Automating Production of Cross Media Content for Multi-channel Distribution

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DE12.1.5.2
AXMEDIS-4HOME Demonstrator Report

Version: 1.0
Date: 20 August 2008
Responsible: BBC (revised and accepted by coordinator)

Project Number: IST-2-511299 Project Title: AXMEDIS Deliverable Type: report Visible to User Groups: yes Visible to Affiliated: yes Visible to the Public: yes
Deliverable Number: DE12.1.6.1 Contractual Date of Delivery: M48 Actual Date of Delivery: …M48 Title of Deliverable: Document DE12.1.5.2. AXMEDIS-4HOME Demonstrator Report Work-Package contributing to the Deliverable: WP12.1 AX4HOME Task contributing to the Deliverable: WP12.1.6 Nature of the Deliverable: report Author(s): BBC,sDae,PKU,ETRI,TI

Abstract This document is a report of the AX4HOME demonstrators.

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

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1 Executive Summary

This demonstration report covers the testing and assessment of the practical set-up of the application demonstrators developed by the 4HOME consortium based on the AXMEDIS Tools.

The 4HOME consortium has been engaged in providing further richness and possibilities to the AXMEDIS consortium by working with the technology partners to build on the AXMEDIS Tool features and develop practical system demonstrators enabled by AXMEDIS Tools relevant to the partners' respective businesses.

The system application demonstrators are the OMA Gateway, implemented by Telecom Italia and served by an AXMEDIS back office implemented at their laboratories, and the AX4HOME Recorder Application implemented by the BBC at their R&I Laboratory in the UK.

The implementation of these demonstrators has relied heavily on the latest development of the AXMEDIS Tools by the AXMEDIS technology implementers.

These demonstrators are sufficiently mature to be tested by and assessed by those outside the AXMEDIS Consortium. This report covers the nature of such tests and the results gained.

In addition to the main demonstrators, work was also done to realize a rights ontology within the AXMEDIS framework and integrate its use into a licence validation tool. The work was undertaken by sDae and the application of this part of the AXMEDIS-4HOME work is reported below.

As part of the realization of the 4HOME recorder application, work was done within the 4HOME consortium and with the AXMEDIS Technologists to enlarge the AXMEDIS Domain functionality to include user device registration. This would enable more attractive business models to be realized within concepts such as the 4HOME Recorder Application. This aspect of the AX4HOME architecture was undertaken by PKU and implemented and integrated within the AXMEDIS Tools by UPC - the technology partners responsible for the AXMEDIS domain features, such that it functions as part of the AX4HOME recorder application.
As this is part of the AXMEDIS Framework, the functionalities of domain management is not explicitly tested in 4HOME project, but only the usage of the domain is employed in conjunction with the BBC Home DTV Recorder Application to enable content bound to some specific domain to be consumed over different devices in the same domain environment.

Also not requiring separate testing and demonstration, the 4HOME project has developed a DRM Protection Tool Server and Prototype test client to enable users to download AXMEDIS DRM Protection plug-ins. Though not fully integrated into the AXMEDIS client module, it has been designed for business models requiring integration of this feature, for example one based on the concept of the AX4HOME DTV Recorder Application. This development has been undertaken by ETRI.

2 AX4HOME Home DTV Recorder Application (BBC)

2.1 Overview of Application

The AX4HOME DTV Recorder Application is a demonstration of a new business model made possible using the AXMEDIS Technologies. It demonstrates a novel approach for broadcasters who are currently using both Digital Television and the Internet to reach audiences.

In recent years it has become clear that the digital broadcast television and the open internet, though both used to deliver content to a home based audience, have different strengths and weaknesses. In particular the internet can be characterized as a best effort, low bandwidth service providing 'pull' services. The nature of

the content can be controlled (selected) on demand by the audience and the content is therefore searched for and selected by user behaviour.

Broadcast on the other hand is highly efficient high bandwidth 'push' service. In this case though, the audience is essentially served at a time determined by broadcast schedules and the services are common to all the potential audience. It is common for home viewers to capture television programmes on Personal Video Recorders (PVR) for viewing at their convenience, subsequent to transmission.

As television and the internet evolve, so the internet naturally attempts to become 'faster' and more robust. Television services will move towards more niche channels to satisfy a more demanding audience and incorporate more interactivity to provide even more viewing options, subject to the limitations of a unidirectional service.

Another distinction between public service broadcasting and the internet, is that many broadcast services are transmitted unencrypted. A benefit of this is that the home viewer finds it easy to store and time-shift, and there are many receivers able to receive the broadcasts built to a horizontal market open standard. Distribution over the internet however provides more challenges. Distribution 'in the clear' gives world wide access and raises issues of broadcast jurisdiction, rights and remuneration. Distribution using protection technologies causes interoperability issues for the home viewer related to proprietary systems that may favour only a limited number of platforms.

Whether approached from the Broadcast side – providing home viewers with more choice through more high bandwidth television services, or from the 'on demand' internet side, there is a common problem of relating programmes together as an editorial service and providing automatic ways to capture those programmes.

The application demonstrated and tested here attempts to use the stronger characteristics of each platform to strike a particular balance between the needs of broadcasters, rights holders and home viewers. It recognizes that Digital Television can be captured and viewed on the home PC using 'off the shelf' PC USB cards and proprietary software. Such products however do not enable branding and presentation to the home viewer by the broadcaster and so can 'sever' the audience from the broadcaster.. They 'cut out' the programme of interest from the surrounding interstitials and risk misrepresenting the programme by losing the surrounding context.

By using AXMEDIS Tools in conjunction with a DTV recorder card an application has been developed to allow the user to capture a scheduled television programme that when played back can reflect the context of surrounding interstitials and be branded by the service provider. Using the support of the rights managed AXMEDIS P2P system and the characteristics of the AXMEDIS MP21 object, the supporting interstitial material can be delivered to registered users safely without risk of global uncontrolled access and presented to the user along with the requested programme.

In order to help counter problems with unauthorized redistribution of broadcast television, the resulting presentation package is bound to the home viewer devices using the AXMEDIS domain features and AXMEDIS rights management. The domain server was run remotely by UPC.

2.2 Introduction to User Testing

2.2.1 Overview

This user trial considers the user experience when confronted with a novel TV recording application aimed not only at easy scheduling and recording of user-selected TV Programmes, but also at providing an enhancement to this functionality using internet-based programme-related data and timely delivery of associated content for presentation to the user as a completed 'package' for viewing and browsing.

The user will also experience a content-protection feature of the technology that is used to dissuade users and technology providers from unlawfully redistributing the finished digital item, whilst enabling the user to move and copy the finished item to other nominated machines for viewing.

Apart from the technological aspects of interacting with the application and understanding the expected outcomes of user actions, there is also an editorial/service element to the design of the 'recommendations' by the service provider that affect the user's experience and perception of relevance of the technology.

The testing should expose the novel parts of the AX4HOME recorder application made possible through the integration within the application of the AXMEDIS Technology tools and help evaluate the configuration as a basis for future business models that simultaneously exploit;

- Internet based EPG content scheduling
- Capture of DVB-T broadcast television content off-air
- Integration with a rights-managed Peer-to-Peer internet platform and use of content from this platform.
- Integration with supporting TV-Anytime metadata server
- Service-provider guided packaging for the user experience
- Redistribution control for rights-managed compliance

Although aimed at end users, the tests might also consider the overall aims and purpose of the development of such an application in terms of the wider industrial context. In particular the tests may reveal whether this approach addresses any of the higher industrial aims from the user perspective.

These aims are;

- To support consumption of Free to Air Broadcasts on a modern PC based platform
- To establish means of reducing the threat of redistribution of Free to Air Broadcasts, especially in a way likely to threaten the continuation of the provision of such services in a connected world. ("Keep honest people honest")
- To support a relationship between the audience and the broadcaster in the context of stored content where the schedule can no longer be used to link together or promote future items.
- To preserve visibility of the broadcaster outside the context of the service schedule when using stored content.
- To be fun and compelling to use.
- To encourage derivatives that support interesting business models for Free to Air public service and commercial broadcasters in the digital age. (Efficient video podcasts)
- To consider the concept of 'Complex Content' that is more than a time shifted linear playback but is an interactive engagement with a number of separate resources assembled in a meaningful manner and identified within a single file.

2.2.2 Purpose

The purpose of this section is to set out the tasks and evaluation process necessary for the testing of the AX4HOME Recorder Application built by BBC R&I as part of its participation in the EC AXMEDIS 6th Framework project.

The tasks and evaluation process will centre around the user workflow that will see the user being able to;

- Browse from an EPG style web page that allows programme selection based on programme descriptors
- Initiate automatic scheduling of content capture from the broadcast input at the broadcast time.
- Select the playback of recorded content from the recorder interface

- Interact with the stored content when presented with an opening 'menu' to initiate the playback of the A/V feature
- Interact with the stored content to initiate the playback or rendering of supporting features, such as accompanying trailers and promotions, supporting web sites or scheduling of recordings.

2.2.3 Audience

This document will be included as part of the Axmedis-AX4HOME deliverable DE12.1.6.1. AXMEDIS-4HOME Demonstrator Report.

2.2.4 Scope

- The scope of this document is to set out a task led testing and evaluation plan centred around the intended workflow with end users.

- Aimed at satisfying the EC reporting requirements concerning the possible business models made possible through this arrangement and exploitation of the AXMEDIS Technology.

2.2.5 Confidentiality

The results obtained are part of the AXMEDIS Project formal deliverables and are subject to the rules governing Axmedis-AX4HOME deliverable DE12.1.6.1. AXMEDIS-4HOME Demonstrator Report.

2.2.6 Related documents

The related documents are the series of AX4HOME deliverables DE12.1.2 through DE12.5.1. In addition this document relates to the AXMEDIS-4HOME Description of Work, Addendum 12.1 of Annex 1.

2.2.7 Testing Responsibilities

Testing is the responsibility of the BBC coordinator who is grateful for the help from colleagues from BBC R&I for their technical support and invaluable user testing expertise.

2.2.8 Inter dependencies

The testing of the prototype is dependent upon sufficient maturity of the supporting AXMEDIS technologies used by the Recorder Application. It is also dependent upon the supporting AXMEDIS services for Protection Services and the ability to editorially design a compelling walkthrough exposing the potential of the configuration.

