AXMEDIS Overview and Content Distribution

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- Short Market Analysis and Opportunities
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- AXMEDIS Application Scenarios
- Conclusions and references
AXMEDIS is a consortium/project of the European Commission proposed by companies and institutions to solve a set of problems in the area of e-commerce of digital content:

- approved by the EC for reaching specific objectives, among them the creation of an Open Platform for the digital content production, protection and distribution.
- partially funded by the EC and partially from the Companies and Institutions involved.

- Start: 1st September 2004
- Cost: about 14 Meuro, >8 Meuro of Funding
- About 200 people are working on AXMEDIS every day
- More than 35 partners (contractors and affiliated)
Growing and numbers

- **AXMEDIS started in Sept 2004 with fewer partners**
  - GIUNTI, TISCALI, EUTELSAT, HP, AFI, SEJER, etc.
  - Univ. Florence, Univ. Leeds, FHG, Univ. Politecnica Catalunya, Univ. Reading, etc.
- **Added 10 more partners in the December 2006:**
  - BBC, TEO, ELION, TI, SDAE
  - MBI, VRS, KTU, ETRI, PKU
- **Added Affiliated partners:**
  - SIAE, PENTEX, GESFOR, MAAT-G, FIA, RIGEL, HEXAGLOBE, Focuseek, AI2, TELSEY
- **Now**
  - >700 AXMEDIS technical documents/tools have been downloaded
  - >1.2 Millions of accesses

Objectives

- **exploiting new models, methods and tools for content production, protection and distribution**
  - Content more
    - interactive: .....cross media, multimedia
    - interoperable: .....device, DRM, formats
- **reduction of costs for content production, management and distribution considering activities of B2B and B2C**
- **Supporting massive processing for content production and distribution (on demand)**
- **Harmonize B2B and B2C**
  - Enforcing flexibility in business and transaction models
  - Integration of B2B and B2C areas
  - Modeling secure/legal P2P content sharing for both B2B and B2C
- **Create the AXMEDIS Framework for all**
Applications and Customers

- **Applicative areas of AXMEDIS automation**
  - Entertainment, edutainment, infotainment, educational, etc.
    - Real-time and non-real-time content production, distribution and sharing
    - Internet, P2P, broadcast, IPTV, mobiles, DVB-T, DVB-S, DVB-H, etc.
  - And also:
    - banking, governmental, military and healthcare

- **AXMEDIS Customers**
  - content management, production, protection and distribution
    - Broadcasters, satellite, terrestrial, etc.
    - Telecom operators, multichannel operators
    - Content producers, editors, publishers
    - Collecting societies
    - Multimedia and cross media archives and WEB Portals
    - Etc.

Technical Applications

- General content management and processing
- Multi-channel production and distribution: broadcasting, IP/Internet, WEB sites, P2P, mobile, PDA, IPTV, interactive TV and channels, etc.
- Multi-channel experience for customers
- Video on Demand (VOD), and production on demand solutions
- Control of P2P content sharing and distribution, involving your customers in distribution (super-distribution)
- Involve customers and final users in content production and social networking
- interoperable DRM (MPEG-21, OMA, etc.)
- different business models and/or transactions on the same distribution channels: pay per play, monthly rate, preview, renting, advertising, etc.
Automating Content/Metadata Life-Cycle

- Satellite
- Internet
- P2P sharing
- Terrestrial
- Mobile
- 
- languages
- GRID solutions
- P2P sharing
- processing
- workflow
- flexibility
- plug-ins
- tools
- databases
- standards
- webservices
- optimisation

Pre-production
- Production
- Post-production
- Distribution
- Consumption

Customizations
- languages
- P2P sharing
- processing
- workflow
- flexibility
- plug-ins
- tools
- databases
- standards
- webservices
- optimisation

GRID solutions
- P2P sharing
- processing
- workflow
- flexibility
- plug-ins
- tools
- databases
- standards
- webservices
- optimisation

P2P sharing
- flexibility
- plug-ins
- tool
- databases
- standards
- webservices
- optimisation

Content Providers
- Collecting Societies
- AXMEDIS Portal

Internet Distributor
- VOD

Mobile Distributor

Media Distributor

Broadcasters

i-TVs

STB

Collecting Societies
- AXMEDIS Portal

Content Integrators
- Content Producers

Content Integrators
- Collecting Societies

Content Providers

AXMEDIS Portal
Technical Objectives

- Enhance the interactivity and content forms
  - cross media and simple resources
- Enabling interoperability among different
  - distribution channels (TV, PDA, mobile, kiosks, broadcasting,...)
  - DRM (digital rights management) models (e.g., MPEG-21, OMA, Windows DRM, etc.),
    - make possible translations among license formats
- Harmonize B2B and B2C
  - Enforce flexibility in business and transaction models
  - Facilitate the passage from Contract to Digital Licenses and viceversa
  - Insertion of DRM domain management for Business and final users
- Enabling the production and processing
  - at low costs and in a scalable manner with GRID technology
- Enabling secure/legal P2P content sharing for both
  - B2B and B2C
- Reuse and improve standards, remaining open and expansible
  - Adoption and extension of MPEG-21 and OMA
AXMEDIS Framework

- A unified European platform for content production and distribution, AXFW
  - Improve standards
  - Development of the AXFW
  - Make the AXFW open, expansible and accessible to all
  - Open the Affiliation Programm to access at the AXFW
  - Set up of trials and demonstrators

AXMEDIS Framework for all

- Partners
  - Content Distributors
  - Content Providers
  - Content Integrator, editors
  - IT Companies
  - Telecom Operators
  - Broadcasters
  - Collecting societies
  - Associations
  - Research institutions
  - Cultural Institutions
  - Etc.

AXMEDIS Based solutions

trials, and channels
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Trend of Paid On Line Content

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
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<tbody>
<tr>
<td>Publishing</td>
<td>268</td>
<td>326</td>
<td>370</td>
<td>403</td>
</tr>
<tr>
<td>Video</td>
<td>88</td>
<td>133</td>
<td>186</td>
<td>244</td>
</tr>
<tr>
<td>Games</td>
<td>368</td>
<td>485</td>
<td>610</td>
<td>762</td>
</tr>
<tr>
<td>Music</td>
<td>269</td>
<td>452</td>
<td>652</td>
<td>836</td>
</tr>
<tr>
<td>Other</td>
<td>448</td>
<td>487</td>
<td>518</td>
<td>540</td>
</tr>
<tr>
<td>Total content</td>
<td>1,441</td>
<td>1,883</td>
<td>2,336</td>
<td>2,765</td>
</tr>
</tbody>
</table>

Source: JupiterResearch - European Paid Content and Services Forecast
The Long Tail, 80/20 → 60/40

ANATOMY OF THE LONG TAIL

Online services carry far more inventory than traditional retailers. Rhapsody, for example, offers 10 times as many songs as Wal-Mart’s stock of 20,000 items. The appetite for Rhapsody’s more obscure types of material is so vast thatumatizes the so-called Long Tail. Meanwhile, even as consumers flock to mainstream books, music and films right, there is real demand for niche fare found only online.
Needs and the cure

- Lower costs for
  - production (packaging, protection, management, advertising, etc.), distribution and advertising
  - contract management, licensing, accounting, reporting, etc.
  - P2P distribution

- Automation is THE cure/solution to
  - reduce the costs
  - make the long tail access possible and convenient for all

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Contingency

- **Trend of the market for digital content:**
  - Audio and Video distribution growing
  - Issues regarding the market loss for piracy (60-80%)
  - Issues regarding the P2P as primary source of piracy
  - High costs of content production and distribution
  - Long tail of content (the low of 80/20, 60/40)
  - High business risks

