Interface Specification

for the
passive Network Termination Point
in the Cable Network of
PŸUR – Tele Columbus Group

Version: 2.0
Date: Mai 25, 2020
Status: Issued
Author: PŸUR – Tele Columbus Group

1 Disclaimer

This document is furnished on an "AS IS" basis. Tele Columbus Group and its affiliates and/or subsidiaries as defined under 4. below (together "Operator") are not liable regarding claims arising from or in context with the application of this document.

Operator reserves the right to apply at any time implementations deviating from this document for reasons of technical trials that are limited in time and geographic area.

This document is subject to amendments without any notice as described in more detail under 0 below. From publication of a new version of this document all prior versions shall become obsolete.

2 Contents

3   Conventions

Throughout this document, the key words "**MUST**", "**MUST NOT**", "**SHALL**", "**SHOULD**",
"**SHOULD NOT**", and "**MAY**" in this document are to be interpreted as described in [RFC2119]:

"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. One vendor may choose to include the item because a particular marketplace requires it or because it enhances the product, for example; another vendor may omit the same item.

4 Applicability and Contact

This document applies to Tele Columbus Group. Affiliates and/or subsidiaries as listed below:

- Martens Deutsche Telekabel GmbH
- PrimaCom Berlin GmbH
- KSP-Kabelservice Prenzlau GmbH
- Tele Columbus Multimedia GmbH
- Tele Columbus Hessen GmbH
- Tele Columbus Kabel Service GmbH
- Tele Columbus Netze Berlin GmbH
- BIG Medienversorgung GmbH
- Tele Columbus Cottbus GmbH
- Tele Columbus Berlin-Brandenburg GmbH & Co.KG
- Tele Columbus Sachsen-Anhalt GmbH
- Tele Columbus Sachsen-Thüringen GmbH
- BBcom Berlin-Brandenburgische Communikationsges. mbH
- Teleco GmbH Cottbus Telekommunikation
- Cable Plus GmbH
- Wwcon Wärme-Wohnen-Contracting GmbH
- pepcom GmbH
- KKG Kabelkommunikation Güstrow GmbH
- TKN Telekabel-Nord GmbH
- FAKS, Frankfurer Antenne- und Kommunikationsservice GmbH
- REKA Regionalservice Kabelfernsehen GmbH
- Tele-System Harz GmbH
- Kabelcom Rheinhessen GmbH
- NEFtv GmbH
- Kabelfernsehen München Servicecenter GmbH
- WTC Wohnen & TeleCommunication Verwaltung GmbH & Co.KG
- Cabletech Kabel- und Antennentechnik GmbH
- MEDIACOM Kabelservice GmbH
- Hlkomm Telekommunikations GmbH

For all questions regarding this document please contact:
Tele Columbus AG
Kaiserin-Augusta-Allee 108
10553 Berlin
Website: http://www.pyur.com

5   Scope

This document describes the basic requirements to be met by CPE equipment for using data and voice services at the passive network termination point (pNTP) of the Operator cable network according to Sec. 5 FTEG (German Act on Radio Equipment and Terminal Equipment).

The first part of this document (Part A) covers the basic physical as well as DOCSIS protocol requirements for using Internet protocol (IP) services over the Operator cable network. The second part (Part B) focuses on the Internet access service whereas the third part (Part C) lists the requirements for using Operator's telephony services.

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. The values in this interface specification take precedence over requirements in equipment product standards and in installation standards. The given characteristics are not intended to be used as electromagnetic compatibility levels or user emission limits in the Operator network.

This interface specification may be changed at any time to reflect changes made to the network as required by Sec. 5 para. 1 FTEG. Anyone using this specification is encouraged to regularly check for the newest version available from the Operator web site. This interface specification may be superseded in total or in part by the terms of a contract between an individual user of this specification and the Operator.

6   References

In the case of a conflict between specific requirements in this document with requirements in any of the directly or indirectly referenced documents, the specific requirements of this document take precedence.

6.1   Normative References

In order to claim compliance with this specification, it is necessary to conform to the following standards and other works as indicated, in addition to the other requirements of this specification. Notwithstanding, intellectual property rights may be required to use or implement such normative references.