Demonstration Success

- Technology Support
- Editorial Service Support

Technology Support

- AMEDIS Tool maturity
- AXMEDIS Protection Support
- AXMEDIS P2P Support
- Live metadata server support

Editorial Support

- Example proposition concept
- Supporting content preparation
- Content identification & delivery
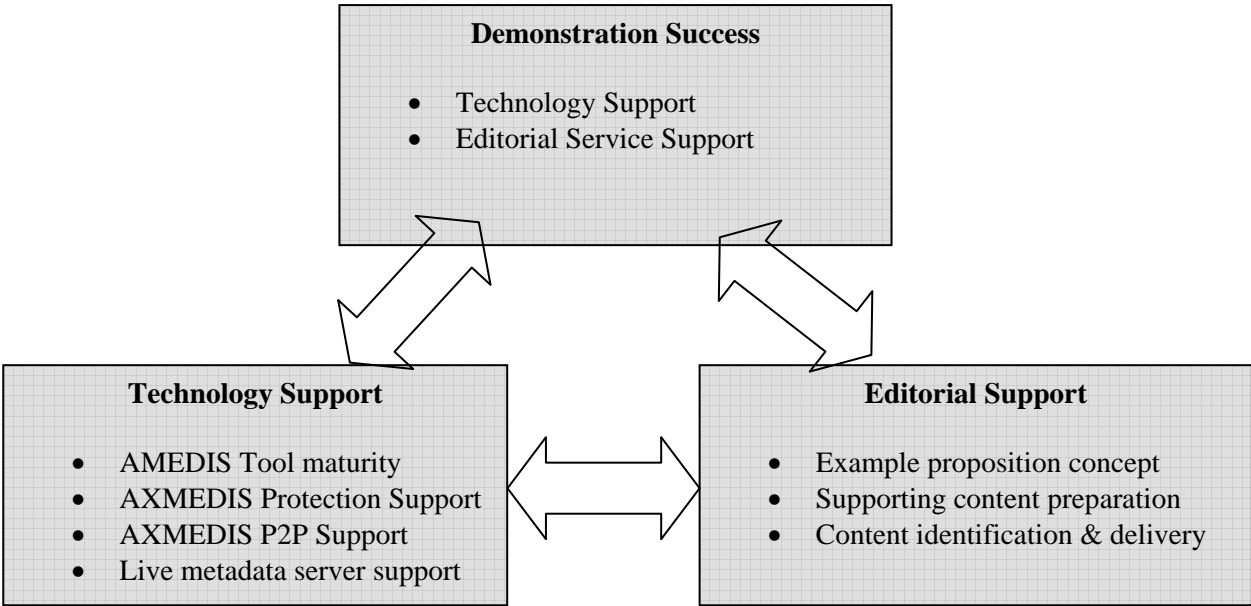
2.3 Evaluation Method and Design

2.3.1 Scope

The scope of the evaluation and testing falls into the area of "user interaction and experience" Where the objectives and boundaries are to capture, interpret and document an application which has been delivered following functional testing by the technology supplier. In the event of usability issues arising, they will be weighted for their impact and/or risk to the concept and documented in the evaluation report.

2.3.2 Methodology

The usability evaluation of the application is being carried out on a task led approach adopting "user-centred" methodology http://en.wikipedia.org/wiki/User-centered_design . Through the use of a work place (field evaluation) the testing is being undertaken with a representative sample of the end users.
This approach has been chosen as:

- It is typically used on number of projects with new applications within the last few years in the BBC which has proved useful in validation.

- It is cost effective, as BBC staff carry the necessary skills and experience in this area to provide an efficient evaluation and report in the timeframe and resources of the project.

- It conforms to ISO standards in relation to software evaluation

2.3.3 ISO Standards

Evaluation and testing carried out will conform to the ISO standard on software quality ISO/IEC 9126 http://en.wikipedia.org/wiki/ISO_9126 . These standards centre around six main themes which put the user needs for task completeness at the forefront, helping to ensure that what develops is in accordance with usability best practice.

1. Functionality
2. Reliability
3. Usability
4. Efficiency
5. Maintainability
6. Portability

Within the areas of this user centred evaluation we are concerned with 1 – 4 from the above list. Items 5 and 6 are addressed largely in functional and technical testing of the software. (out of scope of this trial)

2.3.4 Design
The design of the evaluation has been structured to:

a) Ensure that all the features implemented into the recorder at the time of testing are exposed.

b) Asses the overall usability of the application through user-interaction. Investigating if the application meets the expected range of tasks that it has been developed for. - Focusing on "task achievement" and acceptability of use.

2.3.5   Overview Chart

Functional and User Test   Observations and Reporting

BBC Testing
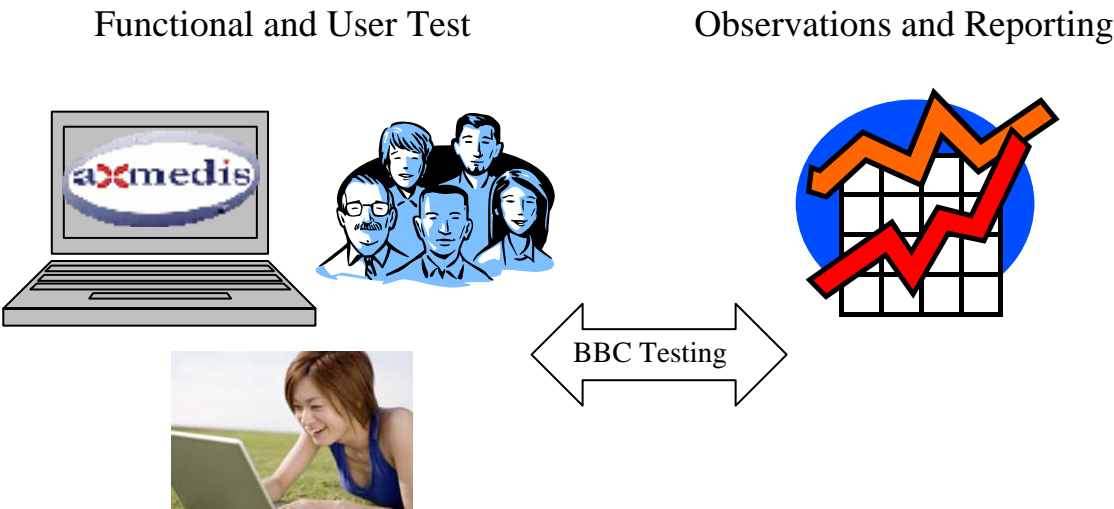
2.4 Test Plan

2.5 Structure

The tests will be structured to focus on the following areas

- Overall Aims of Recorder Application
  - Capturing off-air content
  - Use of resulting media object

- Usability of the recording interface
  - Schedule a recording
  - Viewing recorder status

- Usability of and access to media playback
  - Initiating access to stored item
  - Selecting highlighted features

- Value in presentation of interactive object
  - Satisfaction with the 'playback Interface'

- Value realized in suggestions and associated trailers added.
  - Satisfaction with the 'Added Value'

2.6 Test Scenarios

The testing of the system is based around a script (Section 2.9) based upon a home usage scenario which reflect actual usage. Giving the users participating in the evaluation meaningful tasks based on likely interactions.

Task 1: System Initialise & general use

This should cover bullets 1 & 2 above.

Presentation of application to end user.

1. Starting with startup of EPG within the AXEPTOOL Icon and initialization of the recorder application

2. Look at intuitive responses, playback from list, initiate a recording.

Task 2: Using the captured content.

This should cover bullet 3 above.

1. Open a content item – use recorder interface to stimulate use of AXMEDIS player.

2. Allow general user interaction with the interface.

Task 3: Detailed consideration on the use of the content on playback.

Covering bullets 4&5 above – assuming that the user can record and play;

1. What is the perceived relevance of the side panel options

2. Are they helpful

3. Could there be stronger themes

4. Is it fun

5. Are there any stronger themes that may seem more useful

6. Does it enhance the connection with the service provider?

7. Is it preferable to a simple cut – and- store application

8. Would you like more personalization?

These tasks were the basis of the Workflow Script used to carry out the tests and included in Section 2.9

2.6.1   Out of scope

As the test is task oriented, the testing of domains was ruled out of scope, although domain binding is included as an active function of the prototype. It was considered important to include the functionality to ensure any associated process latency was present in the user experience. However, adding the task of copying content and observing it play or not play was ruled out of scope since this overlaps with the utility of home networking which although supported by this prototype is not functionality provided by it. Furthermore such a large area of user experience would severely detract from the concepts of interest in the recorder application

2.6.2   Measuring User Satisfaction

This is being measured primarily through the post-test interview and observations. Satisfaction, the likes & dislikes of a system or interface are key areas of usability. It has a strong impact on the users overall perception and features highly along with issues of task efficiency and accuracy.

2.6.3   Post test Interview

After task led testing, subjects usually have a break and are then interviewed about their experiences in the test. During testing, observers have noted the subject's interactions and behaviour. Noting verbal points made during testing.
It is at this stage, (the post-test interview) when the subjects are asked about these. Typically issues over hesitation, confusion, and errors arise during testing. - It is important to note that the interview is also used to get the subject's opinions on likes and dislikes of the system. So questions to them are structured and open ended to allow the subject to bring up points.
The person conducting the interviews role is to get from the subject as much information they can about their thoughts on using the system and it's suitability in context of use (the workplace).

2.7   Tools and Apparatus

2.7.1   Test Apparatus

- A working system is needed for the evaluation and necessary computer hardware
  - Recorder running on a PC
  - Live TV feed and corresponding Service EPG
  - Connection to AXMEDIS P2P network
  - Provision of protected content enhancements on the AXMEDIS P2P Network
  - Connectivity and support of AXMEDIS Protection Management Server (PMS) and home Domain server. (This may be supplied locally or remotely by project partners)
  - Installation of AXMEDIS Tools including AXPlayer
  - A second machine with the AXMEDIS tools installed and connected (though not necessarily the recorder application)
- Suitable room and furniture
- Scripts, task lists and associated documentation

2.7.2 Test Environment

The user testing was conducted in a User Testing Laboratory – a room setup as a typical UK domestic dwelling where User Testing of consumer items takes place. There is also an observation gallery for the observers to sit and make notes, hidden from the subjects by a one way window.

Figure 1: Photo of User Testing lab

The apparatus was set up in the room to facilitate the interview and interaction with the recorder in an environment that would give context to the application under scrutiny. The interviewer and the tester are recordered using the camera (tripod on the right) and the microphone on the table enables the hidden observers to hear the interview.

Figure 2:Close up of Test Apparatus

The apparatus was set up in front of the observation gallery in a manner to allow both the observers and the camera to record the interview

Figure 3: View from Observers' Gallery

Tests results were noted by the observers using both the visual and audio clues

Figure 4: View when interview in progress

2.7.3 Pre Evaluation – System Access

In advance of the evaluation it was necessary to log onto the system to align the test scripts and carry out a pilot evaluation with participants who will not be included in the formal testing.

This was done in the period leading up to the User Trials and involved BBC User Behaviour testing specialists who helped in identifying the limitations listed below and developed the testing scripts.

2.7.4 Known Limitations of the Test Prototype Setup.

At the time of testing, the recorder application was very recently developed and the supporting AXMEDIS Tools that were being exploited were also new and still within the residual development phase.

As a result, there were some limitations identified which, given the sort of investment required of a product launch could be solved. Such issues are noted below and where possible were either compensated in the testing, for example through use of non-real time programme capture or it was understood that the ideal case could not be fully presented within the scope of the remaining project.

The following limitations to the technological setup were identified during the test planning stage and possible compensatory actions or acknowledgments considered or made.

Only setup in context of a single owner/user
The recorder application currently does not allow the 'logging in' of different users with the environment. It therefore remains open to everyone in the user environment.
It is realized that this reduces some potential features that could be considered further if such knowledge was available to the system. These features would include:

- Displaying the recorder list of the current individual only
- Personalizing the recorder action towards a category of programme enhancements based on individual tastes
- Take parental control considerations into account when displaying or creating content.

