



## Automating Production of Cross Media Content for Multi-channel Distribution

[www.AXMEDIS.org](http://www.AXMEDIS.org)

DE12.1.5.1.

# AXMEDIS-4HOME Demonstrator Set Up

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**Abstract** This document describes the experimental Set Up of the AXMEDIS Ontology interface and API, 4HOME recorder, Tool Server, OMA Gateway and Home Domain.

**Keyword List:** DTV, OMA, Domains, Tool Servers, Rights Ontology

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## 1 Executive Summary and Report Scope

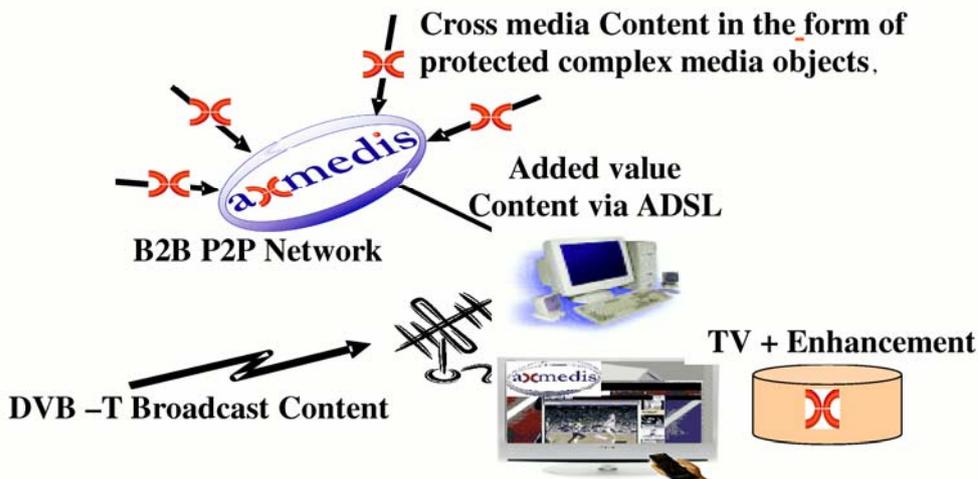
This document describes the experimental setup of the components described in DE12.1.4.1.

## 2 BBC – Setup of the 4HOME client recorder

### 2.1 Functionality realization and installation

#### 2.1.1 Functionality

The AX4HOME Demonstrator is built around the capture of off-air content and the subsequent creation of an AXMEDIS object on the client from a number of sources, including: the captured off-air recorded file, a supporting TV-Anytime metadata server and any associated ‘broadcast enhancements’. Enhancements take the form of AXMEDIS objects, distributed over the internet, with extra related content for the user such as trailers, promotions, news flashes and so on.



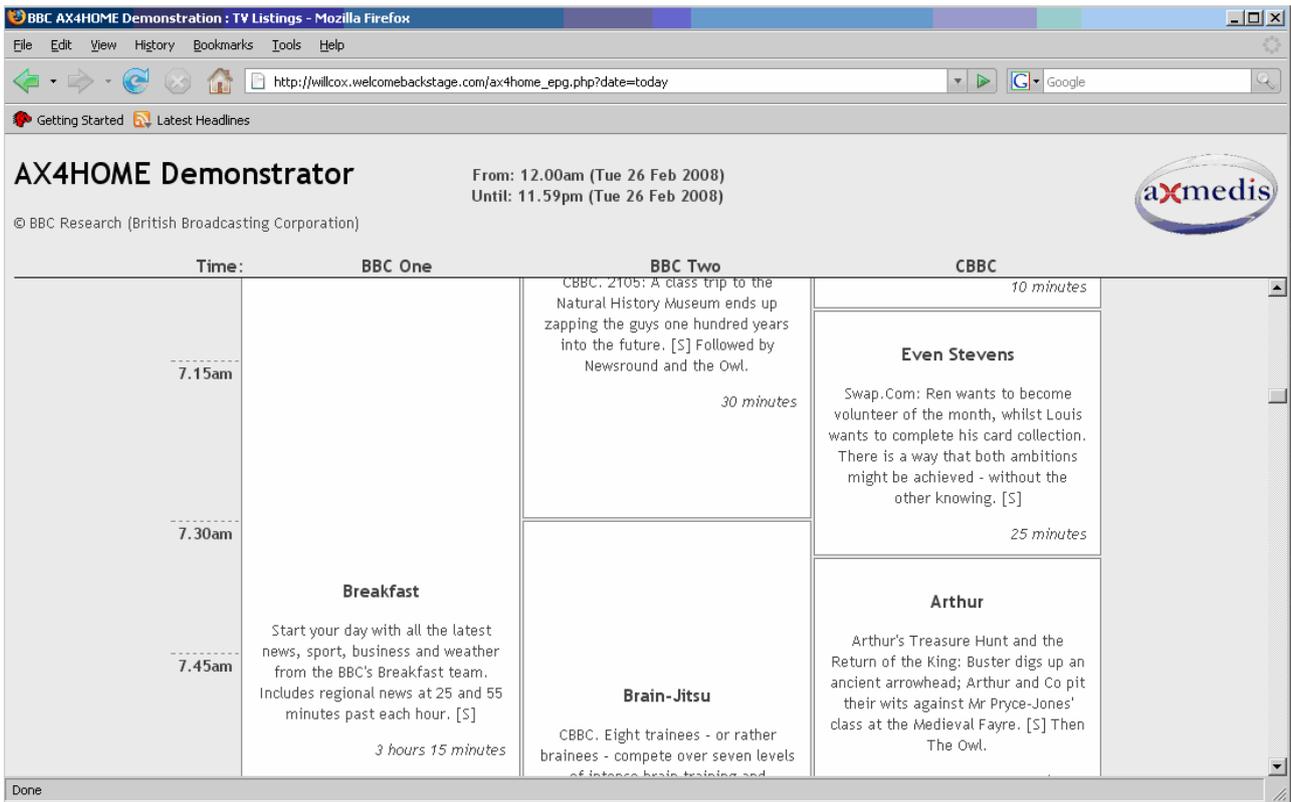
**Figure 1: AXMEDIS Tools applied to a home environment scenario. Enhancing off-air content with internet delivered components to create local complex objects**

The DVB-T recording application has been developed as a background application to run on a Microsoft Windows home PC. It can be stimulated for scheduling and recording off-air programmes by the selection of a programme by the home viewer. The selection of the off-air broadcast programmes to be recorded is made by the home viewer through a web-based Electronic Programme Guide.

Control of the formulation of the AXMEDIS object is through the AXMEDIS scripting environment. The AXMEDIS scripting rules have been designed to determine the appropriate broadcast enhancements available to the home client at the time of recording and access these to build the AXMEDIS object. In addition, the AXMEDIS rule scripts formulate a SMIL presentation script to bind the resources, both off-air and internet delivered, into a single meaningful presentation to the home viewer. This presentation is incorporated into the AXMEDIS object being created and forms the primary presentation that the home viewer will experience when they play it back.

#### 2.1.2 Realisation and Installation For the broadcaster

The broadcaster provides a website containing an Electronic Program Guide (EPG) service. A view of the one set up for the demonstrator is shown below.



**Figure 2:View of example web based EPG**

In addition to the web-based EPG above, the broadcaster also makes available a web-based TV-Anytime metadata lookup service for programmatic access by the client side AXMEDIS tools.

An existing BBC Research application is used to serve TV-Anytime data through a simple queryable Web API. The EPG is implemented as a collection of PHP scripts running on the same server that in turn query the same Web API to generate a schedule listing.

The EPG web page identifies programmes using the TV-Anytime Content Reference ID (CRID). These IDs are mapped to Service IDs and Event IDs that will identify the programme within the DVB-T broadcast stream. The mapping is performed by querying a BBC TV-Anytime metadata server via HTTP.

A broadcaster would need to implement an appropriate bespoke equivalent of this – providing a “crid://” hyperlink based EPG and TV-Anytime metadata service, generated from their broadcast chain systems.

### 2.1.3 Realisation and Installation For the home user (viewer)

The home user requires a home PC with the following capabilities and software installed:

- Microsoft Windows XP Operating System.
- Microsoft Direct X 9. Runtime
- Internet connection
- Hauppauge WinTV DVB-T receiver device and drivers (such as the. “Hauppauge Nova-T USB 2”)
- AxMedis content production tool suite
- 4HOME Client Recorder application
- The 4HOME AXMEDIS rule script, supporting images, video and SMIL templates

The 4HOME Client Recorder should be manually installed by simply transferring the executable file to the target machine.

The 4HOME Client Recorder is intended to be left running in the background whilst the user's PC is running. It invokes the AXMEDIS Rule Executor and a specific AXMEDIS script to produce the final AXMEDIS object containing the enhanced programme content. The 4HOME Client Recorder must be configured (using its configuration window) with:

- The filepath of the AXMEDIS Rule Executor
- The filepath of the AXMEDIS rule script
- The filepaths of temporary working and final output directories
- The IP address or server name of the TV-Anytime metadata server

The AX4HOME AXMEDIS Rule script must also be configured by editing parameters at the start of the file listing to specify where the SMIL template and associated video/image resources are held. Any text editor is a suitable tool to achieve this.

## 2.2 Usage from users' perspective

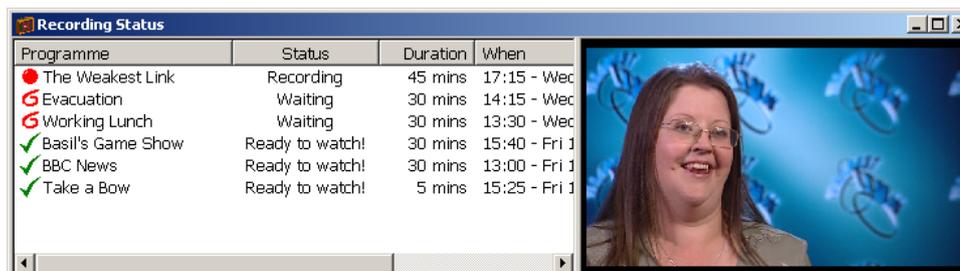
The home user benefits from a viewing experience with enhancements over the normal broadcast version of the program. The program also has useful metadata attached - such as description of an episode - and provides easy links for the viewer to follow to reach related websites and content.

