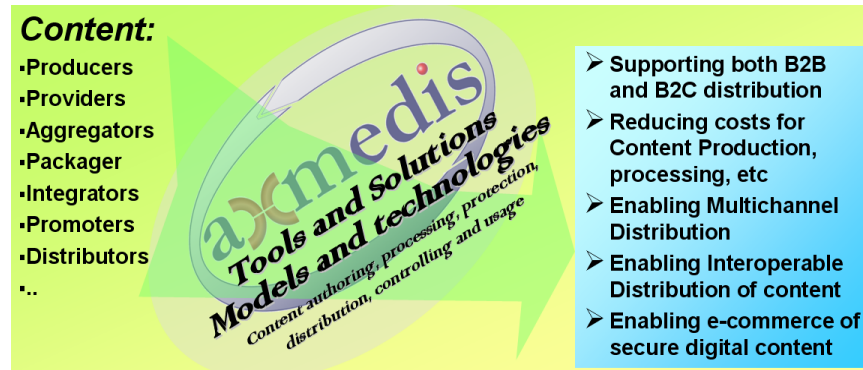# Automating Production of Cross Media Content for Multi-channel Distribution
www.AXMEDIS.org

AXMEDIS is a large Integrated Project of Research and Development partially founded by the European Commission in IST FP6 and includes about 20 partners among them: University of Florence, HP, EPFL, FHGIGD, ACIT, AFI, TISCALI, University Pompeo Fabra, University of Leeds, CPR, EXITECH, XIM, University of Reading, etc. The duty of AXMEDIS is to work on research activities, develop new tools and products and trial them as effective demonstrators.

Content:
- Producers
- Providers
- Aggregators
- Packager
- Integrators
- Promoters
- Distributors
- ..

- ➢ Supporting both B2B and B2C distribution
- ➢ Reducing costs for Content Production, processing, etc
- ➢ Enabling Multichannel Distribution
- ➢ Enabling Interoperable Distribution of content
- ➢ Enabling e-commerce of secure digital content

AXMEDIS aims

AXMEDIS has created the so called AXMEDIS Framework that is an open solution that permits to exploit a set of new technologies and tools for enforcing in your solutions and applications the:

- Reduction of costs increasing efficiency for content production, protection, management and distribution; better pricing and value-for-money for industry products and services, containing costs to set up sustainable business ventures in the digital cross media content.
  - o integrating your Content Management Systems, CMSs, with the distribution systems by automating the communication and update of content and information between the two systems;
  - o automating content gathering and ingestion processes from local or remote CMSs and file systems;
  - o automating composition, allowing parallel processing, GRID, and optimization techniques for content ingestion, production, protection and formatting;
  - o managing the workflow at level of the content factory and among different content factories sharing the same content production objectives;
  - o automating the whole process allowing content production on demand;
- support for the whole value chain: composition, packaging, integration, aggregation, synchronization, formatting, adaptation, transcoding, indexing, integration in the same objects protected and non protected components, definition of relationships with other resources, metadata integration and remapping/transcoding, protection, license production and verification, etc.;
- convergence of the media, interoperability of content supporting the multichannel distribution, support content distribution
  - o on different channels such as: satellite data broadcast, Internet, cellular network, wireless, traditional supports as DVDs, internet, mobiles networks, local and wireless networks,
  - o including P2P in both B2B and B2C levels,
  - o on different devices such as PC, PDA, i-TV, etc.
  - o with different transaction models on the same channels and content with flexibility in the business and transaction models,
- adoption of new methods and tools for innovative, flexible and interoperable Digital Rights Management (DRM), including
  - o exploitation of MPEG-21 and overcoming its limitations with specific extensions,
  - o supporting different business and transactions models and their integration,
  - o supporting the integration/interoperation of different DRM models such as with ODRL OMA;
- harmonization of B2B and B2C areas for DRM, bringing the DRM model in the B2B area, supporting production and protection models in the whole value chain;

- increment of content accessibility with a Peer-to-Peer (P2P) platform at Business-to-Business (B2B) level, which can integrate content management systems and workflows;

AXMEDIS realizes the AXMEDIS Framework for All, to be used by small and large industries having interest in exploiting new technologies and solutions produced by AXMEDIS to solve the above mentioned problems. The AXMEDIS Framework can be used to setup and built a set of full system applications in the area of content production, protection and distribution. The flexibility of AXMEDIS dynamic Plug-In technology allows customizing your applications and processes according to your needs.