Scheduling requests after the broadcast time
In the current EPG it is possible for the user to select and 'click' over any of the programmes in the screen area, including programmes scheduled at a time that has already lapsed.

This could be modified with more time spent refining the selection interface, either to inform the user of this anomaly or prevent this occurring.

Handling of repeat transmissions
It was observed that there are often series of programmes available over a short time period each member of which is given a common title, eg 'Neighbours'.

In this case, the recorder application will recognize these programmes as being distinct and therefore record each without deleting the previous programme with the same title. Consequently there will be a number of programmes listed with the same title. These will be differentiated through the time of recording column in the interface.

Scheduling a recording over another request.
Due to the use of only a single tuner/receiver architecture, the application cannot record more than one programme at any one time. However, the recorder will not discover this collision in requests until it attempts to execute the actions at the time of recording. At this time an error is reported on the second (latest) item. In a production model, this function would be moved to the time of scheduling..

Checking amount of disc space to fulfill user requests
Currently, a large number of recordings can be scheduled for recording as a result of direct EPG requests, or interaction with the playback interface on a 'hot link'

In both of these cases, the current application does not check that there will be enough disc space reserved on the PC hard disc to fulfill these recordings.

It is recognized that this is a serious failing for a novice user and would have to be rectified in a production model.

Integration of EPG and recorder interface.
During the preparation of the testing, it was evident that novice users might benefit from the integration of the recorder scheduling EPG. However, a 'power user' might prefer the separation of these functions to allow separate monitoring of each with minimum disruption to any other process workflow being executed. In practice this may be offered as a user –specified customization.

Use of GMT as timing reference in EPG
Check use of GMT/BST

Lack of Parental Controls in Schedule/Playback interface
Currently there are no parental controls in the system. Typically the broadcast networks use the position in the broadcast service to reflect the suitability of content for the younger audience through the time of broadcast or the branding of services as "Childrens TV"

This can be determined from the playback interface only but has not been further exploited in this prototype.

Ensuring proper use of the 'Recommendations'
In order to exploit the recommendations to the full, many of the limitations already listed are relevant. In particular:

- Personalisation – To enable targeted trials, or commercially related propositions
- Suitability for Children – An aspect of personalization.

- Resolution beyond a 'single user'; Identification of a specific family user to allow customization of the interface to reflect personal tastes.

In addition, the moderation and recommendation of additive content would in practice become an editorial skill akin to marketing. This is required to ensure that the editorial links are relevant, obvious and meaningful to the end user. It requires an understanding of the audience and the availability of resources (programme trailers, news roundups, and promotional features).

Despite these limitations, the following actions were taken to simulate a more varied user experience than can be created simply with the present prototype simple.

- Use of AXMEDIS objects that were prepared off-line using the same AXMEDIS technology to gain user feedback on alternative editorial propositions.
- Use a subjective response scale to gauge user satisfaction with these test cases.

Known Limitations to the control of content use

Deleting a recording
  i. The user would benefit from action confirmation
  ii. Fluency and consistency. Play on Left click is OK, but should have been an option on right click also

Full screen options
  i. Menu option to cause player to switch to full screen is outside the rendering area, - difficult to find switch.
  ii. The full screen option doesn't re-scale video or fill surround

Playback
  i. Presentation 'Menu' button in vision tab – this is not a typical PC option menu, more a DVD style menu
  ii. The position of the presentation Menu might be confusing
  iii. The recording status of trailer link is not shown [Ambulant/SMIL limitation]
  iv. Pause, transport controls, drag to timeline – likely to be of use in production model but not available in the present prototype
  v. There is no quick indication to answer ' What am I watching'

2.8 Pilot Test

The pilot test is essential and carried out with all testing staff, apparatus, and documentation. Those involved in testing are the test monitor and observers. A simulated test is carried out with a user who is not involved in the actual tests themselves but is representative of the actual users. The reasons that pilot testing is essential are:

- It ensure the test sequence works

- It gives the test monitor and observers a chance to practice their roles and responsibilities

- Tasks and test data can be checked for accuracy

- Task time can be checked

- An opportunity is given to modify the test plan.

- Check on all the equipment.

In the weeks prior to the user testing, the testers were shown the technology and through use and explanation were involved in the authoring of the walkthrough scripts. On the final week, when the system was set up, the training scripts were developed iteratively to establish paths that were within the capabilities of the set up and typical of user behaviour.

Finally, once the work scripts were finalized, the process was tested using BBC Personnel, - a Technologist and Librarian, to assess whether the participants will be able to understand the tasks and evaluate the time taken for each test.

2.8.1 Participants

2.8.1.1 Profile of Participants

There were 11 participants (we invited 12 but we had one no-show) to sit the test. These participants were drawn from the general public and the table below gives a profile as determined through an application form. This is in addition to the BBC personnel who helped align the scripts in the pilot test and the behavioural experts who suggested some modifications to allow the non-technologists to interact more ably.

Table 1: Day 1 Respondents

ID	Gender (F/M)	Age	SEG	Occupation	PVR owned? (Q4)	Used 4oD or BBCiPlayer? (Q5a)
1	F	44	B	Housewife	Sky+ & Freeview box and combined DVR	Neither
2	M	55	C1	Retired Station Officer	Sky+	Neither
3	F	30	C1	Housewife	Sky+	4oD & BBC iPlayer
4	M	16	C2	Student	V+	4oD & BBC iPlayer
5	M	41	B	Pilot	Sky+	4oD & BBC iPlayer

| 6 | M | 17 | C1 | Student | Sky+ | BBC iPlayer |

Table 2: Day 2 Respondents

ID	Gender M/F	Age	SEG	Occupation	PVR owned? (Q4)	Used 4oD or BBCiPlayer? (Q5a)
7	M	23	B	Events Organiser	None	4oD & BBC iPlayer
8	M	39	B	Teacher	None	BBC iPlayer
9	F	20	C2	Assistant	Sky+	4oD
10	F	52	C2	Pharmacy Assistant	V+	Neither
11	F	29	C1	Buyer	Freeview Box and combined DVR	4oD
12	F	58	C1	Medical Secretary	Sky+	Neither

2.8.1.2 Pre test questionnaire

Pre Test User Information

There is a certain amount of orientation and training needed by a person undertaking task led testing prior to the actual test. This is to bring them up to the minimum skill level to be ready for the tests. It is a basic

requirement that everyone participating in testing is capable of using a computer and this has been verified through the "Profile user questionnaire", which includes questions relating to computer usage and experience.

The pre-test questionnaire was hosted on http://www.surveymonkey.com/ and designed to help ensure our test Users were not from a specific social or interest group

Table 3: Pre -Test Questionnaire with Respondent Replies

Q1. Which of the following age categories do you fit into?

Answer Options	Response Percent	Response Count
I am below 15 years of age	0.0%	0
15-21	18.2%	2
22-35	**27.3%**	3
36-50	**27.3%**	3
50 Plus	**27.3%**	3
	answered question	11
	skipped question	1

Q2. What level of confidence would you say you have in using computers?

Answer Options	Response Percent	Response Count
Very Confident	27.3%	3
Confident	**63.6%**	7
Not so confident	9.1%	1
	answered question	11
	skipped question	1

Q3. On average how many hours do you spend on a computer (outside of work) a week?

Answer Options	Response Percent	Response Count
Under 5 hours	16.7%	2
Between 6-10 hours	**58.3%**	7
More than 10 hours	25.0%	3
	answered question	12
	skipped question	0

Q4. How do you you currently record television programmes?

Answer Options	Response Percent	Response Count
I use VHS	33.3%	4
I use a DVD, or DVD hard disc recorder	8.3%	1
I record to my PC hard drive.	0.0%	0
I use another method to record programmes	**58.3%**	7
	answered question	12
	skipped question	0

Q5. If you could receive access to unique extra content based on your interests and recording preferences.

What type of service would you like to see?

Answer Options	Very interested	Moderately interested	Not interested	Rating Average	Response Count
Recommendations on programmes coming up?	7	4	0	1.36	11
Programme Extras: Specially made segments	2	6	2	2	10
The ability to set your own preferences & alerts for new material?	**8**	2	0	1.2	10
Comments					0
				answered question	11
				skipped question	1

Q6. What topics would you be interested in?

Answer Options	Response Percent	Response Count
Drama	**81.8%**	9
Sport	27.3%	3
Documentaries	**81.8%**	9
Comedy	72.7%	8
Nature/Wildlife	36.4%	4
Environment	18.2%	2
History	27.3%	3
Politics	9.1%	1
Science	27.3%	3
Comments		2
	answered question	11
	skipped question	1

Q7. Thank you for your responses. If you wish to leave any additional information please use the box below.

Answer Options	Response Count
	0
answered question	0
skipped question	12

The 11 participants had varied experience of on-demand service and PVR. The tests were carried out with one facilitator and 2 observers to asses what the users felt about the recorder application through the recording of qualitative and quantitative data.

2.9 Test Script

The following script was used by the tester as the basis of the interview to take the interviewee through a walkthrough to make observations and gauge satisfaction with the product. The responses are summarized in Section 2.12.

2.9.1 Comments to participant

Spoken by the test monitor

- *Heath & Safety*

Thank you for volunteering to take part in these user trials. The purpose is to introduce you to a computer based TV guide and recording service we are developing as part of our research into how programmes may be delivered in the future. This prototype is much like a home recording device such as a PVR. We are going to ask you to use it and give us your feedback.

This research is based around the TV schedule and delivering extra items to you alongside the programme you are recording. – It is different to the I-Player, as the I-Player is a catch up service of what has already been transmitted.

The session will last for approximately 40 minutes and if you want to pause or as questions at anytime that is fine. There are two parts to this session. I will ask you to carry out some tasks and then afterwards I will ask you a few questions about the application.

I will ask to carry out tasks and as you progress I will also be asking you questions and I would welcome any comments you want to make as we go along. This is helpful to us as we can get more information.

There is a camera and microphone to capture the session and behind the glass screen we have some observers who are taking notes. The recording is made only to assist in the analysis. It will not be used outside of the project.

Before we start, would you like to make sure the PC/monitor and seating is adjusted correctly so you are comfortable?

Do you have any questions?

2.9.2 Introduction to the interface

2.9.2.1 Scope Notes

The user is presented for the first time to the "opening interface" showing the 3 channels. In this section we want to capture the user's perception of what they understand. Can they clearly see scheduling, channels programme and metadata?

2.9.3 Introduction to the recording interface

2.9.3.1 Could you tell me what you see and understand about this screen

User needs to understand concept and what the screen is displaying

2.9.3.2 *Please look at one of the programmes displayed and tell me about them from the available information.*

2.9.4 Setting up a Recording

2.9.4.1 *Scope Notes*

In this section we want to see if the user can make a current recording and set one up for later. Can they carry out the task and see the feedback on offer to confirm their actions? - Does the user understand the "now" symbol indicating what is on TV now? Do they notice the colour change indicating recording status?

