Automating Production of Cross Media Content for Multi-channel Distribution
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Abstract:
Project flyer for technical and B2B new version, single flyers for P2P B2B area, Content Processing, Content Protection and AXMEDIS tools.

Keyword List:
AXMEDIS flyer, dissemination, promotion, exploitation.
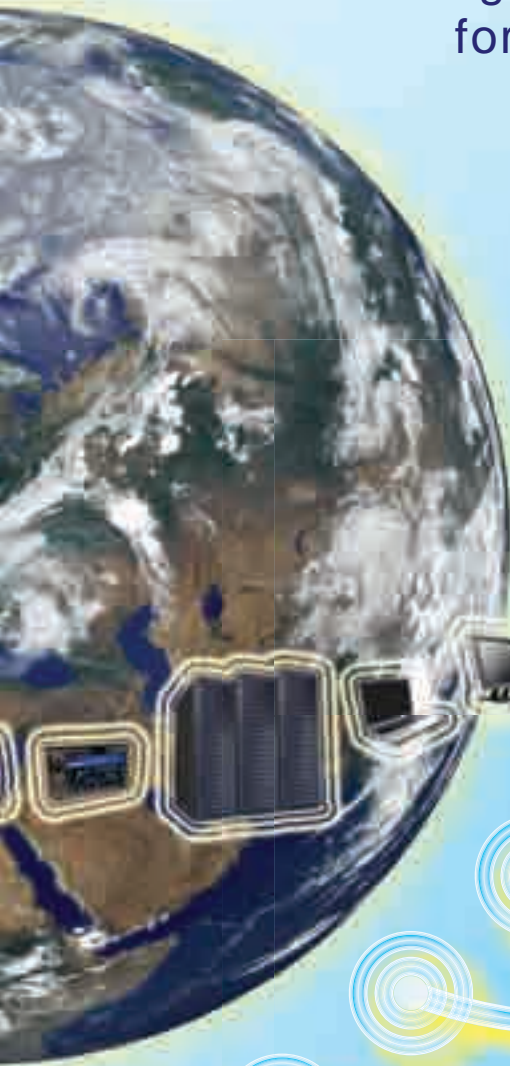
List of Brochures and Flyers included:
- AXMEDIS project brochure v3.1.3
- AXMEDIS flyer on major AXMEDIS tools, v0.3
- AXMEDIS flyer on content processing capabilities, v0.9
- AXMEDIS flyer on DRM and protection aspects, v1.1
- AXMEDIS flyer on B2B and AXEPTOOL, v0.8
- AXMEDIS project brochure, old version

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Automating Production of Cross Media Content for Multi-channel Distribution

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AXMEDIS Framework

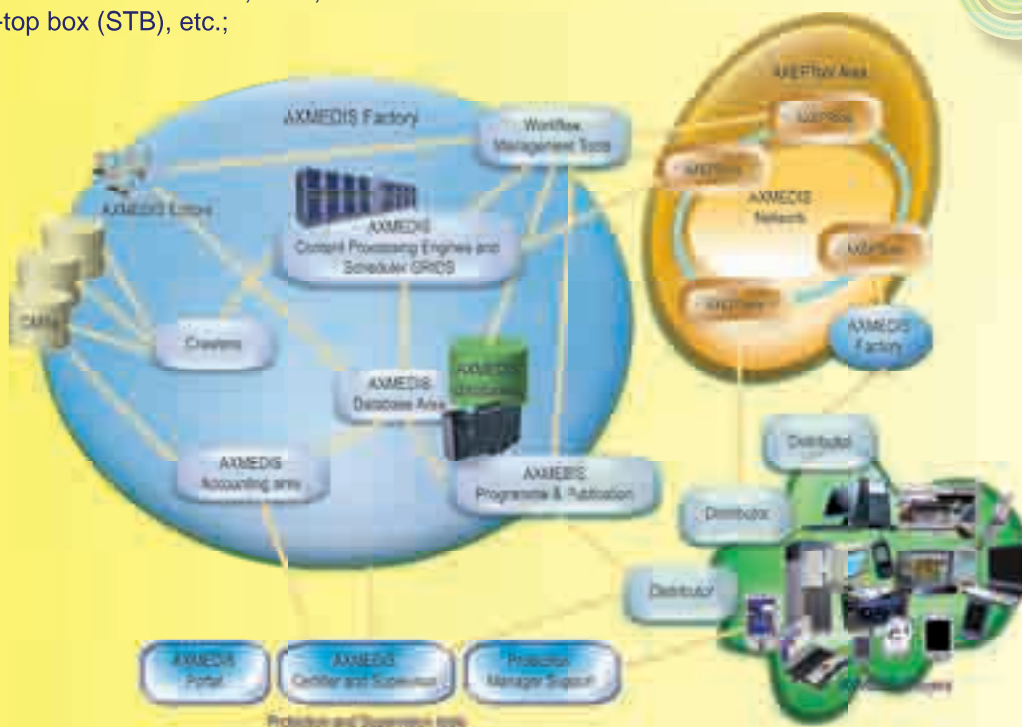The AXMEDIS Framework is an open solution which builds on technologies and tools to:

- 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 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,
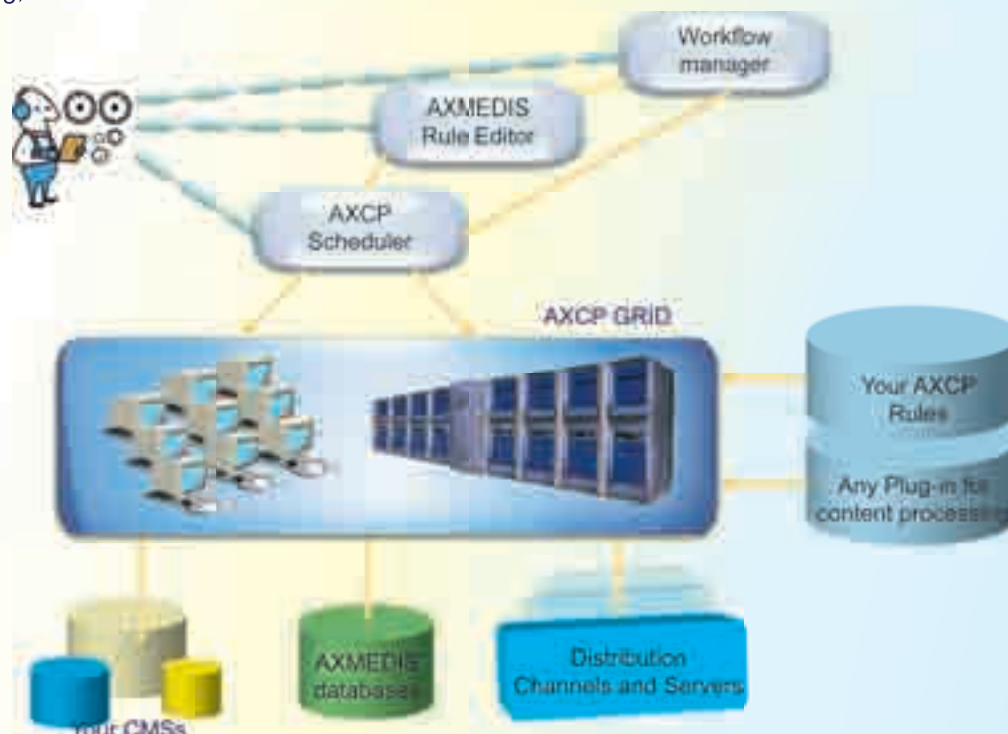

AXMEDIS Architecture

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 Components

- 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 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;
- 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 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.

