

**WHOLESALE REFERENCE OFFER
OF SMP OPERATOR**

TV SERVICES OVER CABLE

ANNEX 2 – TECHNICAL SPECIFICATIONS

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1 GLOSSARY

| | |
|------------|---|
| ADI | Asset Distribution Interface, an Interface Format commonly used for distributing VoD assets between content archives |
| BAL | Beneficiary Access Line, one or more physical network links between SMP operator and Beneficiary over which all network traffic required to operate the wholesale services will be organized |
| Bouquet | A group of digital TV services that are together sold as a Product |
| BSS | Business Support Systems are the components that a telecommunications network provider uses to run its business operations towards customers. BSS and OSS platforms are linked in the need to support various end to end services |
| CA | Conditional Access, the protection of content by requiring certain criteria to be met before granting access to this content. The term is commonly used in relation to digital television systems |
| CAL | CAS Access Line, a network link between SMP operator and the externally hosted CAS for Beneficiaries |
| CAS | Conditional Access System, the System that enforces the CA |
| CASV | Beneficiary's (externally hosted) CAS Vendor |
| CATV | Cable Analog TV |
| CM | Cable Modem |
| CMTS | Cable Modem Termination System, the general term for the central head-end controller in a cable modem network based on the EuroDOCSIS family of standards |
| CPE | Customer Premises Equipment |
| DHCP | Dynamic Host Configuration Protocol, the standard Internet protocol to allow a networked device to obtain an IP address for one of its network interfaces from a DHCP server in the network. |
| DTV | Digital TV |
| DVB | Digital Video Broadcast standard |
| DVB-C | Digital Video Broadcast standards specific to cable networks |
| EAE | Early Authentication and Encryption, term in the EuroDOCSIS standard whereby a cable modem is authenticated and establishes secured communication even before the exchange of data on the IP network level starts |
| EIT | Event Information Table, part of DVB SI metadata that is typically used to carry the EPG data |
| EPG | Electronic Program Guide, an application showing on screen which content is being broadcast now and in the immediate or further future on each channel |
| EU_ID | End User Identified, the unique ID used to identify a service account between SMP operator and Beneficiary. The EU_ID is created upon initial activation of CATV service after which all communication (orders, billing, status) between SMP operator and Beneficiary is based on this EU_ID. |
| EuroDOCSIS | Family of industry standards used for IP data services over cable networks in Europe |
| HFC | Hybrid Fiber/Coax, a telecommunications industry term for a broadband network which combines optical fibre and coaxial cable. It has been commonly employed globally by cable operators since the early 1990s |
| IHN | In Home Network |
| MPEG | A family of video compression standards |

| | |
|------|---|
| MPTS | Multi Program Transport Stream, a digital audio/video transport stream that groups multiple channels and typically is broadcast to fill up one frequency on the cable network. |
| NIU | Network Interface Unit, a device installed in consumer's homes to provide proper termination of the cable network and connectivity for the various services offered by cable operator |
| NTP | Network Termination Point (as defined in section 4.1 of the Main Body) |
| PSI | Program Specific Information the metadata for transport streams as defined by the MPEG standards |
| OSS | Operational Support Systems, computer systems used by telecommunications service providers dealing with the "network functions" including the telecom network itself and the supporting processes such as maintaining network inventory, provisioning services, configuring network components and managing faults. BSS and OSS platforms are linked in the need to support various end to end services |
| PVR | Personal Video Recorder |
| QAM | Quadrature/Amplitude Modulation, the modulation technique used on DVB-C networks |
| RTSP | Real-Time Streaming Protocol, commonly used to control the streaming behavior of video servers (start/stop/pause/slow/fast/forward/reverse) |
| SOAP | Simple Object Access Protocol, an industry standard for allowing systems to communicate by exchanging XML messages |
| SI | Service Information, additional metadata for transport streams as defined by the DVB standards, complements the PSI from MPEG |
| SMS | Subscriber Management System, the business IT system of SMP operator, Beneficiary or CASV responsible for management of subscribers |
| STB | Set-top Box (the digital TV Decoder) |
| VHE | Video Head-End, the main facility in the SMP operator network where the DTV signals are prepared for broadcast over the HFC network |
| VoD | Video on Demand |
| WRO | Wholesale Reference Offer |
| WSDL | Web Service Description Language, an XML based language for describing the interface of a web service |
| XML | Extensible Markup Language, an Internet standard for representing structured data under form of simple text files |

2 SCOPE OF THIS DOCUMENT

1. This document provides a description of the wholesale TV Services offered by SMP operator.
2. Three main wholesale services are offered:
 - 2.1. Cable Analog TV (CATV)
 - 2.2. Digital TV (DTV) may include interactivity (VoD) but complicated in our case as we are ourselves using a third party VOD supplier
 - 2.3. Broadband internet services.
3. These Service offers are described in Section 4, 5 and 6 of the Main Body respectively.

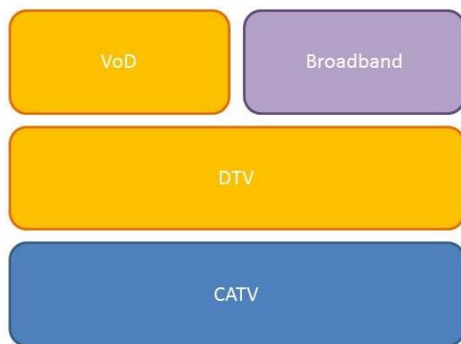


Figure 1: Wholesale Products in the Scope of this WRO

4. The following restrictions apply:
 - 4.1. Any end user wanting to obtain DTV service needs to be activated for CATV service first
 - 4.2. Any end user wanting to obtain Broadband service needs to be activated for CATV and DTV first.
5. The DTV Service offer may include Interactivity (which in practice means: VoD), however it will be possible for Beneficiary to sign up for a DTV Wholesale Agreement without VoD also, which reduces cost and complexity.