- **High demands on**
  - Content interactivity
  - Interoperability of content and devices
  - Tools for cultural valorization of content

- **Issues on DRM**
  - Legal and technical capabilities
  - Lack of interoperability, openness
  - Flexibility in the business and transaction models

- **Massive processing in content production and distribution, and in license processing and event tracking**

- **These are a real challenge for many industries that are discovering the complexity of managing large digital content factories and distribution chains.**

User’s Trends

- **Users are gradually abandoning the traditional TV**
- **We can see that they**
  - Spend more time on PC/games console
  - Spend more money and time on i-TV
    - Cultural/educational, infotainment programs
    - Thematic information
  - Are more attracted by new content models and usages
  - Are more attracted by new devices
  - Are interested in personal content publishing and sharing
    - YouTube, Video Google, etc.,
  - Are interested in Personal TV, personal realities,
  - Are interested in interactive and interoperable content
  - Are interested in home media centers and content management,
  - Etc,
Convergence, the Interoperable Content

- Internet Distributor
- Mobile Distributor
- Media Distributor
- Broadcasters, DVB-H
- Broadcasters, DVB-T
- Broadcasters, DVB-S
- Kiosks distribution

The Media Usage at home

Source: EITO2005
Not enough interactivity and interoperability

Cross Media Content examples are:
- Interactive training material
- Documents with hyperlinks
- Interactive content in which the user may navigate

DVDs, WEB pages, eBooks, etc.
- Mainly audio visual or textual
- Allow the inclusions of Simple Games (only DVD)
- Mainly for physical distribution (e.g., DVD)
- eBooks and WEB pages are only digital distribution
- Low or absent interoperability among devices and distribution channels

AXMEDIS Innovations
- More interactivity and interoperability among devices/players
  - Content moving among devices and players
  - The same content on different devices
  - Different media inside
- Flexibility in creating content packages
- ...

Traditional value chain Issues, state of the art

The protection is performed just before distribution
- By the distributor or
- By a specialized third party company as a service

The B2B areas are (production, integration, etc.):
- Considered trusted
- Based on paper contracts
- Contracts are produced on the basis of a limited and not standard terminology, so that they are not easy interpreted and transported on other media, or channels, etc.

Producers and integrators have no control about what is done on the content in the last phase of distribution:
- Authors and producers cannot verify, they may ask
- Integrators cannot verify, they may ask at the business partners
- Etc.

The distributors:
- Control the selling of content, mainly with conditional access systems
- Do not control/verify the exploitation of each single rights
Aim of Digital Rights Management

- To prevent the non-authorized rights exploitation by who has not acquired the rights
- To allow accessing at the digital content functionalities in a controlled manner
  - To who has been authenticated/certified
  - To do what (are the rights) is defined in a License
  - Verifying/Control/Supervise if the above conditions and others are respected
  - By using technologies to protect content (e.g., encryption, fingerprint, watermark, etc.)
- To Verifying/Control if the allowed rights are respected

There are some Cons, since the user is constrained:

- Registration of users
- Authentication of users and/or tools/terminal/devices
- Control of users

It has to be supported by a set of additional technical solutions

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Market solutions viz AXMEDIS

<table>
<thead>
<tr>
<th>Business Models</th>
<th>Larger number of Business Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proprietary / Standard DRM and model</td>
<td>Standard DRM: MPEG-21, OMA, etc.</td>
</tr>
<tr>
<td>Non interoperable DRM</td>
<td>Allowed Interoperable DRM: MPEG-21, OMA, etc.</td>
</tr>
<tr>
<td>Fixed/Flexible Protection Model</td>
<td>Any Protection Model, key, algorithms, etc.</td>
</tr>
<tr>
<td>Separation among Content and license</td>
<td>Separation among Content and license</td>
</tr>
<tr>
<td>Signed Content Header</td>
<td>Signed Content AXINFO, any Metadata</td>
</tr>
<tr>
<td>Channel distribution</td>
<td>Multichannel with the same license</td>
</tr>
<tr>
<td>Players and Devices</td>
<td>Players and Devices: PC MS-Windows, PDA Windows Mobile, STB, Linux OS, Apple MAC, Mobiles</td>
</tr>
<tr>
<td>License Proprietary: number of rights</td>
<td>Licenses MPEG-21 REL: Expandable dictionary, Any type of rights, Licenses OMA</td>
</tr>
<tr>
<td>Authentication of Player</td>
<td>Authentication of device, user, domain, etc.</td>
</tr>
<tr>
<td>Revocation per Player</td>
<td>Revocation per device, user, etc.</td>
</tr>
<tr>
<td>Revocation per license</td>
<td>Revocation per license</td>
</tr>
<tr>
<td>digital resources that can be included and protected</td>
<td>Any digital format, of any type</td>
</tr>
<tr>
<td>Media content</td>
<td>Single audio, video, image, doc, and Cross media: SMIL, HTML, SVG, MPEG-4,…</td>
</tr>
<tr>
<td>Customizable Tools</td>
<td>Customizable Tools: servers and player clients</td>
</tr>
</tbody>
</table>
B2B Rights Management

- Advantages of B2B DRM
  - Automation of contract-based deals
  - Assessing the Usage in the B2B
  - Reducing costs of B2B promotion
  - Allowing integration and composition of protected content
  - Allowing content production on demand, no contracts signatures, immediate DRM processing
  - Try and buy, try and use for business
  - Free try for Business users
  - Increasing the control, decreasing the risk

- P2P distribution
  - sharing of content
  - lower costs to access content
  - Lower costs to promote/distribute content
  - Increment of accessible content

Summary of Major Challenges

- Reduction of production, protection and distribution costs
- Content production/protection on demand
- Automating the B2B area, DRM and distribution
  - Production, protection and distribution phases
  - Expanding DRM to B2B
  - Reducing costs of B2B distribution
- Real Time content Processing
  - Reducing production and distribution costs
  - Flexible Content Distribution
  - Content production, protection, distribution on demand
  - Adaptation and transcoding
  - Accelerating B2B processing
- Increasing security: rights usage and control on
  - Harmonization of B2B and B2C
  - Increasing security and interoperability
  - Increasing control of rights exploitation
  - Allowing the set up of a large number of business models

- Any other question/issue ??
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  - Content Models vs DRM models
  - Content Model and hierarchy
- AXMEDIS Content Protection and Tracking
- AXMEDIS Content Production and Processing
- AXMEDIS Application Scenarios
- Conclusions and references

### AXMEDIS Content Elements

- Content Packaging for protection and distribution
  - Streaming (so called real-time) and/or downloading
  - Sharing on P2P, etc.
  - portable on physical supports, etc. (scalable)
  - binary and/or XML, etc.

- Real Cross Media
  - Multimedia hierarchies of digital resources such as models based on:
    - HTML, SMIL, SCORM/IMS, WEDELMUSIC, MPEG-4, etc.
    - With internal and external links and relationships: for example one HTML page may be build by using several images and audio files.
  - Integration of docs, audio, video, images, via spatial rendering and synchronization, providing interactivity

- The Content Package in the hands of the final user to be used may need of the following information
  - Metadata
  - Digital Resources
  - Protection Information
  - License
AXMEDIS Metadata

- Metadata:
  - Identification of information,
    - unique ID (AXOID), UUID,
    - distributor ID, UUID,
    - other codes such as: ISRC, ISBN, etc.
    - Producer ID and Information, etc.
  - Author Information, etc.
  - Classification information also for indexing:
    - Dublin core, etc.
  - PAR: Potentially Available Rights
  - Descriptors: for indexing, MPEG-7, technical and conceptual, etc.
  - References to Owner, to Distributor, etc.
  - Fingerprint
  - Historical and versioning aspects
  - Etc.

