AXMEDIS

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Automating Production of Cross Media Content for Multi-channel Distribution

www.AXMEDIS.org

Instrument: Integrated Project
Thematic Priority: Knowledge Technologies and Content Creation,
cross media content for leisure and entertainment

Final Report

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1. Executive Summary

AXMEDIS

Automating Production of Cross Media Content for Multi-channel Distribution

www.AXMEDIS.org

Current market trends and, more specifically, end-users needs demand the content industry to reduce prices without reducing products quality. This is where AXMEDIS project comes in to offer novel solutions and new possibilities to provide viable and sustainable e-content based business activities. Production costs can be substantially reduced while retaining (or even improving) product quality. Content providers, aggregators and distributors need innovative tools to increase efficiency. AXMEDIS automates, accelerates and restructures the production (mainly pre and post production) process making them faster and cheaper. AXMEDIS has obtained those results by: (i) reducing content production costs, accelerating the process with automatic content composition / formatting and workflow support tools and solutions, (ii) reducing distribution and aggregation costs, increasing accessibility, thanks to AXMEDIS production language and solutions, P2P platform at B2B level integrating content management systems and workflow, (iii) providing algorithms and tools for innovative and interoperable Digital Rights Management, exploiting MPEG-21, OMA DRM yet overcoming their limits; supporting several business and transactions models. AXMEDIS consortium has created a framework comprising innovative methods and tools to speed up and optimize content production, protection and distribution, and enabling *production-on-demand*. AXMEDIS has opened the access to the framework by means of an affiliation programme, provoking a relevant interest and collecting a number of new affiliated partners. The AXMEDIS framework has included a set of tools for creating and playing AXMEDIS MPEG-21 objects, cross media content with SMIL and/or HTML as presentation layers and any kind of files as essences or resources. The concept of MPEG-21 has been extended with a lot of features by the AXMEDIS team, among them: the AXMEDIS file format, the intelligence of the AXMEDIS content, the related tools to make them usable for the final users on PC, mobiles, PDA, and STBs. AXMEDIS has produced the only available MPEG-21 authoring tools making the difference and identifying a set of problems of the standard and solving a lot of them.

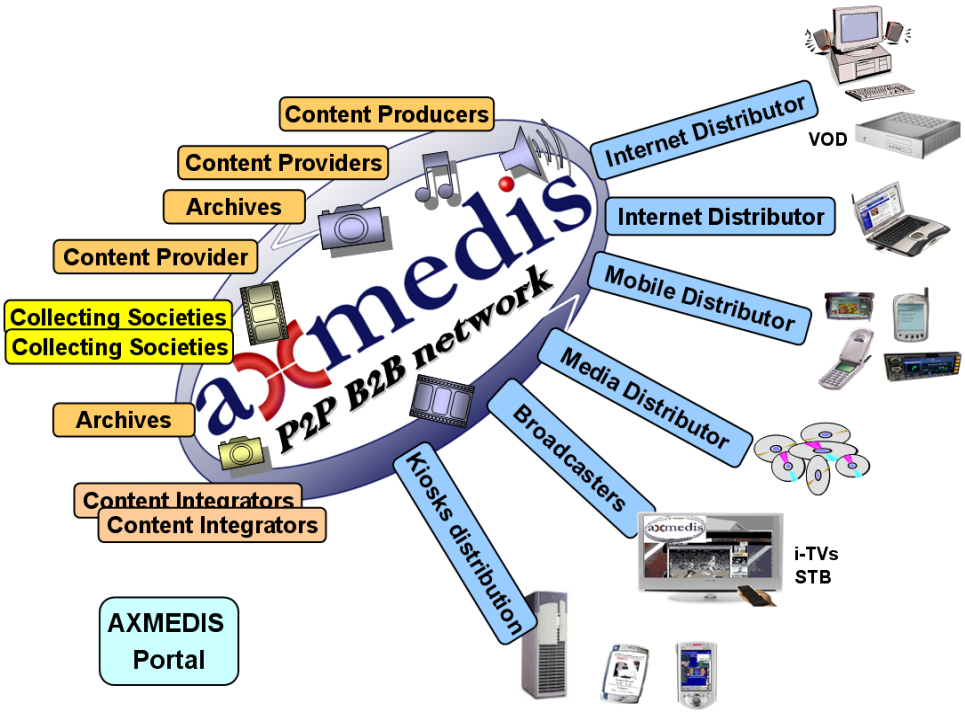
On the basis of the AXMEDIS Framework, AXMEDIS is distributing demonstrators and tools, validated thanks to initiatives managed by leading distributors (partners) in cooperation with end-users and dealing with: (i) tools for content production, protection and B2B distribution; (ii) content production and distribution for i-TV-PC, PC, kiosks, mobiles, PDAs, STB. The most relevant result has been achieved by transforming demonstrators into effective solutions for content production and distribution. Additional demonstrators have been added later in the project duration: AX4HOME and AXELTEO. The project also performed effective activities of: training, management, assessment and evaluation, dissemination and demonstration at conferences and fairs (please see the established

AXMEDIS conference series, published by IEEE Computer Society Press and by the Florence University Press).

1.1 Objectives

Given the above overall aim the main AXMEDIS objectives have been:

- Allowing automating cross-media production and distribution, by supporting interoperability on content, protection (DRM, Digital Rights Management), and distribution, etc., making possible the deployment of solutions for content production on demand; This objective has been reached developing suitable models, languages and tools. The tools can be accessed on the AXMEDIS portal.
- Creation of a common model for interchanging: content, cross media content and components among content providers and distributors, supporting copyright law, interoperability for content formats and DRM models. Safeguarding owners' rights during content production process considering the whole value chain; This goal has been largely solved providing interoperability among PC, STB, PDA, and mobiles. In addition, also among OMA and MPEG-21 DRM.
- Establishing modalities and tools for managing, distributing and sharing cross media content and components among producers, publishers, distributors to reach final users via a multi-channel architecture (including but not limited to i-TV, PC, PDA, mobile phones, Kiosk, STB/PVR, etc.); This objective has been largely solved demonstrating that AXMEDIS model and tools can be suitable used to profitably manage: IPTV, PC distribution, PDA distribution, mobile distribution, satellite in push solution, VOD towards STB, IPVOD, Distribution via Kiosks, etc.
- Deployment of a set of demonstrators with and without DRM and the automated tools for content production and distribution:
    - (i) integration of Content Management Systems with AXMEDIS solutions including P2P framework, see AXMEDIS P2P solution.
    - (ii) accelerating content production, composition / formatting, and P2P sharing at B2B level, see AXMEDIS AXCP tools.
    - (iii) content production and distribution on-demand for i-TV-PC,
    - (iv) content production and distribution for PC,
    - (v) content production and distribution on-demand for mobile phones,
    - (vi) content production and distribution to kiosks and local PDAs,
    - (vii) content production and distribution via IP for STB and/or PC, Video on Demand,
    - (viii) automated content management and protection with MPEG-21 and OMA, related distribution toward mobiles and PC,
    - (ix) automated content production on the final user site recording free on air channel and compounding it with additional contributions (extra content, cover, information, etc.) coming from IP (server or from P2P),
    - (x) managing DRM domains for home content distribution and management;
- Research and develop tools and technologies to make large content collections more accessible to
    - (i) the business market of content integration/aggregation and for
    - (ii) the mass market over several distribution channels.
    - Some of these collections are either in the archives of the project partners;



The AXMEDIS consortium (consisting of leading European digital content producers, integrators, aggregators, and distributors; and also information technology companies and research groups) has created the AXMEDIS framework to provide innovative methods and tools to speed up and optimise content production and distribution, up to the *production-on-demand* capability, for leisure, entertainment and digital content valorisation and exploitation in general.
AXMEDIS format may include any other digital formats and it can exploit and expand: SMIL, HTML, PDF, PS, FLASH, DOC, images, video, MPEG-4, MPEG-7, MPEG-21, as well as many *de facto* standards.

AXMEDIS has deployed a set of tools in the AXMEDIS framework and is now using them for a set of demonstrators operating as real components in activities such as production, protection and distribution organised by the leading distributor partners. This is to achieve and realize a real-life distribution chain validated by the activities of end-users. The demonstrators focus on tools for:

(i) content production, protection and B2B/C2C distribution / sharing;
(ii) content production and distribution to end-users via different channels including interactive TV (i-TV), personal computer (PC), kiosk, mobile, PDA, STB/PVR, and others,
(iii) digital rights management (MPEG-21 and OMA) and control of all the activities regarding the production and the accounting for the DRM.

AXMEDIS already started and is offering assistance and technical support to companies interested in using the developed platform and adopting AXMEDIS solutions, accessing to the so-called AXMEDIS Framework. Presently AXMEDIS has in additional to the following partners a set of Affiliated partners (see http://www.axmedis.org for the list, among them: SIAE (I), FOCUSEEK (I), GESFOR (Spain), PENTEX (I), Albeniz Foundation (Spain), HEXAGLOBE (Fr), RIGEL (I), RAI (I), Telecom Bretagne (Fr), Maat-G (Spain), etc.). To these companies and institutions, AXMEDIS has provided training and demonstration and support maintaining and improving the framework. AXMEDIS has also provided them the opportunity of meet each other at the AXMEDIS conferences and workshops.

1.2 AXMEDIS Consortium

AXMEDIS Partner/Contractor	ACRONYM	COUNTRY
Dipartimento di Sistemi e Informatica, Università degli Studi di Firenze, DISIT Lab.	DSI	Italy
Dipartimento di Italianistica, Università degli Studi di Firenze	DIPITA	Italy
ASSOCIAZIONE DEI FONOGRAFICI ITALIANI	AFI	Italy
FONDAZIONE ACCADEMIA NAZIONALE DI SANTA CECILIA	ANSC	Italy
ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE	EPFL	Switzerland
EUTELSAT S.A.	EUTELSAT	France
FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.	FHGIGD	Germany
GIUNTI INTERACTIVE LABS S.R.L.	ILABS	Italy
HEWLETT PACKARD ITALIANA S.R.L.	HP	Italy
TISCALI S.P.A.	TISCALI	Italy
XIM LIMITED	XIM	UK
ACit - ADVANCE CONCEPTS FOR INTERACTIVE TECHNOLOGY GMBH	ACIT	Germany
SEJER REPRESENTING BORDAS AND NATHAN	SEJER	France
UNIVERSITY OF LEEDS	UNIVLEEDS	UK
THE UNIVERSITY OF READING	UR/IRC	UK
EXITECH srl	EXITECH	Italy
STRATEGICA srl	STRATEGICA	Italy
TISCALI Services	TISCALI	Italy
Universitat Politècnica de Catalunya	UPC	Spain
MBI Srl.	MBI	Italy
British Broadcasting Corporation	BBC	UK
Electronics and Telecommunications Research Institute (Korea)	ETRI	Korea
Peking University, China	PKU	China
Sociedad Digital de Autores y Editores	SDAE	Spain
Telecom Italia	TI	Italy
TEO LT, AB	TEO	Lithuania
Elion Enterprises Ltd.	ELION	Estonia
Kaunas University of Technology	KTU	Lithuania
VRS Grupe, UAB	VRS	Lithuania

1.3 Work Performed

The AXMEDIS framework with all its valuable tools have been completed and many demonstrators of AXMEDIS capabilities have been made accessible and functional 24 on 24, 7 days on 7. In fact, from a scientific and technical viewpoint, the consortium has:

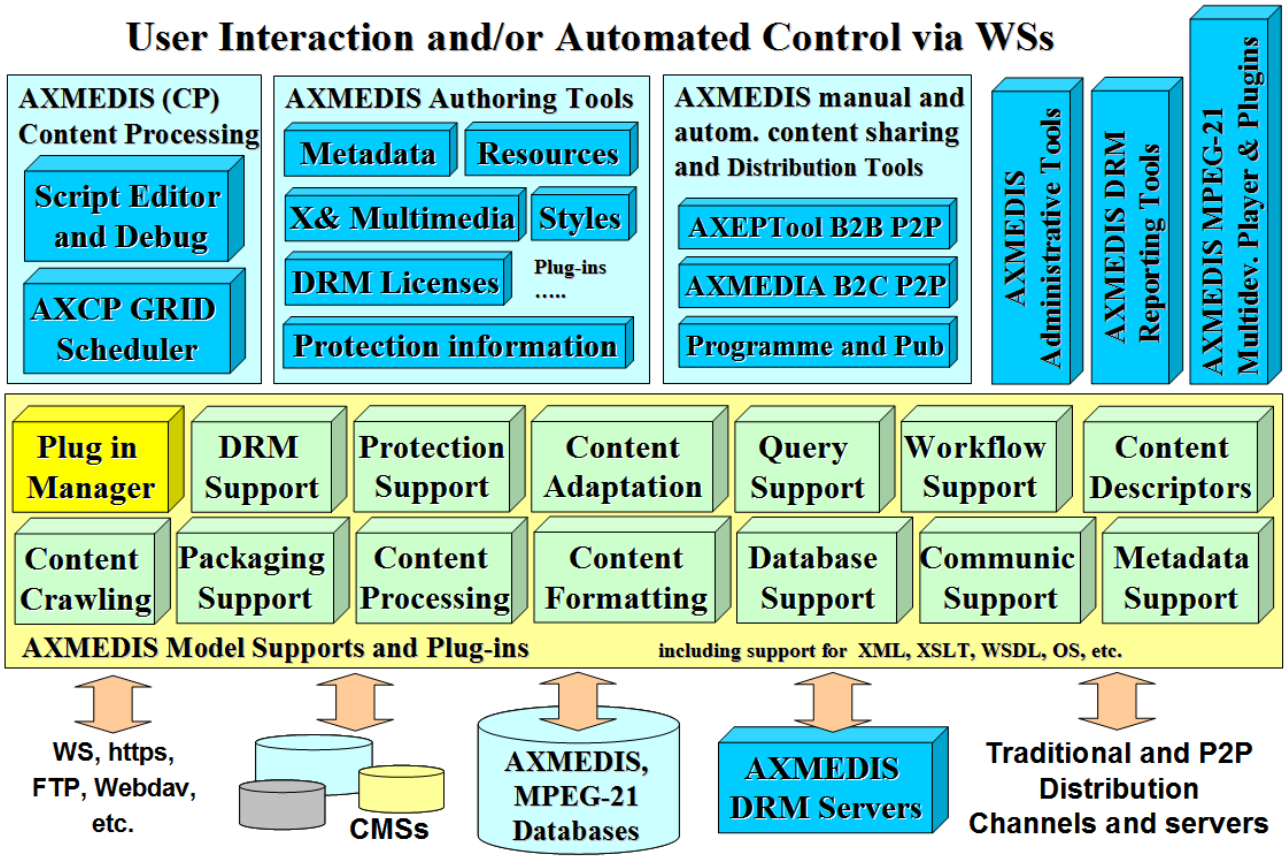
- Completing and validating cross media content model and tools for managing any kind of content model and protecting it with the support of MPEG-21 DRM. The model goes beyond the state of the art of the intelligent content. AXMEDIS Model integrates in a unique model aspects: structure, metadata, classification, semantics, intelligence, content behavior, communication, reactivity, protection, IPR, interoperability, etc.;
- **Development of a set of basic enabling technologies** as a results of the research activity such as: cross media model, protection models and tools, workflow integration, GRID language for cross media content processing, database modeling for MPEG-21 and AXMEDIS, license formalization and DRM interoperability, formatting algorithms based on SMIL descriptors and genetic algorithms, integrated P2P architecture with fast seeding, adaptation and transcoding algorithms and processing tools (for video, audio, documents, and images), multichannel distribution, architecture and tool for AXMEDIS/MPEG-21 editing, architecture and tools for AXMEDIS/MPEG-21 playing with rights enforcement, algorithms and support for protecting complex cross media content, streaming of MPEG-21/AXMEDIS objects, etc.
- **Publication of the specification of AXMEDIS framework for**.
    - AXMEDIS cross media model
    - AXMEDIS editors and tools, workflow, metadata, etc.

    - AXMEDIS content processing area with GRID language for media processing, scheduler, fault tolerant architecture, content processing algorithms, adaptation, fingerprint, communication, access to databases, etc.
    - AXMEDIS P2P network (including AXEPTools, AXMEDIA for P2P clients and related servers),
    - AXMEDIS database and query support
    - AXMEDIS protection models and tools, including the domain management aspects
    - AXMEDIS players and tools for PC, PDA, Mobiles, STB,
    - Programme and Publication Tools, integration with AXMEDIS content processing, and with Satellite distribution
    - Demonstrators of the AXMEDIS framework and platform for distribution and other activities,
    - AXMEDIS database and query support, access to AXMEDIS certifier and supervisor, AXCS, for reporting and statistics
    - AXMEDIS protection models and tools, PMS client and Server, AXMEDIS Certifier and Supervisor, registration, certification of users, certification authority
    - AXMEDIS players and tools, usage of OSMO MPEG-4 and SMIL players (PC stand alone based, PC based on Active X, PC based on Mozilla Plug in, PDA based)
    - AXMEDIS framework and platform Demonstrators
- management of the User Group, collection of questionnaires and usage of them for improving requirements, specification and tools,
- AXMEDIS results and related Exploitation plan, also taking into account the new partners,
- Realization of a spinoff company, namely AxMediaTech, with the aim of exploiting AXMEDIS results: that means to maintain and improve the framework. To this end the AxMediaTech is going to continue the affiliation/licensing programme and will realize some commercial version of some of the major tools.
- **Assessment of project evolution and results**.
    - Identification and usage of metrics and reference parameters to measure work progressed and results achieved in relation to planned work and time schedule,
- **Dissemination and general demonstration, training:**
    - Produced dissemination material (flyer, press cutting, DVD, CD, project presentation, tutorial, video, posters, web pages, etc.) and published them on the web, and distributing them in different occasions, from conferences to fairs and other manifestations,
    - Produced training documentation and material, and organisation and deploy of training courses as tutorial days,
    - Organized the AXMEDIS 2005 conference held in November-December 2005, Florence, Italy,
    - Organized the AXMEDIS 2006 conference held in Leeds, UK, December 2006,
    - Organized the Workshop on Content Production, April, 2007, Rome, Italy,
    - Organized the AXMEDIS 2007 conference to be held in Barcelona, November 2007-,
    - Production and demonstration of several videos for the major AXMEDIS tools, distribution of them via AXMEDIS P2P and on YouTube,
    - Production of 3 special videos for promoting AXMEDIS as interoperable model, automated technical solution for content production and cost reduction solution.
    - Dissemination of results via several conference attendance/organisation, articles submission, development and distribution of supportive dissemination material (CD, DVDs, posters, flyers, etc.)
    - Promotion of the AXMEDIS at IBC2007, with a special WEB page, press promotion, advertising, invitation, production of dissemination material, presentation of major AXMEDIS products,
    - Production of the dissemination report and plan

- Promotion and publication of the demonstrative AXMEDIS cross media finder portal, to also collect user generated content and transform them in MPEG-21 automatically.
- Production of the AXMEDIS show case as DVD including: technical reports, demonstration tools, example of content, technical notes, dissemination material, and videos.

- **AXMEDIS Framework and its demonstration**
  - implementation of AXMEDIS Framework, tools, documentation and components
  - Distribution of a several versions of AXMEDIS tools (they have been downloaded in several thousand from the AXMEDIS portal) for:
    - content production (manual and automated), AXMEDIS Editor, AXMEDIS content production tools, AXMEDIS workflow support
    - content playing, with related AXMEDIS content for demonstration (in AXMEDIS format), AXMEDIS player for PC, WEB, PDA, STB, and Mobiles
    - content protection and DRM, AXMEDIS DRM tools
    - P2P content distribution and sharing, AXMEDIS P2P tools
    - content managing on databases, AXMEDIS database
  - maintenance of a stable AXMEDIS P2P network with the major AXMEDIS partners as supernodes of the network, distribution of content on the stable AXMEDIS P2P network
  - maintenance of AXMEDIS stable services:
    - AXMEDIS User Registration and certification
    - AXMEDIS Tools certification
    - AXMEDIS PMS, for the AXMEDIS DRM licensing
    - AXMEDIS Certifier and Supervisor, for the AXMEDIS DRM
    - AXMEDIS maintenance support for the partners: production, P2P, DRM , etc.
  - Production of a set of documents for promoting the AXMEDIS framework:
    - AXMEDIS for all,
    - user manual of major AXMEDIS tools,
    - user manual of the AXMEDIS content processing GRID java script language,
    - user manual for the P2P network tools,
    - technical notes as white papers, one document for each major tool area and one paper for each demonstrator,
    - cross media finder portal,
    - AXMEDIS tools catalogue,
    - etc.
- **Affiliation programme**
  - promotion of the Affiliation programme
  - acceptance and integration of new affiliated partners, providing them access to the AXMEDIS Framework,
- **Content production and modeling**
  - Production of content production guidelines, and of content for validation of AXMEDIS MPEG-21 tools and distribution channels,
  - Production of content and tools for test and validation, they have been downloaded in many instances from the AXMEDIS portal,
- **Demonstration and AXMEDIS Framework Exploitation**
  - Specification and realization of the demonstrators for multichannel distribution via internet (PC), via kiosks (PC and PDA), towards mobiles, via satellite data broadcast (PC and STB/PVR, media centers), VOD, DVB-T, etc.
- **WEB portal:**
  - Effective AXMEDIS portal with tools to be downloaded, videos, demonstrators, show cases, trials, content, examples, technical notes, etc.,

- Effective Cross Media Finder portal to directly test content production, protection and distribution, with the integrated AXMEDIS player for cross media content on Internet Explorer and/or Firefox Mozilla,
- AXMEDIS Wiki portal for providing promotional documentation about AXMEDIS Framework,
- powerful search engine to provide it to users of the AXMEDIS portal to search into public and/or private documentation,
- Integration of a BLOG for collecting impressions from the public attracted on the AXMEDIS portal,



1.4 Intentions for use and impact of AXMEDIS results:

The AXMEDIS results are mainly exploitable for

- organizing and automating the content back officer activities such as production, pre and post production, transcoding and distribution with the aim of reducing related costs. This result is mainly due to the
  - AXMEDIS Content Processing platform, AXCP GRID, solution, tools and language, reliable solution for content processing, allocation of tasks, integration with workflow management systems such as OpenFlow and BizTalk, etc.
  - Availability of a sufficient number of integrated functionalities into the AXCP language and solution including: content processing, CMS access, transcoding, coders, encoders, communication capabilities, information processing, licensing, gathering, etc.;
- enabling the distribution of content on multichannel architectures and introducing cross media models which enforce more interactivity, flexibility, interoperability and intelligence into the content for the final users. This result is mainly due to the:
  - AXMEDIS cross media model and tools,

    - AXMEDIS players for PC, PDA, STB and mobiles (their customization and reuse in source code for creating other players in other platforms or customized players),
    - AXMEDIS Content Processing platform, AXCP GRID platform, for multichannel content production, adaptation, transcoding, etc., thus for backoffice automation;
- enabling the distribution of content with open and interoperable DRMs and content. This is mainly due to:
    - set and implementation of a fully functioning DRM solution for multichannel based on MPEG-21 but integrating several AXMEDIS solutions: AXCS, PMS, AXMEDIS registration portal, AXMEDIS certification authority, etc.;
    - the improvement of the MPEG-21 and its integration with OMA standards at level of transcoding, transcoding of MPEG-21 into OMA and viceversa,
    - usage of the AXMEDIS Content Processing platform, AXCP GRID solution, for the uniform back office management of DRM supported channels. With the AXCP GRID back office, other different DRM models can be easily added,
    - usage of AXMEDIS DRM tools: certification authority, registration portal, PMS (license server), certifier and supervision, etc.
- enabling the distribution of content via P2P setting up B2B, B2C, C2C and B2B2C models. This is mainly due to the AXMEDIS P2P solution based on:
    - AXMEDIS P2P tools and hierarchical architecture derived from BitTorrent with the possibility of its controllability, insertion of hierarchical solution on BitTorrent, improvement of the BitTorrent protocol,
    - AXMEDIS Content Processing platform, AXCP GRID platform, to control and P2P architecture, publication, downloading, seeding, monitoring, and getting statistical information and reporting;
- AXMEDIS Infrastructure and framework per se accessing to
    - advanced State of the Art on content modeling and tools
    - advanced and improvement of standards solutions,
    - knowledge and tools for content production, protection and distribution,
    - tutorials on content: general aspects and state of the art, content production and protection, on distribution tools, on general AXMEDIS aspects, etc.,
    - experience about the usage of the AXMEDIS solutions and tools from several industrial partners such as TISCALI, ILABS, HP, TEO, BBC, SIAE, ELION, XIM, TI, AFI, etc., plus affiliated partners such as: SIAE, APT, RAI, MAATG, etc.

