Automating Production of Cross Media Content for Multi-channel Distribution
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AXMEDIS-ELTEO Demonstrator Set Up

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Abstract: This document describes the architecture of TEO and Elion demonstrators, provides step-by-step description of usage and demonstration scenarios, AXMEDIS tools used and instructions for users on usage of the demonstrators. It also describes the validation metrics for visitors of both demonstrators.
Keyword List:TEO demonstrator, Elion demonstrator, IPTV, STB, PC,VOD, AXMEDIS compliant STB, AXMEDIS PC Player, demonstrator scenarios

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1   Executive Summary and Report Scope

The aim of this deliverable is to provide the details of AXMEDIS-ELTEO demonstrator set up. AXMEDIS – ELTEO demonstrator consists of TEO demonstrator for distribution of video to STB via IPTV and Elion Demonstrator for distribution of video to PC via Internet.

The purpose of TEO Demonstrator is to showcase AXMEDIS technology adopted for IPTV platform. It demonstrates broadband operator's distribution of video on demand (VOD) content to trial IPTV service subscribers. IPTV service subscribers can view digital video material on their TV through an AXMEDIS compliant Set Top Box (STB).

The purpose of Elion demonstrator is to showcase AXMEDIS technology adopted for streaming/downloading protected AXMEDIS content to PC over internet .It shows to broadband operator's distribution of value added video on demand (VOD) content to Elion trial internet service subscribers using the media rental. Internet service subscribers can view digital video material on their PC through an AXMEDIS PC Player.

This report describes the architecture of both demonstrators, provides step-by-step description of usage and demonstration scenarios, AXMEDIS tools used and instructions for users on usage of the demonstrators. It also describes the validation metrics for visitors of TEO and Elion demonstrators.

2   Introduction

As part of AXMEDIS project, a group of partners from Baltic States has undertaken to deploy an integrated AXMEDIS Framework for video-on-demand distribution. The real life demonstration prototype involves a video content producer from Lithuania (VRS Grupe), and two broadband operators – Elion (Estonia), operating an internet-based media distribution portal, and TEO (Lithuania) – IPTV service provider.

Entire ELTEO demonstrator consists of TEO, Elion and VRS Factories – sets of integrated AXMEDIS Tools to serve specific purposes of either content production/adaptation (VRS), or content distribution (TEO and Elion). Elion demonstrator uses AXMEDIS tools for PC platform. TEO demonstrator uses adopted AXMEDIS tools with newly developed components for STB platform. VRS demonstrator uses AXMEDIS tools with added functionality to produce required content for Elion and TEO demonstrators.

Although the purpose of the demonstrator is to show how AXMEDIS tools can be used in an integrated automatic content production and distribution value chain, this paper describes integration aspects of developed specific AXMEDIS tools into IPTV video on demand (VOD) service and broadband provider's VOD service for internet users.

A more detailed description of demonstrators and demonstrators themselves can be accessed at www.axmedis.org/com

2.1   TEO demonstrator prototype architecture

The basic structure for AXMEDIS content distribution toward TEO IPTV network is presented in this section. TEO IPTV demonstrator setup is based on existing TEO Gala TV infrastructure. It uses existing IPTV architecture components in addition with AXMEDIS components and newly developed components for demonstrator setup.

A set of AXMEDIS tools will be used for proper operation of TEO AXMEDIS demonstrator. AXMEDIS Query and AXEPTool will be used for content searching and downloading from global AXMEDIS network. AXMEDIS PMS server is required for licensing operations. AXDB will be used for storing AXMEDIS objects and their metadata in local TEO IPTV network.

Used tools for demonstrator setup:

VRS	TEO	Elion
AXEPTool	AXEPTool	AXEPTool
AXCP	AXCP	AXCP
AXCS	AXCS	AXCS
PMS	PMS	PMS
MPEG TS Adaptation Plugin[*]	P2P Query Support WS	P2P Query Support WS
	AXMEDIS AXDB	AXMEDIS PC Player
	AXSTB Player	**ELAXAPI_WS**
	Content downloader P2P client	**Content & user management portal**
	Content & user management portal	**Credit card, bank and mobile payment gateways**
	VOD access service	
	VOD server prototype	

[*] In bold – tools and components developed by ELTEO partners
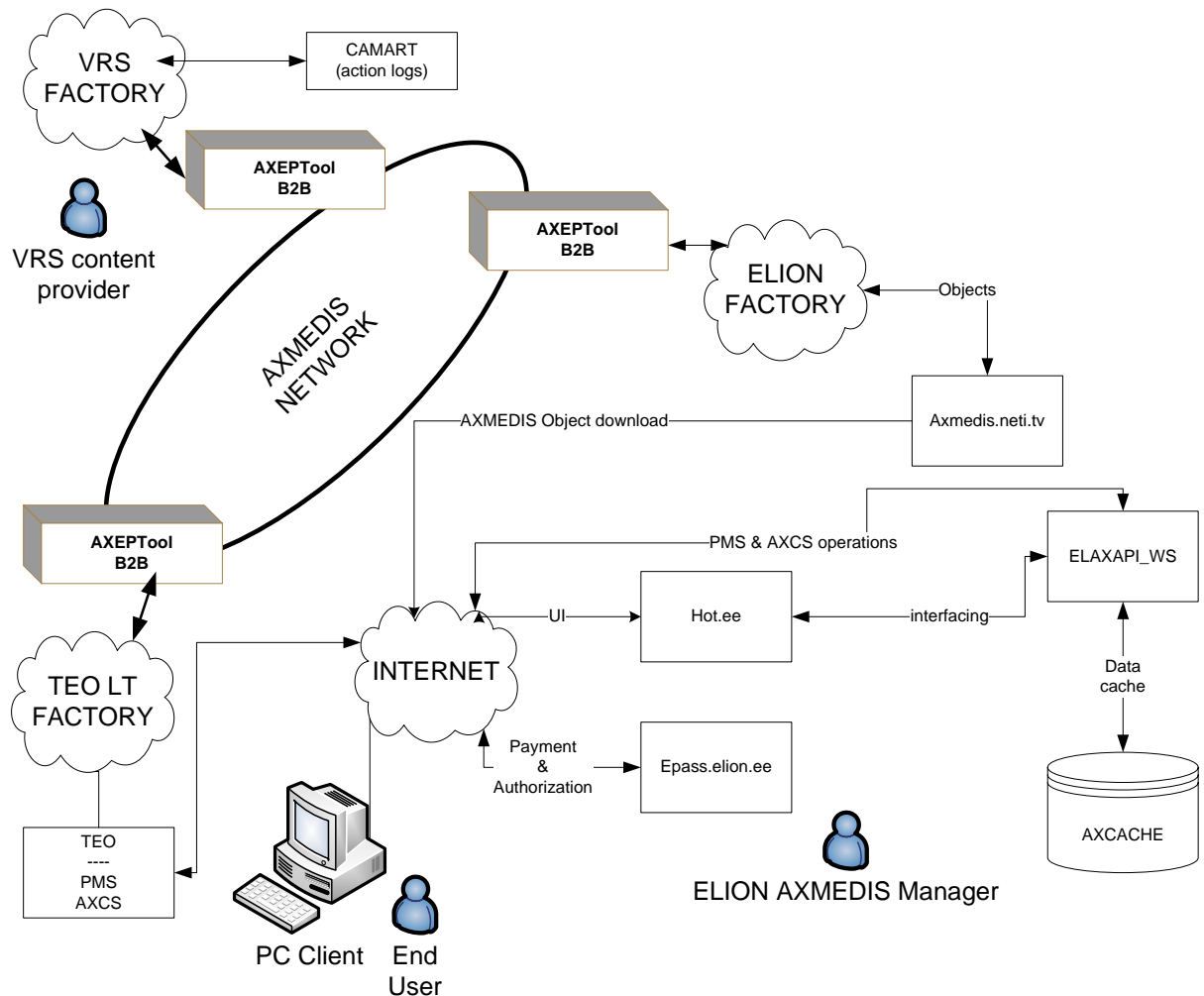
2.2 TEO IPTV architecture components

The existing TEO IPTV architecture components are:

- IPTV database, where information about users is stored;

- Billing DB, where users billing information is stored;

- Data integration module (DIM), which is existing TEO solution for integration different data formats in databases;

- TV Portal - existing portal for Gala TV. This portal is used in TEO Gala TV for IPTV services:

  - On-line TV channels;
  - Electronic program guide;
  - Gaming, etc.;

- IPTV Content Management Portal;

- VOD Server - VOD content storage server. VOD Server will be compatible with existing GALA TV network resources (Kreatel Application platform). The VOD will be capable of streaming DVB-CSA encrypted streams.

- Headend server - IPTV content distribution and broadcasting server, used for transferring MPEG-2 designated content via TCP/IP network.

Newly developed or existing AXMEDIS Framework components:

- AXDB - existing AXMEDIS database, which is used for storing metadata about AXMEDIS objects in local DB;

- AXMEDIS VOD Portal - new component developed on TEO Middleware platform. This portal is used for TEO demonstrator to present AXMEDIS content for End User. AXSTB Player use this portal to achieve information about content and usage information;

- AXMEDIS Content & User Management Portal - new component developed on IPTV Content Management Portal platform and used for TEO AXMEDIS content and user management. This module is implemented in IPTV Content Management Portal and used by TEO VOD Manager and TEO IPTV Administrator;

- VOD Access Service - a newly developed component for TEO demonstrator setup. This component is responsible for proper End User AXSTB Player connection with used DB's and services.

- AXEPTool B2B - existing AXMEDIS tool used for connecting Middleware server with AXMEDIS network and downloading AXMEDIS data from it.

- Content downloader P2P client - a newly developed component for searching and downloading AXMEDIS objects to VOD server, updating AXMEDIS object metadata and placing metadata and stream information into local AXDB. Content downloader P2P client use AXCP for automatically downloading new objects designed for TEO demonstrator. This component is a part of AXMEDIS Content & User Management Portal and is used by TEO VOD Manager for content management purposes.

- AXSTB Player - a newly developed component to play AXMEDIS objects in Kreatel STB.