- Some of them are grouped in AXMEDIS format in the so called AXMEDIS Information, AXINFO

- One Metadata set for each resource or group, ITEM

AXMEDIS Content Elements

- Digital Resources:
  - Any digital information: images, docs, txt, video, game, application, xml files, audio, animation, etc.
  - Hierarchy of digital resources, nesting levels
  - Internal and external links: e.g., HTML navigation, SMIL references, MPEG-4 paths..

- Protection Information:
  - What has to be done to access (unprotect) a given information/resource
  - Protection Tools used, their parameters, etc.

- License:
  - Which rights are provided, who is the recipient, what are the conditions, etc.
### Packaging and Protection, AXMEDIS model

![Diagram showing Packaging and Protection, AXMEDIS model]

### The Cross Media Content Model

- Based on MPEG21 Digital Items, but not limited to
- Overcoming limitations in content modeling and DRM:
  - Cross media:
    - any kind of metadata and any kind IDs
    - presentation and glue (e.g., HTML, SMIL), plus
    - digital resource images, documents, video, audio, games, MPEG-4, etc.
  - Content components: composition and reuse;
  - DRM interoperability: MPEG-21 and OMA
  - DRM Chain of licenses: B2B and B2C integration;
  - Integration of semantics and behavior into the content.
- DRM, Digital Rights Management
  - Modeling licenses for the B2B-B2C areas
  - Algorithms and tools for processing licenses, chains and relationships
- Supporting legal/secure P2P for B2B and B2C/C2C
- Supporting B2B-B2C content production and transactions,
  - for protected and non protected objects
AXMEDIS Object Model

- **AxObject**
  - **AxOID**
  - **AxMetadata**
  - **AxContent**
- **AxInfo**
- **AxDublinCore**
- **AxResource**
- **AxReferred Object**

- MPEG21 Digital Item
- Resource embedding
- Hierarchical composition
- External content referencing

**Mandatory**

**Special B2B metadata**

**Unique identification**

**Content description**

**Resource embedding**

**Hierarchical composition**

**External content referencing**

AXMEDIS Editor: some examples
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  - Protection Technologies
  - License Models and Processing
  - Rights Monitoring, Tracking and Reporting
- AXMEDIS Content Production and Processing
- AXMEDIS Application Scenarios
- Conclusions and references

AXMEDIS Digital Rights Management

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

  - To who has been registered the first time and continuously: **authenticated and certified**
  
  - To do what is defined in a **license** (to allow exploiting the rights)
  
  - By using technologies to **protect content** (e.g., encryption, fingerprint, watermark, etc.)
  
  - **Verifying/Control/Supervise** if the above conditions and others are respected
Managing License and Protection Information

- Once obtained the content a license is needed to exploit the right you have acquired,
  - or at least you need a server that verify that you are authorized to exploit some right and provide you the Authorization
- Once you are Authorized to exploit the rights you may get a reference to
  - the Protection Information to Unprotect the specific object segment and/or digital resources
- License and Protection Information are typically located in external and remotely located Servers
  - but may be cached on the terminal device if allowed by the license issuer
- During all these phases the AXMEDIS Certifier and Supervisor verify integrity and certificate

AXMEDIS DRM Aspects

- Formal definition of Licenses as MPEG-21 REL
  - Facilitate the passage from Contract to Digital Licenses and viceversa
- Support and make easier the B2B market of digital content, and cross media content
  - Content composition and DRM management
  - Tracking and monitoring the exploitation of rights
  - Reduction of costs for B2B trading of content
  - Enforce flexibility in business and transaction models
  - Harmonize and automating B2B and B2C
  - Management of domains
- Enable interoperability among different
  - distribution channels and devices with their DRM
    - TV, PDA, mobile, kiosks, broadcasting...
  - DRMs models: MPEG-21 and OMA, other can be added
- Enabling
  - Content production on the consumer side
  - secure/legal P2P content sharing for both B2B and B2C
An example of REL statement

- Rosy can Play 3 times the Ocean Wilds in November 2003.

Managing License Chain, B2B and B2C

- Alice states: “Bob has the right to issue a license to anyone to print the book in Italy”
- Bob states: “Carl has the right to print the book in Italy”
- To solve the SubSubLicense for Carl all the connected Licenses are needed
- Licenses have to be accessible on Processing Engine
- Alice can revoke the license to Bob
Cross media content and composition

- AXMEDIS objects can be used as components for creating other added values AXMEDIS objects
  - Allowing the production added value object for composition or integration of protected content
    - Who is composing can add its own protection and licensing
  - Allowing the Rights Management Of Composition, in the digital world similarly at what is performed in the physical world
  - The shares along the value chain are de facto formalized

Make easier the B2B market of digital content

PAR: Potentially Available Rights into AXMEDIS objects
The PAR can be used to make queries
- PARs based content trading, Customers may know directly which rights they could buy and by who
- PARs may be used to harmonize and automate B2B and B2C

Audio tracks of Bocelli for Audio broadcasting for June 2008 in Gemany?
Managing License Chain and Protection Information

- Protection Manager
- Content Provider
- Content Integrator
- Content Distributor
- License Server, DRM Processor
- Action log database

Steps:
1. Store Key
2. Produce License
3. Use
4. Integrate
5. Distribute
6. Use
7. License Server, DRM Processor
8. Action log database

Integrated Digital Protected Content

Digital Protected Content

Protected Content

Licensed Content

License Server, DRM Processor

Right Auth.

Digital Protected

Use

License

Auth.

Integrate

Distribute

Key

Store

Protected

Content

Metadata

Resource

Protected

Digital

Content

Use

Produce

License

Auths to integrate

Auths to distribute

protected

subLicenses

contract

produce

use

use

use

integrate

integrate

distributed

right auth.

License Server, License Server,
AXMEDIS The Protection and Control Process

A Distributor

A Protector

New Protected Object: Post ProtInfo (WS)

do license (WS)

AXMEDIS Protection Tool

AXMEDIS Protection Manager

AXMEDIS Certifier and Supervisor

AXMEDIS Compliant Players

AXMEDIS License Production

A Distributor

Requesting license Production (WS):

--Distributor ID
--Object ID
--User ID
--Rights

Need of Massive Production: one License X each user X each resource
DRM and Domain Management

- Users are strongly interested in acquiring a content to be used in their domain in which they have their
  - Home devices, cars, mobiles, etc.
- Media Centers and/or Home Servers are going to manage content and licenses for the whole domain
  - One license for all devices and people

Tracking and monitoring Exploitation of Rights

- Different reports and statistics for different roles
  - Reports on licensing and on the consumption/exploitation of rights
- REL and Composition enforce flexibility in business and transaction models, multiple models for the same channel
  - Pay per play, all you can eat, subscription, etc. etc.
**Event reporting**

- Single traces, events, etc.
- Statistical data for reporting and analysis

*Distribution of exploited objects Playing in March*

**List of Events/Actions on rights Exploitation**

- Collecting Events and Actions
  - Further reporting
  - Further verification of consistency
  - provide the evidence about the exploitation of rights to: content owners, producers, collecting societies, distributors, etc.
  - provide the billing information to the final user
  - provide the statistical information

- Counting the usage, exploitation of rights
  - how many times a music piece has been played, how many print out have been produced, etc.
  - Dynamic definition of price for example…

- Extending MPEG-21 Event Reporting
  - Specifies how to express ER-Request and Event Report and how they are represented as digital item
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  - AXMEDIS players
  - Automated AXMEDIS Content Processing and Production
  - Multichannel Back-Office Management
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Major Tools