The project as also exploited the possibility of "affiliating" new partners in project life due course. Presently a number of affiliations have been performed, see www.axmedis.org . The rational for this is that there are many **reasons to get affiliated to AXMEDIS,** which can be summarized as follow:

- *Reduction of costs* for content gathering, processing, production, protection and distribution;
- Saving money in accessing at innovative technologies for content production and distribution, integrated environment;
- Obtaining access to an *open platform* that can be customized for your production, protection and distribution needs, related training and technical material and documentation;
- Accessing to strongly innovative technology to trial it;
- Adopting a standard model (MPEG-21) for content and licenses modeling and thus for inserting DRM in your business;
- Exploiting and trial of new business models;
- Setting up of one-stop service for content protection and DRM set up;
- Acquiring a larger control about content usage;
- Allowing reporting to your business customers which rights are exploited on their content;
- Allowing the management of rights reporting for multimedia products;
- Creating customized players;

- Exploiting capabilities of secure legal P2P distribution;
- Setting up and create a customized distribution channel interoperable with others;
- Setting up some new service (empowering your present solution) on the basis of AXMEDIS technology;
- Establishing contacts with other business partners interested in exploiting similar technology;
- Allowing using a solution that can be safer and more flexible with respect to state of the art;
- Promoting your AXMEDIS based solutions to the AXMEDIS community and the general public and global sector industry via the AXMEDIS dissemination and promotion channels;
- Promoting your AXMEDIS based solutions at AXMEDIS conferences and workshops;
- Contributing to the AXMEDIS Framework is allowing you to continuing accessing to the framework reducing the costs for its accessibility.

For such reasons **research institutions and technology providers** are interested in getting affiliated with AXMEDIS, in more detail, once affiliated it will be possible for them to:

- access at low cost a the whole AXMEDIS framework by means of which several different configurations and solutions may be built to cover the needs of the value chain actors and tested with low effort;
- access at tools based on MPEG-21 standard;
- exploit the AXMEDIS Framework to make business with it for the reasons reported in the above list;
- collaborate with relevant and well known research institutions and companies of the areas, may be defining collaborative projects and strategic commercial goals;
- develop and test new algorithms and tools with respect to the state of the art solutions, in a very easy and cheep manner;
- add new content models and new DRM models and make them interoperable with MPEG-21 and others already in place on AXMEDIS;
- make visible and promote towards other AXMEDIS partners the produced algorithms, solutions and tools that can be used for content processing and modeling and that can be in somehow integrated into the AXFW or proposed on the market. These tools may be provided for dissemination and promotion via AXMEDIS portal as demonstrators with limited capabilities;
- attend AXMEDIS training and tutorial days, access to training material;
- access to mailing list for sharing ideas on the future improvement of the AXMEDIS framework;
- etc.

Demonstrations of AXMEDIS tools and of the whole AXMEDIS Framework are provided at AXMEDIS conferences and workshops, and in other occasions listed on AXMEDIS Portal. The AXMEDIS Framework can be accessed by following the Affiliation programme.

2. Project objectives and major achievements

Current market trends and, more specifically, end-users needs demand the content industry to reduce prices without reducing products quality. This is where AXMEDIS project comes in to offer novel solutions and new possibilities to provide viable and sustainable e-content based business activities. Production costs can be substantially reduced while retaining (or even improving) product quality. Content providers, aggregators and distributors need innovative tools to increase efficiency. AXMEDIS automates, accelerates and restructures the production (mainly pre and post production) process making them faster and cheaper. AXMEDIS has obtained those results by: (i) reducing content production costs, accelerating the process with automatic content composition / formatting and workflow support tools and solutions, (ii) reducing distribution and aggregation costs, increasing accessibility, thanks to AXMEDIS production language and solutions, P2P platform at B2B level integrating content management systems and workflow, (iii) providing algorithms and tools for

innovative and interoperable Digital Rights Management, exploiting MPEG-21, OMA DRM yet overcoming their limits; supporting several business and transactions models. AXMEDIS consortium has created a framework comprising innovative methods and tools to speed up and optimize content production, protection and distribution, and enabling *production-on-demand*. AXMEDIS has opened the access to the framework by means of an affiliation programme, provoking a relevant interest and collecting a number of new affiliated partners. The AXMEDIS framework has included a set of tools for creating and playing AXMEDIS MPEG-21 objects, cross media content with SMIL and/or HTML as presentation layers and any kind of files as essences or resources. The concept of MPEG-21 has been extended with a lot of features by the AXMEDIS team, among them: the AXMEDIS file format, the intelligence of the AXMEDIS content, the related tools to make them usable for the final users on PC, mobiles, PDA, and STBs. AXMEDIS has produced the only available MPEG-21 authoring tools making the difference and identifying a set of problems of the standard and solving a lot of them.
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2.1 State of the Art

There exists a large number of content formats that ranges from the simple files/resources/essences such as documents, videos, images, audio, multimedia, etc. to integrated content models such MPEG-21, MXF, MHP, NewsML, SCORM/IMS, MPEG-4, and proprietary formats such as Macromedia, Adobe, etc. Most of these formats try to offer advanced experiences to the final users. Some of them wrap different kinds of digital resources/files in a container/package with their related information (e.g., content metadata and descriptors, relationships among resources, etc.) and they make such resources ready for delivery (streaming and/or downloading), in plain (clear-text) and/or protected forms. The presentation layer and user interaction are formalized with specific formats such as: SMIL, HTML, MHP, MHEG, Laser, Java, SVG, BIFS, etc. The metadata are frequently defined together with content Id codes. Among the metadata: Dublin Core, TVAnyTime, MPEG-7, etc. and among the id codes, ISBN, ISAN, ISRC, ISMN, etc. The content behavior is in few cases formalized in Java and/or JavaScript.
Among the standard formats, MPEG-21 is focused on the standardization of the content description related to digital rights management aspects [Lee, et al., 2003], [Nesi at al., 2006, DMS]. AXMEDIS is an extended version of MPEG-21 proposing content packing and integrating presentation aspects in HTML, FLASH and SMIL. SCORM is a comprehensive standard for the organization and delivery of learning packages. The MHP enables the reception and execution of interactive, Java-based applications on a TV-set. Interactive MHP applications can be broadcast together with audio and video streams. The applications can be on information services, games, interactive voting, e-mail, SMS or shopping. MXF has been designed as an exchange format and to address a number of problems of non-professional formats. MXF has full timecode and metadata support, and it is intended as a platform-agnostic stable standard for future professional video and audio applications.
Among the most relevant European Commission research and development projects in the field, we have posed the attention on those mainly focused on intelligent content such as: ACEMEDIA [http://www.acemedia.org/aceMedia], X-MEDIA [http://www.x-media-project.org], SALERO [http://www.salero.info/en/project/index.html], and LIVE [http://www.ist-live.org]. ACEMEDIA defined a new format of content to enable creating personalized content collections. X-MEDIA

project and content models are mainly focused on semantic aspects in content that can be managed by ontologies and RDF. X-Media is mainly oriented towards knowledge management and sharing with limited application to text and image contents and has related content objects with very limited autonomy of work that are not proactive with the user. SALERO aimed mainly to cross media-production for games, movies and broadcasting. LIVE project content is focused on semantic based description of live content for streaming and broadcasting.
Other models for intelligent content are EMMO e KCO. EMMOs (Enhanced Multimedia Meta Objects) [Karim at al., 2003] encapsulates relationships between multimedia objects and maps them into a navigable structure. An EMMO contains media objects, semantic aspect, associations, conceptual graphs, functional aspect. KCO, Knowledge Content Objects, is not a package [Behrendt et al, 2005], and it is based on the DOLCE foundational ontology and have semantic aspects to describe the properties of KCOs, including raw content or media item, metadata and knowledge specific to the content object and knowledge about the topics of the content (its meaning). The semantic information in a KCO includes: content description; propositional description (Semantic Description and Content Classification); presentational description; community description (the purpose); business description (the trade, price…); trust and security description, self description (the structure). These last models are less powerful with respect to the above mentioned models while they present descriptors that may be used for a more powerful classification of these objects.

	Format	Interactivity	distribution	Devices
DVB (T, S, H)	Video, MPEG2, MPEG4, MHP, etc.	Low	Streaming	STB, PC, Mobile
IPTV, WEBTV	Video, MPEG2, MPEG4, MHP, etc.	Low-Medium	Streaming	PC and in some cases STB
P2P	any	any	P2P	IP based
WEB on IP	Any, mainly single files	Any, html based	Download and progressive download	IP players on Browsers
UMTS/GPRS	Audio, video, OMA based	low	RTPS	mobile
Social Networks	Video, images	Absent on content	Progressive, download	IP players on Browsers
Mobile	Flash, Java	Local side, even quite high	download	Mobiles smartphones

The market of digital content is rapidly changing. Users are becoming more interested in using more interactive and intelligent content, that example can:

- include/describe/package several kinds of media (audio, video, games, documents, etc.), reproducing in a single digital object the interactivity and much more powerful entertainment capabilities than DVDs;
- provide enhanced interactivity such as navigating and selecting content elements to be played, making queries into the content elements, reacting to user commands and changes, providing annotations, etc.;
- be exchanged and distributed among different devices/tools: PC, mobiles, smart-phones, STB/PVR, HDR, PDA, game station, etc.;
- be obtained from several different interoperable distribution channels based on Internet, P2P, wireless mobile, satellite and/or terrestrial networks, etc.;
- change content behaviour according to the context and/or to the user profiles, context, device capabilities, etc.;

- protect and manage the IPR, that means that the content format has to support some DRM model and that this support a set of business models, for example: renting, pay per play, subscription, advertising, etc.;
- be stored in media centers to be redistributed to other devices;
- present some autonomy of control, asking to the user to provide information and data;
- provide autonomous capabilities for example to create an electronic guide, to issues content usage licenses, ask at the user to provide content, etc.;
- be personally produced at home and/or shared in the network.

These new forms of content and content usages can be fully exploited for digital content distribution, and are opening paths for a larger set of new applications and markets beyond the limitations of the physical media. With AXMEDIS the combinations of digital content formats and digital distribution channels are creating new applications including: user content, shared content, IPTV, DVB, VOD, POD, WEBTV, etc., for PC, PDA, mobiles and STB/PVR. Recent distribution models have been enabled by a set of new technologies grounded on content formats, content processing and adaptation capabilities, content protection models and solutions, hardware capabilities, and new solutions for Digital Rights Management, DRM.

The new trend is to substitute the MHP or other format for presentation with more standard and portable formats such as HTML, see for example the Alcatel Lucent solution. AXMEDIS in this sense has already advanced the market. The market of Alcatel Lucent solution is presently limited to big Hotels and communities. On mobiles the market is moving to more interactive models. The present solutions are not interactive enough and the interactivity is limited to local applications in Java or Flash.

The state of the art of content modeling composition, formatting, protection and management is grounded on content formats. Presently there are a large number of content formats that ranges from simple files: documents, video, images, audio, authoring, etc., to integrated content models and packages such as MPEG-21, MXF, IMS SCORM, NEWSML. AXMEDIS has moved the state of the arts beyond the limitation of these models in terms of:

- modeling of cross media content integrating audio visual content, MPEG-4, HTML, SMIL, FLASH, SCORM, etc.,
- managing at level of an integrated content management systems among several leader companies in the sector. Allowing the sharing of content and the automatic accounting and DRM. In this area no P2P applications for integrating Content management systems have been proposed for B2B applications. This is a totally new action that also include technical queries integrating content aspects, legal, DRM, and technical aspects.
- formatting aggregated content to quickly produce complete and integrated content according to formatting style description based on SMIL and potentially extendible to other formats. This is the first step for the deployment of *production on demand.*
- combining, Transcoding/adapting and formatting, and profiling for accelerating and automating as much as possible the production process protecting complete objects and components with the usage of DRM rules and licensing information. This will allow to process right automatically on the basis of the contracts.
- studying and realizing tools for content production and usage/play in MPEG-21.

DRM provides support for defining and implementing any business and transaction models. DRM is a key issue for the real deployment of multimedia content distribution and e-commerce. One valid approach to achieve this deployment is to exploit standards allowing interoperability of solutions among different DRMs. MPEG is one of the international standardization initiatives that are trying to

take this path. Although currently several solutions for content distributions are available (Microsoft DRM, Media Commerce Suite of Real Network, EMMS of IBM, Liquid Audio, DMD Secure, Soudwrap, Sealed Media, Intertrust, DMOD, CAS, DVB CMCP, etc.), they do not seem to be fully accepted by the general public.

MPEG is not the only effort for interoperability. There are many other consortia working in the field, in most cases oriented towards a particular application area or market sector. Examples are OeBF, DVB, Open Mobile Alliance (OMA), OASIS, IEEE/LOM, CEN/ISSS, etc., just to mention a few of them. It is worth noting the initiatives in the area of rights expression languages, such as XrML (eXtensible Rights Markup Language) – the basis for MPEG-21 REL –, ODRL (Open Digital Rights Language) or LicenseScript.

AXMEDIS content format supports from simple files to complex collections of multimedia for a large range of applications, from business to business to personal and/or global scale production, protection and distribution, with and without DRM. AXMEDIS format and solution can be used:

- for describing and/or packing and may be protected any kind of digital content, with standard, custom and extended metadata;
- for cultural heritage valorisation and distribution, educational and infotainment content: lessons, coursewares;
- for content distribution: VOD, IPTV, WEBTV, etc.;
- for modelling content for PC, PDA, P2P, Kiosks and mobiles with interactive parts;
- as intelligent content having the possibility of defining the internal business model and actions on the content itself, dynamic modelling of content behaviour;
- as interchange content format, wrapping any kind of files, including SMIL, HTML, FLASH, MXF, etc., for safer audio/visual sharing;
- for sharing content among B2B actors of the value chain, in protected and non protected versions;
- for leisure and entertainment content: video, TV, games, etc.;
- for distributing and protecting governmental, military, clinical information;
- for packaging, protecting and distributing newsML;
- for creating audio guides for PDA and mobiles
- for producing content with advertising (customized and/or real time personalized advertising inside the package or linked to outside);
- for producing and delivering personalized content inside the package or linked to outside;
- for managing personally produced content from final users and customers;
- to provide multichannel experience and distribution: different content on different channels at the same time for multichannel experience of the user.

The above mentioned scenarios and many others can be realized thanks to AXMEDIS technology and tools of: AXMEDIS content format, DRM, controlled P2P, and Content Processing, see AXMEDIS Technical Notes http://www.axmedis.org/documenti/documenti.php

The results have been obtained by realizing an open solution integrated in the production process (back office supported by AXMEDIS Content Processing tools and workflow) of any content provider, aggregator or distributors. AXMEDIS solution overcomes the problems and allows integrating solutions to manage multi-channel distribution by inserting it into the post-production phase.

2.2 General Project Objectives

AXMEDIS aims to meet the challenges of market demand by (i) reducing costs for content production and management by applying different technologies (e.g., content representation, content processing (GRID based architecture and language, adaptation, fingerprint, etc.)) and workflow; (ii) reducing distribution and aggregation costs in order to increase content accessibility with a P2P

platform at B2B level, which can integrate content management systems and workflows; (iii) developing and providing new methods and tools for innovative and flexible DRM, including exploiting MPEG-21 and OMA, overcoming its limitations, supporting different business and transaction models including domain management.

The AXMEDIS format has a set of capabilities that permit its usage as intelligent content. AXMEDIS format extended the MPEG-21 format with a set of features, which can be mainly listed as: file format, package, extended processing, metadata, descriptors, and tools. This advanced aspect is clarified in the following paragraphs in which the above mentioned main features are listed and commented.

The structural aspects are modelled in AXMEDIS format by using the MPEG-21 DI, DIDL. According to AXMEDIS any kind of digital essences/files can be enforced into the package including: metadata files, presentation information, descriptors, annotations, and JavaScript methods. Regarding structural aspects, cross media formats are those that may contains other essences, for example AXMEDIS, SCORM, MXF, etc. In some cases, they can be also managed as groups of files, such as HTML, SMIL. The structure has to allow the navigation, the creation of nesting levels and the direct access to the resources via links and references. The structural complexity is a problem for the content distribution and usage since multiple and non linear paths are not simple to be accessed in real time when played, neither simple to be streamed.
In AXMEDIS, a set of identification and classification **metadata** are provided for defaults. They consist of an instance of Dublin Core, the so called AXInfo, plus one or more identification codes such as ISBN, ISAN, ISMN, etc. The AXInfo is a set of metadata used to manage the AXMEDIS life-cycle (Object Creator, Contributors, Object Owner, Object Status, Potential Rights that can be acquired on the content, etc.) The AXMEDIS model is extensible since it allows adding any kind of additional metadata file in XML or other formats, RDF, or other. This allows modelling the knowledge and representation for an efficient data search and indexing. Each AXMEDIS objects is uniquely identified with its AXOID, that it is also used for the issue of licenses. **Descriptors** may be freely included into the AXMEDIS content package and referred to internal essences. So that the indexing and the semantics search can be performed also on these content formats and models. Descriptors may be formalized in MPEG-7 or in direct XML.
An AXMEDIS intelligent content may have multiple **presentational** models in the same package. For example it may alternate HTML, XML, SMIL, MPEG-4 and FLASH in dominating the main canvas the AXMEDIS player. This aspect is not dependent of MPEG-21. HTML and other XML formats may have dependencies with respect to style sheets and digital essences (text, video, audio, image, etc.) directly hosted into the AXMEDIS package. The rendering and animation capabilities of AXMEDIS are those of the above mentioned presentation formats, but can be easily extended to other formats such as MHP, SVG or DVD by using suitable renderers. In AXMEDIS tools presentation layers such as SMIL, HTML, and FLASH may put in execution AXMethods written in JavaScript for activating behavioural actions allowing to inspect and modify the content structure (e.g., add new resources), control the resources rendering, perform calls to webservices, etc.
The interaction aspects in the AXMEDIS model are delegated to the presentation layer. Interaction implies the definition of actions to be performed on the basis of the user actions. Typical stimulus for user actions can be button pressings, mouse movements, text input, voice, etc. Also multimodal input may be arranged for 3D navigation or other purposes. HTML has an interactivity that typically is closed on server, for example with the forms, or calling other pages. The user provides some input that is passed to the server or managed on client side by some JavaScript, java applet or as a limit Active X or plug in. SMIL has a limited interactivity mainly related to client side. The interactivity of AXMEDIS objects can be a both client and server side, but also object/package side. This means that when a link is clicked the next page may be loaded from the AXMEDIS package itself, and when a form is provided, the input can be read/managed by the AXMEDIS object intelligent. This allows to pass parameters from one essence to another and to create sophisticated user generated content.

AXMEDIS **distribution** has been particularly developed. AXMEDIS content can be downloaded, streamed or progressively downloaded. For the download, AXMEDIS has no limitations while for the real time playing during streaming and/or progressive download the AXMEDIS objects should be simpler. For example, on PC the AXMEDIS objects containing metadata, descriptors and an audiovisual essence can be streamed on an MPEG-2 TS. AXMEDIS objects with simple SMIL and audiovisual can be also played in real time on the AXMEDIS Mobile and PC player. On mobiles the AXMEDIS complex content with nesting levels have to be decomposed into multiple objects to be played while distributing. In all these cases, the AXMEDIS DRM based on MPEG-21 REL is functional.

The File format of AXMEDIS can be either binary or XML. This possibility is also present for AXMEDIS protected objects. XML AXMEDIS objects have the extension ".AXM", while the binary format has the extension ".MP21". When an AXMEDIS object is saved in XML format the resources are coded in base 64. XML version of the AXMEDIS content is not suitable to be streamed or accessed in fast manner. The binary version is optimized and coded on the basis of the ISOMEDIA standard. The AXMEDIS binary format includes the packaged digital files in binary and a table to the fast access to them.

The DRM in AXMEDIS includes also protection solutions with authentication and certification. AXMEDIS protection model fully support the AXMEDIS complex structure with nesting levels and can support multiple and nested protection models. AXMEDIS DRM allows defining licenses with multiple rights and conditions according to MPEG-21 REL standard.

The behavioural aspects are covered in AXMEDIS allowing to code the business logic intelligence with JavaScript, as described in Section 5. In AXMEDIS, p**rocessing capabilities** are an integrated part of the behaviour and are inherited from the backoffice AXMEDIS Content Processing, AXCP, which include transcoding, filtering, conversions, and many others.

In AXMEDIS Links and relationships among the elements are formalized to allow accessing from HTML, FLASH and SMIL presentations files to internal essences that used for composing the presentation layer. An internal hyperlink model/protocol is used to navigate through the object and access unambiguously from a link potentially any content essence element. The AXMEDIS model allows to link local and remote files via URL and also elements that are located into the AXMEDIS MPEG-21 package. In addition, the AXMEDIS links allows activating the AXMethods that implements in the Extended JavaScript the behavioural aspects from SMIL, HTML, FLASH and other AXMethods; thus creating new non linear paths and/or new behaviours into the intelligent content.

AXMEDIS organizes and realizes several *demonstrators,* which have been

- managed by industrial project partners,
- to bring different types of digital contents (such as music, video/film, educational materials, documents, images, programmes, etc)
- via different distribution channels (such as the Internet, DVB-S, DVB-T, DVB-H, P2P, etc)
- towards different players (such as PC, PDA, Mobiles, STB, etc.) and
- according to different business models: VOD, POD, pay per play, subscription, etc.

These demonstrations have highlighted the innovative results of the AXMEDIS platform in a variety of activities including content production, automated formatting and distribution (protected or unprotected), towards i-TV, mobiles, kiosks, Internet for PC through mechanisms of Business-to-Consumer (B2C, Client Server) and Peer-to-Peer (P2P). Furthermore, the AXMEDIS P2P network has been set up to allow content sharing among the main content actors of the value chain at B2B level and integrated also with the consumer level.

Along the project duration, several training events has been organized to diffuse and provide better understanding of AXMEDIS models, technologies and solutions. Business delegates have attended these events. The interaction with them has also influenced the definition of requirements and of the

tuning of the detailed objectives of AXMEDIS. Special training sessions and courses have been held for managers, content managers, content producers and integrators, and digital content distributors. Workshops and courses have been organized in several venues in Europe. To provide better understanding of the new solutions, AXMEDIS is providing a forum for discussion, with technologists and experts who are ready to assist with any AXMEDIS related problems and concerns. Furthermore, with AXMEDIS portal, access is provided to a substantial pool of information and examples of technical solutions, digital contents, software components and systems, technical documentation, tools, videos, examples, which are provided by the project partners from the very beginning of the project.

The ***main*** objectives of the AXMEDIS have been:

- **To reduce the costs of cross media production** by accelerating the production process with several techniques for:
    - increase efficiency in content production, together with the validation of such solutions, e.g., GRID based content processing language;
    - composing, integrating, indexing, aggregating and formatting digital contents, according to simple rules or complex styles (e.g., SMIL, styles, SMIL template, optimization of formatting parameters with Genetic Algorithms, etc.);
    - defining and activating automatic rules or customized ones, in order to compose, integrate, index, aggregate and format digital contents (e.g., production of rules as script language for GRID and allocating them on scalable infrastructures);
    - integrating computer systems for content management (Content Management System, CMS) with distribution system and workflow management by automating the communication of content and information among systems (e.g., integration of crawling, direct access to databases with several protocols directly from the AXMEDIS content processing GRID environment);
    - Managing the workflow, both internally and externally, for the production of digital contents;
    - automating the production process, enabling on demand content production, in real time and upon request, custom activation of GRID processing rules, management of profiling;
    - protecting and controlling the use of digital contents, in a scheduled and automated manner, support for the DRM at B2B and B2C;
    - Supporting the standardization process and contributing to the development of MPEG-21.

With the enabling of the "automatic content" and on-demand production, it is estimated that the reduction of production costs will be around 30%. It is expected that AXMEDIS solutions will be adopted by producers, aggregators and distributors with recognized well-known expertise and background.

- To reduce the costs of **distribution** at the Business-to-Business (B2B) level (e.g., among editors, content producers, aggregators and digital content distributors, small and independent market actors, professional organization, companies for DRM, etc.), as well as, at the B2C level (e.g., between distributor and end-user). This is to be achieved through:
    - an infrastructure for content distribution at B2B level. The distribution platform is based on a complete model of P2P (being supported by a set of software instruments and a front-end called AXEPTool/AXMEDIA). The AXMEDIS P2P platform allows the distribution and exchange of digital contents in a controlled manner. AXMEDIS P2P network is the ideal environment for activities like technical search (for example performing queries based on the licensing aspects), integration and production of complex digital contents.
    - content distribution for the general public (B2C) through a multi channel system such as i-TV, Internet, mobiles, PDA, kiosks, P2P, STB, PVR, etc.