The AXMEDIS digital content and content components is an **open format** capable of integration inside any kind of cross media format (video, images, animations, games, learning objects, multimedia, audiovisual, document, audio, etc., in any digital format), any kind of metadata including identification, classification, categorization, indexing, descriptors, annotation, relationships and play activities and protection aspects.
The AXMEDIS format permits the combination of content components, their secure distribution, etc., in the respect of the copyright laws, 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 low level formats). AXMEDIS is open to any DRM model and solution.
Within the AXMEDIS content any type of cross media content can be included from simple multimedia files to games, software components, for leisure and entertainment, infotainment, etc., but not only also for managing protected governmental content, healthcare information, business of value information, etc.

This white report describes the AXMEDIS architecture and framework. More technical information on AXMEDIS architecture and framework and about how to access at the AXMEDIS framework getting affiliated to AXMEDIS can be recovered on http://www.axmedis.org .

Business to Business areas

For the harmonization of the business area AXMEDIS is providing a set of tools and among them the so called AXEPTool that is a P2P tool for B2B distribution of content. AXMEDIS supports the DRM and the reporting back to the several actors of the information related to the exploitation of rights along the value chain and in the hands of the final users. These utilities are very useful to provide the evidence of the exploited rights in a transparent manner to collecting societies to other business partners.
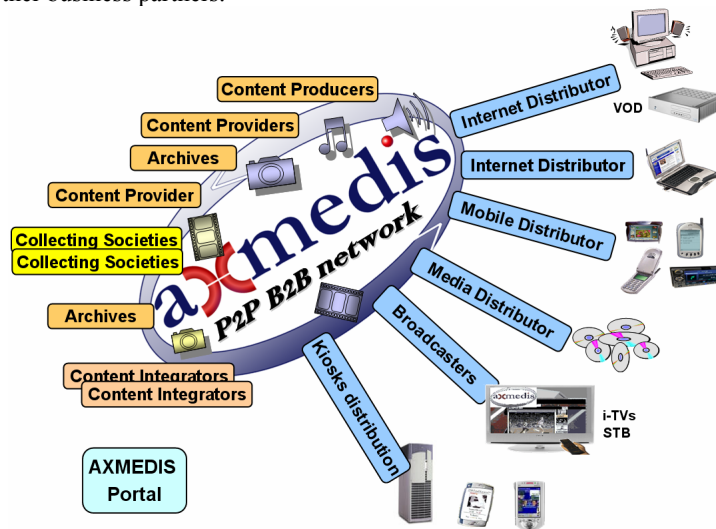
AXMEDIS Business to Business area with some distributors

The distribution side may present one or more single distribution paths for each type of content. In AXMEDIS, the content distributors can continue their preferred mechanisms for reaching the final users.
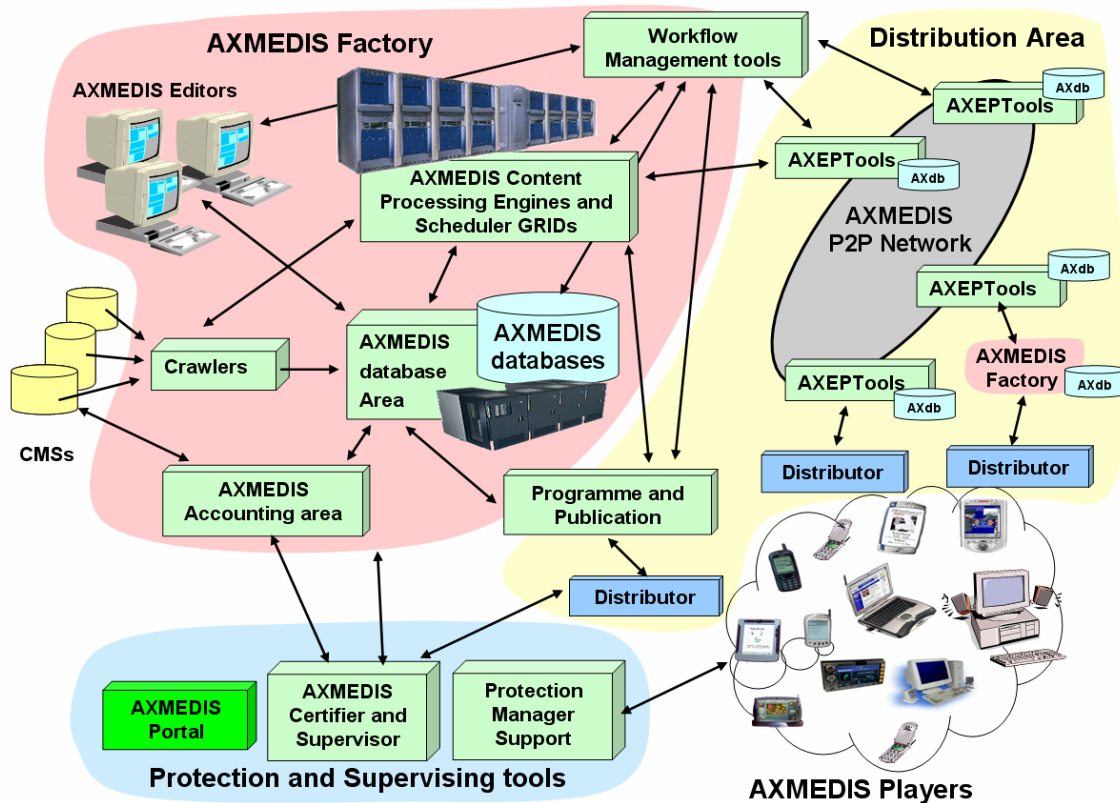
AXMEDIS General Architecture

