TLN WRO Architecture type Document

< Architecture ROBB >

Document Housekeeping

Document Category and type

CAT	TYPE	DOC ID	Comment
Broadband	ARCH	TLN_WRO_TA_B_A_PAAA	Architecture type documents (ARCH) mainly have an informational/explanatory purpose to highlight the overall technical set-up.

Document Status

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1.0	09.10.2013	Final
2.0	29.12.2018	Final
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Legal Disclaimer

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List of Appendixes

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A reference to an appendix is in this document highlighted with grey background.
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None.

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1 Abstract

This document provides a high-level network and service architecture overview of the Telenet Broadband Services Wholesale Reference Offer. It describes the main building blocks and building blocks on a conceptual level.

2 TLN WRO Overall Reference Architecture

This section displays in figure 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 building blocks which are then further described in "specification" type documents which will allow the beneficiaries to implement the required building blocks 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 building block.

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 building blocks.

- 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.

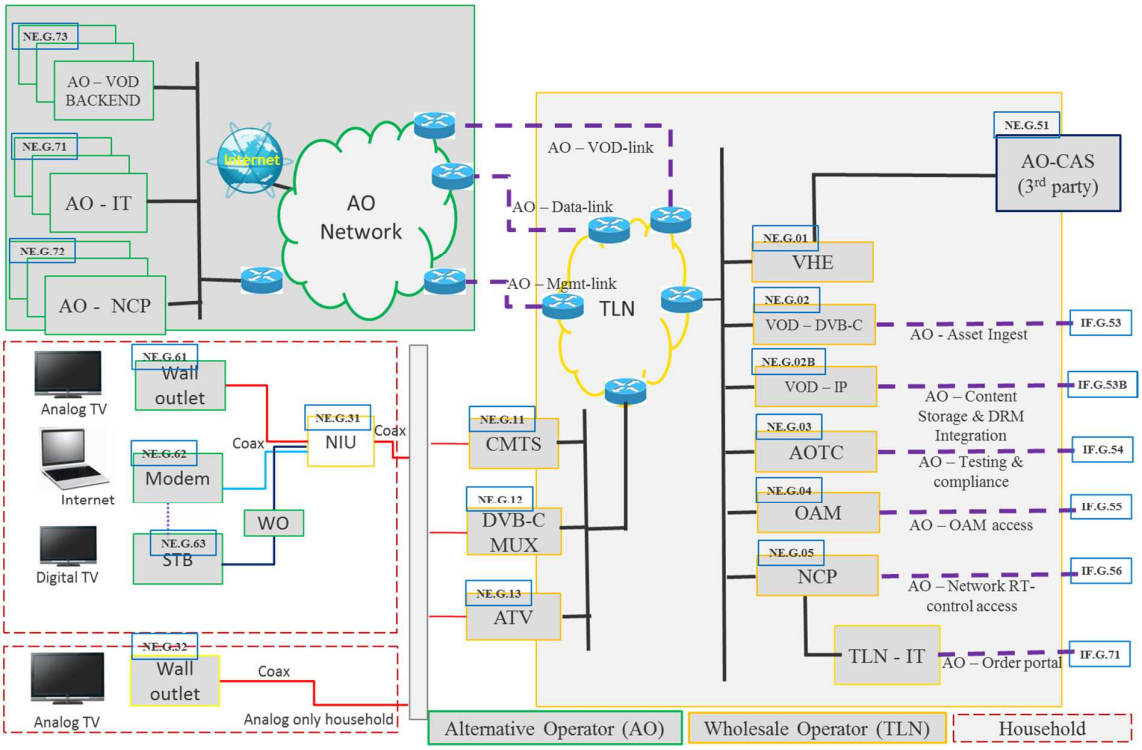

Figure 2-1: Overall Architecture and Block Diagram

AO-IT (NE.G71)

(1) AO-IT is used as an umbrella name for the set of systems that together implement the AO CRM and OSS/BSS systems in the broad sense of the definition. The TLN WRO does not make any assumption on the nature or architecture of the AO IT system. The main purpose of including this building block in the architecture drawings is highlighting possible ways of implementing the requirements of the TLN WRO.