All references are subject to revision, and parties to agreements based on this specification or other users of this specification are encouraged to investigate the possibility of applying the most recent editions of the documents listed below.

[ANGA NTP]	ANGA, "Specification for the passive Network Termination Point in DOCSIS 3.0 Environment Network and Provisioning requirements, Version 1.01", ANGA 100 001 v1.01 (2016-07), July 2016.
[TC SIP]	Tele Columbus AG, "Interface Specification for the Telephony Service in the Cable Network of Tele Columbus AG", June 2019
[RFC1918]	Rekhter, Y. et al., „Address Allocation for Private Internets", BCP 5, RFC 1918, February 1996.
[RFC2119]	Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.
[RFC2131]	Droms, R., "Dynamic Host Configuration Protocol", RFC 2131, March 1997.
[RFC2132]	Alexander, S., and Droms, R., "DHCP Options and BOOTP Vendor Extensions", RFC 2132, March 1997.

[RFC2460]	Deering, S. and R. Hinden, "Internet Protocol, Version 6 (IPv6) Specification", RFC 2460, December 1998.
[RFC3315]	Droms, R., Bound, J., Volz, B., et al., "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", RFC 3315, July 2003
[RFC3633]	Troan, O. and R. Droms, "IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) version 6", RFC 3633, December 2003.
[RFC3646]	Droms, R., Bound, J., Volz, B., Lemon, T., Perkins, C., and M. Carney, "Dynamic Host Configuration Protocol for IPv6 (DHCPv6)", RFC 3315, July 2003.
[RFC6598]	Weil, J., Kuarsingh, V., Donley, C., Liljenstolpe, C., and M. Azinger, "IANA-Reserved IPv4 Prefix for Shared Address Space", BCP 153, RFC 6598, April 2012.
[RFC3261]	Rosenberg, J., Schulzrinne, H., „SIP: Session Initiation Protocol", RFC3261, June 2002
[CM-SP-MULPIv3.0]	DOCSIS-over-Cable Service Interface Specifications, Media Access Control and Upper Layer Protocols Interface Specification, CM-SP-MULPIv3.0-I29-160602, June 2, 2016, Cable Television Laboratories, Inc.
[CM-SP-SECv3.0]	Data-Over-Cable Service Interface Specifications, Security Specification, CM-SP-SECv3.0-I15-130808, August 8, 2013, Cable Television Laboratories, Inc.

[EuroDOCSIS BPI+ Requirements]	EuroDOCSIS BPI+ Requirements, Version 7.0, October 23, 2007, Excentis.
[CM-SP-OSSIv3.0]	DOCSIS-over-Cable Service Interface Specifications, Operations Support System Interface Specification, CM-SP-OSSIv3.0-I29-160602, June 2, 2016 , Cable Television Laboratories, Inc.
[DIN EN 50117]	Coaxial cables - Part 2-1: Sectional specification for cables used in cabled distribution networks - Indoor drop cables for systems operating at 5 MHz - 1000 MHz, DIN EN 50117-2-1:2008-08, 2008, DIN.

6.2 Reference Acquisition

ANGA specifications	http://www.anga.de, available from http://www.pyur.com/schnittstellenbeschreibung
Internet Engineering Task Force (IETF) RFCs	http://www.ietf.org
CableLabs specifications	http://www.cablelabs.com
Excentis EuroDOCSIS and EuroPacketCable requirements including MIBs	http://www.excentis.com
EuroCableLabs EuroPacketCable MIBs	http://www.excentis.com
DIN German Institute for Standardization	http://www.din.de

7 Definitions and Abbreviations

7.1 Definitions

The definitions in [ANGA NTP], subclause 3.1 apply.

7.2 Abbreviations

The abbreviations in [ANGA NTP], subclause 3.2 apply.

