

# TLN WRO Specification type Document

< General building block requirement  
specification for AO Set Top Box (**STB**) to enable  
usage of TLN Basic TV Wholesale Reference Offer  
(**TLN ROTV**) >



## Document Housekeeping

### Document Category and type

CAT	TYPE	DOC ID	Comment
iDTV	SPEC	TLN-WRO-TA-I-S-PDAA	Specification type documents (-SPEC) are documents specifying logical / physical interfaces / protocols, etc..., to which AO equipment/systems need to comply

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### Document Effective Date

This document has come into effect as of xx/xx/2012 and remains valid until a valid subsequent Telenet Wholesale Reference offer, substituting this document is published.

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## Table of Contents

Table of Contents.....	3
Table of Figures.....	3
List of Appendixes .....	4
List of References .....	4
Restricted information.....	4
1 Abstract.....	5
2 Glossary and Abbreviations.....	6
3 AO STB General Functional Description .....	7
4 AO STB General Functional Requirements.....	8
4.1 AO STB HARDWARE AND OS .....	8
4.2 AO STB MIDDLEWARE .....	8
4.3 AO STB BUSINESS LOGIC LAYER.....	8
4.4 AO STB USER INTERFACE LAYER .....	8
4.5 AO STB DVB-C CABLE FRONT-END.....	8
4.5.1 QAM tuner module.....	8
4.5.2 MTPS DEMUX module .....	9
4.5.3 DVB-C PSI/SI signalling decoding module.....	9
4.6 AO STB CAS SUBSYSTEM.....	10
4.6.1 Descrambler.....	10
4.6.2 CAS control message (EMM/ECM) module .....	10
4.6.3 Smart Card .....	10
4.7 AO DEVICE MANAGEMENT BY TLN REQUIREMENTS.....	11
4.7.1 Concept and purpose .....	11
4.7.2 Device management Functions .....	11
4.7.3 SNMP MIB specifications .....	11
4.7.4 Reset and Factory Reset specifications .....	11
5 AO STB general - Non Functional Requirements .....	12
5.1 MECHANICAL REQUIREMENTS.....	12
5.1.1 Housing .....	12
5.1.2 Diagnostic Leds .....	12
5.1.3 Labels .....	12
5.1.4 Connectors .....	12
5.2 ENVIRONMENTAL REQUIREMENTS.....	13
5.2.1 Packaging.....	13
5.2.2 RoHS and WEEE compliancy .....	13
5.2.3 EU CoC compliancy .....	13
5.3 SAFETY REQUIREMENTS .....	13
5.3.1 Surge and Lightening protection.....	13
5.3.2 Temperature and Humidity .....	14
5.3.3 Fire resistance.....	14
5.4 EU CONSUMER GOODS LABEL REQUIREMENTS .....	14
5.4.1 CE - mark .....	14

## Table of Figures

Figure 3-1 .....	7
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## List of Appendixes

This document may refer to further detailed documents that are added in Appendixes to this document.

A reference to an appendix is in this document highlighted with grey background.

The list with appendixes of this document:

A. Appendix A, <APP-I-C-PDAA-A> contains :

- 1) Appendix A1 - <Surge and lightening protection>

## List of References

This document may refer to external documents or information sources.

A reference to an external document or information source is in this document highlighted with grey background.

The list of referred external documents or information sources in this document:

Reference 1 : TLN WRO CAT: (i)DTV : TLN-WRO-TA-I-C-PDAA

Reference 2 : TLN WRO CAT: (i)DTV : TLN-WRO-TA-I-S-PIAA

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# 1 Abstract

This document describes on a conceptual level the major building blocks an AO STB must have in order to be able to successfully interoperate with the TLN ROTV. Each required building block is briefly described explaining it's expected functional behavior.

In addition the non functional requirements for the AO STB are also described in this document.

This document has a corresponding certification document with reference: **TLN-WRO-TA-I-C-PDAA** which is used to test AO WO equipment compliance against this specification

Note : this document describes the non interactive variant (DTV variant) of the STB that is a one way STB without IP data return path. The interactive variant is described in the document with identification **TLN-WRO-TA-I-S-PIAA**