(2) The AO – Order Portal interface (IF G.71) gives the AO the possibility to order TLN WRO services management on behalf of its customers

AO-NCP (NE.G72)

(3) 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 as a destination for control plane message flows originated from AO CPE that are "proxied" by its counterpart the TLN NCP. The TLN WRO does not make any assumption on the nature or architecture of the AO NCP system. The main purpose of including this building block in the architecture drawings is highlighting possible ways of implementing the requirements of the TLN WRO.

AO-VOD BACKEND (NE.G73)

(1) The AO VOD Backend is the combination of services the AO has to provide in order for VOD over IP services to work, as described in the ROTV and AIDTV Architecture.

(2) The AO – VOD-Link will be used for connecting the Telenet provided services and components with the AO VOD Backend. This will be a separate NNI link between Telenet and the AO as described in the Specification and Certification BB and VOD IP Interconnect document.

CMTS (NE.G11)

(3) The CMTS communicates with Docsis type CPE (Cable modems, Home Gateways) over the TLN HFC network and as such provides the basic transport services that allow communication between Docsis CPE and the TLN network.

(4) The logical connection between CMTS and CPE is IP over Euro Docsis.

(5) 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.

Modem (NE.G62)

(6) Euro Docsis compliant modem or Home gateway to enable communication between the customer in home LAN side network and the TLN CMTS.

(7) The Docsis modem has multiple logical interfaces towards TLN and AO network components, such as CMTS, NCP, etc., involved in the E2E service delivery.

(8) 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.

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

NCP (NE.G05)

(10) 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) to pass those parts of the control flows that require AO interaction. In addition to the real-time flows the TLN NCP will also interact with the AO NCP via non real-time transactions such as pre-loading of AO Docsis modem configuration files. In practice the NCP is a collection of platforms, using different protocols that are together addressed as NCP for clarity and simplicity of the reference offer.

(11) The AO – Network RT Control Access interface (IF G.56) gives the AO the possibility to receive in a controlled way the session set-up messages involved in initiating and closing of network connections by AO CPE devices and in this way participate in this process allowing the AO to build its own value added services.

NIU (NE.G31)

(12) The Network Building block Unit (NIU) is a device that provides the termination and hand-over point between the HFC network plant and the in customer home coaxial network. This device is always owned by TLN. One of its important functions is to protect the network against ingress of inappropriate signals on the RF level.

(13) NIU data and TV ports acts as signal transfer point between TLN and the beneficiary and provide DOCSIS, DVB-C (broadcast, VOD) and analog TV connectivity to the AO provided and/or owned broadband CPE and/or AO set top box for signaling, management and monitoring purposes.

(14) 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).

(15) 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).

(16) Typical example of a NIU installation is shown above.

OAM (NE.G04)

(17)The OAM environment provides facilities that enable the beneficiaries to operate and maintain their end-user equipment connected to the TLN network as well as to supervise status information about the health of building blocks between AO systems and the TLN network and about TLN network components involved in delivering service to their customers.

(18)AO will connect to the OAM environment to operate and maintain its end-user equipment (excluding the "modem" or "Docsis" part) over secure IP connection.

(19) Status information about health of interfaces between TLN network and AO equipment and about TLN network components will be available over the same links.

TLN Converged Network

(20)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".

(21)Its logical interfaces allow general data exchange for all services and all IP traffic between the TLN domains and the AO domains.

(22)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.

(23)Two types of distinct interconnection points exist as described further.

(24) 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 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.

(25) The interconnect point for "AO Mgmt" physical link between AO and TLN is at one of the RPOI´swhich is physically located in one 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 carry "management" type traffic that needs to be exchanged between TLN and AO and provide also the infrastructure to receive e.g. AO 3rd party CAS provisioning commands and VOD asset files.

