AXMEDIS Tutorial
Overview and General Solutions

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  - Etc.

Affiliation to the AXMEDIS

- You can be affiliated with AXMEDIS. The affiliation provides access to a large amount of information and knowledge, and source code related to the AXMEDIS Framework.
- If you are interested in the affiliation please contact P. Nesi at nesi@dsi.unifi.it. The benefits of the affiliation include the possibility of using the AXMEDIS specification and technology for your business.
- You are invited to:
  - contribute to the improvement of AXMEDIS documents and specification by sending the contribution to P. Nesi at nesi@dsi.unifi.it
  - attend AXMEDIS meetings that are open to public, for additional information see www.axmedis.org or contact P. Nesi at nesi@dsi.unifi.it
# Preface

Currently, market of digital-content is growing very fast and it needs solutions for accessing new markets and defining/trial new business solutions.

- **Major needs:**
  - Convergence of the media, interoperationability of content
  - Flexibility in the business and transaction models
  - DRM applications and introduction in several distribution channels
  - Harmonization of B2B and B2C areas for DRM
  - Massive processing in content production and distribution, and in license processing and event tracking
  - Etc.

- These are a real challenge for many industries that are discovering the complexity of managing large digital content factories and distribution chains.
- Content producers, providers, aggregators and distributors need to adopt innovative means to cope with the above needs

# Purpose of this Tutorial

- This training course is the first of a series and provides you an overview of the AXMEDIS technologies, solutions and architecture.
- It gives you answers to the following question:
  - What is AXMEDIS?
  - Which is the State of the Art?
  - Needs and Limitations of AXMEDIS?
  - What can I do with AXMEDIS?
  - Why I should use AXMEDIS?
  - Which are the innovations/advantages of AXMEDIS?
  - Which is the State of the Art of the sector?
- If you are not satisfied please ask to the tutor to have more!!

# WHAT is AXMEDIS

- Preface
- What is AXMEDIS
- Market Analysis and Opportunities
- General State of the Art
- Needs and Limitations
- AXMEDIS Content Packaging
- AXMEDIS Content Protection and Tracking
- AXMEDIS Content Production and Processing
- Examples of AXMEDIS Applications
- Conclusions and references

# Conclusion

- Further information and downloads available at www.axmedis.org
- Thank you for your attention.
AXMEDIS Training slides, http://www.axmedis.org

**What is AXMEDIS?**
- A project of the European Commission, proposed by a set of companies to solve a set of problems in the area of e-commerce of digital content
  - approved by the EC for reaching a fixed set of objectives
  - partially funded by the EC and partially from the Companies involved
- The major aim is:
  - to create the AXMEDIS Platform on the basis of new technologies and
  - to make accessible this platform for SME, research centers, and any other partner interested in
- The affiliation is possible, and allow you to access at the knowledge and tools/source code produced
- Started the 1st September 2004
- Value of about 14 Meuro
- About 120 people are working on AXMEDIS every day

**Main general Objectives**
- reducing distribution and aggregation costs for content production and management by
  - applying innovative techniques to content production, processing (GRID), representation (format) and workflow;
  - Produce and distribute cross media content in protected manner, integrating B2B and B2C sides, the IPR respect
  - Allowing the content distribution and collaborative production at B2B level, via P2P in the respect of IPR
- Increase accessibility to the European audio visual content for its exploitation for entertainment, valorisation, etc.
- Create a unified European platform for content distribution in terms of DRM and interoperability

**AXMEDIS purpose**
- Content:
  - Producers
  - Providers
  - Aggregators
  - Packager
  - Integrators
  - Promoters
  - Distributors
- Tools and Solutions
  - Models and technologies
  - Secure digital content
- Content authoring, processing, protection, distribution, controlling and usage
- Supporting both B2B and B2C distribution
- Reducing costs for Content Production, processing, etc
- Enabling Multichannel Distribution
- Enabling Interoperable Distribution of content
- Enabling e-commerce of secure digital content

**Main general Objectives**
- developing and providing new methods and tools for innovative and flexible Digital Rights Management (DRM), including the
  - Allowing file sharing on P2P with the respect of IPR
  - exploitation of MPEG-21 and overcoming its limitations,
  - support different business and transaction models.
  - Supporting MPEG-21 and ODRL of OMA

- Integrating present CMSs and solution with AXMEDIS framework and tools

**AXMEDIS B2B Distribution and Sharing**

**AXMEDIS Consortium**
**Business Opportunities 1/2**

- For ALL Business Actors and for Content Provider/Producers
  - exploit a multi-channel distribution, convergence of media
  - greater control of content usage in all the channels B2B/C
  - possibility of creating new business model
  - lower costs of production, B2B distribution, promotion via P2P B2B
  - lower costs for content gathering, transcoding platform, production of content on demand with AXCP
  - greater level of security

- For Content Distributors/Mediators to
  - defining several different business models adapting the distribution channel to the users needs and would
  - distribute content with AXMEDIS tools on P2P to Consumers but based on DRM
  - exploit P2P technology to access content via the AXEPTool

**Business Opportunities 2/2**

- For Content Integrators and Multimedia Publishers to
  - simple and direct access at content coming from many content providers, integrators, etc., in easy manner,
  - integrate cross media content and automatically managing rights for complex multimedia products
  - have the possibility of defining several different business models adapting the distribution channel to the users needs and would

- For Final user to
  - get access to the same content on several platforms and locations, to have content at low price, etc.
  - have content at lower price, etc.
  - share content with AXMEDIS tools on P2P but based on DRM

- For Collecting Societies to
  - have access at direct reports about the Content exploitation

- For IT companies to
  - Save time and money in accessing at innovative technologies for content production and distribution, integrated environment

**AXMEDIS Architecture**

**AXMEDIS Framework**

**AXMEDIS features**

- Technical solutions related to the above mentioned technical objectives:
  - Integration with legacy
  - Interoperability of content and DRM, multichannel, etc.
  - Reduction of production costs
  - DRM improvement, tracking of events
  - Innovative technologies in Fingerprinting, modelling, P2P, DRM, authoring, production, etc.