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

BER: Bit Error Rate  
BSS: Business Support Systems  
CAS: Conditional Access Systems  
CE: European Conformity  
CFE: Cable Front End  
CoC: Code of Conduct  
CPE: Customer Premises Equipment  
CPPS: CAS Proxy Provisioning Service  
DEMUX: De-multiplexer  
E2E: End to end  
ECM: Entitlement Control Message  
EMM: Entitlement Management Message  
IRD: Integrated Receiver/Decoder  
LED: Light Emitting Diode  
MPEG: Moving Picture Experts Group  
MPTS: MPEG Transport Stream  
MUX: Multiplexer  
OSS: Operational Support System  
PSI: Program Specific Information  
PVR: Personal Video Recorder  
QAM: Quadrature Amplitude Modulation  
RCU: Remote Control Unit  
RF: Radio Frequency  
RoHS: Restriction of Hazardous Substances  
SC: Smartcard  
SI: Service Information  
SNR: Signal-to-Noise Ratio  
STB: Set-top-box  
TS: Transport Stream  
UI: User Interface  
VHE: Video Head-end  
WEEE: Waste Electrical and Electronics Equipment

### 3 AO STB General Functional Description

- (1) The conceptual block diagram of an AO STB is shown in figure 1 below.
- (2) In summary the AO STB needs to capture, descramble and decode TV signals and related program information transmitted over the TLN cable network and present this on its output interfaces towards the TV set. Further it provides interaction capabilities with the customer by implementing a graphical user interface allowing interaction via an RCU.

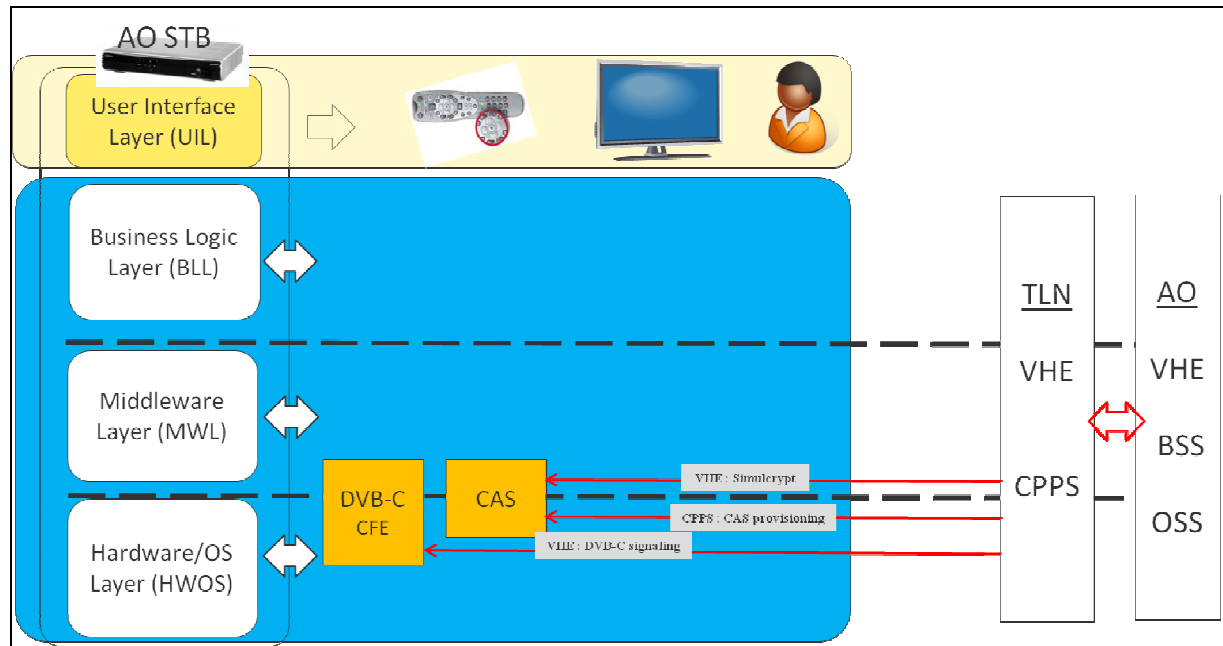


Figure 3-1

## 4 AO STB General Functional Requirements

### 4.1 AO STB Hardware and OS

- (3) TLN does not impose specific requirements on AO-STB HW and OS, the AO is free to choose any type of STB HW or OS as long as the overall solution can support the complete set of requirements for the TLN ROTV.

### 4.2 AO STB Middleware

- (4) The middleware typically supports a number of common platform services that can be accessed by the Business Logic Layer (BLL). TLN does not impose specific requirements on middleware; the AO is free to choose any type of STB middleware as long as the overall solution can support the complete set of requirements for the TLN ROTV.

### 4.3 AO STB Business Logic Layer

- (5) The Business Logic Layer (BLL) typically supports the applications that run on the STB, like EPG, User Preferences settings, Recording functions, Reminders, etc... TLN does not impose specific requirements on the BLL; the AO is free to choose any type of BLL as long as the overall solution can support the complete set of requirements for the TLN ROTV.

### 4.4 AO STB User Interface Layer

- (6) The User Interface Layer (UIL) defines the way the customer can interact via its RCU with the applications offered by the service. TLN does not impose specific requirements on the UIL; the AO is free to choose any type of UIL as long as the overall solution can support the complete set of requirements for the TLN ROTV.