The major AXMEDIS areas are the:

- **AXMEDIS Factory** for automating: to collect content from legacy CMSs, to produce the content, to program and schedule the production process, to edit and process metadata, to compose and format content, to collect content information from content usage, to produce licenses to harmonize 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.

- **AXMEDIS Distribution Area** for automating the content publication and acquisition in the business area allowing the interconnection of AXMEDIS Factories by means of the so called AXEPTools which is a secure and legal P2P tool. Among connected AXMEDIS Factories, it is also possible to make distributed queries 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 content distribution and publication towards external web services for example those of front end distribution servers.
- **AXMEDIS Player:** for content playing and execution on several different platforms, to built specific and customized content players, for distributing and sharing content among final users by means of secure P2P tools such as AXMEDIA P2P tool.
- **AXMEDIS Protection and Supervising tools**: for registering users, certificating users, authenticating devices and tools, monitoring all the activities 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 Architecture

AXMEDIS Factory

A content factory can be built on the basis of AXMEDIS tools in a scalable and flexible manner. Also tuning for example, GRID size, database size and type, number of authoring tools, number and type of tools/algorithms and libraries for processing content, licenses, integration support based on Workflow or not, etc. This allows setting up a large range of configurations to satisfy the needs of small and large content producers, integrators, and distributors.

The **AXMEDIS Database Area** includes the AXMEDIS/MPEG-21 database model, supporting the storage and access to AXMEDIS content via a large set of metadata for each object called AXInfo that can be customized. The database also includes produced licenses for the objects, history of performed actions on content, potentially available rights for each digital resource, models of contracts, etc. The AXInfo includes Dublin core plus descriptors and many other metadata for managing protection, lifecycle, etc. Any additional descriptors and metadata can be added in a flexible manner. Thus, different AXMEDIS factories may be based on different AXInfo and metadata, while automatic adapters can be defined and activated. The database area is based on a scalable database, a powerful AXMEDIS Database manager, and an effective **AXMEDIS Query Support** endowed of an easy to use user interface. The User may perform

queries to search for objects and content located in the CMSs, in the local AXMEDIS database and in the virtual database comprised of the AXMEDIS content accessible/published via the P2P network of AXEPTools in the AXMEDIS B2B Network.

The **AXMEDIS Content Processing Area** (AXCP Area) is based on a GRID solution for automating all the activities to be performed for the production, and processing of content. The major tools are the so called **AXCP Engines and Scheduler,** that are respectively the single code of the GRID and the organizer of processes on the GRID nodes. They implement a scalable solution to process from smaller collections to huge amount of content per day, per minute. The processing algorithms can be specified in terms of script code (Spider Monkey) allowing the manipulation of complex AXMEDIS data types and simple digital resources and content in general, and for the direct access to the AXMEDIS database and processing queries with the help of the AXMEDIS Query Support. The solution allows the writing of any kind of content processing algorithms, to activate them automatically on some query result, and these can be put in execution as independent processes on a scalable GRID for massive production and processing of digital resources in respect of the DRM.