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,

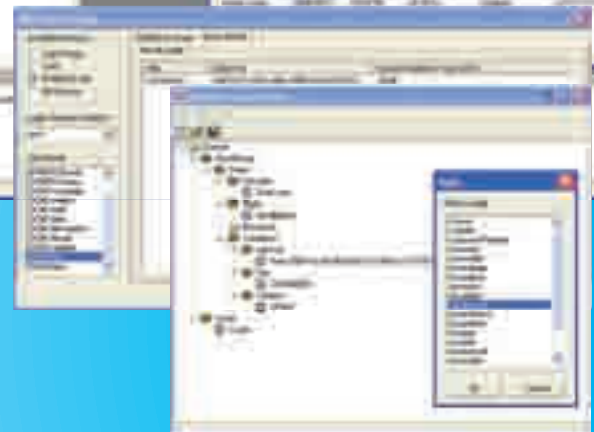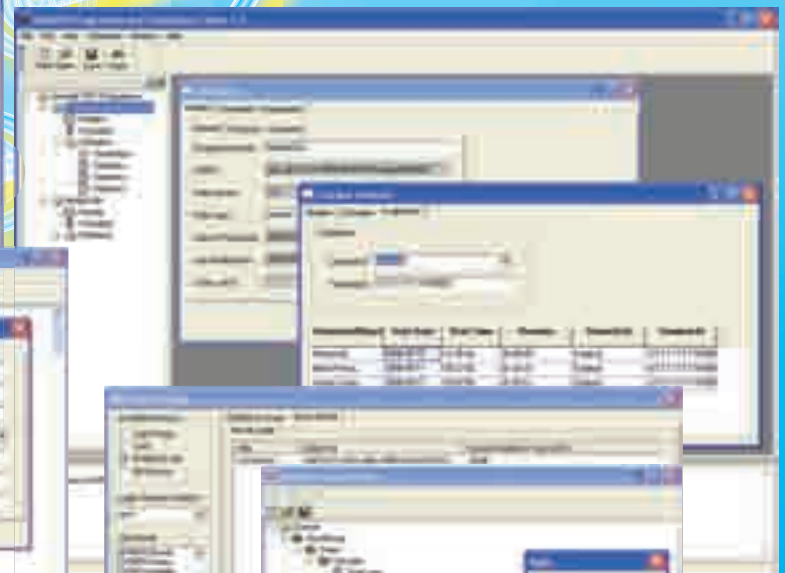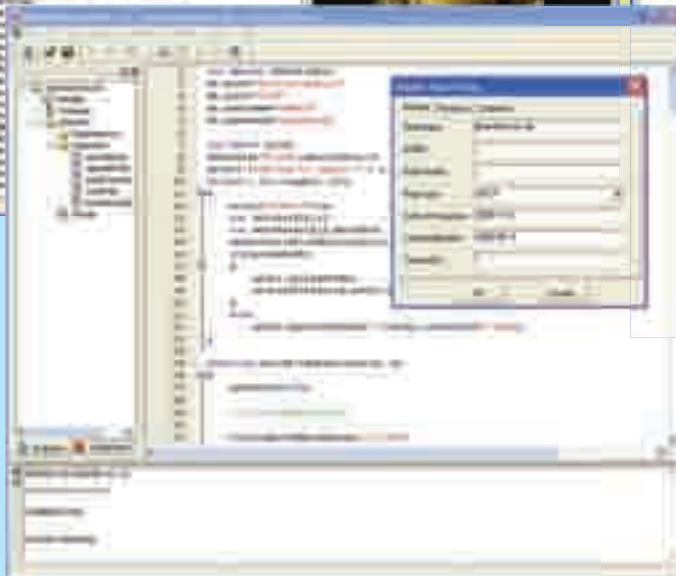applying encryption, scrambling, compression, and many other algorithms;
  - posting specific protection information of a given AXMEDIS object to the AXMEDIS Certifier and Supervisor server;
  - tracking exploited rights and reporting actions performed to the content owner, distributors, collecting societies, 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 and accesible from AXMEDIS portal. Its 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 specification and the source code for creating new plug-ins are public and accessible without the need to be affiliated. Any tool can be integrated into the AXMEDIS Content Processing GRID with this technology.
 • AXMEDIS partners are open to your needs that may be useful to improve the capabilities of the AXMEDIS framework.

To take advantage of the AXMEDIS framework and technologies, you are invited to apply for the AXMEDIS Affiliation.

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.

With the AXMEDIS Affiliation, Research institutions can:
 • 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.

AXMEDIS B2B Distribution and Sharing

For latest information, developments, events and announcements, please visit the AXMEDIS web portal at **http://www.axmedis.org**.
If you have any queries or comments, please email **axmedisinfo@axmedis.org**.

AXMEDIS Partners include:
 • Accademia Nazionale di Santa Cecilia Fondazione, Italy
 • Advance Concepts for Interactive Technology GmbH, Germany
 • AFI, Associazione dei Fonografici Italiani, Italy
 • BBC, British Broadcasting Corporation, UK
 • DSI, Department of Systems and Informatics, University of Florence, Italy
 • Dipartimento di Italianistica, Università degli studi di Firenze, Italy
 • EPFL, Ecole Polytechnique Federale de Lousanne, Switzerland
 • ETRI, Electronics and Telecommunications Research Institute, Korea
 • Elion Enterprises Ltd., Estonia
 • EUTELSAT S.A., France
 • EXITECH S.r.l., Italy
 • Focuseek, Italy
 • FHGIGD, Fraunhofer Institute for Computer Graphics, Germany
 • GIUNTI Interactive Labs S.r.l., Italy
 • HP, Hewlett Packard Italy S.r.l., Italy
 • Hexaglobe, France
 • Kaunas University of Technology, Lithuania
 • MBI S.r.l., Italy
 • Peking University, China
 • Rigel Engeneering, Italy
 • SEJER, Bordas and Nathan, France
 • SDAE, Sociedad Digital de Autores y Editores, Spain
 • SIAE, Società Italiana degli Autori ed Editori, Italy
 • Strategica S.r.l., Italy
 • Telecom Italia, Italy
 • TEO LT, Lithuania
 • TISCALI Services, Italy
 • UPC, Universitat Politècnica de Catalunya, Spain
 • University of Leeds Interdisciplinary Centre for Scientific Research in Music, UK
 • University of Reading Informatics Research Centre, UK
 • VRS Grupé, Lithuania
 • XIM Ltd., UK
For the full list, please see the AXMEDIS portal.

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Image courtesy of NASA and the Visible Earth, http://visibleearth.nasa.gov
Thanks to EUTELSAT for the images

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Information Society
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(IST-2-511299)

Automated Content Tools to Manage Your Processes as You Like

AXMEDIS the perfect solution for new content models, protection solutions and processing for multi-channel management.
**Stop working to converging technologies and let technology working for you.**
AXMEDIS provides manual and automated tools to make easy the migration towards multi-channel of your production and distribution processes.