- Players for cross media content:
  - PC, PDA, STB, mobiles, etc.
- Tools for DRM and protection
- Content Production tools
  - Authoring tools for cross media content: AXMEDIS Editor
  - Automated production tools for content, protection packages and licenses: AXCP, Workflow
  - CMS: search and retrieval, automated connection with your own and/or third parties CMSs
- Content Distribution
  - P2P tools for B2B and C2C in a controlled and safe/legal manner: AXEPTool, AXMEDIA
  - User and tool Registration portals
  - Certification authority, AXCA
  - License Server and Certifier and Verificator, PMS/AXCS
  - Scheduling: Program and publication, Workflow, etc.
  - Distribution Portal
  - Content acquisition portal for end user production
AXMEDIS Architecture

AXMEDIS Cross Media Content

Any content inside a package:
- Video, Audio, Documents, Images, games, animations, WEB pages, tools, etc.
- compliant and extend MPEG-21

AXMEDIS content that can
- create content for other devices, etc.
- satisfy social activity, user annotations, user content production, etc.
- be digitally streamed on TV (DVB-T/DVB-S/DVB-H with the same level of interactivity
- be protected with the needed flexibility
- be distributed on different terminals/devices and via different channels.
- be customized for culture and language
AXMEDIS Authoring Editor

- The AXMEDIS Editor is an application allowing
  - manual production of AXMEDIS objects
  - inspection of automatically produced objects
  - finishing AXMEDIS objects pre-produced automatically

- It integrates many Editors & Viewers to handle all the aspects of the AXMEDIS Objects production
  - Resource
  - OBJ Composition
  - Metadata
  - DRM/Licenses
  - Protection
  - Presentation
  - Behavior
  - Etc.

AXMEDIS Tools

- AXMEDIS/MPEG-21 Model plus a set of players
  - Audio and video players: almost any format
  - Document viewers: PDF, HTML, etc.
  - Image viewers: any format.
  - Cross media: MPEG-4, SMIL player, HTML, etc...
  - Etc.

- AXMEDIS Metadata support
  - AXInfo, Dublin Core, etc.
  - Any descriptors, etc.

- Possible integration AXMEDIS AXOM core module in any player
  - The access to the AXMEDIS Framework allows you to create in short time your customized AXMEDIS compatible player in many platforms based on AXOM:
    - Windows
    - Linux
    - PDA, Windows Mobile 5
    - Etc.
Interoperability among devices

The user likes interoperability among devices, e.g., getting

- a video for the TV and reproducing it on mobiles, PC, etc.
- an MP3 audio track and using as ringtone in the phone, reproducing it on the car stereo, or in the living room, passing to a friend.
- a guide in a museum for his mobile, using there, and passing and playing it at home on the TV set
- Etc……

AXMEDIS interoperability satisfies these demands among a large set of devices:

- PC, STB/PVR/HDR, PDA, Mobiles, etc.
- You can buy once to use on all

Interoperable Players

- PC players with full functionalities
  - Stand Alone Player for Windows
  - Version with Replaceable skins
  - Active X Player for Windows, for:
    - Integrating player in Html pages
    - Microsoft Internet Explorer Browser
    - Macromedia tools Authorware
    - Realising customised AXMEDIS Players based on .NET
  - Plug in for Mozilla Internet Browser
  - Integrating player in Html pages
  - Two different skins
- PDA player:
  - MPEG-4, SMIL, HTML
- STB player:
  - for IPTV
  - for DVB-S
  - MPEG-2, MPEG-4
- Mobile player:
  - A pure Java player will be ready for Feb 2008
  - SMIL support with Audio Visual, MMAPI of Java
AXMEDIS slides, http://www.axmedis.org

**AXMEDIS:** videos, SMIL

AXMEDIS Player for STB, PVR, Decoders, etc.

STB with AXMEDIS technology
Table of Content

- What is AXMEDIS
- Short Market Analysis and Opportunities
- State of the Art, Limitations, Needs
- AXMEDIS Content Packaging
- AXMEDIS Content Protection and Tracking
- AXMEDIS Content Production and Processing
  - AXMEDIS Editors, Authoring
  - AXMEDIS players
  - Automated AXMEDIS Content Processing and Production
  - Multichannel Back-Office Management
- AXMEDIS Application Scenarios
- Conclusions and references
AXMEDIS allows you to reduce costs and increase efficiency of your content management.

- Automating back office content production/protection and distribution
  - Open and secure architecture for content production, processing, protection and enrichment, based on a scalable GRID model
  - Maximum flexibility with
    - AXMEDIS content processing GRID Language
    - Uses plugins for content adaptation/transcoding for multi-channel production, fingerprinting, processing profiles, etc.

- AXCP GRID solution allows automated management of:
  - content, metadata and licensing information, etc.,
- AXCP tools can be integrated and controlled by your applications and/or workflow management systems.
AXMEDIS Content Processing GRID

AXMEDIS Content Processing GRID language and tools for

- Automated Content Ingestion and Gathering
- Automated Content Query and Retrieval
- Automated Content Load and Storage: databases and files
- Automated Content and Metadata Processing, enrichment
- Automated Content and Data processing
- Automated Content Filtering and Repurposing
- Automated Content Composition, Formatting
- Automated Content Protection and Licensing
- Automated Content Publication/Download on/from:
  - Any channel including P2P Network
- Automated Content Distribution
- Automated Profiles management and processing
- Automated Production of Content on Demand
In AXCP Scripts you can manipulate, produce, adapt, extract, manage and process:
- Any type of resource in any format
  - AXMEDIS/MPEG-21 Objects, IMS, SCORM, OMA objects, and features
  - Digital resources in any format
  - Production of new objects: composition, etc.
  - Formatting, automatically producing/selecting: SMIL, XSLT, etc.
  - Digital resource adaptation, transcoding, …
  - Extraction of descriptors and fingerprints
  - Synchronization of media, etc.
  - Metadata processing, adaptation, and mapping
  - Production and posting of licenses/PAR in OMA and MPEG-21
  - Verification of Licenses against them and PAR
  - Protection Information, OMA and MPEG-21 IPMP
  - Profiling for devices and network capabilities,
  - Reasoning on device capabilities and user preferences
  - User Profile and preferences
  - Etc.

Open to any other module with plug-in technology:
- Burning
- Etc.

Addressed value chains
Table of Content

- What is AXMEDIS
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- AXMEDIS Content Production and Processing
- AXMEDIS Application Scenarios
  - Application Scenarios
  - Content Sharing and/or Distribution
  - AXMEDIS Trials and Demonstrators
- Conclusions and references

Applicative Areas

- Multi-channel production and distribution: broadcasting, IP/Internet, WEB sites, P2P, mobile, PDA, IPTV, interactive TV and channels, etc.
- Multi-channel experience for customers
- Video on Demand (VOD), and production on demand solutions
- Control of P2P content sharing and distribution, involving your customers in distribution (super-distribution)
- Involve customers and final users in content production and social networking
- interoperable DRM (MPEG-21, OMA, etc.)
- different business models and/or transactions on the same distribution channels: pay per play, monthly rate, preview, renting, advertising, etc.
- interactivity with cross media models
- advertising (customized and/or real time personalized advertising)
- Production and distribution of content with unprotected preview and the rest protected
- Etc.
Applications and scenarios