The available data types, operators and accessible algorithms allow manipulation of any digital resources in a large number of formats. Algorithms can be defined for massive content composition (packaging, combination, etc.) and content layout formatting (synchronization, image and screen layout, from image sequence to video, etc.), content adaptation (change in resolution, subsampling, change in format, etc.), transcoding, coding, decoding, fingerprint extraction, estimation of descriptors, license adaptation and transcoding, license production and verification, etc.;

The users of the **AXMEDIS Content Processing Area** can code in terms of Java Script rules any kind of processing procedures and algorithms to manipulate/produce:
- Any digital resource:
  - Such as images (more than 150 different formats), audio (more than 60 formats), video (more than 50 formats), documents (TXT, PS, HTML, PDF, DOC, etc.), multimedia (more than 30 formats including MPEG-4, HTML, LOM, etc.), etc.,
  - for their transcoding, adaptation, feature and descriptor extraction, recognition, certification, etc.
  - with functionalities of many well know and powerful processing libraries such as: FFMPEG lib, LibSNDFile, TreTagger, DocFrac, GhostScript, XPDF, HTMLDOC, ImageMagic, MP4Box, Xerces, XALAN, CCPP, etc.
- Packages and their composition and formatting
  - AXMEDIS objects with AXInfo Metadata and indexing
  - MPEG-21 Objects,
  - including digital resources, metadata (e.g., DublinCore, etc.),
  - protection information
  - etc.
- Protected objects and resources, managing protection information:
  - By using MPEG-21 IPMP model (Information Property Management Processor), and format
  - Using algorithms such as encryption/decryption, scramble, compression, key production, etc., different sizes for keys, etc. A
  - Etc.
- Licenses on the basis of the business models chosen:
  - stating grants, conditions, etc.,
  - verifying license consistency with respect to the potentially available rights, with the license in production, etc.
  - by using formalism of MPEG-21 REL, and with OMA ODRL – MPEG-21 REL transcoding
- Automatic content and information access
  - Database accesses (ODBC, etc.) with direct facilities
  - Database access by means of crawling facilities to access to a larger set of possible database models. They may contain digital content, resources, files, metadata, administrative and licensing information, etc., and can be physically located in several different computer systems and based on several different database models: ODBC, MySQL, ORACLE, MS-SQL, etc., or files systems. The access to this information is performed by means of Focuseek Crawler.
  - File system and operating system access
  - http and ftp accesses
  - AXMEDIS database access with query support, actualization of selections, active queries, etc.
- Device capabilities format and processing facilities
- User Profile format and processing facilities
- XML facilities for the application of styles and general processing
- SMIL facilities for the application of templates and styles and processing

- Etc.

The algorithms and procedures used in the AXCP Area can be expanded by using the AXMEDIS Plug In technology that allows customizing and easily expanding the processing capabilities of the AXMEDIS GRID. Algorithms for the extraction of fingerprint, descriptors, adaptation, content processing, DRM adaptation, metadata adaptation, are built as pluggable algorithms. *Any other library, model and format and related algorithms for their manipulation can be added by adding plugins to the AXCP in a very easy manner.*

The AXMEDIS **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.

The **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,
- 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;

The **AXMEDIS Accounting Area** includes a set of tools which allow content producers, distributors or collecting societies to collect administrative information and report 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 customer relationships services.

AXMEDIS Distribution Area

The AXMEDIS tools for the distribution area allow automating the content publication and acquisition in the business area establishing also interconnection among different AXMEDIS Factories by means of the so called AXEPTools (AXMEDIS P2P Tool for B2B distribution) which is a secure and legal P2P tool. The tools in this area also allow scheduling content distribution and publication towards external web services for example those of front end distribution servers.

Each **AXEPTool** includes an instance of the AXMEDIS Database that allows making distinction from content in the AXMEDIS Factory and content published to be distributed and shared with other business partners. It also allows searching for content among business partners connected on the AXMEDIS Network. Typically the network allows sharing content among producers, integrators, distributors, publishers, archives, etc. Among the interconnected AXEPTools it is possible to make distributed queries to search for content, and to automatically publish and acquire/update content from/to the business partners, etc. The Potentially Available Rights and the contact information are the instruments to start the negotiation of content acquisition. This mechanism makes the B2B content distribution fasters, simpler and more secure. Each transaction and trial is monitored by the AXEPTool and by the AXCS. During queries, the content and the technical metadata are certified thus avoiding trivial problems of many P2P architectures.