AMEDIS EDITOR, a tool for the
• authoring of multiple Object Identification codes: ISRC, ISAN, your personal codes, etc.
• authoring of multiple Metadata
• creation of simple and/or complex AXMEDIS objects, MPEG-21 content
• creation of nested AXMEDIS objects
• creation of objects with links/URI to other objects and/or resources
• definition of SMIL based presentation layers
• acceptance of any kind of resources and/or collections including HTML, SMIL, etc.
• application of content processing (any AXMEDIS Content Processing plug in)
• application of content protection (any AXMEDIS Protection Tool plug in)
• registration and certification of content for DRM
• protection of content for DRM
• search and query on database
• save, post on database, etc.

AXMEDIS EDITOR Tools:
• Hierarchy editor
• Metadata editor and Mapper
• Visual and behavioral editor
• Workflow editor
• Protection editor
• Java Script editor
• License editor (MPEG-21 REL)
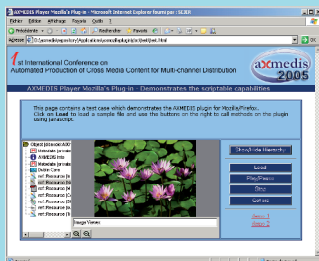
AXMEDIS object model
• structure and packing models and formats
• metadata capabilities
• presentation and interaction model
• DRM support
• protection and security supports
• dynamic behavior support

Supported by several tools for
• manual production and protection
• automated production, protection and distribution
• workflow management
• DRM for B2B, B2C, and B2B2C
• Multi-channel distribution and convergence

Structural and Packaging Capabilities:
Any file in any format/type can be packaged
• images, video, audio, documents, animations, etc.
• from executables to games and DLL
• any presentation model and file, single and multiple
• nested AXMEDIS objects
• MPEG-21 format and ISO MEDIA Binary File format
• default AXMEDIS model: MPEG MAF CMIP (prop)
• nested Objects: nested levels of metadata are reported on the top in an AXMEDIS index
• simple and nested protection models are supported
• support for MXF, SCORM, OMA, etc.

Metadata Capabilities:
• any identification model, default AXOID
• any classification model, default AXInfo with Dublin Core, B2B metadata, etc..
• any descriptor, default fingerprints, plus MPEG-7
• any file can be included into the package as additional metadata or info, from RDF to ontologies, free text, XML

### Presentation and interaction Capabilities:
Any presentation model/format can be included into the AXMEDIS package.
Presentation models of AXMEDIS players
• any combination of cross media content based on HTML, SMIL, MPEG-4 plus single multimedia.
    • SMIL for PC, Mobile and PDA
    • MPEG-4 for PC, STB(Linux) and PDA
    • HTML for PC and PDA
    • SCORM for PC
• any presentation/interaction paradigms depending on the presentation format used, such as:
    • Menus and collections
    • Hypermedia (internal and external links)
    • Cross media and Multimedia
    • animations
    • dynamic scripts
    • dynamic advertising integration
    • gaming, etc.
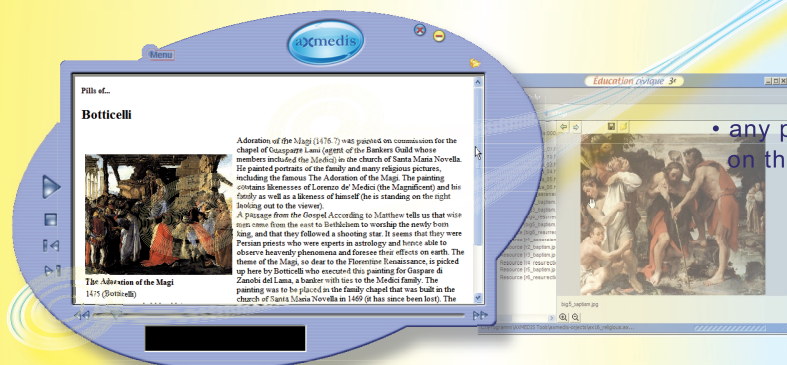
DRM support and tools:
• MPEG-21 DRM model plus OMA interoperability
• MPEG-21 REL as licensing
    • AXMEDIS profile and OMA interoperability
    • AXMEDIS License Server (AXPMS)
• MPEG-21 Event Reporting
    • AXMEDIS Action Log extensions and
      servers
    • Statistics and reporting with CAMART and
      AII tools of AXMEDIS

Protection and security services and tools:
• AXMEDIS Protection Processor (AXPP)
      • extending and supporting MPEG-21 IPMP
      • dynamic replaceable protection tools as
       AXMEDIS Protection Tools plug ins
      • fully customizable protection tools
• AXMEDIS protection servers:
      • AXMEDIS Certifier and Supervisor (AXCS)
      • AXMEDIS Registration Service (AXRS)
      • AXMEDIS Certification Authority (AXCA)

Dynamic Behavior Capabilities:
• Java script integrated at model level
      • MPEG-21 DIP, DIM, DIBO
      • AXMEDIS extensions
• Narrative capabilities of SMIL, HTML,... plus
  JavaScripting

## AXMEDIS players
For different devices and Operating Systems:
• PC windows
• STB/PVR and Media Centers
• PDA windows Mobile 5
• PC Apple MAC
• Pure java for mobiles
• PC windows, based on Active X, for usage into HTML
  and simple VB and .NET applications
• PC windows, based Mozilla plug in
• PC windows, based on .NET

Players Capabilities:
• fully customizable with plug ins and GUI
• DRM support (MPEG-21)
• downloading and streaming
• dynamic behavior with scripting
• metadata viewer
• presentation and interaction layers: SMIL, HTML,
  SCORM, MPEG-4, etc.
• annotation support

P2P and Final User Tools
• AXMEDIA P2P client tool
    • P2P community for content sharing
    • integrated with the players
    • version for Mobile is coming
• Content Posting Tool, COPOP
    • to involve final users in content production
    • automated packaging, protection and
      publication of AXMEDIS content of final
      users.
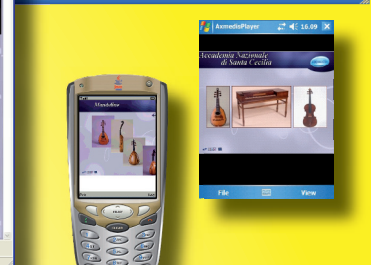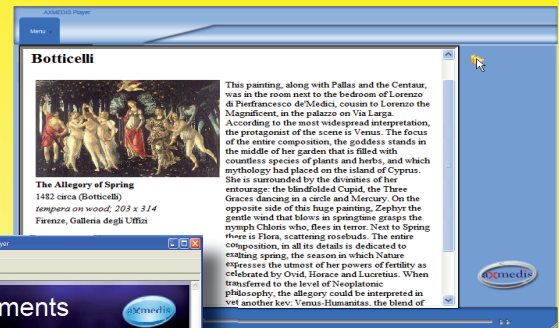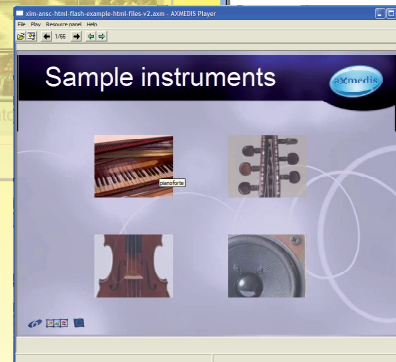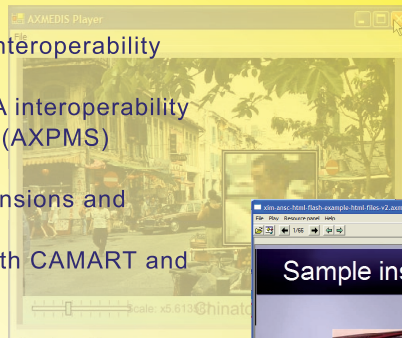
AXMEDIS Content Processing GRID
To automate any business solution with and without DRM such as:
• advertising (including customized and/or real time
  personalized advertising inside the package or linked
  from outside)
• personalization (including personal content inside the
  package or linked)
• DRM with transaction model depending on the MPEG-
  21 REL
• content production on the final user side
• B2B content distribution
• B2C content distribution
• B2B2C content distribution and sharing
• P2P controlled content sharing
• Super-distribution and its control
• video on Demand, VOD
• production on demand
• Multi-channel experience and distribution
• Multi-business integration: several business and
  transaction models on the same distribution channel
  with a unique AXMEDIS-based production platform/
  factory (AXCP)
• etc.

