AXMEDIS Annual Report

(October 2006, V1.3)

www.axmedis.org

Automating Production of Cross Media Content for Multi-channel Distribution

AXMEDIS aims to meet the challenges of the market demand by: (i) reducing costs for content production and management for content composition, layouting, adaptation, processing, protection and workflow; (ii) reducing distribution and aggregation costs in order to increase accessibility with a P2P at B2B level, which can integrate content management systems and workflows; (iii) providing new methods and tools for innovative and interoperable Digital Rights Management (DRM), including the exploitation of MPEG-21, OMA and overcoming limitations supporting different business and transactions models and multichannel distribution. AXMEDIS consortium consists of leading European digital content producers, integrators, aggregators, distributors, and information technology companies and research groups. AXMEDIS created a framework solving the above issues, and it is realising a set of demonstrators for content production, protection and sharing, and content distribution to end-users via different channels including interactive TV (i-TV), personal computer (PC), kiosk, mobile phones, PDAs, etc. AXMEDIS has closed the second year of work producing a set of demonstrators, the AXMEDIS Framework and their detailed specification and documentation, both accessible on the AXMEDIS portal. At AXMEDIS conference, demonstrations and tutorial are provided, while you can access to a large set of training material on the portal. Visit http://www.axmedis.org to discover the location of the next conference.

Objectives

The main objectives of AXMEDIS are:

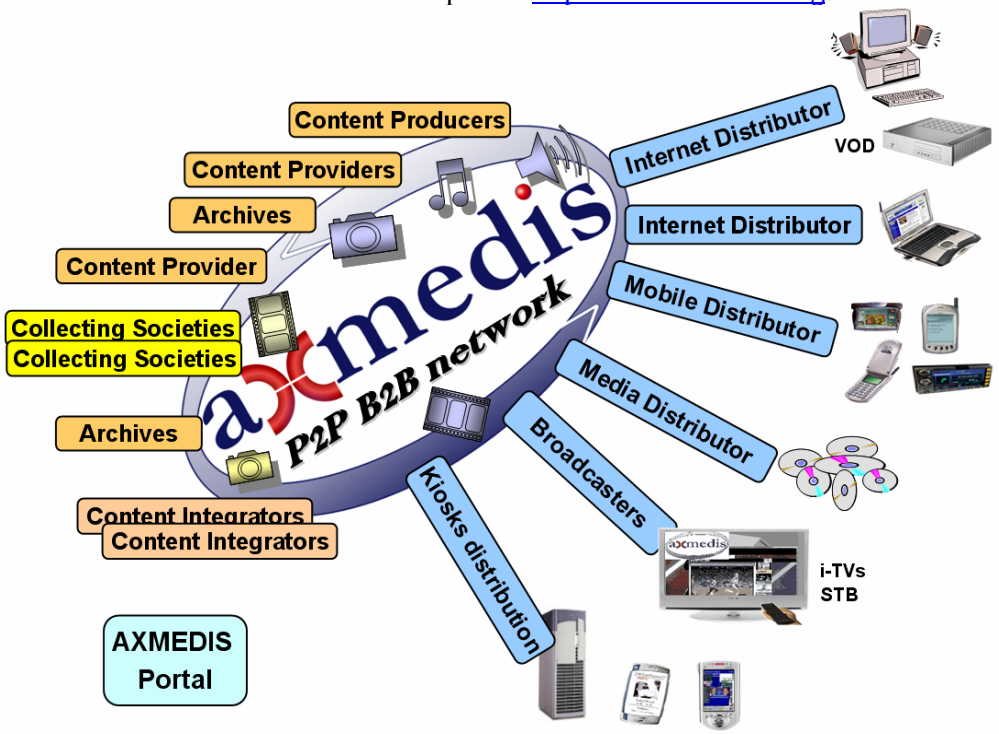
- Study and define a cross media model supporting content distribution at B2B level, interoperability on content, composition, protection (DRM, Digital Rights Management), etc.,
- Study and define solution for “automatic” cross-media production, processing and distribution to allow the realisation of solutions for content distribution on demand for multichannel;
- Study and definition of model for interchanging cross media content and components among Content Providers and Content Distributors, supporting copyright law, interoperability for Content Formats and DRM models. Safeguarding the owner’s rights during the content production process and considering the value chain;
- Establishing modalities and tools for managing, distributing and sharing cross media content and components among producers, publishers, distributors to reach the final

users via a multi-channel architecture: i-TV, PC, PDA, Cellular phones, Kiosk, etc.;