The AXMEDIS **Programme and Publication tool, AXP&P,** includes a set of tools which allow interconnecting AXMEDIS Databases content to the distribution channels for producing programs to public content on the distribution

channel, and to transfer the related to content on the channel. It also allows the management of requests for content production/adaptation on demand. The production of content programs is capable of scheduling the production/adaptation of content depending on the distribution profile, production time costs and on delivering time. These tools also provide a front end in terms of web services to delivering content ready for the distribution.

The **Distributors** represent any kind of content distribution services (see Fig.3): Internet, satellite and terrestrial broadcast, mobile, towards: PC, STB, I-TV, mobiles, PDAs, etc.

Distributors may be also interested in having in their plant some components of the AXMEDIS factory such as an instance of the AXMEDIS Database to make queries, license editor to produce licenses, AXCP for content adaptation and/or to protect content in massive manner, for content production on demand, etc. In order cases, they can delegate these actions to other parties or to external web services. Some examples about the usage of AXMEDIS tools to set up solutions for content distribution are reported in the following. In some cases, the Distributors may be interested in establishing a connection with the AXMEDIS Certifier and Supervisor for obtaining reports about the rights exploitation or for getting statistical information.

Some Distributors may be interested in exploiting AXMEDIS technology to set up a legal P2P service for content distribution. This solution can be realized by using the so called **AXMEDIA** tools. It is a P2P tool for distributing and sharing AXMEDIS content among end users, the distributor may insert AXMEDIS content in the network of peers and this may freely navigate among them but with the supervision and control of AXMEDIS protection and monitoring models.

AXMEDIS Players

The **AXMEDIS players** are based on the AXMEDIS object model and manager called AXOM. They are capable of reading and playing/executing AXMEDIS objects according to the business models chosen and the license associated with the user/device. AXMEDIS player are available mainly for PC (as independent tools, as plug in for Internet Explorer and Mozilla browsers) and PDA with Pocket PC 2003.

AXMEDIS framework provides tool kits and libraries to create a large number of different players on different platforms, leaving free the customization of the user interface, skin, and much more; mainly MS-Windows, MAC and Linux, for PC, PDA and may be for mobiles.

AXMEDIS Protection and Supervising Tools

AXMEDIS Protection and Supervision Tools provide support for registering and certificating users, providing unique IDs for the AXMEDIS objects, authenticating of devices and tools, processing licenses, managing black lists, continuous monitoring of the user activities on the AXMEDIS content on AXMEDIS players and tools on the basis of licenses, and collecting and reporting the information about content usage and rights exploitation, etc. The tools of this area are described in the following.

The **AXMEDIS Certifier and Supervisor, AXCS,** is the responsible of user registration, for device and tools authentication and certification, and for the registration and tracking of the activities performed on AXMEDIS objects on any AXMEDIS compliant tool. The AXCSs provide protection information and share with the AXMEDIS Protection Manager Supports (PMS) the responsibility of managing the protection for distribution channels and domains. The AXCS also manages black lists of users, devices and tools to restrict their activities when irregularities are detected.

The **AXMEDIS User Registration portal** is a service that can be used by Distributors to make the registration of their final users. Any User has to make a registration on AXMEDIS to obtain a certificate that could allow him/her to install tools and to cope with the related AXMEDIS licenses. Some Distributors may prefer to use a direct Web Service to register their users in AXMEDIS model and support via the AXCS, both solutions can be used.