In the case of Coditel, Coditel doesn't own his VOD platform but use itself a third party to deliver VOD content using QAM. Coditel can facilitate the contact between the OA and his VOD supplier, but the OA need to conclude a contract with this supplier to be able to do VOD over QAM.

Another option for the OA that will be cheaper is to do VOD OTT, but in that case no QoS can be guaranteed to this VOD by Coditel.

3 END-TO-END VIEW

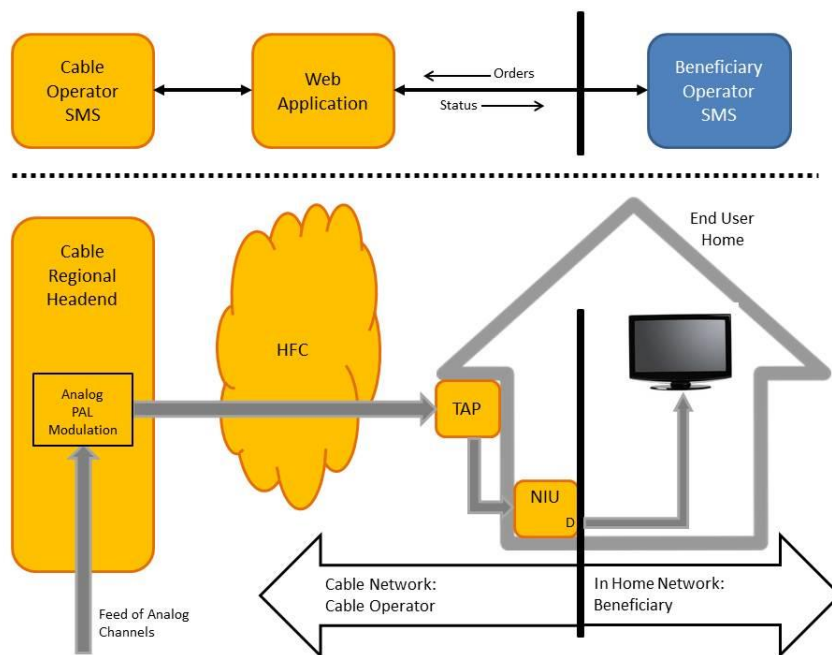


Figure 2: End-to-End Overview of CATV Service

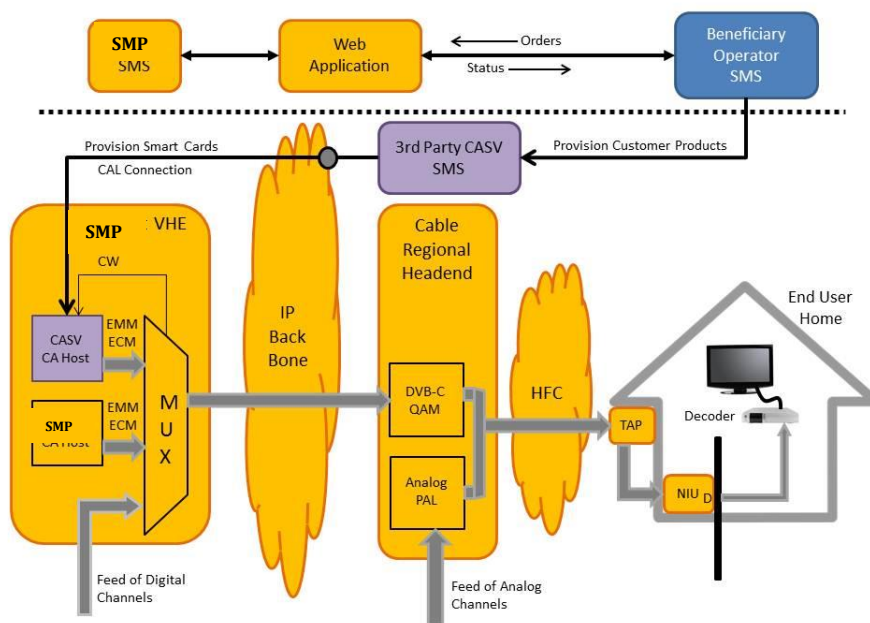


Figure 3: End-to-End Overview of DTV Service

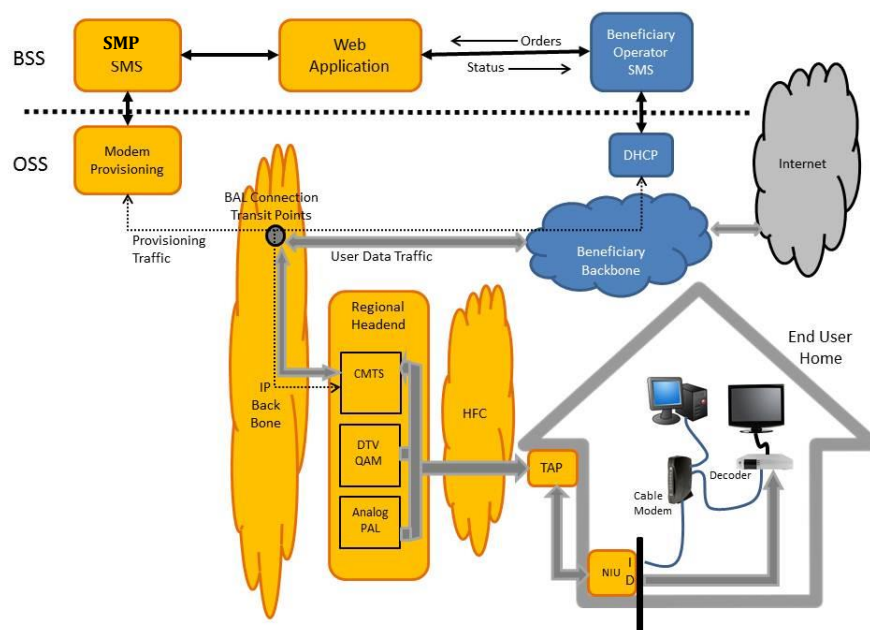


Figure 4: End-to-End Overview of Broadband Service

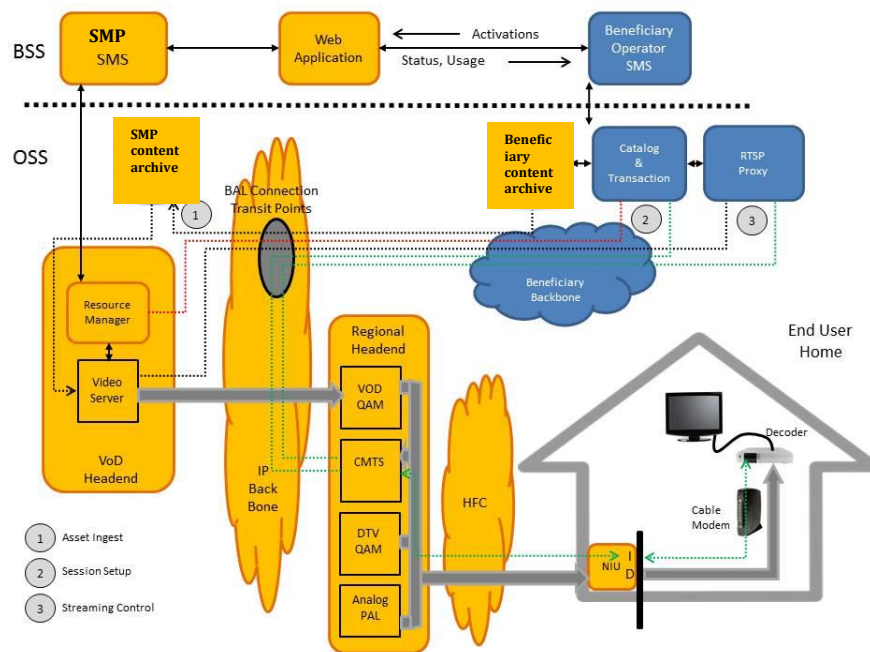


Figure 5: End-to-End Overview of Video-on-Demand Service

4 APPLICABILITY MATRIX

6. The following matrix indicates which Technical Specifications described in this document are applicable to which service being deployed by Beneficiary.

| | CATV | DTV | VoD | Broadband |
|-----------------------------|----------------|----------------|----------------|-----------|
| Web Application | Yes | Yes | Yes | Yes |
| Network Connections | Optionally (1) | Optionally (2) | Yes | Yes |
| CA Host Integration | | Yes | Optionally (4) | |
| CA Client Integration | | Yes | Optionally (4) | |
| STB Network Integration | | Yes | Yes | |
| Provisioning of Cable Modem | | | Optionally (3) | Yes |
| Asset Ingest | | | Yes | |
| Session Setup | | | Yes | |
| Video Server Control | | | Yes | |

(1): Only required if the connectivity to the web application is over the network iso over the internet

(2): Beneficiary needs this connection if the connectivity to the web application is over the network i.s.o. over the internet; CAS provider needs this connection to connect his SMS to the CA Host function integrated in SMP operator VHE.

(3): If the return channel for VoD is realized via the SMP operator EuroDOCSIS network

(4): If the VoD service is scrambled

5 NETWORK CONNECTIONS

5.1 NETWORK CONNECTIONS AND TRANSIT POINTS

7. SMP operator will define a number of transit points on its backbone network.

-> only one: the Brussels' headend.

8. At these transit points, the network connectivity with Beneficiaries and the CASV will be established and IP traffic will be handed over to/from a Single Mode fiber link of SMP operator from/to a Single Mode fiber link of Beneficiary.