DE12.2.5.1 AXMEDIS-ELTEO Demonstrator Set Up

2.3   Elion demonstrator prototype architecture

In this demonstrator of B2B automatic content production and distribution for PC, content producer VRS produces and makes available some trial video content for Elion internet service. The videos are formatted as AxObjects for Elion, with pre-set usage rights and conditions and defined metadata. VRS places these AXMEDIS objects into P2P network (AXEPTOOL).

In Elion system the AXMEDIS content ready for distribution is stored in delivery server at Elion site. The content is downloaded from AXMEDIS network using content downloader P2P client. Then the content is prepared with AXMEDIS Editor for distribution. After content is prepared it will be made available for download over web server using public networks.

2.4   Elion demonstrator architecture components

Elion AXMEDIS Video on demand distributor for PC is based on existing Elion's Hot.ee community portal to enable content listing and usage. It uses existing broadband network architecture components in addition with some newly developed components for AXMEDIS integration.

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Elion AXMEDIS demonstrator is comprised of:

- **Axmedis.neti.tv virtual sever** node including:
    - AXEPTool B2B node for content download and sharing on AXMEDIS B2B Network
    - ELAXAPI_WS interfacing web service for end user UI representation on hot.ee
    - IIS web folder share for AXMEDIS object downloads to end user
    - IIS web folder share to distribute AXMEDIS PC Player
    - AXCACHE database for ELAXAPI_WS web service data store
    - SQL Server manager express for AXCACHE.

- **www.hot.ee portal** – hot.ee portal is Elion's existing proprietary community & communication portal that will be featuring additional menu option to enable AXMEDIS object distribution and marketing.

- **Epass.elion.ee** – epass is ELION's proprietary account services and billing system serving as single shared resource between several solutions.

Elion will use global PMS & AXCS servers. Elion Manager will use axmedis.neti.tv node to manage AXMEDIS object distribution and statistics gathering.

2.5   Elion demonstrator developed components

Existing components are:

- Epass - Elion's membership, authorization, subscription and payment system.

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- Hot.ee - Elion's community portal.

Developed solutions;

- ELAXAPI_WS; Web Service designed for providing single independent interface for AXMEDIS functionality and business logic for easy and rapid integration of any web portal.
- Payment channels extension; payment logic was extended to include credit card payment to support global markets.

3 Distribution of Video to STB via IPTV (TEO, VRS, KTU)

3.1 Short Description

The objective of the TEO demonstrator is to show the application of AXMEDIS Framework across IPTV media delivery platform with the focus of video distribution on demand (VOD). An integrated solution of several value chain actors (producer – distributor - end-user) has been set up with integrated AXMEDIS Framework, enabling distribution of video to end users of IPTV operator in Lithuania (TEO). The demonstrator will show the full cycle of automated content distribution from production of video files (VRS) to distribution to end users with real-world business features such as rights and conditions definition for content usage, content encryption and protection, user registration and licence issuance, payment methods, advertising insertion, accounting and reporting, etc., utilising a number of AXMEDIS tools integrated with other system components.

Partners involved:

- o TEO (IPTV operator)
- o VRS (content producer)
- o KTU (research institution, developer)

3.2 Configuration

- **Computers and equipments**
  - o Number of computers: 3:
    - 1 for VRS, content producer, with AXMEDIS factory setup
    - 2 for TEO, IPTV distributor (1 for Content manager with AXFW & IPTV mock-up infrastructure and 1 for VOD server)
  - o Type of computers and software installed: HW & software of sufficient grade and capacity
  - o Connection needs:
    - Broadband connection for access to TEO Web Interfaces and download content from P2P network in Vilnius (Lithuania),
    - Broadband connection for placing content to P2P network for VRS in Vilnius (Lithuania),
    - local 8-port 100Mbps network switch for interconnection of demonstrator components with router to external connection
  - o Other needs:
    - AXMEDIS Tools, including PMS, P2P tracker, AXCS servers up and running in DSI Florence (Italy),
    - 8 STB's for TEO demonstrator
    - Users needed to be properly registered in AXMEDIS Registration Portal: VRS creator, TEO distributor and TEO end users.
- **AXMEDIS Tools involved:**

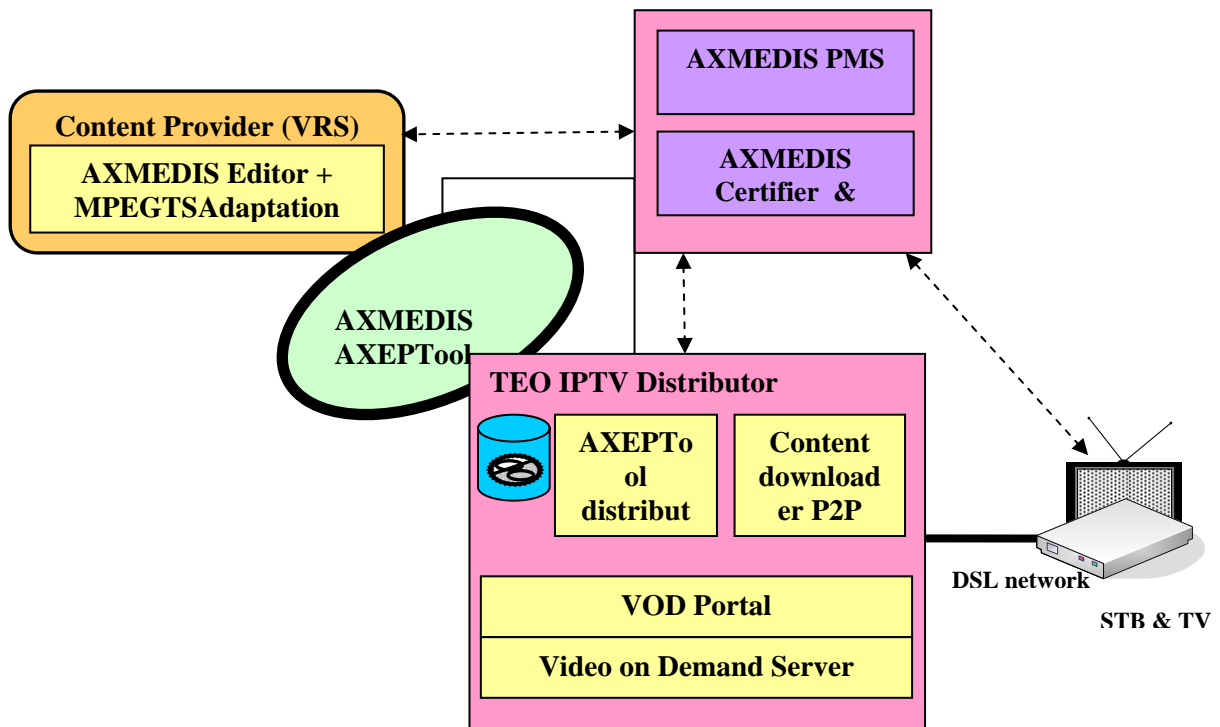Physical servers are located in the following network nodes:

- TEO (Vilnius)
  - o AXMEDIS AXEPTool
  - o AXMEDIS AXDB
  - o AXSTB Player in STB

DE12.2.5.1 AXMEDIS-ELTEO Demonstrator Set Up

- o PMS Client in STB
- o Content downloader P2P client
- o VOD access service
- o Content & User management portal
- o VOD server
    - ▪ VRS (Vilnius)
        - o AXMEDIS AXEPTool
        - o AXMEDIS Editor (for testing)
        - o AXMEDIS AXCP with MPEG TS Adaptation Plugin
        - o AXMEDIS CAMART
    - ▪ DSI Florence
        - o AXMEDIS AXCS (registration and usage reporting portal)
        - o AXMEDIS PMS (for end user license creation)
- **Content**
    - o 20 episodes of VRS authored hidden camera show videos with embedded video ads will be used for demonstration

3.3 Demonstrator scenarios

1. Content producer (VRS) produces content for the demonstrator:
    a. Using AXCP and MPEG TS Adaptation Plugin produces AXMEDIS objects for TEO demonstrator:
        i. Sets usage rights and conditions
        ii. Defines metadata
        iii. Creates distribution licenses
    b. Places the created AXMEDIS objects into P2P network (AXEPTool)

2. IPTV service provider (TEO) manages AXMEDIS content and makes it available for its IPTV service trial subscribers:
    a. TEO VOD Manager downloads videos from P2P manually or automatically
    b. Manages users and content on Content & User Management Portal
    c. Generates reports about object usage and user viewing behavior, billing, etc.

3. IPTV service end user consumes AXMEDIS content:
    a. Connects to VOD Portal via STB
    b. Browses content available and selects desirable content for viewing
    c. If prompted for payment, buys licence
    d. Plays, skips, pauses, stops, the video on TV, demonstrates inability to skip ads, using his remote control

3.4   Issues

The network connection is fundamental and has to be reliable, PMS and AXCS servers must be running and integrated.

3.5   Trial user selection and engagement in demonstration (TEO)

User selection method for TEO demonstrator

Because TEO demonstrator is designed for IPTV, an inherently closed system accessible only by TEO IPTV authorised subscribers, the demonstrator is set up for two types of evaluation:

- Actual trial end users – IPTV service subscribers and
- The general public – non subscribers

Final users – TEO IPTV service subscribers

Gala TV, TEO IPTV service for residents was launched in October 2006. Prior to the launch, extensive testing with over 400 trial users was performed of IPTV broadcast and interactive services. Even though today TEO has over 18,000 IPTV subscribers, the trial users mailing list is active for trials of any new service offerings, including video on demand, games on TV, internet on TV, HDTV, and others. Within the 400 trial users, another group of approximately 30 early adopter trial users is set up for trials of all early-stage projects and services. 8 trial users were selected from this group of 30 for testing AXMEDIS TEO prototype. They were provided with AXMEDIS compliant STBs, and connected to AXMEDIS system.

General public – non subscribers

A web interface replicating the actions performed by the end user on STB will be set up for any non-subscriber to get a look and feel of the TEO demonstrator. Although AXMEDIS demo functionality aspects of the STB are not unique to any other VOD systems, the behind the scenes actions (licensing, protection, AXMEDIS STB player ported on STB) are prevalent in the TEO demo. However, being behind-the scenes

technological processes, they will not be visible through this web interface, but will merely show the functionality aspects of the demonstrator.