- AXMEDIS framework for all
  - European platform for common exploitation of results
Any Workflow
Fingerprint and Descriptor
DRM and

AXMEDIS Framework
- Exploitation of AXMEDIS research and innovation
- To guarantee the return of investment
- To exploit AXMEDIS Infrastructure
- Exploiting AXMEDIS Framework and Tools
  - Content Processing (AXMEDIS CP GRID)
    - Reducing production costs and time
    - Accelerating: composition, formatting, protection, feature extraction, distributions, publishing, etc.
    - Set-up and management of single/multichannel Content Distribution with DRM
    - Customising AXMEDIS Players (PC, PDA, etc.) for creating YOUR Players
    - Customising AXMEDIS P2P tools for B2B
  - Exploiting AXMEDIS Infrastructure
    - Accessing to advanced State of the Art and standards solutions
    - Sharing Content in a B2B Environment (AXEPTool)

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Key facts
- IP infrastructure is reshaping the media entertainment and media business market
- Western Europe broadband entertainment content will rise from less than 1 Bil. € in 2005 to over 5 Bil. € in 2009 (IDC)
- By 2009 over 50% value in video distribution. The rest being made of music and gaming distribution (IDC)
- Two new distribution paradigms adding to existing digital distribution:
  - IPTV – operator centric DTV model
  - Home and personal Network Entertainment – open PC centric model (with DMAs, mobiles etc.)
Content and channels

- Younger are abandoning the TV
  - More time on PC/games console
  - More money on i-TV
- Market is becoming fragmented
  - push, time shifted, live, media center, DVD recorders, DVB-S, DVB-T, DVB-H, VOD, etc.
  - Several media: video, audio, iTV, etc.
  - Personal TV: …………
- Consumers are going to
  - Differentiate each other, more individuality
  - More personal needs

Western European Online Content revenues

User’s Trends

- Hardware devices will be key to the customer relationship
  - The Apple i-Tunes/i-Pod success story
  - During the 2000-2003 timeframe the music industry has lost ca. 15% value each year
  - By combining a service (iTunes) to the device (iPod) Apple has managed to kick start the music on line distribution business
  - 300 million tracks sold (up 200% over 6 months)

Hardware devices will be key to the customer relationship

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The Media Usage at home

The long tail
Trends

- **The tail is growing**
  - The ration 20%/80% is moving to a 40%/60%

- **Making more visible to buyers**
  - Smart metadata would help in suggesting content and thus on going on the tail:
    - “who you like AAAA also take BBBB!”
    - “if you like AAAA, you will love also BBBB!”

- **Characterization and comparison with the rest of the head, the 20% of the famous pieces**

- **B2B Needs**
  - Lower costs of production (packaging, protection, management, etc.)
  - Lower costs of distribution
  - Automating contract management, licensing, accounting, reporting, etc.

The new value chain

- Distributors (Telcos, ISPs and portals) have a weak position in the long run and must secure their business by developing/integrating certification (DRM) and building the user experience

- **Content**
  - **Certificator**
  - **Distributor**
  - **Software**
  - **Device**
  - **Manufacturer**

- **END USER**

Emerging On Line Music Value Chain

Emerging Broadband VOD value chain

General State of the Art

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Rights Management

- DRM: Digital Rights Management, general terms many times abused
- Management of Digital Rights
  - Limited to the management of rights of digital content?
- Digital Management of Rights
  - More correct and reasonable
  - Management of both rights for original works and related manifestations, digital resources, etc.
  - in many solutions DRM is not intended in this way

Terminology

- The artist creates a Work
- The work may be used to produce several manifestations

Some Actors of the value chain, “definitions”

- Right/Content Owners, B2B, artists, etc.
  - who has the rights on the initial work, non digital
- Content Producers, B2B, Publishers
  - Who is producing the manifestations of the work, define its rights, may produce the digital resources or not, etc.
- Content Integrators, aggregators, B2B
  - Who is Integration/aggregation: resources * metadata + , added value, etc., may be add other rights, etc.
- Content Distributors, B2B, B2C
  - Who is distributing digital content
- Final Users, C2C (P2P)
  - Who is using (or should use) the digital content on behalf of the rights obtained
- Users, in general
  - All the above actors that use in some way content on the basis of the rights obtained
Digital Rights Management

- **DRM**: Digital Rights Management is
  - A set of technologies and solution to cope with Digital Management of Rights

- **1st generation of DRM cover**:  
  - security and encryption  
  - prevent non authorized copying

- **2nd generation of DRM cover**:  
  - description, identification, trading, protection,  
  - monitoring, and tracking of all forms of rights usages over contents, including management of rights holders relationships

Motivations for Digital Rights Management

- Prevent the rights exploitation to who has not acquired the rights
- Verifying/Control if the allowed rights are respected:  
  - In the whole value chain or at least at the end users
- This role is traditionally partially covered by Collecting Societies (clearing house) that  
  - Guarantee/protect the interests of the content/rights owners.  
  - One or more Collecting Soc. for each Country  
  - Some agreements among the majors Collecting Societies in Europe: SIAE, SDAE, SAGEMA, etc.

How is DRM Secure?

- **Encryption**  
  - DRM may use strong encryption (128 bits) never been cracked
- **Digital signatures**  
  - content header is digitally signed to prevent tampering  
  - License is digitally signed, etc.
- **Separation of licenses from content**  
  - Licenses should be kept separate from content,  
  - content can be widely and securely distributed, P2P allowed  
- **Revocation of licenses or objects**  
  - of license, of authorization, etc.  
  - various ways to prevent players from exploiting content
- **Authentication and certification of users and devices**  
  - To prevent compromised player or non trusting users to receive or distribute other content, ...

Aim of …… Digital Rights Management

- 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.)
- **Cons:**  
  - Registration of users  
  - Authentic. of users and/or tools/terminal/devices  
  - Control of users
- It has to be supported by a set of additional technical solutions

Simple protection with Key sending

- The protection is performed before distribution  
- The B2B areas are (production, integration, etc.):  
  - Considered trusted, based on paper contracts  
  - The authors and producers cannot verify  
  - The integrators cannot verify
- The single channel distributor:  
  - Establishes the business models for the channel:  
    - pay per play, subscription, ………… etc.  
    - Produce licenses for each person/device, etc.  
    - sale the content and produce the Bill  
    - has a limited control on the exploitation of rights  
    - Etc.
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AXMEDIS Content Elements

- Content Packaging
  - To contain the following information
    - Metadata............
    - Digital Resources......
    - Protection Information.....
    - License............
  - Suitable for
    - Streaming (so called real-time) and/or downloading
    - Sharing on P2P, etc.
    - Portable on physical supports, etc.
  - In specific formats
    - Binary and/or XML, etc.

