

**Technical Note  
n.6401  
February 2008**

**Technical description**  
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 content via Satellite Data Broadcast**

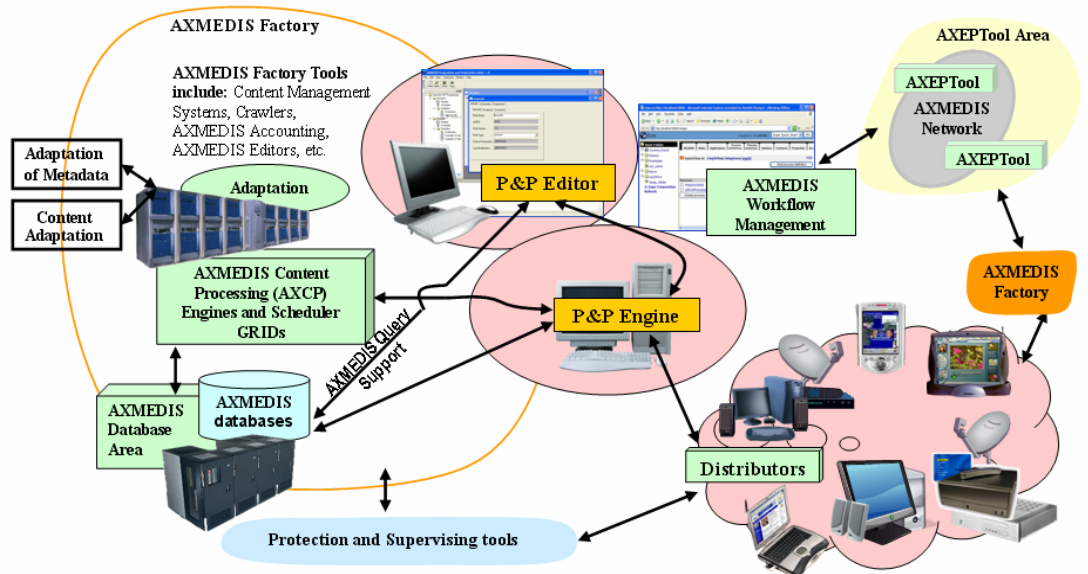
Among the available distribution channels, this technical report focuses on the satellite channel providing content to i-TV's, i.e., PC and SetTop Boxes (STB). The satellite distribution is powered by the OPENSKY™ technology of EUTELSAT, implementing the satellite data broadcasting. Satellite Broadcast allows content to reach several-unlimited receivers spread in a large area at the same time. The advantages to the satellite broadcast solution are costs reductions, no terrestrial network infrastructure limitations, no network congestion. The distribution is based on the DVB-S protocol, and in this case uses 512Kbps-10Mbps bandwidth.

[http://www.axmedis.org/com/index.php?option=com\\_content&task=view&id=73&Itemid=47](http://www.axmedis.org/com/index.php?option=com_content&task=view&id=73&Itemid=47)

**AXMEDIS Framework**

AXMEDIS framework brings together innovative methods and tools to speed up and optimize content production and distribution at reduced costs, for leisure, entertainment and digital content valorization and exploitation.

The AXMEDIS framework has two main areas: the production (also referred to as AXMEDIS Factory) and the distribution. The AXMEDIS Factory is responsible for the whole spectrum of content production such as Content Processing, Database, Editors and Viewers, and so on. The distribution area includes the distributors who deliver digital contents via different channels including satellite, the AXMEDIS P2P tool for B2B distribution, and the AXMEDIS Players for end users. Both the production and the distribution areas are connected to the AXMEDIS Protection and Supervising Tools that support digital rights management, AXMEDIS DRM.



The AXMEDIS Programme and Publication (AXP&P) section is a key part of the AXMEDIS framework that provides links between the production and the distribution areas. The AXP&P tools facilitate the distribution of the AXMEDIS contents (which consists of one or more digital objects and other information) over various distribution channels.