- quick and easy access to cross media collections and related technical information for the commercial exploitation of contents, including format information, legal information, Digital Rights Management (DRM), costs, accessibility, integrative, capability (integrability) etc.
- access to trial versions of digital contents for demonstration and/or promotional purposes and for testing their usage with other digital products.
- defining models for the production and the automatic re-distribution of contents.
- managing and monitoring of workflow using the AXMEDIS Workflow Management tool, related to the contents within the AXMEDIS environment.

Each and every actor in the production and distribution chain (value chain) of digital contents can benefit from taking part in the management and sharing of contents through the AXMEDIS AXEPTool.

- **To search for and integrate objects and components** through a query support system using technical parameters such as costs, license type (PAR), file type, duration, format, fingerprint, language, level of protection provided, content information, classical metadata, etc. Research can be integrated within the following areas:
  - client content management systems (CMS), via crawler;
  - AXMEDIS complex objects and models;
  - client archives made of AXMEDIS objects, MPEG-21;
  - archives of AXMEDIS objects belonging to project partners and being connected each other via the AXMEDIS P2P AXEPTool;
  - a part of the client AXMEDIS objects' archive, being made available to end-users for content on demand.
- **To manage and monitor content distribution** through
  - Formal models of contracts in terms of Digital Rights Management (DRM), using MPEG-21 or some other possible AXMEDIS evolution; content exploitation reporting in an integrated way, always consistent with the client models;
  - Digital content protection through DRM models and their integrative capability (for instance: MPEG-21, OMA, Windows Media, etc.), using techniques such as encryption, fingerprinting, etc.;
  - Continuous tracing of any operation performed on contents (for example: printing, copies, play, etc.), regardless of the distribution model used, and yet integrated within it, based on markers and control engines, to understand better how such AXMEDIS contents are being used;
  - Registration and certification of distribution and fruition tools, monitoring the access to the contents, watermarking models and encryption systems, integrated within all distribution models.

AXMEDIS objectives have been achieved by producing and integrating research results, algorithms and tools for content production and distribution, thus supporting the adoption of the new AXMEDIS technologies by major companies and SMEs involved into the consortium and reached with the affiliation programme. AXMEDIS platform has been made available from the very beginning of the project, for industrial groups and research institutions via affiliation. The AXMEDIS new technologies offer a higher level of integration capability with other standards in the market allowing their exploitation in a large set of distribution solution also the forthcoming: IPTV, DVB-H, WEB-TV, social networks, etc.

3. AXMEDIS Content model and tools

The market of digital content is rapidly changing. Users are becoming more interested in using more interactive and intelligent content, that example can:

- include/describe/package several kinds of media (audio, video, games, documents, etc.), reproducing in a single digital object the interactivity and much more powerful entertainment capabilities than DVDs;
- provide enhanced interactivity such as navigating and selecting content elements to be played, making queries into the content elements, reacting to user commands and changes, providing annotations, etc.;
- be exchanged and distributed among different devices/tools: PC, mobiles, smart-phones, STB/PVR, HDR, PDA, game station, etc.;
- be obtained from several different interoperable distribution channels based on Internet, P2P, wireless mobile, satellite and/or terrestrial networks, etc.;
- change content behaviour according to the context and/or to the user profiles, context, device capabilities, etc.;
- protect and manage the IPR, that means that the content format has to support some DRM model and that this support a set of business models, for example: renting, pay per play, subscription, advertising, etc.;
- be stored in media centers to be redistributed to other devices;
- present some autonomy of control, asking to the user to provide information and data;
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- be personally produced at home and/or shared in the network.

These new forms of content and content usages can be fully exploited for digital content distribution, and are opening paths for a larger set of new applications and markets beyond the limitations of the physical media. With AXMEDIS the combinations of digital content formats and digital distribution channels are creating new applications including: user content, shared content, IPTV, DVB, VOD, POD, WEBTV, etc., for PC, PDA, mobiles and STB/PVR. Recent distribution models have been enabled by a set of new technologies grounded on content formats, content processing and adaptation capabilities, content protection models and solutions, hardware capabilities, and new solutions for Digital Rights Management, DRM.

3.1 AXMEDIS Content Model Applications

AXMEDIS content format supports from simple files to complex collections of multimedia for a large range of applications, from business to business to personal and/or global scale production, protection and distribution, with and without DRM. AXMEDIS format and solution can be used:

- for describing and/or packing and may be protected any kind of digital content, with standard, custom and extended metadata;
- for cultural heritage valorisation and distribution, educational and infotainment content: lessons, coursewares;
- for content distribution: VOD, IPTV, WEBTV, etc.;
- for modelling content for PC, PDA, P2P, Kiosks and mobiles with interactive parts;
- as intelligent content having the possibility of defining the internal business model and actions on the content itself, dynamic modelling of content behaviour;
- as interchange content format, wrapping any kind of files, including SMIL, HTML, FLASH, MXF, etc., for safer audio/visual sharing;
- for sharing content among B2B actors of the value chain, in protected and non protected versions;
- for leisure and entertainment content: video, TV, games, etc.;
- for distributing and protecting governmental, military, clinical information;
- for packaging, protecting and distributing newsML;
- for creating audio guides for PDA and mobiles

- for producing content with advertising (customized and/or real time personalized advertising inside the package or linked to outside);
- for producing and delivering personalized content inside the package or linked to outside;
- for managing personally produced content from final users and customers;
- to provide multichannel experience and distribution: different content on different channels at the same time for multichannel experience of the user.

The above mentioned scenarios and many others can be realized thanks to AXMEDIS technology and tools of: AXMEDIS content format, DRM, controlled P2P, and Content Processing, see AXMEDIS Technical Notes http://www.axmedis.org/documenti/documenti.php

3.2 AXMEDIS Content Model and Package

AXMEDIS content model can be used as a descriptor and/or package for the content for distribution of more complex elements such as NewsML, MXF, SCORM, collections, menus, etc. The AXMEDIS package can be protected and the resources managed by AXMEDIS DRM model. It may contain also links to other AXMEDIS objects and direct URL. AXMEDIS may range from simple files with single resources such as video, audio, images, documents, animations, games, etc., to cross media and multimedia content including: HTML, SMIL, MPEG-4, FLASH, etc., as presentation layer. Combinations of the above mentioned content formats can be used, protected and managed in terms of detailed rights. AXMEDIS content model extends the MPEG-21 standard and allows creating different solutions for any distribution channels for download or streaming.

AXMEDIS Objects may contain:

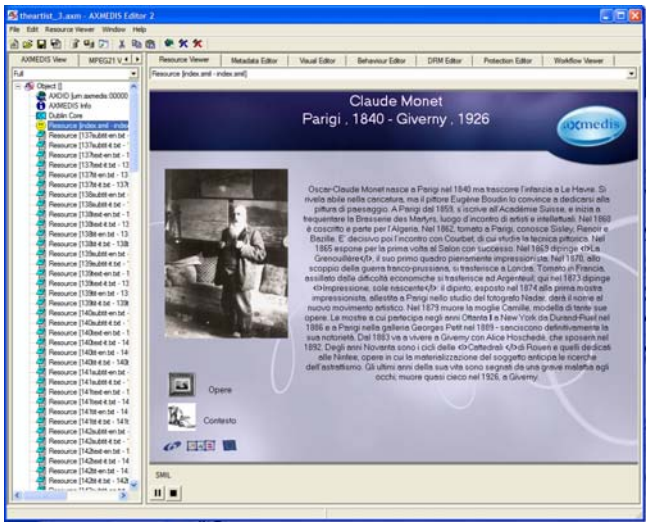
- **elements** which are essences:
  - simple files audio, video, images, documents, animations, games, etc.;
  - any combinations of cross media with and without presentation: HTML, SMIL, MPEG-4, XML, FLASH, MXF, NewsML, SCORM, ZIP, etc.;
  - hypermedia with internal and external links;
  - AXMEDIS Objects as well;
- **reference** to external files and/or other AXMEDIS objects as URIs and links;
  - menus, collections, lists, interactive elements on animations, etc.
- **metadata and descriptors** associated with single resources and/or collections:
  - metadata, classification information, Dublin Core, etc.;
  - descriptors such as fingerprint, technical information, MPEG-7, XML, etc.;
  - single and/or multiple identifications: AXOID, UUID, ISBN, ISMN, ISRC, ISAN, etc.
  - business descriptors such as the AXInfo, PAR, etc.;
  - annotations to AXMEDIS/MPEG-21 content elements;
- **collections** as lists, hierarchy of files, nesting levels, menus, etc., on which users may
  - navigate, make queries on the basis of metadata of single components or files;
  - receive auto play, automated presentation, dynamic advertising, chained videos, special

content, packaging audio visual with additional content, etc.;
  - access to content with different presentation algorithms, protected and/or selectively non-protected, with or without previews, and many other models.
  - perform annotations to content elements;
- **narrative capabilities:** actions and semantics to make intelligent and interactive the content package behaviour, allowing the final users to perform not only interaction but
  - enrichment (addition of comments and data to content);
  - transformations (for example the migration of the same object to another device with some adaptation);
  - queries inside the content collection;
  - recording with additional content coming from P2P, Web, etc.
  - licensing with specific content wizard;
  - Forms to get inputs from the users;

AXMEDIS model supports both binary and XML file formats, as ".mp21", ".m21" and ".axm" extensions, respectively, download and progressive download.

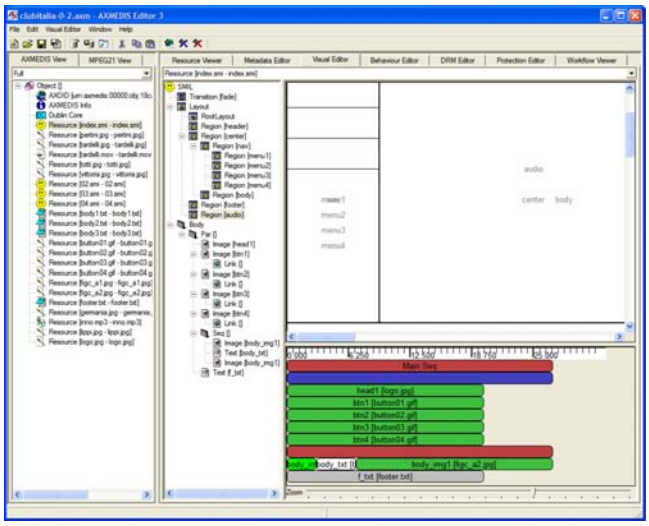
3.3 AXMEDIS Editor, how to create AXMEDIS cross media content!

The AXMEDIS Editor can be used for the manual production, authoring, editing and/or inspection of AXMEDIS MPEG-21 cross media content/objects.



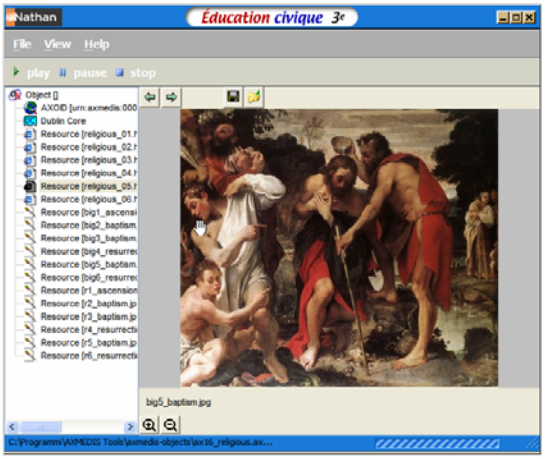
It can be used for

- creation of simple and/or complex (nested) AXMEDIS objects, MPEG-21 content, collections, etc.;
- creation of objects with links/URI to other objects and/or resources;
- authoring of multiple Metadata and IDs;
- integration/inclusion of digital resources and presentation information and content into the AXMEDIS object package;
- application of content processing and/or protection algorithms (via AXMEDIS plug in);
- registration and certification of content for DRM;
- protection of content for DRM;
- search, query, load and save on databases, etc. The integration with the AXMEDIS database is performed via Web Services and the AXDB module;
- integration with OpenFlow workflow to receive commands from the workflow management system, and integrate the tools in any production process.



The AXMEDIS Editor presents:

- Hierarchy editor to navigate the object structure, to add resources with drag and drop: images, video, documents, audio, SMIL, HTML, MPEG-4, etc., to edit their details and parameters, etc.;



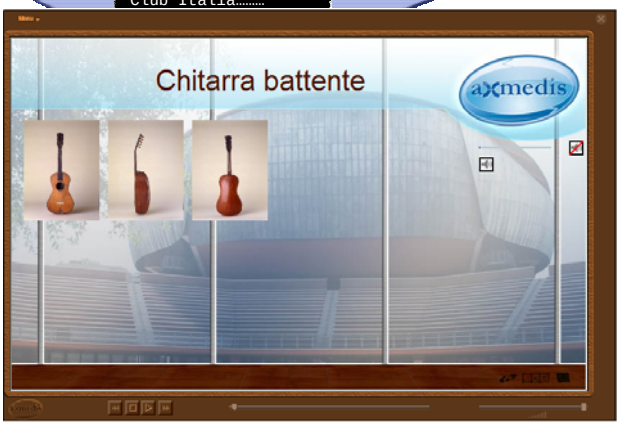
- Metadata editor and Mapper, to manipulate metadata and create XSLT mappings for them;
- Visual editor for defining SMIL presentation details and links. Any other SMIL or HTML Editor can be used and files can be dropped into the package. HTML files can be included with their own CSS, and JavaScript, etc.;
- Behavioural editor to create Axmethods in JavaScript defining the content business intelligence and semantics, associated with actions and other events;
- DRM editor (MPEG-21 REL) to create licenses; Also performed with simple wizard for creating licenses and tools for licensing content for distributors;
- Protection editor to protect the content with several different algorithms;
- Workflow editor to set up workflow parameters, etc.

The production of AXMEDIS content can be automated by using AXCP tools as described in the Technical Note: http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624

3.4 AXMEDIS Players

AXMEDIS players are interoperable, that means that are capable of rendering the same AXMEDIS objects on different players and operating systems:

- PC Windows players, capable of executing SMIL, HTML, MPEG-4, video, audio, documents, images, etc., and JavaScript. PC player may provide different skin; Most of the AXMEDIS players can be customized in terms of GUI and functionalities. AXMEDIS Skin based player can be easily customized by a designer changing the graphical look and feel.

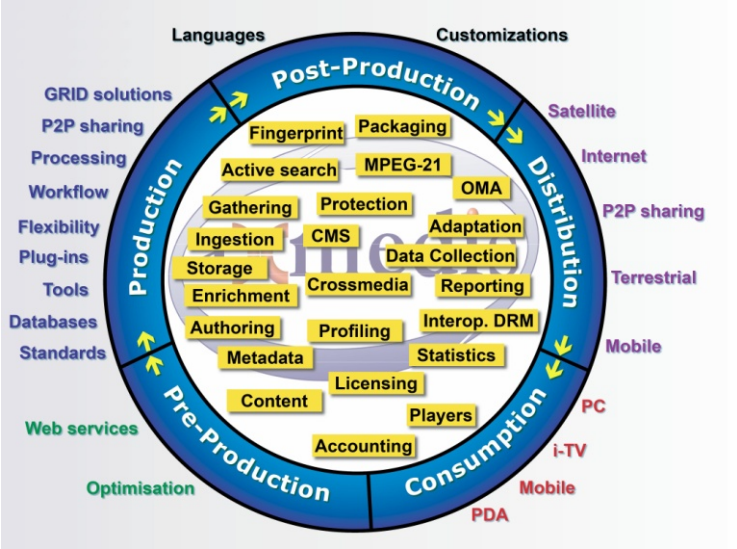


- Active X for IE player to integrate the player into WEB pages and other applications, for example .NET based; See the CrossMedia Finder of AXMEDIS as example.
- PDA Windows Mobile 5 and 6 player, supporting: SMIL, HTML, MPEG-4, video, audio, documents, images, etc.;
- STB/PVR player based on (i) Linux, supporting audio visual, SMIL and HTML and on (ii) Kreatel STB;
- Pure java player for mobiles, supporting: SMIL, images and audio visual for all mobile phones supporting MMAPI;

All the above AXMEDIS players have DRM capabilities. In order to access protected AXMEDIS objects, players have to be certified by a registered AXMEDIS user. AXMEDIS players are capable of reading AXMEDIS objects from files and streaming, navigating the resources, showing metadata, presenting the internal hierarchy, etc.

4. AXMEDIS CMS and Automated Content Production Tools

The AXMEDIS is an open solution to reduce costs and increase efficiency for content management, post-production, repurposing, processing, production, protection, and multichannel distribution.
AXCP allows an integrated content management of pre- and post-production, following your business growth and integration demands.



AXMEDIS allows automating solutions with scalable tools for managing single and multiple:

- distribution channels: VOD, IPTV, WEBTV, DVB-T, web, P2P, FTP, WEBDAV, WebServices, etc.
- content formats: any video, any image, any document, any audio, SMIL, HTML, MPEG-21, MXF, NewsML, XML, XSLT, etc.;
- final user devices: PC, STB/PVR, i-TV, Kiosks, PDA and mobiles;
- interoperable DRM (digital rights management) models: MPEG-21 and OMA;
- business models on the same and multiple distribution channels and content: pay per play, subscription, counting, renting, billing, etc., for B2B and B2C;
- services for content production and/or distribution on demands;
- content factories and processing areas via workflows (OpenFlow and BizTalk);
- content management systems, CMSs, and/or archives.

4.1 AXCP Main Technical capabilities

The integrated management of channels, formats, devices, business models, services, etc. is performed by means of AXMEDIS Automated Factory Tools, also called **AXMEDIS Content Processing, AXCP,** tools. AXCP tools include solutions for the automated management, pre-/post-production processing and distributions of a large range of content formats, for automatically producing, processing, packaging, adapting, transcoding, formatting, and/or repurposing content, metadata, files, user registrations, profiles, licensing, etc.

AXMEDIS tools and solution allows the automation of the content management process, and the content production, distribution, and publication, The automated, AXCP, and manual authoring solutions are based on a Service Oriented Architecture, SOA, to exploit legacy CMSs and archives, scheduling and automating the content production processes in the content factory and among

geographically distributed factories, and workflows, etc. The user can easily formalize custom processes in AXMEDIS JavaScript language and/or visual tools (the AXMEDIS JavaScript is compliant with JavaScript language).

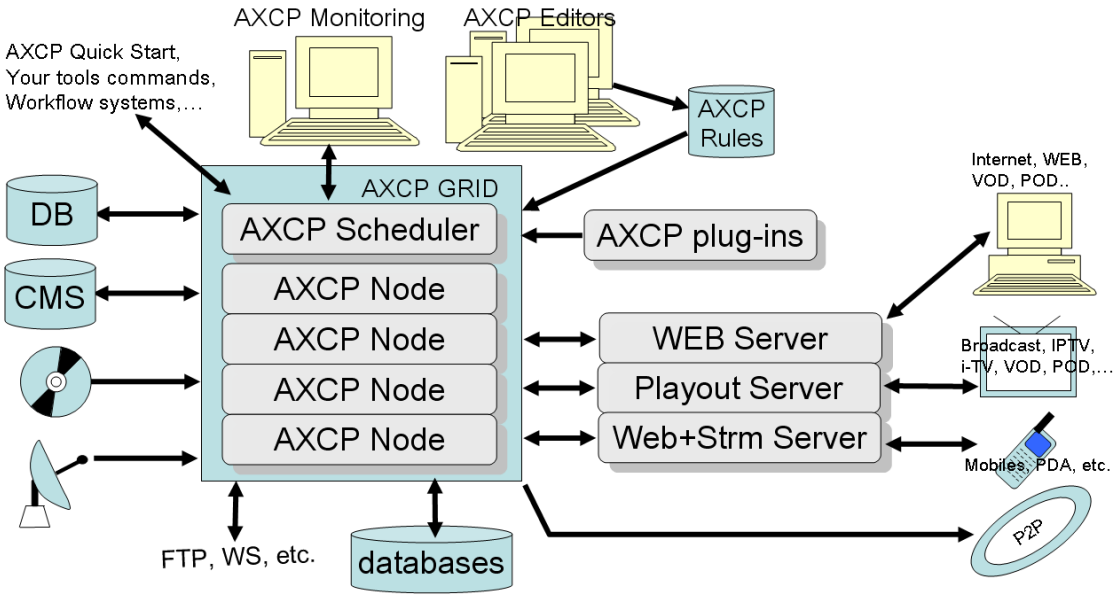
AXMEDIS reduces the costs of content management, supports the whole value chain and makes real the convergence of media, and the interoperability of content enabling multi-channel distribution (e.g., mobile, satellite, kiosk, iTV, web, P2P, interactivity, etc), and provides a flexible and interoperable DRM, for both B2B and B2C across traditional and P2P distribution platforms. The following figure depicts an integrated AXCP solution for automated content processing and multichannel distribution.

AXCP solution is based on a scalable technology to satisfy the needs of small and large content producers, integrators, and distributors. The AXCP offers automated features and functionalities, supporting convenient integrated development tools to automate integrated activities of:

- content Ingestion and gathering, database management, crawling, indexing, archiving;
- content storage and retrieval, active querying;
- content processing, repurposing, adaptation, transmoding, transcoding for text, docs, images, audio, video, multimedia, XML, SMIL, HTML, styles, MXF, newsML, MPEG-4, MPEG-21, etc.;
- metadata repurposing, adaptation, transcoding, integration, enrichment, validation;
- content descriptors, extraction and comparison, fingerprint, MPEG-7, MPEG-21, etc.;
- content composition, formatting, layout, styling;
- communication with databases, FTP, HTTP, P2P and distribution servers via several protocols;
- content packaging: MPEG-21, MXF, OMA, newsML, ZIP, etc.;
- content protection via several algorithms;
- content DRM with MPEG-21 and OMA, with tracking and reporting rights exploitation;
- content licensing, licensing the production of licenses;
- content publication and distribution toward multiple channels;
- workflow management integration with BizTalk and OpenFlow;
- user management: registration, licensing, profiling, advertising.

4.2 Open P2P Architecture and Solution

AXCP solution is based on AXCP Rules formalized in AXMEDIS JavaScript language to formalize jobs, processes and their deadlines, needs, etc.



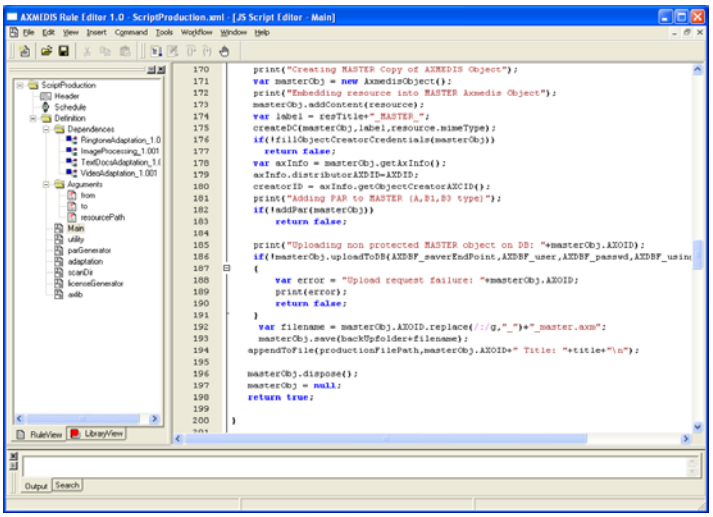
The AXCP solution is open and can be expanded and/or customized by:

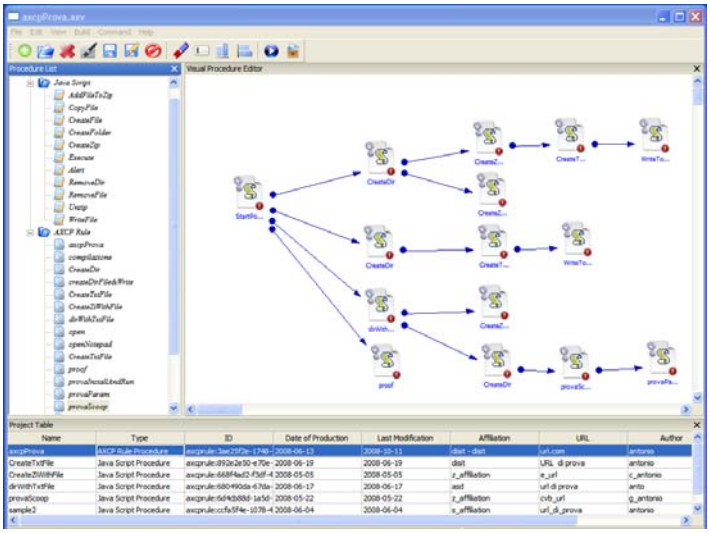
- creating and customizing AXCP Rules to be executed on AXCP Nodes;
- activating Rules according to different policies such as: periodic, sporadic or on demand from third parties, external tools, web services, etc.;
- customizing, realizing and installing additional AXMEDIS plug-ins to add new formats, encoders, decoders, adapters and converters, etc. The AXMEDIS Plug-in technology is open, well documented and supported by a development tool kit;
- organizing AXCP GRID Nodes in a hierarchical manner. An AXCP Node may control one or more AXCP Schedulers which in turn may control other AXCP Nodes, etc.;
- executing operating system processes, passing them parameters/files and getting eventual errors.