Packaging and Protection, Open Model

Production of Governed Objects

Production of Objects and Augmented License
Some Considerations

- **Open Model:**
  - Supporting P2P
  - The volume of Objects is acceptable
  - The elements can be independently manipulated
  - Licenses can be changed, reissued
  - Suitable for B2B and B2C

- **Governed Object:**
  - The user may see what can be done on the objects on the basis of their license
  - The same object with different licenses implies
    - to produce too many objects

- **Augmented License:**
  - Supporting P2P
  - The license has to include the same protection information
  - The objects can be substituted independently
  - Licenses can be changed, reissued

Managing License Chain

**Pros of Open Model vs the Augmented License**

- If the protected objects are used for producing several different more complex objects:
  - They are reused in the B2B area for different productions
  - Since the Protection Information is stored only once and not in every license, this implies to
    - have a more precise control of the black list, and
    - avoid duplications
  - Better for hierarchical nested protected and non-protected objects
  - Thus the Open model is better for the B2B

- **Pros of Augmented License vs the Open Model**
  - Simpler management for the servers
  - Higher number of licenses
  - Suitable for simpler objects, non-nesting protected objects
  - May be better for B2C

AXMEDIS Considerations

- In AXMEDIS it is possible to adopt different models for packaging and/or protecting objects
  - Open Model
  - Governed Objects
  - Augmented License

- AXMEDIS provides tools for
  - Packaging Object, protecting objects, etc.
    - AXMEDIS Editor, and AXMEDIS Content Processing
  - Creating Licenses:
    - DRM Editor in the AXMEDIS Editor
    - WEB Service for remote production of licenses
  - Managing/Processing Licenses:
    - Protection Manager Support, PMs, Server
    - Controlling and Supervising User Actions:
      - AXMEDIS Certifier and Supervisor, AXCS

- Any other question/issue?
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**Technologies and standards**

- Technologies for content protection
  - Microsoft Windows Media, DRM
  - Apple iTunes
  - Media Commerce Suite of Real Network
  - EMMS of IBM
  - Liquid Audio
  - DMD secure
  - Sealed Media
  - Intertrust
  - DMOD
  - Adobe, mainly limited to documents

- DRM
  - ODRL, OMA, Open Mobile Association
  - XrML, Content Guard, related to MPEG-21
  - MPEG-21

**Process Overview**

1. Package
2. Set Rights
3. Overtrust
4. Access Media
5. Request License

**Major Related Organisations**

- Standardisation Bodies for elements
  - MPEG-2, MPEG (Motion Picture Expert Group)
  - OMA (Open Mobile Alliance)
  - MDIP (ID and licensing aspects)
  - OASIS (Organisation for advancement in Structured Information Standards)
  - TV-AnyTime (DVB...)

- Associations/organization:
  - OeB (Open eBook Forum)
  - CRF (Content Reference Forum)
  - WIPO (World Intellectual Property Organization)
  - RIAA (Recording Industry Association of America)
  - WS-I (Web Services Interoperability Organisation)
  - ISMA (Internet Streaming Media Alliance)
  - CC (Creative Commons)

- Projects on Architecture and Value chain solutions
  - AXMEDIS Project, research and development project
  - DMP (Digital Media Project), standardisation project
  - Etc.

**Windows Media DRM?**

- Pay per view
  - Play count
- Rental
  - Expiration after first use
  - Expiration on store
  - Begin & expiration dates
- Subscription
  - Begin & expiration dates
  - Controlled distribution of media assets
  - Can include any of the above

**Microsoft Windows Media Rights Manager License**

- License contains the
  - Key to unlock the Windows Media file.
  - Rights, or rules, that govern the use of the digital media file.
  - (model based on Augmented License)

- Content owner sets rights to determine which actions are allowed from minimal control over playback to more restrictive licenses.

- Licenses can support different business rules, including:
  - How many times can a file be played.
  - Which devices a file can be played or transferred on. For example, rights can specify if consumers can transfer the file to portable devices that are compliant with the Secure Digital Music Initiative (SDMI).
  - When the user can start playing the file and what is the expiration date.
  - If the file can be transferred to a CD recorder (burner).
  - If the user can back up and restore the license.
  - What security level is required on the client to play the Windows Media file.
  - And many others.

**Microsoft License delivering**

- Licenses can be delivered in different ways and at different times, depending on the business model
  - Can be delivered before or after the content
  - Both possible if downloading
  - Only the first is reasonable in the case of streaming

- Licenses can be delivered with or without the consumer being aware of the process using silent or non-silent license delivery.
i-Tunes of Apple, iTMS, i-Tunes Music Store

- AAC 128 Kbit, comparable with 160Kbit MP3
- 70 Millions of Files in the first year of work
- > 500,000 traces
- Very easy
- No subscription costs
- Pay per download (0.99$ per file, 9.99$ per collection)
- Tools: download, player, burning, play lists, etc.
- DRM proprietary, “FairPlay”, cracked in April 2004
- Continue to work even if cracked

i-Tune and DRM limits

- Transfer of a trace to at most
  - 7 CDs, burning
  - 3 authorized computers
- Authorized transfer on a non limited number of i-POD
  - Market and money on iPODs
- Content is bought forever
- Authorized transfer on any computer but they can be played only on those that are authorized

Concept of Super Distribution

- What is intended as superdistribution ??
  - A distribution in which the users collaborate to the distribution, such as in the P2P environments
  - A solution in which the content is separate from the license:
    - Open Model
    - Augmented License
  - A Solution in which the Certifier and Supervisors and/or the devices are capable of detecting violations thus activating some recovering activity

AXMEDIS Considerations

- In AXMEDIS it is possible to select different models and/or configure/reconfigure your distribution channel according to your needs and business
- At macro level, AXMEDIS supports your:
  - Content Distribution
    - Multichannel
    - reducing your costs for setting up
    - B2B distribution with P2P and DRM
  - Content protection and DRM
    - Many many many new rights with respect to other models
    - Interoperable MPEG-21 ↔ OMA licenses
  - Content production
    - GRID processing for production and distribution, for transcoding and on-demand, etc.
    - Integration with Workflow
    - Content supervision and control
  - Any other question/issue ?

Needs and Limitations

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The effective User Needs and AXMEDIS Motivations

- **The market is moving**
  - From few content of high value to many of lower value, the log tail is become fatter and more relevant
  - From few actors to many
  - From high costs of production to more sustainable lower costs
  - From high prices to more sustainable lower prices
  - From ringtones to audio tracks and from them to video
  - From single channel to multichannel, the convergence
  - From proprietary to standard, interoperable solutions
  - From illegal to legal to P2P
  - From DRM for B2C to DRM for B2B2C, etc.
  - ……
  - The digital content is not only entertainment but also: e-learning, e-culture, e-banking, e-government, e-health, e-personal content, etc.

- **Business Rules, a way to formalize allowed rights**
  - Exploitation Models (contracts from the consumers to the provider are aligned to the exploitation model):
    - Subscription to a collection or service
    - All you can heat
    - Pay per renting
    - Pay per use, pay per play, pay per print, etc.
    - Pay per stream, download, etc…
    - Pay per minute all you can heat
    - Burning the CD
    - Copy the object
    - Moving the object
    - Passing the object to a different device
    - Pay per building a collection
    - Preview without paying
    - Try and buy
  - Etc.

