MAC AND NETWORK LAYERS**				
	8.1		Fault Management	x	x		
		8.1.1	SNMP Usage	x		x	
		8.1.2	Event Notification	x		x	
		8.1.3	Throttling, Limiting and Priority for Event, Trap and Syslog	x		x	
		8.1.4	SNMPv3 Notification Receiver config file TLV	x		x	
		8.1.5	Non-SNMP Fault Management Protocols	x		x	
	8.2		Configuration Management	x	x		
		8.2.1	Version Control	x		x	
		8.2.2	System Configuration	x		x	
		8.2.3	Secure Software Download	x		x	
		8.2.4	CM configuration files, TLV-11 and MIB OIDs/values	x		x	
	8.3		Accounting Management	x	x		
		8.3.1	Subscriber Usage Billing and class of services	x	x		
	8.4		Performance Management	x		x	
		8.4.1	Treatment and interpretation of MIB counters	x		x	
	8.5		Security Management	x		x	
		8.5.1	CM SNMP Modes of Operation	x		x	
		8.5.2	CM SNMP Access Control Configuration	x		x	
9			**OSSI FOR CMCI**				
	9.1		SNMP Access via CMCI		x		
	9.2		Console Access		x		
	9.3		CM Diagnostic Capabilities	x			x
	9.4		Protocol Filtering	x		x	
10			**OSSI FOR LED INDICATORS**				
	10.1		CM LED Requirements and Operation		vendor specific		
		10.1.1	Power On, Software Application Image Validation and Self-Test		vendor specific		
		10.1.2	Scan for Downstream Channel		vendor specific		
		10.1.3	Resolve CM-SG and Range		vendor specific		
		10.1.4	Operational		vendor specific		

Index			Description	relevant for IF Spec	informative	mandatory	optional
		10.1.5	Data Link and Activity		vendor specific		
	10.2		Additional CM Operational Status Visualization Features		vendor specific		
		10.2.1	Secure Software Download		vendor specific		
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	A.2		[RFC 2863] ifTable/ifXTable MIB-Object Details	x		x	
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		B.1.1	LLC Filters	x		x	
		B.1.2	Special filters	x		x	
		B.1.3	IP Protocol Filtering	x		x	
		B.1.4	Protocol Classification through Upstream Drop Classifiers	x		x	
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	D.1		Overview		x		
		D.1.1	PNM	x		x	
		D.1.2	Latency Reporting	x		x	
	D.2		Enhanced Signal Quality Monitoring Object Definitions	x		x	
		D.2.1	Type Definitions	x		x	
		D.2.2	PnmCaptureFile Object	x		x	
		D.2.3	PNM CM Control Object	x		x	
		D.2.4	CM Spectrum Analysis Objects	x		x	
		D.2.5	CmSymbolCapture Object	x		x	
		D.2.6	CmOfdmChanEstimateCoef Object	x		x	
		D.2.7	CmDsConstDispMeas Object	x		x	
		D.2.8	CmDsOfdmRxMer Object	x		x	
		D.2.9	CmDsOfdmMerMargin Object	x		x	
		D.2.10	CmDsOfdmFecSummary Object	x		x	
		D.2.11	CmDsOfdmRequiredQamMer Object	x		x	
		D.2.12	CmDsHist Object	x		x	
		D.2.13	CmUsPreEq Object	x		x	
		D.2.14	CmDsOfdmModulationProfile Objects	x		x	

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		D.3.1	CMLatencyRPT	x		x	
		D.3.2	Latency Performance Reporting File Format	x		x	
		D.3.3	Example		x		
	D.4		Slope and Ripple Algorithms		x		
		D.4.1	Overview		x		
		D.4.2	Best-Fit Equations		x		
		D.4.3	Magnitude Summary Metrics		x		
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		D.4.5	Group Delay Summary Metrics		x		
	D.5		Bulk Data Transfer	x		x	
		D.5.1	CM Bulk Data Transfer Requirements	x		x	
		D.5.2	CM Data-File and Storage Requirements	x		x	
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	E.2		Data Type Mapping		x		
		E.2.1	Data Type Requirements and Classification		x		
		E.2.2	Data Type Mapping Methodology		x		
		E.2.3	General Data Types		x		
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		E.2.5	Common Terms Shortened				
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	F.2		CM Operational Status Object Definitions	x		x	
		F.2.1	Overview	x		x	
		F.2.2	Type Definitions	x		x	
		F.2.3	CM Operational Status Objects	x		x	
	F.3		CM Downstream and Upstream Interfaces Information Models	x		x	
		F.3.1	DS US Common Data Type Definitions	x		x	
		F.3.2	CM Downstream Interface Information Model	x		x	
		F.3.3	CM Upstream Interface Information Model	x		x	
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		G.1.1	Cable Modem Service Groups (CM-		x		

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			SGs)				
		G.1.2	Downstream Bonding Group (DBG)		x		
		G.1.3	Upstream Bonding Group (UBG)		x		
	G.2		Object Definitions		x		
		G.2.1	Type Definitions		x		
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		I.1.1	Use Case 1: Figure of Merit Estimation for Logical Upstream Channel		x		
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APPENDIX II			**ACKNOWLEDGEMENTS (INFORMATIVE)**		**x**		
APPENDIX III			**REVISION HISTORY**		**x**		

5.4 Registration and provisioning

During registration cable modems will receive a generic configuration file. All network provided channels MUST be supported to achieve the maximum configurable traffic rate per network segment.
Vendor and model fields of the system descriptor (sysDescr) MUST NOT change during the lifetime of the product.

6 IP-addresses for devices behind the cable modem (informative)

IP-capable devices/interfaces behind the cable modem can be assigned with IP configuration in one of the three possible scenarios:

1. IPv4-only configuration – each allowed device/interface will receive a native IPv4 address and other corresponding configuration to use for inbound/outbound IPv4-based traffic
2. Dual-Stack – each allowed device/interface will receive a native IPv4 address and a global IPv6 address as well as a delegated prefix in the range of /56 to /64 to use for inbound/outbound IPv4- and IPv6-based traffic respectively.
3. Dual-Stack Lite – each allowed device/interface will receive a global IPv6 address as well as a delegated prefix in the range of /56 to /64 to use for inbound/outbound IPv6-based traffic. Also, DS-Lite configuration will be assigned to the device/interface for IPv4-based traffic.

6.1 DHCPv4

The following information MUST be requested by the DHCP client and will then be provided by DHCP server:

- IP-address
- Subnet mask
- Gateway address (router option)
- DNS-server

6.2 DHCPv6

The following information MUST be requested by the DHCP client and thus will be provided by DHCPv6

- IPv6-address
- DNS-server
- DS-Lite option (if requested see 10.3 below)
- Delegated prefix

To avoid a configuration conflict, the configuration of the router device WAN behind/in the cable modem MUST be done via respective DHCP and other procedures such as static configuration MUST NOT be used.

6.3 DS-Lite

Dual-Stack Lite is implemented according to RFC6333. The FQDN of the AFTR device is provided to the client-router according to RFC6334. DS-Lite MUST NOT be activated if an IPv4 public lease is obtained.

6.4 Prefix delegation

IPv6 Prefix delegation according to RFC3633 MUST be supported.

6.5 Multicast

If the modem contains an eRouter, IGMP/MLD proxy and IPv4/IPV6 multicast forwarding SHOULD be supported as described by CM-SP-eRouter-I21-220200.