

TLN WRO Architecture type Document

< High level network system and equipment
physical interface description of the TLN WRO >



Document Housekeeping

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List of Appendixes

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None.

List of References

This document may refer to external documents or information sources.

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Reference 1 : <identification of reference>

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1 Abstract

This document provides a high level overview of physical interfaces of network and service systems/equipment to the beneficiaries of the Telenet Wholesale Reference Offer. A physical interface is the boundary that sends and receives signal between AO and Telenet, it is a representation of an instance of any physical hardware. This document describes main physical interfaces between AO and Telenet in an exhaustive way but on a conceptual level.

The feasibility of the technical designs and methods described in this document are subject to verification by a Proof of Concept (POC) test organized by Telenet and may be changed or updated depending on the outcome of this POC.

2 Glossary and Abbreviations

AOTC: Alternative Operator Testing & Compliance
CAS: Conditional Access System
CMTS: Cable Modem Termination System
CPE: Customer Precise Equipment
DOCSIS: Data over Cable Service Interface Specification
DSL: Digital Subscriber Line
DVB-C: Digital Video Broadcasting - Cable
ECM: Entitlement Control Messages
EMM: Entitlement Management Messages
eMTA: Embedded Multimedia Terminal Adapter
EPG: Electronic Program Guide
FM: Frequency Modulation
HFC: Hybrid Fiber Coax
HGW: Home Gateway
iDTV: interactive Digital Television
MPEG-2: Moving Picture Experts Group
MUX: Multiplex
NCP: Network Control Platform
NE: Network Element
NIU: Network Interface Unit
NOC-H: Network Operations Center-Hoboken
NOC-M: Network Operations Center-Mechelen
OAM: Operations and Maintenance
QAM: Quadrature Amplitude Modulation
RF: Radio Frequency
RPOI: Regional Point of Interconnection
SO: Switching Offices
STB: Set top box
TV: Television
VHE: Video Head end
VOD: Video on Demand

3 TLN WRO Overall Reference Architecture

This section displays in figure 1 below the overall architecture and block diagram of the Telenet Wholesale Reference Offer technical set-up. This figure is repeated in each “service specific” architecture document with as purpose to have a clear common reference and a strict application of naming conventions on building blocks and interfaces which are then further described in “specification” type documents which will allow the beneficiaries to implement the required interfaces on their end-user equipment, network and IT CRM systems.

Naming Conventions:

Each Network building block on the overall (General) level has a unique reference naming in the format: NE.G.xy, where xy is the number of the block. (xy <= 50 means TLN Network Element(NE) and xy >= 60 means AO NE

Each Network Interface on the overall (General) level has a unique reference naming in the format: IF.G.xy, where xy is the number of the interface.

Four main domains are defined:

- Wholesale Operator (TLN) domain: this is the set of all systems that are/will be present in the Telenet infrastructure to implement the TLN Wholesale reference offer. Per convention they will always be depicted as boxes with yellow borders in all documents.
- Alternative Operator (AO) domain: this is the set of all systems that are/will have to be present in the AO infrastructure to make use of the TLN Wholesale reference offer. Per convention they will always be depicted as boxes with green borders in all documents. Obviously TLN does not impose by any means how the AO should organize its own infrastructure, hence the AO domain components must be mainly seen as an example how the AO could organize its infrastructure to make use of the TLN WRO and for clarity of the TLN WRO by describing clearly the interfaces.
- Household domain: this is the set of all systems that are/will have to be present in the customer home to make use of the TLN Wholesale reference offer. Per convention they will be depicted as boxes with yellow or green borders in all documents, depending if they are TLN owned and/or provided equipments or AO owned and/or provided equipments. Obviously additional equipment may be present in the household, typically owned by the customer and where relevant for the technical explanations these equipments have been depicted as boxes with black borders. The household domain is for clarity reasons always bordered by red dotted lines. Obviously TLN does not impose by any means how the AO should organize its own household equipment, hence the AO elements in this domain components must be mainly seen as an example how the AO could organize this to make use of the TLN WRO and for clarity of the TLN WRO by describing clearly the building blocks.
- Third party domain (3rd party): this is the set of all systems that will be provided and operated by third parties on common behalf of the AO's and that require interfacing with TLN systems to enable use of the TLN Wholesale reference offer by AO. Per convention they will always be depicted as boxes with blue borders in all documents. Currently only the AO CAS system belongs to this category.