- **Content distribution, the multichannel needs**

- **New markets and business solutions**
  - Convergence of distribution on different channels
  - Reduction of production, protection and distribution costs
  - Increment of control
    - insertion of DRM in the B2B areas
    - Harmonization of B2B and B2C
  - Content management in the home
    - the domain management
    - Interoperability of content in the home, interoperability of the devices, the Home Media Server
    - Multimedia Middleware among devices
    - Integration with domotic applications and tools
  - Content production/protection on demand
  - Content on demand, content in Push, personal content, etc…

- **Interoperable Content**
  - diversification of channel management has to be performed
    - When and where?
  - More channels may be obtained with
    - A smarter production
      - More formats, more production lines and/or
      - Scalable formats (not for all media) or unified formats and/or
      - Adaptation tools, etc.
    - DRM uniform, standard or interoperable?
  - No one of these paths is 100% systematically used, but some of them could be viable?
    - Emerging standard/formats for scalability
    - The production and process is a problem, huge amount of data to be processed per day, week and month, etc., flexibility is needed
    - Many DRM models for license, they are not interoperable at the 100%, standards are not consolidated.
Limitations of Present DRM solutions

- DRM is typically added only in the integration or distribution phases
  - DRM is seen mainly for B2C
  - Owners demand to producers
  - Distributors demand to carriers
- DRM is tuned for a specific distribution channel
  - Windows Media DRM for PC/internet, etc.
  - OMA DRM for Mobile
  - Etc.
- No convergence
  - No interoperability of content
- Large Limitations for the final users
- Limitations for the business and markets

The Convergence, the Multichannel Problems

- Different formats to be produced
  - Different terminal support different formats
    - PC: many formats
    - Mobiles: MPEG-4, or specific formats
    - DVB-S: MPEG-4
    - Etc.
  - Different content type: video, audio, multimedia, etc.
- Different business and transaction models
  - Pay per play, subscription, etc.
  - Different methods for payments
- Different methods of delivering
  - Streaming, downloading, push, etc.
- Large number of final hardware devices, need of profiling for users and devices with channel

Present Needs for Accessing New Markets

- Reduction of costs to access at the Fatter "Tail"
- Needs of Interoperable Content that may migrate from
  - one terminal/device to another
  - one user to another
  - one channel to another
  - Licenses assigned to users, devices or domains
  - etc.
- Transcoding/Adaptation problems
  - Content is packaged
  - Content is protected, adaptation of protected content is needed
  - Content contains several types of information: digital resources, metadata, glue, etc.
  - On the servers and/or on the client terminals
- DRM Architecture has to support Migration and Adaptation
  - see in the following

EX: Convergence, the Interoperable License, DRM

- When interoperable content in terms of format passes from two devices supporting different DRM models and licenses
- License needs to be transcribed and rights semantics preserved
- License chain processing need to be interoperable

Factory: Multichannel with Domain Manager

- Only one License for the whole set of devices/terminals, tools, of the company, and thus for any AXMEDIS Tool, etc.
- Only one Transaction for all the company
- Transparent management of licenses
- Etc.
AXMEDIS Training slides,  http://www.axmedis.org

**Home: Multichannel with Domain Manager**

- Only one License for the whole set of devices
- Only one Transaction for all the family
- Transparent management of licenses
- Etc.

**Real Time Content Processing**

- Reducing production and distribution costs
  - High costs of content processing
- Flexible Content Distribution
  - Automating content packaging
  - Automating production of licenses
  - Automating content formatting
- Content production on demand
  - Device capabilities
  - User Profile and preferences
  - Request of the User
  - Transcoding/adaptation needed
- Real Time
  - Massive processing

**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

**Windows Media vix AXMEDIS**

- Limited number of BMs
- ProtMod limited to Key Content and license
- Signed Content Header
- Single channel
- Proprietary License
  - Limited dictionary
  - Limited number of rights
- Authentication of Player (device plus user)
- Revocation per Player
- Revocation per license
- Only digital resources that can be included into Widows Media
- Non B2B DRM
- Allowed B2B DRM
- Larger number of BMs
- Any Protection Model
- Content and license
- Signed Content AXINFO
- Multichannel
- MPEG-21 REL license
  - Expandable dictionary
  - Any type of rights
  - Authentication of device, user, etc.
  - Revocation per device, user, etc.
  - Revocation per license
  - Any digital format, of any type

**Summary of Needs: the AXMEDIS Challenges**

- Unified Platform for all
  - AXMEDIS Framework
  - Accessible Source code and Knowledge
  - Complement and make new technologies accessible for the industry, reducing the gap to enter in the market
- Standardization
  - Exploitation and expand standard models such as MPEG-21, etc.
- Convergence of content distribution and usage
- Real Time content Processing
- Increasing security: rights usage and control on
- Automating the B2B area, DRM and distribution
  - Harmonizing B2B and B2C area for DRM
- Integrating the effort of many skilled actors
Summary of Needs: the AXMEDIS Challenges

- Convergence of content distribution and usage
  - Interoperable Content and Devices
  - Interoperable DRM, Licenses
  - Multichannel solution
- 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
  - Increasing security and interoperability
  - Increasing control of rights exploitation
  - ALLowing the set up of a large number of business models
- Automating the B2B area, DRM and distribution
  - Expanding DRM to B2B
  - Reducing costs of B2B distribution
- Any other question/issue ??

Table of Content

- Preface
- What is AXMEDIS
- Market Analysis and Opportunities
- General State of the Art
- Needs and Limitations
- AXMEDIS Content Packaging
- AXMEDIS Content Protection and Tracking
- AXMEDIS Content Production and Processing
- Examples of AXMEDIS Applications
- Conclusions and references

AXMEDIS Object Elements

- Metadata (the so called AXMEDIS Information, AXINFO)
  - Identification information, unique ID (AXOID), distributor ID, UID, ISRC, etc.
  - Descriptions: for indexing, MPEG-7, technical and conceptual, etc.
  - References to Owner, to distributor, etc.
  - Fingerprint
  - Historical and versioning aspects
  - Producer ID and Information, etc.
  - Author Information, etc.
  - etc.
- Digital Resources:
  - Any digital information: images, doc, txt, video, game, application, file, audio, etc.
- Protection Information:
  - What has to be done to access at a given information/resource
  - Tools used, their parameters, etc.
- License:
  - Which rights are provided, who is the recipient, conditions, etc.