**Content Distribution via Satellite**

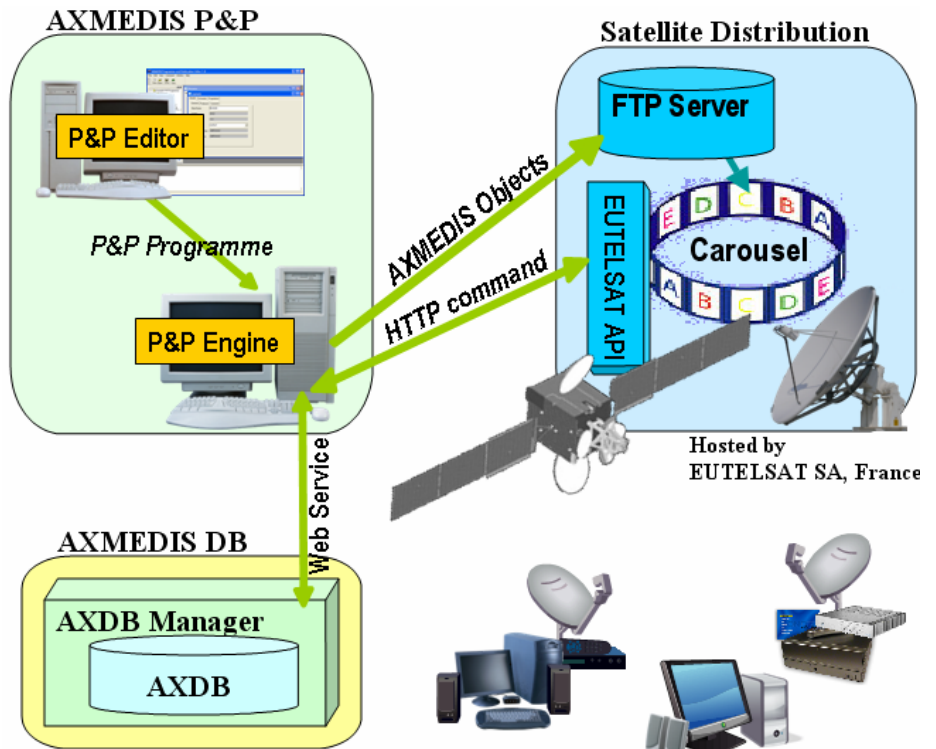
This technical note focuses on content delivery towards i-TV (a traditional PC equipped with a DVB-S card). A distributor uses the AXP&P tools to schedule digital contents for satellite distribution and at the right time (based on the activated programme) users can receive the contents ("push" model) or browse the catalogue and select what to download ("pull" model) via satellite data broadcast.



AXMEDIS Satellite based distribution consists of the following main components: the AXMEDIS Database (AXDB), the AXCP, the AXP2P, the AXP&P Tools, and the satellite platform. In the case study shown in the figure below, components communicate via Web Services (WS). The Satellite Distribution platform is based in the EUTELSAT Teleport in France. The AXP&P interacts with the satellite distribution through APIs.

The satellite distribution is based on the OPENSky™ technology of EUTELSAT. OPENSky™ Push is a multicast data application to distribute content via DVB-S/IP. For distribution on this channel AXMEDIS objects, which are MPEG-21, are packaged according to this protocol.

The AXP&P tools simplify the above mentioned processes and complications by providing an easy to use environment for the preparation and scheduling of the contents. Through the AXP&P Editor interface, it is easy for the distributor to search and select the object(s) to be sent from the AXMEDIS Database or AXP2P, specify the time schedule for each object, and choose the channel (the EUTELSAT satellite channel in this case). Additional channels can be easily added using the integrated Configuration Manager. The distributor can then activate the programme by submitting it to the AXP&P Engine for processing and distribution.



**AXMEDIS Satellite Distribution Architecture**

On reception of a programme, if found necessary, the AXP&P Engine can ask the AXCP for transcoding the AXMEDIS object(s) into a suitable format. Satellite distribution is performed in two stages. In the first stage, the packaging, the AXP&P Engine uploads the AXMEDIS objects onto the EUTELSAT FTP server and creates an associated OPENSky™ package. The FTP upload occurs as soon as the AXMEDIS objects are received from the AXCP or from the AXMEDIS Database (AXDB) depending on whether they have been processed or not. After that, the associated OPENSky™ package is created which involves embedding the newly uploaded objects and setting the package properties (e.g., target group, automatic download or not).