Interested prospective users can access the web site through AXMEDIS portal www.axmedis.org/com

Business and technical users, wishing to familiarize themselves with the setup of TEO demonstrator, have a dedicated area on the demonstrator web page www.axmedis.org/com to be able to view the screenshots of Content & User Management Portal.

Table below summarize what end users can see.

USERS	What they can see
Business Users	• A set of application related administrative pages • A set of user related administrative pages • The AXMEDIS framework tools
Technical users	Same as above
Final users	Final users simply use AXMEDIS video on demand service as one of the several services provided in Gala TV menu: 1. Go to Gala TV main menu *(screenshot)* 2. Select AXMEDIS button 3. Browse the content available and select desirable content for viewing 4. If prompted for payment, acquire the content selected (you may be billed with your monthly subscriber bill as part of value added services) 5. Play, skip, pause, stop, the video on your TV 6. For free content with embedded ads you will not be able to skip the ads 7. View your content viewing history and payment information by pressing Usage or Billing information in Axmedis menu

3.6   Information on access usage and trial of AXMEDIS tools and services (TEO)

Category	Description
Web page link	http://www.axmedis.org/com/index.php?option=com_content&task=view&id=72&Itemid=51
Web page status	Public access
Tools provided	The end user needs to be a Gala TV subscriber, needs to have a TV and Motorola 1720 STB. System administrator sets up AXMEDIS user accounts for the AXMEDIS trial users and redirects the trial users to TEO AXMEDIS server. Upon re-booting their STBs, trial users automatically download AXSTB Players onto their STBs. After rebooting, the trial user's STB will need to be registered with Content & User manager, by entering Service number and PIN,
Tools links	The user only needs AXSTB player with PMS client, which is uploaded onto an STB by the service provider.
Content to be used	Content is provided from the list from TEO AXMEDIS VOD portal

USERS	What they can DO
Business and technical users	In this demo of B2B automatic content production and distribution for IPTV, content producer VRS Grupe (www.vrs.lt) produced and made available some trial video content for TEO IPTV service. VRS takes the following steps to produce content for streaming to the AXMEDIS compliant STB: ▪ Using AXCP and MPEG TS Adaptation Plugin produces AxObjects for

	TEO
	▪ Sets usage rights and conditions, defines metadata
	▪ Places the AXMEDIS objects into P2P network (AXEPTOOL)
	TEO VOD content manager manages AXMEDIS content and makes it available for its IPTV service trial subscribers:
	    ▪ TEO VOD Manager automatically or manually downloads videos from P2P
	    ▪ Manages users and content on Content & User Management Portal *(provide screenshots of the portal)*
	Generates reports about object usage and user viewing behaviour, billing, etc. *(provide screenshot of the usage report)*

Final users	Final users simply use AXMEDIS video on demand service as one of the several services provided in Gala TV menu: 1. Go to Gala TV main menu *(screenshot)* 2. Select AXMEDIS button 3. Browse the content available and select desirable content for viewing 4. If prompted for payment, acquire the content selected (you may be billed with your monthly subscriber bill as part of value added services) 5. Play, skip, pause, stop, the video on your TV 6. For free content with embedded ads you will not be able to skip the ads View your content viewing history and payment information by pressing Usage or Billing information in Axmedis menu.

3.7 TEO demonstrator validation strategy and metrics

The Content & User Management Portal of the TEO demonstrator has an accounting and reporting interface, where user actions with regards to content viewed, income generated, etc. can be monitored, analysed and reported. In addition, VRS will be able to see the same information through CAMART generated reporting.

Due to the nature of the TEO demonstrator, where STB player is initially pre-downloaded for each of the 8 trial users by the TEO service administrator, there will be no monitoring of AXSTB Player downloads.

Trial users can view their content viewing history and payment information in TEO VOD portal by pressing Usage or Billing information links.

Visits to the TEO demonstrator web page will be monitored as part of the overall AXMEDIS portal visitor statistics gathering exercise. Metrics to be estimated:

Logging data to be collected from demonstrator web page:

- starting date of the demonstrator
- number of unique and returning visitors on the demonstrator page
- number of times TEO demonstrator video viewed
- number of registrations per demonstrator
- number of logins to the STB public demo interface and STB player downloads.

TEO will also collect answers to a Feedback Form for validation of TEO demonstrator (TBD).

4 Distribution of Video to PC via Internet (ELION, VRS)

4.1 Short Description

The objective of the ELION demonstrator is to show the application of AXMEDIS Framework across internet PC media delivery platforms with the focus of video distribution on demand. An integrated solution of several value chain actors (producer – distributor - end-user) has been set up with integrated AXMEDIS Framework, enabling distribution of several formats of video to end users of broadband operator in Estonia (ELION). The demonstrator will show the full cycle of automated content distribution from production of multiple format video (VRS) to distribution to end users with real-world business features such as rights and conditions definition for content usage, content encryption and protection, user registration and licence issuance, payment methods, advertising insertion, accounting and reporting, etc., utilising a number of AXMEDIS tools integrated with other system components.

Partners involved:

- o Elion (Broadband service provider)
- o VRS (content producer)

4.2 Configuration

- **Computers and equipments**

  - o Number of computers: 4:
    - 1 for VRS, content producer, with AXMEDIS factory setup
    - 3 for Elion, Broadband distributor, with AXFW setup and Internet provider portal, etc.
  - o Type of computers and software installed: HW & software of sufficient grade and capacity
  - o Connection needs:
    - Broadband connection for access to Elion's Web Interfaces in Tallinn (Estonia),
    - local 8-port 100Mbps network switch for interconnection of demonstrator components with router to external connection
  - o Other needs:
    - AXMEDIS Tools, including PMS and AXCS servers up and running in DSI Florence (Italy),

- **AXMEDIS Tools involved:**

  Physical servers are located in the following network nodes:
  - Elion (Tallinn)
    - o AXMEDIS AXEPTool
    - o AXMEDIS PC Player
    - o AXMEDIS AXCP
    - o ELAXAPI_WS
  - VRS
    - o AXMEDIS AXEPTool
    - o AXMEDIS CAMART
    - o AXMEDIS Editor
    - o AXMEDIS AXCP
  - DSI Florence

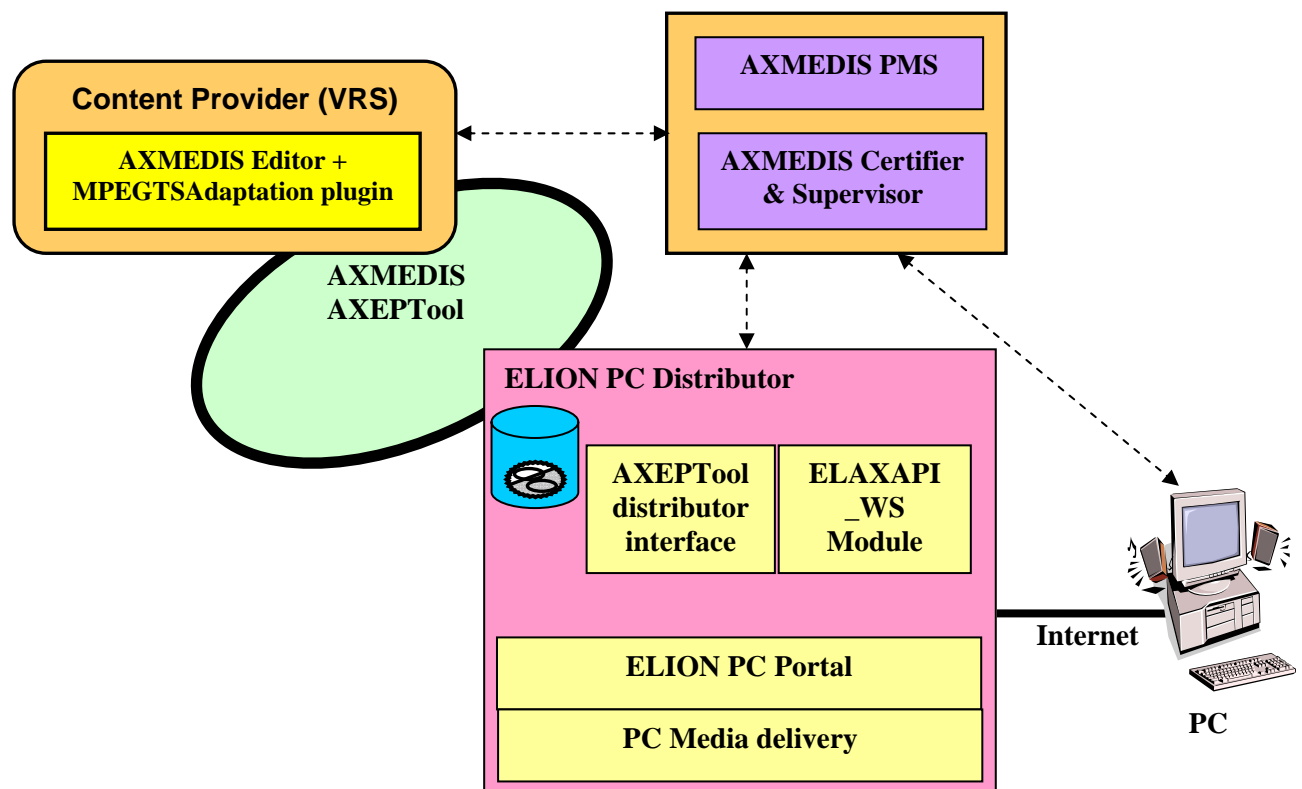DE12.2.5.1 AXMEDIS-ELTEO Demonstrator Set Up

- o AXMEDIS AXCS (portal/network registration and usage reporting)
- o AXMEDIS PMS (end user license creation)

- **Content**

   - o 20 episodes of VRS authored hidden camera show videos with embedded video ads will be used for demonstration

4.3 Description of demonstrator scenarios

1. Content producer (VRS) produces content for the demonstrator:
   - Using AXCP tools produces AxObjects for Elion demonstrator
   - Sets usage rights and conditions, defines metadata
   - Places the AXMEDIS objects into P2P network (AXEPTOOL)

2. Broadband service provider (Elion) manages AXMEDIS content and makes it available:
   - Elion VOD Service administrator downloads videos from P2P
   - Manages users and content on content & user management portal
   - Generates reporting about object usage and user billing, etc.