For the broadcaster, this kind of approach provides the opportunity to promote related content to the viewer and a mechanism for the viewer to record, time-shift and share broadcast programs whilst respecting any rights associated with that content

The broadcaster's role is to provide broadcasts, supporting internet broadcast enhancements, EPG and TV-Anytime metadata services. The 4HOME Client Recorder application is solely used by the home user (viewer).

Typical usage for the viewer is as follows:

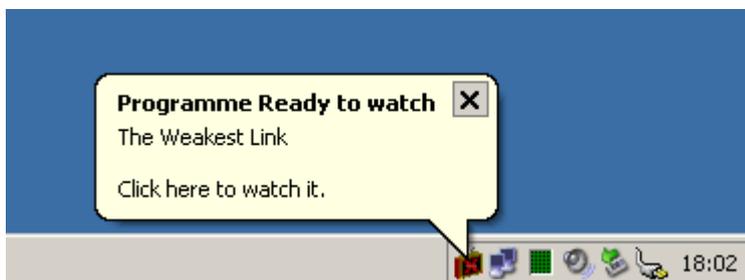
1. When a viewer wishes to record a program, they can browse the broadcast schedules using a web based Electronic Program Guide (EPG) to select programs to be recorded. Clicking a hypertext link to a "crid://" URI invokes the 4HOME Client recorder, requesting that particular programme to be recorded.
2. To select a program for recording, the user simply clicks on it. The AX4HOME client software, running on the user's PC logs the booking and, using an attached DVB-T capture device records the program when it is broadcasted. The software provides a simple interface window to manage the programmes that are scheduled to be recorded. The user can view the progress of recordings and cancel or prematurely stop recordings. The recorder interface encapsulates the live TV preview window, a directory listing of the AXMEDIS Objects available and a general purpose 'status output' text box, to allow monitoring of the recorder activity and status.



**Figure 3: The Recorder application presents a list of recordings and their status**

3. General recorder status is also reported to the user through a status information column in the list of scheduled recordings and also by pop up notifications. Once a recording is complete and has been

transformed into an enhanced AXMEDIS object, the viewer is notified. They can then select the recording for viewing.



**Figure 4: Pop-up notifications alert the home viewer when recordings begin or when a programme is ready to watch.**

In addition to the listing of AXMEDIS objects, the active component allows automatic loading of the AXMEDIS objects into the ACTIVE X player by double-clicking on the selected item.

## 2.3 Monitoring and measurements

The 4HOME Client Recorder uses a unique “browser identification string” when it issues HTTP based queries the broadcaster operated TV Anytime server. It makes these requests for programmes that the viewer has requested to be recorded. This could be used to build statistics of users' intended recording habits.

When content is protected, playback requires the obtaining of the decryption key from the Protection Management Server, tied to the unique AXOID (object identifier). Again, this could be used to determine viewing audience size statistics.

## 2.4 Validation

Validation of the 4HOME data recorder and broadcast enhancer depends upon the resulting business models that this kind of setup can support. In particular, this arrangement brings together the concepts of serving audiences over the internet – data services and programme extensions over P2P, with the current broadcasting concepts of wide-band broadcast services served on a scheduled basis. Aspects of validation then are in 3 categories.

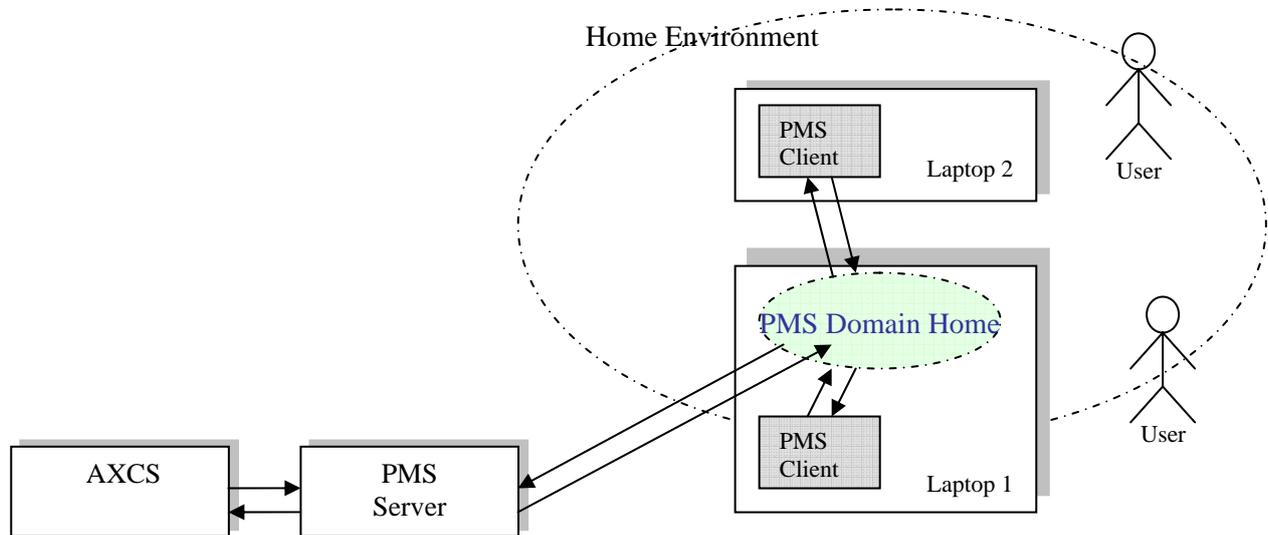
- The usability of the application in the home, - its robustness and intuitive interface from the home user perspective
- The added value of the concept to the home viewer – can the connections to the broadcaster add more to the convenience of off-air recording in terms of the service relationship with the broadcaster augmented over the internet with its potential to offer targeted and timely enhancements.
- The added value to the broadcaster as it tries to attain a closer relationship with the audience through appropriate internet content related to high bandwidth broadcast offerings and the use of protected content to give added value to PC card users through an incentive to use a technology that can protect rights issues by using the home domain concept to limit content spread on the internet.

Validation of the demonstrator then is a user centred activity combined with experiments to find the best way to use the combination of broadcast and enhancements

## 3 PKU – Setup of a home domain

### 3.1 Introduction

In the demonstration, two laptop computers are used to form a domain to mimic a home environment.



In the figure above, two users and two laptop devices form a domain in a home environment. The PMS Domain Home component is installed in the laptop 1 responsible for managing the domain, including creation and deletion of the domain, and any member in the home can add or delete a user and a device to the domain.

#### Establishment of the home domain

A user in the home creates a domain through the DUDmanager, a GUI application installed on the same device as the PMS Domain Home. The PMS server plays the role of creation of domain license for the domain. After the creation of the domain license, a duplicate copy of the license is sent and stored in the local database of Domain Home.

#### Management of home domain

- 1) When the domain administrator needs to add a user or a device to a registered domain, the PMS client on the device requests to the PMS Domain Home to register the corresponding information into the local Domain Home database. This process is carried out using the DUDmanager.
- 2) When the domain administrator deletes a user or a device from the domain, the PMS Domain Home deletes the corresponding information. This process is also performed using the DUDmanager.

#### Content usage in the home domain

In order to enjoy a protected content associated with a domain, the user should request the corresponding domain license. The user needs to send his/her user ID (and the device ID) to the Domain Home, which verifies the domain license of the user and the PMS server can verify the user information accordingly.

### 3.2 Functionality realization and installation

#### 3.2.1 Registering a domain

Registering a domain is the first step towards being able to associate any user or device to it.

Typically, the addition of domains works in the following manner:

- When using the PMS Domain Factory, devised for factory or company environments, the system administrator of the factory where it is installed is able to manage a number of domains freely, creating new domains or deleting them when needed. In this way, the Factory can have different

groups of users and/or devices that each with different conditions of usage for the same content. For example, some groups may be authorised to access some content and modify it without any restriction, whereas some others may have more restrictive conditions such as just playing or even not being able to reproduce the content.

- When using PMS Domain Home, devised for home environments, we could have two situations. One where the user can manage different domains, or another where there is a single domain predefined in the set top box or gateway of the home domain. In the latter case, the user could manage which users and devices are associated to the home domain.

Registering a domain supposes the addition of an entry in PMS Domain Home or PMS Domain Factory database. In order to do this, there are two options.

- 1) First, a command line application has been developed. It can be found at:

AXMEDIS-SVN\Applications\domainmanager\bin\win32

Next we provide the details about the usage of the application.

```
Domainmanager.exe option [parameter1] [parameter2]

Options
-c [DomainName]           Creates a Domain
-d [DomainName]           Deletes a Domain
-u [OldDomainName] [NewDomainName] Update a Domain
-r                         Retrieve a list of all Domains
```

- 2) Moreover, a GUI application has been developed. If the access to the domain database is added to the configuration file, it will be capable of adding and deleting domains in the db. It is available in the repository at:

AXMEDIS-SVN\Applications\DUDManager\bin\win32

Next we provide the details for the configuration of the application, as explained in AXMEDIS-SVN\Applications\DUDManager\doc\configuration-deployment\HowToDeploy.txt

```
Configuration file (cfg.ini)
=====
This file must be located at the "cfg" directory from the root application directory.

The configuration file is divided into two parts: *PMS and *DOMAIN

*PMS
address:      the URL of the PMS Domain Server Home or Factory
clientcert:   the client certificate
clientcertpass: the password of the client certificate
cacert:       the certification authority certificate

*DOMAIN
host:         the URL of the Domain database host
dbname:       the name of the domain database
user:         the user of the domain database
pass:         the password for the domain database

Notes
=====
1) In the cfg.ini the *DOMAIN part could be omitted. If so, the user will not have access to the domain database, so he would not be able to create or delete domains. However, he would be able to manage the users and devices of previously created domains. This
```

feature may be useful for those Home domains where the user may not be expected to add or delete default domains.

2) The \*PMS part needs to be always at the top of the cfg.ini file.