AD	Frequency dependant Amplitude Distortion (Peak to Peak)
AOR	Address of Record
BPI	Baseline Privacy Interface
C/(N+I)	Carrier (C) to Noise (N) and Intermodulation (I) ratio
CM	Cable Modem
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name System
DOCSIS	Data-over-Cable Service Interface Specifications
DS	Downstream
E-MTA	Embedded Multimedia Terminal Adapter
HFC	Hybrid Fibre Coax
IP	Internet Protocol
MTA	Multimedia Terminal Adapter
NTP	Network Termination Point
PD	Frequency dependant Phase Distortion (Peak to Peak)

pNTP	passive Network Termination Point
QoS	Quality of Service
SIP	Session Initiation Protocol
RF	Radio Frequency
UA	User Agent
US	Upstream
VSC	Vertical Service Code

Part A

Cable Network

8   RF Interface connector

The mechanical coaxial connector and the connection requirements at the customer's pNTP in [ANGA NTP], clause 4 apply.

9   Network RF characteristics

9.1   Downstream RF characteristics

9.1.1   Downstream frequency range

The downstream frequency range specification at the customer's pNTP in [ANGA NTP], subclause 5.1.1 applies. The supported DOCSIS DS frequency range **MUST** be 112 to 1002 MHz (centre frequency).

9.1.2   Downstream RF performance

The downstream RF performance characteristics at the customer's pNTP in [ANGA NTP], subclause 5.1.2 apply.

9.2   Upstream RF characteristics

9.2.1   Upstream Frequency Range

The upstream frequency range specification at the customer's pNTP in [ANGA NTP], subclause 5.2.1 applies. The usable upstream frequency range **MUST** be 10 MHz to 65 MHz.

9.2.2   Upstream RF Performance

If not listed otherwise in this subclause the upstream RF performance characteristics at the customer's pNTP in [ANGA NTP], subclause 5.2.2 apply. The reference channel bandwidth is 3.2 MHz. Nominal values valid for 99,5 % of time. The table in [ANGA NTP] is being clarified as follows:

Parameter	Nominal ratings and characteristics at installation time	Absolute maximum ratings and characteristics
per channel US level range	98.1 to 110 dB(µV)	≤ 114 dB(µV)
C/(N+I)	≥ 64.5 dB	≥ 62.5 dB
MER [1]	≥ 32 dB	≥ 30 dB
AD	≤ 1.1 dBpp	≤ 2.4 dBpp
PD	≤ 1.1 dBpp	≤ 2.4 dBpp
[1] 16 QAM in 3.2 MHz channel		

Table: 862 MHz Network Upstream Characteristics at the pNTP

Parameter	During Burst transmission	Between Bursts
Inband	-43 dBc	-72 dBc

Table: Spurious Emissions in 5.12 MHz upstream channel

10 Physical Interface Requirements

The physical interface requirements at the customer's pNTP in [ANGA NTP], clause 6 apply.

Part B

Internet Access Service

11 Cable Modem requirements

11.1 MAC and Upper Layer

The modem **MUST** comply with [CM-SP-MULPIv3.0].

The following minimum requirements apply:

- The modem **MUST** support DS channel bonding of at least 8 DS channels; the modem **SHOULD** support DS channel bonding of 16 DS channels.
- The modem **MUST** support US channel bonding of at least 4 US channels.
- The modem **MUST** support at least 8 US service flows.

11.2 Security layer

The modem **MUST** comply with [CM-SP-SECv3.0].

The cable modem certificate requirements are defined in [EuroDOCSIS BPI+ Requirements]. Requirements specified in that document take precedence over requirements in [CM-SP-SECv3.0].

11.3 OSS layer

The modem **MUST** comply with [CM-SP-OSSIv3.0].

12   IP Addressing

12.1 IP addresses for devices connected to the cable modem

The Operator provides a native IPv4/IPv6 dual-stack Internet access service to its customers. Each allowed IP capable device/interface behind the cable modem will on request receive a native IPv4 address and a global IPv6 address as well as a delegated IPv6 prefix and other corresponding configuration to use for inbound/outbound IPv4 and IPv6 ([RFC2460]) traffic, respectively.

Devices/interfaces behind the cable modem **MUST** support IPv4.

Devices/interfaces behind the cable modem **SHOULD** request an IPv6 address and an IPv6 prefix.

The number of devices/interfaces concurrently supported behind the cable modem depends on the actual tariff booked by the customer. In the most common setup there is one single IPv4 capable device/interface, e.g. a real or logical router instance, which provides Internet access to its clients by the means of network address translation (NAT) techniques. The real or logical

router instance **SHOULD** also request an IPv6 address as well as an IPv6 prefix to address other clients and to provide direct routed IPv6 Internet access to these clients.