- Creation of the AXMEDIS framework to enable e-commerce of cross media digital content overcoming the state of the art limitations in content model and DRM, and offering the framework to all;
- Providing access to the AXMEDIS framework to affiliated partners and subprojects;
- Realisation of a set of demonstrators for exploiting the AXMEDIS framework: (i) integration of Content Management Systems with AXMEDIS solutions including P2P framework, (ii) accelerating content production, composition and formatting, and P2P sharing at B2B level, (iii) content production and distribution on-demand for multichannel and multiple devices: i-TV, PC, Mobiles, kiosks and PDAs;
- Validation of usage of the AXMEDIS framework with a set of demonstrators spread in Europe for several purpose from backoffice content production and processing to content distribution towards final users.

Summary of Activities

The project started (September 2004), it considered requirements of all the actors of the content value chain. On the basis of them, AXMEDIS started working, researching on a set of basic technologies for creating the so called AXMEDIS framework taking into account that the market evolution of cross media content production and distribution. And in particular the continuous evolution of the market segments for the production of content for delivering include PC, I-TV (satellite data broadcast, which is satellite distribution toward PC), Mobiles, PDA, and kiosks. In the fall of every year the AXMEDIS consortium organizes a conference, including several demonstrations, workshops and tutorials about related technologies and AXMEDIS framework. You can access to more information from the portal: http://www.axmedis.org .



AXMEDIS is creating and developing the AXMEDIS Framework, an open solution exploiting a set of new technologies and tools, which can be used by your solutions and applications for:

- reduce costs and increase efficiency for content production, protection, management and distribution. It offers effective automation for

  - integrating your Content Management Systems (CMSs) with distribution systems by automating the communication and maintenance of content and information between the two;
  - content gathering and ingestion processes from local and remote CMSs as well as file systems;
  - composition, supporting parallel processing, GRID technology, and optimisation techniques for content ingestion, production, protection and formatting;
  - managing the workflow processes at content-factory level and between content-factories with the support of OpenFlow and BizTalk Workflow Management systems;
  - the overall process allowing content production on demand.
- support the whole value chain, including composition, packaging, integration, aggregation, synchronisation, formatting, adaptation, transcoding, indexing. Additional features include the integration of both protected and non-protected components within an object, definition of relationships with other resources, metadata integration and remapping/transcoding, protection, license production and verification;
- allow the convergence of the media and interoperability of content to enable multi-channel distribution. The framework supports content distribution:
  - on different channels such as satellite data broadcast, Internet, cellular/mobile network, wireless and traditional media support such as CDs, DVDs;
  - via different communication technologies, particularly with Peer-to-Peer (P2P) for both B2B (Business-to-Business) and B2C (Business-to-Consumer) levels;
  - to different devices such as PC, PDA, interactive TV (i-TV), set-top box (STB), etc.;
  - with different transaction models on the same channels and content, and with flexibility.
- adopt new methods and tools for flexible and interoperable
- Digital Rights Management (DRM) in order to facilitate a smooth transition from paper contracts to digital licenses.
  - exploitation of MPEG-21 REL (Rights Expression Language) with specific extensions and enhancements;
  - support of different business and transaction models and their integration;
  - integration/interoperation of different DRM models such as MPEG-21 REL and ODRL OMA (Open Mobile Alliance).
- harmonise B2B and B2C areas for DRM, bringing the DRM model in the B2B area, supporting production and protection models in the whole value chain;
- increase content accessibility via the AXMEDIS P2P platform at B2B level, which can integrate content management systems and workflows.

