**Automating Production of Cross Media Content
for Multi-channel Distribution
www.AXMEDIS.org**

DE9.3.5
Final report on Demonstration on content production and distribution via satellite

Version: 1.0
Date: 31/08/2008
Responsible: EUTELSAT

Project Number: IST-2-511299 Project Title: AXMEDIS Deliverable Type: Public Visible to User Groups: YES only the document and the demonstrations Visible to Affiliated: YES only the document and the demonstrations Visible to Public: YES only the document and the demonstrations
Deliverable Number: DE9.3.5 Contractual Date of Delivery: M48 Actual Date of Delivery: 31/08/2008 Work-Package contributing to the Deliverable: WP9.3 Task contributing to the Deliverable: WP9.3 Nature of the Deliverable: Report Author(s): EUTELSAT, MBI
Abstract: This is the final report on the demonstrator for content distribution via satellite, to PC and STB. **Keyword List:** Distribution channel, content, satellite, i-TV, PC, STB, Programme&Publication, demonstrator

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1 Executive Summary and Report Scope

This document relates to the Demonstrator on content distribution via satellite, as defined in the WP9.3. The distribution targets PC-based clients and Set-Top-Boxes. The demonstrator is based on the specifications resulting from WP4 and WP5, in particular WP4.8.

The present report contains an introduction to the AXMEDIS satellite distribution channel, then an overview of the integrated architecture, and then a description of the demonstrator built during the project.

2 Introduction

The *Satellite Data Broadcast* is a content distribution mechanism that enables the distribution of digital content, and in this case of the AXMEDIS content, in a very efficient manner. This technology, provided by EUTELSAT OPENSKY platform, allows large quantities of data to be pushed via satellite directly on the user's stations without congesting local networks. The PUSH mechanism can be used, again, to renovate the catalogue of the Distributors periodically at low cost.

The first prototype for the Satellite Data Broadcast inside the AXMEDIS environment, focused on the content delivery towards PCs equipped with a DVB/IP satellite card, was called in this context i-TV.

Later on during the project, a second kind of receiving device was included in the demonstration of the satellite distribution, the Set-Top-Box (STB). The STB developed for the AXMEDIS purpose is of an evolved kind including a hard disk for data storage and a guide for selecting programs to be rendered on a TV screen.

The integrated prototype used for the demonstration phase can support the complete cycle performed by a new content to be distributed by the content provider to a large number of content distributors, as well as from a distributor to the final users: this proves how the platform is suitable for both B2B and B2C cases.
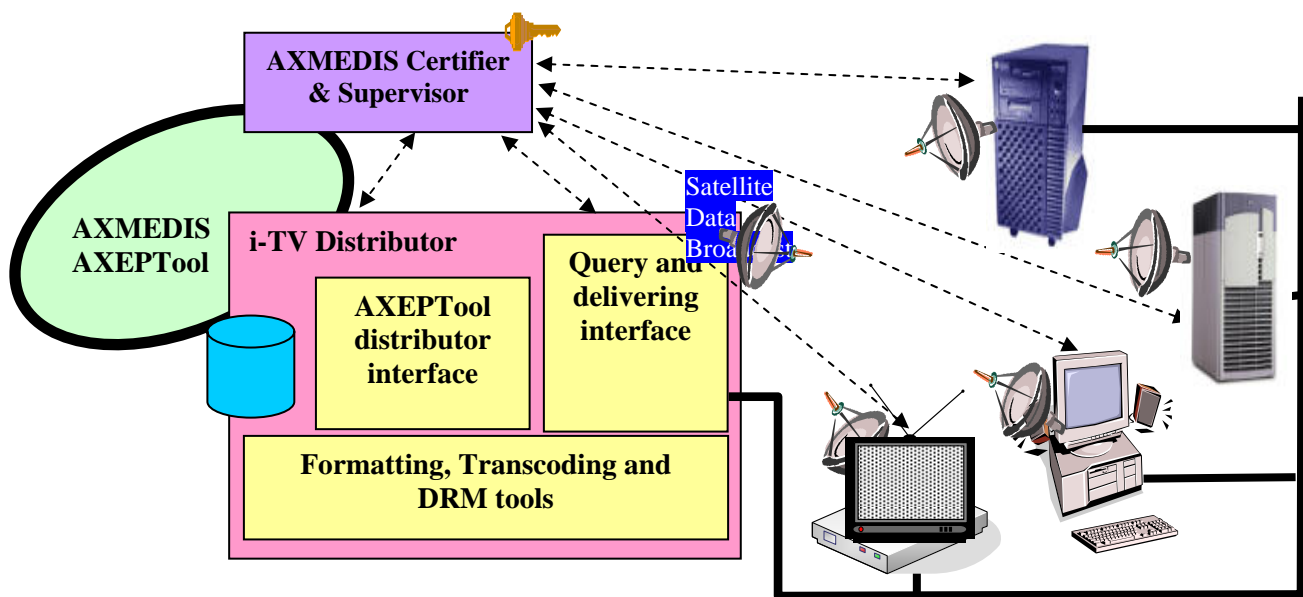
AXMEDIS Distribution of i-TV Content via satellite data broadcast

The distribution process uses the PUSH transmissions of the content according to the protocols that have been previously defined.