AXCP GRID as technical backoffice tool for
• content packaging: MPEG-21, OMA, MXF, SCORM, etc.
• content digital signature application
• content management system
• content processing and house keeping
• content transcoding, adaptation platform
• content fingerprinting
• content and metadata enrichment
• access to legacy CMS and Metadata
• license transcoding (MPEG-21, OMA)
• licensing platform, production of licenses on demand
• profiles management and processing
• metadata follower and integrator
• crawling resources and metadata
• valorization of legacy content and CMSs
• integration with OpenFlow and/or BizTalk workflow
  Management Systems
• recognition and channel monitoring
• etc.
See specific flyer and technical references for the AXCP.

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Automating Production of Cross Media Content for Multi-channel Distribution

www.AXMEDIS.org

axmedisinfo@axmedis.org

AXMEDIS Content Processing (AXCP)

AXMEDIS technologies reduce the costs of digital content production, protection and distribution. AXMEDIS supports interoperable DRM considering multiple DRM models, open standard DRM MPEG-21 and OMA and integrated and expandable back office management.

AXMEDIS has been funded by the European Commission.

IST-2-511299

European Commission

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Technologies

Automate activities of

- **Content and metadata Ingestion and Gathering** CMS such as ORACLE, XML databases, Tamino, MySQL, MSSQL, HP DMP, ODBC, etc), file system, and protocols; via Web Services, FTP, HTTP, WebDAV, SMB, Gopher, NNTP, and other models.
- **Content Storage and Retrieval** from/to AXMEDIS database, MPEG-21 database, other AXMEDIS content Factories by means of the AXMEDIS P2P tools (AXEPTool), ODBC databases.
- **Content Processing** such as
  - digital resources **adaptation,** extraction of descriptors, **transcoding,** synchronization, estimation of **fingerprint,** watermarking, indexing, content summarization, etc.;
  - **metadata manipulation**, mapping and adaptation, Dublin Core, MPEG-7, XML;
  - resource d**escriptors recognition for monitoring distribution channels**.
- **Content Composition** for creation of content by combinations of raw assets such as text, images, audio, video, animation, metadata, descriptors, licenses, and other multimedia objects such as MPEG-4, HTML, SMIL, Macromedia tool file, games, etc.
- **Production Process workflow management** integration with OpenFlow and BizTalk Workflow Management systems.
- **Content Packaging** and DRM such as MPEG-21, with any digital resource inside, from other MPEG-21 to HTML, SMIL, groups of files and related resources; OMA, etc.
- **Content Presentation and Interactive models** such as: SMIL, HTML, MPEG-4, etc.
- **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, Genetic Algorithms, best time fitting, etc.
- **Content Protection and DRM**
  - protecting digital resources and objects;
  - tracking exploited rights and reporting actions performed to the content owner, distributors, collecting
    societies, etc.
- **Content Licensing and DRM**
  - generating license from license model and additional information, storing licenses, and posting to license server automatically;
  - supporting transcoding/translating licenses (MPEG-21 REL, OMA ODLR).
- **Content Publication and Distribution**
  - supporting distribution towards multiple channels, for one or more: Internet, satellite, mobile, P2P distributions;
  - producing, monitoring and editing programmes and schedules;
  - controlling P2P network in download and publishing reducing the seeding time to zero;
  - connecting AXMEDIS Factories of content integrators, producers, and distributors.