### 3.2.2 Registering users in a domain

Registering a user in a domain is necessary for being able to authorise the user to perform some operations according to the rights and conditions established in domain licenses. Registering users in a domain can be done by using PMS client library. Thus, any application which uses PMS Client could integrate this functionality. It can even be done through AXCP scripting. For that purpose, a simple application has been developed (UPC), providing a GUI that enables both the registration of users and devices in domains. It is available in the repository at Applications/DUDManager. The PMS Client calls are as follows:

```
std::string doUserRegistration(std::string AXUID, std::string AXDOM);
int doUserUnregistration(std::string AXUID, std::string AXDOM);
bool isUserAlreadyRegistered(std::string AXUID, std::string AXDOM);
std::vector<std::string> retrieveRegisteredUsers(std::string AXDOM);
std::vector<std::string> RetrieveDomains(int xValue);
```

Where,

- AXUID is the AXMEDIS User Identifier
- AXDOM is the Domain Identifier
- xValue is any integer value (Note: for technical reasons we need to have at least an argument)

### 3.2.3 Registering devices in a domain

Registering a device in a domain is necessary for being able to authorise any user using the device to perform some operations according to the rights and conditions established in domain licenses. Currently PMS Domain Home, PMS Domain Factory and PMS Server are not prepared to perform those kind of authorisations that involve devices. They have to be updated so that when authorisation is requested, PMSs are intelligent enough to determine if the device belongs to a domain and use domain licenses to perform the authorisation, if needed. In order to perform this integration, PKU needs to clarify which kind of identification is currently being used to identify devices in AXMEDIS. Registering devices in a domain can be done by using PMS client library. Thus, any application which uses PMS Client could integrate this functionality. It can even be done from AXCP tools. For that purpose, a simple application has been developed (UPC), providing a GUI that enables both the registration of users and devices in domains. It is available in the repository at Applications/DUDManager. The PMS Client call is as follows:

```
int doDeviceRegistration (std::string DEVICE_ID, std::string AXUID, std::string AXDOM);
int doDeviceUnregistration(std::string DEVICE_ID, std::string AXUID, std::string AXDOM);
int isDeviceAlreadyRegistered(std::string DEVICE_ID, std::string AXDOM);
std::vector<std::string> retrieveRegisteredDevice(std::string AXDOM);
```

Where,

- DEVICE\_ID is the AXMEDIS Device Identifier
- AXDOM is the Domain Identifier

### 3.2.4 License generation using DRM Editor and Viewer

DRM Editor includes a new feature that enables the possibility of creating domain licenses. Thus, DRM Editor can be used both for creating domain licenses, distribution licenses and end user licenses, depending on the option selected in the GUI.

The user will be asked to provide the identifier of the domain to which the license is related, which will be used as the principal of the license. A verification tick will appear besides the Principal area when creating

the license. When activated, the license will be created for a domain. Otherwise, the standard user will be set as the principal.

### 3.2.5 License generation using AXCP tools

Licenses can be generated from AXCP tools. For creating domain licenses it is compulsory to use the "sendLicense" method, which sends the complete license to PMS Domain, since the step by step license creation is not enabled. In this kind of licenses, the principal is a special variable and must be defined as follows:

```
<r:forAll varName="domainVariable">
  <r:propertyPossessor>
<sx:propertyUri xmlns:sx="urn:mpeg:mpeg21:2003:01-REL-SX-NS" definition="DomainID"/>
  </r:propertyPossessor>
</r:forAll>
<r:principal varRef="domainVariable"/>
```

Where,

- DomainID is the domain identifier

### 3.3 Usage from users' perspective

Home users benefit from the convenience of enjoying his/her content on any devices s/he owns, and also the easy sharing of protected content purchased by a member of the family or friends anywhere.

The distributors benefit from ease with which they can serve of a group of people who can share common content and thus avoiding the production of redundant licenses for the same content.

### 3.4 Monitoring and measurements

When domains are created, the information of users and devices are stored in the local database of the PMS Domain Home or Domain Factory. The data could be used to determine audience size statistics

When a protected content is bound to a particular domain, the corresponding domain license is created by the PMS Domain Factory or the PMS server, and a copy of the license is also stored in the local database of the PMS Domain Home or the PMS Domain Factory. This information builds statistics of users' intended consuming habits

### 3.5 Validation

The validation of the domain management is the same as the one of the PMS components

## 4 TI – Setup of the OMA gateway

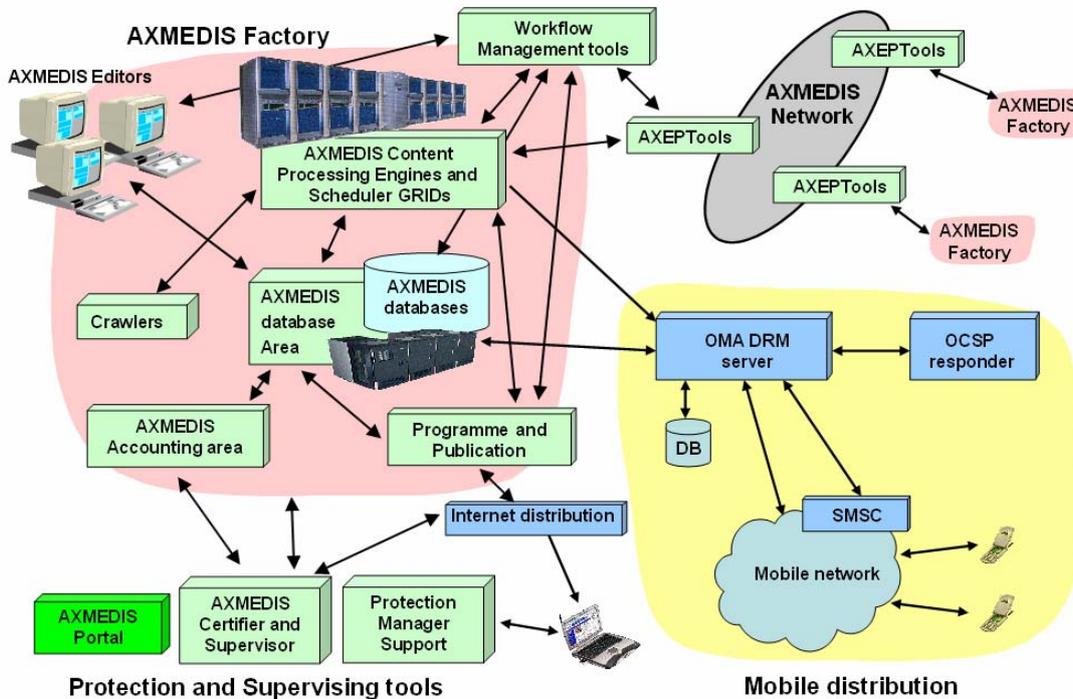
### 4.1 Introduction

The AX4HOME demonstrator shows how the AXMEDIS framework can be deployed to support the distribution of content over the mobile distribution channel. At the same time, it shows that the same content is made available in the native AXMEDIS format for download and use on PCs under the same conditions.

The AX4home demo uses an OMA DRM 2.0 Server which has been adapted to operate as an OMA Gateway in order to be able to receive content from the AXMEDIS platform. The OMA DRM 2.0 server is composed by an OMA DRM Rights Issuer which implements the ROAP protocol; an OCSP responder which checks

and validates the certificates; a root Certification Authority issuing certificates for devices, Rights Issues and OCSP responder.

The mobile demo uses as client devices two Nokia N91 commercial terminals equipped with certificates issued by a customized root Certification Authority.



## 4.2 Functionality realization and installation

The OMA gateway has been implemented by interfacing a customized AXMEDIS Content Factory with an OMA DRM v2.0 server. In order to do so, the following components have been installed on the AX4home server (<http://ax4home.axmedis.org/>):

1. Basic tools required by the AXMEDIS architecture:
  - Java SE JDK 5.0.12
  - Apache 2.2.4
  - MySQL 5.0.41
  - PHP 5.2.2
  - Tomcat 5.5.20
  - Filezilla FTP server 0.9.23
2. AXMEDIS DB and Web services required to implement the functionality of an AXMEDIS Content Factory:
  - AXDB support WS
  - AXDB administrative interface
  - Loader-Saver
  - Lock-Unlock WS
  - Crawler WS
  - P2P WS
  - External query support WS
  - PAR query support WS
  - AXDB query support WS

- Main query support WS
  - User selection archive WS
  - Query web user interface
3. AXMEDIS tools required to perform content processing:
    - AXCP Rule Editor
    - AXCP Rule Executor
    - AXCP Scheduler
    - A rule named “OMAGateway.axr” running every 5 minutes on the Rule Executor, which exports Objects from the AXMEDIS DB into the OMA DRM 2.0 Server
  4. the OMA DRM 2.0 Server (OMA Gateway) components:
    - OMA Rights Issuer implementing the ROAP protocol
    - Content ingestion web service
    - Content Database
    - OCSP responder
  5. the demo front-end on the web:
    - a Web site based on Wordpress 2.3.3
    - A simple music shop web portal based on PHP

Moreover, the AX4home demonstration uses the services provided online by the AXMEDIS Certifier and Supervisor and by the Protection Manager Support.

### 4.3 Usage from users' perspective

The users who can benefit from the services provided by the Content Factory are content providers (who can easily distribute their content in a protected way without having to deal with the complexity of performing themselves the content protection and the license generation), and end users who can access a (potentially very large) music library with very simple usage conditions.

Users	What they can do
Business Users	<ul style="list-style-type: none"> <li>• Possibility of creating objects and uploading them on the AX4HOME Content Factory</li> <li>• The objects are converted, protected and published automatically on the AX4HOME portal in both AXMEDIS and OMA DRM v2 format.</li> </ul>
Technical users	<ul style="list-style-type: none"> <li>• Possibility of testing the OMA distribution channel by installing the TI certificates on an OMA DRM v2 compliant mobile phone.</li> </ul>
End users	<ul style="list-style-type: none"> <li>• Possibility of testing the Broadband distribution channel using the AXMEDIS player</li> </ul>

#### 4.3.1 Step by step instructions for Business Users

The demo shows how a content provider can post content (music) on the AX4home Content Factory and see the same content appearing automatically on distribution on the AX4home Music Shop for mobile phones and PC's. Content can be uploaded in cleartext; it will be automatically protected by the AX4home content factory before publication.