The AXCP architecture is Service Oriented Architecture (SOA); fully documented APIs for all the JavaScript functionalities, and WEB Services for accessing and controlling tools, and for distributing produced content towards your front-end distribution servers. This means that the Distribution Servers and solutions may very easily interact with the AXCP GRID via web services. All the services may lead to put in execution processes, to create licenses, content, etc.

AXCP GRID solution main elements:

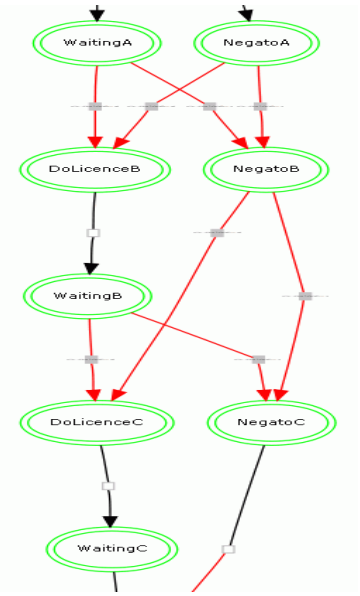
- **AXCP Rules can be:**
  - put in execution on any AXCP Node as well as on a single computer;
  - used/parameterized for automating management activities;
  - activated from Workflow Management System, from PHP applications, from Web Service clients, etc.;
  - activated by other AXCP Rules, detecting changes in the file system, into the local database, in the P2P, etc.;
- **AXCP Nodes** are controlled by the AXCP Scheduler, and can be
  - industrial computers or desktop computers in your offices delegating at the AXCP a part of their CPU along the day profile;
  - executed alone (with the AXCP standalone node) for executing sporadic AXCP Rules for ad-hoc processing and activation without demanding their allocation to the AXCP Scheduler;
- **AXCP Scheduler to allocate and manage AXCP Rules on GRID Nodes:**
  - scheduling and balancing jobs/processes on AXCP Nodes according to the content production and processing needs in terms of time and resources: balancing nodes workloads, Deadline Monotonic, starting time, optimization;
  - activating jobs as sporadic and periodic tasks, controlled by other tools and/or web services;





- monitoring progress of production processes and their status, etc.;

- **AXCP Rule Editor** is used to produce, debug, test and validate AXCP Rules to execute them on AXCP Nodes via AXCP Scheduler. As depicted in the first figure of this page.
- **AXCP Visual Designer:** a visual tool for creating sequences of JavaScript segments and/or process components, and/or to define flows of rules that can be compounded and activated by the AXCP Scheduler with a click. The Visual Designer makes the programming of AXCP very simple and accessible to non expert users. Libraries of components can be created with the AXCP Editor;
- **AXCP Quick Start** permits to activate AXCP Rules in a very simple manner by passing them parameters; for examples a collection of objects, a path, a database, a query, a list of files, etc., or just a click;
- **AXCP Standalone Node** allows putting in execution a single AXCP Rule from your applications and servers via a simple shell command. This solution is an easy way to access to the whole functionalities of the AXCP for executing an asynchronous process without calling the Web Service AXCP Scheduler.



- **As depicted on the right, the AXCP tools can be controlled at higher level by means of Workflow management systems such as OpenFlow and/or BizTalk.**

5. AXMEDIS Multichannel DRM support

AXMEDIS solutions reduce costs and increase efficiency for content management. AXMEDIS supports the whole value chain and provides tools to simplify the convergence of media, the media transcoding, and the interoperability of content enabling multi-channel distribution. AXMEDIS provides a flexible and interoperable DRM, for both B2B and B2C across traditional and P2P distribution platforms.

AXMEDIS Multichannel DRM is an open interoperable solution for protecting and managing rights for a wide range of content, from single files to complex cross-media and multimedia, distributed on different channels towards different type of players and devices. AXMEDIS can be used to setup and manage DRM solutions for:

o Internet, client server and P2P distribution;
o broadcasting, satellite and terrestrial distribution;
o production and video on demand distribution;
o mobile and PDA distribution;
o interactive TV and educational content distribution;
o PC, STB/PVR, HDR, PDA, Mobiles, etc.;
o physical media: CD, DVD, USB, etc.;
o business to business (B2B) distribution;
o integrated business to business to consumers (B2B2C) distribution models.

AXMEDIS DRM architecture has been designed to be easily integrated into any distribution channel, allowing maintaining the your front end distribution solution and customer relationship management tools. In the following figure, the grey parts are your servers and orange are your customers/markets; cyan and light blue parts are those that can be provided by AXMEDIS or in which AXMEDIS parts can make the difference with enhancing tools.

AXMEDIS DRM exploits and extends the MPEG-21 standard allowing to:

o **protect any content formats and types:**
- video, audio, images, documents, games, etc.;
- cross media and multimedia content: HTML, SMIL, MPEG-4, etc.;

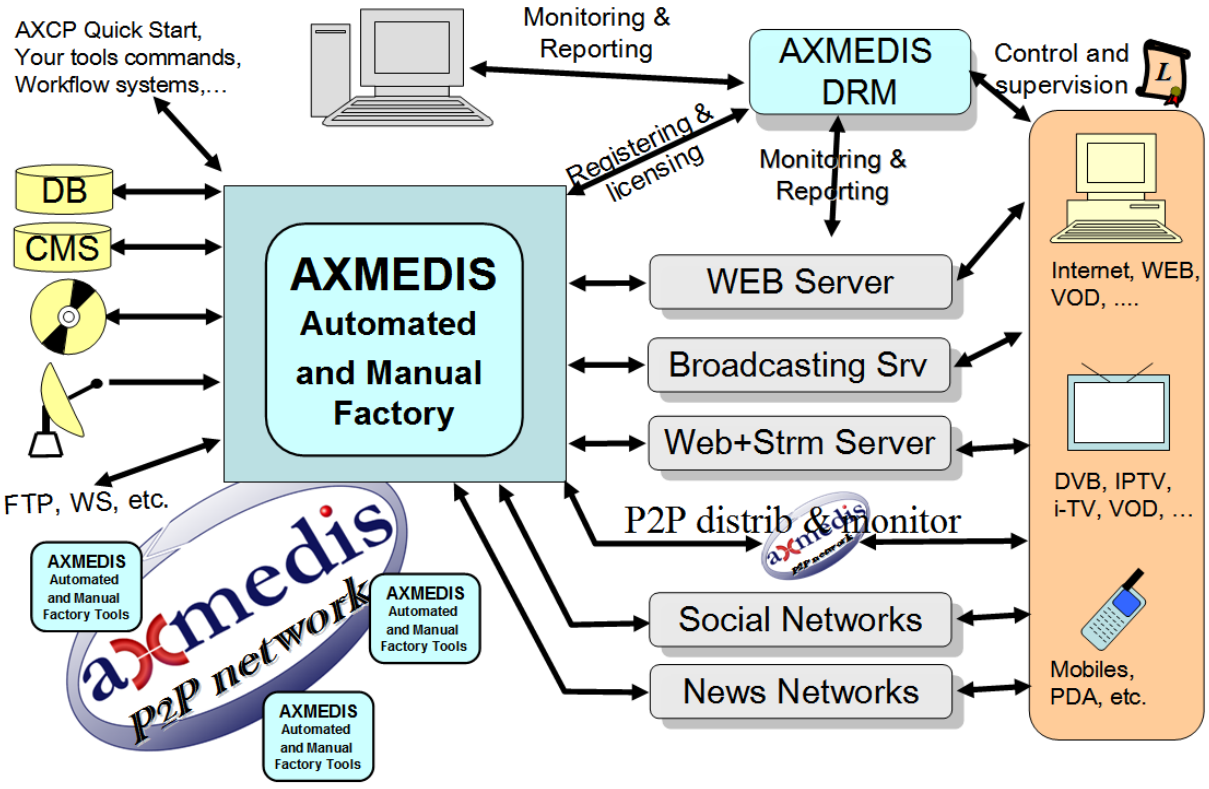
- collections and combinations of the above mentioned content formats;

o **control the exploitation of rights** of the above content formats:

- formalization of rights and conditions with formal content licenses. The license is a digital version of a contract that contains the list of rights (with related conditions) that can be exploited on that content by a given user. In AXMEDIS, licenses are formalized in MPEG-21 REL Standard;

o **collect and report information about consumption** of rights for

- accounting, billing and/or statistical analysis;



AXMEDIS DRM solution provides:

- **Automated and Manual Factory: AXCP GRID tools for content post production, packaging and protection** (they range from simple manual tools to automated tools based on GRID technology, AXMEDIS Content Processing, AXCP solution), and are capable to make automatic: registration of users, content adaptation, transcoding, fingerprinting, management, repurposing, licensing, delivering, etc., see a summary in the following technical note http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624
- **DRM servers** for (i) controlling the exploitation of rights of protected content, (ii) collecting information about the exploitation of rights; for example counting the times a given content object has been played, by a given user, on given device, etc. (iii) optionally interacting with an intellectual property ontology to facilitate the production and verification of licenses.
- **AXMEDIS players for protected and non protected cross media content** on PC (MS Windows), PDA (Windows Mobile 5 and 6), STB/PVR (Linux and Kreatel based), and AXMEDIS Java based Mobile. AXMEDIS players can be customized in several different manners and can be hosted in WEB pages (AXMEDIS player in the form of Active X). http://www.axmedis.org/documenti/view_documenti.php?doc_id=3845
- **DRM tools** for
  - o manual and automated production of licenses

- accelerating the transformation of contracts to licenses directly from the contract text, and vice versa for legal validation of licenses.
- producing licenses, via licensing wizard produced as AXMEDIS object, see the LicenseMaker AXMEDIS object.

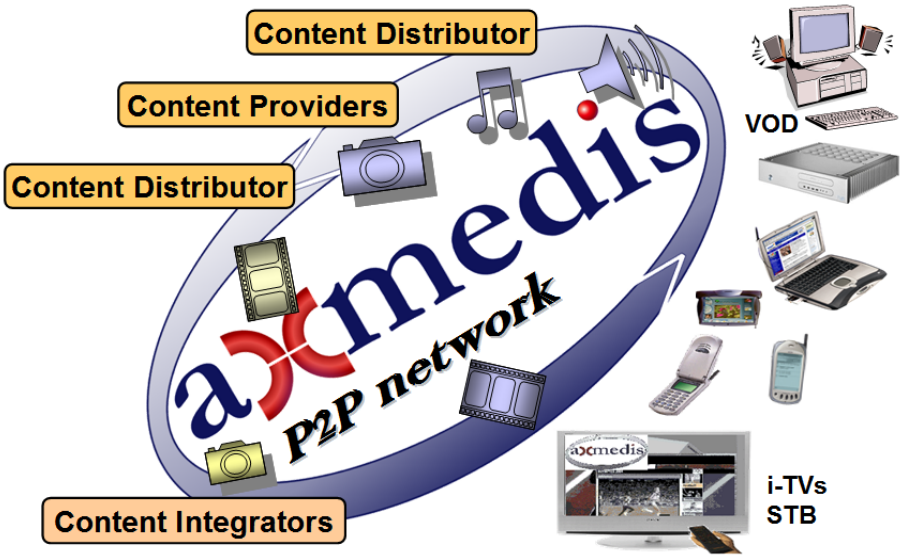
To make a tour in the AXMEDIS DRM we suggest to read and try the AXMEDIS DRM for dummies: http://www.axmedis.org/documenti/view_documenti.php?doc_id=3993

Front end content distribution servers, commerce servers, customer relationship servers can produce licenses for your final customers. These licenses are required to be produced posted onto the AXMEDIS DRM Servers via a Web Service call. In alternative, the same servers can use the AXCP GRID to perform the same activity, particularly when there are a high number of licenses produced. For example, in the case of a business model based on subscription; each new subscription produces a set of licenses to enable the new user to access all the content distributed.
As illustrated in the above figure, it is possible to exploit the P2P technology for content distribution by using AXMEDIS P2P Network solution which is fully integrated with the AXCP GRID and AXMEDIS DRM.

6. AXMEDIS P2P: for legal, flexible and controllable P2P

Content sharing via P2P is regarded by many content owners as one of the major reasons for lack of revenues. This opinion has grown on the basis of the way users exploit some P2P applications. However, P2P technology can be used in profitable manners. P2P networks have been proven to be controllable, profitable and efficient for commercial content distribution. It should be noted that currently more than 80% of data downloaded by final users/consumers are obtained via P2P protocols.

P2P implies (i) large scale and scalable content distribution, (ii) creation and management of a collectivity of consumers for advertising and profiling, (iii) lower costs for content distribution since the front end distribution servers do not have to provide all the amount of bytes downloaded by final users. These are the main reasons behind the usage of the P2P protocol for WebTV, IPTV and also for content distribution in general.



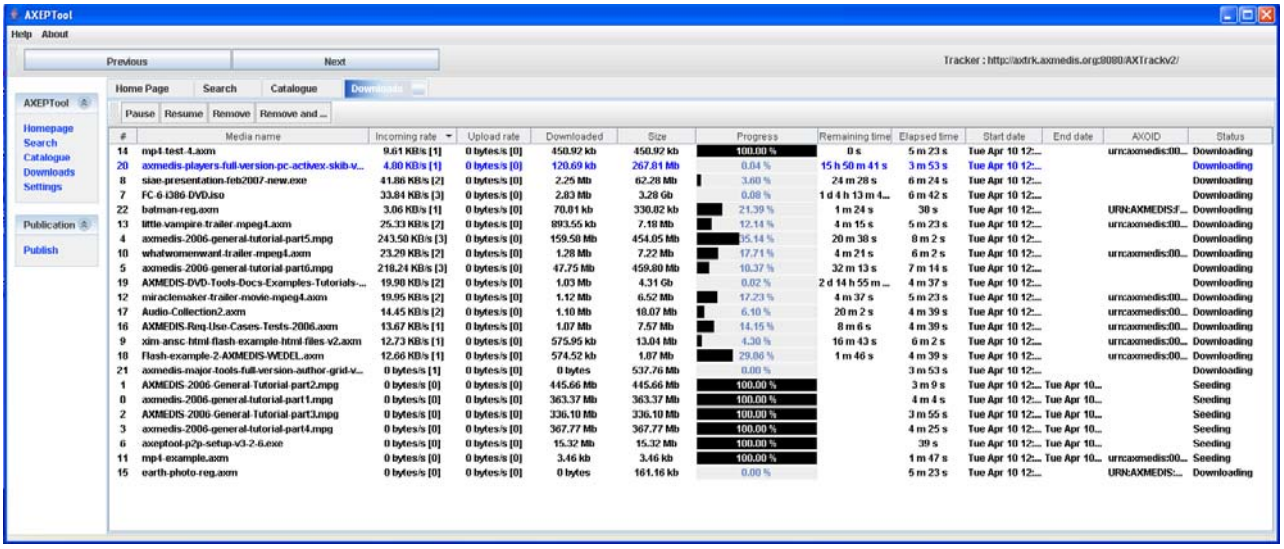
The AXMEDIS P2P is an open and scalable solution for setting up P2P networks for content distribution and sharing which can be used among business actors or consumers, or for creating thematic or mixed P2P networks for B2B/B2C content distribution and sharing. Content in this case, can be any kind, from video to audio, games, documents, etc.

AXMEDIS P2P solution allows content owners and distributors to exploit the capabilities of P2P protocols to create efficient, controllable, legal and secure P2P networks for content distribution and sharing. By using the AXMEDIS P2P solution a distributor may automatically publish content in the P2P network; and the content may freely navigate among peers with the supervision and control of the AXMEDIS DRM and monitoring tools.
Content distributors may use the AXMEDIS P2P solution to set up legal P2P services for content distribution towards and among their customers, thus reducing their direct costs for distribution and infrastructure. Final users can be profiled and may be stimulated by advertising, and/or promotions of content to acquire licenses to play the content (e.g., pay per play). Other business models such as the monthly rate or the renting for a period are also possible, see for example the Cross Media Portal show case: http://xmf.axmedis.org

The AXMEDIS P2P solution allows to:

- share any kind of content (digital files) or limit the content sharing to particular types/formats of content, protected or not;
- publish/distribute content with DRM or not (for example with MPEG-21 REL DRM, but other DRMs are also supported). In the case of DRMed content, different business models can be supported on the same P2P network and on the same content at the same time: pay per play, monthly subscription, renting, etc.
- publish and distribute content in a fast and reliable manner on the P2P network,
    - "immediate seeding" of P2P network, in direct connection with your Content Management Systems;
    - automated publication of content for controlling P2P distribution;
- monitor P2P activity of your node
    - upload and download traffic, etc.
- create a community of users/actors, for distributing/sharing content and tools among:
    - business partners: B2B solution;
    - consumers: C2C solution;
    - mixed community of business partners and consumers: B2B2C. In this case, both of them may enjoy the sharing of files (faster download) for different purposes;
- control the activity of the P2P network by including
    - monitoring and measuring performances in particular points of the geographical P2P network;
    - balancing the workload of seeding servers;
    - information regarding the status and profile of the P2P control nodes and of peers;
    - statistic analysis about the status of the whole P2P network;
    - detailed reporting about the activity related to each content/object on the P2P network;
- filter content that is not
    - authorized to be shared on the network, for example when a content is infringed with some Intellectual Property. The filtering can be based on detection of content on the basis of fingerprint or watermark solutions, or of simple IDs. This feature allow to implement monitoring systems for P2P bittorrent networks;
    - conformant to some standard or format;
- control the activity of the P2P network
    - automated content publication and/or download;
    - managing black lists of P2P clients and content;
    - strategies for the publication, polishing and maintenance of the P2P network;
- be easily integrated with WEB portals and services for content distribution and sale;
    - starting the download with P2P client tools with just a click from any WEB page by using the BitTorrent file or the AXOID, which is the unique ID of the AXMEDIS objects;

- promoting new content, top/premium content, advertising, etc., towards the users connected with the P2P network via P2P Clients;
- bringing users to a specific WEB page for each DRMed content to provide additional information for sale and/or promotion of related products;
-



Download interface of the P2P clients

With the AXMEDIS P2P solution, it is also possible to

- have facilities to make queries into the P2P network. This search facility is provided for MPEG-21 objects and it is based on Dublin Core metadata and classification model plus additional business information such as licensing information, distributor information, etc.;
- expose the whole content catalogue to your P2P network clients;
- have a direct integration of P2P tools with your content management systems, CMS;
- have a direct integration of P2P tools with your workflow management systems, WFMS;
- get statistics data from the P2P tracker and from the your own client.

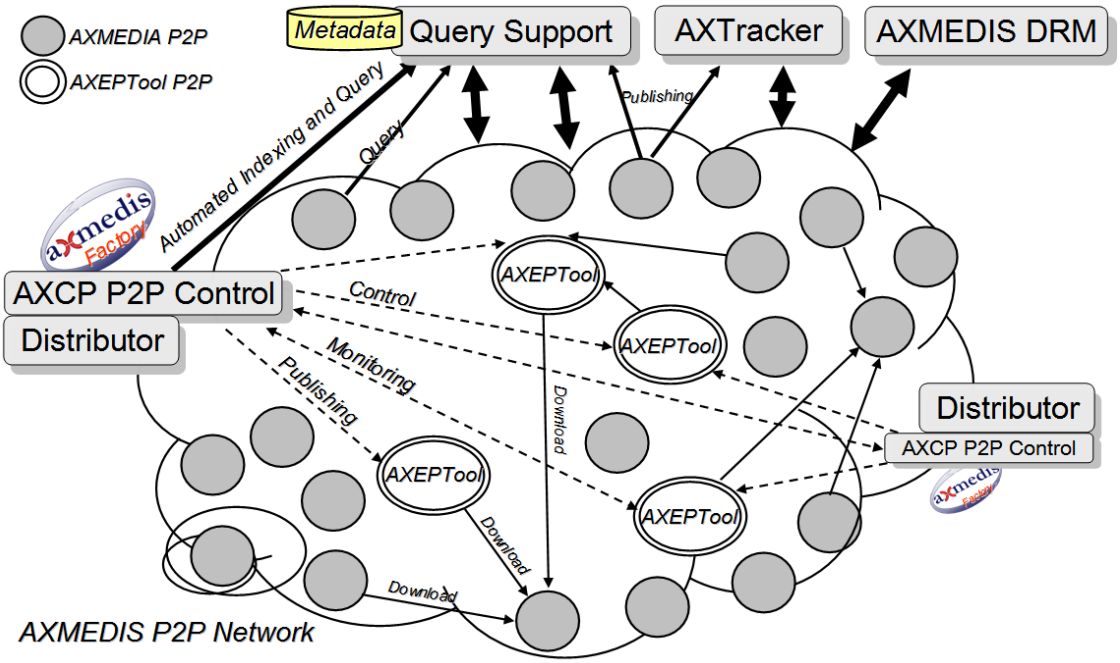
AXMEDIS P2P is fully integrated with the AXMEDIS GRID for Content Processing, AXCP. It is an open and scalable solution for automating content production, management and protection for multichannel distribution. AXCP allows setting up integrated and automated content management systems for pre- and post-production, following your business growth and integration demands. The AXMEDIS P2P solution provides the above mentioned capabilities of control and monitoring when it is integrated with the AXCP tools and facilities. Direct integration with your existing factory and tools is also possible, see technical note:
http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624

6.1 AXMEDIS P2P Architecture and Solution

AXMEDIS P2P is based on the BitTorrent technology for P2P distribution and sharing. The AXMEDIS P2P technology enhances the classical BitTorrent solution with several innovations (still remaining fully compatible with standard BitTorrent protocols and tools) to realize the possibilities of:

- monitoring and controlling the network,
- creating P2P networks for e-commerce at business and consumer levels, managing DRMed content, managing protected and non protected content,
- making queries to look for shared content,
- deriving statistics from the tracker and from the client tools,
- distributing MPEG-21 objects,

- automating publication and download,
- accelerating the publication up the immediate distributed seeding of content in the network,
- integrating easily the P2P into WEB pages of content distribution servers,
- filtering content on the P2P network, and more.



A minimal AXMEDIS P2P network is based on:

- one AXTracker that manages and defines the P2P community. Multiple AXTrackers can be used to manage large communities with millions of users and files
- an unlimited number of AXMEDIS P2P clients, called AXMEDIA tools. The P2P clients in the hands of final users with the above mentioned capabilities of publishing, downloading, receiving advertising, etc. They are Java-based applications which are easy to be installed on a large range of systems. Simplified versions are also available for mobiles and STB/PVR.

Please note that in this minimal configuration the P2P network is free to evolve without control, and the performance in download cannot be controlled neither optimized.
A minimal P2P network can be managed with a single server including an AXTracker and an AXEPTool for seeding on the same Linux computer.

An AXMEDIS P2P network may **optionally** have:

- **Query Support** to allow indexing content published in the P2P network thus making available a query portal for your users. The indexing is based on Dublin Core plus other additional information depending on the MPEG-21 model. In principle any kind of metadata can be added;
- **AXEPTool P2P super nodes,** which are the points of control in the P2P network directly managed by one or more content Distributors or by whom is devoted to monitoring the correctness of the content shared on the P2P; for example, by filtering unauthorized content. AXEPTools should be installed by your business and/or affiliated partners. These control nodes of the P2P network can be controlled and monitored by one or more AXCP P2P Control servers;
- **AXCP P2P Control** servers to control and exploit the P2P network which includes monitoring files, automatic publication, automatic download, accelerating seeding, etc. These are the engines to control one or all the super node AXEPTools in the network. Specific policies can be set up according to your needs for seeding and controlling the network. A set of predefined rules is provided, while additional rules can be easily defined in JavaScript; **AXMEDIS AXCP** to automate your content production, protection and distribution as stated above.