AXMEDIS Package

- Streaming and/or downloading
- Binary and/or XML, etc.
- Single files, and/or Multimedia hierarchies of files such as those related to
  - HTML, LOM, W3DMUSIC, MPEG-4, etc.
- Containing the following information
  - Metadata (the so called AXMEDIS Information, AXINFO)
  - Digital Resources
  - Protection Information
  - License
Packaging AXMEDIS Objects

 AXMEDIS Object

- Any digital resource
  - Any hierarchy can be incorporate and modeled
  - Nested information
- Addition of formalized Metadata
  - AXMEDIS Information, AXInfo
- Extension for AXMEDIS objects
  - <file name>.axm
- MPEG-21 based
  - DID: Digital Item Declaration
  - DII: Digital item Identification
  - XML, binarization

 Examples of AXMEDIS objects

 AXMEDIS Objects

- AxObject
  - an MPEG21 DIDL Item (or IPMPIDDL)
    - Recursive Structure
- AxInfo
  - B2B relevant metadata
    - Creator, Owner, Distributor,…
    - Workflow info, lifecycle details and history of commands
    - Potentially Available Rights (PAR): which describes rights can be acquired by a customer (B2B)
    - Fingerprint algorithms info, metadata certification
- Public and Private object metadata
  - issue
    - Public must be always at disposal for indexing, querying, etc.
    - Private metadata are assets to be protected with the content
    - Some of the metadata are replicated in both locations
  - thus
    - Once resolved with "index" Item
    - Now addressed in new IPMPIDDL:ContentInfo
    - Metadata are reported in clear for protected content

 Coffe Break

 AXMEDIS Content Protection and Tracking
# Table of Content

- Preface
- What is AXMEDIS
- Market Analysis and Opportunities
- General State of the Art
- Needs and Limitations
- AXMEDIS Content Packaging
- AXMEDIS Content Protection and Tracking
  - Authentication and certification
  - License Definition and Production
  - Protection Information & low level technologies
  - Tracking: Supervision and Control
- AXMEDIS Content Production and Processing
- Examples of AXMEDIS Applications
- Conclusions and references

## AXMEDIS Digital Rights Management

- 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
  - By using technologies to protect content (e.g., encryption, fingerprint, watermark, etc.)
  - Verifying/Control/Supervise if the above conditions and others are respected

## AXMEDIS Protection and Tracking

### Authentication and Certification

- Authentication is the process:
  - To register the User/Device/Terminal/Tool, independently or as unified elements
  - To assign a unique ID to an User/Device/Terminal/Tool, independently each other or as a unified element
  - Typically concluded with the emission of a Certificate

## The Protection and Control Process

1. Registration Authentication
2. Content Access
3. Business Transaction
4. Tool Certification
5. Usage
6. Control and Supervision
7. AXMEDIS or Distributor Registration Site
8. Any Distributor Tool and Server
9. Transaction Host and Server
10. AXMEDIS Protection Manager
11. AXMEDIS Certified and Supervised

## AXMEDIS Protection and Tracking

- Controls and Supervision
- AXMEDIS Protection Manager
- AXMEDIS Certified and Supervised
- Transaction Host and Server
- AXMEDIS or Distributor Registration Site
- Any Distributor Tool and Server
- Content Access
Certification and verification

- Certification and Verification is the process:
  - In which an authenticated User/Device/Terminal/Tool is confirmed/verified to be still trusting, not corrupted or violated
  - For which eventual attempts/trials of violation are detected
- Performed by:
  - Verification about the consistency
  - Verification of the certificate
  - Verification about the eventual corruptions
  - Verification of Tool, Device, Terminal, Tool violation or not
  - Etc.
- When one is not certified and tries to play a protected content, it is required to become certified and thus to upgrade its security

License Definition and Processing 1/2

- License:
  - A digital version of the contract
  - The contract/license is signed by clicking
  - Is supported by a way to demonstrate its authenticity
  - Associated with who has signed the contract thus he/she has to be authenticated and may be certified/verified at each action
  - can be stored in the digital object or not
  - If not, may in the terminal or remotely located
  - may refer to other licenses, creating a chain of licenses for the evaluation of each given grant associated to a right

License Definition and Processing 2/2

- License:
  - Is formalized in some language
    - Refer to some dictionary for terms that define the semantics of the expressions of the language
  - contains the list of acquired rights
  - may refer to other licenses, creating a chain of licenses for the evaluation of each given grant associated to a right
  - May be produced only by who has the rights to do it
  - May define/provide the price for each grant/action performed
  - May be revoked
  - May allow to define dynamic policies of control
  - Etc.

Managing License and Protection Information

- Once obtained the content a license is needed to know what you can do on it, which Right you have acquired
- On the License you may get a reference to
  - the Protection Information to Unprotect the specific object segment and/or digital resources
- During all these phases the AXMEDIS Certifier and Supervisor verify integrity and certificate
- 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

AXMEDIS License formal language

- AXMEDIS License
  - Derived from MPEG-21 REL
  - Support for ROD: Rights Data Dictionary
- MPEG-21 RELRights Expression Language
  - Derived from XML
- XrML 2.0: eXtensible rights Markup Language
  - Derived from DPRL
- OMA ODRL: Open Digital Rights Management
  - Expression language for mobiles
  - Simpler than MPEG REL
  - Under certain restriction is compatible with AXMEDIS license
  - Etc.
**MPEG-21 REL data model**

- REL grant consists of:
  - principal to whom grant is issued
  - rights the grant specifies
  - resource to which right in grant applies
  - condition to be met before grant can be exercised

**Possible values for terms**

- **Principal**: AllPrincipals and KeyHolder
- **Rights**: Issue, Obtain, PossesProperty and Revoke
- **Resources**: DIGitalResource, Revocable and ServiceReference
- **Conditions**: AllConditions, ExerciseMechanism, ExisteRight, FullElar, PrerequisiteRight, RevocationFreshness, ValidityInterval
  - CallForCondition
  - ExerciseLimit
  - FeeFlat
  - FeelMetered
  - FeePerInterval
  - FeePerUse
  - FeePerUsePrePay
  - SeekAproval

- **Examples of Rights**: Adapt, Delete, Diminish, Embed, Enhance, Enlarge, Execute, Install, Modify, Move/Migrate, Play, Print, Reduce, Uninstall, Burn

**ODRlv2 MPEG-21 (Jaime Delgado, FUPF, AXMEDIS)**

- Differences:
  - Different syntax and elements.
  - ODRL is simpler. MPEG-21 REL has many options.
  - MPEG-21 REL works with an independent rights data dictionary.

<table>
<thead>
<tr>
<th>ENTITY</th>
<th>ODRL</th>
<th>MPEG-21 REL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
<td>Party</td>
<td>Principal</td>
</tr>
<tr>
<td>Object</td>
<td>Asset</td>
<td>Resource</td>
</tr>
<tr>
<td>Right (action)</td>
<td>Permission (Right)</td>
<td>Right</td>
</tr>
<tr>
<td>Condition (terms)</td>
<td>Constraint (Right)</td>
<td>Condition</td>
</tr>
</tbody>
</table>

**AXMEDIS License Production**

- **Need of Massive Production**: one License

- **A Distributor**
  - Requesting license
    - Production (WS)
    - License Editor
    - Protection Manager
    - AXMEDIS Compliant Players

- **Protected Object**: Post Paid Info (WS)
  - AXMEDIS Protection Tool
  - AXMEDIS Certifier and Supervisor

**AXMEDIS Training slides, http://www.axmedis.org**
AXMEDIS The Protection and Control Process

AXMEDIS Consideration

 AXMEDIS License:

- Formalized in MPEG-21 REL
- Can be interoperable with OMA ODRL licenses
- Can be produced
  - Manually with AXMEDIS DRM Editor
  - Remotely by using a WEB service
- Massively by using AXMEDIS content processing tools
- Is processed in the chain of licenses
  - by the AXMEDIS Protection Manager Support as License Server/DRM Processor
- Can be included into AXMEDIS objects or can be provided independently
- Can be cached or not on the client terminal
- Etc.