3. Broadband service trial end user consumes AXMEDIS content :
   - Connects to Elion PC Portal via internet
   - Browses content available and selects desirable content for viewing
   - If prompted for licence, acquires licence, by secure on-line credit card payment
   - Plays, skips, pauses, stops, the video on PC (according to PC player functionality)

4.4 Issues

The network connection is fundamental and has to be reliable, PMS and AXCS servers must be running and integrated.

4.5 Trial users selection and engagement in demonstration (ELION)

ELION will be exposing AXMEDIS services in three stages;

- Stage 1) Controlled closed room demonstration & feedback collection –30 users
- Stage 2) The service will be made available to limited selection of ELION clients for remote testing & feedback (from a sample of ~1000)
- Stage 3) After completion and service finalization it will go live and be available for all hot.ee subscribers, new users can just subscribe to hot.ee to start using it.

Table below summarize what end users can see.

USERS	What they can see
Business Users	ELAXAPI_WS administration pages, including; • User management • Content management • Basic reporting
Technical users	Same as above
Final users	Hot.ee AXMEDIS pages for content consumption as described in specifications including • Registration for service consumption • Content browsing • Content downloading • Content exploitation with ability to pay for commercial content within licensed rights (non limited play count for 24 hour period from the moment of purchase)

4.6 Information on access usage and trial of AXMEDIS tools and services (ELION)

Category	Description
Web page link	http://axmedis.neti.tv/info.aspx
Web page status	Public access
Tools provided in download	AXMEDIS PC Player (small footprint)
Tools links	AXMEDIS Framework, Players
Content to be used	From ELAXAPI_WS

USERS	What they can DO
Business Users	• Get easy overview of provided services and values
Technical users	• Get technical overview of standards and processes
Final users	Hot.ee AXMEDIS pages for content consumption as described in

	specifications including • Registration for service consumption • Content browsing • Content downloading Content exploitation with ability to pay for commercial content within licensed rights (non limited play count for 24 hour period from the moment of purchase)

4.7 Elion demonstrator validation strategy and metrics

Metrics to be estimated:

Logging data to be collected from demonstrator web page:

- starting date of the demonstrator
- number of unique and returning visitors on the demonstrator page
- number of registrations per demonstrator
- number of certifications (per tool)
- number of downloaded tools (per tool) from a demonstrator page
- number of downloaded objects (per object) from a demonstrator page

Elion will also collect answers to a feedback form for validation of Elion demonstrator (TBD).

5 Bibliography

[1] DE12.2.2.1 AXMEDIS-ELTEO requirements

[2] DE12.2.3.1 AXMEDIS-ELTEO specification

[3] DE12.2.4.1 AXMEDIS-ELTEO Component Integration Prototypes and Documentation

[4] DE12.2.4.2 AXMEDIS-ELTEO Content Modeling and Production

[5 Technical Note No. 6001 Video on Demand Distribution for IPTV Digital Set-Top-Box

[6] Technical Note No. 6501 Elion Content on Demand Distribution for PC

[6] AXMEDIS project website – www.axmedis.org

[7] Demonstrator web pages: general – www.axmedis.org/com

[8] Demonstrator web pages. TEO demonstrator:

 http://www.axmedis.org/com/index.php?option=com_content&task=view&id=72&Itemid=51

[9] Demonstrator web pages. Elion demonstrator:

 http://www.axmedis.org/com/index.php?option=com_content&task=view&id=75&Itemid=46

6 Glossary

AXCS, **AX**medis **C**ertifier and **S**upervisor
AXCS is the authority put in charge of supervising the certification process over all its phases

AXCP, **AX**medis **C**ontent **P**rocessing

DE12.2.5.1 AXMEDIS-ELTEO Demonstrator Set Up

Tools set for automatic content production, adaptation and protection of AXMEDIS object and their publication on a P2P environment.

AXDB, **AX**medis **D**ata**B**ase
Database for storing Axmedis objects

B
B2B, **B**usiness to **B**usiness
Refers to one business communicating with or selling to another.

I
IPTV, **I**nternet **P**rotocol **T**elevision
A system where a digital television service is delivered by using Internet Protocol over a network infrastructure

M
MPEG TS, **M**oving **P**icture **E**xperts **G**roup **T**ransport **S**tream
Communications protocol for audio, video, and data which is specified in MPEG-2 Part 1, Systems (ISO/IEC standard 13818-1).

P
P2P, **P**eer-to-**P**eer
Computer network which uses diverse connectivity between participants in a network and the cumulative bandwidth of network participants rather than conventional centralized resources where a relatively low number of servers provide the core value to a service or application

PMS, **P**rotection **M**anager **S**upport
A tool set for protecting/unprotecting Axmedis objects.

STB, **S**et **T**op **B**ox
A device that connects to a television and an external source of signal, turning the signal into content which is then displayed on the television screen

V
VOD, **Video O**n **D**emand
Systems which allow users to select and watch video and clip content over a network as part of an interactive television system

W
WS, **W**eb **S**ervice
A software system designed to support interoperable Machine to Machine interaction over a network.

**Technical Note
n.6001
January 2008**

Technical description
B2C distribution of video content via IP network by means of MPEG-2 Transport Stream (TS) feeding an AXMEDIS compliant Set Top Box (STB) for viewing video on TV

Description of Content
Trial video clips of VRS authored funny home videos with embedded video ads, formatted as AXMEDIS objects with MPEG 2 video content, specially processed for MPEG TS video with accompanying information. The objects are streamed to trial IPTV service user's STB's.

Business Model
Revenue from content distribution to consumers could be earned based on three basic models:

- Advertiser pays to the distributor for ads shown to consumers;
- Consumer pays to the distributor for paid content; or
- A combination of the two.

VIDEO on demand distribution for IPTV digital set-top-box

As part of AXMEDIS, a group of partners from Baltic States has undertaken to deploy a video-on-demand distribution solution based on AXMEDIS Framework. The real life demonstration prototype involves a video content producer from Lithuania (VRS Grupe), and two broadband operators – ELION (Estonia), operating an internet-based media distribution portal, and TEO (Lithuania) – IPTV service provider. Although the purpose of the trial is to show how AXMEDIS solutions and tools can be used in an integrated automatic content production and distribution value chain, this technical note describes the technical aspects of the TEO platform, integrating AXMEDIS tools into IPTV video on demand (VOD) service.

The purpose of TEO trial is to showcase AXMEDIS technology adopted for IPTV platform. It demonstrates broadband operator's distribution of video on demand (VOD) content to trial IPTV service subscribers. IPTV service subscribers can view digital video material on their TV through an AXMEDIS compliant Set Top Box (STB).

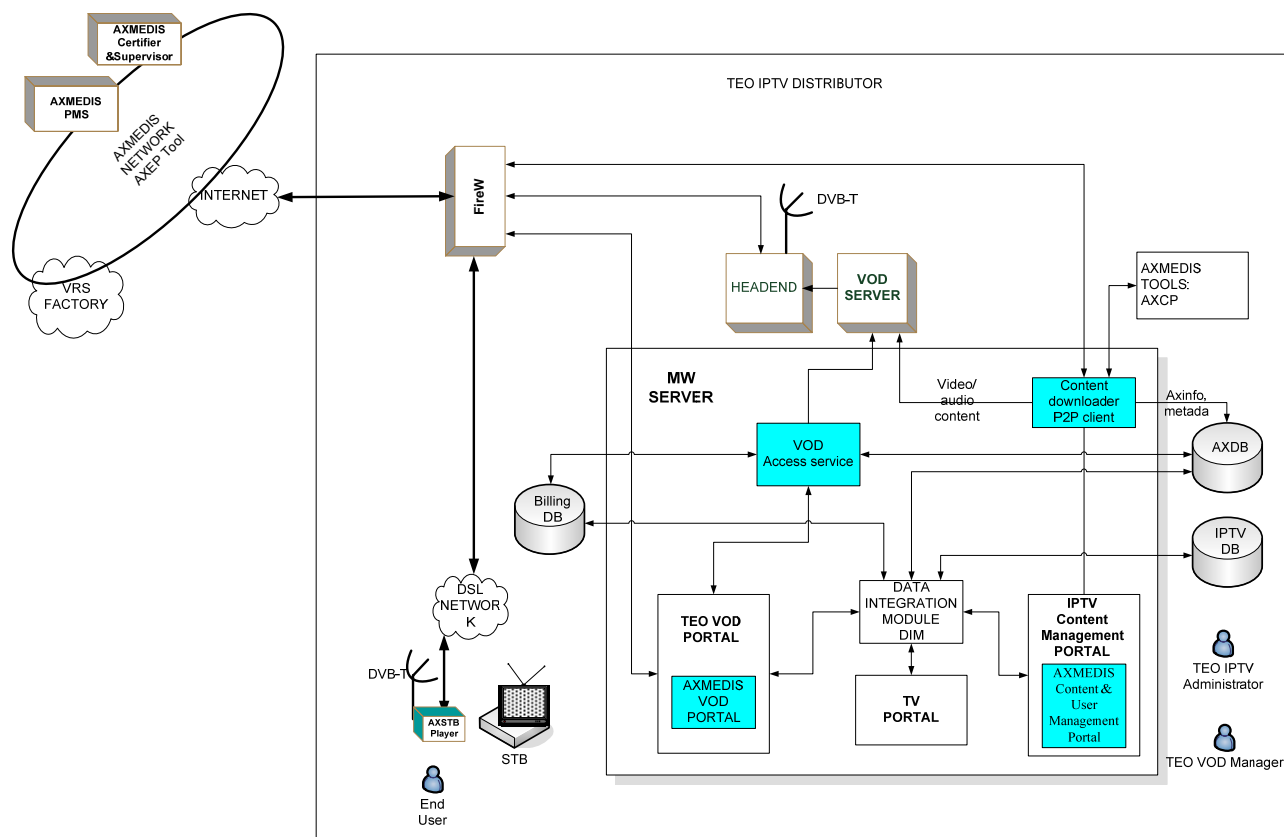## TEO IPTV AXMEDIS system architecture

High level description
The scheme below depicts the general components of the integrated TEO trial. Components depicted in yellow background are software components developed by the above mentioned partners specifically for this IPTV STB solution.