Depending on tariff and/or available IPv4 address space supported IPv4 devices/interfaces receive either a public IPv4 address out of the Operator's RIPE assigned IPv4 address space or an IPv4 address out of the [RFC1918] address space or an IPv4 address out of the [RFC6598] address space. In case of [RFC1918] or [RFC6598] addressing, IPv4 Internet access is provided centrally through Carrier Grade NAT (CGN).

If DHCPv4 [RFC2131] is used for configuration, the following information **MUST** be requested by the DHCP client and will then be provided by the DHCP server in accordance with [RFC2132]:

- IPv4 address
- DNS server
- Subnet mask
- Gateway address (router)

If DHCPv6 [RFC3315] is used for configuration, the following information **MUST** be requested by the DHCP client and thus will be provided by the DHCPv6 server:

- IPv6 address (IA_NA)
- DNS server

If DHCPv6 [RFC3315] is used for configuration, the following information **MAY** be requested by the DHCP client and thus will be provided by the DHCPv6 server:

- Delegated IPv6 prefix (IA_PD)

In order to avoid configuration conflict, the configuration of the device/interface (e.g.router instance) behind cable modem **MUST** be done via respective DHCP. Other procedures such as static configuration **MUST NOT** be used.

12.2 IPv6 Prefix delegation
IPv6 Prefix delegation according to [RFC3633] **MUST** be supported.

Part C

Telephony Service

13 General

- The Operator provides a SIP voice service based on [RFC3261] as a primary line telephony service.
- There is one SIP accont per directory number (DN).
- SIP accounts **MUST** only be used at the customer's pNTP these DNs are assigned to.
- SIP accounts and other necessary data is available from PC's customer portal upon successful service activation.
- The SIP user agent (UA) **MUST** allow the user to configure at least the following parameters on a per DN basis:
  - ↘ Phone number (DN)
  - ↘ SIP domain
  - ↘ Outbound SIP proxy
  - ↘ (Authentication) user name
  - ↘ (Authentication) password

- The SIP UA **MUST** support user names matching this regexp: „[a-zA-Z0-9_]{9,20}"
- The SIP UA **MUST** support passwords matching this regexp: „[a-zA-Z0-9!$/()=?*+#-_.:]{8,32}"
- The SIP UA **MUST** use the same IP interface that is provisioned for Internet access service (cf. section 12)
- The SIP UA **MUST NOT** request a separate IP address and **MUST NOT** announce itself as a PacketCable device in any respect.
- The SIP UA **MUST** use IPv4
- The SIP UA **SHOULD NOT** be used behind NAT
- The SIP UA **MUST NOT** use IPv6

- The SIP UA interface to the Operator's voice service is described in [TC SIP]
- By the way of derogation from [TC-SIP], subclause 17.4, Operator's SIP Signaling Entity will reply "403 - Unknown username or password" if the Registration AOR of the SIP Endpoint is not found in its database.

14 Call features / Supplementary services

Supplementary services are controlled through Vertical Service Codes (VSC), for details see the user's manuals on the Operator website.

VSCs beginning with an asterisk (*) **MUST** be escaped and sent transparently and as is by the SIP UA to the SIP server.

15 Quality of Service

Quality of Service (QoS) for voice calls (signalling and media) set up per this specification will be taken care of by the network.

16 Fax

Fax and other analogue modem transmission is sent in-band over the voice codec.

Fax relay techniques such as T.38 **MUST NOT** be used.

17 Annex A: Coaxial cable assemblies

The screening effectiveness requirements for cable assemblies in the Operator network depend on the capabilities of the demodulator within the cable modem and the physical parameters like return loss and the length of the cable assembly itself. [ANGA NTP], annex 1.1 applies.

Coaxial cable assemblies to be used at the pNTP **MUST** fullfil the requirements of [DIN EN 50117] for Class A equipment.

18 Document History

Version	Date	Status
1.0	July 29, 2016	Initial public version
2.0	Mai 25, 2020	Updated PŸUR version