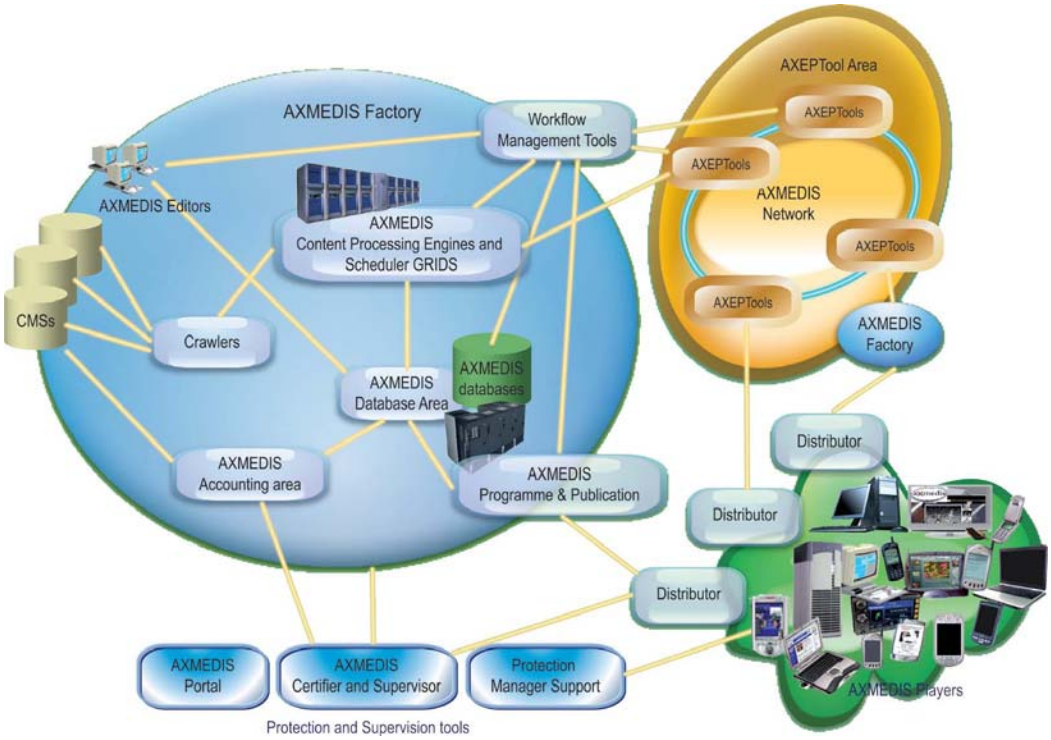
AXMEDIS realises the AXMEDIS Framework for all, and especially for small and large industries sharing a common interest in the exploitation of new technologies and solutions. The AXMEDIS Framework can be used to setup and built a set of complete applications and services in the area of content production, protection and distribution. With the flexibility of AXMEDIS dynamic Plug-In technology, you can customize your applications and processes according to your needs.

AXMEDIS Content Model

AXMEDIS content model is designed to support all types of cross-media content; from simple multimedia files to software components such as games, for all kinds of

applications, from personal to global scale usages including leisure, education, entertainment, infotainment as well as the management of protected content for government, healthcare, business, etc.

AXMEDIS is an open format which is capable of integrating any kind of cross-media format (e.g. video, images, animations, games, learning objects, multimedia, audiovisual, document, audio, etc.) in digital format with any kind of metadata including identification, classification, categorisation, indexing, descriptors, annotations, relationships and play activities, and protection aspects. The AXMEDIS format permits the combination of content components and their secure distribution in respect of their intellectual property rights, supporting a large variety of DRM rules and models according to concepts of interoperability among DRM models (mainly, but not only, based on MPEG-21, with both binary and XML formats). AXMEDIS is open to all DRM models and solutions.