- Any other question/issue ??

Protection information Model

 Protection information for each Single Protected Object

- How an object is protected
- How each digital resource is protected
  - Which algorithms are used for encryption, scrambling, compressing, etc.
  - How they are applied: sequence, segment, etc.
  - Which parameters have been used, associated key, etc.
- Protection behavior in download and streaming
- References to other IPMP models and information
- For example into an MPEG-21 object MPEG-4 IPMPX are included
- Etc.


Protection, Low Level Technologies

 Encryption

- A digital resource transformation based on some algorithm and a key. The inverse operation is typically computationally expensive to be performed without knowing the needed key even if one know the algorithm

 Scrambling

- A digital resource transformation based on some simple algorithms: line, byte, segments, exchanges, etc. The inverse operation is typically simply if one know the algorithm to scramble.

 Digital Signature

- The estimation of a unique code presenting a digital resource, license or certificate. It can be re-estimated to verify the consistency of the original resource, license or certificate.

 Fingerprint

- Estimating a code (may be unique) from the digital resource data, it may be strong enough to remain valid even after adaptation

 Watermark

- Hiding into the digital resource some information, transforming the original digital resource, it is permanently associated with...
Supervision and Control about the rights usage

Continuous Control and Supervision
- Continuously verify and certify the trusting level of the Tool/Device/Terminal and of the User
  - Verification of certificates
  - Verification of terminal consistency and trusting level
  - Detecting infringement and violations
  - Recovering of critical situations
  - Taking decision on the movement of User, Tools, etc. into the black list to revoked authorizations

List of Events/Actions on rights Exploitation
- Collecting Events and Actions
  - Further reporting
  - Further verification of consistency
  - Provide evidence about the exploitation of rights to: content owners, producers, collecting societies, distributors, etc.
  - Provide 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...
- MPEG-21 Event Reporting
  - Specifies how to express ER-Request and Event Report and how they are represented as digital item

Reporting, accounting manager and tool, examples
- Reporting to Distributor
  - Each exploited right with references to the User-ID for each distributed object (objects that contains its Dist-ID)
- Reporting to the Integrator/creator
  - Who create new object from other objects of from scratch
  - The number of exploited rights for each object that contains the Creator-ID and the Dist-ID for each of them
- Reporting for the Collecting societies, CS
  - Who is monitoring the exploited rights for third parties, for other creators
  - The number of exploited rights for each Creator-ID associated with the CS, for each object that contains the Creator-ID and the Dist-ID for each of them, in a certain Geographic Region or State

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

Distribution of exploited objects in Play in the March 2005
Providing Action Log and Statistical Information

Black Lists Management

- AXMEDIS Certifier and Supervisor may manage black lists of:
  - Users
  - Licenses
  - Objects
  - Devices
  - Distributors
  - Etc.

- The distinction from Users and Devices is strongly needed to preserve the distinction from the several channels
- This allows to define precise and fine policies for managing critical conditions that may occur.

AXMEDIS Considerations

- AXMEDIS:
  - Controls user terminals
  - Collects Actions Logs
  - Manages black lists
  - Allows the definition of policies for putting user, device, license, objects, etc. into the black lists
  - If requested, Provides the evidence of the exploited rights
  - Allows the control on multichannel distribution
  - Provides statistical data on the rights exploitation
  - Allows to bring back easily the Action Log on your Administration
  - Etc.

- Any other question/issue ??

Content Production and Processing

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**AXMEDIS Training slides, http://www.axmedis.org**

**AXMEDIS Architecture**
- AXMEDIS Factory
- AXMEDIS Editor
- AXMEDIS Database
- AXMEDIS Portal
- AXMEDIS Clusters
- AXMEDIS Network

**AXMEDIS Content Production and Processing**
- **Content Authoring, Editing**
  - AXMEDIS Editor and Viewer
  - Automating Content Processing
    - Content production with GRID support
    - Content Gathering/Ingestion, Systems Crawler
  - Workflow
    - Workflow integration with AXMEDIS
  - AXMEDIS Objects Management Systems
    - AXMEDIS database
    - Content description and indexing
    - Technical queries
  - AXMEDIS Distribution tools
    - AXEPTool for P2P B2B distribution
    - AXMEDIA tool for P2P content sharing on C2C
    - Programme and Publication tool
  - AXMEDIS Client tools
    - AXMEDIS clients

**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
  - Metadata
  - DRM
  - Protection
  - Presentation
  - Behavior
  - License
  - Annotation
  - Etc.

**AXMEDIS Editor inside the AXMEDIS Factory**
- AXMEDIS Editor
- Creators PCs
- Workflow Manager
- AXMEDIS Database
- CMS
- P2P Network
- DB
- DB

**www.axmedis.org**
AXMEDIS Content Production and Processing

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AXMEDIS Content Processing

AXMEDIS Factory

- AXMEDIS Content Processing GRID

Content production, protection, etc., at B2B
**AXMEDIS Content Processing capabilities**

- Scripts will be produced by Example (recording commands) on the AXMEDIS Authoring Tools
- In AXCP Scripts you can manipulate, produce, adapt and process:
  - AXMEDIS/MPEG-21 Objects and features
  - Digital resources in any format
  - Descriptors, fingerprint, etc.
  - Metadata, metadata mapping
  - Licenses and PAR
  - Protection information
  - Device Capabilities
  - User Profile and preferences
  - Etc.
- And you can automate:
  - Load and Save of AXMEDIS objects
  - From/By the AXMEDIS database
  - From/By other legacy CMS via Crawler and other means
  - From/By the file system and Local Area Network
  - Publication of results on distribution channels

**AXCP as Transcoding/Adapt. Platform**

- AXMEDIS Rule Editor
- User profile
- Distributor front end server
- Device capabilities
- AXMEDIS Scheduler

**AXMEDIS Considerations**

- AXMEDIS Content Processing allows you to automate any kind of content processing:
  - Massive or small scale processing
  - Locally performed or Workflow controlled
  - On any kind of Digital Resource not only AXMEDIS objects
- AXCP Applications for massive processing as:
  - Production/packaging platform for producers and integrators
    - Digital files, metadata, etc.
  - Protection of objects, and protection information processing
  - Transcoding/adaptation platform for distributors
  - License Production, or as License Sever/processor
  - Etc.
- Any other question/issue ??