AXMEDIS Content Processing: **a GRID solution** supported by tools:
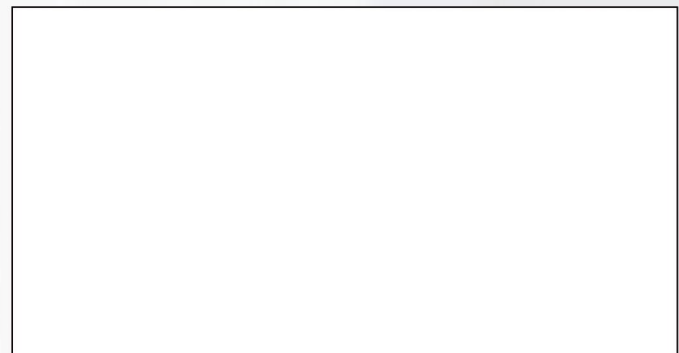
- **AXMEDIS Rule Editor**: to produce, debug, test and validate executable AXCP Rules that can be:
  - written with an Extended Java Script for **content production**;
  - tested, debugged and validated on the AXMEDIS Rule Editor;
  - activated for content processing on any AXCP GRID Node or on a single computer;
  - used/parameterized for producing content on demand or to be integrated in your content factory;
  - activated from your Workflow Manager engine via web service;
  - activated by changes in remote objects and queries in the local database and on the P2P network;
  - created to specify the internal behavior of AXMEDIS Cross media content.
- **AXCP quick start**: to make queries and activate AXCP rules with a mouse click;
- **AXCP GRID**: a set of general purpose, office, industrial or specialized computers to execute AXCP Rules governed by the AXCP Scheduler;
- **AXCP Nodes**: a single general purpose, office, industrial or specialized computers of the AXCP GRID;
- **AXCP Scheduler to manage AXCP rules of GRID nodes**:
  - Scheduling rules according to the content production and processing needs in terms of time and resources. Allocating tasks on the basis of Deadline Monotonic solution and optimizing with taboo Search Solution;
  - Activating rules as sporadic and/or periodic tasks, controlled by other tools and/or web services;
  - Monitoring progress of production processes and their status, etc.
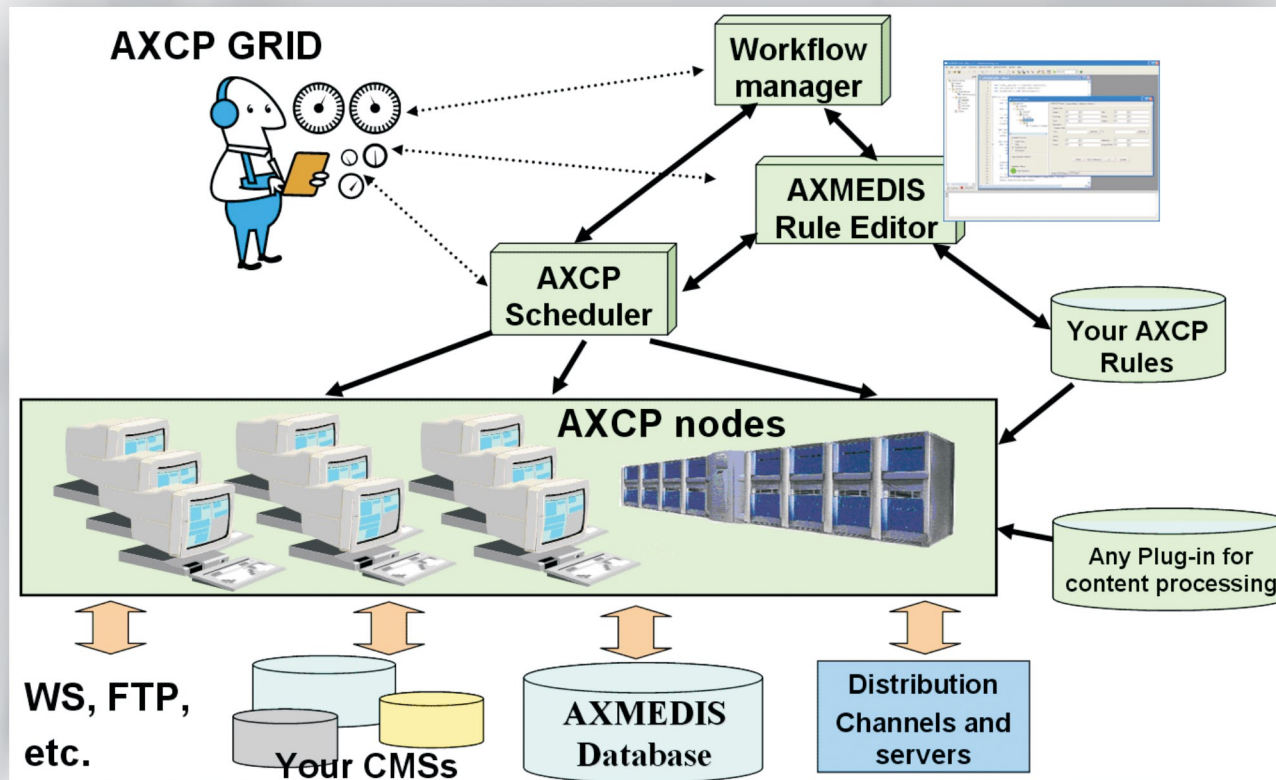
The processing capabilities and functionalities are accessible from AXCP Tools and Rules and can be simply **expanded/customized** by means of realizing and/or installing a set of additional plug-ins.
The AXMEDIS Plug-in technology is open.

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AXMEDIS DRM and Protection

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Protection Processor

- Register and certify AXMEDIS tools such as editors, players, engines, etc., with the AXMEDIS Certifier and Supervisor.
- Detects attacks and defends security
- Protects elements of AXMEDIS objects
- Protection Tools can be customised and delivered as AXMEDIS Plug-ins

To allow accessing at the digital content functionalities in a controlled manner

- Who is **Authenticated** and **certified**
- To do what is defined in a **license**
- Using technologies to **protect content**
- **Verifying/Control/Supervise** activities

License and Protection Information

- Needed to exploit rights acquired
- Authorization provides information to exploit the specific rights of object segment and/or digital resources
- Information and Protection Information located in remote Servers or cached

Content Owner

Metadata

Automatic Production of licenses

License models

Metadata

License A

License B

License C

Add, update, include and define: rights, tems, territory,

That allows opening the resource accordingly to license conditions

License B

Protection Information

Reference to paper contracts - open negotiation possible

Metadata

Protected Digital Content

AXMEDIS Object

Metadata

References to external Objects

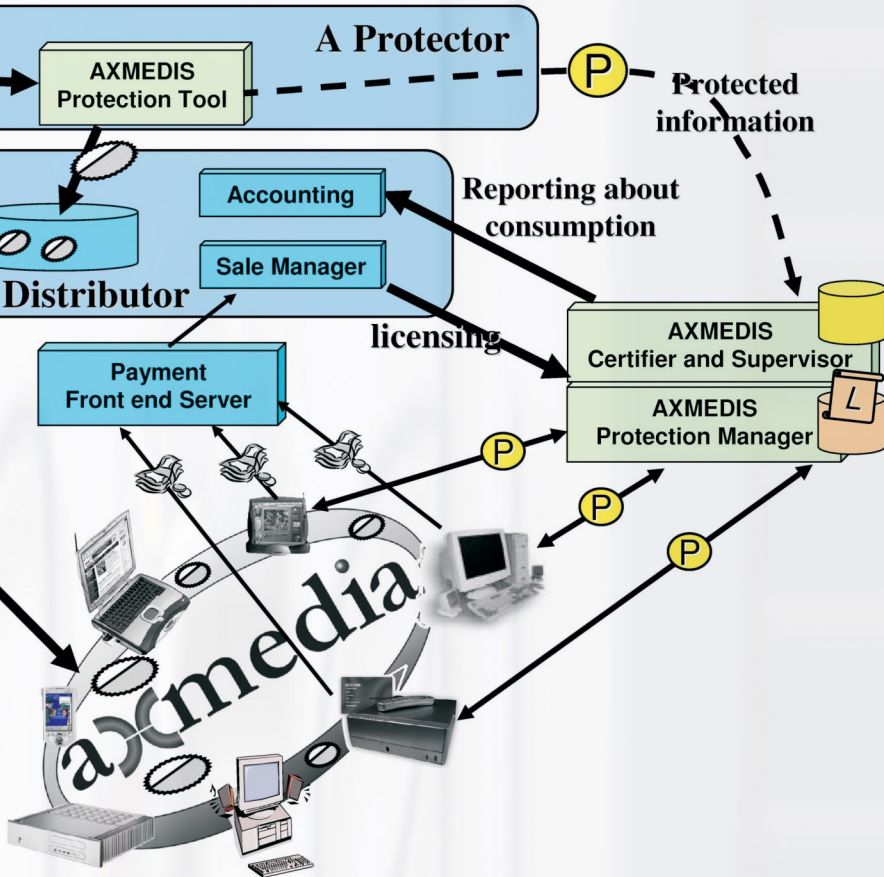**Nesting levels of Objects**

License

- Formalised in MPEG-21 REL, support for Rights Data Dictionary and OMA
- A digital version of the contract
- A list of acquired rights
- Can be stored in digital objects
- May refer to other licenses creating chains
- May be revoked
- OMA MPEG-21 conversions

AXMEDIS Control and Supervision

- Performed by the Certifier and Supervisor and the Protection Manager
- **Continuously verifying** and **certifying** tools, device, terminals and users
- Collecting **Action Logs** (event reports) related to rights exploitation
- **Black lists** for Users, Tools, Devices/Terminals, Licenses

AXMEDIS DRM support

- Track users' action allowing on-line and off-line operations
- Certifier and Supervisor checking on-line user actions, tool certification and verification
- Licenses processing
- License verification

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a✗medis

Automating Production of Cross Media Content for Multi-channel Distribution

www.AXMEDIS.org

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AXMEDIS B2B and AXEPTOOL

European Commission

Information Society
Technologies

6

AXMEDIS allows setting up and management of P2P network for content and tools distribution and sharing. They can be used for creating communities among different actors B2B and/or B2C and/or Consumers.