9. Network connections with capacity of 1 Gbps and 10 Gbps will be available.

We will begin with multiple 1Gbps connections, 10Gbps in the core router is expensive and not needed unless the used bandwidth grows above 3Gbps.

10. For reasons of economy, the number of transit points needs to be limited. At initial launch, one or two transit points will be deployed. As traffic requirements increase, additional transit points may be introduced. The amount of transit points will never exceed 5. The locations for these transit points are chosen such that there is already connectivity to a number of carrier providers (such as Colt, Level3, BICS) there. In this way, Beneficiary has the choice to either hire capacity on a fiber link of these carrier providers or to bring its own fiber to the transit points. -> This is not possible for us, or the OA need to pay for the connexion between the collocation and our headend.
11. These network connections serve a number of functions as described in sections 5.2 and 5.3. It is not necessary to establish separate physical connections for each of those functions: they can all use the same physical connection through virtualization of the traffic, e.g. in a number of VLANs.

5.2 BAL (BENEFICIARY ACCESS LINE)

12. The BAL connections provide network connectivity for the following functions exchanging data between the systems of Beneficiary and those of SMP operator.

5.2.1 Web application

13. The Web Application exchanges XML messages between SMP operator and Beneficiary as described in section 6 of this document and in Annex 3 and **Annex 3.3**. The description of the XML messages will only be defined when a concrete projet will exist (see Coditel Reference Offer – 5.1 Macro planning).

14. This exchange can either be via email or via a SOAP web service. In the case of a SOAP web service, the exchange can be over the Internet using secured protocols or over the BAL connection (which reduces the security hazards).

5.2.2 Internet traffic

15. For the Broadband service, all End User traffic to/from the cable modems of Beneficiary's End Users will be routed towards the network of Beneficiary and Beneficiary is responsible for realizing connectivity to the Internet.