### 4.5 AO STB DVB-C cable front-end

- (7) The AO-STB must be equipped with a DVB-C front-end module that allows “tuning” into DVB-C QAM modulated signals carrying TLN DTV signals. It consists of following major sub-components :
- QAM tuner module
  - MPTS DEMUX module
  - DVB-C PSI/SI signalling decoding module

#### 4.5.1 *QAM tuner module*

- (8) The digital television audio and video signals are coded in MPEG transport streams. Different MPEG transport streams are multiplexed and modulated, using a QAM (Quadruple Amplitude



Modulation) scheme to allow transport of the digital information over the analogue cable network. The QAM tuner module allows the STB to lock-into the different modulated transport multiplexers, de-modulate the signals and extract the digital frames for feeding into the de-multiplexer module. The common forms of QAM include 16QAM, 32QAM, 64QAM, 128QAM and 256QAM. Telenet uses 256QAM modulation for the transport of its digital TV signal MUXes.

#### **4.5.2 MPTS DEMUX module**

- (9) When an AO STB tunes into a TLN DTV MUX , it will select the correct MPTS services for decoding in function of the end-user channel selections. In order to do this, AO STB must contain a MPTS demux module. A de-multiplexer (or demux) is a device taking a single input signal and selecting one of many data-output-lines, which is connected to the single input. A multiplexer is often used with a complementary de-multiplexer on the receiving end. In digital television and digital radio systems, several variable bit-rate data streams are multiplexed together to a fixed bit-rate transport stream by means of statistical multiplexing. This makes it possible to transfer several video and audio channels simultaneously over the same frequency channel, together with various services. The device that accomplishes this is called a statistical multiplexer. In several of these systems, the multiplexing results in an MPEG transport stream(MPTS).

#### **4.5.3 DVB-C PSI/SI signalling decoding module**

- (10) DVB Service Information (SI) is an enhancement of MPEG PSI (Program Specific Information). It provides extra information which the receiver can use. Where there are several TS available, in order to successfully demultiplex a program (i.e. Channel), the decoder must be notified of both transport stream id (to find the correct multiplex) and the program number of the service (to find the correct program within the multiplex).

## 4.6 AO STB CAS subsystem

- (11) The AO-STB must be equipped with a CAS module that allows descrambling of encrypted MPTS service streams and can handle CAS entitlement messages to add/remove rights to a given STB to access certain services. It consists of following major sub-components /
- Descrambler
  - CAS control message(ENM/ECM) handling module
  - Smart Card (SC)

### 4.6.1 *Descrambler*

- (12) A conditional access system (CAS) uses a combination of scrambling and encryption to prevent unauthorized reception. Scrambling is the process of rendering the sound, pictures and data unintelligible. Encryption is the process of protecting the secret keys that have to be transmitted together with the scrambled signal in order for the descrambler to work. The responsibility of the descrambler module is de-scrambling the signals, to which the individual STB is properly entitled so that they can be viewed.

### 4.6.2 *CAS control message (EMM/ECM) module*

- (13) The EMM(Entitlement Management Message) allows a single decoder to view the programme material which is scrambled via a DVB 'common scrambling algorithm' by providing the key to the code word which is involved in the scrambling. The code word is sent via the ECM(Entitlement Control Message).

### 4.6.3 *Smart Card*

- (14) Each CA system provides a security module that scrambles and encrypts data. This security module is either embedded within the STB ("software" Smart card) or is insert-able in the form of a Smart card. The Smart card contains the subscriber's authorization codes required to de-scramble the signals and the EMM/ECM messages.

## 4.7 AO Device Management by TLN Requirements

### 4.7.1 *Concept and purpose*

- (15) TLN requires that it has remote management access with a minimum basic capability set on AO CPE devices. This access is required to allow TLN to ensure network integrity and assist the AO in efficient troubleshooting on complex E2E network problems, by being capable of integrating a basic management view of the AO devices in TLN's troubleshooting tools.

### 4.7.2 *Device management Functions*

- (16) This document describes the non interactive DTV service without an IP network return path. As the device is not remote reachable from the network, no remote management functions are possible.
- (17) TLN recommends however that the AO will build in enough diagnostic capabilities in its STB that can be activated by the end-user, under guidance of an AO telephone support advisor to assist in easy troubleshooting.

### 4.7.3 *SNMP MIB specifications*

- (18) As this document describes the non interactive DTV service without an IP network return path, SNMP management is not possible.