**Fast and Continuous Crawling of Content**

- Your CMSs
  - List of Sources
  - Definition of Active Queries
  - User Profile
- Workflow manager
- AXMEDIS Rule Editor
- AXMEDIS Scheduler
- AXMEDIS Database

**Content Gathering from Content Management Systems**

- Access to several different resources:
  - File Systems: Win, Linux, MAC, etc.
  - ODBC, JDBC, etc.
  - Native DB: DB2, Oracle, MS-SQL, MySQL, etc.
  - Protocols: IMAP, POP, Z39.50, etc.
  - XML databases
- Integrated with AXMEDIS Content Processing Capabilities:
  - Processing of any digital resources and metadata
  - GRID executing and computing, high performance
What is Workflow?

- Definition of activities/tasks/production-processes:
  - What they are,
  - how they are structured, step by step,
  - how they are tracked, controlled,
  - who or what has to perform them,
  - what is the relative order of actions, they are synchronized?
  - Which is the information/control flow when they are carried out automatically and/or manually either by human actor and/or tools in the defined order produces the desired output,
  - Etc.
- AXWF provides an interface & glossary to
  - define the workflow and enables some users to act and monitor the progress of all the activities
  - a centralised mechanism for controlling the productions of a factory.

AXMEDIS Workflow

- Based on
  - OpenFlow, Biz Talk in a second step
  - Web service as integration
- Control and monitoring of
  - AXMEDIS Authoring/Editing tools
  - AXMEDIS Scheduler of the AXCP
  - AXMEDIS database
  - AXMEDIS AXEPTools
  - AXMEDIS Programme and Publication
  - Etc.
- Full control and monitoring of all the Content Factory activities

AXMEDIS Objects Management Systems

- AXMEDIS Content Production and Processing
  - AXMEDIS Editor and Viewer
  - AXMEDIS Scheduler of the AXCP
  - AXMEDIS database
  - AXMEDIS AXEPTools
  - AXMEDIS Programme and Publication
  - AXMEDIS clients
AXMEDIS Training slides, http://www.axmedis.org

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  - AXMEDIS clients

AXMEDIS Database Information

- AXMEDIS database management systems, CMS
  - Scalable to manipulate a large number of:
    - Objects, components, protected objects
    - Licenses, protection information
    - Digital resources
    - Etc.
  - Making queries on the basis of:
    - Descriptions, formal descriptors
    - Technical information
    - License information
    - Classification metadata
  - Indexing on the basis of selected information
  - Direct access via IDs
    - Fast Retrieval
    - Typically objects on File Systems
    - Modelling of XML information

AXMEDIS Database Accessibility and recovering

- AXMEDIS Content Accessibility and recovering
  - AXMEDIS Database Manager
  - AXMEDIS databases
  - AXPETools
  - Forward Query
  - AXMEDIS Query Manager
  - AXMEDIS Query User Interface
  - Select The Objects
  - Ask for a list of AXMEDIS DB contents
  - Ask for a list of AXMEDIS DB contents
  - Collect results from different sources
  - Return a list of AXMEDIS DB contents
  - Build a query
  - Bookmark a query
  - Retrieve a query
  - Issue Query
  - Auto-updating Query

AXMEDIS Considerations

- AXMEDIS Integrates:
  - A crawling solution to fast gathering of Content and other information located in your CMSs
  - A database manager capable of collecting and managing AXMEDIS content
  - Query support to make technical business queries on: local AXDB, AXPETool, and on your CMSs
  - Queries on the AXPETools are applied to all the P2P AXMEDIS network virtual database
- AXMEDIS Automated Content Processing Integrates:
  - Access to the AXMEDIS database
  - Publication of Content on the P2P AXPETool
  - Publication of Content towards the Distributors Servers
  - Loading and processing content coming from the legacy and/or current CMSs via the integrated Crawler Focuseek
  - Saving results of the Content Processing back to your CMSs
- Any other question/issue ??
AXMEDIS Training slides, http://www.axmedis.org

**AXMEDIS Distribution tools**

**AXMEDIS Content Production and Processing**
- Content Authoring, Editing
- Automating Content Processing
  - Content production with GRID support
  - Content Gathering/Ingestion, Systems Crawler
- Workflow
  - Workflow integration with AXMEDIS
- AXMEDIS Objects Management Systems
  - AXMEDIS database
  - Content description and indexing
  - Technical queries
- **AXMEDIS Distribution tools**
  - AXEPTool for P2P B2B distribution
  - AXMEDIA tool for P2P content sharing on C2C
  - Programme and Publication tool
- AXMEDIS Client tools
  - AXMEDIS clients

**AXMEDIS Publication Capabilities**

**AXMEDIS P2P Tools**
- AXMEDIS P2P tools for content sharing respecting IPR
  - Content Distribution and P2P file sharing
  - 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
  - Control and certification of metadata
- AXMEDIA tool:
  - Only for C2C and B2C
  - Simple queries on simple user focused metadata
  - Simple management of files on the file system
  - Control and certification of metadata

**AXMEDIA Tools for P2P Content Sharing**

**AXMEDIS Program and Publication**
- Programme and Publication
- Protection and Supervising tools
**AXMEDIS Programme and Publication**

- **AXMEDIS P&P Editor**
  - Users create and edit programmes for the multi-channel publication of AXMEDIS objects

- **Distribution Server/Channels**
  - P&P Programme
  - On-Demand
  - Request to play/view and AXMEDIS object

- **AXMEDIS Database Manager**
- AXMEDIS databases

**AXMEDIS Content Production and Processing**

- **Content Authoring, Editing**
  - AXMEDIS Editor and Viewer

- **Automating Content Processing**
  - Content production with GRID support
  - Content Gathering/Ingestion, Systems Crawler

- **Workflow**
  - Workflow integration with AXMEDIS

- **AXMEDIS Objects Management Systems**
  - AXMEDIS database
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- **AXMEDIS Distribution tools**
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- **AXMEDIS Client tools**
  - AXMEDIS clients

**AXMEDIS ActiveX**

- The AXMEDIS ActiveX allows
  - the fruition of AXMEDIS Objects within other Windows applications and web pages

- It allows to:
  - Show the resources inside the object (unprotected)
  - Control the execution of resources (play/pause/stop)
  - Hide/show the AXMEDIS Hierarchy

- It has been used to produce a prototype of the PC Player

**AXMEDIS Client Tools**

- **AXMEDIS clients tools**
  - Based on AXOM module plus a set of players
  - Audio player
  - Video player
  - Document viewer
  - Image viewer
  - Etc.

- Different devices:
  - PC player, PDA player, etc.