5.2.3 DHCP relay

16. DHCP traffic will be relayed to the DHCP servers of Beneficiary.

5.2.4 Device Monitoring & Management

17. A separate (virtual) network connection will be provided to allow Beneficiary (and to some extent SMP operator) to perform monitoring and management tasks. This will be described in Annex 3 – Planning and Operations and in detail in **Annex 3.5: Device Monitoring & Management**, after the OA has placed his order, see Coditel Reference Offer - 5.1 Macro planning.

5.2.5 VoD Asset Ingest

18. In the Coditel used model with his VOD supplier, there is no specific link to do VOD ingest, this is done through the Internet to the supplier ingest server.

5.2.6 VoD Resource Manager

19. This connection is used for the communication between the VoD catalog and transaction server of Beneficiary and the SMP operator VoD Resource Management Server of SMP operator as **described in Annex 2.6.2**. This point has to be confirmed during the negotiation between the OA and the Coditel's VOD supplier, other technical schemes can be defined.

5.2.7 Video Servers

20. This connection is used for the RTSP communication to the VoD Video Servers of SMP operator as **described in Annex 2.6.3**. Same remark as in previous item.

5.3 CAL (3RD PARTY CAS ACCESS LINE)

21. See Coditel Reference Offer 3.1.4 + the added Security Paper, this line will not be necessary as Coditel will manage the CAS for the OA.

5.4 DETAILED DESCRIPTION OF NETWORK CONNECTIONS

22. A more detailed description of aspects regarding Network Connections will be provided in **Annex 2.3.1**, after the order will be placed (see Coditel Reference Offer – 5.1 Macro planning) except the ones that are trivial, detailing out the following info:
 - 22.1. Locations of transit points; Bxl rue des 2Eglises 26
 - 22.2. Carrier providers (such as Colt, Level3, BICS) with presence at these transit points; No one, Coditel uses a third party intermediate between those operators and his network.
 - 22.3. Physical Interface specifications: 10Gbps/1Gbps, fiber mode, physical patching format, etc... Multiple 1Gbps to begin, 10Gbps will only be available if the needed bandwidth is above 3Gbps
 - 22.4. Configuration of Connections for different Functions.
23. During implementation, SMP operator and Beneficiary will have to agree upon a number of configurable parameters, such as:
 - 23.1. VLAN IDs and IP ranges for the various VLANs for each of the network functions;
 - 23.2. Parameters for DHCP servers of Beneficiary;
 - 23.3. Parameters for DNS servers of Beneficiary.
24. **Annex 2.3.2 provides a template form to be completed by Beneficiary and SMP operator during the implementation phase.**

6 WEB APPLICATION

The below description is theoretical as today the web application does not exist at all. When an OA has placed an order, we will define and develop this web application.

6.1 FUNCTIONALITY

- 25. The web application serves the following purposes:
 - 25.1. Treatment of Orders from beneficiary and feedback on Status:
 - 25.1.1 Network Modification Request/Offer/Accept/Cancel;
 - 25.1.2 Network Installation Order/Offer/Accept/Cancel;
 - 25.1.3 Provider Change Order;
 - 25.1.4 Service Activation/Deactivation;
 - 25.1.5 Repair Order/Cancel;
 - 25.1.6 Notification of outage or planned maintenance.
 - 25.2. Notification of Crucial Information with Beneficiary: SMP operator will inform Beneficiary regarding crucial events affecting the Service, such that Beneficiary can properly inform and support its End Users. In particular, SMP operator will notify Beneficiary of network element outages and will make announcements of planned maintenance activities that affect service availability;
 - 25.3. Reporting back of customer detailed usage records for VoD and Broadband;
 - 25.4. Reporting back of wholesale Billing info.
- 26. The processes behind those functions are described in more detail in Annex 3 – Planning and Operations.

6.2 MESSAGES AND MESSAGING PROTOCOL

- 27. The Web Application will exchange XML messages between SMP operator and Beneficiary.
- 28. Two protocols will be available for the message exchange:
 - 28.1. Via e-mail;

- 28.2. Via a SOAP Web service;
- 29. The SOAP web service can work over the Internet or over the BAL network connection between SMP operator and Beneficiary.
- 30. A message encryption infrastructure will be implemented based on common Internet content encryption standards.
- 31. All details for setting up the Web Application will be presented in detail in **Annex 3.3 – Web Application: Description of XML Content Formats**, after the order will be placed and during phase 1 (see Coditel Reference Offer – 5.1 Macro planning) which lists amongst others:
 - 31.1. The exact XML message formats;
 - 31.2. the procedure to set up a message encryption infrastructure;
 - 31.3. the WSDL for the SOAP variant of the tool;
 - 31.4. the process for setting up the mail variant of the tool.

7 CA HOST INTEGRATION

32. All Beneficiaries will have to work in the worst case with one shared hosted 3rd party CAS. In the best case, all OA will use the same CAS as Coditel uses today, this will reduce costs and implementation duration. Following some words of the worst case implementation scenario: the CA Host function of this CAS will be integrated in the VHE of SMP operator alongside the CA Host component of SMP operator's existing CA system(s) to allow decryption of digital broadcast content. This will happen through a mechanism known in the DTV industry as "DVB Simulcrypt". Only one external 3rd party CAS can be supported to be used for all Beneficiaries. The Beneficiaries are free to select this CAS provided that the CAS system proposed can be considered a well-established state-of-the-art industry player with a proven track record in terms of:

32.1. DVB Simulcrypt integration into DVB VHEs;

32.2. Content security.

33. In case there is any discussion about a CAS being an established state-of-the-art industry player, and that discussion cannot be resolved between the Beneficiaries and SMP operator, the matter shall be presented to the authorized regulator, who will decide.