2.9.4.2 *From this schedule it is possible to record programmes. - Can you record something that is on television now from one of the channels available?*

2.9.4.3 *From the schedule can you set up a recording of something that is on later today?*

2.9.5 Review /Playback & deletion of content /bookings

2.9.5.1 *Scope Notes*

Following on from setting up recordings we want to see if the user can identify the path they need to take to review the stored content. Can they see the "My bookings" icon? Once presented with the list of available content stored, can they play and delete it?

2.9.5.2 *Can you see a summary of what you are recording now, and what you have set on timer*

2.9.5.3 *What can you tell me about what you see in the list?*

2.9.5.4 *Can you <u>stop</u> the recording you set for something on now?*

The machine is capturing the programme you have recorded and using the internet to gather related information and present it to you along with the recorded programme. You will be able to see that shortly.

2.9.5.5 *Please close the bookings list window.*

2.9.5.6 *It is possible to review your bookings from the TV guide – can you try and do this?*

2.9.5.7 *Can you see how to play the clip you recorded?*

2.9.5.8 *Can you see what else is on offer to you?*

The idea of these added features is to allow you to see other things that are available or upcoming on the BBC related to your choice of recorded programme. This includes web pages related to the programme and trailers for future programmes.

2.9.5.9 *Please close the player window*

2.9.5.10 *Can you see how to delete the recording you have just watched?*

2.9.6 Playback Interface

2.9.6.1 We have put in extra programmes for this trial. - Can you select and play one of the programmes from the list of pre recorded programmes?

(Top Gear/Eastenders/Celebrity Master Chef)

2.9.6.2 What do you think is on offer to you from this screen?
- Record button?
- Play trailer
- Web link
- Textual information

2.9.6.3 Please try it out?

2.9.7 Post test Interview

2.9.7.1 Scope notes
In this part of the evaluation the test monitor sits down with the user following the task led testing. The user is asked a series of questions to get subjective information such as likes and dislikes. They are asked about their impressions on usability, and of the application overall.

2.9.7.2 Dialogue question to test-users

2.9.7.3 Overall, how easy was it to use? (Would you say it was easy to use)

2.9.7.4 On a rating of 1 - 5 how easy was it for you to use?

1: Very difficult

2:

3:

4:

5: Very Easy

2.9.7.5 Were there any parts you found particularly appealing?

2.9.7.6 As you can see in this prototype when you record a programme extra material is presented. Would this type of service be attractive to you?

1; It would be of no interest to me
2:
3:
4:
5: I would definitely use it

2.9.7.7 Can you think of any types of content that would appeal to you alongside the programme you have recorded?

2.9.7.8 Can you see your friends or family using it?

2.9.7.9 How would you describe this (prototype) to them?

2.9.7.10 Looking back on what you have seen today, are there any other comments you would like to make?

2.10 Screenshots of the AXMEDIS Objects seen by the testers

When the participants were asked to look at an AXMEDIS object prepared earlier, we provided the following 3 working examples, with the appropriate server support to ensure recordings could be booked on the recorder
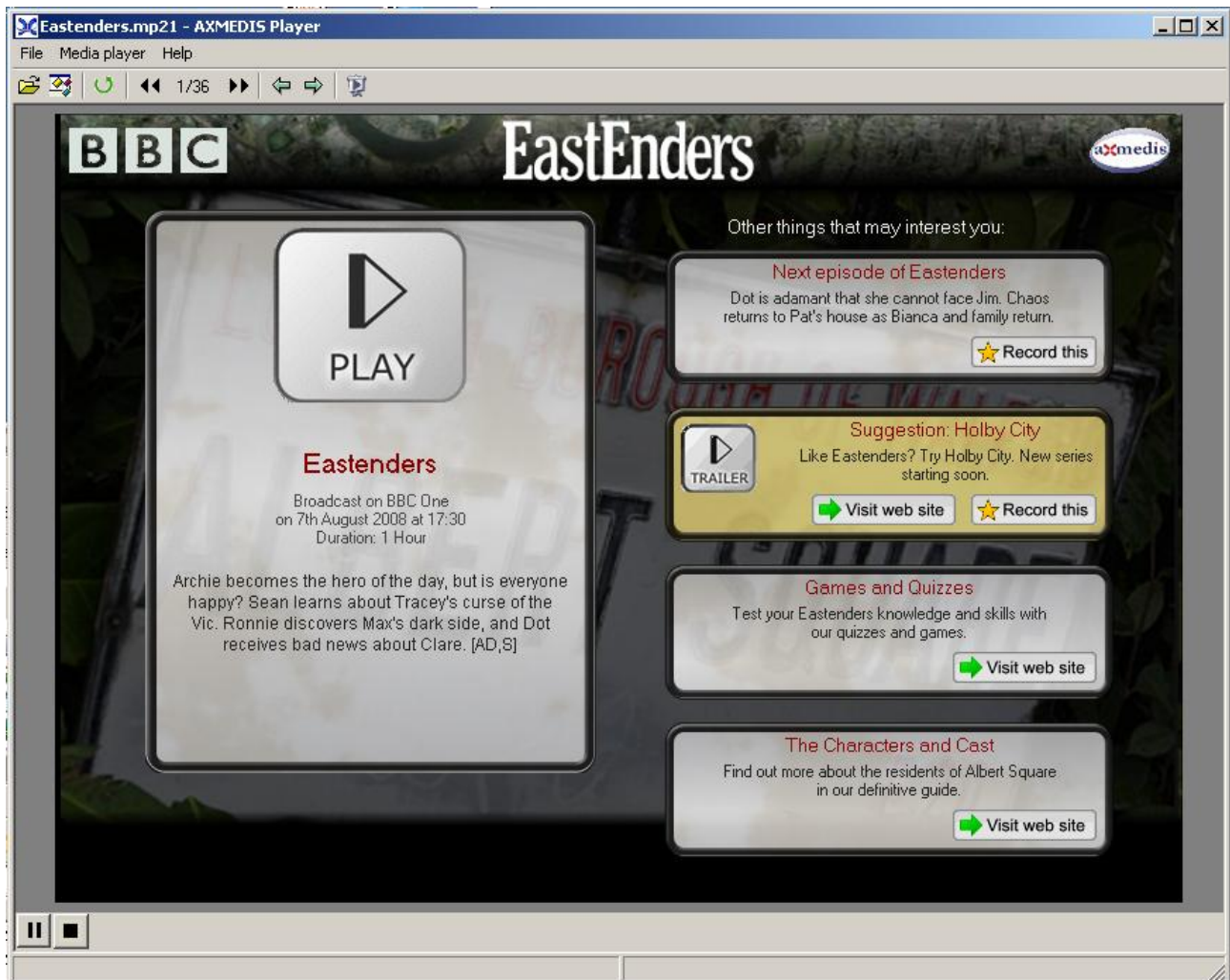

Figure 5:The Eastenders Presentation

Figure 6:The Celebrity MasterChef Presentation

Figure 7:The Top Gear Presentation

Typically, when recording their own, the following interface was presented (depending on their choice from the TV Schedule and time of day)

Figure 8:The 'Native' Presentation Template

2.11 Screenshots of the AX4HOME EPG seen by the testers

The initial screen seen by the tester is of the AX4HOME EPG Schedule with the 'time now' marker showing the current time. As this is the starting point for the test it is shown here for completeness.
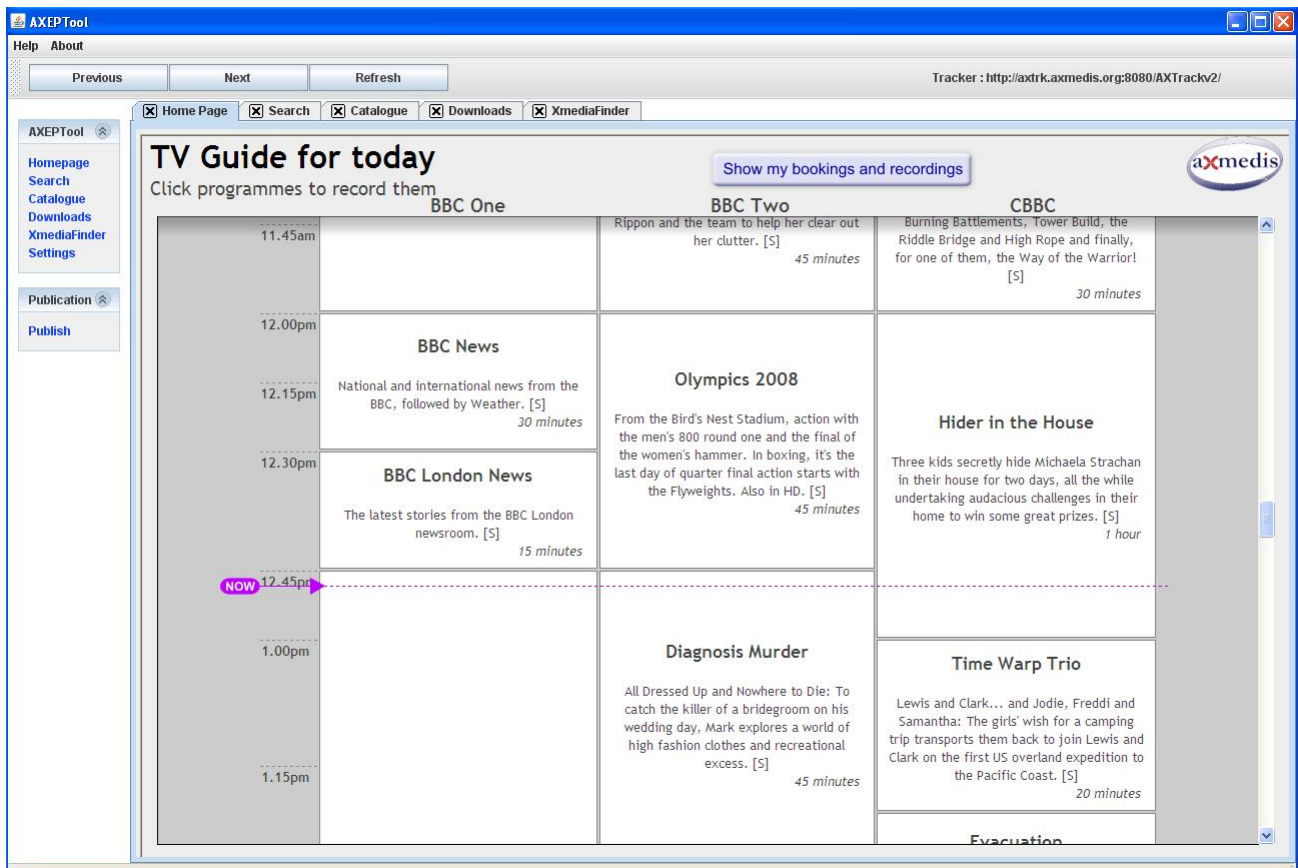
Figure 9: Initial EPG Showing 'Now' Marker

2.12 Results: Test Script Response Summary

2.12.1 Introduction to the interface

2.12.1.1 Aims

The user was presented to the "opening interface" showing the 3 channels.
The aim was to capture the user's perceptions of the interface. For example, do they understand the scheduling, channels programme and metadata.