The distributors act as proxies for the content, making it available for the clients without the need to contact the content provider directly. The integrated prototype uses the Programme and Publication (P&P) module of the AXMEDIS platform to prepare the content and send it through the satellite channel. This tool interfaces

with the API of the EUTELSAT OPENSKY system in a transparent manner for the distributor; advantages are evident, since the distributor can use a single tool/interface to create its transmissions and then choose the satellite channel as well as one of the other distribution channels.

On the client side, the demonstrator focuses on the B2C distribution, with a typical scenario of broadcast of contents from the distributor to the users. Client stations are able to store the received data in a cache area, where additional applications can access the data and handle it, likely for filtering, statistics, etc.

The demonstrator aims at validating the distribution of content to PCs and STBs via Satellite Data Broadcast. The use of satellite for data distribution has the incontestable advantage of reaching any geographical area with minimal infrastructure, and the possibility to broadcast data to many users at the same time.

Distribution via satellite can be done in *Push*, forcing the reception of content to receiver (as in the case of the STB), or proposing to the final users the catalogue (guide) of contents and let them select what to download (*Pull*). In both cases, the content stored on the hard-disk of the terminals is listed on the program guide and can be then regularly fruited with the AXMEDIS PC/STB Player.

3   System Overview

This section gives an overview of the integration of the satellite distribution in the AXMEDIS context.
As said before, the Satellite Distribution Channel targets the two receiving devices described in this document, i.e. the PC-based clients and the STBs provided by MBI.
In both cases the Distribution is performed in multicast through the EUTELSAT's OPENSKY platform. EUTELSAT provides the satellite distribution channels; a distribution channel includes satellite capacity as well as all the facilities on the Satellite Distribution platform to support the transmissions.
The Programme&Publication (P&P) is the tool that joins the AXMEDIS platform with the satellite distribution. The P&P Engine, connected with the AXP2P network, allows choosing content to be sent via satellite, and provides all the necessary steps to translate the transmission program onto the EUTELSAT platform. The figure below shows the interaction between these modules.

The selection on the P&P Editor of the satellite channel for the distribution of content brings the P&P Engine to automatically put that content in the sequence of the satellite carousel: the content will be transmitted at next repetition of the carousel, and then removed, by the P&P Engine, at the expiration date defined.

Distribution via satellite can be done in *Push*, forcing the reception of content to receiver (as in the case of the STB), or proposing to the final users the catalogue (guide) of contents and let them select what to download (*Pull*). In both cases, the content stored on the hard-disk of the terminals is listed on the program guide and can be then regularly fruited with the AXMEDIS PC/STB Player.

The characteristics and advantages of this satellite distribution channel can be simply listed as follow:

- B2B/B2C distribution of digital content via Satellite Data Broadcasting from the AXMEDIS Factory to users' PCs and AXMEDIS compliant Set Top Boxes (STBs)

- A single transmission to reach several unlimited receiving devices at once (broadcasting)

- High distribution speed with no terrestrial infrastructure limitations and zero network congestions (operate via satellite)

- Definition of distribution programmes with large flexibility and easy to use with the AXMEDIS Programme and Publication Tools

- AXMEDIS compliant STB for satellite reception for enhanced business solutions.
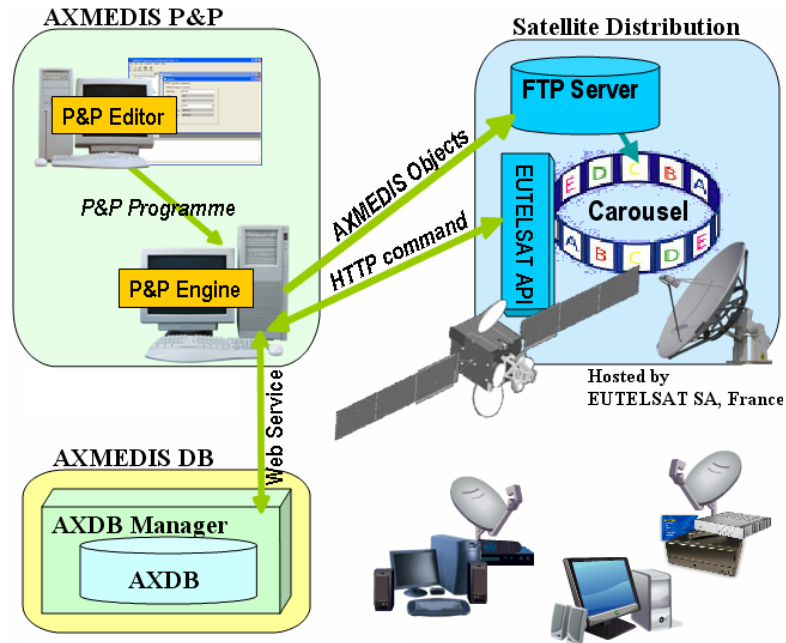
AXMEDIS Satellite Distribution Architecture