- In most of the cases there is:
  - Usage of the AXMEDIS Editors and Players
  - Massive usage of the AXCP GRID for managing back office issues, defining specific scripts for:
    - Automated content production and adaptation (MPEG-21, OMA, etc.)
    - Automated creation of licenses (MPEG-21, OMA, etc.)
    - Automated regeneration of new versions of the objects
    - Automated object acquisition and posting on DataBases
  - Support of the AXMEDIS PMS and AXCS for the DRM aspects
  - Support of the CAMART and All for collecting reporting data
  - Usage of the AXMEDIS Editors and Players
  - Front ends for selling and distributing of the Distributors involved so that to maintain their plate and relationships with their customers

- In some cases there is the usage of:
  - The P2P tools, for B2B and B2C
  - Some specific tools for content posting on the databases
  - Some specific player tools for final users
  - Some specific tools for Home and Factory Domain Management
  - Workflow support

Enabling secure/legal P2P

- P2P network set up for content distribution
  - BitTorrent Technology with Query and Catalogue
  - Protected content, legal P2P set up
  - P2P Client Tools
  - Automated B2B content distribution/publication via P2P, fast seeding,
  - Automated and efficient control of P2P networks
  - CONSUMER content distribution and sharing

- Content Sharing among, producers, integrators, archives and libraries, etc.
AXMEDIS P2P Tools

- AXMEDIS P2P tools for content sharing respecting IPR
  - Content Distribution and P2P file sharing based on BitTorrent
  - DRM support, supervision and control
  - Certified metadata, etc.

- AXEPTool
  - Only for B2B
  - Technical queries and information:
    - Features, descriptors, duration, formats, license information, distribution model, etc.
  - Automated loading and publication via the AXCP tools
  - Control and certification of metadata

- AXMEDIA tool:
  - Only for C2C and B2C
  - Simple queries on simple user focussed metadata
  - Simple management of files on the file system
  - Control and certification of metadata
Content Sharing among Content Archives

Content Provider

P2P B2B network

Content Integrator

Archive A

Library C

Mediateque C

Archive B

Wireless LAN

Internet Distributor

Mobile Distributor

Archive Z

AXMEDIS Multichannel Distribution

- PCs via Internet+P2P, AXMEDIS P2P and PC player: TISCALI Media Club, DSI
- PCs via Internet, AXMEDIS PC player:
  - ELION, VRS
- PCs via Satellite data broadcast, AXMEDIS PC player:
  - EUTELSAT, UNIVLEEDS
- PDA via Kiosks, AXMEDIS PDA player:
  - ILABS + ANSC Kiosks, TISCALI, DSI
- STBs and PVRs:
  - AXMEDIS STB: IPTV, Internet VOD: TEO, VRS
  - AXMEDIS STB/PVRs via Satellite data broadcast: EUTELSAT, MBI
- Mobiles:
  - AXMEDIS mobile player: ILABS, TISCALI, DSI
  - OMA player: Telecom Italia (TI), DSI
- PCs via Internet+P2P, AXMEDIS P2P and PC player:
  - free air DVB-T + home domains/media center
  - BBC, SDAE, ETRI, UPC
AXMEDIS Multichannel Content Distribution

AXMEDIS distribution on VOD on PC with P2P

Cross media Content, from video, audio to complex content

Accounting and reporting

Sale and CRM service

issue license

AXMEDIS DRM
TISCALI Distribution with AXMEDIS Technology

- **B2C distribution**
- **AXMEDIS objects with**
  - Video and Audio Files, with MD, images and also MPEG-4
- **The AXMEDIS Objects may be**
  - Downloaded from the TISCALI media club or P2P AXMEDIA
  - shared among consumers with AXMEDIA Tool a P2P tool
  - Visualized and played on AXMEDIS players free accessible
- **The users**
  - have to perform the registration on TISCALI
  - by a license to use the content
  - may use any AXMEDIS player
  - Mainly on PCs and Media Centers. PVRs
- **License allows**
  - Content sharing on AXMEDIA
  - Content play
  - Content Adaptation…
  - Content Migration on other P2P channels…
  - Content Migration on any other AXMEDIS terminal
EUTELSAT Distribution with AXMEDIS Technology

AXMEDIS Service on ATLANTIC BIRD™ 1:
- 12.5° West, covering Europe and Americas
- Frequency: 11.428GHz
- Symbol rate: 30000KSym/s
- Polarization: Horizontal

http://www.eutelsat.com/satellites/125e.html

VIDEO on EUTELSAT distribution

The link to download the video is in the last page of these slides.
EUTELSAT Distribution with AXMEDIS technology

- B2B and B2C distribution
- AXMEDIS objects with
  - Any kind of content,…
  - Video, images, document, audio, animations, etc.
- The AXMEDIS Objects may be
  - Visualized and played on AXMEDIS players free downloaded
  - Received on Kiosks
  - Received and player on STB of MBI
- The users have to perform the registration of
  - themselves on an AXMEDIS portal or via the STB ID/PIN
  - any AXMEDIS player tool they would use
  - Mainly on PC for TV and/or STB and/or Kiosks
- License allows
  - Content play
  - Content Adaptation…
  - Content Migration on any other AXMEDIS terminal, in some cases

ILABS Distribution with AXMEDIS technology

- B2B and B2C distribution
- AXMEDIS objects with
  - Educational and cultural content,…
  - Video, images, document, audio, animations, etc.
- The AXMEDIS Objects may be
  - Produced on demand on the basis of phone profile, POD
  - Visualized and played on AXMEDIS players free downloaded
- The users have to perform the registration of
  - themselves on ILABS portal and/or an AXMEDIS portal
  - any AXMEDIS player tool they would use
  - Mainly on PC-Kiosks, PDA and/or mobiles
- License allows
  - Content play
  - Content Adaptation…
  - Content Migration on any other AXMEDIS terminal, in some cases
Mobile & kiosk scenario as 2 channels, POD

- AXMEDIS P2P Network
- Kiosk (n)
- Mobile Distribution
- GPRS, UMTS, EDGE, ...
- Content delivery to user
- Content delivery to distributor
- Content sharing via AXEPTool

ILABS Content Distribution to Kiosks and PDA

- AXMEDIS DRM
- Content Factory
- Kiosk (1)
- Mobile & Mobile & kiosk scenario scenario as 2 channels, POD
- ILABS Content Distribution to Kiosks and PDA
AXMEDIS distribution on IPTV, VOD on STB

- Cross media Content, from video, audio to complex content
- Audio and Video
- TEO Video on Demand Front End Server
- Sale and CRM service
- Issue license
- AXMEDIS DRM

VIDEO on TEO VOD channel

The link to download this video is on the last page of these slides
AXMEDIS distribution via Internet, VOD on PC

Distributor Front End Server

Payment Front end Server

Distributor

Accounting and reporting

do license

AXMEDIS DRM

Cross media Content, from video, audio to complex content

Elion

VIDEO on ELION VOD channel

Kõik sobitlik seks vajalik uhes kohas

Postimees.ee

http://www.axmedis.org
Content Production on the Consumer Side

- Cross media content, from video, audio to complex content
- P2P B2B network
- Added value content via ADSL
- Recording, added value Content Package on site production and domain management
- Free on air transmission
- TV free on air
- BBC Broadcasting DVB-T
- Grant authorization
- Accounting and reporting

VIDEO on BBC content production

- Cross media Content, from video, audio to complex content
- AXMEDIS DRM
- BBC London News
  - 10:30am, 10:30am
  - "The latest stories from the BBC London newsroom" [1]
  - 30 minutes

- Class TV: Primary Geography
  - [age 6-11] World Environmental Changes - Delta's Delta: programmes exploring the value in both human being, care and influence (environmental and social) [1]
  - 15 minutes

- Lily the Witch
  - 1:45pm and 5:15pm
  - "Lily is the witch. Lily and her friends decide to learn about harmonious living inside the real world" [20]
  - 15 minutes