2.12.1.2 Introduction to the recording interface

2.12.1.3 Could you tell me what you see and understand about this screen

The user was asked to describe what they saw on the screens and offer an explanation of functionality.

All participants recognise major features of the screen (channels times, programme synopsis and duration), and most describe it as a 'TV guide'.
Other less familiar features, such as the 'Now' tab are recognised and understood.

2.12.1.4 Please look at one of the programmes displayed and tell me about them from the available information.

Main items related to individual programmes are recognised and understood (title, short synopsis, duration time).

A couple of participants queried the [s] subtitle label, there were also requests for programme episode numbers (e.g., 1 of 5).

Two users comment on the dryness of the visual design, and ask for more colour and graphics.
> *"Its missing graphics of some description"* John.
> *"A bit bland, almost like I've gone into word or excel, loads of writing nothing jumps out"* Jon.

2.12.2 Setting up a Recording

2.12.2.1 Aims
The user was asked to make a current recording and set one up for later, to review whether they could carry out the task and see the feedback on offer to confirm their actions.

2.12.2.2 From this schedule it is possible to record programmes. - Can you record something that is on television now from one of the channels available?

The remaining two participants who had previously not identified the 'now' tag, became aware of its presence, and all users then utilised it to locate a current programme to record.

All users selected a current programme to record with ease, and found the process simple and 'natural'.

The pop-up confirmation window, indicating that the start of the programme would be missed, was noted and understood by all. The change in colour (to red) indicating recording status was also understood and appreciated.

2.12.2.3 From the schedule can you set up a recording of something that is on later today?

All participants understood that they could scroll down the EPG to find future programmes, and all understood the highlight to indicate a future recording.

One participant liked it to '*marking-up the Radio Times'*.

All participants found the process of booking a recording simple, and performed the task with minimal clicks in a short-time. (They quickly became expert users!)

2.12.3 Review /Playback & deletion of content /bookings

2.12.3.1 Scope Notes
To review whether the user can identify the path they need to take to review the stored content.

Can they see the "My bookings" icon?

Once presented with the list of available content stored, can they play and delete it?

2.12.3.2 Can you see a summary of what you are recording now, and what you have set on timer

All participants found the booking window. The majority used the 'your recordings/bookings' button at the top of the EPG, while the remaining participants clicked on a programme that was already highlighted to record.

2.12.3.3 What can you tell me about what you see in the list?

All participants understood the contents of the 'bookings/recordings' window without prompting from the facilitator.
> *"Its reminding me what I've done, a reference really."* Sue
> *"Its like a schedule of whats happening when you print, things that are about to be done and things that have been done."* Jon.

All participants identified and understand what is to be recorded, recording and recorded and ready to watch. An understanding of the icons closely follows, and all are accepted by the particpants.

One user questions if the recordings will be deleted once they have been watched.

2.12.3.4 Can you <u>stop</u> the recording you set for something on now?

The majority of users understood to right click a programme in order to cancel it, but many expressed that this was linked to their familiarity with general PC functionality.
"Right clicking is fairly standard across the board." Alex
"For people who don't know about computers, they may not know what to do." Ian

Confirmation was needed by a few participants regarding the difference between 'cancel and save' and 'cancel and delete'.

This activity took a little more thought than previous activities, but most participants achieved the task with no prompting.

2.12.3.5 Please close the bookings list window.

All participants managed to close the bookings window using familiar PC-based logic!

2.12.3.6 It is possible to review your bookings from the TV guide – can you try and do this?

Only two participants had problems finding the 'bookings/recordings' button at the top of the EPG. For the rest the activity was quite straightforward and understandable.

2.12.3.7 Can you see how to play the clip you recorded?

A few difficult moments are experienced initially, but participants soon learn to either double-click (left button) to selected the programme they wished to view, or right click and select 'watch'.

Several users suggest the playback window is 'i-player'.

There is some disappointment that the playback window cannot go full-screen.

2.12.3.8 Can you see what else is on offer to you?

The idea of these added features is to allow you to see other things that are available or upcoming on the BBC related to your choice of recorded programme. This includes web pages related to the programme and trailers for future programmes.

All participants were able to identify the main feature they had selected to view, and the programmes details that accompanied it. They were also aware of the 'additional features' (recommendations), and the majority welcomed this function, only two participants needed confirmation that the recommendations were related to the main feature.
"It's a sort of multimedia thing I suppose, I can play top gear but it also gives me a link to the website" Jon
"If I'm watching a crime programme could it show me other crime programmes?" Charlotte
Only one participant expressed no interest in the recommendations.

Regarding functionality, many participants did not see or utilise the BACK button.

2.12.3.9 Please close the player window

2.12.3.10   Can you see how to delete the recording you have just watched?

Most particpants deleted programmes by right-clicking in the programmes list.

2.12.3.11   Summary of Setting Up a Recording

Generally participants were able to set up recordings with ease. Participants became familiar with the functionality of the interface very quickly, particularly when they utilised PC based functionality.

The concept that the application was used to record, store, view and delete programmes was clear and understandable to all participants.

The bookings/listing window was a facility that participants could understand, and would use for reference.

Participants likes the idea if recommendations.

2.12.4 Playback Interface

In this part the user is looking at the recorded objects and assessing the playback interface revealed when an object is opened. The test objects are shown in this report above.

2.12.4.1 We have put in extra programmes for this trial. - Can you select and play one of the programmes from the list of pre recorded programmes?

People were drawn to programmes they like and responded warmly to the 'designer objects', especially when their favourite programmes were involved. This part solicited the warmest response as the testers identified with the programmes.

2.12.4.2 What do you think is on offer to you from this screen?

Testers were happy to explore the additional enhancements and understood they were video or web links. Some were not keen on the internet access - see it as a distraction as with trailers. Others were very positive. "You forget to look it up, so this really helps" The ability to book the programme being trailed was also warmly appreciated. The distinction between A/V trailers and web connections was understood. Some were really positive at this point.

2.12.4.3 Please try it out?

Here the interview was more dynamic and comments were made to the interviewer

Suggestions: Epsode number, series booking.

Generally liked the internet access for related material. The player functionality proved confusing, though the pause and play on the player affected the video in a way consistent with expectation, other player functions outside the presentation were ignored or caused confusion. The web EPG also exposed further AXEPTool functionality out of the scope of the tests and caused confusion. Differences in the form of some objects (3 trailers or 4) was also an issue for one person.

2.12.5 Post test Interview

2.12.5.1 Scope notes

2.12.5.2 Dialogue question to test-users (needs further discussion),

2.12.5.3 & 1.12.5.2 Overall how easy was it to use? (Would you say it was easy to use)

Participants found the application very easy to use, giving it a rating of 4.5 out of 5 for ease of use. Participants comments helped us unpick what features made it easy to use…
"I didn't have to read a manual, I could just guess" Alex
"With practise you'd know where to go quickly,, and it happens very quickly to reassure you." Amanada
Particopants enjoyed the familiar layout and functionality, and its quick response time. It allowed users to utilise behaviours leant from the PC environment.

2.12.5.4 Were there any parts you found particularly appealing?

Very positive about clicking on an EPG to record. Very positve about extra material. No comments about the latency, but some comments on the style, eg, the vertical timeline, the 'blandness'

2.12.5.5 As you can see in this prototype when you record a programme extra material is presented. Would this type of service be attractive to you?

Mostly very positive. Would prefer it set up on the TV. Some testers thought a home network would add a lot of value. It seems the utility of the PC is countered by the PC viewing experience, so were optimistic that full screen 'lean back' might be enabled.

The average rating for attractiveness was 4.4 out of 5.

2.12.5.6 Can you think of any types of content that would appeal to you alongside the programme you have recorded?

Some Users interpreted this question in terms of ease of use, rather than conceptual

Suggestions: keyframes/thumbnails on the trailers to help determine if they are familiar;series linking, episode information, related web services such as shopping lists
Some wanted a fuller service of TV schedules. Some were aware that the iplayer is limited in quality and in programme availablity compared with TV and saw this as a positive development.

2.12.5.7 Can you see your friends or family using it?

Lots of responses were 'definitely', 'its very easy'

Most people thought their relatives would be able to easily use it, although some thought relatives were prejudiced against PC for TV. Many thought the utility of booking on an EPG to be a very helpful thing.

2.12.5.8 How would you describe this (prototype) to them?

Understood the PVR aspect ('Abit like Sky+, but easier to use than a TV Guide') coupled with the EPG and extra material – and were positive about this. Non of the users questioned how the extras were delivered but accepted they were there and could be made meaningful to the user and compelling

2.12.5.9 (7.1.1) Looking back on what you have seen today, are there any other comments you would like to make?

Again a number of repeated themes emerged: Horizontal timeline, programme time remaining, have I watched it? will it auto delete, series linking, old episode pointers (maybe into a VOD system), stylistic issues on colour coding, more on screen buttons (record highlighed programmes, delete..). Transport shuttle controls

2.13 Summary

The Users comments are based around expectation and implementation, stylistic approach and the overall concept.

Implementation

- No one complained of the time to prepare the recorded object.

- Users understood the information on the screens and had expectations of what might happen from similarity with familiar things – listings magazines, media players, MS Windows file system.

- The prompts included in the implementation proved critical for user navigation, in particular the headings on the EPG, the 'Now' marker, the visual confirmation that a recording had been booked and subsequently recorded and the action prompts when right clicking.

- There was some confusion over the embedding of the EPG in the AXEPTOOL as this provides more functionality outside the scope of the User experience under test

- There was some confusion using the player as the more generic player functions are not directed at the SMIL presentation (except for pause and re-start) and can also expose the MPEG21 Object hierarchy, - this is a distraction to the user and irrelevant in this application. Most users limited their experiments to the internal SMIL presentation buttons so were not challenged in this way. A more comprehensive approach would have been to customize the player and avoid this.

- Although playing on a large monitor, the Users were keen to see TV on full screen and as a 'lean back' TV experience. This is within the capability of the system except that the player full screen did not expand to full screen video. A larger implementation with a home network integrated would also have helped reinforce this, though it would have brought home networking issues into the test and merged a number of separate issues.

- In contrast to the point above, Users were comfortable and indeed positive about the PC style EPG as a great way to book recordings and view the schedule. Some were even aware that the view of the

EPG broadcast schedule would be better than the BBC catch up service (iPlayer) since iPlayer does not make all broadcast programmes available. (This is due to the different rights associated with Terrestrial TV compared with an internet catch-up service)

- Some users wanted fast forward/rewind controls or expected the video to continue from where it was when they closed the object.

- Most users suggested a schedule containing more BBC services (one suggested radio) and over a longer period – say a week or a month.

Stylistic Approach.

- Some Users have clear opinions on the artistic and stylistic aspects aiding user interaction. Suggestions for the EPG included: Colour coding the programmes according to genre, 'it's a bit bland', indicate how much programme remains, indicate if already viewed and run the timeline from left to right like music editing programmes – ' a proper timeline'

- Some Users suggested including adding buttons for each action rather than rely on the selection of the item and right clicking for say 'save'. They would have liked a 'delete this' button for each item (a TV approach) or a check box and 'delete all these' (an email approach) functionality, though there was no overall consensus on this.