**Role:** content provider

**Hardware needed:** A PC running WinXP.

**Distribution channel:** broadband internet and mobile

Steps

1. First, install the AXMEDIS Editor which is available from <http://www.axmedis.org/http://www.axmedis.org/documenti/documenti.php>
2. Then, start the AXMEDIS Editor, certify it as explained in the manual, and configure it as described in [http://ax4home.axmedis.org/home/?page\\_id=4](http://ax4home.axmedis.org/home/?page_id=4) in such a way that you can upload and download objects from the AX4home Content Factory using the Editor. In order to do so, you need an account on AX4home, which can be obtained by subscribing to AX4home (you can do it at <http://ax4home.axmedis.org/home/wp-login.php?action=register>).
3. Now you can package your audio resource into an AXMEDIS Object using the Editor, obtain a final unique identifier for your content (you must be connected to the Internet), and provide metadata information (Dublin Core). Please note that in order to be automatically published by the AX4home Content Factory, an Object must contain the following metadata information in the Dublin Core section:
  - a. **"title"** - the title of the song;
  - b. **"creator"** - the author of the song, or (in case of commercial music) the performer.
  - c. **"subject"** – must be "music"!
  - d. **"description"** – a short description of the song.
4. You can save the Object locally, either in AXMEDIS or mpeg-21 format, and continue editing it later on as long as you wish until you are satisfied with the result. Adding pictures, Smil presentation, video, is not a problem – the system will recognize automatically the audio resource and select it for mobile distribution.
5. Finally, you can upload your Object to the AX4home content factory, by clicking the "upload to DB" button of the AXMEDIS Editor. Use the username and password obtained at step (2). Please be patient, the uploading procedure makes your Editor apparently hang for a while.
6. Once uploaded, an automatic script (running every 5 minutes on AX4home) will take care of adapting the Object to mobile distribution by converting it into an OMA DCF, and posting it on the very simple "music shop" portal for mobiles on AX4home (also reachable from PC's at the following address: <http://ax4home.axmedis.org/mobile/> ). A PC version will also be produced and posted on the corresponding music shop portal for PC's (<http://ax4home.axmedis.org/broadband/>). Both the mobile and the PC version are protected with a time-constrained license expiring in 35 days.
7. The Object processing lasts a maximum of 5 minutes. If the Object doesn't show up in the portal within 5 minutes, you may have forgot to insert the metadata required at step (3), or you may have used a resource format which is not supported by AXMEDIS. In this case, you can modify your Object and upload it again.

#### 4.3.2 Step by step instructions for Technical Users

The demo shows how a technical user (e.g. a mobile phone manufacturer employee) can use the content (music) on distribution on the AX4home Music Shop for mobile phones. This demo requires the ability to customize the mobile phone by installing a device certificate for the OMA DRM Agent.

**Role:** end user (customer)

**Hardware needed:** an OMA DRM v2 compliant mobile phone.

**Distribution channel:** mobile

In order to be able to access the content present on the AX4home portal, the end user must be equipped with an OMA DRM v2 compliant mobile phone like the Nokia N91. Moreover, the phone must be customized by installing a device certificate provided by TI. This limitation is due to legal restrictions on the usage of CMLA certificates (the certificates normally installed on OMA DRM v2 mobile phones) which do not allow

us to provide a “transparent” service for this trial. Apart from the certification, no other customization of the mobile phone is needed.

#### Steps

1. Request us a Device Certificate by subscribing to AX4home (you can do it at <http://ax4home.axmedis.org/home/wp-login.php?action=register>) and posting a message on the “demo” page of AX4home ([http://ax4home.axmedis.org/home/?page\\_id=22](http://ax4home.axmedis.org/home/?page_id=22)); we will send you the certificate at your email address.
2. Install the Device Certificate on your OMA DRM v2 compliant mobile phone.
3. Open the browser of your phone at the following address: <http://ax4home.axmedis.org/mobile/>
4. Browse through the various tracks and select one of them.
5. Download the track.
6. Open the media player of your phone (this may be different depending on the phone model) and play the downloaded track.

The phone will perform automatically several steps:

- Register the phone on the AX4home OMA DRM v2 server;
- Check (and possibly correct) the DRM clock of your phone;
- Download the Rights Object (OMA license) corresponding to the selected music track
- Check the license constraint
- Get the content key from the license
- Decrypt the content
- Play the content

### 4.3.3 Step by step instructions for End Users

The demo shows how an end user can use the content (music) distributed by the AX4home Music Shop for PS's. This demo only requires the download, installation and certification of the AXMEDIS player.

**Role:** end user (customer)

**Hardware needed:** A PC running WinXP

**Distribution channel:** broadband internet

#### Steps:

1. Download the AXMEDIS player from the AXMEDIS portal: <http://www.axmedis.org/documenti/documenti.php>
2. Install the player;
3. Run the player and perform (as explained in the user manual):
  - a. the user registration (you will receive a UserId and a certificate with the associated password)
  - b. the tool certification (using the certificate and the password obtained in the user registration);
4. Subscribe to AX4home as end user (you can do it at <http://ax4home.axmedis.org/home/wp-login.php?action=register>). Post a message in the “demo” page of AX4home ([http://ax4home.axmedis.org/home/?page\\_id=22](http://ax4home.axmedis.org/home/?page_id=22)) in which you send us your UserID, in such a way that we can generate the licenses that grant you access to the music store protected Objects; the UserID must be the one received in the AXMEDIS user registration at step (3);
5. wait for an email notification informing you that your licenses have been produced;
6. Using your favourite browser, go to <http://ax4home.axmedis.org/broadband/>
7. Browse through the various AXMEDIS Objects and select one of them.
8. Download the Object.
9. Play the Object using the certified AXMEDIS player.

## 4.4 Monitoring and measurements

The demo uses the monitoring and measurements features of the AXMEDIS framework, plus the standard logging functionality of the Apache Tomcat service platform. Number of tool downloads can be monitored by means of standard data mining applications examining the web server logs.

## 4.5 Validation

The demo is online 24x7, so it can be validated at any time by following the instruction provided above. Moreover, it is possible to perform some low level testing to check the status of various web services using the following URLs:

1. To test the AXMEDIS web service on AX4home:
  - <http://ax4home.axmedis.org:8080/AXDBWS/publication>
  - <http://ax4home.axmedis.org:8080//axdb-administrative/>
  - <http://ax4home.axmedis.org:8080//LoaderSaver/load>
  - <http://ax4home.axmedis.org:8080//LockUnlockWS/lockunlock>
  - <http://ax4home.axmedis.org:8080//CrawlerWS/CrawlerWS>
  - <http://ax4home.axmedis.org:8080//P2PWS/P2PWS>
  - <http://ax4home.axmedis.org:8080//ExternalQuerySupportWS/ExternalQuerySupportWS>
  - <http://ax4home.axmedis.org:8080//PARQuerySupport/PARQuerySupport>
  - <http://ax4home.axmedis.org:8080//AXDBQuerySupportWs/QuerySupport>
  - <http://ax4home.axmedis.org:8080//MainQuerySupportWS/mqs>
  - <http://ax4home.axmedis.org:8080//UserSelectionArchive/sa>
  - <http://ax4home.axmedis.org:8080//QueryWebUserInterface/>
2. To test the OMA DRM v2 Right Issuer (OMA Gateway)
  - Follow the instructions provided online at [http://ax4home.axmedis.org/home/?page\\_id=7](http://ax4home.axmedis.org/home/?page_id=7)

It is also possible to provide feedback by registering on the ax4home portal, logging in, and posting a comment to the relevant page in the portal (posting of messages is reserved to subscribed users in order to avoid indiscriminate spamming).

## 5 ETRI – Setup of the Tool server

### 5.1 Functionality realization and installation

#### 5.1.1 Functionality realization

The DRM Protection Tool Server, has been developed by ETRI for AX4HOME, provides functionalities of registering, deleting and downloading DRM tools. It basically manages the DRM tools as a form of the XML package and transmits any tool when the AXMEDIS Client requests to encrypt or decrypt content.

A communication between the DRM Protection Tool Server and AXMEDIS Client consists of “GetTools” message for request and “GetToolsResponse” message for transportation of DRM tool. The messages are realized as the XML form defined 12.1.3.1 specification.

The followings are DRM Protection Tool Server’s main functionalities.

- Registering – to register new tool including its’ parameter setting
- Modifying – to modify existing tool’s parameter
- Deleting – to delete useless tool

To support downloading function, the Test Client has been developed. It can be used as a functional part of AXMEDIS Client to connect the DRM Protection Tool Server by suitable modification.

- Downloading – to download any tool

To facilitate management of the DRM Protection Tool Server, all components of it are realized using most common dialog based MFC with windows environment.

The DRM Protection Tool Server requires following environments.

Items	Environments
Operation system	Microsoft Windows XP Professional Service Pack 2
Development tools	Microsoft Visual Studio .NET 2003 Service Pack 1
	Microsoft Server 2003 Platform SDK
	MSXML 4.0 SDK
	Subversion svn 1.4.5
	Subversion TortoiseSVN 1.4.5.10425
Database	MySQL Essential 5.0.45
	MySQL Connector ODBC 3.51.20
	MySQL GUI Tools 5.0 r12

### 5.1.2 Installation

To test all functionalities, the following MySQL tools need to be installed.