The second stage occurs at the defined time schedule for the distribution of the objects (i.e. starting time) where the associated package is added to the carousel for broadcasting. The package is removed from the carousel at the assigned end of distribution. All operations are executed by the AXP&P Engine automatically.

## AXMEDIS Programme and Publication Tools

The AXMEDIS P&P (programme and publication) section encompasses the AXP&P Engine and AXP&P Editor. It is located in the middle of the overall framework as shown in the Figure below. For their operations, the AXP&P tools interlink the following major sections of the AXMEDIS framework: the Content Processing Engines (AXCP), the Distributors, the AXP2P network and the AXMEDIS Database (AXDB).

For additional details on the AXMEDIS content model, AXCP, AXP2P and AXDRM solutions and tools, please see the following technical notes:

- AXMEDIS content model: [http://www.axmedis.org/documenti/view\\_documenti.php?doc\\_id=3634](http://www.axmedis.org/documenti/view_documenti.php?doc_id=3634)
- AXCP: [http://www.axmedis.org/documenti/view\\_documenti.php?doc\\_id=3624](http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624)
- AXP2P: [http://www.axmedis.org/documenti/view\\_documenti.php?doc\\_id=3612](http://www.axmedis.org/documenti/view_documenti.php?doc_id=3612)
- AXDRM: [http://www.axmedis.org/documenti/view\\_documenti.php?doc\\_id=3616](http://www.axmedis.org/documenti/view_documenti.php?doc_id=3616)



The AXP&P Editor is a Graphical User Interface (GUI) for a user to create and edit AXP&P programmes. A AXP&P programme is a distribution programme which can be viewed as a form of a TV/Radio programme. It contains details such as the digital objects to be distributed, time schedule, delivery channel, and so on.

The user can:

- search for AXMEDIS objects available in the AXMEDIS Database
- search on the connected AXMEDIS P2P networks (AXP2P)
- select the object(s) of interest,
- specify distribution parameters such as start and end times, start and end dates, distribution channels
- set the AXCP content processing rule for content adaptation and the AXCP rule parameters
- activate a programme by submitting to the AXP&P Engine for processing (if necessary) and distribution
- store AXP&P Programmes in local AXP&P repository

When the AXP&P Engine receives a AXP&P Programme, it checks the compatibility of the digital object(s) with the target delivery channel. If it is not compatible, the AXP&P Engine asks the AXCP for processing before delivering the object(s) in an appropriate representation (e.g. format, dimension, etc) to users.

### AXP&P Programmes can be:

- activated for distribution processing on a AXP&P Engine
- specify content processing using specified AXCP Rules and setting rule parameters
- activated from your Workflow Management System or from any other application including AXMEDIS Query On-demand