- There was a comment on the playback interface regarding using thumbnails on the trailers to help visualize whether they had already seen the programme trailed.

Overall Concept.

- All Users were impressed with the concept and registered a high score for the ease of use (rated 4.6 out of 5) and a high score for 'attractive service' (rated 4.4 out of 5). Some respondents indicated that the PC nature of the viewing experience was the only drawback. A test setup with a home network would have improved their satisfaction in this regard.

- The stylized presentation objects (Eastenders, Celebrity Master Chef and Top Gear) were highly regarded and seen as interesting. There were very positive comments about the integration with the BBC programme website (a link to the programme website as one of the 'extras) and the 'record this' button. In both cases this was seen as aiding the user to carry out tasks that might otherwise have been too demanding for a social domestic environment. At least two respondents commented that they had young babies at home and were easily distracted from more complex tasks.

- Ease of use was also reinforced by comments such 'anyone can do it' and 'even my wife', indicating that there was no obvious perceived barrier to use and a motivation to be interested.

- No one queried the complexity of the setup – requiring broadband and DTV receiver, but maybe with more PCs being packaged with DTV Tuners this is not a shock to the general users.

2.14 Conclusion

The recorder application was well liked and was considered a 'next step' by many of the respondents undertaking the test, with some thinking it was 'obvious' to others who were fascinated by the web support (even though this is already in place), it seemed to help direct people to the correct pages and through the enhancements give a more continuous experience between TV programmes, associated trailers and web support. It also made sense in that it benefitted from the PC style user interaction for recording and also the potential of large scale video playback not associated with internet on-demand streaming or download. One

tester also appreciated the comparative richness of the broadcast schedules compared with an internet catch up service.

It was considered a prototype, not a completed proposition as the player occasionally froze and there were obvious limitations to the design that were highlighted in this report, though some these are more to do with time invested rather than fundamental technology limitations, except perhaps limitations of the SMIL engine that limited some of the desired functionality such as full screen and programme transport

3 Report of Back Office and OMA Gateway Use (TI)

3.1 Showcase description

The showcase developed by Telecom Italia in the AX4HOME activity is an example of 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. <u>for end-users</u>: just browse the music shop, find the favorite track, download it and play it. All DRM-related operations (device registration, license acquisition) are transparent to the end users;
    b. <u>for business users</u> (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 are 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/Mobiles 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 showcase, the AX4HOME Server is the 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 automated production is performed thanks to the usage of the AXMEDIS content processing tools (AXCP tools).

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	• Possibility of creating objects and uploading them on the AX4HOME Content

	Factory • The objects are converted, protected and published automatically on the AX4HOME portal in both AXMEDIS and OMA DRM v2 format.
Technical users	• Possibility of testing the OMA distribution channel by installing the TI certificates on an OMA DRM v2 compliant mobile phone.
End users	• Possibility of testing the Broadband distribution channel using the AXMEDIS player

3.2 Implementation

The showcase is implemented by five AXCP periodic rules running on the AX4HOME Content Factory: A detailed description of the role and functioning of each rule is given in AXMEDIS-DE12-1-6-2-AXMEDIS-4HOME-Final-Success-Story

3.3 Test report

The strategy selected to test the showcase has been dual: on one side, let anybody access and try the showcase by putting it online and collecting comments; and on the other side, perform ourselves a limited number of lab trials. In the following we present the results obtained by the two strategies.

3.3.1 Chronology of events

A detailed chronology of events is maintained in the AX4HOME Web page, which is reachable online at http://ax4home.axmedis.org/. Most notable events are the following:

- August, 2, 2007 – the AX4HOME Content Factory appeared online; no showcase or demo was available at that time, but it was possible to store and retrieve content in AXMEDIS format into/from the AX4HOME data base;

- January 9, 2008 – the OMA Gateway went online. This made it possible to convert content from AXMEDIS format to OMA DCF v2.0 format, but the operation involved manual intervention.

- February 1, 2008 – the Content Factory was upgraded in order to comply with a major modification of AXMEDIS tools and formats that broke compatibility with earlier versions of the Data Base and Web Services.

- March 18, 2008 – the project released version 1.4 of the AXMEDIS Tools. This release was a big step forward compared to the previous version, although it wasn't yet completely stable.

- July 11, 2008 - the AX4HOME "Music shop" showcase (formally named "automated back office management of content for mobile and broadband distribution") went online. All the major issues preventing a stable operation of the AXCP Tools had been solved at that time. The event was announced on an internal mailing list in Telecom Italia, inviting people to test the showcase.

- July 28, 2008 – two online polls were added to the AX4HOME Web page in order to collect opinions on the showcase and on the AXMEDIS Tools respectively.

- August 5, 2008 – collection of feedbacks and results.

3.3.2 Lab trials results

We asked three technical experts to conduct a laboratory test on the showcase and to provide their opinion by filling the AXMEDIS Questionnaire. The people involved in this test were technically skilled but didn't

know anything in particular about AXMEDIS. They performed the "end user" role and one of them also tried the "business user" role, but was surprised to discover that this implied downloading a package of more than 300 MB. In the following we present the anonymous questionnaires as collected after the trial.

3.3.2.1 *Questionnaire 1*

Rate the following quality aspects:	1	2	3	4
Access to demonstrator and user registration processes.	**Very easy**	**Easy**	**Difficult**	**Very difficult**
Demonstrator structure.	**Self-explanatory**	**Good**	**Difficult to understand**	**Very difficult to understand**
Menus	**Excellent to use**	**Usable**	**Difficult to use**	**Very difficult to use**
Graphical user interface (GUI).	**Very attractive**	**Attractive**	**Poor**	**Very poor**
Selecting and navigating a catalogue.	**Very easy**	**Easy**	**Difficult**	**Very difficult**
Contents accessible through the demonstrator	**Very attractive**	**Attractive**	**Poor**	**Very poor**
Contents accessible through the demonstrator	**Very informative**	**Informative**	**Moderately informative**	**Not informative**
Selecting and buying content	**Very easy**	**Easy**	**Difficult**	**Very difficult**
Selecting and buying content	**Very efficient**	**Efficient**	**Moderately efficient**	**Not efficient**
Emerging features and technologies for me are	**Highly relevant**	**Relevant**	**Moderately relevant**	**Not relevant**
Emerging features and technologies for my organization are	**Highly relevant**	**Relevant**	**Moderately relevant**	**Not relevant**
Business potential of the proposed solutions	**Very large**	**Large**	**Moderate**	**Low**
Your experience with the demonstrator	**Very satisfying**	**Satisfying**	**Moderately satisfying**	**Not satisfying**
Overall impression of the AXMEDIS project	**Excellent**	**Good**	**Average**	**Bad**

Please feel free to add any further comment in the text box below:

The player is nice but it doesn't allow to create a play list and it seems slow to react sometimes.

3.3.2.2   Questionnaire 2

Rate the following quality aspects:	1	2	3	4
Access to demonstrator and user registration processes.	**Very easy**	**Easy**	**Difficult**	**Very difficult**
Demonstrator structure.	**Self-explanatory**	**Good**	**Difficult to understand**	**Very difficult to understand**
Menus	**Excellent to use**	**Usable**	**Difficult to use**	**Very difficult to use**
Graphical user interface (GUI).	**Very attractive**	**Attractive**	**Poor**	**Very poor**
Selecting and navigating a catalogue.	**Very easy**	**Easy**	**Difficult**	**Very difficult**
Contents accessible through the demonstrator	**Very attractive**	**Attractive**	**Poor**	**Very poor**
Contents accessible through the demonstrator	**Very informative**	**Informative**	**Moderately informative**	**Not informative**
Selecting and buying content	**Very easy**	**Easy**	**Difficult**	**Very difficult**
Selecting and buying content	**Very efficient**	**Efficient**	**Moderately efficient**	**Not efficient**
Emerging features and technologies for me are	**Highly relevant**	**Relevant**	**Moderately relevant**	**Not relevant**
Emerging features and technologies for my organization are	**Highly relevant**	**Relevant**	**Moderately relevant**	**Not relevant**
Business potential of the proposed solutions	**Very large**	**Large**	**Moderate**	**Low**
Your experience with the demonstrator	**Very satisfying**	**Satisfying**	**Moderaty satisfying**	**Not satisfying**
Overall impression of the AXMEDIS project	**Excellent**	**Good**	**Average**	**Bad**

Please feel free to add any further comment in the text box below:

Unclear why in the registration we receive 2 login/pwd.

Slightly unclear where the download page is located in the referred link.

Unclear what tool a business user must download to create content: AXMEDIS editor and GRID AXCP tools or AXMEDIS Editor, Authoring Tools, MPEG-21 authoring editor?

Player: we submit a request and we get an email with subject "Confirmation of registration to AXMEDIS Portal". At this time it is not clear how we can proceed, until a new email is received (after 1-2 minutes) with the certificate to import. At this time it is not clear that to import the certificate we must use the password we have received in the previous email, because it is not written anywhere. It is not clear why we should use certificate and password for tool certification, as it happens automatically at the selection of a menu command.

It is not clear why we should register once in the main web site and once more in the web page that is automatically opened when we register the user in the player.

Suggestion: change the following

the user registration (you will receive a UserId and a certificate with the associated password);

the tool certification (using the certificate and the password obtained in the user registration);

into

the user registration (you will receive in two separate emails a UserId with an associated password, and a certificate (to be imorted using the password received in the previous email);

the tool certification (just using the command in the help menu);

it is quite annoying to get the following error message, until the next day, even for a demonstrator: <<ERROR: access not granted for play – Authorization failed from the PMS License Server – a license for "play" is missing.>>

3.3.2.3 Questionnaire 3

Rate the following quality aspects:	1	2	3	4
Access to demonstrator and user registration processes.	**Very easy**	**Easy**	**Difficult**	**Very difficult**
Demonstrator structure.	**Self-explanatory**	**Good**	**Difficult to understand**	**Very difficult to understand**
Menus	**Excellent to use**	**Usable**	**Difficult to use**	**Very difficult to use**
Graphical user interface (GUI).	**Very attractive**	**Attractive**	**Poor**	**Very poor**
Selecting and navigating a catalogue.	**Very easy**	**Easy**	**Difficult**	**Very difficult**
Contents accessible through the demonstrator	**Very attractive**	**Attractive**	**Poor**	**Very poor**

Contents accessible through the demonstrator	Very informative	Informative	Moderately informative	Not informative
Selecting and buying content	Very easy	Easy	Difficult	Very difficult
Selecting and buying content	Very efficient	Efficient	Moderately efficient	Not efficient
Emerging features and technologies for me are	Highly relevant	Relevant	Moderately relevant	Not relevant
Emerging features and technologies for my organization are	Highly relevant	Relevant	Moderately relevant	Not relevant
Business potential of the proposed solutions	Very large	Large	Moderate	Low
Your experience with the demonstrator	Very satisfying	Satisfying	Moderaty satisfying	Not satisfying
Overall impression of the AXMEDIS project	Excellent	Good	Average	Bad

Please feel free to add any further comment in the text box below:

(no comment)

3.3.2.4 Summary of results

The following table presents a summary of the lab trial results, where all votes have been accumulated in a single table (1= best result, 4=worst result)

Summary of results (total votes):	1	2	3	4
Access to demonstrator and user registration processes.	1	2		
Demonstrator structure.	2		1	
Menus		3		
Graphical user interface (GUI).	1	2		
Selecting and navigating a catalogue.	3			
Contents accessible through the demonstrator	1	1	1	
Contents accessible through the demonstrator	1	1	1	
Selecting and buying content	3			
Selecting and buying content	1	2		

Emerging features and technologies for me are	1	1	1	
Emerging features and technologies for my organization are	3			
Business potential of the proposed solutions		3		
Your experience with the demonstrator	1	1	1	
Overall impression of the AXMEDIS project	2	1		

3.3.3 Open access results

As explained before, the AX4HOME "Music shop" showcase has been published online on July 11, 2008 and is since then open to anybody to try. On August 5, 2008, after less than one month, we collected the results about user activity that we are presenting here.