AXMEDIS solutions can be used to set up legal P2P services for content distribution towards and among their users, thus reducing direct costs for distribution and infrastructuring.
**AXMEDIS P2P tool** can be used for distributing and sharing **AXMEDIS** content and any other content format.
AXMEDIS content can be easily published in the network of peers and content may be shared among network peers with the supervision and control of **AXMEDIS** protection and monitoring tools.
Final users may share their content by using the same P2P network or a separate one.

AXMEDIS P2P network:
- Based on **BitTorrent technology** for high performance in downloading/sharing
- Allow creation of legal P2P network in which content can be limited to DRMed content
- Reduction of costs for content distribution, promotion and publication
- Control of the P2P network for fast, automated, programmable and reliable
  - Publication of content
  - Downloading of content
  - Monitoring of the network status
  - Monitoring publication/download processes
- Integration with **AXMEDIS** content factory and processing, workflow, etc.
- Management of the content catalogue
- Advertising on the P2P clients
- Search support on the content based on **Dublin Core** plus other metadata
- Three kind of P2P clients nodes that can be mixed in the network:
  - **AXEPTool** for B2B for PC
  - **AXMEDIA** for consumers, for PC
  - **MAXMEDIA** for mobile
- Providing statistics
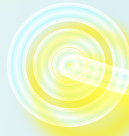- Providing detailed reporting
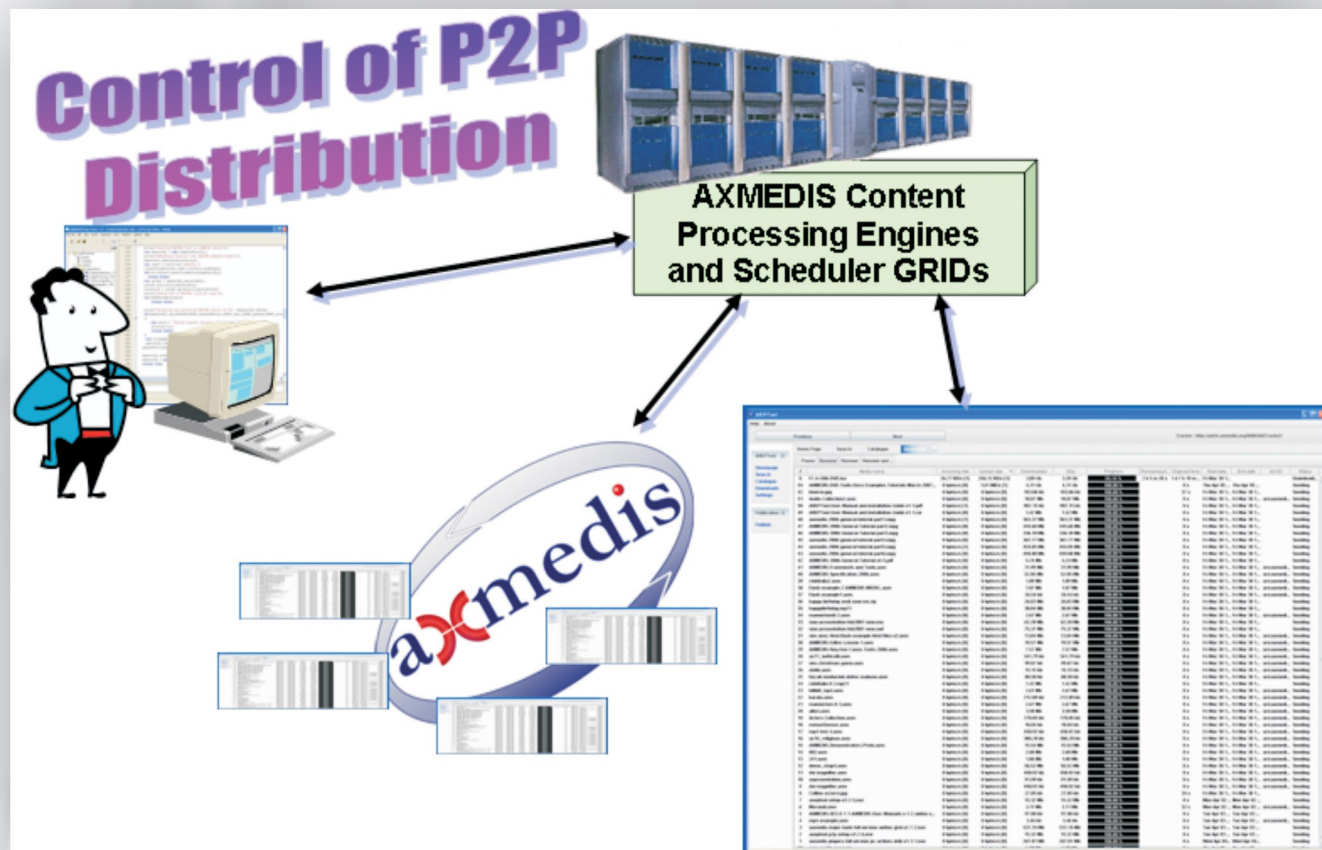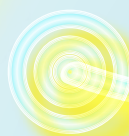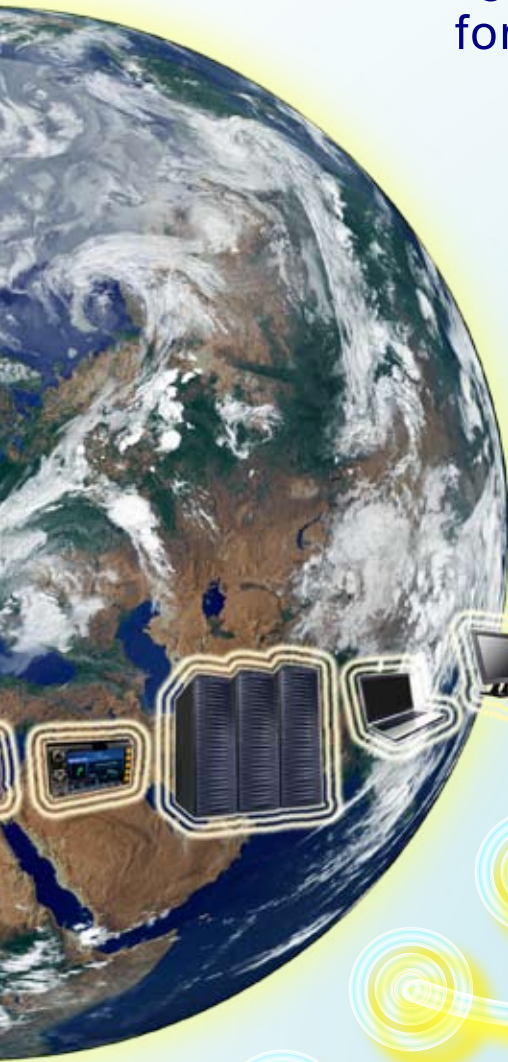
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Automating Production of Cross Media Content for Multi-channel Distribution