- **AXMEDIS DRM** server to set up and manage digital rights management policies on protected objects shared on the P2P network or directly distributed from your servers (it works mainly according to the MPEG-21 standard, other DRM models can be integrated). Protected content is licensed to the user defining the rights that he/she can exploit on the content. The DRM server allows to authorize the final users' players and to keep trace of activities performed by the users on the content for accounting and reporting them in details to the Distributors and/or content owners.
- **AXMEDIS Cross Media Finder:** an integrated portal for demonstrating AXMEDIS content and distribution: http://xmf.axmedis.org/

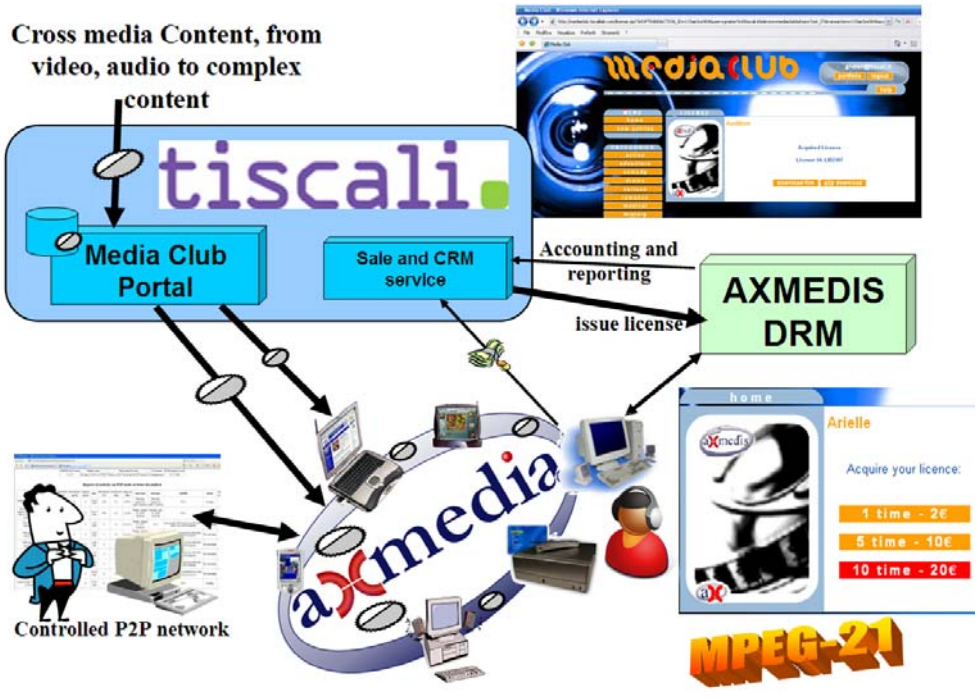
7. AXMEDIS Multichannel distribution and demonstrators

7.1 AXMEDIS Video on demand, TISCALI

Among the available distribution channels, TISCALI focused on the content on demand and P2P distribution of multimedia (mainly video) content to PC. The target audience of this distribution channel is mainly represented by young people consuming video content on the Web (video clips, movies, etc.). In this context, AXMEDIS supports several possible business models, with the following two being the most relevant:

- Pay per play: an AXMEDIS license is released to the end users for them to play the (video) content up to a maximum defined number of times;
- Pay per view: an AXMEDIS license is released to the end users authorizing them to watch/access the object for a certain period of time (for instance 48 hour);

The solution provides a complete and easy to use environment for the publication and up-selling of content over the Internet. Access to the multimedia content available on the AXMEDIS P2P network is offered by interfacing the system with the AXEPTool P2P tools of AXMEDIS. The current implementation of the TISCALI Media Club and Center has been integrated with the AXMEDIS framework to obtain an end-to-end solution for acquiring, importing, publishing, up selling and delivering the broadband content that is available on the AXMEDIS network. The system is designed to support all main business models for content delivery, as free-to-air, subscription, Pay-per-View, etc.



The solution also includes, in addition to the B2C, some services for B2B. The scenarios mainly focus on the opportunity offered to Content distributors to explore media catalogues published directly by content producers on the AXMEDIS B2B P2P Network and the possibility of exploiting the AXMEDIS CAMART (Accounting Manager and Reporting Tool) for identifying the market trends.

7.2 AXMEDIS Video on demand, TEO

As part of AXMEDIS, a group of partners from Baltic States has undertaken to deploy a video-on-demand distribution solution based on AXMEDIS Framework. The real life demonstration prototype involves a video content producer from Lithuania (VRS Groupe), and two broadband operators – ELION (Estonia), operating an internet-based media distribution portal, and TEO (Lithuania) – IPTV service provider. Although the purpose of the trial is to show how AXMEDIS solutions and tools can be used in an integrated automatic content production and distribution value chain, this technical note describes the technical aspects of the TEO platform, integrating AXMEDIS tools into IPTV video on demand (VOD) service. The purpose of TEO trial is to showcase AXMEDIS technology adopted for IPTV platform. It demonstrates broadband operator's distribution of video on demand (VOD) content to trial IPTV service subscribers. IPTV service subscribers can view digital video material on their TV through an AXMEDIS compliant Set Top Box (STB).

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

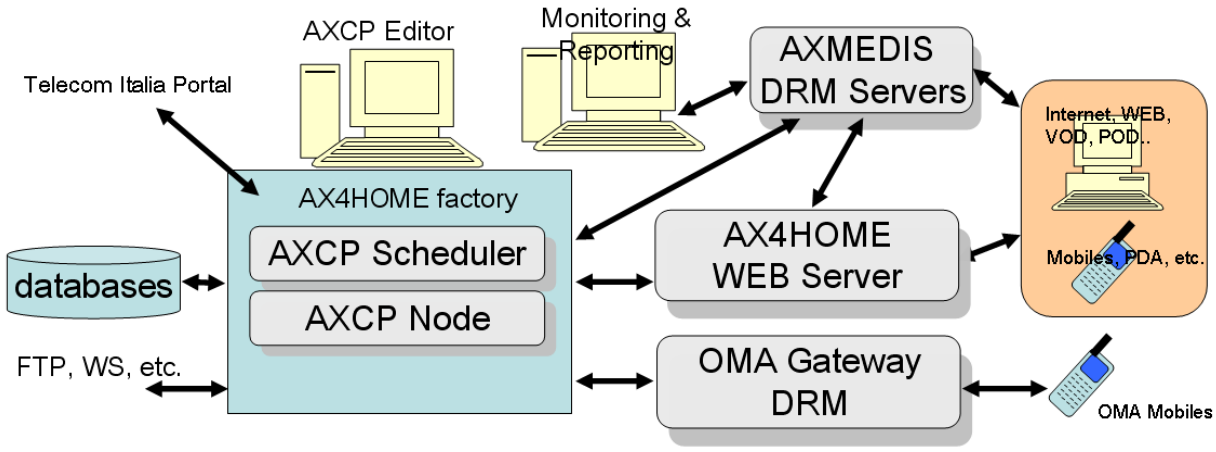
For this solution, of B2B automatic content production and distribution for IPTV, the content producer VRS uses AXCP http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624 and an AXMEDIS MPEG TS Adaptation Plugin to produce and make available trial video content in AXMEDIS MPEG-21 format for TEO IPTV service. The videos are formatted as AXMEDIS Objects, with pre-set usage rights and conditions and defined metadata. VRS places these AXMEDIS Objects into P2P network by using the AXEPTool http://www.axmedis.org/documenti/view_documenti.php?doc_id=3612

TEO IPTV distribution facility downloads the AXMEDIS objects from the P2P by using content downloader P2P AXEPTool client and ingest service and place them into VOD portal and server which includes also Customer relationship manager and content management system. The VOD server it is capable to stream the content on demand to the users' STB.

7.3 AXMEDIS back office for MPEG-21 and OMA mobile distribution, TI

This show case developed by Telecom Italia in the AX4HOME activity uses the digital rights management of AXMEDIS DRM http://www.axmedis.org/documenti/view_documenti.php?doc_id=3616 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 for the OMA distribution, while no specific certificate is needed for the AXMEDIS DRM mobile player.



The show case is supported by a specific installation of the AXMEDIS Content Factory based on the AXCP tools: http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624, complemented by an OMA DRM v2.0 Rights Issuer ("OMA Gateway DRM"), running side-by-side on a server which has been named AX4HOME Factory. 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, a music shop which only distributes music has been implemented. Moreover, in order to provide a friendly and convenient end user experience 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).
The showcase is 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) are 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 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).

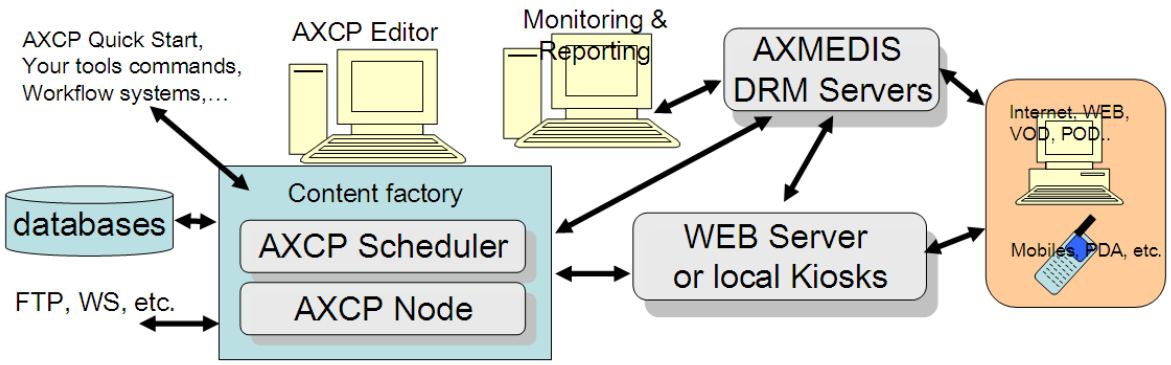
- ***Based on standard OMA client*** – the OMA distribution channel does not require an ad-hoc player to be installed on the mobile phone, since it uses standard OMA DRM v2 formats. However, it requires a device certificate to be installed on the phone.

In the show case, 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, the AXCP tools mentioned above. 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.

7.4 AXMEDIS mobile distribution, ILABS

Within AXMEDIS mobile distribution show case the benefits coming from the combination of several technologies in a mobile environment are shown. Thanks to a basic subset of the overall AXMEDIS tools mobile interactive cross media contents can be designed and tailored to offer a fully-fledged set of services in parallel to heterogeneous groups of moving users, thus exploiting all tools made available by the project to this end as a real and new distribution channel. The mobile distribution is divided into two components: the "factory", where contents are produced and the "client application", which allow users to have a unique access to available services and contents.

The distribution infrastructure includes a Content Factory (where the necessary back office components include the AXMEDIS AXCP tools for the automated production of content), the WEB server or local kiosks for content distribution towards a set of mobile terminals endowed of AXMEDIS player.



The overall mobile scenario covers two interrelated sub-scenarios, the first one dealing with content production, categorization, storage and management (the Content Factory), and the other one related to the distribution of those contents on mobile devices, including browsing, selection and fruition.
In the Content Factory, content authors and distributors select contents to be presented, assign those to proper categories, and define access/retrieval rights and costs for any of them. The Digital Rights Management, DRM, of AXMEDIS is used.
For accessing contents through the mobile client application, the user shall register prior to being granted access to the application itself. During the registration phase, some demographic data and some preferences are collected for subsequent usage (even if only very little data is mandatory). Once registered, the user can finally access the core application, which displays the available contents divided by categories for enhanced browsing, searching and retrieval. When needed, depending on the mobile device features, the AXMEDIS mobile player can be downloaded from http://www.axmedis.org/com/index.php?option=com_content&task=view&id=172&Itemid=91

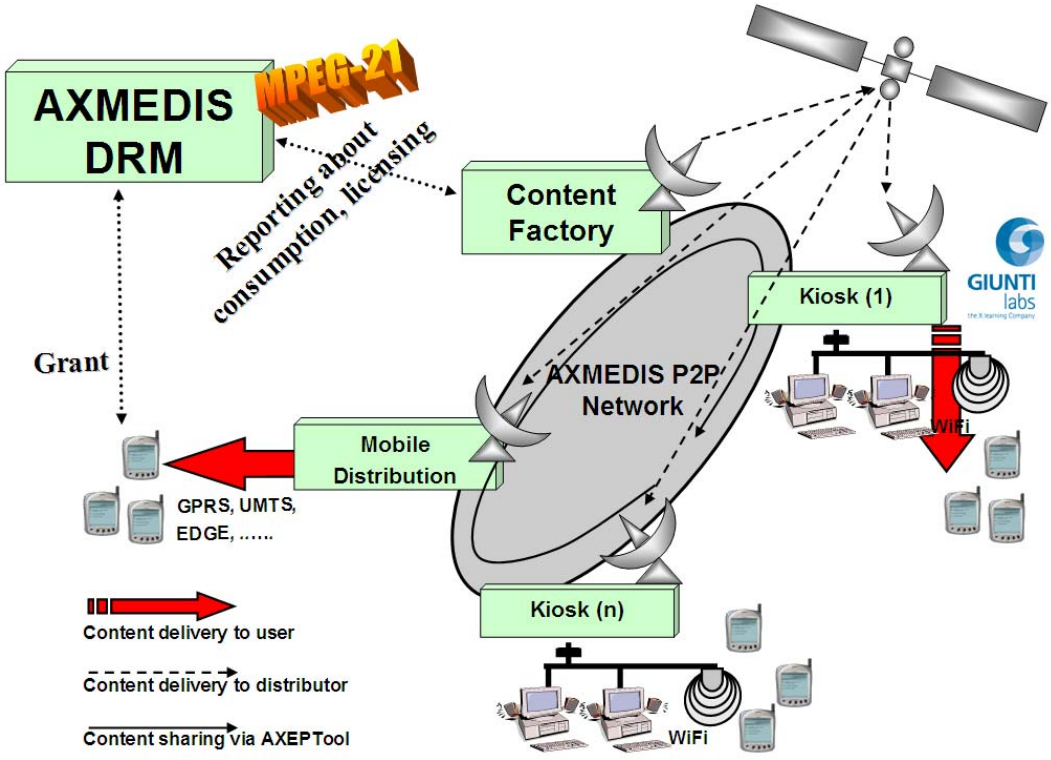
7.5 AXMEDIS mobile distribution via Kiosks, ILABS

Within AXMEDIS the kiosk show case of Giunti Labs aims at showing the benefits coming from the combination of several technologies in a totally new environment. Usually when referring to kiosks (in tourism or museums) people are focused on points of services with the typical aspect of what is called a "totem".

In AXMEDIS a kiosk is much more; it is a basic subset of the overall framework, designed and tailored to provide a fully-fledged set of services to a set of users in parallel exploiting all available tools as a real and new distribution channel.

The kiosk architecture within the AXMEDIS context is divided in two components: the "content factory" where contents are produced and the "kiosk" itself where users have access to services and contents. Distribution from the content factory to kiosks is handled via satellite in order to optimize bandwidth and data transfer rate when updating (in broadcast) units that may be geographically dispersed on the territory. On site, content access, selection, acquisition and fruition at the kiosk is achieved by exploiting either local terminals (kiosks as true points of service) or a WiFi based access via PDA and/or mobiles.

The distribution infrastructure includes a Content Factory server (where AXMEDIS Tools are installed along with the other back office components needed), a few distribution kiosks acting as POPs (Point Of Presence, basically PCs) and a few PDAs or mobiles acting as mobile terminals.



What follows is a detailed description of the kiosk distribution architecture specified in terms of involved blocks, actors and relations.

At a very high level the system components are summed up as follows.

- **Content Factory**: this is the part of the system that holds a local instance of AXMEDIS Content Processing tools, the so called AXCP tools (see in the following for the references to technical notes) and it is interconnected to the P2P infrastructure. Here the Catalogue is produced and contents are aggregated, produced and distributed.
- **Kiosk** is interconnected to the AXMEDIS P2P infrastructure and has local terminals (including PC, PDA, mobiles). It assures management of satellite downstream and modem upstream (it can

also be used in downstream). It provides security features to the local LAN. The kiosk architecture will enable wireless communication with local mobile devices (PDAs).

- **Terminal for the final users**: this can be PC, PDA and mobiles for accessing to services provided by the Kiosk (mainly browsing and previewing of content listed into a catalogue for local fruition). With this device only rental is available. The terminal has to be endowed of an AXMEDIS Player.

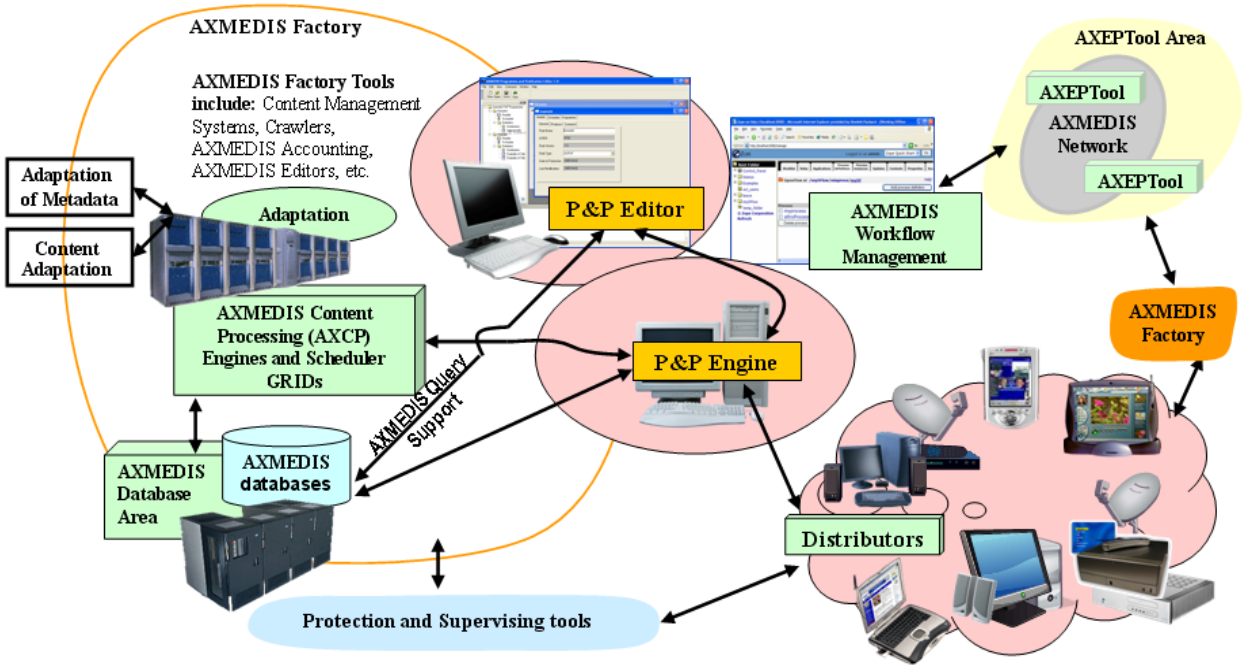
Content Factory Manager: interacts with the Content Factory, which is connected to the AXMEDIS P2P infrastructure via AXEPTools, and prepares, publishes & distributes content for the AXMEDIS Kiosk instances. The Content Factory may send the content to the Kiosks via the AXEPTool or via satellite data broadcast. In the kiosk factory, the distributor (or the authors preparing contents for kiosk distribution) takes care of selecting the contents that will be presented into a catalogue, assigning the proper category, rights and costs to each one, preparing and distributing the catalogue.

User that can interact with the Kiosk directly (on the PC) or via terminals: PDA or mobiles. The users need to be registered and to certify their own PDA/mobile prior to being granted the possibility of using AXMEDIS DRM protected content. If PDAs are provided locally by the Kiosk Manager they will already be equipped and configured to properly interact with kiosks and therefore the user will be able to use them as if s/he is using the kiosk.

At the POPs side the application has been designed to accommodate terminal content fruition, and a user-friendly web-based interface has been designed and developed. The user should register (and download the AXMEDIS player whenever needed) prior to be granted access to the application. During the registration phase some demographic data and some preferences are collected for subsequent usage (even if only very little data is mandatory). Once registered, the user can access to the core application that will display the kiosk catalogue, where available contents are categorized and can be browsed or searched. The user can select content for preview and once the selection is performed the user can purchase the selected content and, upon process completion, also access to it using the specific player.

7.6 AXMEDIS Satellite distribution, EUTELSAT

Among the available distribution channels, this technical report focuses on the satellite channel providing content to i-TVs, i.e., PC and Set Top Boxes (STB). The satellite distribution is powered by the OPENSKY™ technology of EUTELSAT, implementing the satellite data broadcasting. Satellite Broadcast allows content to reach several-unlimited receivers spread in a large area at the same time. The advantages to the satellite broadcast solution are costs reductions, no terrestrial network infrastructure limitations, no network congestion. The distribution is based on the DVB-S protocol, and in this case uses 512Kbps-10Mbps bandwidth.
http://www.axmedis.org/com/index.php?option=com_content&task=view&id=73&Itemid=47
AXMEDIS framework brings together innovative methods and tools to speed up and optimize content production and distribution at reduced costs, for leisure, entertainment and digital content valorisation and exploitation.
The AXMEDIS framework has two main areas: the production (also referred to as AXMEDIS Factory) and the distribution. The AXMEDIS Factory is responsible for the whole spectrum of content production such as Content Processing, Database, Editors and Viewers, and so on. The distribution area includes the distributors who deliver digital contents via different channels including satellite, the AXMEDIS P2P tool for B2B distribution, and the AXMEDIS Players for end users. Both the production and the distribution areas are connected to the AXMEDIS Protection and Supervising Tools that support digital rights management, AXMEDIS DRM.



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

7.7 AXMEDIS Content on Demand, ELION

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

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

The scheme below depicts the general components of the ELION trial. Components depicted in yellow are software components developed by partners specifically for this solution.

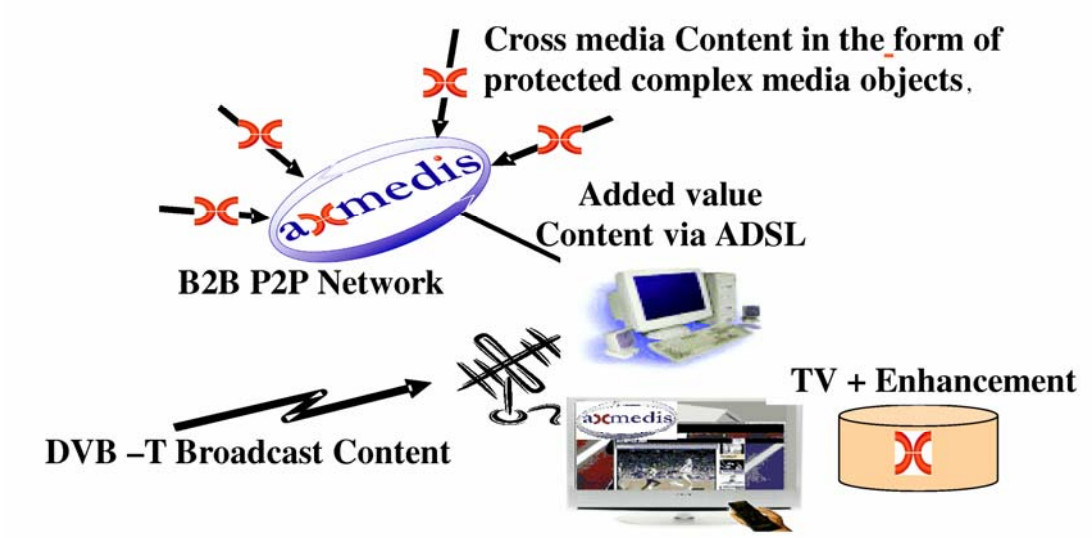
In this solution, the content is produced at B2B level automatically and delivered to ELION via P2P. Content producer is VRS, which produces and makes available some trial video content for ELION

internet service, other cross media AXMEDIS content can be taken from the AXMEDIS P2P network as well. The videos are formatted as AXMEDIS Objects, with a pre-set usage rights and conditions and defined metadata. VRS places these AXMEDIS objects into P2P network (AXEPTOOL). http://www.axmedis.org/documenti/view_documenti.php?doc_id=3612 The content producers, VRS, use the content production automation provided by AXCP tools: VRS uses AXCP http://www.axmedis.org/documenti/view_documenti.php?doc_id=3624

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

7.8 AXMEDIS DVB-T recorder and broadcast enhancer of BBC

The AX4HOME show case is built around the capture of off-air content selected from an Electronic Program Guide 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, games and so on.