3.3.3.1 Number of users

Total number of users subscribed to AX4HOME: 21

This is the number of people that registered themselves at http://ax4home.axmedis.org/home/wp-login.php?action=register in order to get an account on AX4HOME, which is needed to perform the "business user" role and the "technical user" role in the showcase. This registration is not needed in the "end user" role but some users may have confused this with the AXMEDIS user registration which is needed in order to certify the AXMEDIS Player.

Total number of users registered on the Music Shop (broadband version): 10

This is the number of users who at least downloaded the AXMEDIS Player, installed it on a PC, performed the AXMEDIS user registration and tool certification, downloaded an MPEG-21 content object form the Music Shop at http://ax4home.axmedis.org/broadband/ and played it. The first time this results in the automatic registration of the AXMEDIS user in the Music Shop data base. Another (less likely) possibility is that somebody registered himself manually at the Music Shop customer registration link http://ax4home.axmedis.org/broadband/customer.php?action=add

Total number of devices registered on the Music Shop (mobile version): 2

Due to hardware constrains, imposed by the current phone certification policy, only two phones are registered on the mobile version of the Music Shop, which are the two Nokia N91 provided by TI.

3.3.3.2 Online poll results

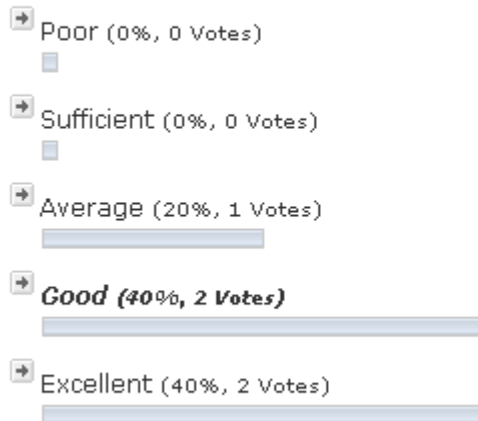*Total number of people responding to the online polls*: 6

This is the number of people that responded to the online polls that were posted online on July 25, collected on August 5 (after 11 days).

Question asked in the polls:
- How is the showcase?
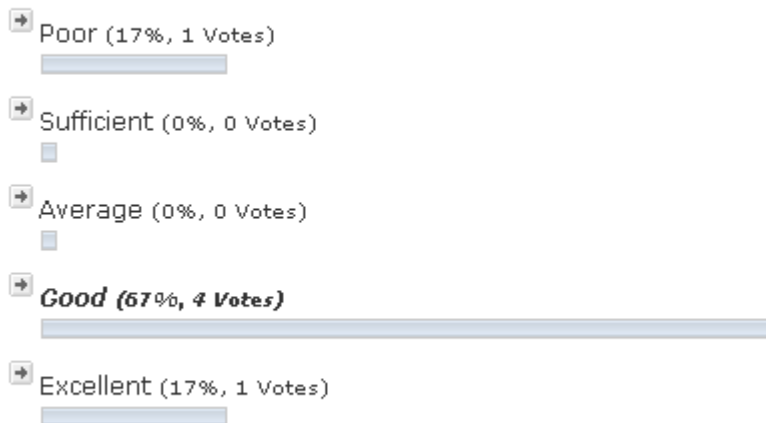- How are the AXMEDIS Tools?

Poll 1 results

How is the showcase?

→ Poor (0%, 0 Votes)
□

→ Sufficient (0%, 0 Votes)
□

→ Average (20%, 1 Votes)
▬▬▬▬▬▬▬

→ *Good (40%, 2 Votes)*
▬▬▬▬▬▬▬▬▬▬▬▬▬

→ Excellent (40%, 2 Votes)
▬▬▬▬▬▬▬▬▬▬▬▬▬

Total Voters: 5

Poll 2 results

How are the AXMEDIS Tools?

→ Poor (17%, 1 Votes)
▬▬▬▬▬▬▬

→ Sufficient (0%, 0 Votes)
□

→ Average (0%, 0 Votes)
□

→ *Good (67%, 4 Votes)*
▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬

→ Excellent (17%, 1 Votes)
▬▬▬▬▬▬▬

Total Voters: 6

3.3.4 Conclusion

The Music Shop showcase went online on July 11 2008, when finally all the major issues preventing a stable operation of the AXCP Tools had been solved, and was announced on an internal mailing list in Telecom Italia. Subsequently, a couple of online opinion polls were added to collect opinions on the showcase and on the AXMEDIS tools; unfortunately, most of the people had already seen the site at that time, and the period of summer vacation was approaching, so just a few votes were collected.

Meanwhile, we conducted the lab trials by asking to some technical experts to test the showcase. The people involved in this test were technically skilled but didn't know anything in particular about AXMEDIS. At the end of the test they were asked to fill a questionnaire and to comment on the showcase. Some further comments were reported verbally. The results were generally positive even though some specific points in the showcase were indicated as possible candidates for further improvement. Among these the most important are:
- The same username/password should be usable in all tools throughout the showcase (single sign on);

- The AXMEDIS registration and tool certification procedure is complex;
- The AXMEDIS Editor does not show a progress bar when uploading content;
- Usage of AXMEDIS Player/Editor behind a corporate firewall needs custom configuration of the tool, while it could use the system configuration;
- The AXMEDIS player shows an unpleasant error message when the user plays a content object for which he has no license.

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4 Report of Use of Rights Ontology API Within AXMEDIS (sDae)

4.1 Recapitulation

The AXMEDIS-4HOME, as an AXMEDIS extension, is made up of a number of components from the AXMEDIS Framework plus new extensions, as described in the document DE12.1.2.1. The AX4HOME Intellectual Property Ontology, called **AxIPOntology**, is one of these extensions.

The use cases the AxIPOntology covers were described in the section 3.4 of the document DE12.1.2.1. They include scenarios of DRM license creation and user actions authorization among others. In particular, the following uses were considered:

- **In the creation model**. At Axmedis Object creation time, PARs[1] are embedded in the object. The ontology should be queried to assert that the User effectively had been registered as a creator, and should be informed that such a User has effectively created such object (when sending the object to the database)
- **At licensing time**. When creating a license, either with the DRM Editor and Viewer application or the ContractManager application, also the Ontology has to be checked and informed. It should be queried to know if the license is valid according to the relations defined in the ontology, and informed if the license is finally uploaded.
- **At consumption time**. When exercising certain rights, a check could be done against the ontology to assure the validity of the operation.

The Specification of the AxIPOntology is given in the section 3.6 of the DE12.1.3.1, "Specification of the AXMEDIS IP Ontology for IP Entity representation – including associated demonstration components". It describes how the ontology has to be elaborated, and a complete API to facilitate the use of the ontology. The API is described defining its classes and enumerating the public methods. Section 4 in the same document describes the AXIPOntology itself.

4.2 Support of the existing business models

The AxIPOntology is the semantic expression of the Intellectual Property Model in AXMEDIS along its value chain. It is far more important than a mere software module; it is a basic strategic keystone establishing the foundations of the Intellectual Property Model, upon which the legitimacy of the income in any media business is based.Therefore, the ontology does not support any Business Model in particular, but rather supports all of them.

In practice, the AxIPOntology becomes real as an OWL Ontology, with a set of limited statements describing the elements of the model and their relations. This model is public and accessible for verification. Furthermore and beyond modeling aspects, practical functions can be built on and/or supported by the OWL.

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[1] A Potential Available Right (PAR) is a license addressed to no one in particular, it comes embedded in an AXMEDIS object and it allows the creator to restrict the licensing modalities over its object.

An important functionality that the ontology can offer is that of certifying that operations of AXMEDIS modules are conformant to the agreed IP model.

4.3 Operation and use of the demonstrator

According to what had been specified, an implementation was done, resulting in the following elements:

- The AXIPOntology, as a server
    - The ontology AxIPOntology itself, an OWL file (see Figure 14).
    - A Java API for an easy access to the ontology
    - A command-line monitor tool, to operate and make basic operations directly on the ontology (see Figure 13).
    - A windows monitor tool, to register and monitor the activity of the ontology by means of tracing the transactions (see Figure 11).
- A demonstrator application to test the application
    - Integration of ontology queries in the ContractManager tool (see Figure 12).

This software was implemented, tested, and demonstrated in the Review on October 2007 in Florence. The next figure is useful for recalling the arrangement:
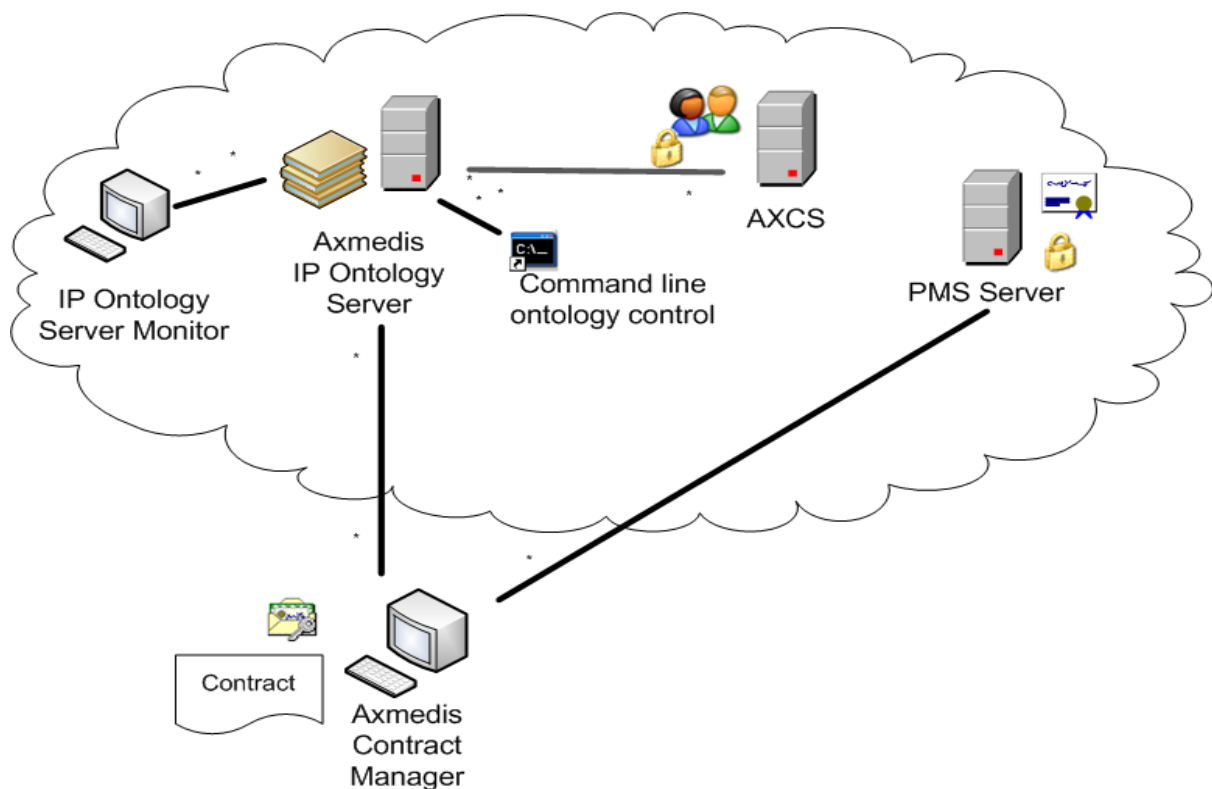
Figure 10. Axmedis IP Ontology Schema