- Animal Park
  - 2:00pm
  - "The adventures of Lunch, a playful monkey" [21]
  - 20 minutes

The link to download this video is in the last page of these slides.

www.axmedis.org
Interoperability among channels

Channels are the distribution methods for content:
- Streaming, e.g., DVB-T, S, H
- Downloading, WEB

Channels are grounded on different communication standards,
- MPEG, HTTP, RTSP, DVB, etc.
- Content and devices are strongly related to the supported input channel

AXMEDIS content is independent on the communication channel
- Content can be automatically produced for multiple channels at the same time
- Content received from one channel can be passed to a different one

Mobile distribution, OMA and MPEG-21

| Mobile | Distribution | Content | Selection | Rights | acquisiti | x
|---|---|---|---|---|---|
| distribution, OMA and | MPEG-21 | AXMEDIS License Server | OMA Content Issuer | Rights server | Content Acquisition & usage | Rights acquisiti x exploitation

Collection of Actions Logs Records
Telecom Italia, OMA & MPEG-21 distribution

AXMEDIS Automated PRODUCTION

AXMEDIS content processing, multichannel

AXP2P

AXMEDIS DRM Servers

AXP2P Servers

WEB Server

Playout Server

Web+Strm Server

AXCP Node

AXCP Scheduler

AXCP Grid

AXCP Node

AXCP Editors

Monitoring & Reporting

databases

FTP, WS, etc.

Internet, WEB, IPTV, DVD...

Broadcast

TV, VOD...

Mobiles, PDA, etc.

AXMEDIS Quick Start,
Your tools commands,
Workflow systems...

AXMEDIS content processing, multichannel
USERs production and distribution

- Content production tools for final users, SIAE trial
- Set up a service for final users’, producers
  - content acquisition and collection from the final user would,
    - Definition of the DRM rules from the final users
  - automated content production, protection and adaptation
  - automated license creation
  - License production on demand, different models
  - Content distribution via distribution portal with/without DRM
  - Automated counting of consumed rights

Fase 1: file upload with COPOP client

The link to download this video is in the last page of these slides
Content Enrichment with final users

- Content Enrichment with AXMEDIS
- e-ContentPlus
- www.variazioni.org
- **Content**
  - enrichment, several forms
  - produced and reproduced on demand at each enhancement
  - production with DRM
  - distribution from VARIAZIONI portal and from AXMEDIS P2P
- > than 10 partners + communities
  - Partners from Spain, Lithuania, Belgium, Portugal, Italy, Finland, Portugal

Content Enrichment and social network

- **audiovisual**
  - Master classes of famous magisters (Harmos)
  - Concerts
  - Conferences
  - Special Events…
- **audio**
  - Concerts
  - Lessons
  - Rehearsals of concerts
  - Popular Songs…
- **historic documents**
  - Programs of concerts
  - Letters
  - Scores
  - Images
  - Articles
  - Pedagogical Material
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- Preface
- What is AXMEDIS
- Market Analysis and Opportunities
- State of the Art, Limitations, Needs
- AXMEDIS Content Protection and Tracking
- AXMEDIS Content Production and Packaging
- Examples of AXMEDIS Applications
- Conclusions and references

AXMEDIS Technical Architecture

- User Interaction and/or Automated Control via WSs
- AXMEDIS Model Supports and Plug-ins
  - AXMEDIS (CP) Content Processing
    - Script Editor and Debug
    - AXCP GRID Scheduler
  - AXMEDIS Authoring Tools
    - Metadata
    - Resources
    - X & Multimedia
    - Styles
    - DRM Licenses
    - Protection information
  - AXMEDIS manual and automated content sharing and distribution tools
    - AXETool B2B P2P
    - AXMEDIA B2C P2P
    - Programme and Pull
  - AXMEDIS administrative tools
    - AXMEDIS MPEG-21 Wonder, Blade & Bridge
    - AXMEDIS Authoring Tools
    - AXMEDIS DRM
    - Reporting Tools
  - AXMEDIS MPEG-21
    - Traditional and P2P
      - Distribution Channels and servers

Including support for XML, XSLT, WSIDL, OS, etc.
Mapping Main AXTools on Life-Cycle

AXEditor
AXEPTool P2P
AX-DRM
AXPGRID
AXCOPOP
AX-Players

Distribution
Terrestrial
Mobile
Internet
P2P sharing
Satellite

Post-production
Pre-Production
Consumption

GRID solutions
P2P sharing
processing
workflow
flexibility
plug-ins
tools

databases
standards
webservices
optimisation

AXMEDIS Framework for all

AXMEDIS Framework

Content Distributors
Content Providers
Content Integrator, editors
IT Companies
Telecom Operators
Broadcasters
Collecting societies
Associations
Research institutions
Cultural Institutions
Etc.

AXMEDIS Based solutions

Partners

trials, and channels
Can be a very important solution to

- support the distribution of Cross media content
  - More interactivity and capabilities for the consumers
  - Interoperability among devices/content for the consumers
  - Interoperability among DRM for the consumers and along the value chain
- make easier the B2B market of digital content, and of cross media content
  - Composition and DRM management
  - Tracking and monitoring the exploitation of rights
  - Simpler B2B Content Trading, costs reduction
  - High flexibility in business and transaction models
- make easier for SMEs to access/survive in the digital content market
  - Proposed and getting content
  - Set up distribution and other business solutions for content

AUTOMATING the BACKOFFICE

- Lower costs of and enabling
  - content gathering, transcoding/monitoring platform, production of content on demand with AXCP
  - integrate cross media content and automatically managing rights for complex multimedia products
  - production, B2B distribution, promotion via P2P B2B
- New forms of content and unexploited content:
  - Making business with cross media content, integrating HTML, SMIL, document, video, etc., no possible up to now
  - Exploiting the content “long tail”
- Interoperability, convergence of media
  - interoperability of content and DRM, Multi-channel distribution
  - access to the same content on several platforms, devices and locations
  - greater level of security, control of content usage in all channels B2B2C
- DRM, creation new business models
  - different business models on the same channel may be used
  - adapting the distribution channel to the users needs and would
  - Access to detailed reporting on the exploited rights
- Distribute content with
  - Any B2C: Internet, STB, broadcasting, Mobile, kiosks, pda, etc.
  - P2P to Consumers with the support of DRM
A **unique framework for all**

- Cross Media Content and tools
- Backoffice Automation
- Standards
- Open platforms
- Interoperability on content
- Interoperability on devices/players
- Interoperability on DRM

**The added value to your business!**

**Affiliation to the AXMEDIS**

- The benefits of the affiliation include the possibility of using the AXMEDIS technology and tools (customize them from source code), for your business without limitations.
- You can become affiliated with AXMEDIS. The affiliation provides access to:
  - a large amount of information and knowledge
  - full source code AXMEDIS Framework TOOLS
  - AXMEDIS tools ready to be used
  - Technical reports and documentation
  - Mailing and discussion lists, wiki portal
  - Training reports and tutorials, videos, slides and docs
  - Access to the AXMEDIS workshops and training
- The affiliation can be performed via the affiliation agreement
  - information can be recovered from the DVD and on the portal
- The affiliation has a small annual fee that:
  - can be covered in money or by value, offering contributions to the AXMEDIS Framework for the community.
  - Is free of charge for no profit institutions
Technical Notes

- Please stay tuned other technical notes are coming on:
  - Satellite distribution, EUTELSAT OPENSKY show case
  - Content recording and production at home, BBC show case
  - Content production and distribution for PDA, ILABS show case
  - Content distribution from server and via P2P, TISCALI show case
  - ...........
  - .....