- MySQL Essential 5.0.45
  - <http://dev.mysql.com/get/Downloads/MySQL-5.0/mysql-essential-5.0.45-win32.msi/from/pick>
- MySQL GUI Tools
  - <http://dev.mysql.com/get/Downloads/Connector-ODBC/3.51/mysql-connector-odbc-3.51.21-win32.msi/from/pick>
- MySQL Connector/ODBBC 3.51.20
  - <http://dev.mysql.com/get/Downloads/MySQLGUITools/mysql-gui-tools-5.0-r12-win32.msi/from/pick>

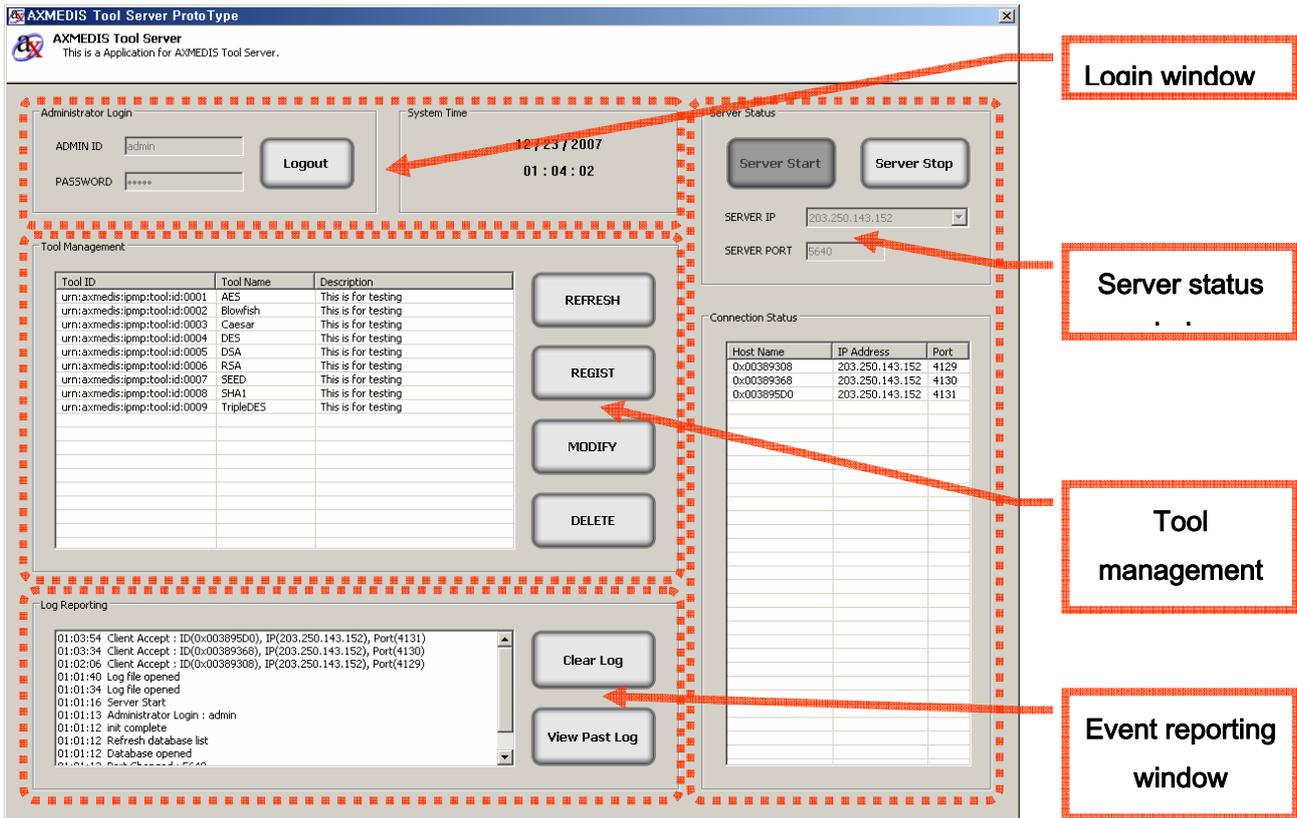
The installation processes are described below.

1. Install MySQL components for management of tools.
2. Execute MySQL Administrator and restore DB.
3. Make an account with ID/PW are Server/Server for setting authority of DB.

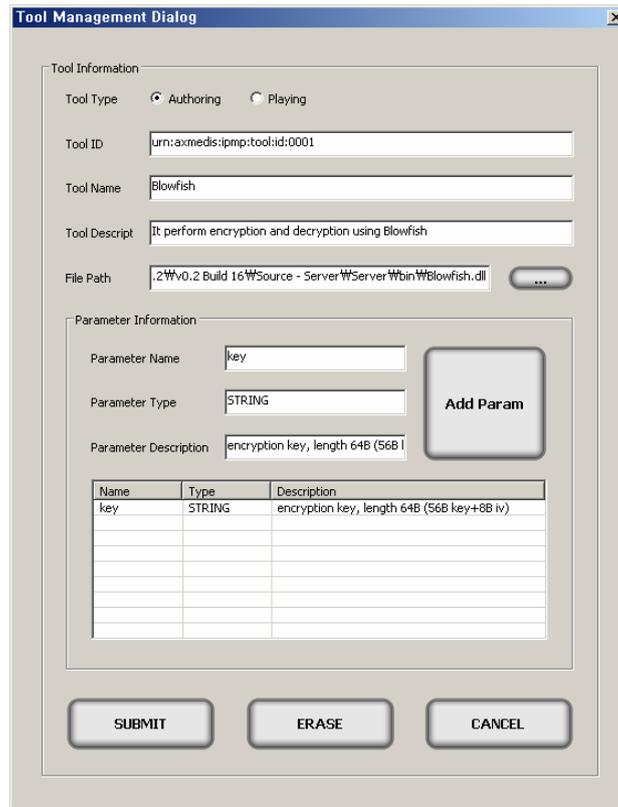
For testing, The DRM Protection Tool Server and the Test Client shall be executed without any installation (If tested in one PC, setting of IP addresses for server and client shall be same).

### 5.2 Usage from user’s perspective

The user who manages the DRM Protection Tool Server can easily and conveniently register, modify and delete tools and monitor all tools’ status. The DRM Protection Tool Server’s user interface consists of four main windows as shown below.

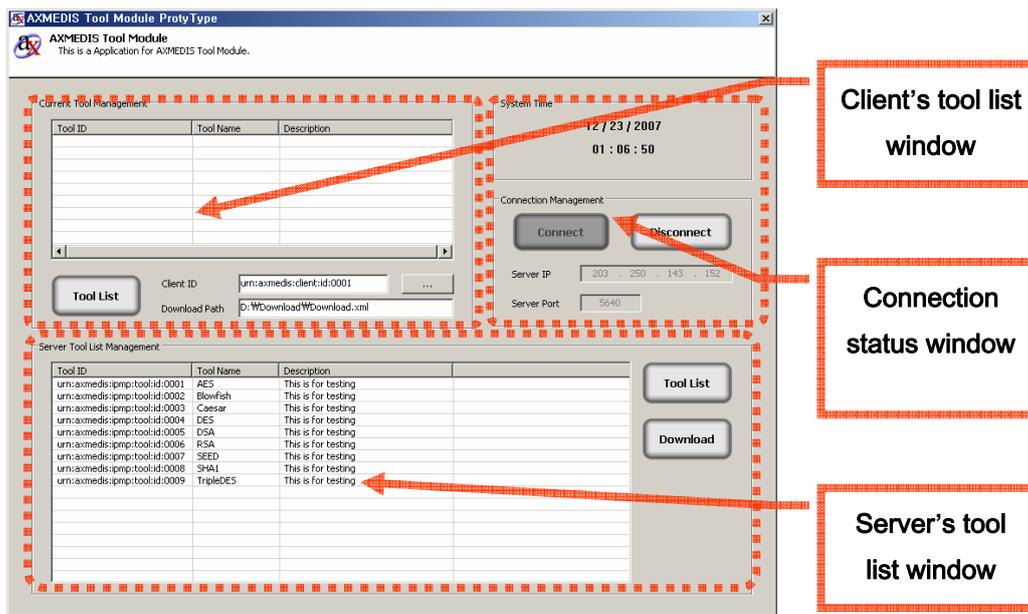


- Login window – is used for confirmation user’s authority on management of tools. To test, ID and PW (admin:admin) are needed.
- Server status window – provides server start/stop function, and supports multiple IP address in order to use one or more network card. In addition, this window can monitor all existing access of clients.
- Tool management window – provides an interface for registering, modifying and deleting tools for users. Respective buttons are “Refresh” button for updating tool list about existing tools in storage, “Register” button for registering a new tool, “Modify” button for revision of tool parameter such as name, type, path, etc and “Delete” button for deleting any tool. If click on “Register” or “Modify” button, following dialog box is provided for setting of various tool information.



- Event reporting window – provides monitoring function of all generated event in this server. “Clear log” button can delete a recorded log, and “View past log” button can read a past log.

The user who downloads the DRM tool can use following the Test Client. Test Client can connect the DRM Protection Tool Server using XML based communication message through TCP/IP protocol, and download the needed tool. The Test Client is composed three main windows as shown below.



- Client’s tool list window – shows all holding tools in this Test Client. User can set storage path before this Test Client downloads any tool.

- Connection status window – provides an interface to connect or disconnect the DRM Protection Tool Server. In order to connect the server, “Connect” button shall be clicked. If the connection is successful, all buttons on the Test Client are activated to use. “Disconnect” button can end a connection.
- Server’s tool list window – shows tool list which this Test Client can request to the DRM Protection Tool Server. “Download” button can download a selected tool in the tool list, and store it as a form of the XML package from the DRM Protection Tool Server. A path for storage is set in the above Client’s tool list window.

### 5.3 Monitoring and measurements

The DRM Protection Tool Server stores and manages all generated events from it or connected client. All events can be monitored through “Event reporting window” in real time. And it is also possible to monitor past event through a stored text. In addition, the Test Client can monitor download-possible tools if connected to the DRM Protection Tool Server.

In a view of throughput, the DRM Protection Tool Server needs to be tested using many connections of clients in order to guarantee the stability.

### 5.4 Validation

The DRM Protection Tool Server and the Test Client source codes are provided in the ETRI’s webhard URL <http://etrimedia.webhard.co.kr/english/> with ID: AXMEDIS and PW: ax4home. Moreover, after MySQL installation, it is possible to test and modify them for an adequate usage or an adaptation.

## 6 sDae - Setup of the Rights Ontology API

### 6.1 Functionality realization and installation

#### 6.1.1 Functionality realization

The ontology called AxIPOntology (Axmedis Intellectual Property Rights Ontology) is an ontology developed by sDae for Ax4Home.