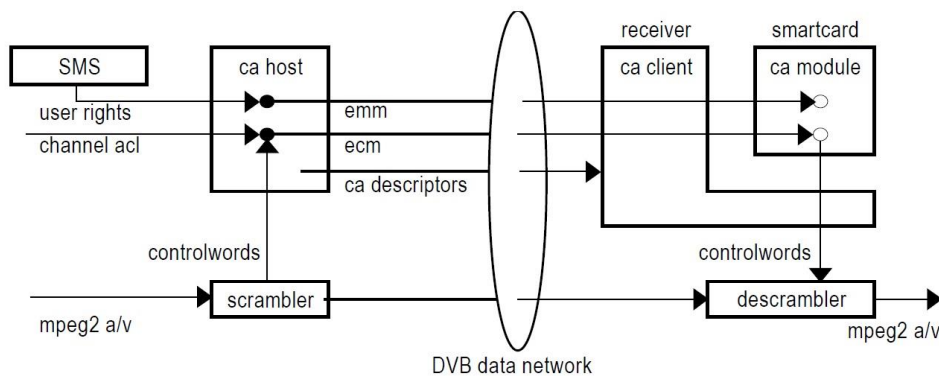


Figure 6: CAS Components

34. Upon selection of the CAS, SMP operator will support the chosen CAS vendor to:

- 34.1. Provide a network interface point through which the CAS vendor can establish the CAL connection for secure network connectivity between the 3rd party CAS vendor's SMS (Subscriber Management System) – which is hosted outside the network of SMP operator - and the CA Host equipment (ECM/EMM generator and potentially other components) in the VHE of SMP operator.

Comment [j1]: We have space to allow the first mode that's to OA installs all the CAS equipment in our VHE

35. The following topics need to be arranged between the Beneficiary and the CAS vendor and fall outside the scope of this WRO:

- 35.1. integration between the CAS SMS (Subscriber Management System) and the IT systems of the individual Beneficiaries for provisioning of CA Clients (e.g. smart cards);
- 35.2. define and configure the content bouquets desired by Beneficiary on the CAS system ;
- 35.3. smart card logistics;
- 35.4. activation of smart cards;
- 35.5. reporting on smart cards and content bouquets activated.

7.1 DTV

36. For the DTV service, the scrambling of content takes place in the VHE of SMP operator. Some equipments of the CASV will have to be collocated in the SMP operator VHE to implement the Simulcrypt.

7.1.1 Hosting

37. The CA Host function of a CAS Vendor is usually subject to stringent security requirements. SMP operator provides a rack with the same level of security as for its own CAS to the OA. If this level of security is not sufficient for this CAS, then the OA will have to host itself his CAS. SMP operator is responsible for bringing the CAL connection to this rack before handing the access over to CASV.

7.1.2 EMM/ECM generators

38. Implementation of the CA Host function in the SMP operator VHE mainly comprises:

- 38.1. The export of control words from the SMP operator scramblers to the ECM generators of CASV;
- 38.2. The generation of ECMs by the equipment of CASV and the streaming out of these ECMs into the SMP operator VHE;
- 38.3. The insertion of these ECMs into the DTV transport streams at the muxes of the SMP operator VHE.
- 38.4. The generation of EMM is preferably done in the OA technical room.

7.1.3 Network Tables

39. SMP operator will modify its existing PSI/SI tables to take into account the presence of the additional CA system on its network and allow proper operation of Beneficiary STBs. This action is done for Coditel by a third party supplier. Coditel will facilitate the discussions between the OA and his supplier to have the work done. If this cannot be done by the Coditel's supplier, Coditel will have to install its own SI/PSI generator system and this will increase the setup costs for the OA.
40. **The full PSI/SI data scheme will be described in Annex 2.5.2 – DTV Network Description – AV Formats, Services, SI/PSI Scheme after the order is placed by the OA (see Coditel Reference Offer – 5.1 Macro planning)**

7.2 VOD

41. For VoD, there are two ways of realizing content protection:
 - 41.1. Session based encryption: the VoD streams are scrambled as they are being streamed, a process that usually takes place in the Edge QAM devices in the regional head-ends. The CA Host function of CASV needs to generate ECMs based on the control words used for scrambling the VoD streams.
 - 41.2. Asset pre-encryption: the VoD assets are stored in the content archive in already encrypted format.
 - 41.3. DRM can also be used to encrypt the VOD streams.
42. However, Beneficiary always has the option to play out his VoD streams “in the clear” (i.e. unscrambled), and in that case integration of the CASV for VoD is not required.

7.3 DETAILED SPECIFICATIONS

43. The detailed specifications to allow the CASV to integrate its CA Host function in the VHE of SMP operator will be given in **Annex 2.5.3 – DTV Specification for CA Host Integration in SMP operator VHE**, after the order is placed (see Coditel Reference Offer – 5.1 Macro planning) which lists a.o.:
 - 43.1. The details about the secure rack available for CASV (power, network connections);
 - 43.2. The technical specifications on how control words are transferred to the CASV CA Host for DTV broadcast services;
 - 43.3. The technical specifications on how CASV needs to play out ECMs for DTV broadcast;

- 43.4. The technical specifications on how control words are generated for VoD, how these are transferred to the ECM generators of CASV and how the resulting ECMs need to be played out.

8 STB NETWORK INTEGRATION

44. The STB of Beneficiary will have to be compliant with the digital TV signals as they are transmitted on the SMP operator DTV Network.
45. This requires:
 - 45.1. Compatibility with the network modulation used (symbol rate, QAM64/QAM256, etc);
 - 45.2. Compatibility with the audio/video encoding formats used: MPEG2/MPEG4 etc
 - 45.3. Compatibility with the DVB SI/PSI scheme implemented, which is the “Table of Contents” of the collection of services implemented on that Network;
 - 45.4. Ability to tune to VoD streams as they are carried on the network.