For this solution, of B2B automatic content production and distribution for IPTV, the content producer VRS uses AXCP http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624 and an AXMEDIS MPEG TS Adaptation Plugin to produce and make available trial video content in AXMEDIS MPEG-21 format for TEO IPTV service. The videos are formatted as AXMEDIS Objects, with pre-set usage rights and conditions and defined metadata. VRS places these AXMEDIS Objects into P2P network by using the AXEPTool http://www.axmedis.org/documenti/view_documenti.php?doc_id=3612 TEO IPTV distribution facility downloads the AXMEDIS objects from the P2P by using content downloader P2P AXEPTool client and ingest service and place them into VOD portal and server which includes also Customer relationship manager and content management system. The VOD server it is capable to stream the content on demand to the users' STB.

Detailed system description

TEO IPTV AXMEDIS setup is based on existing TEO Gala IPTV infrastructure. It started using existing IPTV architecture components in addition with some newly developed components (depicted in light blue) integrating AXMEDIS DRM elements and AXMEDIS content production and player tools.

TEO IPTV AXMEDIS trial is comprised of:

- **MiddleWare Server** and related components, as follows:
  - Existing TEO Gala IPTV database IPTV DB. In this DB information about clients, services and accounting information are stored. Communication with IPTV DB is performed using DIM-ADO.NET.
  - Existing Billing DB database, where TEO users billing information is stored. Communication with this DB is performed using WebServices.
  - In AXDB the AXMEDIS object metadata and stream information (AxStreamResource) are stored. The MPEG-2 TS resources are excluded due to storage efficiency. This DB is based on AXMEDIS database.
  - Data integration module (DIM) is an additional solution for integration different data formats in databases.
  - TV Portal – TEO portal for Gala TV IPTV services:
    - o On-line TV channels;
    - o Electronic program guide, EPG;
    - o Gaming, etc.;
  - AXMEDIS VOD Portal, based on TEO Middleware platform. This portal is used to present AXMEDIS content for End User. AXSTB Player uses this portal to retrieve information about content and usage information.
  - AXMEDIS Content & User Management Portal, which has been developed on IPTV Content Management Portal platform and used for TEO AXMEDIS content and user management. This module has been implemented in IPTV Content Management Portal and used by TEO VOD Manager and TEO IPTV Administrator.

- VOD Access Service – a component developed for TEO IPTV setup. This component is responsible for proper End User AXSTB Player connection with used DB's and services. VOD Access Service communicates with VOD server, Billing DB, IPTV DB, AXDB and AXMEDIS PMS to present required information to End Users and react to End User actions.
- AXEPTool B2B tool is used for connecting Middleware server with AXMEDIS network and downloading AXMEDIS data from it. http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624
- Content Downloader P2P client is a newly developed component for placing downloaded AXMEDIS object to VOD server, updating AXMEDIS object metadata and placing metadata and stream information into AXDB. Content downloader P2P client uses AXCP for automatically downloading new objects designed for TEO demonstrator. This component is a part of AXMEDIS Content & User Management Portal and is used by TEO VOD Manager for content management purposes.

- **VOD Server** – VOD content storage server. VOD Server is compatible with existing GALA TV network resources (Kreatel Application platform). The VOD server is capable of streaming DVB-CSA encrypted streams.

- **Headend Server** – IPTV content distribution and broadcasting server, used for transferring MPEG-2 designated content via TCP/IP network.

- **AXSTB Player** – based on AXMEDIS module called AXOM, which was integrated into Kreatel STB. AXSTB Player communicates with VOD Server, content and user databases, AXMEDIS PMS Server through VOD Access Service. The AXSTB player is certified and associated to the End User by using AXMEDIS tools and services.
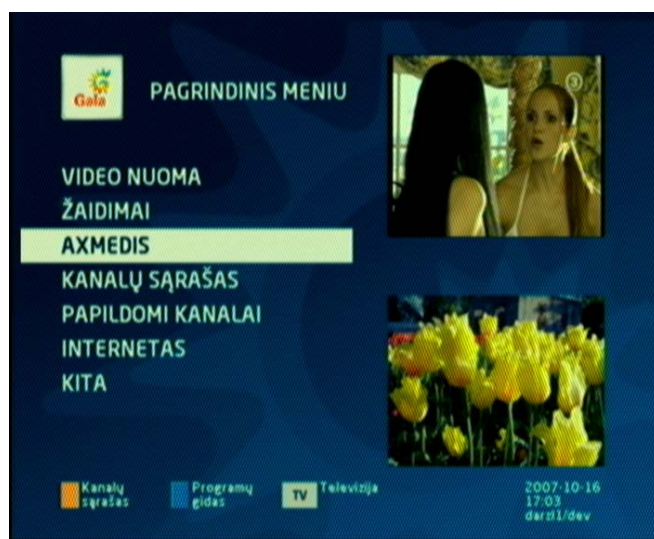
How does the TEO prototype work?

The videos, in AXMEDIS file format, can be manually or automatically downloaded from the AXEPTool (P2P file sharing system), on the video on demand, VOD, server by the VOD content manager operator.

The AXMEDIS objects, are based on MPEG-21 standard, and are specific files with embedded video resources and metadata. They can only be viewed through a specially developed AXSTB Player, and/or on any AXMEDIS player. The AXSTB contains a low-footprint client specifically designed to support MPEG-2 video transport stream.

The AXMEDIS objects with videos are made available for viewer's purchasing and viewing on AXMEDIS VOD portal accessible to the user on television. An IPTV service subscriber access to the VOD portal from the STB and thus to the AXMEDIS content category and may decide to view a video from this service.

When the user wants to view AXMEDIS digital objects, he/she chooses "AXMEDIS" button and connects to TEO VOD Portal. Using the remote control, the user is connected through an STB to IPTV network to browse through local AXMEDIS Database and select objects for viewing, to get them on demand.

In order to view the content, the End User must obtain a license from the AXMEDIS DRM (AXMEDIS PMS

and AXCS tools http://www.axmedis.org/documenti/view_documenti.php?doc_id=3616). In the first step, the AXSTB Player verifies the user ID while the AXMEDIS DRM solution ensures digital rights management and content protection. To this end, the developed VOD Portal service displays on the User's TV screen the billing information and simple license conditions for the selected AXMEDIS object (e.g., paid or free, and pricing). If the viewer decides to view protected content, the user is prompted to enter a PIN, which has been received by the user when signed the contract for the IPTV service. Upon the user entering the PIN, AXSTB Player initializes the license generation process, by sending a request to a VOD Access Service. The VOD Access Service interacts with the AXMEDIS PMS server to generate the specific user license. The production of the license allows the AXOM to Grant the Authorization to unprotect the content via the AXOM module of the AXSTB Player.

AXMEDIS STB Player starts to play the selected Video content. All user actions with regards to this content are registered in AXMEDIS Supervisor and Certifier Database.

The user can "Play", "Stop", "Pause", "Fast forward", "Rewind" and perform other remote control actions with this content within the capabilities of VOD server functionality.

The system allows the distributors and the content producers to access information about the user's statistics from the provider's VOD Portal. On the same line the final user can view all information about the number and type of AXMEDIS objects viewed as well as billing information.

After viewing the video clip, the viewer can go back to AXMEDIS browser or can go to IPTV provider's portal home page by pressing remote control button or by selecting "Home" button on TV screen.

To test the IPTV of TEO you can go on the WEB page and follow the instructions:

http://www.axmedis.org/com/index.php?option=com_content&task=view&id=72&Itemid=51

To see a Video of TEO trial you can download from:

http://www.axmedis.org/documenti/view_documenti.php?doc_id=3604

or simply go on the main page of AXMEDIS:

http://www.axmedis.org/com/index.php?option=com_frontpage&Itemid=1

Description of use cases and scenarios

There are three actors in TEO IPTV AXMEDIS system:

- End Users;
- IPTV provider's System Administrator and
- IPTV provider's VOD Manager

On the content producer's (VRS) side, there is one actor – VRS Content Editor.

The End User uses STB with AXSTB Player and can connect to IPTV network for watching AXMEDIS video content. The End User interface allows browsing through local AXDB and playing selected objects. If selected object is chargeable, End User is prompted to enter his PIN and choose the payment method. End User interface also allows browsing through global AXMEDIS network and viewing object descriptions. End Users can select objects in global AXMEDIS network and subscribe them, but this feature has not been implemented in TEO trial. The End User can view his usage and billing information by using the AXSTB Player.

TEO VOD Manager is responsible for content management in TEO AXMEDIS IPTV network. This actor downloads AXMEDIS objects from global P2P AXMEDIS network and prepares them for streaming in VOD server. TEO VOD Manager downloads objects according to End Users requests or to the business plan.
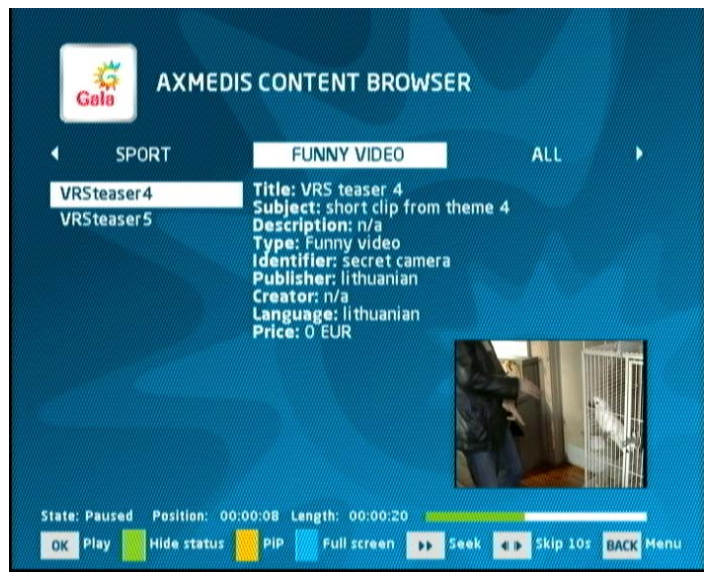
TEO IPTV Administrator is responsible for user management and can add, delete, and modify user.