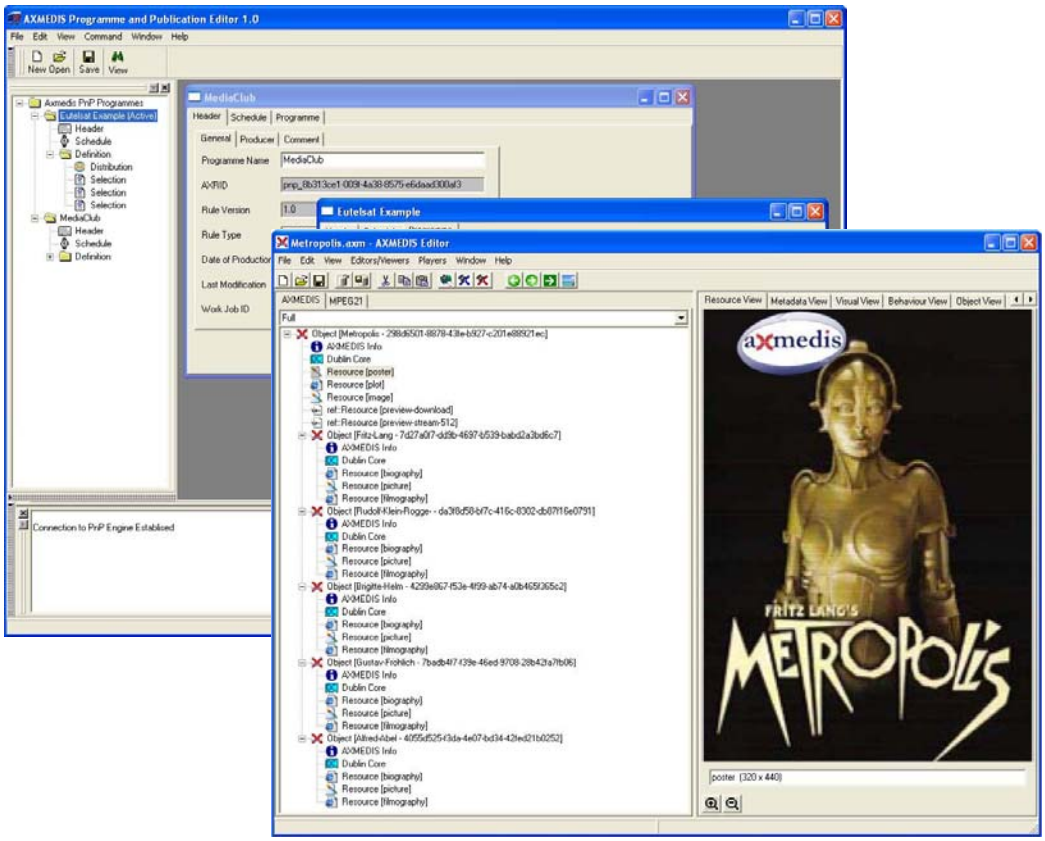
Key AXMEDIS areas and major tools

Most of the following tools are available for download from the AXMEDIS portal:

- **AXMEDIS Factory**: for automatically collecting content from legacy CMSs, producing the content, programming and scheduling the production process, processing metadata, composing and formatting content, collecting content information from content usage, producing licenses to harmonise the production with workflow applications in the factory and among geographically distributed factories, etc. The AXMEDIS Factory is scalable in the sense that it can satisfy the needs of small and large content producers, integrators, and distributors. The factory is supported by tools for automating the production process and to perform manual editing;
- **AXMEDIS Editor** is the authoring tool for manually producing AXMEDIS objects when needed and for supporting the designer to create the scripts for the AXCP that could be considered macros of the AXMEDIS Editor. It is based on the AXMEDIS Object Model, called AXOM and based on MPEG-21, and all the modules and tools