8.1 DTV

46. A DVB compliant DTV network such as that of SMP operator is organized as follows:
 - 46.1. One MPTS (Multiple Program Transport Stream) or multiple SPTS are generated per network frequency;
 - 46.2. Each MPTS consists of a number of Programs, that make up the actual digital channels;
 - 46.3. Each SPTS consist of one Program, the group of SPTS make up the actual digital channels
 - 46.4. Each Program consists of a number of Elementary Streams for video, audio, teletext, etc...
 - 46.5. Multiple programs with their multiple elementary streams are combined in one MPTS by chopping the elementary streams in packets and then streaming all these packets in one large serialized bit stream, consisting of multiple “Packetized Elementary Streams” (PES).
 - 46.6. Each packet in the MPTS has its own header, with a “Packet ID” or PID filed indicating to which PES the packet belongs.
 - 46.7. A number of network tables are also added to the MPTS to describe the structure and contents of the network.

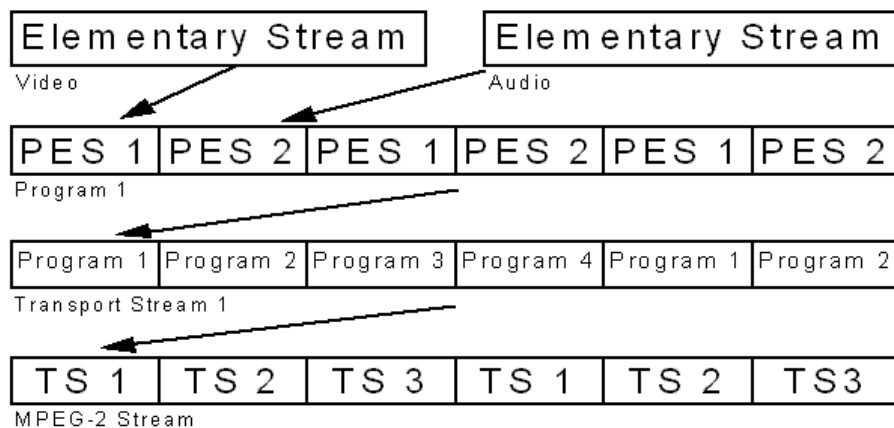


Figure 7: Structure of a Transport Stream

47. A DVB decoder must be able to interpret these tables, as defined by the MPEG (PSI tables) and DVB (SI Tables) standards (the PSI - Program Specific Information - is intended to bind all the elements of a transport stream together, whereas the SI is intended to bind a number of services and transport streams together in order to provide a multi-channel broadcasting environment).

48. In particular, the contents following tables will have to be correctly interpreted:

8.1.1 MPEG PSI Tables

- 48.1. **PAT (Program Association Table)**: lists all the services found in a Transport Stream. Each of these is identified by its PMT and the PAT gives the PID on which the PMT for each service can be found.
- 48.2. **PMT (Program Map Table)**: identifies all the Elementary Streams within a service. There is one PMT per service, but there may be more than one PMT on the same PID.
- 48.3. **NIT (Network Information Table)**: although the existence of this table is defined by MPEG, its content and use are specified by the DVB.
- 48.4. **CAT (Conditional Access Table)**: This table controls the scrambling of a service. It associates one or more CA systems with their EMM stream and any other extra data that may be required.

8.1.2 DVB SI Tables

- 48.5. **NIT (Network Information Table):** groups a number of Transport Streams (with their respective frequencies) together and provides tuning information to the STB which Program can be found on which Transport Stream. If the network is regionalized (i.e. the structure is not the same everywhere on the territory), then multiple NITs may be present.
- 48.6. **SDT (Service Description Table):** A description of a service provides a name and optionally other related information such as language codes, running status and country availability. There may be several sub tables providing additional information for this Transport Stream and other Transport Streams within the network. This is a table where often many operator specific customizations are provided.
- 48.7. **EIT (Event Information Table):** supplies data upon which an EPG (Electronic Program Guide) may be based. Since Beneficiary will have to develop his own Decoder or STB, Beneficiary is free to develop his own EPG Application. Beneficiary may decide to use the EPG data in the EIT table supplied by SMP operator, provided he obtains the content rights to do so.
- 48.8. **TDT and TOT tables**

8.2 VOD

49. When setting up a VoD streaming session, the STB will receive from the SMP operator resource manager the information where the corresponding video stream will be played on the network. This information consists of a transport stream ID and/or frequency together with a program number.
50. The STB must have an application interface that allows the VoD player in the STB to tune to the specified frequency and program.

8.3 DETAILED SPECIFICATIONS

51. All relevant technical characteristics for of the SMP operator DTV network – as described in section 8 - will be described in **Annex 2.5.1 after the order is placed by the OA (see Coditel Reference Offer – 5.1 Macro planning)**

9 CA CLIENT INTEGRATION IN STB

52. To be able to decrypt the AV signals, the STB will have to integrate the CASV CA Client. As Beneficiary will own the relation with the CA vendor, this is a matter between Beneficiary and his STB/CAS vendors and SMP operator is not involved in this process.

10 PROVISIONING OF CABLE MODEM

53. The wholesale broadband service will operate according to the EuroDOCSIS 2.0 and/or 3.0 standard. Only cable modems certified for EuroDOCSIS 3.0 by Excentis will be allowed on the SMP operator network.
54. Further, for certified cable modems of Beneficiary to operate properly on the SMP operator network requires a number of steps as described hereafter.