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AXMEDIS Framework

The AXMEDIS Framework is an open solution which builds on technologies and tools to:

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).
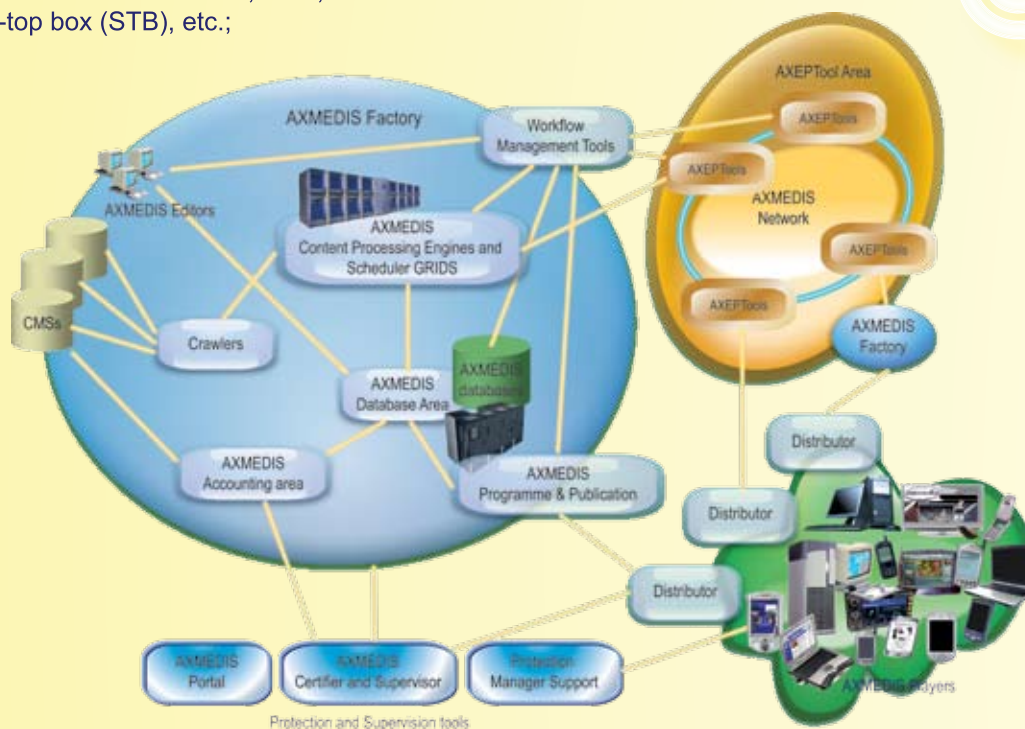
harmonise B2B and B2C areas for DRM, bringing the DRM model in the B2B area, supporting production and protection models in the whole value chain;

increase content accessibility via the AXMEDIS P2P platform at B2B level, which can integrate content management systems and workflows.

AXMEDIS 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,
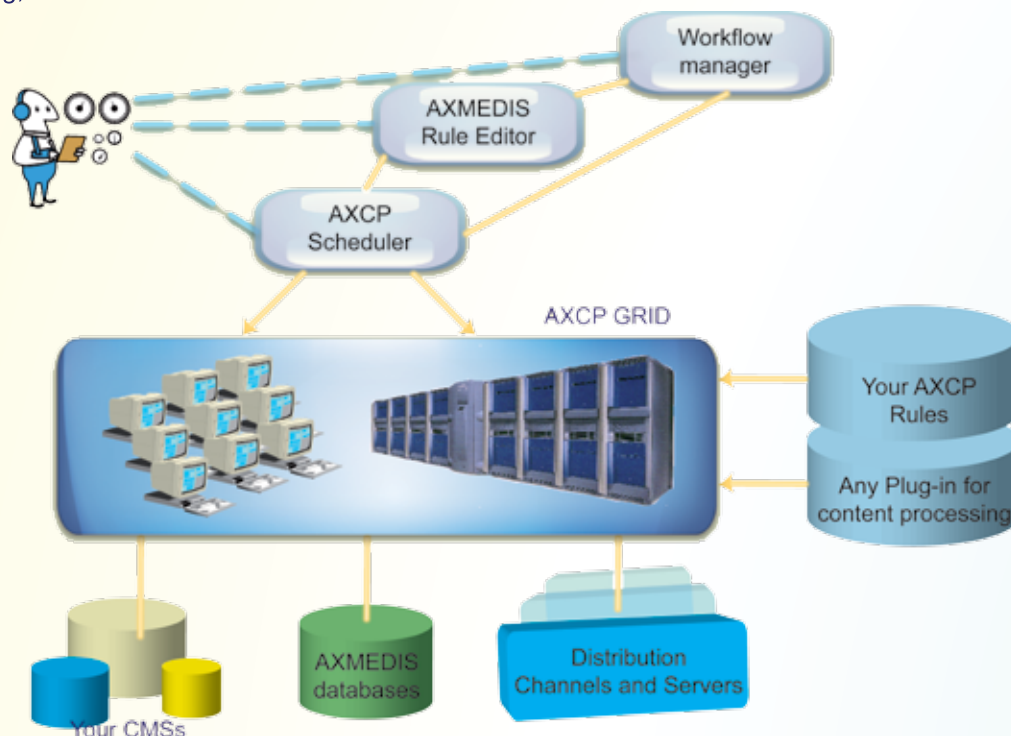

AXMEDIS Architecture

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 Components

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;

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 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.

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;

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;
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