3.1   Transmission Details

Content Distribution Node (P&P Engine)

The distribution programmes are defined via a Programme&Publication Engine connected with the AXP2P network and properly configured to access the satellite distribution platform (see details below).

Using the P&P Editor, content is taken from the P2P network by querying and adding AXMEDIS objects to a P&P Programme. The P&P Programme is then activated into the P&P Engine to process and distribute the objects to the specified distribution channel.

Communication between P&P Engines and satellite platform is via FTP and HTTPS protocols.
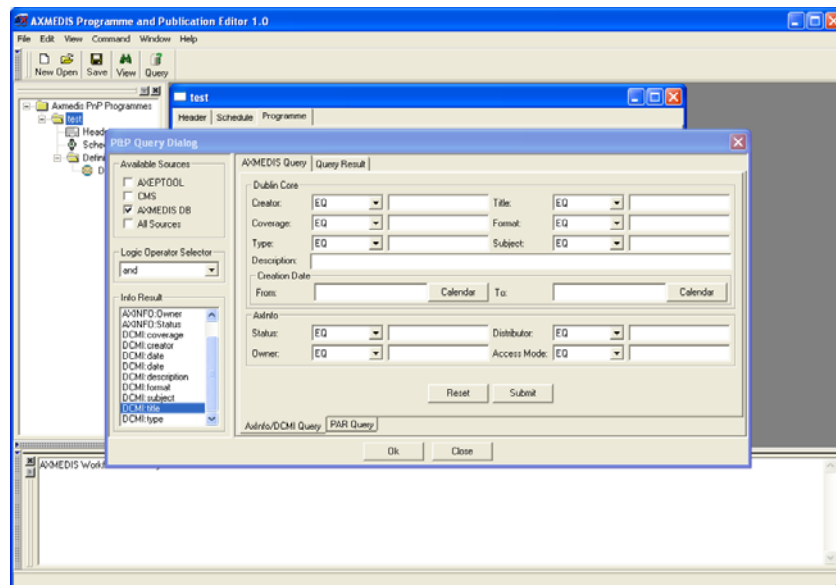
P&PTools interfaces

Satellite Data Broadcast platform

The satellite platform is based in EUTELSAT's Teleport in France. It is accessible via API and FTP at:

URL APIs: https://admin.opensky.eutelsat.net:10718/business/cgi-bin/xml/api

URL FTP: ftp://193.251.135.86 (content upload)

The access to the EUTELSAT platform is rescricted. IP addresses used for connection (i.e. running a AXP&P Engine) have to be communicated to EUTELSAT for authorization.

The satellite channel of 512kbps active 24/7 is provided on EUTELSAT's satellite ATLANTIC BIRD™ 1 (AB1) positioned at 12.5° West, covering Europe with following parameters.

Frequency: 11,4280GHz
Symbol Rate: 30000kSymb/s
Polarization: Horizontal
Viterbi Rate: 5/6
PID: 2411

(Other satellite positions, frequencies and bandwidth can be accorded to reach different geographical areas and business requirements.)

Satellite distribution to PCs and STBs is one-way, thus a simple reception-only dish is required to receive. The size of the dish depends on the signal strength in the region, and starts from 80cm in central areas.
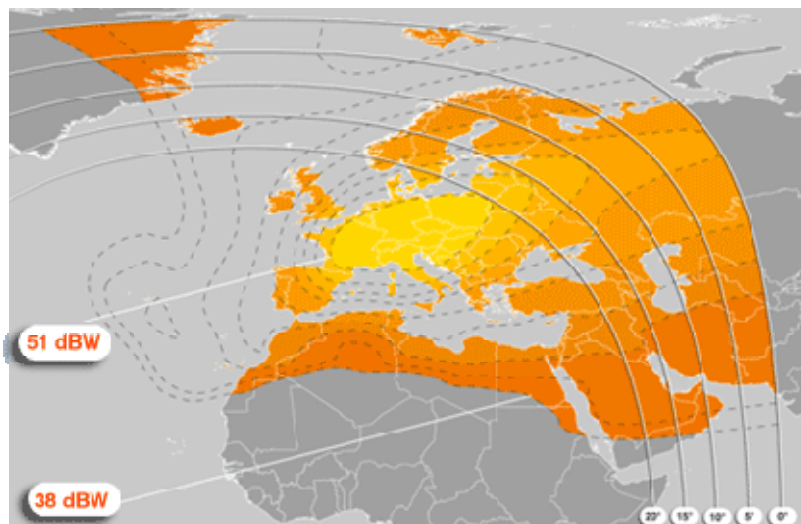
**ATLANTIC BIRD™ 1 Coverage**