10.1 REGISTRATION OF A BATCH OF CABLE MODEMS

55. Each CM contains the following information when shipped from the manufacturer:
 - 55.1. A unique IEEE 802 48-bit MAC address which is assigned during the manufacturing process. This is used to identify the modem to the various provisioning servers during initialization.
 - 55.2. Security information as defined in [ITU-T J.222.3] of EuroDOCSIS standard (e.g., X.509 certificate), used to authenticate the CM to the security server and authenticate the responses from the security and provisioning servers.
56. Before cable modems acquired by Beneficiary can be used on the SMP operator network, their existence must be declared to the SMP operator OSS. This is done by sending the "Register Batch of Modems" message through the Web Application that will be developed after the OA has placed his order. The "Register Batch of Modems" message notifies SMP operator that a group of modems (identified by their 48-bit MAC address and security information) are certified EuroDOCSIS 3.0 devices owned by Beneficiary.

10.2 ACTIVATION OF USER

57. When the Broadband service is activated by Beneficiary for a particular End User, the Activate message needs to be sent through the Web Application that will be developed after the OA has placed his order.
58. This Activate message could contain typically as parameters:
 - 58.1. The EU_ID of the End User where the service is to be activated;
 - 58.2. The desired broadband service profile;
 - 58.3. The cable modem that is going to be used for the service (identified by MAC address).
59. These three type of info allow SMP operator to determine where the modem will become active on the network (based on the EU_ID) and what configuration the modem must be provisioned with (based on the location and the broadband service profile).

10.3 MODEM PROVISIONING

60. The procedure for initializing a cable modem and for a CM to reinitialize its MAC can be divided into the following phases:

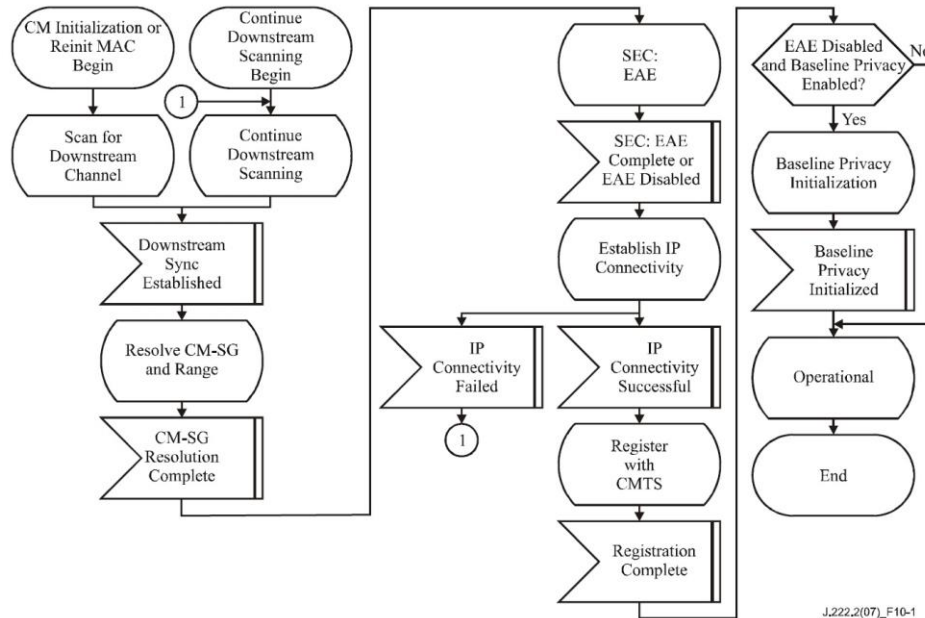


Figure 8: Cable Modem Initialisation Flow

10.3.1 Scanning and synchronization to downstream

61. (including scanning continuation when necessary): the CM continuously scans the channels of the entire downstream frequency band of operation until it finds a valid primary downstream signal.(as defined by EuroDOCSIS standard).

10.3.2 Service group determination and ranging

62. With the information sent in the primary downstream channel, the CM establishes upstream and downstream communication channels with the CMTS to continue the provisioning process.

10.3.3 Authentication:

63. Once a CM has completed ranging, if Early Authentication and Encryption (EAE) is enabled in the MDD the CM will initiate EAE before continuing with the initialization process. EAE helps prevent unauthorized CMs from accessing IP provisioning servers and provides confidentiality/privacy for IP provisioning messages between the CM and CMTS.

10.3.4 Establish IP connectivity:

64. The CM receives IP provisioning directives through TLV (Type/Length/Value) attributes in the MDD (MAC Domain Descriptor) message carried in the primary downstream signal.
65. The MDD IP Provisioning Mode TLVs provide the CM the following IP provisioning information:
 - 65.1. IP provisioning mode: IPv4 or IPv6;
 - 65.2. APM (Alternate Provisioning Mode) enable or disable;
 - 65.3. Dual-stack management address enable or disable;
 - 65.4. Pre-registration DSID (Downstream Service Identifier).
66. With these IP provisioning directives, the CM will follow the appropriate DHCP process (DHCPv4 or DHCPv6) to obtain an IP address.
67. The DHCP servers will be hosted by Beneficiary and SMP operator will relay all DHCP communication to these servers to allow Beneficiary to keep track of which addresses are assigned to which End User's equipment.

10.3.5 Download Configuration File

68. As part of the DHCP process, the CM receives the IP address of a TFTP server and a filename. The CM will use these to download its configuration file from a TFTP server in the network. This configuration file will then be processed by the CM to complete its configuration.

10.3.6 Registration.

69. Once the CM has processed the configuration file, the CM will register with the CMTS to confirm that it has finished its provisioning process and is now on-line.

10.4 ROLES AND RESPONSIBILITIES

70. The process as described in section 10.3 is well standardized by the EuroDOCSIS specifications and any certified cable modem should be compliant with it. On the network side, SMP operator already operates all systems required to support these processes and will accommodate for the introduction of Beneficiary cable modems.
71. For clarity, the roles and responsibilities of the Parties in enabling cable modem provisioning are summarized below.