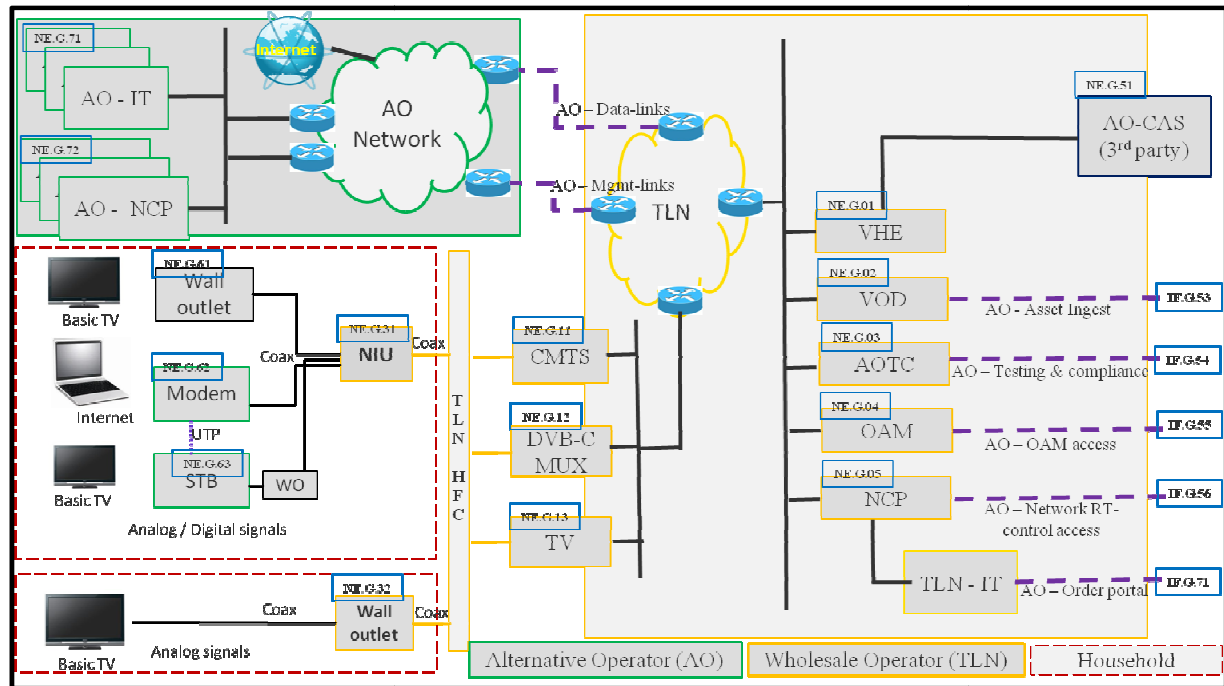


Figure 1

3.1 NE Interfaces described in this document

- (1) This section list all physical interfaces described in this document, together with a cross reference list of the identification tags of the TLN WRO specification type documents in which those interfaces are described in detail.
- (2) **Physical Interface (non-numbered) to CMTS (NE.G11);** This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (3) **Physical Interface (non-numbered) to DVB-C MUX (NE.G12);** This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (4) **Physical Interface (non-numbered) to TV (NE.G13);** This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (5) **Physical Interface AO - Asset Ingest: IF G.53 (on VOD (NE.G02));** This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (6) **Physical Interface AO - Testing & Compliance: IF G.54 (on AOTC (NE.G03));** This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (7) **Physical Interface AO - OAM Access: IF G.55 (on OAM (NE.G04));** This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z

- (8) **Physical Interface AO - Network RT - Control Access: IF G.56 (on NCP (NE.G05))**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (9) **Physical Interface AO - Order Portal: IF G.71 (on TLN-IT)**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (10) **Physical Interfaces: TLN Network**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (11) **Physical Interface (non-numbered) AO-IT (NE.G71)**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (12) **Physical Interface (non-numbered) AO-NCP (NE.G72)**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (13) **Physical Interface (non-numbered) NIU (NE.G31)**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (14) **Physical Interface (non-numbered) Wall Outlet (NE.G32)**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (15) **Physical Interface (non-numbered) Wall Outlet (NE.G61)**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (16) **Physical Interface (non-numbered) from modem (NE.G62)**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (17) **Physical Interface (non-numbered) from STB (NE.G63)**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z
- (18) **Physical Interface (non-numbered) from AO-CAS (3rd party) (NE.G51) to TLN VHE**; This interface is described in documents : <fill in specification type document reference list (if applicable)>doc x, doc y, doc z

4 TLN WRO Overall Reference Architecture

- (19) This document provides a high level network and service architecture overview of the main interfaces on a physical level that need to be build between the Telenet network and systems and the AO network, systems and CPE in order to allow the beneficiary to make use of the Telenet Wholesale Reference Offer. It describes the main physical interfaces on a conceptual level.