The **AXMEDIS Object Registrator** is a service to produce and assign a unique object ID to AXMEDIS objects. In the process the most important metadata may be provided as well allowing establishing relationship from standard and/or proprietary identification codes with those used in AXMEDIS. It is a service accessible by all tools capable of creating new AXMEDIS objects for any AXMEDIS Factory and it is a WEB service directly connected to the AXMEDIS Certifier and Supervisor;

The AXMEDIS **Protection Manager Support**, **PMS,** collects the licenses and has the duty of processing chains of licenses on the basis of the requests received from AXMEDIS players, and all other AXMEDIS tools that include an AXOM to manipulate objects. The PMS allows the management of licenses and the sharing of these along other PMSs

by means of a network of AXCSs. Each PMS can be associated with different distribution channels or geographically distributed. The definition of licenses and the management of information into PMS and AXCS allow to set up of a large variety of different distribution and transactions models, from client server to P2P, from satellite data broadcast toward i-TV to content distribution to cellular phones. The PMS is also provided in versions that allow managing Domains (the so called PMS Domain) such as those that can be set up for managing licenses for a school, a house, or a company, etc. Each PMS Server allows to receive the posting of new licenses by means of a Web Service, this ca be used for automating their production from the Distributor Front End Sale server. In alternative, the **AXMEDIS DRM Editor** (license editor) can be used.

The **AXMEDIS Portal** includes services for all the AXMEDIS users including those that support AXMEDIS and contribute to the construction and improvement of the AXMEDIS framework. It provides a set of service including the database of AXMEDIS documentation, the deployment of the AXMEDIS framework, the management of the mailing lists, etc. It allows providing updated tools and information to AXMEDIS partners. On AXMEDIS portal, you can get the list of AXMEDIS compliant tools, devices, registered companies, test cases, documentation, libraries, etc. In addition, you can find from the AXMEDIS Portal references to the AXMEDIS services that allow the authentication, certification and continuous monitoring and control of any AXMEDIS tools.

AXMEDIS Framework

The AXMEDIS Framework is the set of information and tools that is at the basis of the above mentioned applications and solutions. In the next Figure, the simplified version of the AXMEDIS Framework structure is reported. It contains all the necessary tools to set up a large set of services and solutions in the area of content production, protection and distribution. The AXMEDIS Framework is an infrastructure on which several other models for content modeling, protection, production, DRM and distribution can be built in a very simple manner reusing the components and functionalities provided.
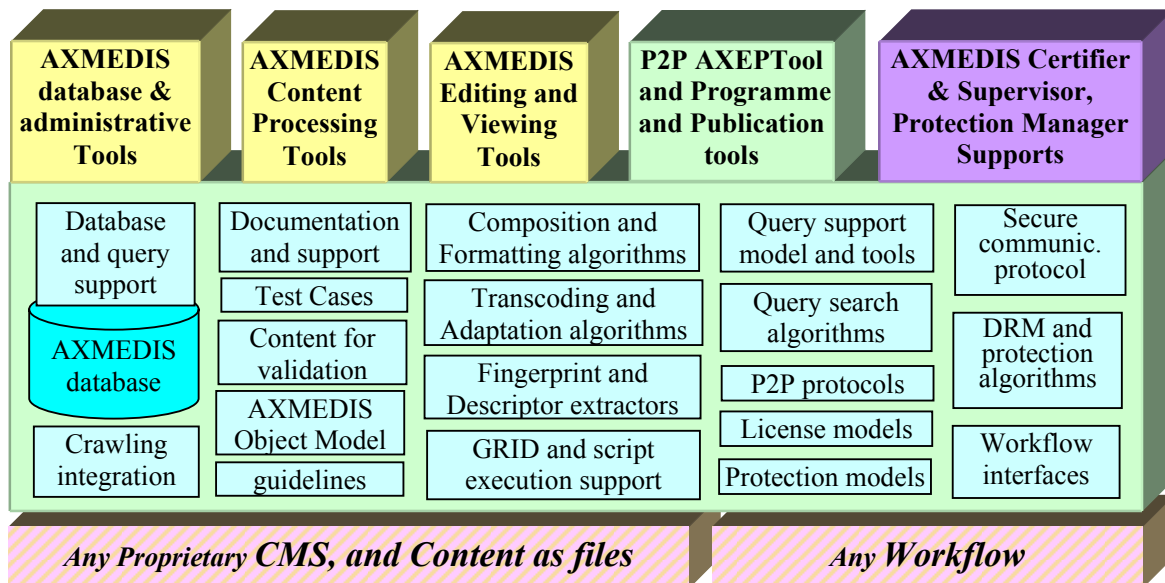
AXMEDIS Framework structure