Reception on PC

To receive the content on a PC (as well as on the STB) a one-way (reception only) antenna is suitable. The dish size depends on the location, as recommended in the following table:

Signal Strenght (dbW)	Dish Size (cm)
>=48	80
47	90
45	110
43	150
40	200

The PC is equipped with a DVB-S adapter connected to the antenna, and configured with the satellite parameters noted above.

Two software applications are required for downloading and playing the content: the OPENSKY™ Client and the AXMEDIS Player.

The registration and certification of the AXMEDIS tool is optional: content reception does not require any registration, but registration is needed for full fruition of protected content.
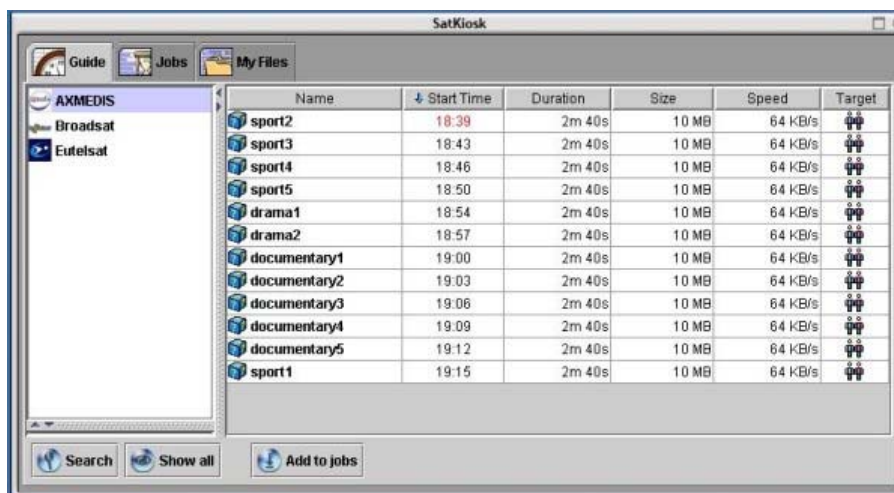
OPENSKY Client interface

Reception on STB

The STB of this demonstrator has been realized by means of development, integration and customization on a specific STB platform brought in the AXMEDIS Project by MBI. By integrating the AXMEDIS Object Model (AXOM) components and the OpenSky Push client this STB is able to render both clear and protected AXMEDIS contents received via (OpenSky) Satellite Push distribution as described above.

This STB can handle both audio/video contents of various formats (including MPEG2, MPEG4 and WMV) without user interaction, and intercative contents (such as HTML and SMIL) through a pointed interface. The User Interface is a typical consumer-electronics one, operated by means of a Remote Control, consisting of menus, lists and banners. The Satellite Push Client task runs in background without any user interaction and handles the STB contents by adding/deleting items.

The figure below shows an example of list that allows the user to navigate the contents via remote control.

Example of content guide for STB

The STB platform is based on an hardware accelerated decoding of the various media. This implies that some limitations exist with regard to the media types that the STB can handle. The following is a list of media types, in terms of codecs and container formats, currently supported by the MBI STB.

4   Demonstrator Show Case

4.1   The Web Page

The usage of the demonstrator is explained in the EUTELSAT Showcase on Content Distribution via Satellite Data Broadcast (DVB-S) to PC and STB, web page included on the AXMEDIS Product & Services portal.

Besides an introduction and related links sections, the web page composes of two sections addressing to the potential final users and the potential distributors (business users) interested in this distribution channel. These sections provide step-by-step instructions for the installation of the hardware and software elements required on the two scenarios.

Final users are accompanied in the experience of the satellite reception of AXMEDIS objects and their fruition. Business users are informed on the potential of the AXMEDIS P&P Tools to benefit of the multicast distribution via satellite. An additional section provides an overview on the STB device.

"Content Distribution via Satellite Data Broadcast (DVB-S) to PC and STB"

The Satellite Data Broadcast, explored by EUTELSAT together with the University of Leeds and MBI, allows the distribution of content with a single transmission to several users located in different geographical areas.