AXMEDIS Tools applied to a home environment scenario. Enhancing Off-air content with internet delivered components creating local complex objects

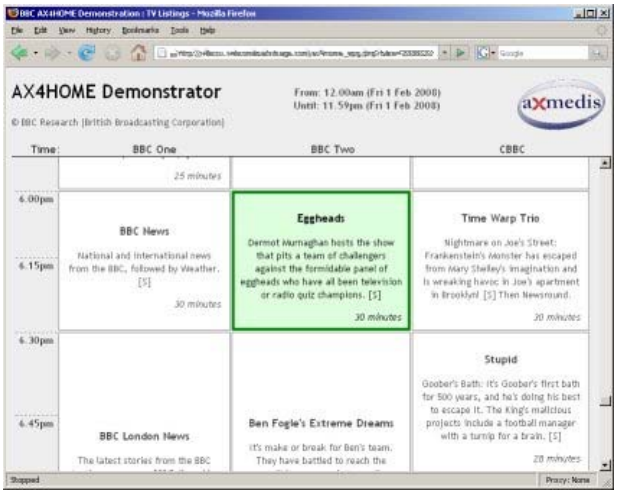
The resulting AXMEDIS object produced on the final user computer/device is a programme that takes the form of a sequence of presentations of audio and video combined with associated text with some interactivity. This presentation is controlled by the SMIL script embedded within the AXMEDIS object that was generated along with the AXMEDIS object at the time of creation using the AXMEDIS Rule Executor running the AXMEDIS Rule Script described below.

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 AX4HOME tool for the final users allows registering DVB-T off-air programmes selected from an EPG and creating AXMEDIS cross media content with additional interactive content inside.

User selection of a programme to be recorded from the broadcast schedules is made though 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 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 '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.

7.9 AXMEDIS Cultural Heritage content, ANSC

The Accademia Nazionale di Santa Cecilia (http://www.santacecilia.it) has always been interested in the opportunities presented by new technologies for the valorisation of musical and cultural heritage content in general. The Accademia has a large archive of content related to music with audio, images and videos. In addition, with the opening of the Musical Instruments Museum, the MUSA (http://museo.santacecilia.it), the Accademia Nazionale di Santa Cecilia is now able to offer users a highly innovative and immersive experience based on the sound of instruments and thanks to AXMEDIS technologies for

- the automatic creation and presentation of interactive content
- visiting the museum, the visitors my perform a tour in the museum assisted by a PDA with AXMEDIS content;
- visiting the museum, the visitors my access to special kiosks in the museum on which they can have interactive experiences on AXMEDIS content;
- distributing the produced content towards PC, PDA and Mobiles on demand or in advance to their visitors.

The AXMEDIS content model and solution has been used to develop a PDA-based Audio Tour of the museum, for Windows Mobile 5 or 6 PDAs. The initiative sprung from the idea, since the beginning, of giving the possibility to visitors of *listening* to the sound of instruments, not only look at them. Willing to go beyond traditional museum audio-guides the choice quite quickly fell on the AXMEDIS content. Additionally most of the audio clips are actually taken from the Accademia's digital archives (both ethnomusicological and classical), thus creating a link for visitors to the heritage held in the multimedia library, where if they want they can find the complete recordings.

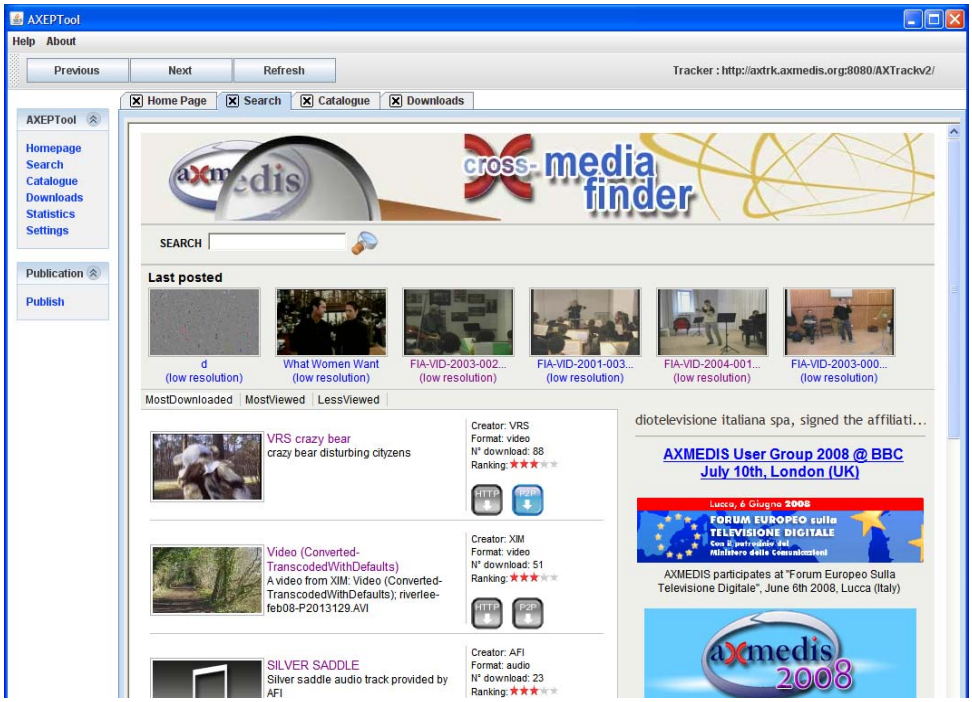
Through to the use of the AXMEDIS technology, MUSA visitors are now able to expand their experience with an AXMEDIS-enabled PDA, that enhances the visit with a multimodal experience and the possibility of hearing real instrument sounds and viewing images while accompanying visitors throughout the whole exhibition gallery.

Visitors are provided with an individual PDA with a standard Windows Mobile installation and the AXMEDIS PDA Player, plus headphones, or in alternative they can use their own PDA or java based mobile phones. The AXMEDIS object -- automatically launched at start-up -- presents users with an interactive menu and navigation system which they can use to explore sound examples of the

instruments seen on display. In this way users can select the desired instruments or simply chose to follow the "path", which is coherent with the display order.
The PDAs available for museum visitors are capable of playing AXMEDIS objects. These can include a wide set of multimedia content: from simple files to complex collections, possibly presented in a highly interactive manner. AXMEDIS Objects are suitable for a wide set of applications for the valorisation of cultural heritage content and/or for educational purposes: as support for museum visits, guides, or simply for entertainment (or "edutainment"). They can be loaned to visitors who will soon be able to upload to their PDA or java-enabled mobiles. See also http://www.axmedis.org/documenti/view_documenti.php?doc_id=3992

7.10 AXMEDIS Cross Media Finder, WEB TV and social network

The Cross Media Finder is a solution which allow you to set up and create your Multichannel distribution, WebTV, content on demand, and Social Networking supporting the Cross Media Content and distributing them on: PC, PDA and Mobile (see http://xmf.axmedis.org). The solution is based on AXMEDIS technology for the cross media content modelling, for the Digital Rights Management, DRM and business models, for the automated production of content for multichannel, and for the collection and management of the User Generated Content.



The main innovations mainly consist in the AXMEDIS Cross Media Content that can:

- present in a single digital object more powerful and participative entertainment experiences than present DVDs;
- provide enhanced interactivity such as making queries into the content elements, supporting and storing annotations, navigating and selecting content elements to be played, reacting to user commands and changes, etc.;
- include/describe/package any kinds of media and media collections: audio, video, games, documents, images, etc.;
- be exchanged and distributed among different devices/tools: PC, mobiles, smart-phones, STB/PVR, HDR, PDA, etc.;

- be accessed from several different interoperable distribution channels: Internet, P2P, wireless mobile, satellite and/or terrestrial networks, etc.;
- change/adapt its behaviour according to the user profiles and experience, context, device capabilities, connection capabilities, etc.;
- be generated by final users, produced at home and/or shared in the network, in the respect of the user Intellectual Properties Rights (IPR), that means supported by some open versatile DRM solution;
- present some autonomy of control, being proactive with the users providing and requesting information and data: for example to create touristic guides, to create travelling reports, coking books, brico-work manual, etc., asking to the user to augment the manual for further experiences and/or friends, etc.; See for example the AXMEDIS objects which are wizards for:
  - leaving a message on the Social Network
  - collecting your content and posting large set of content on the Social Network
  - producing your image collections
  - posting and collecting your content making them accessible for your mobiles,
  - protecting your content, making it accessible only for your friends.
  - Etc.
- be protected and managed with AXDRM that supports a large set of business models, for example: renting, pay per play, subscription, advertising, user generated content, etc.;

A trial version of the Cross Media Finder, XMF.AXMEDIS, solution and portal is accessible on http://xmf.axmedis.org for PC, PDA and Mobiles with suitable demonstrative content. It shows all the presented features and thus how they can be integrated in a portal, WebTV, IPTV for cross media content on demand integrating social networking capabilities obtaining the integrated features reported in this document.
On the Cross Media Finder, the user can directly access to facilities for searching, downloading and publishing/uploading content. Observing and browsing the content already obtained, downloaded in the past. The users can

- access to cross media content as described in the following;
- make queries on cross media content selecting video, audio, documents, images, cross media or any, on the basis of extended metadata, or other categories;
- download the interactive content from the server, client/server direct download;
- play interactive content directly into the WEB page or from the downloaded files;
- browse the list of the most downloaded content;
- browse the list of the less downloaded content;
- browse the list of the most ranked downloaded content;
- see the list of the last recently uploaded content;
- see a preview for each content element with an icon or animated icon;
- see content metadata such as: title, description, format, type, genre, ranks, comments, etc., for each content element in preview or as a result of a query;
- see the extended metadata for each content;
- play and see the content at full screen; In order to play a cross media content, the user has to click on the visible and/or animated icons representing the content. The resulting action is the internal opening of a new web page into the AXEPTool. That page contains the AXMEDIS Active X player with the automatic loading of the selected content.
- upload content and contributions on the Cross Media Finder to see them directly presented in the portal and declined for PC, PDA, STB and Mobile if requested;
- upload content and contribution deciding to protect them, and to make them accessible for some users for example (available with AXMEDIS DRM support only)

8. Exploitable knowledge and its Use

This section presents exploitable results, defined as knowledge having a potential for industrial or commercial application in research activities, for developing, creating and marketing a product, for improving a process or for providing a service.

8.1 Overview table

Exploitable Knowledge (description)	**Exploitable product(s) or measure(s)**	**Sector(s)** of application
Content creation	Tools for automatic content creation, composition and enforcement of DRM (AXMEDIS Editor). -multichannel distribution and format based on DRM -Related consulting services about technologies.	Content producers and aggregators
Content processing and formatting	-Tools for automatic content formatting for content production on demand, multichannel distribution, real time transcoding, etc. - massive content production via GRID processing -Related consulting services about technologies.	Content producers, aggregators and distributors
Interoperable DRM	Tools and technologies	Content distributors
Content usage and play	-Content Players - interoperable payers	Content producers, aggregators and distributors
CMS and DAM technologies	-Tools for integration with CMS and DAM. -Related consulting services about technologies.	Content producers, aggregators and distributors
Tracking models for content creation, aggregation and distribution	-Software for monitoring the transactions and the activities performed on content (AXMEDIS Certifier and Supervisor). -Related services on content usage and transactions such as statistics, reports, etc. -Services related to the registration and/or certification tools.	Content producers, aggregators and distributors
P2P technologies	-AXMEDIS P2P tool for B2B content sharing among producers, aggregators and distributors (AXEPTool) with DRM. - AXMEDIS too for B2C content sharing with DRM -Related services for pulling and pushing content via AXEPTool	Content producers, aggregators and distributors
DRM and protection technologies	-AXMEDIS Protection Model based on MPEG-21 standard. -Services related to the protection of content, and to the protection for content on demand. -Related consulting and training services about technologies.	Content producers, aggregators and distributors
AXMEDIS Framework	Services for: -access to AXMEDIS Framework -software integration and customization (software, documentation, consulting, training, etc.).	Content producers, aggregators and distributors
Consulting services	-Consulting services on the application and customization of the AXMEDIS Framework and related technologies (MPEG-21, etc)	Content producers, aggregators and distributors
Training services	Training activities on the AXMEDIS technologies	Content producers, aggregators and distributors

AXMEDIS project results can be exploited using the developed products and services. The components of the AXMEDIS framework will be available using a dual license business model via the AXMEDIS portal, encouraging content distributors and providers in becoming AXMEDIS compliant. The real economic receipts of the project is to be found in the added value brought by innovative tools for content production and distribution allowing the reduction of production cost, the access to a greater variety of contents and the opportunity to exploit innovative and flexible digital rights management support. The AXMEDIS Consortium has foreseen a set of products and services as described below.

The products of the AXMEDIS project are:

- **AXMEDIS Tools**
  The AXMEDIS Tools will be distributed using a dual license business model. They include:
  - tools for content creation, composition, and enforcement of DRM
  - tools for automatic content formatting, adaptation, content production on demand, etc.
  - tools for digital asset management (DAM) and content management system (CMS)
  - tools for content distribution
  - tools for content consumption (AXMEDIS players)
  - P2P tools for B2B and B2C content sharing among content producers, distributors, and final users

- **AXMEDIS DRM and Protection Model**
  The AXMEDIS DRM and Protection Model include an innovative Digital Rights Management and is integrated on different architecture and platforms, providing the following main tools.
  - License Editor and verificator
  - AXCS, AXMEDIS Certifier and Supervisor for monitoring transaction models and tracking the activities performed on AXMEDIS content during production and distribution;
  - AXPMS, AXMEDIS Protection Manager Support, the so called License Server;
  - AXCA, AXMEDIS Certification Authority;
  - AXRS, AXMEDIS Registration Service;
  - CAMART and AII tools for DRM collection and reporting of rights exploitation and statistics

- **Products based on AXMEDIS framework**
  These products includes those produced from the demonstrators and from the take up actions such as training material, AXMEDIS demonstrations and so on

The following **Errore. L'origine riferimento non è stata trovata.** summarizes the main features of all the AXMEDIS products.

AXMEDIS products: features

Tool/system description	nature	target user / customer
AXMEDIS Tools for content creation, AXMEDIS Editors	software	content producer and aggregators
AXMEDIS AXCP content formatting, SMIL based	software	content producers, aggregators and distributors
AXMEDIS plug in for content processing: fingerprint, adaptation, etc.	software	content producers, aggregators and distributors
AXMEDIS tool for automatic Content Processing, AXCP tools: GRID scheduler, nodes, quick start, etc.	software	content producers, aggregators and distributors
AXMEDIS Programme and Publication	software	content producers, aggregators and distributors
AXMEDIS P2P Tool for B2B (AXEPTool)	software	content producers and distributors

Tool/system description	nature	target user / customer
AXMEDIS P2P Tool for consumers (AXMEDIA)	software	content distributors and final users
AXMEDIS Database Tools for integration with DAM, CMS and P2P, distribution	software	content producers, aggregators and distributors
AXMEDIS DRM: Licenses Editor, AXPMS, AXCS, AXCA, AXRS, Protection Model, Protection processor, guidelines and wizard for Licenses Production, Licenses Translator	software	content producers, aggregators and distributors, colleting societies
AXMEDIS Workflow support	software	content producers, aggregators and distributors
AXMEDIS software players	software	content distributors, final users
AXMEDIS STBs/PVRs	hardware	content distributors, final users
Products based on AXMEDIS Framework	software + multimedia resource + documentation	content producers, aggregators and distributors

The main services provided as exploitation of the AXMEDIS results are related to the access to the AXMEDIS framework via the portal in Source Code (using a dual license business model, together with full source code accessibility via the AXMEDIS affiliation program): this feature can encourage SMEs and institutions to transform their architecture and applications so to become AXMEDIS compliant and can be useful to create a base for future projects.
The availability of the AXMEDIS framework also includes support services (training and consulting) for industries, companies and institutions interested in producing AXMEDIS compliant applications. They are mainly provided by the research institutions involved into the project and underlies a strong commitment to adapt the framework in order to deploy new technologies and solutions related to cross media digital content production, management, protection and distribution.

A demonstration activity is planned for the last year of the project producing four demonstrators regarding the distribution of contents toward i-TV, PDA via kiosks, PC via internet and mobiles. The consortium will offer these demonstrators as a free service for the first five months following the validation period, and as pay per play (or subscription) services for the next three months.

The AXMEDIS project infrastructure and tools include underling services such as:

- **Content production**
- **Content protection**
- **License production**
- **Pulling and pushing the content,** via the P2P tool. Content providers can publish their content so to make it visible to customers. Content distributors can get the content from content providers and repurpose it on the B2B channel or distribute it to the clients on their B2C channels
- **Collecting the content** in a local database so to prepare catalogues and attract the final users
- **Using the query support** to allow customers to search and find the specific content they are looking for
- **Getting update information on available contents** performed in push via satellite data broadcast so to maintain an updated information
- **Accessing statistic** produced by the AXMEDIS Certifier and Supervisor about content usage

The AXMEDIS project also includes a web service on the AXMEDIS portal that will be the front end for the communications among the partners and the customers interested in using the AXMEDIS tools and join the AXMEDIS framework. The web service will be used for providing:

- AXMEDIS components and tools to companies and institutions interested in becoming AXMEDIS compliant via affiliation, included the tools for joining the P2P network for B2B and B2C business models
- open forum for discussion and newsletter
- test cases and content to experiment and validate potential AXMEDIS compliant tools
- general and detailed information about AXMEDIS technologies, such as documents and reports
- a query service on a general index of all the AXMEDIS content available via the AXMEDIS P2P network
- an activation service allowing users and distributors to obtain from the AXMEDIS Certifier and Supervisor the authorization for the connection with the AXMEDIS P2P network

The following table summarizes the main features of all the AXMEDIS services.

AXMEDIS services: features

Service description	nature	target user / customer
AXMEDIS Framework, providing, maintenance, improvement	software, documentation	content producers, aggregators and distributors
Support for customization of some parts of the AXMEDIS framework and tools	software+ documentation+ consulting	content producers, aggregators and distributors
Training on AXMEDIS tools and component and issues of the related areas	documentation+ consulting	content producers, aggregators and distributors
Consulting on AXMEDIS and related areas	documentation+ consulting, software	content producers, aggregators and distributors
Demonstrators, installation and usage	documentation+ consulting, software	content producers, aggregators and distributors
Pulling and pushing services	software	content producers, aggregators and distributors
Content collecting	software	content aggregators and distributors
Query support	software	content aggregators, distributors, final users
Content availability	software	content producers, aggregators and distributors
Statistic and reporting on rights usage and content access	software	content producers, aggregators and distributors
Certification authority for AXMEDIS network, AXCA	software	content producers, aggregators and distributors
Central registration authority for user, devices, tools, etc., AXCS and AXRS	software	content producers, aggregators and distributors
Web services	software + documentation	content producers, aggregators and distributors

A detailed analysis on business models to be used for the above products and services is currently reported in the Exploitation Plan deliverable for M36. The final version of the Exploitation Plan deliverable, available at M48, will include the refined and completed analysis.

8.2 Exploitation spinoff

As result of the analysis on the possible exploitation scenarios and business opportunities, on July 2008 a group of Consortium partners founded AxMediaTech Ltd, an Italian spin-off company.
One of the main goals of this new company is to successfully enter the market by extending, improving and commercializing some of the products and services that have already been identified and listed in the final Exploitation Plan document. Since the AXMEDIS framework will obviously have a central role in the development of the company products, some of the core activities of AxMediaTech will be that devoted to maintain, improve, support and disseminate the framework itself. AxMediaTech will also work on the creation of a customized/extended version of the AXMEDIS framework that will be presented and distributed on the market with the name "AxMediaTech distribution of AXMEDIS framework".
AxMediaTech is obviously interested in signing possible partnerships that can increase the company value and extend its business opportunities. In this respect, AxMediaTech is very open to the possibility of reaching agreements with other AXMEDIS Consortium partners and/or having them as shareholders. Relevant agreement are going to be established with AXMEDIS partners.

9. Dissemination of knowledge

During the project, at least one international conference has been organized, in addition a large set of publications and promotional material has been produced. The list is reported at the end of this document.

The AXMEDIS Conference aimed to provide an exposition area for showing results and state of the art to industries.

The 2nd AXMEDIS International Conference took place from the 13th to 15th December 2006, with a pre-conference tutorial day on 12th December 2006 and held at the University of Leeds, Leeds, UK. The AXMEDIS 2006 conference demonstrated and presented tutorials on the current AXMEDIS Framework and tools to increase the visibility of the project and to have a stronger validation of the results obtained. AXMEDIS2006 consisted of four parallel tracks. Venues include several Lecture Theatres of the Roger Steven Lecture Theatre building and the School of Music Lecture Theatre 1. The AXMEDIS tutorial sessions were held in the School of Music Lecture Theatre 1 from the 12th December 2006. Further details on the AXMEDIS2006 International Conference is available online at the conference website, http://www.AXMEDIS.org/AXMEDIS2006/ with programme, committee members, information for delegates including conference venue location, tourist information and accommodation information used by the delegates at the conference. Links to AXMEDIS2005 together with photos from the AXMEDIS2006 are also presented.

The 3rd AXMEDIS International Conference was held from the 28th November to the 30th November. It took place at the Universitat Politècnica de Catalunya, UPC Campus Nord, Barcelona, Spain. The AXMEDIS conference demonstrated and presented tutorials on the current AXMEDIS Framework and tools to increase the visibility of the project and to have a stronger validation of the results used with industrial partners and their existing business models.
AXMEDIS2007 provided a Program including: Scientific and industrial Papers, Tutorials, 3rd I-MAESTRO Workshop on Interactive Multimedia and Technology-Enhanced Learning and Teaching for Music, VARIAZIONI Workshop on Technologies for Content Enrichment in the Web2.0 era,

Panel on Interoperability between Rights Expressions Languages, Panel on Architectures for security and Digital Rights Management, Panel on Digital context, collective licensing and cultural diversity: the way forward, Demonstrations and Expositions. Further details on the AXMEDIS2007 International Conference is available online at the conference website, http://www.axmedis.org/axmedis2007/ (see Figure below), with all Calls, programme, committee members, information for delegates including conference venue location, tourist information and accommodation information.

AXMEDIS2008 is to be held at Villa Finaly, Florence, Italy from the 17th to the 19th November 2008 http://www.axmedis.org/axmedis2008 .

9.1 Conferences and workshops

AXMEDIS Conference and workshops

Deliverable	Deliverable title
DE7.1.2.1	Workshops for users, decision makers and managers http://www.AXMEDIS.org/AXMEDIS2005/
DE11.4.1	AXMEDIS 2005 Conference http://www.AXMEDIS.org/AXMEDIS2005/
DE7.2.1.2	Intermediate AXMEDIS Training Courses, 2006 axmedis-de7-2-1-2-training-material-intermediate-v0-5.pdf
DE11.4.1.2	AXMEDIS 2006 Conference http://www.AXMEDIS.org/AXMEDIS2006/ http://ieeexplore.ieee.org/xpl/RecentCon.jsp?punumber=4041313
DE7.1.2.2	Tutorial and/or workshop users, decision makers and managers http://www.libreriauniversitaria.it/c_power_search.php?shelf=BIT&q=axmedis
DE11.4.3	AXMEDIS 2007 Conference http://www.axmedis.org/axmedis2007/
	Content production workshop http://www.axmedis.org/cmcps2007/
	AXMEDIS 2008 Conference http://www.AXMEDIS.org/axmedis2008/
DE7.2.1.3	AXMEDIS Training Courses, 2007 axmedis-de7-2-1-3-training-courses-2007-2008-v1-0.pdf

Dissemination Material

Deliverable	Deliverable title
DE11.1.4.4	Project Brochures, version 4 axmedis-de11-1-4-4-project-brochures-version-4-v0-3.pdf
DE11.1.4.3	Project Brochures, version 3 axmedis-de11-1-4-3-project-brochures-revised-m36-v1-0.pdf
DE11.1.4.2	Project Brochures, revised AXMEDIS-de11-1-4-2-project-brochures-revised-v3-0.pdf
DE11.1.5.1	Project Brochures for tools/aspects/areas axmedis-de11-1-5-1-broschures-tools-areas-flyers-v1-1.pdf
DE11.1.6.1	Project Videos axmedis-de11-1-6-1-project-videos-v0-1.pdf
DE11.1.6.2	AXMEDIS Show Case **axmedis-dvd-july2008-iso.torrent**

9.2 Articles and contributions

9.2.1 Press releases and documentation

[1] Final version of Press release (short and long version - 2 and 6 pages respectively) in Italian and English are available on the website.
- Short [http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=231]
- Long [http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=230]

[2] Press communication for the project kick off has been produced in Italian and it is available for the public on the web site.