VRS Producer is responsible for content production for TEO and Elion demonstrators. For TEO demonstrator VRS Producer creates streaming video AXMEDIS objects, for Elion demonstrator – AXMEDIS objects for PC platform.

axmedis — *Automating content production protection and distribution*

End user actions on AXSTB Player
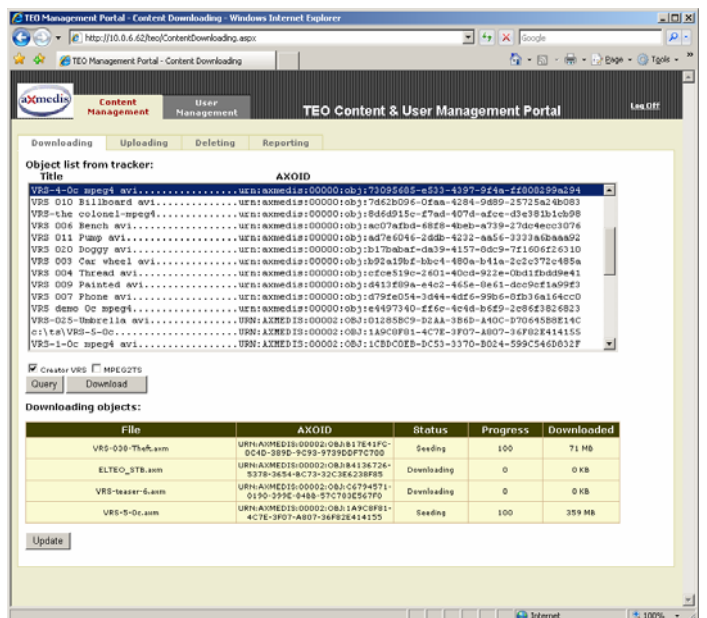
The End User can:
- connect to TEO IPTV network;
- browse and see metadata of AXMEDIS video content (if video object has a trailer, user can watch it for free);
- buy and play AXMEDIS video content (before object playing license must be generated (EU6.)):
  - o enter PIN;
  - o choose payment method;
  - o stop playing video;
  - o pause video;
  - o continue playing;
  - o seek to desired point of video;
- view user information:
  - o view usage information;
  - o view billing information.

VOD manager actions

The TEO VOD Manager can:
- Connect to TEO Content & User Management Portal;
- Manage TEO AXMEDIS content:
  - o Download AXMEDIS content from global AXMEDIS DB, using AXEPTool and place into VOD Server and AXDB;
  - o Delete content from local TEO AXDB;
  - o Make and view reports about usage of AXMEDIS content in TEO IPTV network.

IPTV administrator actions

The TEO IPTV Administrator can:
- Connect to TEO Content & User Management Portal;
- Manage TEO AXMEDIS users:
  - o Add user to TEO AXMEDIS DB;
  - o Delete user from TEO AXMEDIS DB;
  - o Set user rights to use AXMEDIS content in TEO IPTV network;
  - o Make and view reports about user actions in TEO AXMEDIS DB.

Key features of the TEO IPTV AXMEDIS system

The key features of TEO IPTV AXMEDIS solution are:

- AXMEDIS objects with MPEG 2 video content, specially processed for MPEG TS video with accompanying information;
- B2C distribution of video on demand (VOD) via IP network by means of MPEG-2 Transport Stream (TS) feeding an AXMEDIS compliant Set Top Box (STB) for viewing video on TV;
- Distribution and protection at signal protection level:
  - The transmitted video signal resource is encapsulated into MPEG-2 TS resource and scrambled using DVB-CSA algorithm. AXMEDIS AXOM is used for de-protecting video signal.
- Protection and DRM aspects:
  - At production (VRS Factory) level, using AXMEDIS Editor or AXCP automated production tool, with newly developed AXCP MPEG-TS Adaptation Plugin for scrambling MPEG-2 TS resource.
  - At Distributor (TEO) and end user level, upon trying to access protected AXMEDIS object, AXOM protection processor is executed to de-protect the object according to the issued license.
- License production:
  - Content provider creates mother licenses for distribution using its AXMEDIS Editor/DRM or AXCP tools or directly connecting with the AXMEDIS PMS Web Service.
  - End Users licenses are produced by TEO VOD access service using an AXCP Rule executed on the AXCP Scheduler and executor after receiving confirmation of payment. The issued license is sent to AXMEDIS PMS server.
    - License allows:
      - Free of charge view of trailers and pay-per-view for AXMEDIS objects.
      - Play, stop, pause and skip video stream from VOD server.
      - Other rights according to content type and business model
  - The AXMEDIS Objects are streamed from VOD server to the User's STB and played on AXSTB Player,
- Registration of users and tools (AXSTB Player) as follows:
  - The end user is registered to TEO database upon subscription of IPTV service. TEO IPTV administrator checks AXMEDIS option in registration form and the user is registered to AXMEDIS AXCS deployed at TEO site.
  - When user buys STB hardware it is registered to AXCS automatically upon first usage.

Unique AXMEDIS benefits to IPTV service providers

Although technologies for IPTV video on demand content delivery and protection are advanced and available today, the focus of AXMEDIS solution is on showing the automatic nature of value chain relationship between video on demand content producer/wholesale distributor to IPTV service provider for end users. The key benefits are:

- The automatic or semi-automatic nature of workflow at production and distribution levels, thanks to AXMEDIS AXCP tools http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624
- Transparent accounting and reporting of digital content consumed by value chain actors, thanks to AXMEDIS DRM tools http://www.axmedis.org/documenti/view_documenti.php?doc_id=3616
- The usage of a standard interoperable DRM with many other distribution channels and players see other technical notes and show cases, AXMEDIS is an extension of MPEG-21 standard DRM and format;
- The simple integration of distribution and production tools with the efficient P2P content distribution of AXMEDIS for B2B and B2C (in this case only the B2B part has been used) http://www.axmedis.org/documenti/view_documenti.php?doc_id=3612
- The connection with the AXMEDIS P2P network for accessing to the content to be distributed to IPTV
- The cross media content, when this type of content can be played according to the player capabilities. http://www.axmedis.org/documenti/view_documenti.php?doc_id=3634

Contact: Vytautas Valionis
TEO LT, AB; AXMEDIS ELTEO
Savanorių ave. 28
LT-03501 Vilnius, Lithuania
Tel: +370 5 236 7409
Fax:+370 5 212 6665
axmedisinfo@axmedis.org
vytautas.valionis@teo.lt

axmedis

Technical description
B2C video on demand distribution on an IP network by downloading media content onto PC using an http server and streaming video content to end user PC from a streaming server for viewing video on AXMEDIS PC Player

Description of Content
Trial video clips of VRS authored funny home videos with embedded video ads, formatted as AXMEDIS objects with MPEG 4 PC resolution video content with accompanying information.

Business Model
Revenue from content distribution to consumers could be earned based on two basic models:

- Consumer pays to the distributor for paid content;
- Free of charge content.

ELION content on demand distribution for PC

As part of AXMEDIS, a group of partners from Baltic States has undertaken to deploy a video-on-demand distribution for Internet and PC by exploiting the AXMEDIS Framework and solutions. The real life trial involves a video content producer from Lithuania (VRS Grupe), and two broadband operators – ELION (Estonia), operating an internet-based media distribution portal, and TEO (Lithuania) – IPTV service provider. Although the purpose of the trial is to show how AXMEDIS solution and tools can be used as an integrated automatic content production and distribution value chain. This technical note describes the technical aspects of the ELION platform, integrating AXMEDIS solution and tools into video on demand (VOD) distribution for PC service.

The purpose of the ELION trial is to showcase AXMEDIS technology adopted for streaming/downloading protected AXMEDIS content to PC over Internet. It shows to broadband operator's distribution of value added video on demand (VOD) content to ELION trial internet service subscribers using the media rental. Internet service subscribers can view digital video material on their PC through an AXMEDIS PC Player. The ELION trail for the exploitation of AXMEDIS solution intends to show business to consumer (B2C) digital content distribution on IP network by downloading content into PC using http server. The content can consist of AXMEDIS objects with any kind of content with integrative capabilities: video, images, document, audio, animations, games, SMIL, HTML, MPEG-4, etc. The content is protected by the content producer by using AXMEDIS production tools and DRM technology. End User licenses for the content usage are produced on the fly, on demand, when an AXMEDIS object (the license) is bought by the consumer.