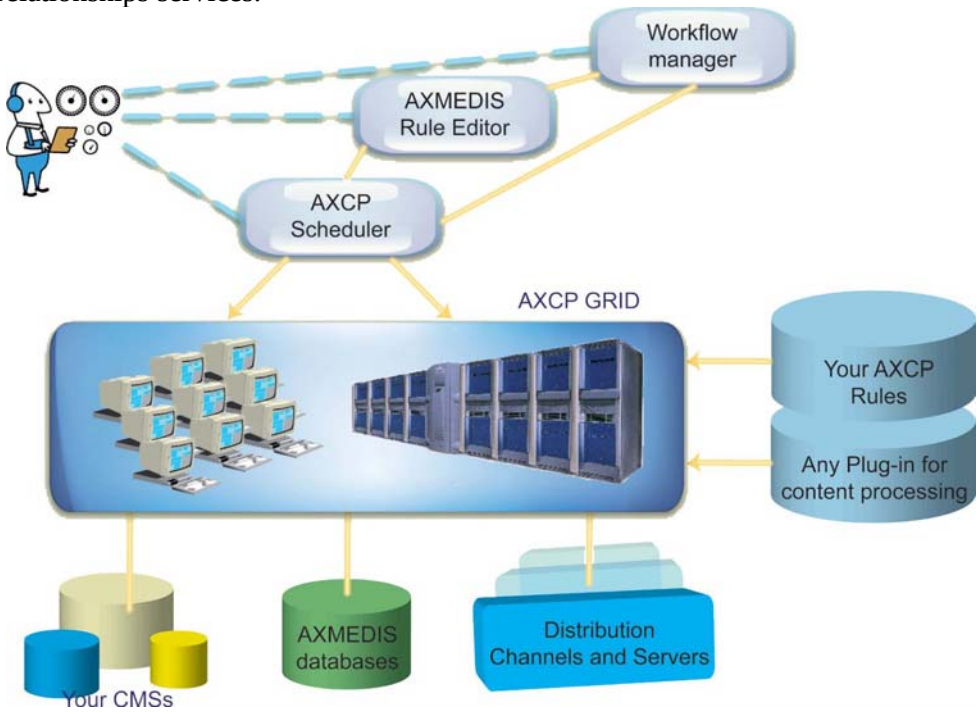
to manipulate and create AXMEDIS objects and related information and digital resources such as:

- resource hierarchy viewer and editor;
- visual and behavioral viewer and editor to show/manipulate visual and temporal aspects of related digital resources according to SMIL;
- metadata editor and viewer, to manipulate and view general XML metadata and specific AXInfo metadata;
- DRM viewer and editor to create and verify the licenses;
- Protection Information viewer and editor to specify, apply and browse protection aspects on the basis of the MPEG-21 IPMP format with extension of AXMEDIS;
- set of plug-ins to use algorithms for content processing as those mentioned and used in the AXCP Area mentioned above;
- set of plug-ins to allow the integration of AXMEDIS Editor within other editing and viewing applications such as: Video Editors, Image Editors, etc.;
- an interface to connect the AXMEDIS Editor with other external powerful editor tools;
- an interface with workflow (OpenFlow and BizTalk);
- set of internal viewers and players for digital resources such as document, images, video, MPEG-4, and audio resources, etc., for more than 250 different file formats.



- **AXMEDIS Protection and Supervising tools**: for registering users, certificating users, authenticating devices and tools, monitoring all the activities performed on the AXMEDIS content on AXMEDIS players and tools, processing licenses, managing black lists, and collecting and reporting the information about content usage and rights exploitation, etc.