(26) 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)

(27)The interconnect point for the "AO VOD" physical link has to be, like the "AO Data" link, at minimum one of the RPOI's which is physically located in one of the five Switching Offices (SO). It will also 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 premise. The RPOI location or locations for the "AO VOD" link might however be different from those for "AO Data". The "AO VOD" link connection carries the AO VOD over IP and the accompanying data path traffic, as described in the ROTV and AIDTV Architecture.

TLN-IT

(28) 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.

(29) Physical connection is realized over the "AO – Mgmt" physical link.

3 TLN WRO Broadband Reference Architecture

(30)This section provides a high level network and service architecture overview of the Telenet Broadband Services Wholesale Reference Offer (ROBB). It shows how the broadband part fits in the overall architecture referenced in section 3 above in this document.

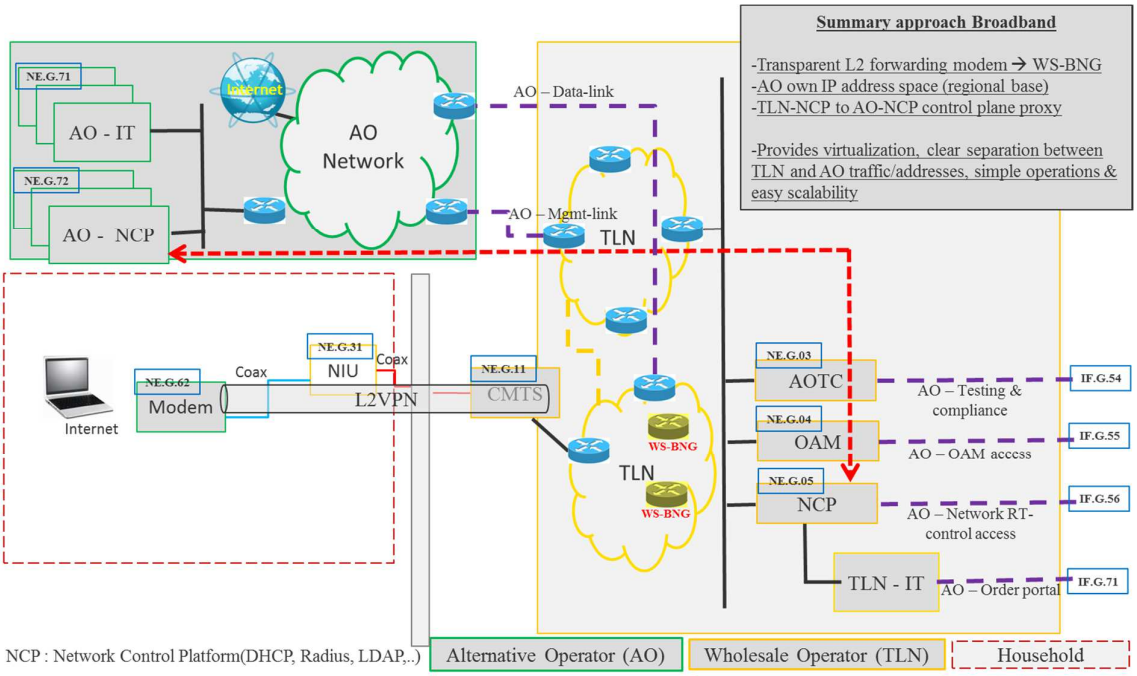

Figure 3-1: Overview Broadband Architecture

3.1 General Approach

(4) The generic approach (see figure above) that has been chosen is to create an L2VPN across the access network (CM to CMTS) using BSoD technology, which is then switched over a virtualized data path towards the WS-BNG. From the WS-BNG all the AO traffic is then routed to the network of the AO.