### 4.7.4 *Reset and Factory Reset specifications*

- (19) Different reset scenario need to be performed.
- Via UI menu
    - Reset settings
    - Reset settings with full disk (PVR only)
    - Reset setting and keep recordings (PVR only)
  - Via IRD (STB)
    - Full factory reset
    - Factory reset keep recording (PVR only)
    - Soft reset and keep setting
    - Soft reset and perform FSCK
    - Reinit
    - Reset
  - Via STB front panel
    - Reinit
    - Reset

## 5 AO STB general - Non Functional Requirements

### 5.1 Mechanical Requirements

#### 5.1.1 *Housing*

(20)TLN does not impose any requirements as this is the responsibility domain of the AO.  
However it is strongly advised to AO to follow industry standard practices.

#### 5.1.2 *Diagnostic Leds*

(21)Below are the minimum LED indication requirements that should be supported by AO STB in order to assist in efficient troubleshooting.

- Alert LED
  - Not active during normal mode
  - Not active when tuned on blocked channel
  - Not active when Ethernet cable is disconnected
  - Active when coax removed
  - Active when tuned on faked channel
  - Active when box not paired
- Recording LED
  - Active during recording
  - Deactivated when recording finished
- Power LED
  - Green in operational mode
  - Orange in standby mode

#### 5.1.3 *Labels*

(22)TLN does not impose any requirements as this is the responsibility domain of the AO.  
However it is strongly advised to AO to follow industry standard practices.  
In addition the logo of the AO must be clearly visible on the device to facilitate customer support and repair actions, giving as such a clear visual indication if a CPE in a customer's home is owned by TLN or one of the AO's.

#### 5.1.4 *Connectors*

(23)TLN imposes requirements only for the Antenna-in connector towards the WO, the rest is AO choice and responsibility, but TLN strongly recommends following industry standards.

- All RF connectors must be F (IEC169-24), torque resistance: 4Nm  
Inner conductor:

Minimum diameter 0,57mm, clamping force 30 grams  
Nominal diameter 0,8mm, clamping force 50 grams  
Maximum diameter 1,0mm, clamping force 80 grams

## 5.2 Environmental Requirements

### 5.2.1 Packaging

(24)TLN does not impose any requirements as this is the responsibility domain of the AO.  
However it is strongly advised to AO to follow industry standard practices.

### 5.2.2 RoHS and WEEE compliancy

(25)RoHS is the directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment on 2002/95/EC and the abbreviation for Restriction of Hazardous Substances. This directive is closely linked with Waste Electrical and Electronic Equipment Directive (WEEE) - 2002/96/EC.

(26)These directives are in the responsibility domain of AO, and TLN does not impose any requirements. AO is strongly advised to follow the standards and the requirements imposed by law about RoHS.

### 5.2.3 EU CoC compliancy

(27)TLN does not impose any requirements as this is the responsibility domain of the AO.  
However it is strongly advised to AO to follow industry standard practices and any requirements in this domain imposed by law should be met.

## 5.3 Safety Requirements

### 5.3.1 Surge and Lightning protection

(28)Telenet will execute a group of tests to be able to determine the immunity level of the various interface ports of the AO STB (sometimes in combination with the AO CM and TLN NIU) against voltages over-surges and lightning strikes. Common mode tests will be carried out up to a test level of 10 kV. Ground will be either the premises earth of the customer or in case of absence of the latter the braid of the CATV cable. Tests that will be carried out are destructive, using a different (new) STB at each stage to avoid “exhausting” phenomena. The connection between STB and modem(if applicable) will be made using a UTP RJ45. After each test the functionality of the STB will be verified.Detailed info can be obtained in the reference document.

(29)This section has a corresponding appendix document with reference : Appendix A1 (see List of Appendixes section).

### **5.3.2 Temperature and Humidity**

- (30) TLN does not impose any requirements as this is the responsibility domain of the AO. However it is strongly advised to AO to follow industry standard practices.

### **5.3.3 Fire resistance**

- (31) Fire resistance rating means the time that a material or assembly of materials will resist the effects of fire as determined by the appropriate standard fire test prescribed in the NBC.
- (32) This rating is in the responsibility domain of AO, and TLN does not impose any requirements. AO is strongly advised to follow the standards and the requirements imposed by law about Fire resistance.

## **5.4 EU Consumer Goods label Requirements**

### **5.4.1 CE - mark**

- (33) CE marking (originally EC mark) is a mandatory conformity mark for products placed on the market in the European Economic Area (EEA). With the CE marking on a product the manufacturer ensures that the product conforms to the essential requirements of the applicable EC directives. The letters "CE" stand for "Conformité Européenne" ("European Conformity").
- (34) This conformity is in the responsibility domain of AO, and TLN does not impose any requirements. AO is strongly advised to follow the standards and the requirements imposed by law about CE labeling.