MSO specific interface description

Unternehmensadresse

Date	**Juli 2016**
Version	**V 04_08_16**

Table of Contents

1 Base specifications

1.1 Access Technologies (non cable)

This document also covers additional (non-cable) technologies. Those are:

- FTTH

The following base interface specifications apply for these technologies:

FTTH to 100 Mbps:	IEEE 802.3u	
FTTH 100 to 1000 Mbps:	IEEE 802.3ab	(1000BaseT)
	IEEE 802.3z	(1000BaseSX1)
	IEEE 802.3z	(1000BaseLX2)

2 Scope

This document contains MSO specific information and specifications, beyond the definitions made in the base specification, for customer owned network termination devices which can be connected and operated on the MSO network.

Any information provided in this document must be taken into account, evaluated and any technical specifications and requirements must be fulfilled to claim full compatibility of the device to the MSO network. Definitions in this document supersede definitions and assumptions made in the base specification.

The equipment vendor is liable for damages and defects and must ensure proper operation, there is no obligation by the MSO to evaluate any customer owned network termination to proof compatibility or detect malfunctions.

3 Definitions, symbols and abbreviations

3.1 Definitions

Carrier Hum Modulation: peak-to-peak magnitude of the amplitude distortion relative to the RF carrier signal level due to the fundamental and low-order harmonics of the power-supply frequency

Composite Second Order beat (CSO): peak of the average level of distortion products due to second-order non-linearity's in cable system equipment

Composite Triple Beat (CTB): peak of the average level of distortion components due to third-order non-linearity's in cable system equipment

customer: human being or organization that accesses the network in order 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

High Frequency (HF): Used in the present document to refer to the entire subsplit (5 MHz to 30 MHz) and extended subsplit (5 MHz to 65 MHz) band used in return channel communications over the cable television network

hum modulation: undesired modulation of the television visual carrier by the fundamental or low-order harmonics of the power supply frequency, or other low-frequency disturbances

Hybrid Fibre/Coax (HFC) system: broadband bidirectional shared-media transmission system using fibre trunks between the headend and the fibre nodes, and coaxial distribution from the fibre 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

micro-reflections: echoes in the forward transmission path due to departures from ideal amplitude and phase characteristics

mid split: frequency division scheme that allows bi-directional traffic on a single coaxial cable

passive network termination point (pNTP): customer terminal with minimum optical/electrical spacing to the CMTS

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 radio-frequency 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 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

3.2 Abbreviations

BER	Bit Error Rate
C/N or CNR	Carrier-to-Noise Ratio
CENELEC	European Commitee for Electrotechnical Standardization
CM	Cable Modem
CPE	Customer Premise Equipment
CoNT	Customer Owned Network Termination Device
CSO	Composite Second Order beat
CTB	Composite Triple Beat
DIN	Deutsches Institut für Normung
DOCSIS	Data Over Cable Service Interface Specifications
ETSI	European Telecommunications Standards Institute
FM	Frequency Modulation
HF	High Frequency
HFC	Hybrid-Fibre/Coax
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
MER	Modulation Error Ratio
MGCP	Media Gateway Control Protocol
NCS	Network Control Signalling
PER	Packet Error Rate
POTS	Plain old telephony service
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase-Shift Keying
RF	Radio Frequency
pNTP	passive Network Termination Point
SIP	Session Initiation Protocol
TI	Terminal Input
SNR	Signal to Noise Ratio
MIB	Management Information Base
RFC	Request for Comment
MSO	Multiple Service Operator
L[1-7]	OSI Layer [1-7]

4 Basic Service Definition

The MSO grants network access to compatible devices which are following the MSO Interface specification. The customer will be able to use the following services, which are referenced as basic services throughout this document:

- L1 Network Access
- L2 Network Access
- IP (Internet) Service
- Voice Service

5 L1 Network Access

FTTH:

The base specification for FTTH describe the L1 network access, no further requirements are set.

6 L2 network access

FTTH:

The base specification for FTTH describe the L2 network access. Terminals for FTTH must support IEEE 802.1Q. Services are provided on VLAN 7, VLAN 8 or VLAN 1066.