The ontology is a plain OWL file representing an Intellectual Property Entity Value Chain model. The model conveys IP Entities, Roles, relations between Roles, Roles and IP Entities and IP Entities. It is written as an open standard that can serve as a common basis for interacting with different digital content platforms. The functionality is useful two ways:

- To express an IP model and verify that a given application is fully conformant with the model.
- To support the actions of individuals as they undertake different roles defined in the ontology. Thus users and digital items can be registered in the ontology so that the ontology can be used to automate the management of which set of authorizations can be undertaken given a user/role and digital object combination.

To facilitate the task of interpreting the OWL file, a Java API has been provided with the most common operations. The Java API shows a public access point under the form of three different Java *interfaces* that can be used by anyone, because they require no a-priori knowledge on the model or about ontologies.

To further facilitate the process a Web Server has been defined to provide ontology access Web Services, called the Semantic Server. To operate with the Semantic Server, a client is also needed, such as a license generator based on the analysis of real contracts as an input.

### 6.1.2 Installation

To test all functionalities, the following tools need to be installed:

- In the server side
  - The OWL with the ontology
  - The Webservice server, a web application prepared to be deployed in an Apache Tomcat Web Server. We shall call this tool *Semantic Server*, all together with the ontology.
  - A *Monitor Tool*, able to view the ontology behaviour (that is to say, in the server computer)
  - A *Command Line Control* tool, to modify the individuals in the ontology.
- In the client side
  - The *contract manager* tool, enabled to interoperate with the ontology.

To install the Webservice server, the following prerequisites are needed:

- An Apache Tomcat web server (tested on version 5.0)
- No restrictions for the ports. Although the webservice is served in the port 8080, which very seldom is blocked, the *Semantic Server* and the monitor tool interact via TCP/IP, through non-standard ports. This provides the advantageous feature of allowing the monitor tool to be run in any machine with an internet connection. Protection is given because the monitor tool has to identify itself with the ontology, that is, no arbitrary users or hackers can have access to monitor the ontology.

## 6.2 Usage from users' perspective

The user may not have consciousness of the existence of the ontology.

The user will use the Contract Manager tool to generate contracts (or any other tool which is based on the ontology), and will not notice special features, except for the grant that he is operating conforming to the common IP model and that the user really possesses the credentials (Role etc.) to warrant authorisation to perform the licensed actions on a given digital item. .

## 6.3 Monitoring and measurements

### 6.3.1 Monitoring

Monitoring for this set of tools is provided in an excellent fashion: there is a dedicated tool just for the very purpose of monitoring the operations in the Semantic Server. The information that is provided in the monitoring tool is the following:

- Connection of clients
- Disconnection of clients
- Queries by clients
- Responses given to clients

### 6.3.2 Throughput

Measurements in the Semantic Server are measurements of the quality of its service. Once asserted that no wrong answers are given, the next parameter of interest is the number of responses that can be served by the Semantic Server per unit of time. This does not only depends on the efficiency of the proposed architecture, but logically also depends on the system resources such as bandwidth and computation speed.

To guaranty the stability of the server for a given real life workload scenario, the system architecture, resources and set-up for each proposed implementation should be tested using appropriate numbers of users and corresponding digital items..

## **6.4 Validation**

Validation of the tool can be followed through the monitoring tool, observing the queries and the responses, and testing its conformance to the ontology model.

Some security tests should be made too, to check that the server is secure and protected against hackers or misuses.

Technical Note  
n.6301  
April 2008

**Technical description**

B2C advanced DVB-T video recording solution .

Additional “extra content” for the recording packages are provided by the P2P network.

The recordings can be protected with domain licenses.

**Description of Content**

Recordings of BBC DVB-T broadcasting enriched with extra content coming from the P2P network.

**Business Model**

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

- Consumer pays the distributor for content or for the service;
- Free of charge content.

# AX4HOME DVB-T Recorder and Broadcast Enhancer

The AX4HOME Demonstrator is built around the capture of off-air content and the subsequent creation of an AXMEDIS object on the client from a number of sources, including: the captured off-air recorded file, a supporting TV-Anytime metadata server and any associated ‘broadcast enhancements’. Enhancements take the form of AXMEDIS objects, distributed over the internet, with extra related content for the user such as trailers, promotions, news flashes and so on.

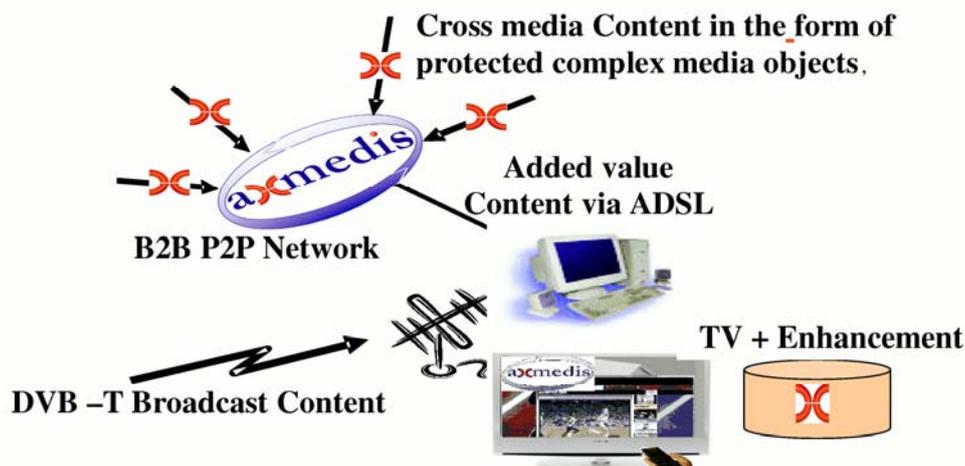


Figure 1: AXMEDIS Tools applied to a home environment scenario. Enhancing off-air content with internet delivered components to create local complex objects

The demonstrator development brings together the capture of off-air recordings through a consumer PC DVB-T card and the functionality of the AXMEDIS tools that permit scripts to be executed on the home client that create, manipulate and extend an AXMEDIS object to include other features

The DVB-T recording application has been developed as a background application to run on a Microsoft Windows home PC. It can be stimulated for scheduling and recording off-air programmes by the selection of a programme by the home viewer. The selection of the off-air broadcast programmes to be recorded is made by the home viewer through a web-based Electronic Programme Guide.

Control of the formulation of the AXMEDIS object is through the AXMEDIS scripting environment. The AXMEDIS scripting rules have been designed to determine the appropriate broadcast enhancements available to the home client at the time of recording and access these to build the AXMEDIS object. In addition, the AXMEDIS rule scripts formulate a SMIL presentation script to bind the resources, both off-air and internet delivered, into a single meaningful presentation to the home viewer. This presentation is incorporated into the AXMEDIS object being created and forms the primary presentation that the home viewer will experience when they play it back.



## **Broadcast content Capture:**

### **Core Application Development**

The core Ax4Home Recorder application is a native Microsoft Windows C++ application consisting of a Microsoft Foundation Classes (MFC) based front-end user interface, statically linked to a library containing the core tuning and capture functionality.

Microsoft DirectShow components are used to control off-air reception, receive, demultiplex and capture the broadcast video. The Microsoft DirectShow components require a Broadcast Driver Architecture (BDA) PC tuning card. In this case we have used a Hauppauge WinTV DVB-T capture device.

The process of recording capture is initiated through the selection of the programme from a web based Electronic Programme Guide (EPG). A separate executable is registered in the Microsoft Windows Registry as a "protocol handler" for the "crid:/" protocol. This provides the bridge, from a user clicking on a programme listing on the Electronic Programme Guide (EPG) web page, to a recording request being scheduled in the Ax4Home Recorder application.

The EPG web page identifies programmes using the TV-Anytime Content Reference ID (CRID). These IDs are mapped to Service IDs and Event IDs that will identify the programme within the DVB-T broadcast stream. The mapping is performed by querying a BBC TV-Anytime metadata server via HTTP.

The recorder application continuously runs a DirectShow filter-graph containing the Broadcast Driver Architecture components to control the Hauppauge receiver device, receive the MPEG transport stream and demultiplex the audio and video stream. The filter-graph is also used to extract basic "now and next" programme schedule information, allowing the recorder to determine what is currently being broadcast on each channel.

The 'now and next' information is data available from the DVB-T broadcast transport stream inserted by the broadcast head-end to provide the end user with running information on the broadcast programmes available. This is carried in the standard DVB Service Information (DVB-SI) format, as 'present-following' data in Event Information Tables (EIT) in the transport stream Programme Status Information (PSI) data.

When the "now and next" information changes, this indicates that a programme has started. The recorder determines if it needs to be recorded by matching the DVB Service ID and Event ID of the scheduled requests to the Service ID and Event ID of the newly commenced programme.

To start a recording, the recorder reconfigures the de-multiplexer to de-multiplex the broadcast channel to be recorded. The filter graph also contains a custom component, designed to retrieve the de-multiplexed audio and video stream and save it to disk. When not recording, this component is simply configured to ignore the data. When recording, it is ordered to write it to a file.

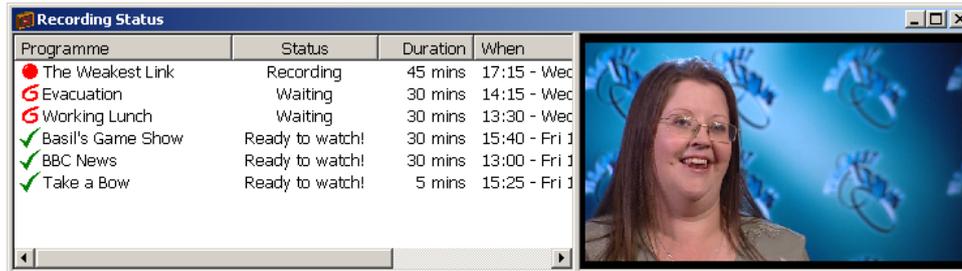
When a recording completes, it is added to an internal job queue. A separate parallel thread processes jobs from the queue one at a time. This invokes the AXMEDIS Rule Executor to post-process the video and create the final AXMEDIS object that combines the recorded video and enhancements. The generic rule script designed for this process and described further in the sections below is customised by the recorder application (a simple textual substitution step) for the specific details of the programme to be packaged, such as the location of the source video file and the CRID identifying the programme.

The recorder User interface also embeds the ActiveX version of the AXMEDIS player to allow the resulting objects to be played within the application.