Advantage. Using the satellite channel, high speed distribution becomes possible everywhere, also in regions not covered by terrestrial broadband infrastructure.

Content from the AXMEDIS Factory is easily delivered to the outside world, and received by final users on their PCs or on AXMEDIS compliant STBs.

The AXMEDIS Demonstrator for Satellite Distribution is a running demo of AXMEDIS content sent in broadcast via the Eutelsat OPENSKY™ platform. A Program & Publication Engine runs permanently at University of Leeds. It automatically generates distribution programs, taking new content from the AXMEDIS P2P and putting it on the satellite carousel.

The distribution to PC is suitable for any kind of digital content, while for the STB audio/video content is more suitable. SMIL and HTML are also supported.

- Technical note 6401: "AXMEDIS content via Satellite Data Broadcast"

Consumers of content who want to try the satellite reception find advice how to download content (for free) from the carousel here.
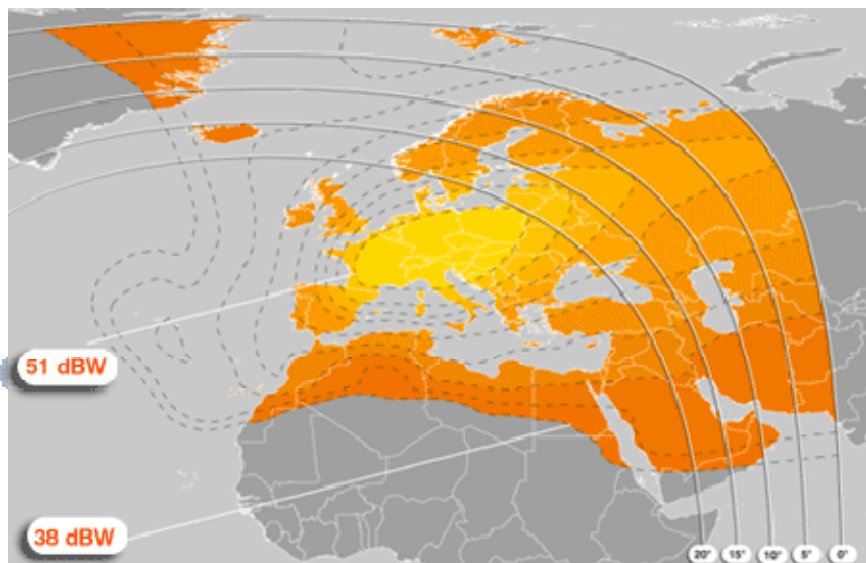
Distributors will find more information about this distribution channel here.

For Consumers
Service prerequisites for consumers

In order to view the AXMEDIS content you need a **satellite dish** pointing to ATLANTIC BIRD™ 1 (AB1) positioned at 12.5° West with a coverage of Europe (Transponder C11).

A one-way (reception only) antenna is suitable. The dish size you need depends on your location. You can find the recommended dish size in the table:

Signal Strenght (dbW)	Dish Size (cm)
>=48	80
47	90
45	110
43	150
40	200

You need a **DVB-S adapter** for your PC. OPENSKY™ services are based on DVB-S technology. Therefore you need a satellite DVB device to receive them. You can use an external DVB USB box connected to your PC via a USB cable or an internal PCI card. Most devices available on the market are compatible with OPENSKY™ services, using following transmission parameters:

Frequency: 11,4280GHz
Symbol Rate: 30000kSymb/s
Polarization: Horizontal
Viterbi Rate: 5/6
PID: 2411

AXMEDIS Player and **OPENSKY™ software application** - To play content you must have the AXMEDIS Player and the OPENSKY™ software application (Windows XP) installed on your PC. Download both here.

Register to AXMEDIS - To play protected content with the AXMEDIS Player please register to AXMEDIS and certify the AXMEDIS Player. Register to AXMEDIS here.

For further information on the hardware installation, please see here.