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;
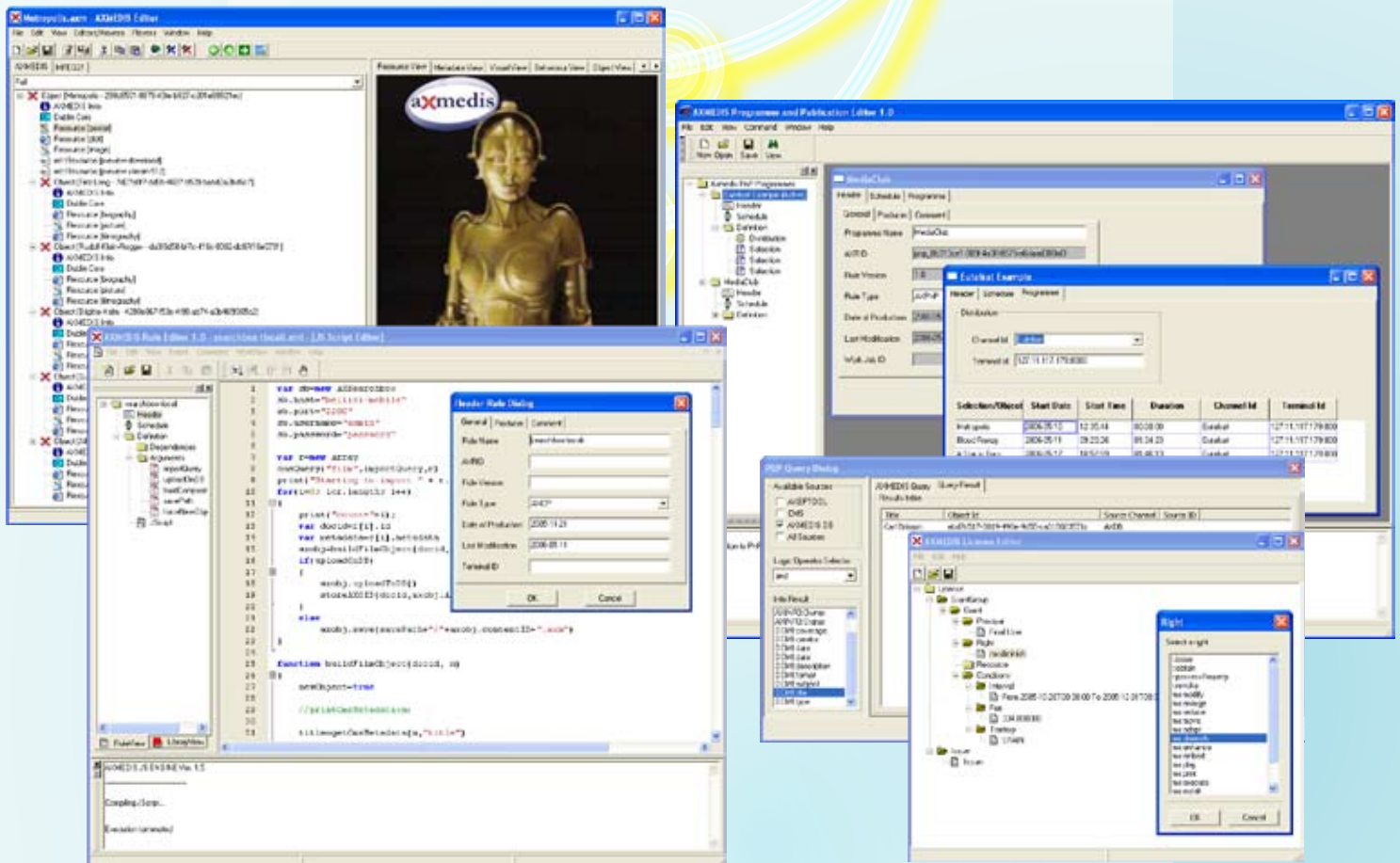
supporting transcoding/translating licenses (MPEG-21 REL, ODRL);

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 and accesible from AXMEDIS portal. Its 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 specification and the source code for creating new plug-ins are public and accessible without the need to be affiliated. Any tool can be integrated into the AXMEDIS Content Processing GRID with this technology.
  - AXMEDIS partners are open to your needs that may be useful to improve the capabilities of the AXMEDIS framework.

To take advantage of the AXMEDIS framework and technologies, you are invited to apply for the AXMEDIS Affiliation.

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.

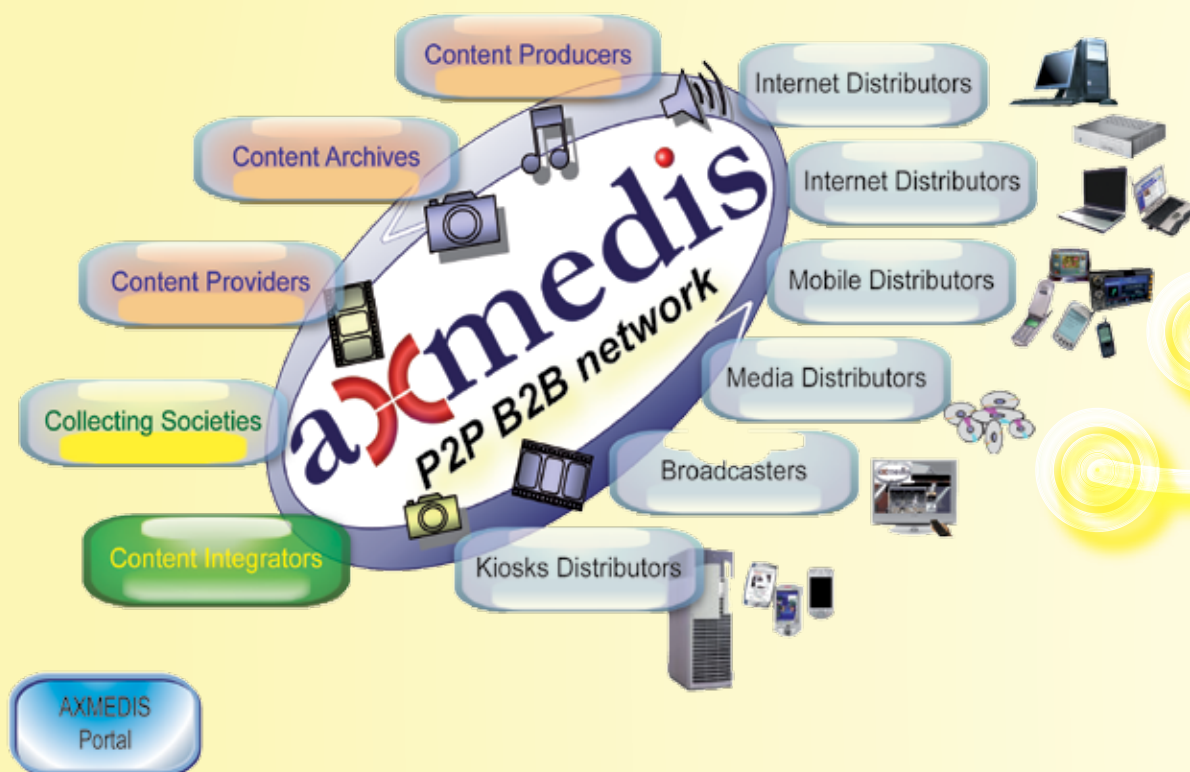With the AXMEDIS Affiliation, Research institutions can:
  - access the AXMEDIS Framework to build different solutions and applications to cover the needs of the value chain actors and tested with low effort;
  - improve visibility, promote and produce algorithms and tools that can be used for content 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.

AXMEDIS B2B Distribution and Sharing

For latest information, developments, events and announcements, please visit the AXMEDIS web portal at **http://www.axmedis.org**.
If you have any queries or comments, please email **axmedisinfo@axmedis.org**.

AXMEDIS Partners include: Department of Systems and Informatics, University of Florence, Italy; Associazione dei Fonografici Italiani, Italy; Accademia Nazionale di Santa Cecilia Fondazione, Italy; Ecole Polytechnique Federale de Lousanne, Switzerland; EUTELSAT S.A., France; Fraunhofer Institute for Computer Graphics, Germany; GIUNTI Interactive Labs S.r.l., Italy; Hewlett Packard Italy S.r.l., Italy; Fundacio Barcelona Media Universitat Pompeu Fabra, Spain; XIM Ltd., UK; Centre for Advanced Studies, Research and Development in Sardinia, Italy; Advance Concepts for interactive technology GmbH, Germany; Sejer, Bordas and Nathan, France; University of Leeds Interdisciplinary Centre for Scientific Research in Music, UK; University of Reading Informatics Research Centre, UK; Strategica S.r.l., Italy; EXITECH S.r.l., Italy; Dipartimento di Italianistica, Università degli studi di Firenze, Italy; TISCALI Services, Italy; Società Italiana degli Autori ed Editori, Italy. For the full list, please see the AXMEDIS portal.

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Image courtesy of NASA and the Visible Earth, http://visibleearth.nasa.gov
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