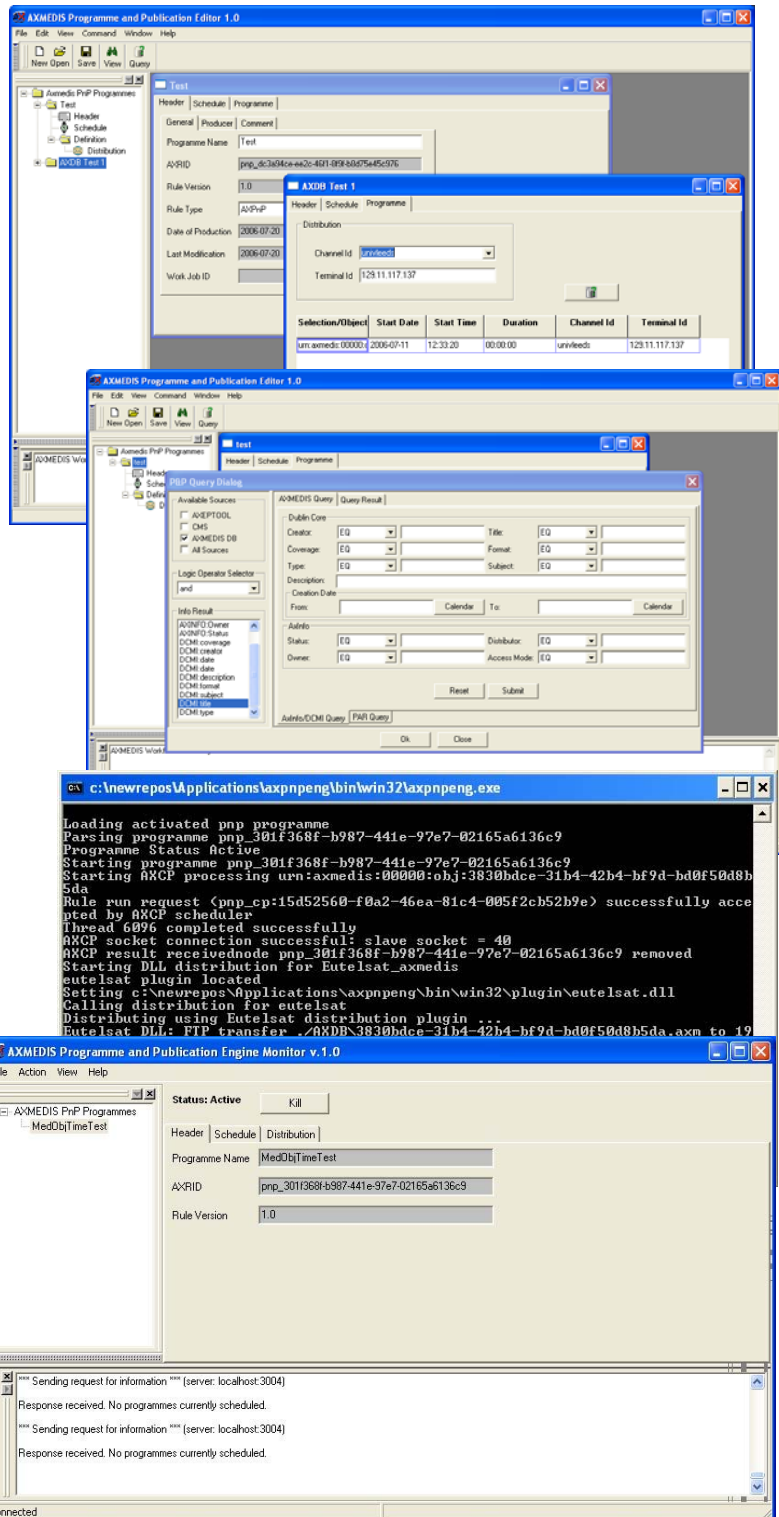
## AXP&P Programme Activities

### Content Processing specification includes

- Specification of AXCP Rules to be called
- Setting rule parameters for content processing

## Customization of AXMEDIS Programme and Publication Tools

The AXP&P Engine can be customized using the configuration properties and/or adding plugins to suit your distribution needs. The AXP&P Engine includes distribution to FTP servers, distribution to the AXP2P tools and the EUTELSAT distribution plugin conforming to the distribution model for EUTELSAT data broadcasting. The AXCP tools can be used for more complex activities of content management.