Contact Information

- If you like to know more about the AXMEDIS framework and other AXMEDIS technologies and functionalities please do not hesitate to contact the project coordinator

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  Web: http://www.AXMEDIS.org
AXMEDIS Overview on Content Production

David Fuschi, Paolo Nesi, Pierfrancesco Bellini, Ivan Bruno, Lorenzo Sutton

http://www.axmedis.org/
version 1.6
February 2008, User Group Meeting

Table of Content

- Introduction on content production in AXMEDIS
- AXMEDIS Model, AXOM
- AXMEDIS Editor / Database query
- AXMEDIS Automated Content Processing
  - Crawling, accessing CMS ....
  - Adapting, transcoding, processing....
  - Protecting, licensing, DRM, ....
- Massive execution on GRID
- AXMEDIS Publishing Tools
  - Distribution via Servers and/or P2P
The process

Automating Content/Metadata Life-Cycle
**AXMEDIS Architecture**

- **AXMEDIS Factory**
  - AXMEDIS Editors
  - AXMEDIS Content Processing Engines and Scheduler GRIDs
- **Content Ingestion**
  - Crawlers
  - CMSs
- **Content Storage**
  - AXMEDIS database Area
  - AXMEDIS Accounting area
- **Protection and Supervising tools**
  - AXMEDIS Certifier and Supervisor
  - Protection Manager Support

**Mapping Main AXTools on Life-Cycle**

- **Production**
  - AXEditor
  - AXCP GRID
- **Pre-production**
  - AXEditor
  - AXCP GRID
- **Content Processing**
  - AXEditor
  - AXEPTool P2P
- **Post-production**
  - AXEditor
  - AX-DRM
  - AXCP GRID

**Distribution**

- Satellite
- Internet
- P2P sharing
- Terrestrial
- Mobile

**Consumption**

- Optimisation
- Web services
- Standards
- Tools
- Flexibility
- P2P sharing
- Processing
- Workflow
- Languages
- Customisations

**Support**

- B2C
- B2B
Please download AXMEDIS Tools

- AXMEDIS PC player:
- AXMEDIS PC player with SKIN
- AXMEDIS PC player, Active X and .Net
- AXMEDIS PC player for EUTELSAT OPENSKY:
- AXMEDIS Editor:
  - AXMEDIS content production tools (includes the above AXMEDIS Editor):
- PDA player:
- PDA content:
- P2P Client tool AXEPTool:

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  - Protecting, licensing, DRM, ....
- Massive execution on GRID
- AXMEDIS Publishing Tools
  - Distribution via Servers and/or P2P
AXMEDIS Model

- **AXMEDIS Objects**
  - MPEG21 Digital Item with a specific structure
  - Can be protected
  - Has several kinds of metadata
  - Any metadata and descriptor can be included
  - Any ID can be included: AXOID, ISBN, ISRC, ISAN…
  - Can embed or refer resources and other AXMEDIS objects

- **AXMEDIS Objects Kinds**
  - Basic – with resources and the related metadata
  - Composite – containing / referencing other Basic or Composite AXMEDIS Objects

AXMEDIS Singularities

- **Structure**
  - Hierarchical with one level for resources
  - Hierarchical with more levels for embedded AXMEDIS objects

- **Protection**
  - AXMEDIS Objects can be protected
  - DRM with MPEG-21 REL

- **Metadata**
  - AXMEDIS Objects have metadata not their components
  - AXMEDIS Objects metadata are always accessible
AXMEDIS Object Model

- **AxObject**
- **AxOID**
- **AxMetadata**
- **AxContent**
- **AxInfo**
- **AxDublinCore**
- **AxResource**
- **AxReferred Object**

**MPEG21**

- Digital Item
- unique identification
- mandatory
- resource embedding
- hierarchical composition
- external content referencing
- content description
- special B2B metadata

AXMEDIS hierarchical objects

- **MD**
- Protected Digital Content
- Nesting levels of Objects
- References to external Objects
- Ref to Protected Digital Content
Metadata - AxInfo

- The AxInfo contains B2B and AXMEDIS specific metadata
  - ObjectCreators (ID, Name, Company, Nationality, etc.)
  - Owner (ID, Company etc.)
  - Distributor (ID, Name, Company, etc.)
  - Object version & revision
  - ObjectStatus, ObjectType
  - IsPromoOf (AXOIDs)
  - History of object production
  - Workflow information
  - Fingerprints algorithms used
  - Internal Potential Available Rights (the rights owned)
  - Potential Available Rights (the rights on sell)
  - Metadata certification and status

Metadata – Dublin Core

- Dublin Core Metadata are a standard set of metadata usable for multimedia cataloguing
- 15 basic elements
  - title, creator, contributor, description, coverage, format, date, identifier, language, publisher, rights, source, subject, type, relation
- Other elements and derived elements
  - abstract, audience, available, conformsTo, dateAccepted, …
- Any other descriptor can be included

- See Technical note on AXMEDIS Object model
The Cross Media Content Model

- simple files:
  - audio, video, images, documents, animations, games, etc.;
  - any combinations of cross media with presentation formalized in HTML, SMIL, MPEG-4, Flash, XML, etc.;
  - hypermedia with internal and external links;
  - menus, collections, lists, etc.

- reference to external files and/or other AXMEDIS objects as URIs and links;

- content with a large variety of information associated to single resources and/or content collections.
  - any metadata, classification information, Dublin Core, etc.;
  - any descriptors such as fingerprint, technical information, MPEG-7, XML, etc.;
  - any identifications: AXOID, UUID, ISBN, ISMN, ISRC, ISAN, etc.

- collections as lists or hierarchically organized files, collections/packages, AXMEDIS objects (nesting levels)
  - on which users may navigate, make queries on the basis of metadata of single components or files;
  - with HTML and/or SMIL as presentation layers to provide interactivity to users, etc.;
  - with files and internal nested packages protected in different manners with different algorithms, or selectively non-protected;

- AXMethods JavaScript to add narrative capabilities and semantics, and in general to make more intelligent and interactive the content package behavior.
An example to wrap it all up

Music Album
- AxInfo
  - Rights Owner
  - Producer
  - Distributor
- DublinCore
  - Title
  - Genre
  - Authors
- Other Descriptions (e.g. MPEG7)

Backstage Video
- Rights Owner
- Producer
- Distributor
- Subtitles Languages
- Playing time
- Resolution
- Resource MPEG2 Video

Metadata will be always accessible for indexing and querying

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  - Crawling, accessing CMS....
  - Adapting, transcoding, processing....
  - Protecting, licensing, DRM, ....
- Massive execution on GRID
- AXMEDIS Publishing Tools
  - Distribution via Servers and/or P2P
The AXMEDIS Editor is an application allowing:
- Manual production of AXMEDIS objects
- Inspection/change of automatically produced objects
- Finishing AXMEDIS objects pre-produced automatically
- Protection of AXMEDIS objects
- Storing AXMEDIS objects into the AXMEDIS database
- Query and load AXMEDIS objects from the database

**AXMEDIS Editor**

- **Metadata editor, Metadata mapper:** AXINFO, DC ++
- **Resource player/viewer:** Images, video, audio, doc, HTML, SMIL, MPEG-4
- **Visual editor:** SMIL, synchronization, presentation
- **Behavior editor,** AXmethods: Business logic, extended JavaScript, ....a huge range of functionalities
- **DRM Editor:** license editor, production of licenses
- **Protection editor:** how to protect the object, DES, AES, etc..
- **Workflow:** content production status, flags, etc.
- **In the short future:** Scenarios Editor to design
Example on the Editor usage, in the room

- Creation of an object via drag and drop resources into the AXMEDIS Editor
  - single resources can be played immediately
  - SMIL/HTML may have internal references to call
    - resources, other SMIL/HTML files, external hyperlinks
    - activation of AXMETHODS
  - FLASH may have internal references to activate AXMETHODS
- AXmethods may
  - put in execution/play resources, presentations
  - communicate with files and channels
  - get information from database
  - create other objects and/or internal resources
  - enrich/analyze/query the AXMEDIS object itself
  - etc..
Example on the Editor usage, in the room

- Usage of a produced objects:
  - SMIL objects with videos on secrete camera
  - SMIL object with video of XIM

- Production of
  - objects with HTML and SMIL
  - objects with nested AXMEDIS objects

- Show of the usage of the:
  - Query support to access at the AXMEDIS database
  - Metadata editor
  - Resources player
  - Visual editor: SMIL
  - Protection information editor
  - Behavioral editor for AXMethods
  - etc.