The consumer experience

Launch the OPENSKY™Client application and you will be ready to access the AXMEDIS content via satellite. The OPENSKY™Guide lists the available content on-air, with expected transmission time.
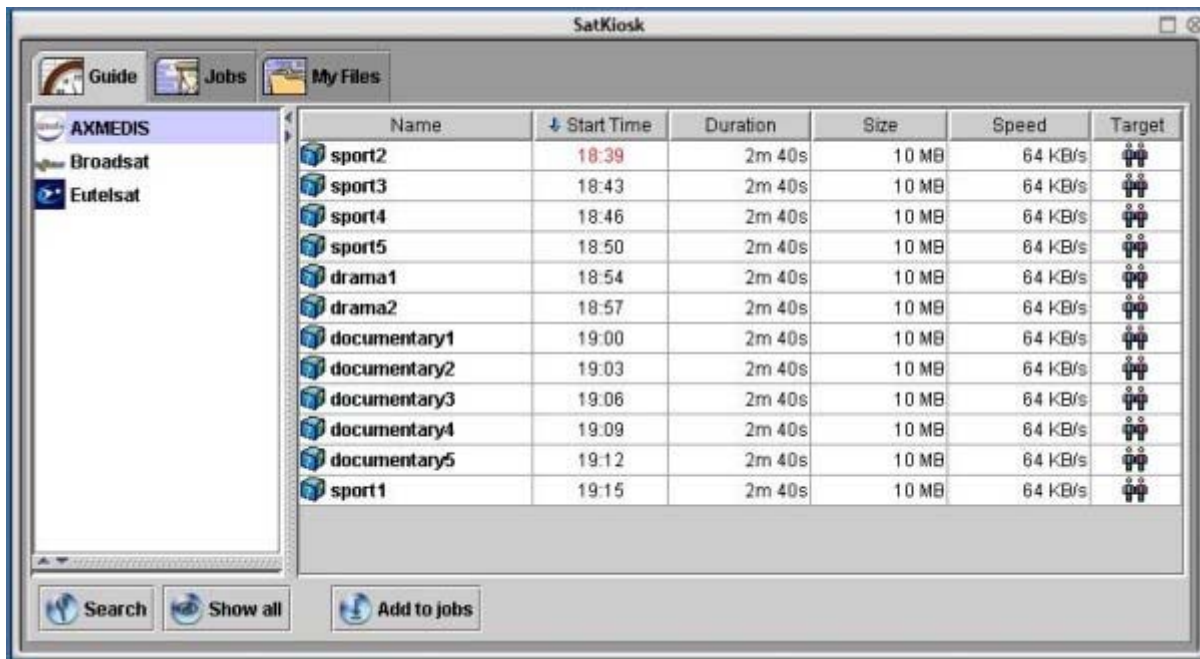
Select the content you wish to receive ("Add to jobs") and just wait. At the transmission start time your application will start the download and store the content on your PC.

During this time you do not need to be connected to the internet. The download works from satellite.

A pop-up window will inform you of the completed download. Now you can open your received AXMEDIS objects. Enjoy!

For Distributors

The AXMEDIS solution gives you access to the Satellite Data Broadcast. The AXMEDIS Program & Publication (P&P) Tools let you define and activate your distribution programs to satellite. Content is retrieved from the AXMEDIS platform, P2P and/or DB, and delivered using the OPENSKY™ technology of Eutelsat.

Service prerequisites for distributors

To try out the distribution of content you need to install the AXMEDIS Tools, including the P&P Tools:

- **AXMEDIS Tools including the P&P Tools -** Download here and install them on your computer.

- **Register to AXMEDIS** - To use the AXMEDIS Tools you must be registered to AXMEDIS and you must have certified the AXMEDIS Tools. Register to AXMEDIS here.

Note that, although the interaction is transparent for the distributors using the P&P Tools, the access to the Eutelsat OPENSKY™ platform's services is restricted and limited to authorised users only. Therefore, you need to contact the AXMEDIS administrators (mailto: info@axmedis.org) to obtain authorisation to fully access the satellite distribution. Your IP addresses will be registered and enabled to access the Eutelsat OPENSKY™ platform.

programs and put them on the carousel (OPENSKY™Guide) for satellite distribution.