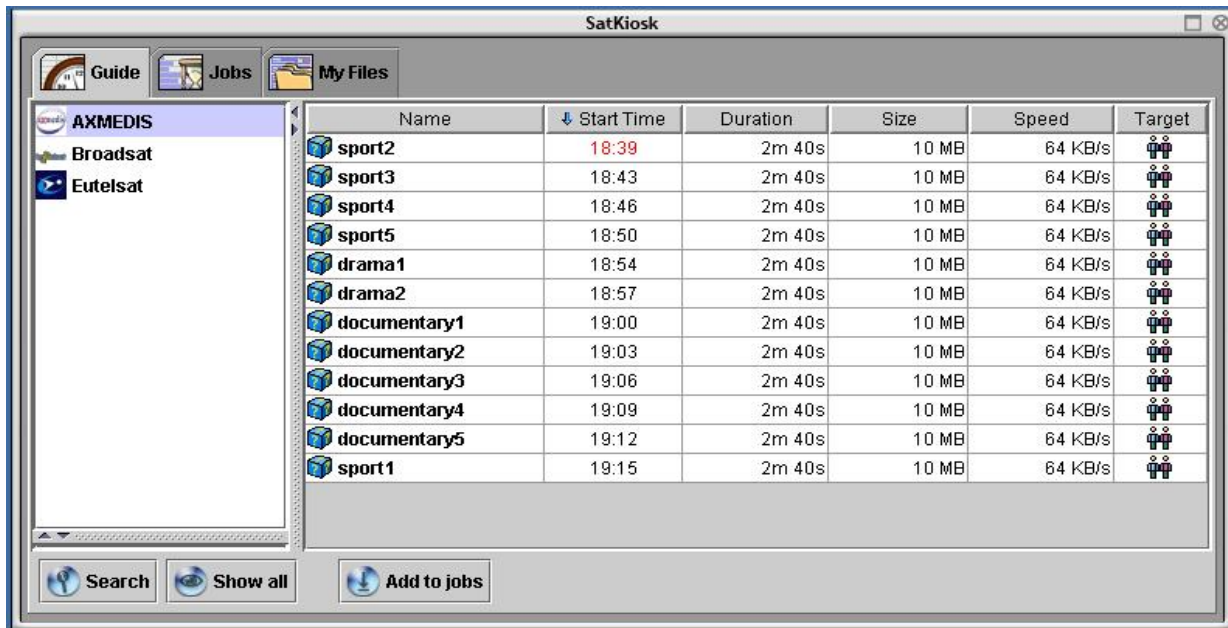
### Distribution channel specification includes

- FTP Servers
- Distribution servers using Plugin technology
- AXP2P distribution using the AXEPTool



### Content Reception on PC

To transform a PC in an i-TV receiving content from satellite, you just need to connect it to a satellite dish and a DVB-S adapter! With the OPENSKY™ OSClient application the users can then browse the distributed contents on the carousel and select their preferences to download (“pull” model). A module called OSListener keeps listening for multicast transmissions and downloads the contents which have been selected, or set for automatic download (“push” model). Once the download completed, the AXMEDIS content can be played with the AXMEDIS Player. Both OPENSKY™ software and AXMEDIS player can be downloaded in a single installable from: [http://www.axmedis.org/documenti/view\\_documenti.php?doc\\_id=3733](http://www.axmedis.org/documenti/view_documenti.php?doc_id=3733)



OPENSKY™ OSClient for PC

### Content Reception on STB

The AXMEDIS Set-Top-Box (STB) has been developed by MBI including AXMEDIS technology which is able to receive multimedia content (AXMEDIS, MPEG-21, MPEG-4 content with SMIL and/or HTML as presentation layers) via satellite and make it accessible to the users via a typical consumer STB user interface. The key feature of this STB is the integration of the AXMEDIS Object Model (AXOM).

The hardware of this STB is based on an x86 CPU, integrates a dedicated Sigma Designs chipset for hardware video decoding and a DVB satellite front-end.