Some Snapshots from the examples shown
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AXMEDIS Content Processing GRID

AXCP GRID

Workflow manager

AXMEDIS Rule Editor

Quick Starter

AXCP Scheduler

AXCP nodes

Any Plug-in for content processing

Your CMSs

AXMEDIS Database

Distribution Channels and servers

WS, FTP, etc.
Content Processing Applications

- AXMEDIS allows you to reduce costs and increase efficiency of your content management.
- Automating back office content production/protection and distribution
  - Open and secure architecture for content production, processing, protection and enrichment, based on a scalable GRID model
  - Maximum flexibility with
    - AXMEDIS content processing GRID Language
    - Uses plugins for content adaptation/transcoding for multi-channel production, fingerprinting, processing profiles, etc.
- AXCP GRID solution allows automated management of:
  - content, metadata and licensing information, etc.,
- AXCP tools can be integrated and controlled by your applications and/or workflow management systems.

AXMEDIS CP GRID tools

- AXCP Rules can be:
  - activated for content processing on any AXCP Node as well as on a single computer
  - used/parameterized to produce content on demand or to be integrated in your content factory
  - activated from your Workflow Management System or from any other application
  - activated by changes in remote objects and queries in the local database and on the P2P network.
- AXCP Nodes allow to be controlled by an AXCP Scheduler. The stand alone version of the AXCP Node can be used for executing AXCP Rules for ad-hoc processing and activation without demanding their allocation and scheduling to the AXCP Scheduler.
AXMEDIS CP GRID tools

- AXCP Scheduler to allocate and manage AXCP Rules on Nodes:
  - scheduling and balancing jobs/processes on AXCP Nodes
  - activating jobs as sporadic and periodic tasks
  - monitoring progress of production processes and their status, etc.
- AXCP Rule Editor allows you to produce, debug, test and validate AXCP Rules to execute them on AXCP Nodes
- AXCP Quick Start allows you to activate Rules in simple manner by passing them parameters;

Content and metadata accesses

- CMSs and databases
  - ORACLE, XML databases, Tamino, eXact, Lobster®, MySQL, MSSQL, HP DMP, ODBC, etc.
- Operating systems files
  - MS Windows
- Protocols
  - SQL, Web Services, FTP, HTTP, WebDAV, SMB, Gopher, NNTP
- Formats
  - MXF, NewsML, IMS SCORM, MPEG-21, etc.
- Focuseek crawling tool
  - file system DB2, Oracle, MySQL, ODBC, IMAP4, POP3, WebDAV, RSS, etc.
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AXCP functionalities 1/2

- Firing and control activities for AXCP rules
- Content and metadata access, ingestion and gathering, management and retrieval, mapping, metadata models and processing
- Content Processing for audio videos, document, images, and any files
  - Text/Document processing, adaptation and transcoding
  - Audio / Video / Image Processing, adaptation and transcoding
  - Digital File Fingerprint and recognition
  - Extraction of Descriptors ...
- Content Composition Presentation and Interactive models
- Multimedia and cross media adaptation/processing
- General Information Processing
AXCP functionalities 2/2

- Communication Capabilities
- Workflow management Production Process
- Content Packages, Media Containers and DRM
- Content Formatting
- Profiling and their management
- Content Adaptation Process
- Content Protection and DRM, Licensing and DRM
- Content Publication and Distribution
- Distribution and control of P2P network

For each item in the AXCP technical note there is a list for supported formats and protocols:


Extraction of descriptors from content

- Each file characterized by a numerical model describing its content according to different dimensions of perception
- Models can be used to compute similarity between files

Application:
- classification
- recommendation
- Playlist generation
- Clustering of collections
Examples shown in live during the meeting

- **Automated**
  - production of interactive content (SMIL and HTML based) with several resources, audio, video, images, docs, MPEG-4, etc.
  - production/adaptation for PC and PDA
  - load/save of AXMEDIS objects from/to AXMEDIS database
  - protection of content
  - production of licenses according to business models

- **Tools used**
  - AXMEDIS Editor for producing AXMEDIS objects and revising them
  - AXMEDIS players for PC, PDA for showing them
  - AXCP Editor for producing the AXCP Rules
  - AXCP Scheduler and nodes for executing scripts
  - AXDRM for protecting content and DRM

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Key Issue: dynamic and real time

- Devices and content delivery formats are not static
  - Emerging devices and formats
  - Dynamic market in terms of possibilities and content types and formats
- Required: Flexible Software Tools
  - Support of numerous content types and formats
  - Support of different devices
- On-demand distribution:
  - Production on the basis of requests and profiling (user device, network, etc.), etc.
  - Request depending adaptation and processing
Key Issue: dynamic and real time

- Multi-channel distribution
  - Differing receiving devices
  - Differing distribution modalities
  - Multiple interoperable DRMs, license chain processing

- Content monitoring
  - Broadcast channels and networks,
  - Peer-To-Peer networks, Websites, etc.

Content Processing

Channels and Players

AXCP Scheduler
AXCP Node
AXCP Node
AXCP Node
AXCP Node
AXCP Grid
AXCP Monitoring
AXCP Editors
AXCP Rules
AXCP plug-ins
WEB Server
Playout Server
Web+Strm Server
FTP, WS, etc.
databases
DB
CMS
P2P
FTP, WS, etc.
CMS
P2P
FTP, WS, etc.
AXMEDIS slides, http://www.axmedis.org

**AXCP for profiling and Production On Demand**

- AXMEDIS Rule Editor
- User and Device profile
- AXMEDIS Scheduler
- Distributor front end server
- AXCP GRID
- Personalized Content on Demand
- Content: Search, Selection, Acquisition, Production, Adaptation, Transcoding, Formatting, Packaging, Protection, Publication and Licensing on Demand

**Examples shown in live during the meeting**

- **Automated**
  - Activation of AXCP Rules on an instance of the AXCP GRID
  - Production, adaptation, protection of content
  - Publication on distribution servers and on AXMEDIS P2P according to business models
  - Licensing and DRM

- **Tools**
  - AXCP for executing Rules
  - AXCP Quick Starter for immediate and simple activation of AXCP rules
  - AXP2P for publication of AXMEDIS objects. You can access to them by joining the P2P network
  - AXDRM for protecting content and DRM

- See the last slide to get the links at the tools to be downloaded.

- You can test some of the AXMEDIS show cases from: [http://www.axmedis.org/com](http://www.axmedis.org/com)
Some Snapshots from the examples shown

Snapshots of the GRID at work
Mapping Main AXTools on Life-Cycle

Contact Information

- If you like to know more about the AXMEDIS framework and other AXMEDIS technologies and functionalities please do not hesitate to contact the project coordinator

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