(31)This approach has the advantage that it offers clear traffic separation between Telenet and AO customers and that Telenet interference with AO end-user functionality is minimized, offering maximum “service differentiation” freedom towards the AO´s.

(32)In addition it uses a clean virtualization approach that will allow the “hosting” of multiple AO´s on the TLN network and also limiting interferences between different AO`s.

(33)In order to make use of the TLN ROBB the AO will have to interconnect its network to the TLN network in at least one of the Regional Points of Interconnect (RPOI) where the traffic will be routed between the AO and TLN.

(34)The AO will be required to have its own IP address range and IP address pools of sufficient size will have to be provided upfront to TLN to allow proper routing set-up configuration in each of the connected RPOI´s.

3.2 Key Broadband Network Elements

(35) This section gives a brief overview of the purpose and function of some key building blocks involved in the implementation of the broadband wholesale offer which have not yet been explained in the overall architecture document.

3.2.1 WS-BNG

(36) The Wholesale Broadband Network Gateway (WS-BNG) is a new network element that will be introduced in the TLN network to support wholesale broadband traffic.

(37) Initially, there might be a single set of redundant WS-BNG's that will be used for all five regions. There will be a logical separation per region on the WS-BNG's. It is possible that instead of a single set of redundant WS-BNG's, multiple sets of redundant WS-BNG's are deployed over time. The AO will interconnect to the WS-BNG's to be able to route CPE IP traffic between Telenet and the AO (data link).

(38) Using the standardized BSoD TLV settings in the Docsis modem configuration file, the AO cable modem will upon start, initiate a BSoD connection to a CMTS, from where traffic is switched to a redundant set of WS-BNG's over a virtualized data forwarding path. This setup creates a layer 2 connection from the AO cable modem to the WS-BNG. The TLN-NCP to AO-NCP message exchange flow will ensure that this L2VPN connection can be established with the appropriate transport characteristics according to the broadband tier profile that has effectively been ordered for the specific AO customer.

(39) The WS-BNG will route the traffic towards the appropriate interconnection link for delivery in the AO domain.

3.2.2 PEP

(40) The AO customers' traffic will be subject to policy enforcement and bandwidth management just like the traffic for Telenet customers.

(41) The Policy Enforcement Point (PEP) function is distributed over several TLN network components and hence, is as such not shown as a separate network element.

4 TLN WRO IP VOD Connectivity Reference Architecture

(1) This section provides a high-level network and service architecture overview of the IP VOD Connectivity between TLN and the AO. It shows how the IP VOD part fits in the overall architecture referenced in section **Error! Reference source not found.** above in this document, how it relates to the broadband part and why a TLN WRO broadband connection is required.