4.1 Architecture Wholesale Operator (TLN) domain sub blocks

- (20) This section gives a brief overview of the physical interfaces on equipment/systems in the TLN domain.

4.1.1 *Physical interface (non numbered) to CMTS (NE.G11)*

- (21) The CMTS communicates with Docsis type CPE (Cable modems, eMTA, Home Gateways) over the TLN HFC network. The physical layer connection between the AO modem CPE and TLN HFC network is realized via the NIU interactive data port using a TLN certified coax patch cord cable, carrying QAM modulated RF signals in both upstream and downstream exchanged between the CMTS and the AO modem CPE.

4.1.2 *Physical interface (non numbered) to DVB-C MUX (NE.G12)*

- (22) The DVB-C Multiplexers transport digital TV broadcast and VOD signals using MPEG-2 / MPEG-4 Transport Stream protocols towards the AO STB CPE. The physical layer connection between AO STB CPE and TLN HFC network is realized via the Wall Outlet using a TLN certified coax patch cord cable, carrying QAM modulated RF signals as being the generated by the TLN edge QAM devices (DVB-C MUX).

4.1.3 *Physical interface (non numbered) to TV (NE.G13)*

- (23) The physical interface for analog TV signals is the TLN certified wall plug and patch cord, carrying Pal encoded analog TV signals and FM modulated analog radio signals.

4.1.4 *Physical interface AO - Asset Ingest: IF G.53 (on VOD (NE.G02))*

- (24) The content management interaction of the VOD system for catalogue (content, metadata, images, trailers), ingest, storage, authorization, authentication and payment control is carried over the "AO - Mgmt" link as described in section 4.1.9 (TLN Converged Network)

4.1.5 *Physical interface AO - Testing & Compliance: IF G.54 (on AOTC (NE.G03))*

- (25) Broadband AOTC environment testing facilities will use physical interfaces as defined in section 4.1.1 to validate AO broadband equipment (HGW, cable modem, eMTA) and profiles for compliance with ingress/egress, RF modulation and shielding.
- (26) Digital TV AOTV environment testing facilities will use physical interfaces as defined in sections 4.1.2-4.1.4 to validate AO digital TV equipment for compliance with DVB-C

physical connectors, Telenet Digital Head end, VOD RF signaling, modulation and shielding requirements for certification prior to deployment approval

- (27) The online access to the AOTC test factory tools environment is carried over the “AO - Mgmt” link as described in section 4.1.9 (TLN Converged Network)

4.1.6 Physical interface AO - OAM Access: IF G.55 (on OAM (NE.G04))

- (28) AO will connect to the OAM environment to operate and maintain its end-user equipment over the “AO - Data” physical link as described in section 4.1.9 (TLN Converged Network).
- (29) Status information about health of interfaces between TLN network and AO equipment and about TLN network components will be exchanged over the “AO - Mgmt” link as described in section 4.1.9 (TLN Converged Network).

4.1.7 Physical interface AO - Network RT- Control Access: IF G.56 (on NCP (NE.G05))

- (30) The network control platform (NCP) is involved in the real-time session set-up and tear-down interactions between AO CPE and the network components. As such it handles the control plane message flows originated from AO CPE that wants to initialize and build-up (or tear down) and transport connection (or session) with the network. The TLN NCP will contact its counterpart at the AO side (AO-NCP) over the “AO - Data” physical link as described in section 4.1.9 (TLN Converged Network).

4.1.8 Physical interface AO - Order Portal: IF G.71 (on TLN-IT)

- (31) TLN-IT is used as an umbrella name for the set of systems that together implement the Telenet OSS/BSS system modules involved in supporting the TLN WRO in the broad sense of the definition
- (32) Physical connection is realized over the “AO - Mgmt” physical link as described in section 4.1.9 (TLN Converged Network).

4.1.9 Physical Interfaces: TLN Converged Network

- (33) The TLN converged network means the complete set of converged backbone and access network infrastructure that transports and routes data, video and voice to its destination and provides interconnection to the Internet. It is in the technical annexes of the TLN WRO often referred to with the generic term “network”.
- (34) The required connections between the TLN network and the AO network will be realized in “interconnection” points, sometimes also called “transit” points. Both terms are used on equivalent basis.
- (35) Two types of distinct interconnection points exist as described further.
- (36) The interconnect point for “AO Data” physical link between AO and TLN is at minimum one of the RPOI's which is physically located in one of the five Switching Offices (SO). Physical interface between AO and TLN will be established through carrier grade equipment using fiber transport with underlying optical multiplexing equipment interconnecting the TLN interconnect router in minimum one of the RPOI locations with its peer router in the AO premises. The “AO Data” physical link connection carries the AO end-user traffic.