The general infrastructure gives a common ground on the base of which other content based applications and tools can be built. In addition, to the modules and tools described before, the most relevant parts of the AXMEDIS Framework are:

o   Requirements and their revisions,
o   test cases and uses cases and their revisions,
o   content for validations, both single resources and metadata and demonstrative AXMEDIS objects,
o   general documentation of AXMEDIS tools and supports, including the whole specification of the AXMEDIS framework and the detailed technical documentation of the source code,
o   CVS tree with source codes of the several modules of the AXMEDIS framework,
o   examples of AXCP scripts modeling algorithms for content compositions and formatting, for transcoding and adaptation, for extraction of fingerprint and descriptors, content processing, license manipulation and verification,

license adaptation, etc., for many different formats of digital resources and for any categories of them: audio, video, document, multimedia, images, animations, text, metadata, etc.,

o   examples and models of licenses, example and models for protection information,
o   examples of workflow usage and programming for controlling AXMEDIS Factories
o   examples of queries for accessing to the database
o   tutorials on content protection, on AXMEDIS tools, on distribution, on general aspects, etc.;,
o   guidelines for source code production for contributing to the AXMEDIS framework,
o   guidelines on content production and distribution,
o   guidelines for the production of AXMEDIS Plug-ins for AXCP and AXMEDIS Editors,
o   guidelines for the production of licenses on the basis of contracts,
o   ready to use/install AXMEDIS tools such as: AXMEDIS Players, AXEPTool, AXMEDIA tool, AXMEDIS Editors, AXMEDIS Programme and Publication tools, AXMEDIS Content Processing Tools, AXCS, AXMEDIS PMS, etc.

Accessing to the AXMEDIS Framework

The present status of the AXMEDIS Framework can be recovered from its coordinator or partners. Demonstrations of the AXMEDIS tools and of the whole AXMEDIS Framework are provided at AXMEDIS conferences and in other occasions listed on the AXMEDIS Portal. The AXMEDIS Framework can be accessed by all affiliated partners. The Affiliation to AXMEDIS is performed by subscribing an Affiliation Agreement with an AXMEDIS Contractor. The Affiliation Agreement and the list of Contractors is accessible on the AXMEDIS portal.

There are many **reasons to get affiliated to AXMEDIS,** which can be summarized as follow:
*   Obtaining access to an open platform that can be customized for your production., protection and distribution needs
*   Reduction of costs for content gathering, processing, production, protection and distribution
*   Adopting at low cost a standard model (MPEG-21) for content and licenses modeling and thus for inserting DRM in your business
*   Establishing contacts with other business partners interested in exploiting similar technology
*   Acquiring a greater control about content usage
*   Creating customized players
*   Exploiting and trial of new business models
*   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
*   Setting up of one-stop service for content protection and DRM set up,
*   Allowing reporting to your business customers which rights are exploited on their content.
*   Allowing the management of rights reporting for multimedia products
*   Allowing using a solution that can be safer and more flexible with respect to state of the art.
*   Saving money in accessing at innovative technologies for content production and distribution, integrated environment
*   Accessing to strongly innovative technology to trial it
*   Contributing to the AXMEDIS Framework is allowing you to continuing accessing to the framework reducing the costs for its accessibility.

Research institutions and technology providers are interested in getting affiliated with AXMEDIS to:
*   make visible, to promote, produced algorithms and tools that can be used for content processing and modeling and that can be in some how integrated into the AXFW. These tools may be provided as demonstrators with limited capabilities.
*   Exploitation of the AXMEDIS Framework to make business with it for the reasons reported in the above list.
*   Adding new content models and new DRM models and make them interoperable with MPEG-21 and others already in place on AXMEDIS.
*   Test new algorithms and tools with respect to the state of the art solutions, in a very easy and cheep manner.
*   Access at low cost a framework by means of which several difference configurations and solutions may be built to cover the need of the value chain actors.
*   Access at tools based on MPEG-21 standard.
*   Collaborate with very relevant and well known research institution and companies of the areas.
*   Etc.

The present **status of the AXMEDIS Framework** can be recovered from its coordinator. Demonstrations of the AXMEDIS tools and of the whole AXMEDIS Framework are provided at AXMEDIS conferences and in other occasions listed on the AXMEDIS Portal. The AXMEDIS Framework can be accessed by Affiliated Partners. The Affiliation to AXMEDIS may be performed by subscribing an Affiliation Agreement with an AXMEDIS Contractor.

The AXMEDIS 2006 conference will be held in Leeds in December 2006. The Call For Papers is open until April 2006.