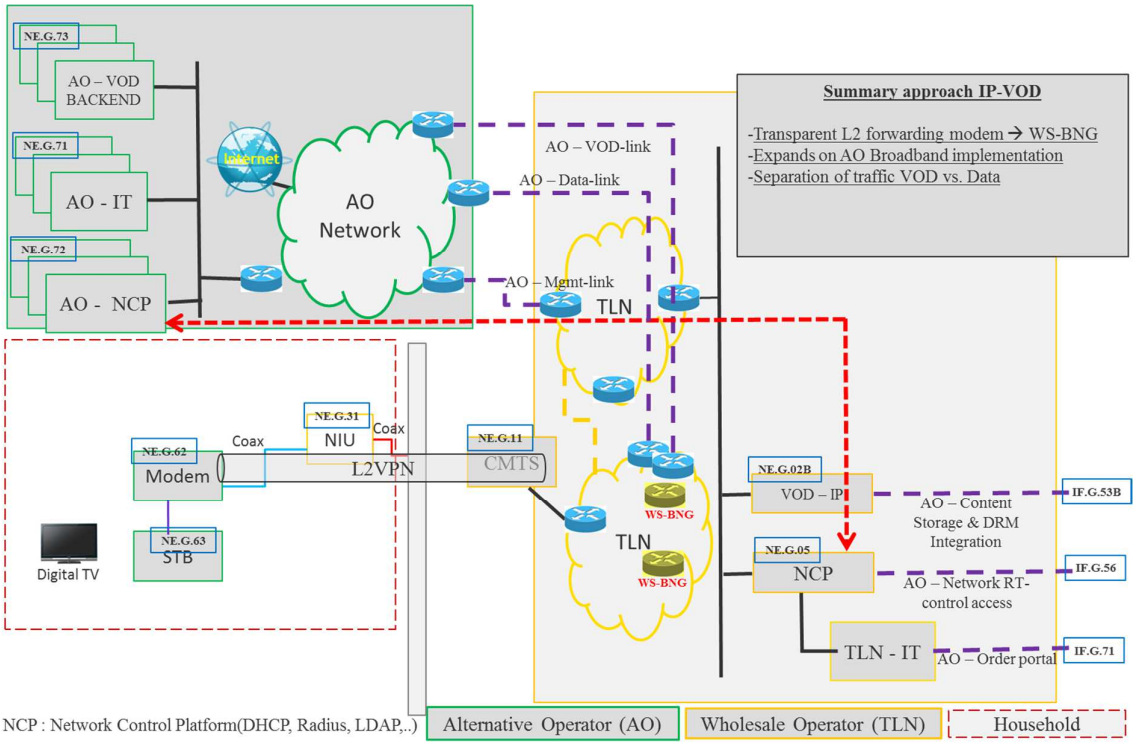

Figure 4-1: Overview VOD IP Architecture

4.1 General Approach

(2) The generic approach, as detailed above, shows that VOD IP is built on top of the broadband reference offer, from a technical point of view, and therefore required, even in an iDTV only deployment. This is because the NCP is required for the VOD IP solution to work.

(3) The same general approach, and benefits, as described in section **Error! Reference source not found.** apply, including the L2VPN approach over the access network and the WS-BNG's. From the WS-BNG's other interconnects, namely the "AO VOD" link, will be used to carry all the VOD over IP and accompanying IP data path traffic, as described in ROTV and AIDTV Architecture.

(4) The separation northbound of the WS-BNG of broadband traffic and VOD IP related traffic has the benefit of offering clear separation of both traffic flows.

(5) In order to make use of the TLN VOD IP the AO will have to interconnect its network to the TLN network in at least one of the Regional Points of Interconnect (RPOI) where the traffic will be routed between the AO and TLN. The RPOI for the "AO VOD" link can be different from the "AO Data" link.

(6) The "AO Data" link and the TLN WHS broadband reference setup is always required for the NCP related traffic to operate. This a mandatory prerequisite to support VOD IP.

(7) The AO will be required to have its own IP address range and IP address pools of sufficient size will have to be provided upfront to TLN to allow proper routing set-up configuration in each of the connected RPOI´s, for the components detailed in the VOD IP section of the ROTV and AIDTV Architecture. The IP address ranges must be uniquely aggregatable in one supernet for IPv4 and one for IPv6. For IPv4 if must be a public address range and for IPv6 a global unicast address range.

(8) On the AO customer's premise, the STB must receive an IP address out of the same subnet as provided to that customer for the broadband offering, effectively making the STB part of the LAN. In order to both classify the VOD IP traffic and route it appropriately, to respect the PEP for VOD IP, the previous single IPv4 and IPv6 supernet requirement must be met.

4.1.1 WS-BNG

(9) The WS-BNG setup will be identical as described in section **Error! Reference source not found.**, therefore requiring the entire broadband reference offer implementation, with the addition of routing the VOD IP traffic to the AO over the "AO VOD" link.

4.1.2 PEP

(10) The AO customers' VOD IP traffic will be subject to policy enforcement and bandwidth management just like the traffic of Telenet customers.

(11) The Policy Enforcement Point (PEP) function is distributed over several TLN network components and hence not shown as a separate network element.