AXMEDIS STB from MBI

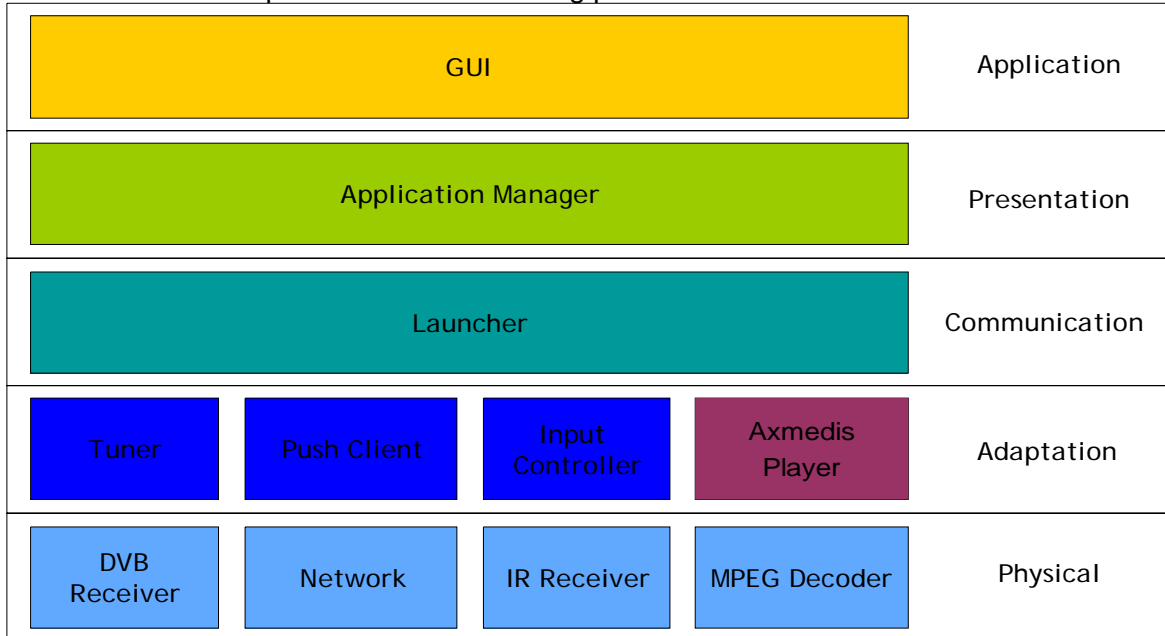
The detailed specification is:

- VIA C3 CPU running at 600Mhz
- Sigma Designs EM8471 hardware MPEG-1/2/4 decoder
- OSD support with 256 colors for scrolling text on TV
- Outputs: SCART, S -video, C-video, SP/DIF, L/R audio with RCA jacks
- Ethernet 10/100 Lan port
- USB port
- DVB-S interface
- 256 MB DDR 266 RAM
- 80 GB Hard Disk
- IR Remote Control
- V.92 PSTN Modem
- External switching power supply, 110/240, 80W peak
- Optional IR Remote keyboard



The STB runs a Linux Operating System while the Graphical User Interface is a based on the X-Window System running on the On Screen Display (OSD) provided by the Sigma video chipset. On top of the Linux layer, MBI have developed their middleware and their GUI.

The STB software stack is depicted as in the following picture.



**AXMEDIS STB from MBI - Software Stack**

From the Adaptation to the Presentation layers there is a set of modules to provide all the functions of the STB. Each module is highly independent from others; the interface paradigm is based on asynchronous messages traveling on TCP/IP channels. The general structure is hierarchical: each module is linked to one parent module and possibly one or more children. In such way each module knows how to communicate with its peers, but has no knowledge of their implementation. The use of standard protocols (TCP) for the interconnection of the modules makes it possible to have them implemented in different languages (i.e. C, C++, Java, Python, etc).

At the data level the DVB Receiver allows the STB to tune to a satellite transponder and receive data from selected DVB Pids. The DVB software driver also presents a network interface (DVB-net) for the incoming IP data encapsulated in DVB streams via Multi Protocol Encapsulation (MPE). The Network interfaces of the STB transmit/receive IP data via Ethernet, PSTN modem and DVB-net (receive only). With the Infrared Receiver driver the STB receives keys from a Remote Control or IR keyboard, while the MPEG decoder module allows the hardware accelerated decoding of the video from both file and stream.

The AXMEDIS STB acts as a slave device of the EUTELSAT's Push service. The OPENSKY™ OSListener runs as a background task on the STB and receives the packages that are targeted to the STB device it is running on ("push" model). The reception of a package is enabled if the device belongs to a group to which the package is delivered. A device may belong to multiple groups. The STB can react automatically upon reception of a package, decompress it if necessary, and present the new content to the user.