The P&P Editor is a Graphical User Interface (GUI) for a distributor to create and edit P&P programs. A P&P program is a sort of TV/Radio program, containing details as the digital objects to be distributed, time schedule, delivery channel, and more.
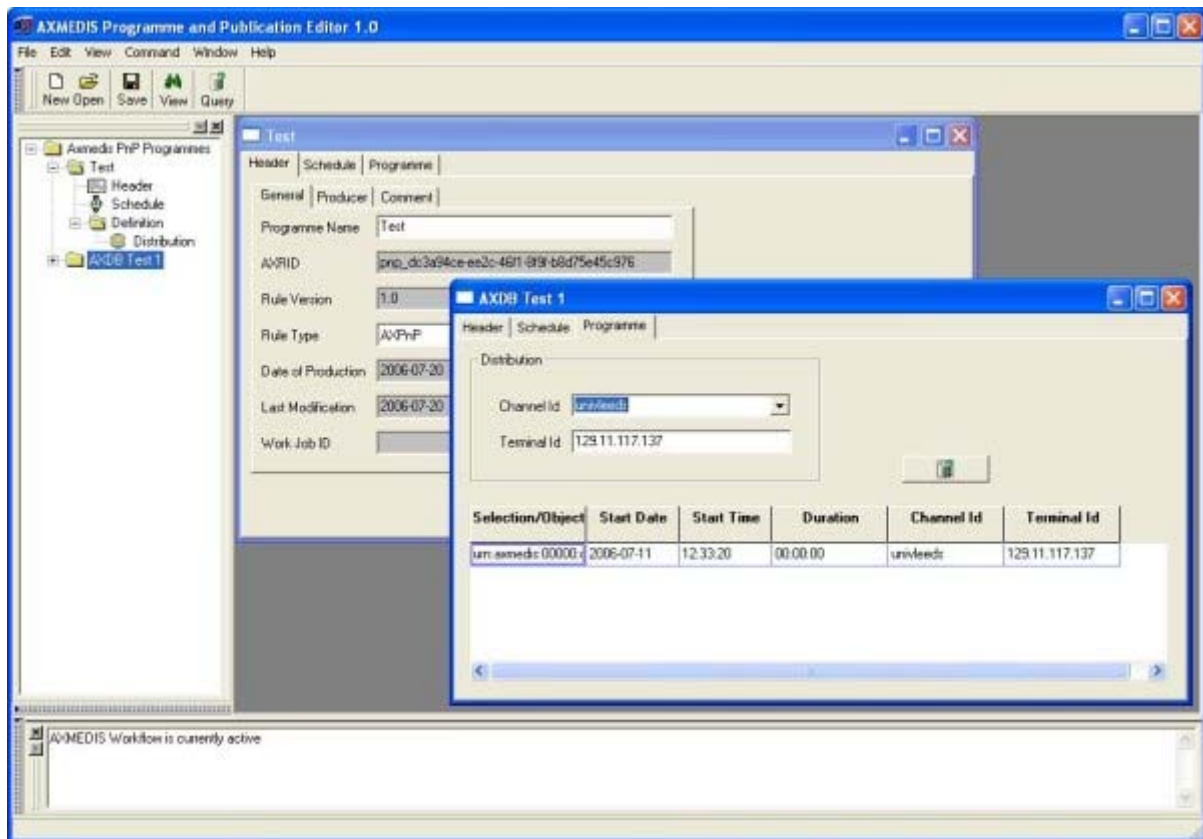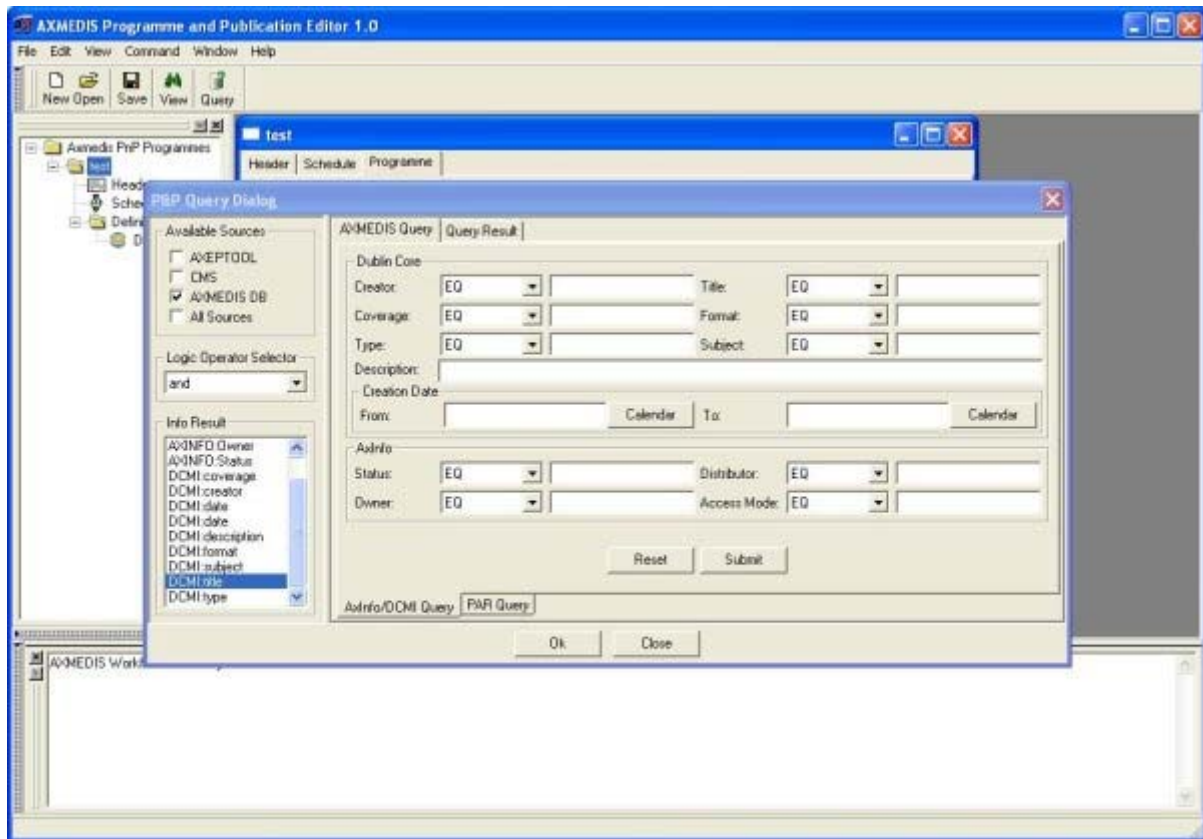
Through the P&P Editor you can:

- search for AXMEDIS objects on the AXMEDIS DB or on the connected AXMEDIS P2P network and select them

- specify distribution parameters as start/end date and time, distribution channels

- save or modify programs

- activate programs for effective processing and distribution

Once your P&P programme is activated, it is submitted to the P&P Engine, which will take care of the connection to the Eutelsat platform and add the selected content into the carousel at the distribution time. At this moment the content will appear on the OPENSKY™Guide and content consumers will be able to select and receive it.

At the defined end of distribution, the P&P Engine will remove your content from the satellite carousel, and it will not be transmitted anymore.

For the purpose of this showcase a channel of 512 Kbps of bandwidth is allocated for distribution. In real deployments a higher speed can be used according to your needs and requirements. Try it now.

AXMEDIS STB DVB-S

Content distribution via satellite is also available on SetTop Boxes (STB). A simple STB receiving data from satellite and displaying on TV screen is an alternative solution for your business. In this case the "push" model is used. Content is directly pushed to enabled users, i.e. automatically downloaded and stored on the devices. The received content is then presented on the Electronic Program Guide (EPG) for play.

This STB is not yet on the market. If you want to have more information and test it you can contact the AXMEDIS Consortium (mailto: info@axmedis.org) and arrange a demo.

In the meantime you can watch a video of the AXMEDIS STB DVB-S usage (here).

4.2   Other demonstrations

EUTELSAT promoted the AXMEDIS activities to its partners and customers already familiar with the OPENSKY technology for the Satellite Data Broadcast.

The OPENSKY service is active on several transponders of the Eutelsat's fleets, covering Europe, Mediterranean countries and North Africa, Middle East and South America, and addresses thousands of households.

The service bouquet is provided through resellers and distributors; this implies that Eutelsat does not have direct contacts with the final users and is not in a position to address them directly. Nevertheless, all of OPENSKY Resellers and Distributors have been contacted in order for them to promote AXMEDIS towards their own customer networks. AXMEDIS content (AXObjects, as well as tools as the AXMEDIS Player for PC and other useful documentation) have been included in the respectively providers' bouquets and carousels, and distributed – via free broadcast sessions – to their communities.

Additionally, 1:1 demonstrations have been performed with business partners and clients. In general demonstrations were focused on the whole distribution chain, using the AXMEDISP&P Tools for a simple

access to the satellite distribution platform of EUTELSAT and then the content reception and fruition on the STB devices.

4.3   Data analysis

The satellite channel of 512kbps at the frequencies listed above has been activated from October 2007. It has been used to broadcast content to both PC and STB devices.

During the final phase of the AXMEDIS project, an automatism has been introduced to provide a standing demonstration (24h/7d) of the satellite distribution: the composition of the satellite carousel is periodically refreshed from a P&PEngine running in Leeds (UNIVLEEDS), that picks up new AXMEDIS objects from the AXP2P network and adds them to the carousel.

In the overall period October 2007 to August 2008 the following number of transmissions have been performed:

- Content distributed on the OPENSKY service frequencies, broadcast on Europe, North Africa and Middle East

- 300563 transmissions effected by the Satellite Data Broadcast: the satellite carousel is active 24h/7d (from Oct 2007 to Aug 2008, with P&P running automatically 24h/7d)

- Content transmission time varies from 2secs (~100KB files) to 10mins (~30MB files)

- 5000 repeated transmissions of objects in the lifecycle of a carousel. According to EUTELSAT this value is not optimized; it should be lowered, but it is a consequence of the large and time-extended satellite capacity compared to the available content

- 2082 content movements were performed on the AXMEDIS P2P infrastructure (B2C). Content transmitted is retrieved from the P2P; however the same content has been selected/downloaded from P2P several times; thus this value includes all downloads of the same objects.

The content broadcast is composed of AXMEDIS objects produced as results of the WP8 activities by the involved partners, and shared on the AXP2P tools.

In particular, the STB demonstrations have been performed with the following types of contents:
- 12 x video clips
- 6 x audio clips
- 4 x HTML contents
- 3 x SMIL contents.

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