Elion AXMEDIS system architecture

High level description
The scheme below depicts the general components of the ELION trial. Components depicted in yellow are software components developed by partners specifically for this solution.
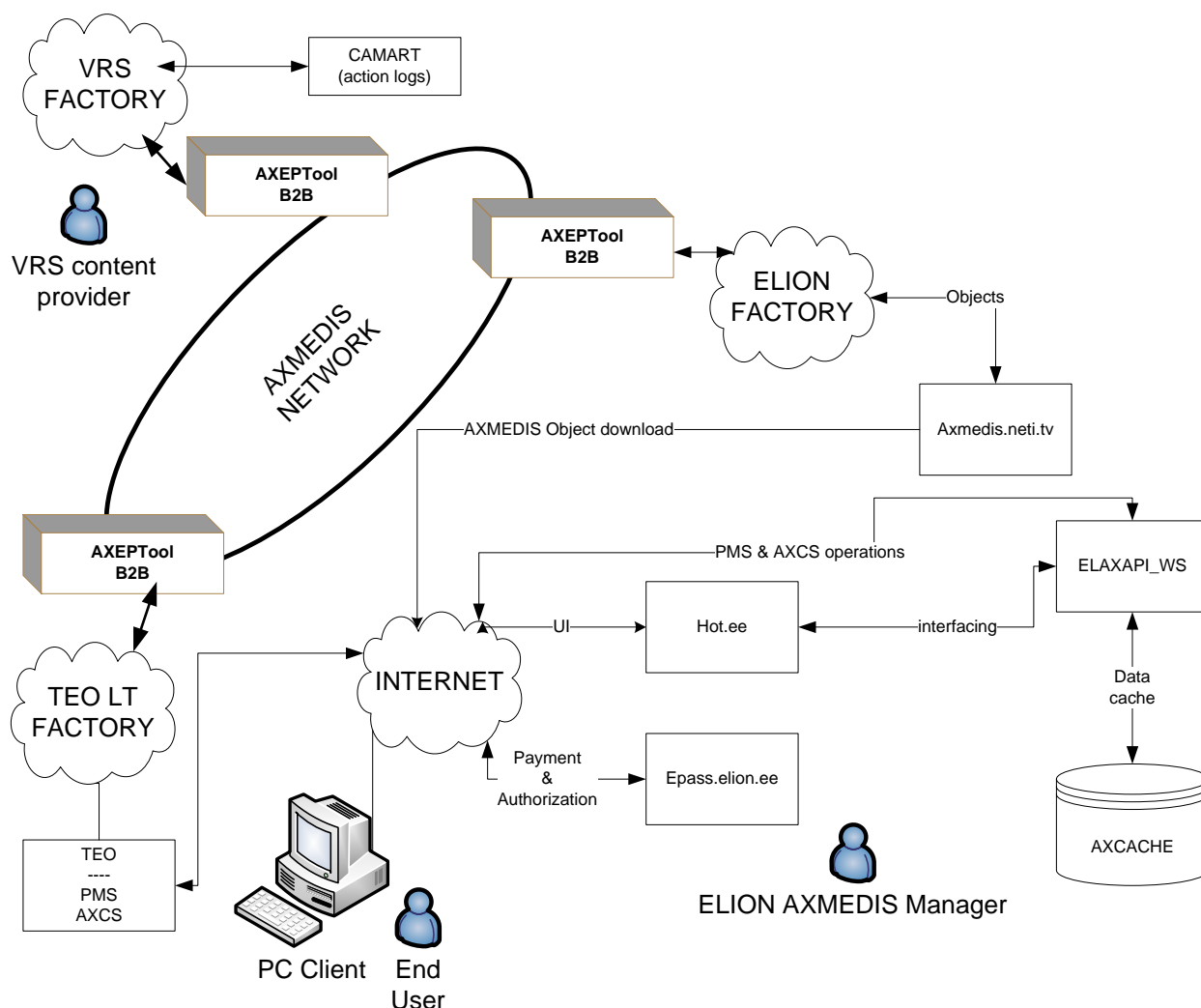
In this solution, the content is produced at B2B level automatically and delivered to ELION via P2P. Content producer is VRS, which produces and makes available some trial video content for ELION internet service, other cross media AXMEDIS content can be taken from the AXMEDIS P2P network as well. The videos are formatted as AXMEDIS Objects, with a pre-set usage rights and conditions and defined metadata. VRS places these AXMEDIS objects into P2P network (AXEPTOOL). http://www.axmedis.org/documenti/view_documenti.php?doc_id=3612 The content producers, VRS, use the content production automation provided by AXCP tools: VRS uses AXCP http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624

In ELION distribution system, the AXMEDIS content ready for distribution is stored in delivery server. The content is downloaded from AXMEDIS P2P network by using content downloader P2P client. Then the content is prepared, if needed, with the AXMEDIS Editor for distribution. After content is prepared it will be made available for download over web server using public networks
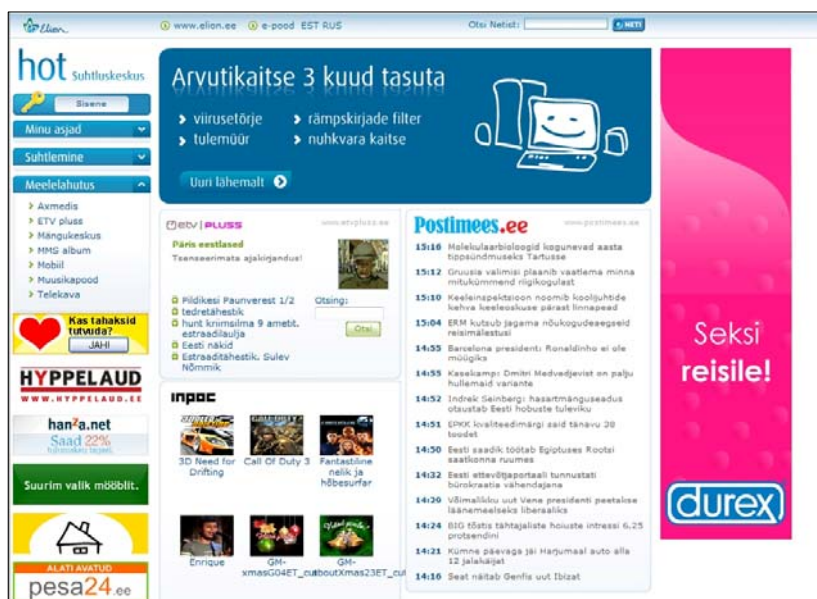
Detailed system description

ELION AXMEDIS Video on demand distributor for PC is based on existing ELION's Hot.ee (http://live.hot.ee/axmedis) community portal to enable content listing and usage. It uses existing broadband network architecture components in addition with some newly developed components for AXMEDIS integration.

ELION solution based on AXMEDIS is comprised of:
- **Axmedis.neti.tv virtual sever** node including:
  - AXEPTool B2B node for content download and sharing on AXMEDIS B2B Network: http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624
  - ELAXAPI_WS interfacing web service for end user UI representation on hot.ee
  - IIS web folder share for AXMEDIS object downloads to end user
  - IIS web folder share to distribute AXMEDIS PC Player: http://www.axmedis.org/documenti/view_documenti.php?doc_id=3634
  - AXCACHE database for ELAXAPI_WS web service data store
  - SQL Server manager express for AXCACHE.

- **www.hot.ee** **portal** – hot.ee portal is Elion's existing proprietary community & communication portal that will be featuring additional menu option to enable AXMEDIS object distribution and marketing http://live.hot.ee/axmedis .
- **Epass.elion.ee** – it is ELION's proprietary account services and billing system serving as single shared resource between several solutions.

ELION shared with TEO AXMEDIS DRM facilities and servers (http://www.axmedis.org/documenti/view_documenti.php?doc_id=3616). ELION Manager uses axmedis.neti.tv node to manage AXMEDIS objects distribution and to gather statistics data about rights exploitation and content consumption.
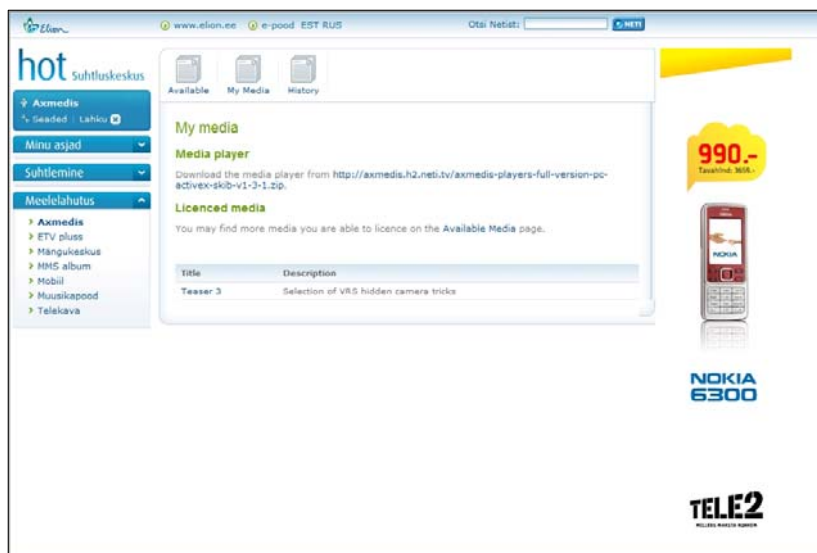
How does the ELION trial work?

The videos content (or eventual any kind of cross media content provided), in AXMEDIS format, have been manually or automatically downloaded from AXEPTool, AXMEDIS P2P file sharing system based on BitTorrent, to be put on the video/content on demand server of ELION by the ELION AXMEDIS manager.

ELION's internet service subscriber knows about AXMEDIS content service and decides to view a video from this service. When the user wants to view AXMEDIS digital objects, he/she may connect to www.hot.ee via internet, register as a hot.ee user and goes to the AXMEDIS area by choosing "AXMEDIS" button.

For the first time, the user has to download the AXMEDIS player from a link provided. The user can browse the content available and select desirable content for viewing. If prompted for licence user acquires the licence by secure on-line credit card or bank transfer payment, by SMS, or using provider's pre-pay service E-Pass.

Only if the user has acquired the licence the AXMEDIS Player permits to play the selected media content on PC.

All user actions with regards to this content are registered in AXMEDIS AXCS / PMS. The user can "Play", „Stop", "Pause", "Skip Forward" and exploit the content unlimited counts within the licensed 24 hour period.

After viewing the video clip, the viewer can go back to AXMEDIS browser or can go to hot.ee portal home page to get another one, etc.

To test the Content on Demand of ELION you can go on the WEB page and follow the instructions:

http://www.axmedis.org/com/index.php?option=com_content&task=view&id=75&Itemid=46

To obtain the AXMEDIS ELION PC player you can download from:

http://www.axmedis.org/documenti/view_documenti.php?doc_id=3731

or simply go on the AXMEDIS main web page:

http://www.axmedis.org/com/index.php?option=com_frontpage&Itemid=1

Description of use cases and scenarios
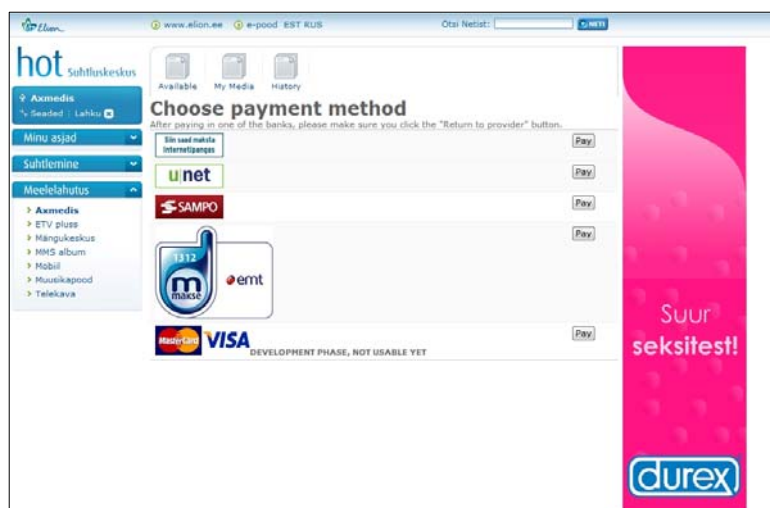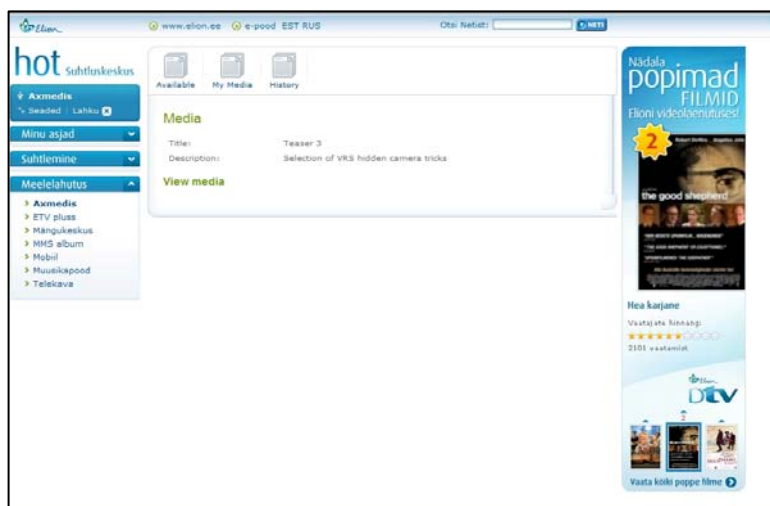
There are two actors in ELION AXMEDIS system:

- End User
- Manager

On the content producer's (VRS) side, there is one actor – VRS Content Editor.

End User has internet connection, windows-based operating system, supported browser, downloaded AXMEDIS player and is authenticated by the E-Pass account and signed up on AXMEDIS. In addition, user must own an internet bank account with supported banks or own a mobile phone subscription with supported local mobile service providers.

End User enters the community and communication portal www.hot.ee, logins (using e-pass), becomes AXMEDIS user by clicking AXMEDIS menu and downloads AXMEDIS Player. End user is presented with available content listing to choose from. When user has chosen an interesting object for purchasing he/she is directed to payment gateway and is presented with payment options. End User performs payment according to selected option and downloads the selected media object on PC. Having downloaded the object the end user uses AXMEDIS player to exploit the object according to license limitations.
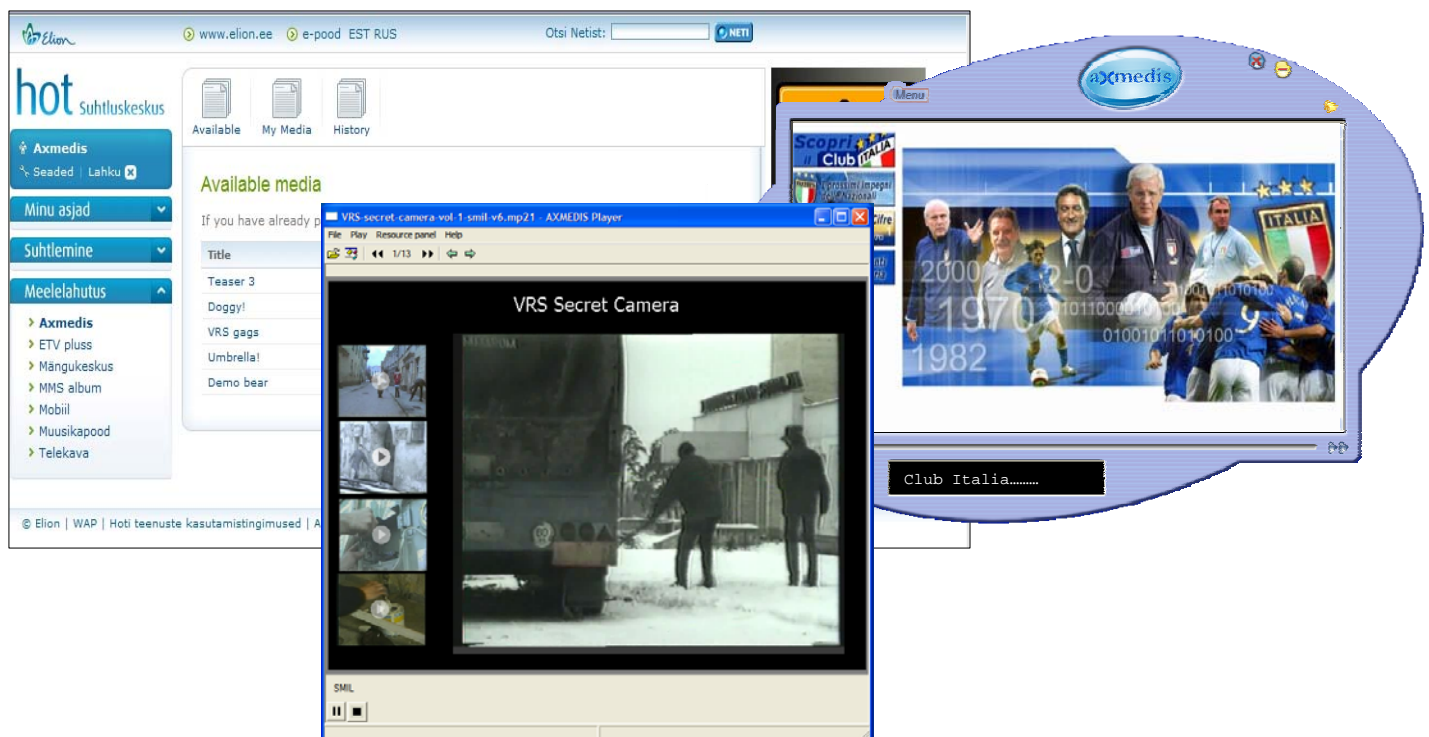
ELION Manager performs actions to manage content on distribution point. All operations are being done over terminal services session by connecting to axmedis.neti.tv node responsible for handling all AXMEDIS operations in ELION distributor.

End user actions

The End User can:

- Enter to www.hot.ee portal;
- Login using e-pass;
- Becomes AXMEDIS Users;
- Browse content;
- Purchase content;
- Downloads content on PC from one or more AXMEDIS compliant channels;
- Consumes AXMEDIS objects via one of the several AXMEDIS free players
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3634

Main Manager Actions

The ELION Manager can:

- downloads new AXMEDIS objects for distribution from the P2P or other means;
- removes objects for the distribution;
- publishes objects for the distribution;
- reviews licensing logs;
- manages user database;
- accessing to AXMEDIS DRM server to download reporting and statistics data. See the following link for other details
  - http://www.axmedis.org/com/index.php?option=com_content&task=view&id=75&Itemid=46

Key features of the ELION AXMEDIS Solution for content on demand

The key features of ELION AXMEDIS solution are:

o B2C video (and potentially any kind of content) on demand distribution on an IP network by downloading media content onto PC using an http server and streaming video content to end user PC from a streaming server for viewing video on AXMEDIS PC Player;

o Obtaining content for the distribution directly from the producers and/or from the AXMEDIS P2P B2B network via AXEPTool http://www.axmedis.org/documenti/view_documenti.php?doc_id=3612

o Usage of AXMEDIS objects with
  o Any kind of content, all types: Video, images, document, audio, animation, etc.

- o http://www.axmedis.org/documenti/view_documenti.php?doc_id=3634
  - o Protection information not in the object
    - o Produced with the AXCP with an automatic massive processing of objects
    - o With the protection tool, automatically posted in the AXCP by the Protection Tool
    - o http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624
  - o License for the end users:
    - o Produced on the fly, on demand, when an AXMEDIS object is bought by
      - ▪ Using internet bank transfer payment
      - ▪ Calling the mobile phone number provided for toll payment
  - o License allows
    - o Free of charge view of trailers and pay per view for AXMEDIS objects;
    - o Play, stop, pause and skim video stream from VOD server (ads inserted into clips cannot be skipped using seek operation: end user can skip forward only)
    - o Other rights according to content type and business model
  - o The AXMEDIS Objects may be
    - o Displayed/played on AXMEDIS PC player, free downloaded from:
    - o http://www.axmedis.org/documenti/view_documenti.php?doc_id=3731
  - o The users operate a PC. The user has to perform the registration of
    - o Themselves as users (on an AXMEDIS portal)
      - ▪ Any AXMEDIS player tool they would use.

Unique AXMEDIS benefits to internet service providers

By integrating AXMEDIS standards into service environments ELION is ensuring its market readiness for new pan-European standards and enabling content producers to exploit a fully transparent delivery & marketing system thus freeing content owners of having expensive solutions for private distribution and need to have dedicated infrastructure.

AXMEDIS enables ELION to address several interoperable channels as well as multitude of possible content formats thus enriching the service capability and in turn unlocking content creator creativity. With rich AXMEDIS objects the final package delivered to end user can include a revolutionary experience due to ability to host any kind of digital elements including interactivity: audio, video, digital imaging, animation, games, text/documents, programs, SMIL, HTML, MPEG-4 with interactive parts, etc. http://www.axmedis.org/documenti/view_documenti.php?doc_id=3634

Other benefits are:

- • The automatic or semi-automatic nature of workflow at production and distribution levels, thanks to AXMEDIS AXCP tools http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624
- • Transparent accounting and reporting of digital content consumed by value chain actors, thanks to AXMEDIS DRM tools http://www.axmedis.org/documenti/view_documenti.php?doc_id=3616 ; and the usage of a standard interoperable DRM with many other distribution channels and players see other technical notes and show cases, AXMEDIS is an extension of MPEG-21 standard DRM and format;
- • The simple integration of distribution and production tools with the efficient P2P content distribution of AXMEDIS for B2B and B2C (in this case only the B2B part has been used) http://www.axmedis.org/documenti/view_documenti.php?doc_id=3612
- • The cross media content, when this type of content can be played according to the player capabilities. http://www.axmedis.org/documenti/view_documenti.php?doc_id=3634
- • The connection with the AXMEDIS P2P network for accessing to the content to be distributed towards several distribution channels;

Contact: Andrius Lokotas
Elion Ettevõtted Aktsiaselts;
AXMEDIS ELTEO
Endla 16,
15033 Tallinn,
Estonia
axmedisinfo@axmedis.org
Andrius.Lokotas@Elion.ee