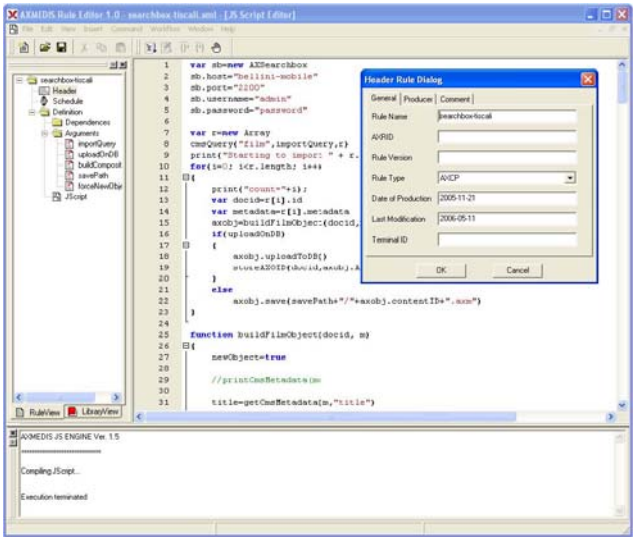
- **AXMEDIS Players:** for content playback and execution on several different platforms (PC, PDA, mobiles, AXMEDIS Mozilla Plug in, AXMEDIS Active X), to build specific and customised content players, for distributing and sharing content among final users by means of secure P2P tools such as AXMEDIA P2P tool;
- **AXMEDIS Distribution tools**: for automating the content publication and acquisition in the business area allowing the interconnection of AXMEDIS Factories by means of the AXEPTools which is a secure and legal P2P tool. It is also possible to make distributed queries among connected AXMEDIS Factories to search for content and to automatically publish and acquire/update content from/to the business partners, etc. The tools in this area also allow scheduling of content distribution and publication towards external web services for example those of front end distribution servers;
- **Workflow Management tools** include a set of micro tools and interfaces which are pervasively connected to all the AXMEDIS tools and plug-ins to allow interfacing the whole content factory to Workflow tools such as Open Flow and BizTalk. The control is performed to define AXMEDIS factory workflow policies and to manage inter-factory workflows policies.
- **Accounting Area** includes a set of tools which allows content producers, distributors or collecting societies to collect administrative information and reports about their content in order to gathering information about the list of rights that have been exploited on their AXMEDIS objects by the final users and by the business users. This information is collected into the AXMEDIS database for further analysis. The acquisition of accounting information is performed by collecting it from the AXMEDIS Certifier and Supervisor, AXCS. The local database and the AXCS provide support to make queries to obtaining statistics data on content usage in the area, in the channel, for a type of content, for a period, etc. A specific tool allows extracting data from the AXMEDIS Database to migrate them towards the administrative side of the CMS, such as high level administrative information to prepare the bill at the content users, distributors, etc., to interface with customer relationships services.



Automated AXMEDIS Content processing

AXMEDIS framework and the AXMEDIS Content Processing (AXCP) based on GRID technology offers automated features and functionalities, supporting convenient scripting interface to enable automation and control with:

- Content Ingestion and Gathering:
  - from Content Management Systems (CMS such as ORACLE, XML databases, Tamino, MySQL, MSSQL, HP DMP, ODBC, etc.), file system, and protocols;
  - by processing resources and coupling them with metadata;
  - via Web Services, FTP, HTTP, WebDAV, SMB, Gopher, NNTP, and other models.
- Content Storage and Retrieval:
  - AXMEDIS database, MPEG-21 database;
  - other AXMEDIS content Factories by means of the AXEPTool.
- Content Processing:
  - digital resources adaptation, extraction of descriptors, transcoding, synchronisation, metadata processing, estimation of fingerprint, watermarking, indexing, content summarisation, etc.; for videos, images, documents, audio files, etc.;
  - metadata manipulation, mapping and adaptation: Dublin core, MPEG-7, etc.;



- Content Composition:
  - creation of content components or objects by a combination of raw assets such as text, images, audio, video, animation, metadata, descriptors, licenses, and other multimedia objects such as MPEG-4, HTML, SCORM, OMA, macromedia tool file, games, etc.;
  - creation of content as linear or hierarchical combination of content components.
- Content Formatting:
  - structuring and styling content elements by means of SMIL based templates and applying style-sheets to define the usage interface (format, layout) of the whole collection of content elements and the interested content usage paradigms. For example, karaoke, collection browsing, selection menus, slide presentation, background window with live video, animated text, graphics etc.;
  - optimising and defining style parameters for layout. For example automated best fit of images for a screen, optimising the amount of text in the page using Genetic Algorithms, best time fitting, etc.
- Content Protection:
  - protecting digital resources and objects with their complex structure;
  - creating Protection Information parameters, such as keys, or other features;
  - applying Protection Information model to content objects, segmenting digital resources, slicing objects, applying encryption, scrambling, compression, and many other algorithms;
  - posting specific protection information of a given AXMEDIS object to the AXMEDIS Certifier and Supervisor server;

  - tracking exploited rights and reporting actions performed to the content owner, distributors, collecting societies, etc.
- Content Licensing:
  - generating licenses from license models and additional information, storing licenses, and posting to license server automatically;
  - supporting transcoding/translating licenses (MPEG-21 REL, ODRL);
  - invoking verification algorithms about licenses and available rights to simulate the usage from the user site.
- Content Publication and Distribution:
  - supporting distribution towards multiple channels;
  - producing, monitoring and editing programmes and schedules.