The STB is equipped with a typical consumer-electronics user interface made up of menus, lists and banners, while the Push reception activity runs in background.



**Example of STB Content Guide**



The figure above shows an example of the EPG for the navigation of the contents via remote control. In terms of media contents, the STB is a video-centric device. It is capable of playing MPEG-1, MPEG-2 and MPEG-4 (ASP) video and related audio types, plus AXMEDIS content with presentation and interactive parts in SMIL and/or HTML.

## Technical Information on Satellite Data Broadcast

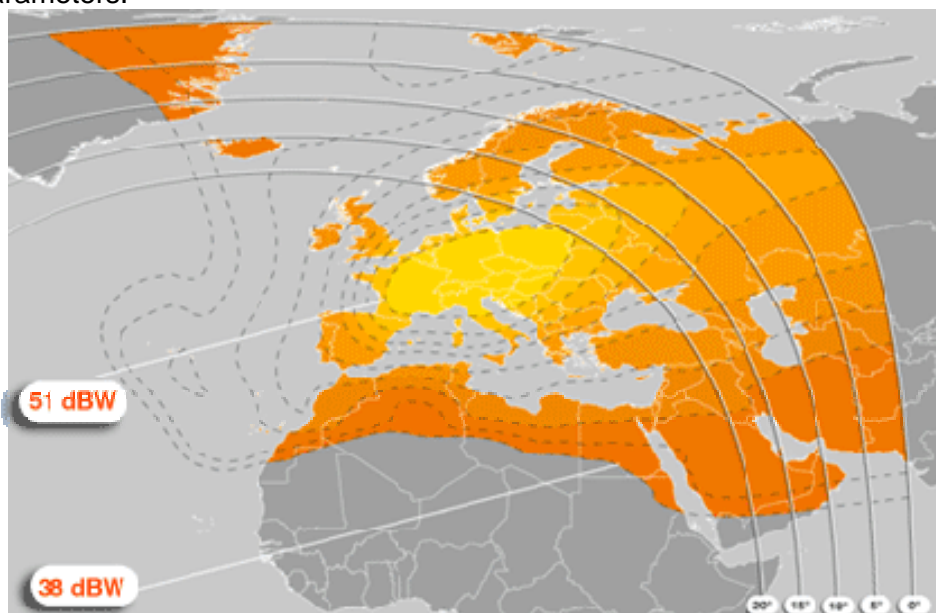
The AXMEDIS tools are based on a Service Oriented Architecture (SOA). Fully documented APIs are available for all the JavaScript functionalities and Web Services for accessing and controlling tools and distributing produced content towards your front-end distribution servers. AXMEDIS servers are based in MS Windows XP and/or Linux. Specific customizations have to be negotiated on the basis of your needs. Training, integration and service level agreement are also available.

The AXMEDIS distribution uses the 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

Distribution via satellite uses the OPENSky™ platform of EUTELSAT for the uplink of the signal. The service is operated from the EUTELSAT Teleport of Rambouillet, France. This interaction is transparent for the distributors using the AXMEDIS tools. However, the access to the platform's services is restricted and limited to authorized users only. Distributors interested to use the AXMEDIS tools for satellite broadcasting have to contact the AXMEDIS administrators in order to obtain authorization to fully access the satellite distribution; their IP addresses have to be registered and enabled to access the EUTELSAT OPENSky™ platform.

## AXMEDIS Adoption and Affiliation Programs

AXMEDIS has been adopted and currently trialed by several industrial partners, who have expressed their appreciation (see <http://www.axmedis.org/com/>). AXMEDIS is open and allows you to access source code, reports, technical support, training days, tutorial material, technical notes and documentation, by means of the affiliation program. AXMEDIS consists of over 38 partners (such as: TISCALI, EUTELSAT, Telecom Italia, TEO, ELION, HP, BBC, Giunti Labs, ACIT, EXITECH, XIM, SIAE, SDAE, etc.). AXMEDIS allows you to exploit innovative results with new tools and solutions for your needs.

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