- (37) The interconnect point for “AO Mgmt” physical link between AO and TLN is at one of the RPOI’s which is physically located in one of the five Switching Offices (SO). Physical interface for this connection between AO and TLN will be established through carrier grade equipment using fiber transport with underlying optical multiplexing equipment interconnecting the TLN interconnect router in one of the RPOI locations with its peer router in the AO premises. The “AO Mgmt” physical link connection carries “management” type traffic that needs to be exchanged between TLN and AO and provides also the infrastructure to receive e.g. AO 3rd party CAS provisioning commands and VOD asset files.
- (38) To make use of the VOD service as described in the AIDTV, the AO will also have to use the same physical connection that is used for “AO Mgmt” which is at one of the RPOI’s which is physically located in one of the five Switching Offices (SO). This link will be used to interconnect to the VOD Regional Service Area interconnection point. This VOD interconnection point is described in more detail in the annexes describing the AIDTV.
- (39) In addition, parts of the “AO Mgmt” physical link between AO and TLN can be established through virtual (VPN) connectivity over the public Internet (such as provisioning, access to test environments, accounting etc)

4.2 Architecture Alternative Operator (AO) domain sub blocks

This section gives a brief overview of the purpose and function of the physical interfaces in the AO domain.

4.2.1 *Physical interface (non numbered) AO-IT (NE.G71)*

(40) The relevant interfaces are described above already as seen from the TLN domain.

4.2.2 *Physical interface (non numbered) AO-NCP (NE.G72)*

(41) The relevant interfaces are described above already as seen from the TLN domain.

4.3 Architecture Household domain sub blocks

This section gives a brief overview of the purpose and function of the physical interfaces in the household domain.

4.3.1 *Physical interface (non numbered) NIU (NE.G31)*

- (42) NIU data and TV physical ports for interconnection of AO CPE equipment are F type coaxial connectors for up and downstream RF communication. NIU is always installed and owned by TLN.



- (43) Typical NIU installation is shown above.

4.3.2 *Physical interface (non numbered) Wall Outlet (NE.G32)*

- (44) This Wall outlet acts as signal transfer point between TLN and the beneficiary. This wall outlet provides analog TV signal connectivity for AO STB's, customer TV sets and/or FM radio's
- (45) The Wall outlet has standard IEC type connectors for connection for AO STB's, customer TV sets and/or FM radio's via a RF coax patch cord.
- (46) The WO must be TLN certified to support TLN HFC network signal characteristics such as frequency range, impedance, loss, etc.

4.3.3 *Physical interface (non numbered) Wall Outlet (NE.G61)*

- (47) This Wall outlet acts as a connectivity point between for the beneficiary STB's and/or customer TV sets and/or FM radio's. This wall outlet provides analog and digital TV signal connectivity.
- (48) The WO must be TLN certified to support TLN HFC network signal characteristics such as frequency range, impedance, loss, etc.

4.3.4 *Physical interface (non numbered) Modem (NE.G62)*

- (49) EuroDOCSIS compliant modem, eMTA or Home gateway to enable communication between the customer home interactive DTV (iDTV) return path and the TLN CMTS. Physical interface between CPE and TLN NIU is an F type connector for RF signaling. AO CPE is certified by TLN for compliance before it can be installed at customer premises.

- (50) The LAN side of CPE physical interface (AO responsibility domain) is typical through Ethernet ports for wired and/or Wifi for wireless connections.

4.3.5 *Physical interface (non numbered) STB (NE.G63)*

- (51) Digital TV STB to enable AO (i)DTV service delivery. AO STB connects to the wall outlet (WO) with certified coax patch cord cable to receive digital TV signals.
- (52) Digital TV STB connects to the TLN certified AO HGW, eMTA, cable modem or through a different return channel other than cable (e.g. DSL) for return path.

4.4 Architecture Third Party (3rd party) domain sub blocks

This section gives a brief overview of the purpose and function of the physical interfaces in the 3rd party domain.

4.4.1 *Physical interface (non numbered) from AO-CAS (3rd party) to TLN VHE*

(53)The AO-CAS (3rd party) is a Single Common Conditional Access System (CAS) operated by a third party CAS provider in joint interest of multiple beneficiaries of the TLN ROTV/IADTV. CAS signaling is part of DVB-C Service Information (SI) conditional access table (CAT). It is used for management of subscriber entitlement control and management messages (ECM/EMM) to descramble encrypted DTV content.

(54)Only one unique 3rd party CAS system can be presented, operating on behalf of all AO's.

(55)The AO-CAS (3rd party) interfaces to TLN VHE (provisioning and EMM/ECM signaling) are carried over the "AO - Mgmt" physical link as described in section 4.1.10 (TLN Network).