Access to the AXMEDIS Framework

The AXMEDIS Framework is accessible to all including industries, large or small, who share the interest to exploit new technologies and solutions for automated content production and multi-channel distribution. The AXMEDIS Framework can be used to setup and build a set of complete applications and services in the area of content production, protection and distribution. With the flexibility of AXMEDIS dynamic plug-in technology, you can customise your applications and processes according to your needs.

AXMEDIS Framework is Open:

- AXMEDIS focuses on interoperability and openness of content model and interoperability of DRM models, including multi-channel distribution;
- AXMEDIS specification is public. Its specific use is royalty free;
- source code of the AXMEDIS Framework is accessible by the AXMEDIS Affiliation programme. The affiliation fee is affordable for all. Alternatively affiliation can also be offered in return for contributions to improve and/or extend the AXMEDIS Framework;
- AXMEDIS plug-in technology is public. The source code for creating a new plug-in is public without the need to be affiliated. Any tool can be integrated into the AXMEDIS Content Processing GRID with this technology.

AXMEDIS Affiliation

To take advantage of the AXMEDIS framework and technologies, you are invited to apply for the AXMEDIS Affiliation. With the AXMEDIS Affiliation, Industrial participants can:

- access the AXMEDIS Framework which can be used to set up and enhance production, protection and distribution facilities/platforms in a simple and cheap manner;
- adopt standard models (e.g. MPEG-21) for content and licenses modelling and hence adding DRM in your content business;
- establish contacts with other business partners interested in exploiting similar technology;
- obtain greater control on the content usage;
- create customised AXMEDIS players for PC, PDA, etc.;
- exploit and trial innovative business models that can be enforced on a distribution channel with management of rights and obtain reports on exploited rights of the multimedia content distributed.

Research institutions and AXMEDIS Affiliation:

- access the AXMEDIS Framework to build different solutions and applications to cover the needs of the value chain actors and tested with low effort;
- improve visibility, promote and produce algorithms and tools that can be used for content processing and modelling, and can be integrated into the framework;
- add new content models and new DRM models, make them interoperable with MPEG-21 and others already in place on the AXMEDIS Framework;
- test algorithms and tools with respect to the state of the art solutions, with ease;
- collaborate with other relevant research institutions and companies within the sector.

Are presently affiliated to AXMEDIS:

- SIAE (the major Italian Collecting Society),
- FOCUSEEK (Italy),
- HEXAGLOBE (France).

For addition information on AXMEDIS Affiliation please see:

- http://www.axmedis.org/affiliation.php
- Affiliation document: http://www.axmedis.org/documenti/view_documenti.php?doc_id=1751

AXMEDIS technology is going to be exploited in VARIAZIONI e-*contentplus* project.

User Involvement, Promotion and Awareness

In order to involve the potential users of AXMEDIS results, AXMEDIS has created a User Group to (i) provide expert consultation, information and verification, (ii) maintain continuous update and monitoring on the pathway of the project development and progress, (ii) promote the activities to decision makers and mangers of small and large companies that have potential interests to become AXMEDIS compliant and to join AXMEDIS in the future.

Other tools for promotion to increase awareness of the project include the dissemination and demonstration activities such as participation at conferences, workshop and fairs; organisation of conference, training and tutorial courses; publication of relevant materials, dissemination of materials, advertising and promotion of WWW pages, etc.

The user group and the activities planned for dissemination will cover all aspects addressed by AXMEDIS in terms of value chain and content models and types.

The project provides a portal for all (public access) to register their interests via the project website. This allows anyone who is interested in AXMEDIS to receive a newsletter with all the latest news and information about the project.

Presently AXMEDIS is the only value chain comprehensive activity on the MPEG-21, also including interoperability for content models and DRM. The AXMEDIS consortium is going to enlarge with the insertion of a set of new partners involved in the development of a set of demonstrator.

Please note that on the AXMEDIS portal we had more than 1,2 million hits (total number of "clicks") to the public part of the web site were counted. Of the 37 documents uploaded to the public part of the AXMEDIS portal in the first year and 113 documents in the second year potential users downloaded 20956 documents in the first year and 35808 documents in the second year.