7 IP (Internet) Services

The following section provides information regarding the IP and Internet Services which will be provided by the MSO. The following definition is set:

- IPv4 support is mandatory
- IPv6 support is mandatory
- DS-lite support is mandatory

The specification only references RFC's which must be supported in addition to the base RFC's which are mandatory to provide basic IPv4, IPv6 and DS-lite protocol operations.

7.1 IPv4 operations

Internet Protocol Version 4 is a widely used protocol in data communication over different types of networks. The logical connection between participating devices is set up by providing identification to each device.

In order to use the internet service, a compatible device must retrieve identification data (IP address) from the MSO backend systems. IPv4 addresses will only be assigned dynamically and may change on any network connect or device restart.

7.1.1 DHCP IPv4 Operation

The following RFC's must be supported for an address assignment performed via DHCP:

- RFC951, updated by 1395, 1497, 1532, 1542, 5494
- RFC2131, updated by 3396, 4361, 5494, 6842
- RFC2132

Any static or stateless configuration approach of IP address information, DNS services or routes on the WAN connection is incompatible with the MSO requirements and specifications.

7.1.2 PPPoE IPv4 Operation

The following RFC's must be supported for an address assignment performed via PPPoE:

- RFC 1661, updated by 2153
- RFC 1662, RFC 2516

Any static configuration of IP address information, DNS services or routes on the WAN connection is incompatible with the MSO requirements and specifications.

7.2 IPv6 operations

Internet Protocol Version 6 is the successor of IPv4 and supports a much larger number of nodes due to an increased address space. The logical connection between participating devices is set up by providing identification to each device.

In order to use the internet service, a compatible device must retrieve identification data (IP address / Ipv6 prefix) from the MSO backend systems. IPv6 addresses and IPv6 prefixes will only be assigned dynamically and are subject to change on any network connect or device restart.

IPv6 addresses on the WAN side are exclusively provided through DHCPv6, SLAAC is not supported and must remain disabled.

The following RFC's must be supported:

- RFC2131 (IPv4)
- RFC2132 (IPv4 and IPv6)
- RFC3315, updated by 4361, 5494, 6221, 6422, 6644, 7083, 7227, 7283, 7550
- RFC6221, RFC6422, RFC6644, RFC6842

Any static or stateless configuration approach of IP address information, DNS services or routes on the WAN connection is incompatible with the MSO requirements and specifications.

7.3 DS-lite operations

DS-lite is a very important IPv4 – IPv6 transition technology and must be supported by any router which connects to the MSO network. The MSO may drop single stack or dual stack operation at any time and move to an IPv6 only network where the customer owned network termination devices will operate as a B4 element.

The following RFC's must be supported for DS-Lite operation:

- RFC6233, updated by RFC 7335

8 Voice Services

SIP based voice services

SIP based voice service are provided based on the IETF RFC 3261 standard and its extensions.
SIP services, opposite to PacketCable based voice services, are not auto provisioned, the customer must enter the data manually in his device. The SIP credentials follow the schema shown below, equipment vendors should provide a compatible input interface for data entry into the device:

```
SIP username:    (^0|^0049)([2-9])(\d{5,}).{10,20}
SIP authname:    (^0|^0049)([2-9])(\d{5,}).{10,20}
SIP password:    (?=.*\d)(?=.*[a-z])(?=.*[A-
Z]).{6,10} SIP registrar:  <host>.<domain>.tld
SIP proxy:       <host>.<domain>.tld
```

9 Other services

There are no other services supported by the MSO.

10 Management, service and support

FTTH

The MSO will not perform any management operations on FTTH customer owned network terminals. Equipment manufacturers may implement TR069 or TR064 on the devices, but this is neither a requirement by the MSO nor will be actively used.

11 Safeguard clause

If any of the information provided in this document are invalid or otherwise, then to the extent and within the jurisdiction which that information is illegal, invalid or unenforceable, it shall be severed and deleted from this clause and the remaining information shall survive, remain in full force and effect and continue to be binding and enforceable.