This software is detailed exhaustively in the document DE12.1.4.1, where each software component is described. A more general document, the DE12.1.5.1 describes how to install the applications, to monitor and validate them.
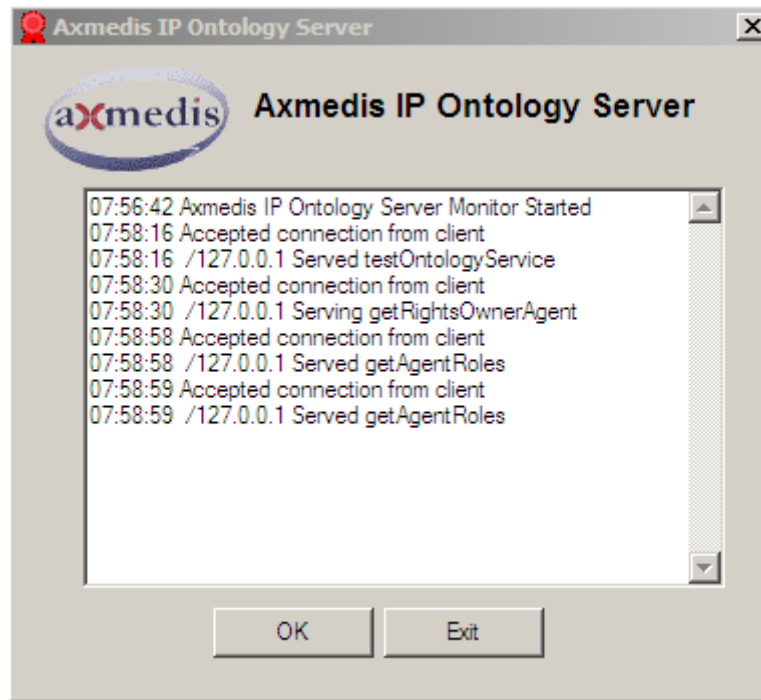
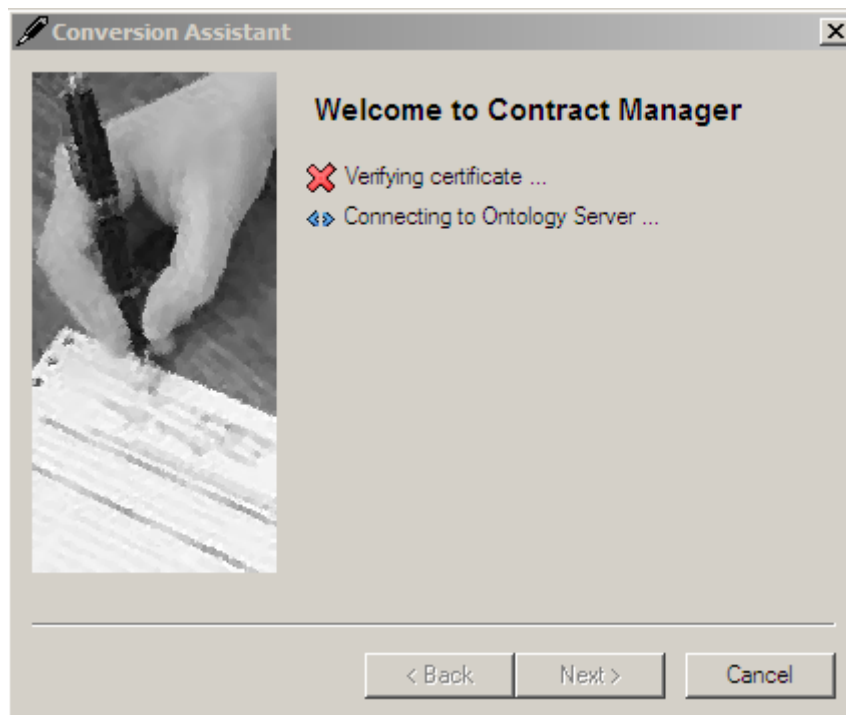**Figure 11. The Axmedis IP Ontology Server Monitor**

Figure 12. The Contract Manager connecting to the Ontology Server

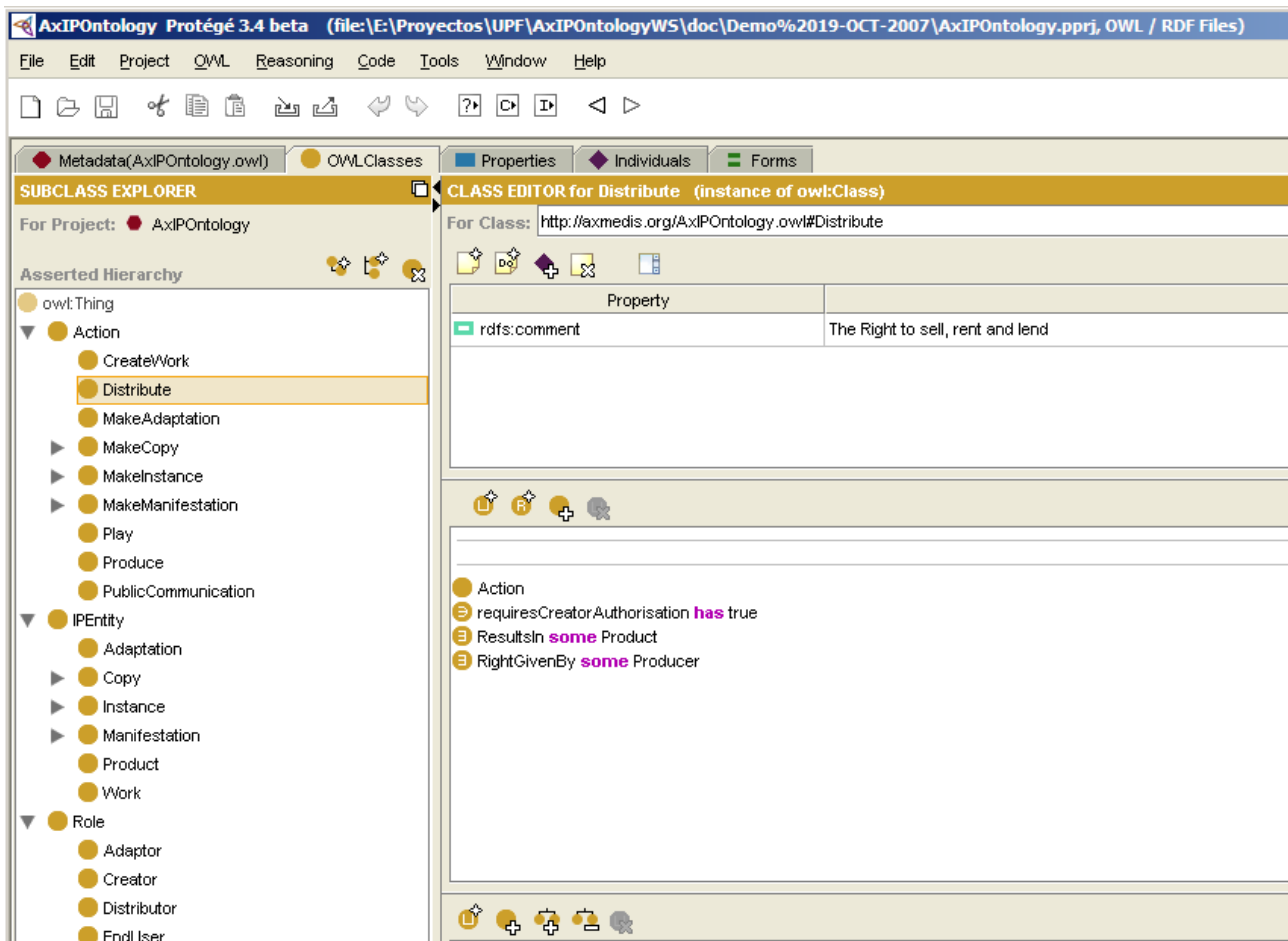**Figure 13. The Ontology Server Command Line application, showing the available commands**

Figure 14. Partial view of the Protègè edition of the AxIPOntology

4.4   Final version of the demonstrator

A final version for the final review will also include the following features:.

- *Use of User and Object Databases*, acknowledging that real users will hold User Databases. The User Database will be a MySQL database accessed via an ODBC connection.

- *The client tool being the Axmedis DRM Editor and Viewer application directly.* This tool has been designed to be easily extendable with additional plug-ins (under the form of dynamic libraries). One of the plug-ins is the contract-based license creation, and other plug-in will be the AXIPOntology support.

- *Use of new services in the AXCV*. New services have been included in the AXCV which allow a better integration between the AxIPOntology and the AXCV. These new functions can be accessed through the PMS Client, which has been conveniently modified for this purpose. In particular, identifiers and descriptive names now can be queried, thus allowing the integration of User Databases.

The demonstrator will be prepared to run the client and server processes in different machines, and a guided tour will be prepared to show the different features of the AxIPOntology and their operation from the AXMEDIS Tools.

5 Summary

This demonstration report has presented the testing and assessment of the main demonstrators within the WP12: AX4HOME activity, namely the running of the AXMEDIS – OMA Gateway from the AXMEDIS Back office from Telecom Italia, and the domestic DTV Recorder application from the BBC. It has given a quantitative analysis of the use of such a system in practice by users including those not associated with AXMEDIS project and in the case of the BBC , assessment by typical home users. These reports also highlight the current limitation of implementation or shortcomings observed by the tests. In particular they draw attention to the perspectives of end users who, whilst presented with functionally correct technology may nevertheless find it at odds with their own perceptions of use and expectations of application behaviour, scope and limitations.

This report has also reflected the testing of the tools utilizing the Rights Ontology developed by sDae which is now integrated into a licence validation tool and runs with a prototype user database.