The main page of the project recently, mention of AXMEDIS in more than 17000 different new websites, and in newspaper articles.

The next AXMEDIS conference will take place in Leeds, UK in December: http://www.axmedis.org/axmedis2006/

Future Work

AXMEDIS is continuing to work on basic enabling technologies for (i) content production such as: automatic composition and formatting, workflow, protection and Digital Rights Management, fingerprint extraction, authoring tools, etc., including the exploitation of MPEG-21 and to expand its capacities, and to support different business and transaction models, DRM interoperability with OMA; (ii) content distribution, such as P2P models at B2B and B2C levels, client tools, etc.; (iii) addressing specific problems for multichannel distribution such as optimisation of channel for satellite data broadcast, content adaptation for mobiles, P2P tools to certify content for final user level, etc.

The results of the research activities have been capitalised into the AXMEDIS framework to develop demonstrators and to make them available to SMEs and institutions that intend to become AXMEDIS compliant. AXMEDIS has the intention to become a reference infrastructure and technology for content production, integration and distribution in Europe.

Acknowledgments

AXMEDIS is partially supported by European Community under the Information Society Technologies (IST DG-INFSO, Unit E2, Knowledge Technologies and Content Creation) programme of the 6th Framework Programme (IST-2-511299, www.axmedis.org). Thanks to all partners and participants of the AXMEDIS project, including all User Group Experts and Affiliated Members, for their contributions, support and collaborations.

Further Information

On the project web site, www.axmedis.org, you can download:

- AXMEDIS Framework for all document: axmedis-de5-1-2-1-axmedis-for-all-v2-7.pdf, http://www.axmedis.org/documenti/view_documenti.php?doc_id=1728
- AXMEDIS demo-of-some-axmedis-tools-v0-2-6-3.exe: http://www.axmedis.org/documenti/view_documenti.php?doc_id=2440
- AXMEDIS some-axmedis-objects.zip: http://www.axmedis.org/documenti/view_documenti.php?doc_id=2422
- AXMEDIS Objects axmedis-doc-in-objects.zip: http://www.axmedis.org/documenti/view_documenti.php?doc_id=2423
- AXMEDIS 2005 Conference: http://www.axmedis.org/axmedis2005/
    - AXMEDIS 2005 Conference Final Programme, version 1.0: http://www.axmedis.org/documenti/view_documenti.php?doc_id=1356
- AXMEDIS 2006 Conference: http://www.axmedis.org/axmedis2006/
    - AXMEDIS 2006 Conference programme (provisional): http://www.axmedis.org/axmedis2006/program.html
- AXMEDIS white paper, short version (v1.2), 2006: http://www.axmedis.org/documenti/view_documenti.php?doc_id=1698
- AXMEDIS General tutorial: http://www.axmedis.org/documenti/view_documenti.php?doc_id=1582
- AXMEDIS Content Production Tutorial: http://www.axmedis.org/documenti/view_documenti.php?doc_id=1559
- AXMEDIS Content distribution Tutorial: http://www.axmedis.org/documenti/view_documenti.php?doc_id=1545

- AXMEDIS Wiki: http://www.axmedis.org/tiki/index.php
- AXMEDIS Affiliation: http://www.axmedis.org/affiliation.php
    - Affiliation document: http://www.axmedis.org/documenti/view_documenti.php?doc_id=1751
- AXMEDIS Demonstrations and videos can be taken and downloaded from the following AXMEDIS Wiki page: http://www.axmedis.org/tiki/tiki-index.php?page=Early+Demonstrations+and+Videos
- AXMEDIS Framework documents: specification, use cases, requirements, etc,
    - http://www.axmedis.org/area_4/doc.php
- AXMEDIS Selection of press cuttings: http://www.axmedis.org/documenti/view_documenti.php?doc_id=259
- A short multilingual overview of the AXMEDIS project, extracted from the home page of the project website: www.axmedis.org

Further information can be obtained directly from the WWW site of the project, or by contacting the coordinator.

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