10.4.1 Both Parties

- 71.1. Agree on a CM configuration file per service profile;
- 71.2. Agree on IP ranges and parameters;
- 71.3. Agree on cable modem types and vendor specific parameters.

10.4.2 SMP operator

- 71.4. Configure the CMTS and all provisioning systems except DHCP and TFTP servers;
- 71.5. Relay DHCP messages to the DHCP server of Beneficiary and TFTP requests to the TFTP servers of the Beneficiary;

10.4.3 Beneficiary

- 71.6. Host DHCP servers and TFTP servers.

10.5 DETAILED SPECIFICATIONS

- 72. More detailed specifications for the cable modem provisioning process will be given in the following Annexes that will be described after the OA has placed his order (see Coditel Reference Offer – 5.1 Macro planning):
 - 72.1. Annex 3 and **Annex 3.3** for specification of the web tool in general and in particular:
 - 72.1.1 The message for registration of batch of cable modems;
 - 72.1.2 The message for broadband service activation.
 - 72.2. **Annex 2.7.1**: Broadband Internet: Service Profiles and Modem Configuration Files;
 - 72.3. **Annex 2.7.2**: EuroDOCSIS Cable Modem Specifications;
 - 72.4. **Annex 2.7.3**: Specifications for Cable Modem Provisioning, including the specifications for DHCP server addresses and parameters and TFTP server addresses;

11 ASSET INGEST FOR VOD

73. Beneficiary needs to encode his video content in a format compatible with the SMP operator VoD streaming system.
74. Beneficiary then needs to ingest this properly encoded video file together with the required content metadata to the network of SMP operator.
75. The metadata for VoD content in particular must contain for each asset the desired “availability window”, i.e. the time period in which the video asset must be available for streaming from the SMP operator video servers.
76. The mechanism for transferring the combined asset and metadata packages from Beneficiary to SMP operator will be FTP of archive files over the BAL connection to a specified directory on a SMP operator content staging server.
77. **The compatible audio/video content formats together with the required asset metadata and the ingest protocols will be specified in Annex 2.6.1** after the OA has placed his order (see Coditel Reference Offer – 5.1 Macro planning):.

12 SESSION SETUP FOR VOD

78. Session setup is the process taking place when an End User has chosen to view a particular piece of video content (“asset”) and has “bought” or otherwise obtained the rights to do so from the transaction servers of Beneficiary.
79. At this point, the SMP operator systems need to be notified that an End User of Beneficiary wants to setup a VoD streaming session.
80. A request for session setup must be sent by Beneficiary’s systems, and this request must contain at least:
 - 80.1. The VoD service area of End User STB, i.e. the area on the network where the video content needs to be streamed out (since VoD is a narrowcast service);
 - 80.2. The asset ID of the audio/video content to be streamed.
81. The SMP operator Resource Manager will then investigate whether streaming capacity in the specified service area is available. If so, it will grant a positive answer containing the following info:
 - 81.1. The network transport stream ID and service number where the VoD asset will be streamed;
 - 81.2. The session ID and IP address for sending the control commands for controlling the VoD streaming session.
82. It needs to be noted here that availability of VoD streaming capacity is never guaranteed: all VoD users share a pool of limited streaming capacity and in moments of peak usage it is possible that no capacity is available. This is the same for End Users of Beneficiary and SMP operator, without discrimination.
83. **Session setup will be specified in detail in Annex 2.6.2** after the OA has placed his order (see Coditel Reference Offer – 5.1 Macro planning)

13 VIDEO SERVER CONTROL FOR VOD

84. The information received during session setup needs to be passed back to the End User STB, which can then start a streaming session.
85. For that, the STB needs to:
 - 85.1. Tune to the transport stream and service number specified;
 - 85.2. Issue the streaming start command to the specified video server.
86. This will cause the video server to start streaming and will make sure that the End User STB is tuned to the proper digital channel to decode and show the requested video content.
87. After this the video streaming session can be controlled by the STB client to start/stop/pause/rewind/forward the video streaming.
88. **The exact control protocol for controlling the video streaming is based on RTSP and will be specified in detail in Annex 2.6.3** after the OA has placed his order (see Coditel Reference Offer – 5.1 Macro planning).

14 REFERENCED DOCUMENTS

89. The following documents may be referenced in this document and together with it form the complete WRO:

Documents of which an example is provided by BIPT:

SMP operator Wholesale Reference Offer - TV Services over Cable – Main Body
Annex 1: General Terms and Conditions
Annex 2: Technical Specifications
Annex 3: Planning and Operations
Annex 4: SLA

Documents to be written by SMP operator to complete the WRO:

Annex 2.3.1: Network Connections and Configuration
Annex 2.3.2: Network Connections – Configuration Form
Annex 2.4.1: CATV Content Offer
Annex 2.5.1: DTV Content Offer
Annex 2.5.2: DTV Network Description – AV Formats, Services, SI/PSI Scheme
Annex 2.5.3: DTV Specification for CA Host Integration in SMP operator VHE
Annex 2.6.1: VoD Asset Ingest – Content Formats, Metadata and Ingest Protocol
Annex 2.6.2: VoD Session Setup
Annex 2.6.3: VoD Control Protocol for Video Streaming
Annex 2.7.1: Broadband Internet: Service Profiles and Modem Configuration Files
Annex 2.7.2: EuroDOCSIS Cable Modem Specifications
Annex 2.7.3: Specifications for Cable Modem Provisioning
Annex 3.1: Specifications for Installation and Repair of Wholesale Services
Annex 3.2: Certification Procedures on Staff, Procedures and Equipment
Annex 3.3: Web Application – Description of XML Content Formats
Annex 3.4: Beneficiary ID Card - Template
Annex 3.5: Device Monitoring & Management

=>Refer to TV services over cable, Main body

90. All these documents and templates will be available on the SMP operator Wholesale Secured website.