AXMEDIS Documents and References

Basic knowledge reports (an updated version will be available soon)
o   User requirements http://www.axmedis.org/documenti/view_documenti.php?doc_id=1062
o   Use Cases http://www.axmedis.org/documenti/view_documenti.php?doc_id=774
o   Test Case http://www.axmedis.org/documenti/view_documenti.php?doc_id=1395

AXMEDIS Framework Specification (an updated version will be available soon)
o   AXMEDIS Framework General aspects, Editor and Model http://www.axmedis.org/documenti/view_documenti.php?doc_id=1379
o   AXMEDIS Viewers and Players http://www.axmedis.org/documenti/view_documenti.php?doc_id=1380
o   AXMEDIS Content Processing tools http://www.axmedis.org/documenti/view_documenti.php?doc_id=1381
o   Estimation of Fingerprints and Descriptors http://www.axmedis.org/documenti/view_documenti.php?doc_id=1382
o   AXMEDIS Database modeling and content Gathering http://www.axmedis.org/documenti/view_documenti.php?doc_id=1383
o   P2P tools, AXEPTools and Programme and Publication http://www.axmedis.org/documenti/view_documenti.php?doc_id=1384
o   AXMEDIS Workflow aspects http://www.axmedis.org/documenti/view_documenti.php?doc_id=1385
o   Protection aspects and rights Accounting aspects http://www.axmedis.org/documenti/view_documenti.php?doc_id=1386
o   Applications of Content Distribution and AXMEDIS Portal http://www.axmedis.org/documenti/view_documenti.php?doc_id=1387
o   Definitions Terms tables links http://www.axmedis.org/documenti/view_documenti.php?doc_id=1388

AXMEDIS reports on basic enabling technologies
o   Content Model and Managing, MPEG-21, authoring, etc. http://www.axmedis.org/documenti/view_documenti.php?doc_id=1423
o   Content indexing and querying http://www.axmedis.org/documenti/view_documenti.php?doc_id=1422
o   Content processing, Composition and formatting, workflow http://www.axmedis.org/documenti/view_documenti.php?doc_id=1479
o   Content Protection and Supervision http://www.axmedis.org/documenti/view_documenti.php?doc_id=1429
o   Content Sharing and Distribution via P2P http://www.axmedis.org/documenti/view_documenti.php?doc_id=1419
o   Content Distribution via Internet http://www.axmedis.org/documenti/view_documenti.php?doc_id=1470
o   Content Distribution via Mobile http://www.axmedis.org/documenti/view_documenti.php?doc_id=1452
o   Content Distribution via Satellite data broadcast http://www.axmedis.org/documenti/view_documenti.php?doc_id=1448
o   Usability issues http://www.axmedis.org/documenti/view_documenti.php?doc_id=1467
o   AXMEDIS vs DMP MPEG21 Analysis http://www.axmedis.org/documenti/view_documenti.php?doc_id=1063
o   AXMEDIS Framework Infrastructure, guidelines and some tools http://www.axmedis.org/documenti/view_documenti.php?doc_id=1391
o   AXMEDIS Framework Validation and integration http://www.axmedis.org/documenti/view_documenti.php?doc_id=1392

Content Modeling and Test Cases
o   Content Aspect Specification http://www.axmedis.org/documenti/view_documenti.php?doc_id=1389
o   Content Aspect Specification Appendix http://www.axmedis.org/documenti/view_documenti.php?doc_id=1670
o   Content for Test Cases and Validation http://www.axmedis.org/documenti/view_documenti.php?doc_id=1393
o   Content Selection Guidelines http://www.axmedis.org/documenti/view_documenti.php?doc_id=1390
o   Multilingual Guidelines and Technical Solutions http://www.axmedis.org/documenti/view_documenti.php?doc_id=1427
o   AXMEDIS Editorial Format Guidelines and basic examples http://www.axmedis.org/documenti/view_documenti.php?doc_id=1394

AXMEDIS Tutorials
o   General Tutorial and Overview http://www.axmedis.org/documenti/view_documenti.php?doc_id=1582
o   Content Production Tutorial http://www.axmedis.org/documenti/view_documenti.php?doc_id=1559
o   Content Distribution Tutorial http://www.axmedis.org/documenti/view_documenti.php?doc_id=1555

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