## Recorder Application User Interface

The user interface for the recorder prototype is based around a demonstration of the recording capture and playback.

Built using the MFC components and C++, the interface comprises the ACTIVE-X AXMEDIS player in a frame that also encapsulates the live TV preview window, a directory listing of the AXMEDIS Objects available and a general purpose 'status output' text box, to allow monitoring of the recorder activity and status.



**Figure 1: The Recorder application presents a list of recordings and their status**

General recorder status is also reported to the user through a status information column in the list of scheduled recordings and also by pop up notifications.



**Figure 1: Pop-up notifications alert the home viewer when recordings begin or when a programme is ready to watch.**

In addition to the listing of AXMEDIS objects, the active component allows automatic loading of the AXMEDIS objects into the ACTIVE X player by double-clicking on the selected item.

User selection of a programme to be recorded from the broadcast schedules is made through a web browser EPG, hosted by the BBC. The user sees a grid of programmes organized by service and time. Each entry gives the title and duration of the programme. Once selection is made by clicking on the chosen programme square the recorder automatically scheduled to record.

The recorder automatically instantiates the AXMEDIS Object building process once the programme file has been captured off air by invoking the AXMEDIS Rule Executor and loading the pre-formed script.

## Design of the Broadcast Presentation

The presentation of the programme recorded off-air takes the form of a sequence of presentations of audio and video combined with associated text. This presentation is controlled by the SMIL script embedded within the AXMEDIS object that was generated along with the AXMEDIS object at the time of creation using the AXMEDIS Rule Executor running the AXMEDIS Rule Script described below.

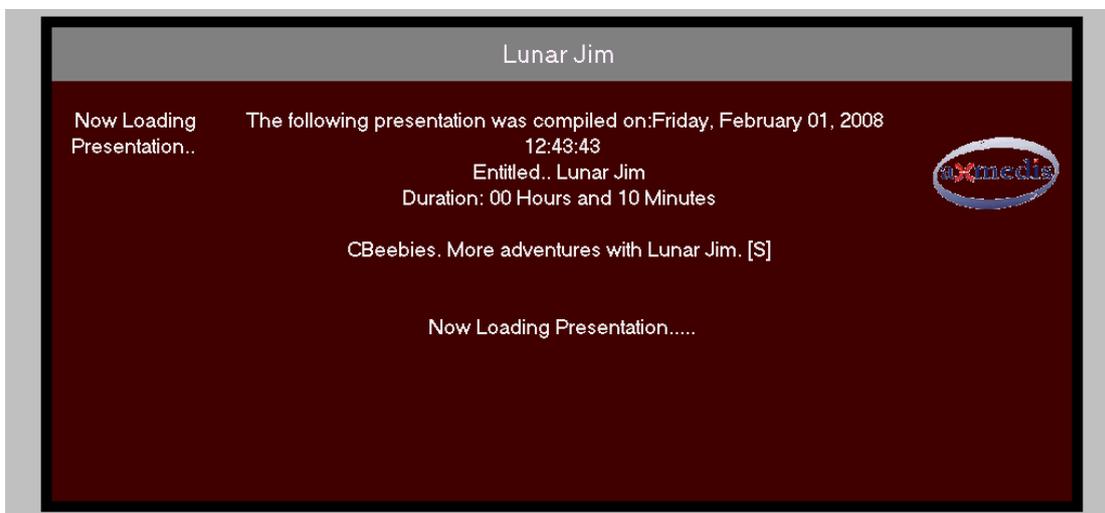


Figure 1: An opening sequence of the presentation.

Beginning with the textual presentation of time of recording, programme title and other details from the TV-Anytime metadata service, the side panels show the AXMEDIS logo and a message that the main presentation is loading. This page is presented whilst the player loads the video presentations.

The video presentations are in 16:9 format and occupy the central panel, leaving the two side panels for logos and programme summaries. Typically the first presentation would be a seasonal promotion, related to service the main off-air programme was taken from. Then a channel ident can follow, and finally the recorded programme. Other areas include the header banner displaying the name of the recorded programme.

The AXMEDIS Rule script that composed the SMIL presentation script is deliberately quite generic: it generates a SMIL script with which the enhancements are displayed first and then the off-air programme. The nature of the enhancements, that might include news, trailers or weather reports, is not determined by the script but instead by the author of the enhancements.

The choice of which enhancements to incorporate is determined by the AXMEDIS Rule script author. In the case of this prototype, it depends on a simple algorithm that matches the broadcast service channel (eg, "BBC One") to the latest enhancement in the download directory (eg, "BBCOne\_enhancement.axm").

## Functionality Contained in the AXMEDIS Rule Script

The AXMEDIS Rule Script is executed on the home client by the AXMEDIS Rule Executor to create the AXMEDIS object. It has been designed and tested using the AXMEDIS Rule Editor as the authoring tool.

The script that executes on the home client to create the AXMEDIS object implements the following operations.

1. **Incorporating the off-air recording.** The filename of the off-air recording is inserted into the script 'on the fly' by the recorder application. It also includes the DVB service ID and Event ID, used by the recorder to capture the file from the broadcast, and also the TV-Anytime Content Reference ID (CRID) of the programme. These act as input parameters to the AXMEDIS Rule Executor.
2. **Retrieve TV-Anytime Data.** Using the programme CRID, the AXMEDIS Script queries, via HTTP, a BBC TV-Anytime metadata server to fetch programme information relevant to the programme (such as its title and synopsis). This information is returned as an XML document.



3. **Parsing XML with XML4J.** Using the AXMEDIS Script XML4J functionality, the incoming TV-Anytime metadata is parsed and textual objects formed containing the main items for presentation, including Title, Service name, Synopsis, related media URL and so on.
4. **Building the SMIL.** As the textual objects are created, so the SMIL template is expanded to produce an output SMIL file. This process is extended further as the related enhancement AXMEDIS object is located and opened. The number of objects within the enhancement is not predetermined but discovered during script execution. The corresponding output SMIL entries are authored according to the number of discovered entries in the enhancement. The text displayed during the rendering of the promo videos is currently generic.
5. **Transcoding.** Optionally, the video adapter plug-in, circulated with the tools, can be invoked on the recorded file.
6. **Creating the AXMEDIS object.** The script then assembles the resources into an AXMEDIS object, placing the newly generated SMIL presentation first in the order. The AXMEDIS object can be written out as ".mp21" (MPEG21) or ".axm" (AXMEDIS) format files.
7. **Protecting.** Optionally, the protection algorithm can be invoked on the object. This also creates and issues a user license which is stored remotely (posted) on the AXMEDIS Licence (PMS) server. This licence can be user based or user home domain based.

At the end of execution control is handed back to the AX4HOME application for reporting.

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Technical Note  
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**Technical description**

B2B contribution of content in AXMEDIS format, and automatic protection and B2C distribution of content over Broadband and mobile channels, in AXMEDIS and OMA DRM v2 format respectively.

**Description of Content**

Short music tracks that can easily be downloaded and stored on mobile phones with limited memory.

**Business Model**

The demonstrator shows a digital music shop based on the “all you can eat” business model. This model is based on the assumption that end users that subscribe to the service on a monthly fee basis have access to the entire music library available in the shop as long as they continue to pay the subscription content. Of course no actual payment is required in the demo.

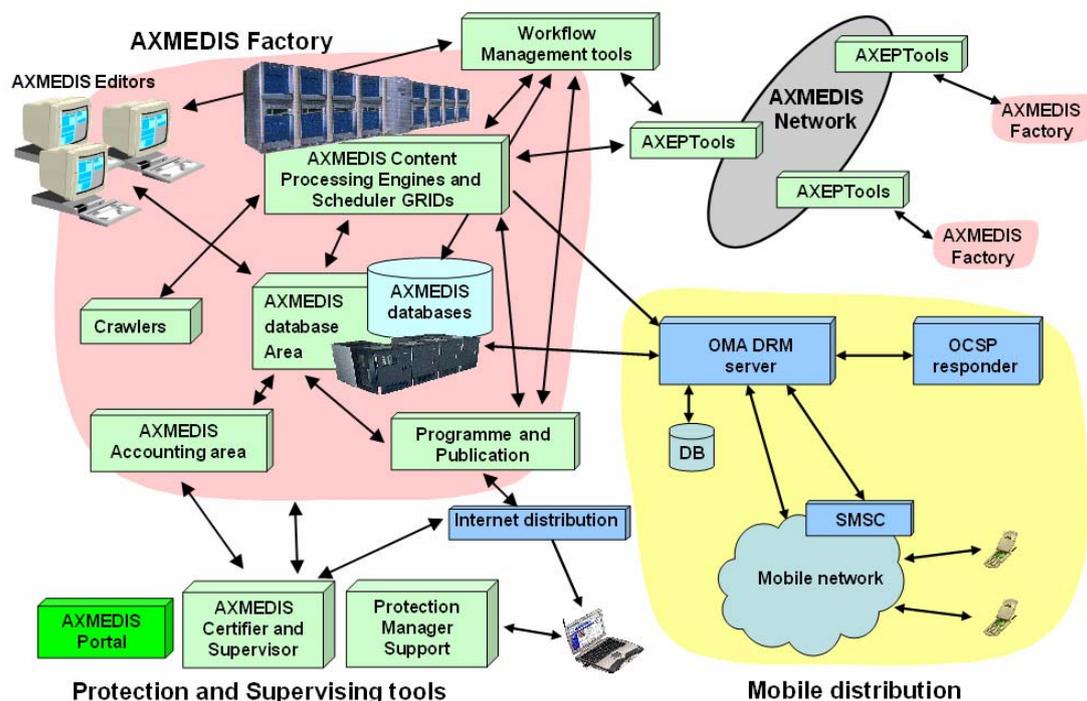
# Back office management of content for AXMEDIS and OMA, Distribution on OMA channel to mobiles (TI)

**Introduction**

The demonstrator shows how the AXMEDIS framework can be deployed to support the distribution of content over the mobile distribution channel. At the same time, it shows that the same content is made available in the native AXMEDIS format for download and use on PCs under the same conditions.