[3] Fact sheet delivered to the Officer up to now and presently available in French, English, Italian, German, Spanish and Chinese. These versions have been made available on the web page of the project.

[4] AXMEDIS project description published on the IMSS website with links to the main AXMEDIS site [www.imss.reading.ac.uk]

[5] AXMEDIS project description and Take up published and distributed by the University of Leeds Press Office, 23 March 2006 [http://reporter.leeds.ac.uk/press_releases/current/AXMEDIS.htm]

[6] AXMEDIS conference, News, University of Leeds Press Office, http://campus.leeds.ac.uk/newsincludes/newsitem4355.htm, 11 December 2006

[7] "Copyright: entro gennaio del prossimo anno sarà operativa ISAN Italia", http://www.newslinet.it/shownews.php?nid=3629. Last accessed 30/08/2008

[8] "Siae, Anica, Apt, Produttori e Autori Indipendenti creano l'anagrafe dell'audiovisivo," http://www.dirittodautore.it/page.asp?mode=News&IDNews=4250. Last accessed 30/08/2008

[9] Midem News, "Axmedis offers cheap and easy access to the digital contents' market. January 2008

9.2.2 National Newspapers

[1] "A difesa del web milioni "europei"," in.*com*, Newspaper article, pp. 6, 08/10/2004.

[2] "Firenze, Progetto Ue contro la pirateria," in *Itali@Oggi.it*, Newspaper article, pp. 2, 09/10/2004.

[3] "Quattro milioni di italiani scaricano da Web," in *La Stampa*, Newspaper article, pp. 32, 08/10/2004.

[4] ""AXMEDIS" per l'Europa," in *La Nazione*, Newspaper article, pp. 9, 08/10/2004.

[5] "E' AXMEDIS l'alleanza contro la pirateria," in *La Nazione*, Newspaper article, pp. 7, 08/10/2004.

[6] "Nasce AXMEDIS per proteggere," in *La Repubblica*, Web E TV, pp. 14, 08/10/2004.

[7] "An interview to Paolo Nesi," in *La Repubblica*, Interview, pp., 08/02/2005.

[8] "Il Progetto Europeo AXMEDIS" in ATA Notizie, Pisa, pp.6-8, No.2, 2005

[9] "Gli obiettivi di AXMEDIS, il progetto della Commissione Europea da 14 milioni di Euro," in Il giornale dell'information & communication technology, Corriere delle comunicazioni, 12-25 Settembre, Italy, pp. 15, Paolo Nesi.

[10] "Il progetto europeo AXMEDIS", ATA Notizie, Unione Industriale Pisana, n.2, 2005

[11] "AXMEDIS", il corriere delle comunicaizoni, 2005

[12] TEO vadovaus inovaciju konsorciumui", Verslo zinios, p.8, 17.10.2006

9.2.3 On Radio:

[1] "Interview in Florence to P. Nesi," in *Mondo WEB*: Radio Swizzera, 2004.

[2] "Interview in Florence to M. Campanai," Radio Tuscany, 2004.

[3] Interview, ICMC net Radio, K. Ng, with Eric Christensen from the Danish Broadcasting corporation, 30 August 2007

[4] several interviews have been provided to press journalists at the IBC 2007, by P. Nesi

9.2.4 On national video channel, broadcaster:

[1] RAI TRE dinner news at the 10 October 2004, time: 21:00

[2] RAI TRE national level, 15 minutes of interview to Paolo Nesi (the project coordinator) and Franco Bixio (AFI) at Neapolis programme: time 15:00 of the 11 October 2004. The Interviews have been performed during kick off meeting.

9.2.5 Government:

[1] Contacts with Dr. Paolo Vigevano - Italian Government Commission on digital commerce, and e-content, performed by AFI, and successively by the coordinator with the sending of informative material and a letter. Dr. Vigevano has accepted the invitation.

[2] Formal letter of AXMEDIS Consortium to the Italian Government Commission on digital commerce, and e-content.

[3] Contact and formal invitation letter to Dr. L. Stanca, Italian Minister of Innovation, to open AXMEDIS 2005 international conference. Dr. Stanca has declined the invitation due to other previous commitment falling in the same period.

[4] Contact and formal invitation to Lord Mayor of Leeds, UK, Councillor Mohammed Iqbal, to open AXMEDIS 2006 International Conference. The Lord Mayor of Leeds has accepted the invitation.

[5] Presentation of AXMEDIS, performed by A.F.I. during the hearing at the European Parliament "Collective Cross Border Management of Copyrights for Online Music Services", 18 September 2006.

[6] Dissemination among the officials of the Italian government involved in European affairs (carriedout by AFI). On the 13th of February 2007 Mr Franco Bixio and Mr Massimo Baldinato from A.F.I. met with Mr Gianfranco Dell'Alba, head of Cabinet of Mrs Emma Bonino, Italian Minister for European Affairs. During this meeting the AXMEDIS project was presented to Mr Dell'Alba. More details can be found in Appendix 16.2, February 2007

[7] Presentation of AXMEDIS to Mrs. Paola Colombo and Mr Christophe Forax, members of the Cabinet of Mrs Viviane Reding, European Commissioner for Information Society and Media, 23 February 2007.

[8] Presentation of AXMEDIS to Mr Tilman Lueder, Head of the Copyright Unit, DG Internal Market and Services, European Commission, 12 February 2007.

[9] Presentation of AXMEDIS to Mr. Carlo Toffolon, official at Media Unit, DG Competition, European Commission, July 2007.

[10] Presentation of AXMEDIS to Mr Antonio Preto, member of the Cabinet of Mr. Hans Gert Pöttering, President of the European Parliament, September 2007

[11] Presentation of AXMEDIS at the European Parliament during AFI's hearing on licensing on the 18th of September 2007 (AFI)

[12] Bilateral meetings with representatives of the European Institutions (carried out by AFI) with the involvement of European Parliament and European Commission. Some important people attended include DG Internal Market, Mr Tilman Lueder, Head of the Copyright Unit; DG Education and Culture, Mrs Valerie Panis, official in charge of the horizontal policies; DG Information Society, Mrs Paola Colombo, member of the Cabinet of the Commissioner Mrs Viviane Reding

[13] Presentation of AXMEDIS to the European Commission, European Parliament, the Council of the European Union and other private stakeholders at Confindustria in Brussels, 20 November 2007. 30 flyers together with a DVD were distributed to the participants.

[14] Various meetings with representatives of the European Institution especially following the adoption of the Communication "Creative Content on line in the Single Market".

[15] AXMEDIS presentation to APT, ANICA and API in Rome, Italy, 10 December 2007

9.2.6 Standard Bodies

[1] Submission of AXMEDIS Uses case deliverable to the DMP, received its appreciation from Dr. Leonardo Chiariglione, DMP;

[2] Submission of AXMEDIS Requirements to the DMP

[3] A Meeting has been held the 14th of June in Florence with DMP;

[4] AXMEDIS delegation attended the DMP meeting in Turin, Italy, June 2005;

[5] A document for comparing DMP, MPEG21 and AXMEDIS has been produced and positively valued by DMP. Comparing DMP-AXMEDIS and MPEG21, architecture, object and IPMP: DSI, FUPF;

[6] Follow up: Acceptance of several suggested AXMEDIS oriented improvements into the DMP;

[7] Several contacts with DMP

[8] Several contacts and communication with DMIN.I

[9] proposal of standardisation of the CMIP MAF file format at MPEG ISO as derived from the AXMEDIS format and experience

[10] comparison of different file formats coming from different MPEG-21 project and developments: AXMEDIS, ENTHRONE, etc.
[11] Presented a set of contributions for a CMIP MAF based on AXMEDS technology at the MPEG San Jose Meeting
[12] Input contributions to JPEG standard:
- Extensions for the JPEG Query Format and its application (31 March – 4 April 2008)
- MPQF Profile for JPSearch Part 3 (7 – 11 July 2008)
- Semantic-driven multimedia retrieval with the MPEG Query Format (7 – 11 July 2008)

[13] Co-editors of the following JPEG standards: ISO/IEC CD 24800-3:2008 CD Information technology - JPSearch - Part 3: JPSearch Query format

9.2.7 Contribution to MPEG standardization body

[9] Busan, Korea, 2005, Request of a core experiment for demonstrating the needed changes in the IPMP schema of MPEG21: DSI-DISIT, DMAG UPF and EXITECH, Poznan, Poland, July 2005.
[10] Input document M12222: Report of CE on the indexing of IPMP protected DIDL content, Paolo Nesi, Davide Rogai, Andrea Vallotti, Pierfrancesco Bellini, Jaime Delgado, Eva Rodríguez, Maurizio Campanai, MDS, DSI-DISIT, DMAG UPF and EXITECH, Poznan, Poland, July 2005.
[11] Follow up: acceptance of some of the proposed changed into the MPEG21 standard
[12] Input document m11893: A subset of MPEG-21 REL for interoperability with OMA DRM v2.0, Busan, Korea, April 2005.
[13] Input document m11934: IPMP Components Reference Software: IPMP information parser, Busan, Korea, April 2005.
[14] Input document m11935: IPMP Components Reference Software: IPMP information extractor, Busan, Korea, April 2005.
[15] Input document m11937: IPMP Components Reference Software: IPMP License extractor, Busan, Korea, April 2005.
[16] Input document m11870: Report for CE on Fragment-level Protection Description, Busan, Korea, April 2005.
[17] Input document M12299: MPEG-21 ER Core Experiments: Core Experiment on use of Event Report Requests: Specification of Use Cases, Eva Rodríguez, Maria Cirera and Jaime Delgado, Poznan, Poland, July 2005.
[18] Input document M12356: Software implementation of ER Core Experiment, Poznan, Poland, July 2005.
[19] Follow up: Ad hoc Group on MPEG-21 Event Reporting to develop reference software and validate relation between event reporting and DI.
[20] Input document m12229: An MPEG-21 REL mobile profile, Jaime Delgado, Jose Prados, Eva Rodríguez, Poznan, Poland, July 2005.
[21] Input document m12297: Comparison of REL mobile profiles, Jaime Delgado, Jose Prados, Eva Rodriguez, Poznan, Poland, July 2005.
[22] Rodriguez, E.; Delgado, J.; Sesmero, J. "Ontological Analysis of the Study of DCOR/2 of ISO/IEC 21000-6". ISO/IEC JTC1/SC29/WG11/MPEG2006/m13453. Klagenfurt, AT. July 2006
[23] Rodriguez, E.; Delgado, J. "Contribution to DIA Reference Software: REL Capabilities Parser". ISO/IEC JTC1/SC29/WG11/MPEG2006/m13575. Klagenfurt, AT. July 2006
[24] Rodriguez, E.; Delgado, J. "Contribution to MPEG-21 IPMP Conformance". ISO/IEC JTC1/SC29/WG11/MPEG2006/m13576. Klagenfurt, AT. July 2006
[25] Delgado, J.; Rodriguez, E. "Comparison between different approaches to map Creative Commons and MPEG-21 REL". ISO/IEC JTC1/SC29/WG11/MPEG2006/m13668. Klagenfurt, AT. July 2006
[26] Delgado, J., Rodriguez, E. "Contribution to MPEG-21 REL Profiles structure". ISO/IEC TC1/SC29/WG11/MPEG2006/m13387. Monteux, CH. April 2006
[27] Delgado, J., Rodríguez, E., Sesmero, J., García, R. "Analysis of current version of MPEG-21 Rights Data Dictionary". ISO/IEC JTC1/SC29/WG11/MPEG2006/M13309. Monteux, CH. April 2006
[28] Sesmero, J., Llorente, S., Rodríguez, E., Delgado, J. "Contribution to MPEG-21 REL Base Profile Ref Sw: License Creator". ISO/IEC JTC1/SC29/MPEG2006/WG11/M13204. Monteux, CH. April 2006

[29] Delgado, J., Rodriguez, E. “Towards the interoperability between MPEG-21 REL and Creative Commons licenses”. ISO/IEC JTC1/SC29/WG11/MPEG2006/M13118. Monteux, CH. April 2006
[30] Rodriguez, E., Delgado, J. “Contribution to MPEG-21 REL Base Profile Ref Sw: Validation Rules Checker”. ISO/IEC JTC1/SC29/WG11/MPEG2006/M13116. Monteux, CH. April 2006
[31] Rodriguez, E., Delgado, J. “Contribution to CE on REL-RDD Terminal Capabilities – Capabilities Parser and REL Translator Service”. ISO/IEC JTC1/SC29/WG11/MPEG2006/M13100. Monteux, CH. April 2006
[32] Rodriguez, E., Delgado, J. “Contribution to MPEG-21 REL Profiles AhG - First mandate”. ISO/IEC JTC1/SC29/WG11/MPEG2006/M13090. Monteux, CH. April 2006
[33] Wang, X., Delgado, J., Barlas, C. “Report of the AhG on MPEG-21 REL Profiles”. ISO/IEC JTC1/SC29/WG11/MPEG2006/M13048. Monteux, CH. April 2006.
[34] Rodriguez, E., Delgado, J. “REL Base Profile Reference Software: Schema Checker”. ISO/IEC JTC1/SC29/WG11/MPEG2006/m12966. Bangkok, Thailand. January 2006.
[35] Delgado, J., García, R., Llorente, S., Rodríguez, E. (DMAG-UPF), Gauvin, M. (SDAE, Spain) “Analysis of Draft Text for RDD Corrigendum/2”. ISO/IEC JTC1/SC29/WG11/MPEG2006/m12961. Bangkok, Thailand. January 2006.
[36] Wang, X., Delgado, J., Barlas, C. “Editors Input on DoC of 21000-5 PDAM1”. ISO/IEC JTC 1/SC 29/WG 11/M12781. Bangkok, Thailand. January 2006.
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[50] Nesi, Bellini, Rogai, ‘’Proposal for a MAF on Cross-Media Interactive Presentation: Overview and Application Scenarios of CMIP MAF’’, San Jose, USA April, 2007.
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[55] Rodríguez, E., Delgado, J. “Software implementation of security in Event Reporting”. ISO/IEC JTC1/SC29/WG11/M14623. Lausanne, Switzerland. July 2007.

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- AHG on Requirements for Rights Ontology (22 – 26 October 2007)
- Introduction of a Data Model for MPQF (22 – 26 October 2007)
- Supporting JOINs and segment-level retrieval in MPQF (22 – 26 October 2007)
- Ad Hoc Group on Requirements of Media Value Chains Ontologies (14-18 January 2008)
- Proposal of Reference Software for MPQF. Validation of embedded XQuery expressions (14-18 January 2008)
- Ad Hoc Group on Requirements for Media Value Chain Ontology (28 April – 02 May 2008)
- Proposal for MPEG Query Format Reference Software Implementation Plan (28 April – 02 May 2008)
- Updated version of the MPEG-21 REL Schema Checker for the OAC profile (28 April – 02 May 2008)
- Use of MPEG-21 REL for the expression of Audiovisual Contracts (28 April – 02 May 2008)
- How to express Exclusivity in MPEG-21 REL (28 April – 02 May 2008)
- An approach to a Syntactic Checker for MPQF Reference Software for MPQF. Validation of embedded XQuery expressions (28 April – 02 May 2008)
- Ontology for IP Media Networks (IPM-Net): A response to the MVCO CfP (21 July – 25 July 2008)
- Response to MXM Call for Proposals (21 July – 25 July 2008)
- Collection of MXM Use Cases (21 July – 25 July 2008)
- Proposal of MXM Technologies (21 July – 25 July 2008)
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- ISO/IEC 21000-15/COR1

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[109] Pierfrancesco Bellini, Ivan Bruno, Daniele Cenni, Paolo Nesi, Performance evaluation and statistical analysis of a BitTorrent tracker, in Proceedings of the 14th International Conference on Distributed Multimedia Systems, Boston, USA, 4-6 September 2008
[110] Atta Badii, Ali Khan, Adedayo Adetoye, David Fuschi, High Resolution Digital Media Personalisation for All Delivery Context Device Agents, in Proceedings of the 14th International Conference on Distributed Multimedia Systems, Boston, USA, 4-6 September 2008

10. References and links to documents and deliverables

Requirements

Deliverable	Deliverable title
DE2.1.1.2.1	User Requirements, First Update of DE2.1.1a AXMEDIS-de2-1-1-2-1-user-requirements-firs-update-v2-5.pdf

Use Cases and test cases

Deliverable	Deliverable title
DE2.1.1.2.2	Use Cases and Scenarios, First Update of DE2.1.1a AXMEDIS-de2-1-1-2-2-use-cases-and-scenarios-first-update-v3-0-consolidated-public.pdf
DE2.2.1.2	Test cases and content description, First Update AXMEDIS-de2-2-1-2-test-cases-and-content-description-first-update-v2-3.pdf

Reports on Basic Enabling Technologies

Deliverable	Deliverable title
DE4.1.1.2	Content Modelling and managing, first update AXMEDIS-de4-1-1-2-content-modeling-and-managing-1st-upd-v1-6.pdf
DE4.2.1.2	Content indexing, monitoring and querying, first update AXMEDIS-de4-2-1-2-content-indexing-monitoring-and-querying-v1-0.pdf
DE4.3.1.3	*CONTENT COMPOSITION AND FORMATTING, FINAL VERSION* axmedis-de4-3-1-3-content-composition-and-formatting-v1-2.pdf
DE4.4.1.3	*CONTENT SHARING AND PRODUCTION ON P2P, FINAL VERSION* axmedis-de4-4-1-3-content-sharing-and-production-on-p2p-v1-1.pdf
DE4.5.1.3	*CONTENT PROTECTION AND SUPERVISION, FINAL VERSION* axmedis-de4-5-1-3-content-protection-and-supervision-v1-0.pdf
DE4.6.1.2	Content Distribution via Internet, first update AXMEDIS-de4-6-1-2-content-distribution-via-internet-1st-upd-v1-5.pdf
DE4.7.1.2	Content Distribution toward mobiles, first update AXMEDIS-de4-7-1-2-content-distribution-toward-mobiles-1st-upd-v1-4.pdf
DE4.8.1.3	*CONTENT DISTRIBUTION VIA SATELLITE DATA BROADCAST, FINAL VERSION* **axmedis-de4-8-1-3-content-distribution-via-satellite-data-broadcast-v1-0.pdf**
DE4.9.1.2	The Usability issues for the AXMEDIS production tools, first update AXMEDIS-de4-9-1-2-the-usability-issues-for-the-AXMEDIS-production-tools-1st-upd-v1-2.pdf

AXMEDIS Framework, Specifications and Documentation

Deliverable	Deliverable title
DE5.1.2.3	AXMEDIS Framework for all, update axmedis-de5-1-2-3-axmedis-for-all-update-v4-5.pdf
DE5.0.1.3	AXMEDIS Major Tools User Manuals and installation manual, third update axmedis-de5-0-1-3-axmedis-user-manuals-v1-0.pdf
DE5.0.1.2, Annex 1	ANNEX 1: AXMEDIS Content Processing multimedia language user manual, programming manual axmedis-de5-0-1-2-annex-1-content-processing-script-language-user-manuals-v1-3-pub.pdf
DE5.0.1.2, Annex 2	ANNEX 2: AXMEDIS P2P user manual axmedis-de5-0-1-2-annex-2-axeptool-axmedia-axtrack-user-manuals-v-1-4.pdf
DE5.0.1.2, Annex 3	AXMEDIS plug ins for Content Processing, Editor and Players, User Manual, Technical Reference axmedis-de5-0-1-2-annex3-axmedis-plugin-sdk-v1-1.pdf FULL Software Development Kit with examples and source code axmedis-de5-0-1-2-annex3-axmedis-plugin-sdk-v1-1-full-version-software.zip
DE5.1.3.1	AXMEDIS Framework Guidelines AXMEDIS-de5-1-3-1-framework-guidelines-v2-2.pdf
DE5-2-2-3	AXMEDIS Framework Validation and Integration Report, third update axmedis-de5-2-2-3-framework-validation-and-integration-report-third-update-v1-0.pdf
DE3.1.2.2.1	Specification of General Aspects of AXMEDIS framework, first update of DE3.1.2 part A AXMEDIS-de3-1-2-2-1-spec-of-ax-gen-asp-of-AXMEDIS-framework-upa-v1-2.pdf
DE3.1.2.2.2	Specification of AXMEDIS Command Manager, first update of DE3.1.2 part B axmedis-de3-1-2-2-2-spec-of-ax-cmd-man-upb-v1-8.pdf
DE3.1.2.2.3	Specification of AXMEDIS Object Manager and Protection Processor, first update of DE3.1.2 part B AXMEDIS-de3-1-2-2-3-spec-of-axom-and-protproc-upb-v2-0.pdf
DE3.1.2.2.4	Specification of AXMEDIS Editors and Viewers, first update of DE3.1.2 part B AXMEDIS-de3-1-2-2-4-spec-of-ax-editors-and-viewers-upb-v2-1.pdf
DE3.1.2.2.5	Specification of External AXMEDIS Editors/Viewers and Players, first update of DE3.1.2 part B AXMEDIS-de3-1-2-2-5-spec-of-external-editors-viewers-players-upb-v2-3.pdf
DE3.1.2.2.6	Specification of AXMEDIS Content Processing, first update of DE3.1.2 part C AXMEDIS-de3-1-2-2-6-spec-of-ax-content-processing-upc-v1-5.pdf
DE3.1.2.2.7	Specification of AXMEDIS External Processing Algorithms AXMEDIS-de3-1-2-2-7-spec-of-ax-external-processing-algorithms-v2-2.pdf
DE3.1.2.2.8	Specification of AXMEDIS CMS Crawling Capabilities, first update of part of DE3.1.2 AXMEDIS-de3-1-2-2-8-spec-of-ax-cms-crawling-capab-v1-3.pdf
DE3.1.2.2.9	Specification of AXMEDIS database and query support, first update of part of DE3.1.2 AXMEDIS-de3-1-2-2-9-spec-of-ax-database-and-query-support-v1-14.pdf
DE3.1.2.2.10	Specification of AXMEDIS P2P tools, AXEPTool and AXMEDIS, first update of part of DE3.1.2 axmedis-de3-1-2-2-10-spec-of-axeptool-and-axmedia-tools-v3-5-public.pdf
DE3.1.2.2.11	Specification of AXMEDIS Programme and Publication tools, first update of part of DE3.1.2 AXMEDIS-de3-1-2-2-11-spec-of-ax-progr-andpub-tool-v1-6.pdf
DE3.1.2.2.12	Specification of AXMEDIS Workflow Tools, first update of part of DE3.1.2 AXMEDIS-de3-1-2-2-12-spec-of-ax-workflow-tools-v1-6.pdf
DE3.1.2.2.13	Specification of AXMEDIS Certifier and Supervisor and networks of AXCS, first update of part of DE3.1.2 AXMEDIS-de3-1-2-2-13-spec-of-axcs-and-networks-v1-5.pdf

DE3.1.2.2.14	Specification of AXMEDIS Protection Support, first update of part of DE3.1.2 AXMEDIS-de3-1-2-2-14-spec-of-protection-support-uph-v1-9.pdf
DE3.1.2.2.15	Specification of AXMEDIS accounting and reporting, first update of part of DE3.1.2 AXMEDIS-de3-1-2-2-15-spec-of-ax-accounting-and-reporting-v1-6.pdf