The demonstrator uses the rights management aspects of the AXMEDIS Framework on the server side and the OMA DRM v2 corresponding features on the client side. To enable this scenario, an OMA gateway is introduced in the AXMEDIS architecture, which translates AXMEDIS Objects and the corresponding licenses from the source format into an OMA compatible format.

The mobile demo uses as client devices two Nokia N91 commercial terminals equipped with certificates issued by a customized root Certification Authority.



**Configuration**

The demo is supported by a customized installation of the AXMEDIS Content Factory, complemented by an OMA DRM v2.0 Rights Issuer (“OMA Gateway”), running side-by-side on a server which has been named AX4HOME. The AX4HOME Content Factory (<http://ax4home.axmedis.org/>) is intended to be a generic repository of any kind of AXMEDIS Objects, e.g. audio, video, complex or simple, etc. However, in order to provide a convenient access to all end users, the distribution of the various Objects is filtered on the basis of their content. As an



example, we have implemented a music shop which only distributes music. Moreover, we want the end user experience to be the most convenient and friendly, so we have selected a business model based on subscription which allows open access to all content contained in the music shop library, although content is protected by DRM, in such a way that usage permission expires and must be renewed every month (by paying a subscription fee – which is not required in the demo of course).

AXMEDIS Tools involved:

- AXMEDIS Editor (in the local client PC)
- AXMEDIS Player (in the local client PC)
- AXMEDIS DB (TI server in Turin)
- AXMEDIS Web Services (TI server in Turin)
- AXMEDIS GRID node to execute script for manipulation of AXMEDIS objects (TI server in Turin)
- AXMEDIS DRM
  - AXMEDIS PMS of reference (DSI server in Florence)
  - AXMEDIS AXCS of reference (DSI server in Florence)
  - AXMEDIS Registration Portal (DSI server in Florence)
  - AXMEDIS Certification Authority (DSI server in Florence)

## Demo description

The demonstrator showcases a digital music shop based on the “all you can eat” business model. This model is based on the assumption that end users that subscribe to the service on a monthly fee basis have access to the entire music library available in the shop as long as they continue to pay the subscription fee. The music shop has the following characteristics:

- **Simple to use** – for both end users and business users;
  - a. **for end-users**: just browse the music shop, find the favourite track, download it and play it. All DRM-related operations (device registration, license acquisition) should be transparent to the end users;
  - b. **for business users** (content providers): using the AXMEDIS Editor, just upload a music track packaged as an AXMEDIS Object on the AX4HOME server, and see how this will be automatically adapted for mobile distribution. Licenses will be automatically produced to support the monthly fee model (all licenses expire every month and are automatically renewed by the AX4HOME server).
- **Multi distribution channel** – end users can either download the music tracks on their PC using the AXMEDIS Player or an adapted version based on OMA DRM v2 on a N91 mobile phone (\*)
- **Based on AXMEDIS and OMA** – the service relies mainly on AXMEDIS technologies complemented by an OMA DRM v2 server which supports the mobile distribution
- **Fully automatic** – no manual intervention needed to perform content processing activities (ingestion, adaptation, protection, license generation and renewal).
- **Based on standard OMA client** – the OMA distribution channel does not require an ad-hoc player to be installed on the mobile phone, since it uses standard OMA DRM v2 formats. However, it requires a device certificate to be installed on the phone,

In the demo we use the AX4home Content Factory as an online repository which can automatically produce specialized views of its content library by selecting some specific content type (music) and by adapting it to some particular delivery channel (Internet and mobile).

The users who can benefit from the services provided by the Content Factory are content providers (who can easily distribute their content in a protected way without having to deal with the complexity of performing



themselves the content protection and the license generation), and end users who can access a (potentially very large) music library with very simple usage conditions.

Users	What they can do
Business Users	<ul style="list-style-type: none"><li>• Possibility of creating objects and uploading them on the AX4HOME Content Factory</li><li>• The objects are converted, protected and published automatically on the AX4HOME portal in both AXMEDIS and OMA DRM v2 format.</li></ul>
Technical users	<ul style="list-style-type: none"><li>• Possibility of testing the OMA distribution channel by installing the TI certificates on an OMA DRM v2 compliant mobile phone.</li></ul>
End users	<ul style="list-style-type: none"><li>• Possibility of testing the Broadband distribution channel using the AXMEDIS player</li></ul>

### Step by step instructions for Business Users

The demo shows how a content provider can post content (music) on the AX4home Content Factory and see the same content appearing automatically on distribution on the AX4home Music Shop for mobile phones and PC's. Content can be uploaded in cleartext; it will be automatically protected by the AX4home content factory before publication.

**Role:** content provider

**Hardware needed:** A PC running WinXP.

**Distribution channel:** broadband internet and mobile

#### Steps

1. First, install the AXMEDIS Editor which is available from <http://www.axmedis.org/http://www.axmedis.org/documenti/documenti.php>
2. Then, start the AXMEDIS Editor, certify it as explained in the manual, and configure it as described in [http://ax4home.axmedis.org/home/?page\\_id=4](http://ax4home.axmedis.org/home/?page_id=4) in such a way that you can upload and download objects from the AX4home Content Factory using the Editor. In order to do so, you need an account on AX4home, which can be obtained by subscribing to AX4home (you can do it at <http://ax4home.axmedis.org/home/wp-login.php?action=register>).
3. Now you can package your audio resource into an AXMEDIS Object using the Editor, obtain a final unique identifier for your content (you must be connected to the Internet), and provide metadata information (Dublin Core). Please note that in order to be automatically published by the AX4home Content Factory, an Object must contain the following metadata information in the Dublin Core section:
  - a. **"title"** - the title of the song;
  - b. **"creator"** - the author of the song, or (in case of commercial music) the performer.
  - c. **"subject"** – must be "music"!
  - d. **"description"** – a short description of the song.
4. You can save the Object locally, either in AXMEDIS or mpeg-21 format, and continue editing it later on as long as you wish until you are satisfied with the result. Adding pictures, Smil presentation, video, is not a problem – the system will recognize automatically the audio resource and select it for mobile distribution.



5. Finally, you can upload your Object to the AX4home content factory, by clicking the “upload to DB” button of the AXMEDIS Editor. Use the username and password obtained at step (2). Please be patient, the uploading procedure makes your Editor apparently hang for a while.
6. Once uploaded, an automatic script (running every 5 minutes on AX4home) will take care of adapting the Object to mobile distribution by converting it into an OMA DCF, and posting it on the very simple “music shop” portal for mobiles on AX4home (also reachable from PC’s at the following address: <http://ax4home.axmedis.org/mobile/> ). A PC version will also be produced and posted on the corresponding music shop portal for PC’s (<http://ax4home.axmedis.org/broadband/>). Both the mobile and the PC version are protected with a time-constrained license expiring in 35 days.
7. The Object processing lasts a maximum of 5 minutes. If the Object doesn’t show up in the portal within 5 minutes, you may have forgot to insert the metadata required at step (3), or you may have used a resource format which is not supported by AXMEDIS. In this case, you can modify your Object and upload it again.

### Step by step instructions for Technical Users

The demo shows how a technical user (e.g. a mobile phone manufacturer employee) can use the content (music) on distribution on the AX4home Music Shop for mobile phones. This demo requires the ability to customize the mobile phone by installing a device certificate for the OMA DRM Agent.

**Role:** end user (customer)

**Hardware needed:** an OMA DRM v2 compliant mobile phone.

**Distribution channel:** mobile

In order to be able to access the content present on the AX4home portal, the end user must be equipped with an OMA DRM v2 compliant mobile phone like the Nokia N91. Moreover, the phone must be customized by installing a device certificate provided by TI. This limitation is due to legal restrictions on the usage of CMLA certificates (the certificates normally installed on OMA DRM v2 mobile phones) which do not allow us to provide a “transparent” service for this trial. Apart from the certification, no other customization of the mobile phone is needed.

#### Steps

1. Request us a Device Certificate by subscribing to AX4home (you can do it at <http://ax4home.axmedis.org/home/wp-login.php?action=register>) and posting a message on the “demo” page of AX4home ([http://ax4home.axmedis.org/home/?page\\_id=22](http://ax4home.axmedis.org/home/?page_id=22)); we will send you the certificate at your email address.
2. Install the Device Certificate on your OMA DRM v2 compliant mobile phone.
3. Open the browser of your phone at the following address: <http://ax4home.axmedis.org/mobile/>
4. Browse through the various tracks and select one of them.
5. Download the track.
6. Open the media player of your phone (this may be different depending on the phone model) and play the downloaded track.

The phone will perform automatically several steps:

- Register the phone on the AX4home OMA DRM v2 server;
- Check (and possibly correct) the DRM clock of your phone;
- Download the Rights Object (OMA license) corresponding to the selected music track
- Check the license constraint
- Get the content key from the license
- Decrypt the content
- Play the content



### **Step by step instructions for End Users**

The demo shows how an end user can use the content (music) distributed by the AX4home Music Shop for PS's. This demo only requires the download, installation and certification of the AXMEDIS player.

**Role:** end user (customer)

**Hardware needed:** A PC running WinXP

**Distribution channel:** broadband internet

Steps:

1. Download the AXMEDIS player from the AXMEDIS portal:  
<http://www.axmedis.org/http://www.axmedis.org/documenti/documenti.php>
2. Install the player;
3. Run the player and perform (as explained in the user manual):
  - a. the user registration (you will receive a UserId and a certificate with the associated password)
  - b. the tool certification (using the certificate and the password obtained in the user registration);
4. Subscribe to AX4home as end user (you can do it at <http://ax4home.axmedis.org/home/wp-login.php?action=register>). Post a message in the "demo" page of AX4home ([http://ax4home.axmedis.org/home/?page\\_id=22](http://ax4home.axmedis.org/home/?page_id=22)) in which you send us your UserID, in such a way that we can generate the licenses that grant you access to the music store protected Objects; the UserID must be the one received in the AXMEDIS user registration at step (3);
5. wait for an email notification informing you that your licenses have been produced;
6. Using your favourite browser, go to <http://ax4home.axmedis.org/broadband/>
7. Browse through the various AXMEDIS Objects and select one of them.
8. Download the Object.
9. Play the Object using the certified AXMEDIS player.