Reports on Demonstrators

Deliverable	Deliverable title
DE9.1.5	Integrated Prototype of CMS integration and feedback axmedis-de9-1-5-integrated-prototype-of-cms-integration-and-feedback-v-1-1.pdf
DE9.2.5	Integrated Prototype of automating content production and formatting into CMSs of integrators axmedis-de9-2-5-final-report-on-demo-on-cont-prod-and-cms-v1-5.pdf
DE9.3.5	Integrated Prototype of content production and distribution in push and on-demand for i-TV axmedis-de9-3-5-final-report-demonstrator-content-distribution-via-satellite-v1-0.pdf
DE9.4.5	Integrated Prototype of content production and distribution on-demand for PC axmedis-de9-4-5-final-report-on-demo-on-cont-prod-and-distr-for-pc-v-0-3.pdf
DE9.5.5	Integrated Prototype of content production and distribution on-demand for Mobile phones, and new generation of PDAs de9-5-5-final-report-on-cont-prod-and-dist-for-mob-v1-3.pdf
DE9.6.5	Integrated Prototype of content production and distribution to kiosks and local PDAs axmedis-de9-6-5-final-report-on-content-prod-and-distrib-to-kiosks-and-pda-v1-4.pdf
DE12.1.2.1	AXMEDIS-4HOME Identification of Technological components Required for Apparatus and Ontology Analysis axmedis-de12-1-2-1-4home-usecase-and-reqs-analysis-v1-0.pdf
DE12.1.3.1	AXMEDIS-4HOME Architecture of Proposed Experimental Set Up, Specification axmedis-de12-1-3-1-spec-of-ax4home-architecture-v1-0.pdf
DE12.1.4.1	AXMEDIS-4HOME Component Integration, Prototypes and Documentation http://www.axmedis.org/documenti/view_documenti.php?doc_id=3939
DE12.1.5.1	AXMEDIS-4HOME Demonstrator Set Up http://www.axmedis.org/documenti/view_documenti.php?doc_id=3958
DE12.1.5.2	AXMEDIS-4HOME Demonstration Report axmedis-de12-1-5-2-4home-demonstration-report-v1-0.pdf
DE12.1.5.3	AXMEDIS-4HOME Final report and Success Story axmedis-de12-1-5-3-4home-final-report-and-success-story-v1-0.pdf
DE12.2.2.1	AXMEDIS-ELTEO Requirements axmedis-de12-2-2-1-elteo-requirements-v2-8.pdf
DE12.2.3.1	AXMEDIS-ELTEO Specification axmedis-de12-2-3-1-ax-elteo-spec-v2-1.pdf
DE12.2.4.1	AXMEDIS-ELTEO AXMEDIS Component Integration Prototypes and Documentation http://www.axmedis.org/documenti/view_documenti.php?doc_id=3933
DE12.2.4.2	AXMEDIS-ELTEO Content Modeling and Production http://www.axmedis.org/documenti/view_documenti.php?doc_id=3935
DE12.2.5.1	AXMEDIS-ELTEO Demonstrator Set Up http://www.axmedis.org/documenti/view_documenti.php?doc_id=3937
DE12.2.5.2	AXMEDIS-ELTEO Demonstration Report axmedis-de12-2-5-2-elteo-demonstration-report-v1-5.pdf
DE12.1.5.3	AXMEDIS-4HOME final report and Success Story. axmedis-de12-1-5-3-4home-final-report-and-success-story-v1-0.pdf

Content models, editorial formats

Deliverable	Deliverable title
DE8.5.1.2	Collection of editorial formats and DRM rules for multi-channel, update axmedis-de8-5-1-2-editorial-formats-and-drm-rules-for-multichannel-first-update-v1-0.pdf
DE8.2.1.2	Content Selection Guidelines, First Update AXMEDIS-de8-2-1-2-contentselectionguidelines-v1-3.pdf
DE8.4.1.3	AXMEDIS Editorial Format Guidelines and basic examples, second Update axmedis-de8-4-1-3-editorial-format-guide-and-examples-second-update-v1-2.pdf
DE8.3.1.2	Multilingual guidelines and technical solutions, first update AXMEDIS-de8-3-1-2-multilingualguidelinesandtechnicalsolutions-v1-1.pdf
DE8.1.1.3	Content for Test Cases, Validation, and Demonstration, first update axmedis-de8-1-1-3-content4testcasesandvalidation-v1-1.zip
DE8.1.1.4	Content for Validation and Demonstration, report axmedis-de8-1-1-4-content-4-validation-and-demonstration-v3-5.pdf

10.1 Prototypes Deliverables

The above mentioned public prototypes are publicly accessible by downloading the file in the following which can be easily installed:

- **AXMEDIS Content Production Tools:**
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3269
- **AXMEDIS P2P AXEPTool**, please download and install to join the AXMEDIS P2P network with a super node:
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3386
- **AXMEDIS AXMEDIA P2P tool**, please download and install to join the AXMEDIS P2P network:
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3321
- **AXMEDIS players for PDA:**
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3877
  - Content for PDA http://www.axmedis.org/documenti/view_documenti.php?doc_id=3246
- **AXMEDIS Player for PC:**
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3880
- **AXMEDIS Multiskin PC player**
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3879
- **AXMEDIS Active X player:**
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3878
- **PC player x VARIAZIONI:**
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3875
- **AXMEDIS Player for JAVA Mobiles:**
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3984
- **AXMEDIS Editor, Authoring tool:**
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=3883
- **AXMEDIS DVD as distributed at IBC 2007** (it has to be used with an AXMEDIS P2P client since it is more than 4Gbyte),
  - http://www.axmedis.org/documenti/AXMEDIS-DVD-July07-for-IBC07.iso.torrent
- **AXMEDIS DVD as distributed at IBC 2008** (it has to be used with an AXMEDIS P2P client since it is more than 3.5 Gbyte),
  - http://www.axmedis.org/documenti/view_documenti.php?doc_id=4236

Additional (with respect to those automatically installed with the above installable file) AXMEDIS objects and AXCP rules can be obtained from:

- **Examples of AXMEDIS objects:**
  - Wiki page: http://www.axmedis.org/tiki/tiki-index.php?page=AXMEDIS+Cross+Media+Content%3A+Examples
  - Content to be downloaded: http://www.axmedis.org/area_4/doc.php?l_s=struttura&gruppo=22&order_by=data&asc_desc=asc
  - From the AXMEDIS P2P network that can be joined with the above mentioned tools: AXEPTool or AXMEDIA
- **Example of the major AXMEDIS tools:**
  - WEB page: http://www.axmedis.org/tiki/tiki-index.php?page=AXMEDIS+Tools+at+Work
  - Videos: http://www.axmedis.org/tiki/tiki-index.php?page=Early+Demonstrations+and+Videos

- To be downloaded http://www.axmedis.org/documenti/view_documenti.php?doc_id=3269
- AXMEDIS plug in development tool kit: http://www.axmedis.org/documenti/view_documenti.php?doc_id=3292

- **Examples of the AXMEDIS JavaScript for content production and distribution:**
- Web page: http://www.axmedis.org/tiki/tiki-index.php?page=AXMEDIS+Content+Processing+Scripts
  - AXCP java script user manual : http://www.axmedis.org/documenti/view_documenti.php?doc_id=3168

10.2 Dissemination Material

Dissemination Material		
Flyer	Version 3.2.5 of the 3xA4 AXMEDIS General Flyer http://www.axmedis.org/documenti/view_documenti.php?doc_id=3873	
Flyer	AXCP flyer, AXMEDIS Content processing http://www.axmedis.org/documenti/view_documenti.php?doc_id=3359	
Flyer	AXMEDIS DRM flyer http://www.axmedis.org/documenti/view_documenti.php?doc_id=3360	
Flyer	AXMEDIS editor and tools http://www.axmedis.org/documenti/view_documenti.php?doc_id=4200	
Flyer	AXMEDIS P2P network and tools http://www.axmedis.org/documenti/view_documenti.php?doc_id=3358	
Flyer	AXCP Technical note , AXMEDIS Content Processing axmedis-tech-note-n3901-axcp-white-paper-v2-3.pdf http://www.axmedis.org/documenti/view_documenti.php?doc_id=3455	
Flyer	Flyer on AXMEDIS Mobile Player and Content Production http://www.axmedis.org/documenti/view_documenti.php?doc_id=4179	
Slides/Video	100 and more reasons to adopt AXMEDIS: http://www.axmedis.org/documenti/view_documenti.php?doc_id=3332	
Slides/Video	AXMEDIS 100 and more reasons to adopt it as your major content production and distribution tool (April 2008, for MipTV) http://www.axmedis.org/documenti/view_documenti.php?doc_id=3943	
DVD with content and tools	AXMEDIS DVD as distributed at IBC 2007 (it need to be used with an AXMEDIS P2P client since it is more than 4Gbyte), http://www.axmedis.org/documenti/AXMEDIS-DVD-July07-for-IBC07.iso.torrent	
DVD with content and tools	AXMEDIS DVD as distributed at IBC 2008 (it need to be used with an AXMEDIS P2P client since it is more than 3,5 Gbyte), http://www.axmedis.org/documenti/view_documenti.php?doc_id=4236	
Web page	AXMEDIS at IBC 2007 http://www.axmedis.org/ibc2007/	
Video	Promotional Video for the IBC 2007: http://www.axmedis.org/documenti/view_documenti.php?doc_id=3369	
Web page	AXMEDIS at IBC 2008 http://www.axmedis.org/ibc2008/	
Video	Promotional Video for consumer audience http://www.axmedis.org/documenti/view_documenti.php?doc_id=3981	
Video	Promotional Video for business audience http://www.axmedis.org/documenti/view_documenti.php?doc_id=3982	
Video	Promotional Video for technical audience http://www.axmedis.org/documenti/view_documenti.php?doc_id=4260	
Presentation	SIAE trial presentation on Video http://www.axmedis.org/documenti/view_documenti.php?doc_id=2922	
White paper	AXMEDIS for All: http://www.axmedis.org/documenti/view_documenti.php?doc_id=3931	
Banner	AXMEDIS 2005 Banner http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1398	
Banner	AXMEDIS 2006 Banner http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1588	

Banner	AXMEDIS 2007 Banner http://www.axmedis.org/documenti/view_documenti.php?doc_id=3504	
Banner	AXMEDIS 2008 Banner http://www.axmedis.org/imgs/AX2008_banner.jpg	
Flyer	French Flyer (v2-2) http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1242	12
Flyer	Spanish Flyer http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1205	12
Flyer	Italian Flyer http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1179	12
Flyer	German Flyer http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1165	12
Flyer	English Flyer http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1163	12
DE11.1.4.3 Brochure	Project Brochures Revised, ver.: M36 http://www.axmedis.org/documenti/view_documenti.php?doc_id=3411	36
	AXMEDIS project brochure v3.1.3 http://www.axmedis.org/documenti/view_documenti.php?doc_id=3502	
	AXMEDIS project brochure v3.1.3, single pages version http://www.axmedis.org/documenti/view_documenti.php?doc_id=3503	
DE11.1.4.2 Brochure	AXMEDIS Brochure v3-0 http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2035 AXMEDIS Brochure v3-0 Lower resolution http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2036 AXMEDIS Brochure v3-0 Single page format http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2034	16
	AXMEDIS Project Brochure: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1991	21
	AXMEDIS Project Brochure (updated): http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2712	29
	AXMEDIS project brochure v3.2.4, single pages version http://www.axmedis.org/documenti/view_documenti.php?doc_id=3871	
	AXMEDIS project brochure v3.2.5, A4x3 High Quality version http://www.axmedis.org/documenti/view_documenti.php?doc_id=3873	
Conference Poster	AXMEDIS2005 Conference Poster (also illustrated below) http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=889	
Conference Poster	AXMEDIS2006 Conference Poster (draft, see design below) http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2259	
DE11.1.3 Poster	Poster 02 – Vertical Poster http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1347	13
	Poster 04 – Vertical Poster http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1347	13
	AXMEDIS Overview Poster http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1434	13
	Design 1 on Technical Aspects, version 0.5 http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1339	
	Design 2 on Distribution Aspects, version 1.5: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1340	
	Design 3 for General, version 0.5: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1341	
	Design 4 on Processing, version 1.1: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1342	
	Poster 02– Vertical Banner AXMEDIS 2006: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1567	16
	Poster 04– Vertical Banner AXMEDIS 2006: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1566	16
	Poster – Automating Content/Metadata Life-Cycle: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=3361	36
	Poster – AXMEDIS Tools: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=3362	36

	Poster – IBC Poster for AXMEDIS: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=3363	36
	Vertical poster with all partners logos, ver. April 2007 http://www.axmedis.org/documenti/view_documenti.php?doc_id=3496	
	Vertical Banner with all partners logos, version for AXMEDIS 2006 Conference: http://www.axmedis.org/documenti/view_documenti.php?doc_id=2631	
Folder	AXMEDIS Folder http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=509	
DE11.1.5 Flyers	Flyer – AXMEDIS Editor and Players: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=3357	36
	Flyer – AXMEDIS P2P: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=3358	36
	Flyer – AXMEDIS Automated Content Processing: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=3359	36
	Flyer – AXMEDIS Digital Rights Management: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=3360	36
	Comparison of AXMEDIS vs other DRM solutions	
	AXMEDIS solution against the state of the art and competitors	
	MS Word version of AXMEDIS at IBC 2007 presentation letter (short version)	
	MS Word version of AXMEDIS at IBC 2007 presentation letter (long version)	
Technical Note	AXMEDIS Catalogue http://www.axmedis.org/documenti/view_documenti.php?doc_id=4146	
Technical Note	Technical Note EN on: AXMEDIS Content Processing GRID all features listed (3903)	
Technical Note	Technical Note IT on: AXMEDIS Content Processing GRID Tutte le caratteristiche descritte (3903)	
Technical Note	Technical Note EN on: AXMEDIS P2P Controlled network all features listed with cases (4001)	
Technical Note	Technical Note IT on: AXMEDIS P2P Controlled network tutte le caratteristiche, con alcune casistiche (4001)	
Technical Note	Technical Note EN on: AXMEDIS Content Model and Tools, Authoring Tools, Players for MPEG	
Technical Note	Technical Note IT on: AXMEDIS Content Model and Tools, Authoring Tools, Players for MPEG	
Technical Note	Technical Note EN on: AXMEDIS DRM, MPEG-21 DRM, Interoperable DRM (4501)	
Technical Note	Technical Note IT on: AXMEDIS DRM, MPEG-21 DRM, DRM interoperabile (4501)	
Technical Note	Technical Note EN on: How to integrate the AXMEDIS DRM into an e-commerce portal and content distribution solution for cotnent on demand and subscription (4510)	
Technical Note	Technical Note IT on: Come integrare l\'AXMEDIS DRM in un portale di e-commerce per la distribuzione di contenuti digitali on demand e con sottoscrizione, abbonamento (4510)	
Technical Note	Technical note 6001: "AXMEDIS Video on demand distribution for IPTV digital set-top-box", TEO Show Case	
Technical Note	Technical note 6201: "AXMEDIS Kiosk Distribution towards PDA and Mobiles", GiuntiLabs Show Case	
Technical Note	Technical note 6301: "AX4HOME DVB-T Recorder and Broadcast Enhancer", BBC show Case	
Technical Note	Technical note 6401: "AXMEDIS content via Satellite Data Broadcast", EUTELSAT Show Case	
Technical Note	Technical note 6501: "AXMEDIS content on demand distribution for PC", ELION show Case	
Technical Note	Technical Note 6601: "AXMEDIS Mobile Distribution, java mobile player", GiuntiLabs Show Case	
Technical Note	Technical Note 6701: "AXMEDIS back office content production, multichannel distribution toward PC, Mobiles and OMA mobile", Telecom Italia Show Case	
Technical Note	Technical Note 6801: "AXMEDIS for Cultural heritage content modeling and distribution, toward PC, PDA and Mobiles", ANSC Show Case	
Technical Note	Technical Note 6901: "AXMEDIS content distribution to PC, via web server and P2P ", TISCALI ShowCase	
Technical Note	Technical Note 7001: "AXMEDIS Cross Media Finder"	
User Manual	AXMEDIS Editor User Manuals (PDF)	

User Manual	AXMEDIS Content Processing Tools User Manual (PDF)	
User Manual	AXMEDIS Script for Content Processing User Manual (PDF)	
User Manual	AXMEDIS PC Player User Manual (PDF)	
User Manual	AXMEDIS ActiveX User Manual (PDF)	
User Manual	AXMEDIS multi skin PC Player User Manual (PDF)	
User Manual	AXMEDIS PDA player User Manual (PDF)	
User Manual	AXMEDIS Mobile Player User Manual (PDF)	
User Manual	AXMEDIS P2P Manual (PDF)	
User Manual	AXMEDIS DRM for Dummies (PDF)	
User Manual	AXMEDIS Major Tools Manual (PDF - old version)	
Main Public Web Pages		
Web page	AXMEDIS Portal Main Web page: http://www.AXMEDIS.org	
Web page	AXMEDIS Technical Portal http://tech.axmedis.org/	
Web page	Content Management Automation, AXCP http://www.axmedis.org/com/index.php?option=com_content&task=view&id=94&Itemid=33	
Web page	AXMEDIS controlled P2P http://www.axmedis.org/com/index.php?option=com_content&task=view&id=97&Itemid=34	
Web page	AXMEDIS production tools and players http://www.axmedis.org/com/index.php?option=com_content&task=view&id=101&Itemid=35	
Web page	AXMEDIS DRM, MPEG-21 DRM http://www.axmedis.org/com/index.php?option=com_content&task=view&id=99&Itemid=36	
Web page	Axmedis Mobile Solutions http://www.axmedis.org/com/index.php?option=com_content&task=view&id=172&Itemid=91	
Web page	AXMEDIS crossmedia content on demand portal, CrossMediaFinder http://www.axmedis.org/com/index.php?option=com_content&task=view&id=178&Itemid=93	
Web page	BBC Showcase: Content Distribution to Licensed Domains via DVB-T and P2P http://www.axmedis.org/com/index.php?option=com_content&task=view&id=113&Itemid=64&Itemid=45	
Web page	TISCALI Showcase: Protected Video on Demand Distribution via P2P toward PC http://www.axmedis.org/com/index.php?option=com_content&task=view&id=70&Itemid=54	
Web page	ELION Showcase: Protected Video on Demand (VOD) Distribution to PC http://www.axmedis.org/com/index.php?option=com_content&task=view&id=175&Itemid=46	
Web page	EUTELSAT Showcase: Content Distribution via Satellite Data Broadcast (DVB-S) to PC and STB http://www.axmedis.org/com/index.php?option=com_content&task=view&id=176&Itemid=47	
Web page	GIUNTI ILABS Showcase: Content Distribution to Kiosks http://www.axmedis.org/com/index.php?option=com_content&task=view&id=76&Itemid=49	
Web page	TEO Showcase: Video on Demand (VOD) Distribution to Set Top Box (STB) http://www.axmedis.org/com/index.php?option=com_content&task=view&id=72&Itemid=51	
Web page	SIAE Showcase: Content Posting Tool, for Final User content production/publication/DRM http://www.axmedis.org/com/index.php?option=com_content&task=view&id=79&Itemid=50	
Web page	VARIAZIONI Showcase: Enrichment of Cultural Content http://www.axmedis.org/com/index.php?option=com_content&task=view&id=78&Itemid=52	

Web page	Showcase: AXMEDIS Content and Tools: Automatic Production http://www.axmedis.org/com/index.php?option=com_content&task=view&id=108&Itemid=62	
Web page	Showcase: AXMEDIS Controlled P2P Network http://www.axmedis.org/com/index.php?option=com_content&task=view&id=107&Itemid=63	
Web page	ANSC Showcase: AXMEDIS for Cultural Heritage Content Distribution http://www.axmedis.org/com/index.php?option=com_content&task=view&id=169&Itemid=86	
Web page	TI Showcase: Automated back office management of content for mobile and broadband distribution http://www.axmedis.org/com/index.php?option=com_content&task=view&id=179&Itemid=100	
Overview	AXMEDIS at IBC 2008 http://www.axmedis.org/ibc2008/	
Downloads	AXMEDIS Essential Downloads http://www.axmedis.org/com/index.php?option=com_content&task=view&id=83&Itemid=55	
Tools	AXMEDIS major tools http://www.axmedis.org/com/index.php?option=com_content&task=view&id=84&Itemid=56	
Technical Notes	AXMEDIS Technical Notes http://www.axmedis.org/com/index.php?option=com_content&task=view&id=168&Itemid=85	
Downloads	Downloads Center http://www.axmedis.org/com/index.php?option=com_wrapper&Itemid=87	
Manuals	AXMEDIS Manuals doanload page http://www.axmedis.org/com/index.php?option=com_content&task=view&id=85&Itemid=92	
Web page	CrossMediaFinder http://www.axmedis.org/com/index.php?option=com_content&task=view&id=178&Itemid=94	
Framework	AXMEDIS Framework http://www.axmedis.org/tiki/tiki-index.php?page=AXMEDIS+Framework+for+all	
Examples	AXMEDIS Java Script examples http://www.axmedis.org/tiki/tiki-index.php?page=AXMEDIS+Content+Processing+Scripts	
Object, content	AXMEDIS Object Examples http://www.axmedis.org/tiki/tiki-index.php?page=AXMEDIS+Cross+Media+Content%3A+Examples	
4HOME	AXMEDIS 4HOME main web page: http://ax4home.axmedis.org/	
AXMEDIS Overview	AXMEDIS Project Overview slides: http://www.AXMEDIS.org/overview.php	
Derived Projects	AXMEDIS Derived Projects (WP9, affiliation, take up): http://www.AXMEDIS.org/derived_projects.php	
Wiki	AXMEDIS Wiki: http://www.AXMEDIS.org/tiki/index.php	
AXMEDIS2005	AXMEDIS 2005 Conference: http://www.AXMEDIS.org/AXMEDIS2005/	
AXMEDIS2006	AXMEDIS 2006 Conference: http://www.AXMEDIS.org/AXMEDIS2006/	
CMPS 2007	AXMEDIS 2007 workshop on content production: http://www.axmedis.org/cmcps2007/	
AXMEDIS2007	AXMEDIS 2007 Conference: http://www.AXMEDIS.org//axmedis2007/	
AXMEDIS 2008	XMEDIS 2008 Conference: http://www.AXMEDIS.org/axmedis2008/	
Affiliations	AXMEDIS Affiliation : http://www.axmedis.org/com/index.php?option=com_content&task=view&id=12&Itemid=39	

Public Documents	AXMEDIS Access to public documents: http://www.AXMEDIS.org/documenti/documenti.php	
Statistics	AXMEDIS WEB statistics: http://www.AXMEDIS.org/statistics.php	
Partners	AXMEDIS Partners: http://www.AXMEDIS.org/partners.php	
Search	AXMEDIS Search service http://www.axmedis.org/gsearch?q=&x=13&y=13	
Blog	AXMEDIS Blog: http://www.AXMEDIS.org/blog/gbook.php	
Demonstration Videos		
Several VIDEOS	Demonstrations and videos http://www.AXMEDIS.org/tiki/tiki-index.php?page=Early+Demonstrations+and+Videos	

	Public Tutorial and Presentations	
	General tutorial: Slides http://www.axmedis.org/documenti/view_documenti.php?doc_id=2659 http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2710	
video	Part 1 Video General Tutorial : http://www.axmedis.org/documenti/view_documenti.php?doc_id=3862	
video	Part 2 Video General Tutorial : http://www.axmedis.org/documenti/view_documenti.php?doc_id=3863	
video	Part 3 Video General Tutorial : http://www.axmedis.org/documenti/view_documenti.php?doc_id=3864	
video	Part 4 Video General Tutorial : http://www.axmedis.org/documenti/view_documenti.php?doc_id=3865	
video	Part 5 Video General Tutorial : http://www.axmedis.org/documenti/view_documenti.php?doc_id=3866	
video	Part 6 Video General Tutorial : http://www.axmedis.org/documenti/view_documenti.php?doc_id=3867	
slides	Content Production Tutorial (AXMEDIS 2007 Conference) http://www.axmedis.org/documenti/view_documenti.php?doc_id=3869	
slides	Automated Content Production tutorial at AXMEDIS 2006 http://www.axmedis.org/documenti/view_documenti.php?doc_id=2655	
slides	Distribution tutorial at AXMEDIS 2006 http://www.axmedis.org/documenti/view_documenti.php?doc_id=2666	
slides	Workflow tutorial at AXMEDIS 2006 http://www.axmedis.org/documenti/view_documenti.php?doc_id=2680	
slides	Content Processing Tutorial (AXMEDIS 2006 Conference) http://www.axmedis.org/documenti/view_documenti.php?doc_id=3868	
slides	Presentation at DMIN 2006, http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2005	
slides	Presentation at INCOM2005: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1069	
slides	Presentation at IST2004: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=346	
slides	Tutorial at IEEE ICECCS 2005: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=1032	
slides	Workflow tutorial 2006: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2652	
slides	Presentation at University of Modena: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=3090	
slides	Presentation at AICA 2006 http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2468	

	Workshop Presentation at CMCPS2007 http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2931 Rome Workshop videos (Italian) Part 1: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2986 Part 2: http://www.AXMEDIS.org/documenti/view_documenti.php?doc_id=2987	

Additional materials and press cuttings can be found online form the AXMEDIS web site, www.AXMEDIS.org .

10.3 AXMEDIS Contact:

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