- **AXMEDIS Plug ins:**
  - Active X for integration with IE, Authorware, Tool Book, etc.

- **For Mozilla**
  - Possible integration of AXMEDIS AXOM in any player

**AXMEDIS Player Mozilla’s plugin**

This page contains a new user interface for AXMEDIS plugins for Mozilla. Click on Levels to load a template.
Examples of AXMEDIS Applications

- Distribution on Internet, the TISCALI demonstrator
- Distribution via Kiosks, the ILABS demonstrator
- Distribution via Satellite data broadcast, the EUTELSAT Demonstrator
- General AXMEDIS Multichannel Architecture
TISCALI Distribution with AXMEDIS Technology

- B2C distribution
- AXMEDIS objects with
  - Video and Audio Files
  - Licenses and Protection Information not in the object
- The AXMEDIS Objects may be
  - shared among consumers with AXMEDIA Tool a P2P tool
  - Visualized and played on AXMEDIS players free downloaded
- The users have to perform the registration of
  - themselves on an AXMEDIS portal
  - any AXMEDIS player tool they would use
  - Mainly on PC and Media Centres
- License allows
  - Content sharing on AXMEDIA
  - Content play
  - Content Adaptation…
  - Content Migration on other P2P channels…

Distribution via Kiosks, the ILABS demonstrator

- B2B and B2C distribution
- AXMEDIS objects with
  - Educational and cultural content,…
  - Video, images, document, audio, animations, etc.
- Licenses and Protection Information not in the object
- The AXMEDIS Objects may be
  - Visualized and played on AXMEDIS players free downloaded
- The users have to perform the registration of
  - themselves on an AXMEDIS portal
  - any AXMEDIS player tool they would use
  - Mainly on PDA and mobiles
- License allows
  - Content play
  - Content Adaptation…
  - Content Migration on any other AXMEDIS terminal, in some cases

Distribution via Satellite data broadcast, the EUTELSAT Demonstrator
**EUTELSAT Distribution with AXMEDIS technology**

- B2B and B2C distribution
- AXMEDIS objects with
  - Any kind of content, ...
  - Video, images, document, audio, animations, etc.
- Licenses and Protection Information not in the object
- The AXMEDIS Objects may be
  - Visualized and played on AXMEDIS players free downloaded
  - Any AXMEDIS player tool they would use
  - Mainly on PC for TV and/or iTV
- License allows
  - Content play
  - Content Adaptation ...
  - Content Migration on any other AXMEDIS terminal, in some cases

**EUTELSAT Distribution via Satellite Data Broadcast**

- Satellite data broadcast in PUSH
- The Produced Content is Packaged, Scheduled and Delivered to authorized Users.

**AXMEDIS Multichannel Architecture**

- AXMEDIS

| AXMEDIS Programme and Publication | AXMEDIS Certification and Supervision |
| AXMEDIS Content Processing | New Protected Object: Post PROPA (WS) |

**The AXMEDIS Multichannel architecture**

- Internet, IP Distributors
- Mobile Distributors
- Broadcasters DVB-T
- Mobile Distributors
- Broadcasters DVB-S
- Kiosks distributors

**AXMEDIS Multichannel architecture**

- Content Integrator
- Content Providers
- AXMEDIS Distributors
- Supervising PMSt/AXCSs
Table of Content

- Preface
- What is AXMEDIS
- Market Analysis and Opportunities
- General State of the Art
- Needs and Limitations
- AXMEDIS Content Protection and Tracking
- AXMEDIS Content Production and Packaging
- Examples of AXMEDIS Applications
- Conclusions and references

Publicly Accessible General AXMEDIS documents

- DE2.1.1 (two parts, and b) User Requirements and use cases
  - A) user requirements
  - B) Use Cases
- DE2.2.1 -- Test cases and content description
- Reports on Content
  - DE3.1.3 -- AXMEDIS Content Aspects Specification
  - DE8.1.1 -- Content for Test Cases and Validation
  - DE8.2.1 -- Content Selection Guidelines
  - DE8.3.1 -- Multilingual guidelines and technical solutions
  - DE8.4.1 -- AXMEDIS Editorial Format Guidelines and basic examples

Publicly Accessible AXMEDIS Framework documents

- DE3.1.3 -- Framework and tools Specification, 10 parts
  - A) AXMEDIS General aspect and Model
  - B) AXMEDIS Viewers and Players
  - C) AXMEDIS content processing area, GRID
  - D) AXMEDIS Fingerprint and Descriptors
  - E) AXMEDIS Database and Content gathering
  - F) AXMEDIS AXEPTools P2P
  - G) AXMEDIS Workflow
  - H) AXMEDIS Protection and accounting
  - I) AXMEDIS Draft Distribution and Portal
  - J) AXMEDIS Definitions and Terminology
- DE5.1.1 -- AXMEDIS Framework Infrastructure
- DE5.2.1 -- AXMEDIS Framework Validation and Integration

Publicly Accessible AXMEDIS Framework documents

- Early reports on Basic Technologies
  - DE4.1.1 - Content Modelling and managing
  - DE4.2.1 - Content indexing, monitoring and querying
  - DE4.3.1 - Content Composition and formatting
  - DE4.4.1 - Content sharing and production on P2P
  - DE4.5.2 - Content Protection and Supervision
  - DE4.6.1 - Content Distribution via Internet
  - DE4.7.1 - Content Distribution toward mobiles
  - DE4.8.1 - Content Distribution via satellite data broadcast, the push optimisation and the on demand problem
- DE4.9.1 - The Usability issues for the AXMEDIS production tools

References

- AXMEDIS: www.axmedis.org
- CRF: Content Reference Forum: http://www.crforum.org/
- DMP: Digital Media Project, www.chiariglione.org
- ODRL: http://www.odrl.org/
- OMA: www.openmobilealliance.org
- MPEG, MPEG-21: www.chiariglione.org
- MUSICNETWORK: www.interactivemusicnetwork.org
- WEDELMUSIC: www.wedelmusic.org

Comments, Acknowledgements & Contact Information

- Conclusions and references
Other AXMEDIS courses

- We hope you have enjoyed this Tutorial
  - For additional information please refer to AXMEDIS contact person or access to the AXMEDIS WEB portal and/or CD for further documentations and reports from which this Tutorial has been produced.
  - Updated reports are produced annually
  - By affiliating with AXMEDIS and participating at the AXMEDIS events and activities you will be kept up to date with the latest progresses and development
- Additional AXMEDIS courses include:
  - AXMEDIS Detailed Overview, 6 hours, full day course
  - AXMEDIS Content Production area, demonstration and training
  - AXMEDIS Content Distribution area, demonstration and training
  - They are available online at the AXMEDIS web portal.

Affiliation to the AXMEDIS

- You can be affiliated with AXMEDIS. The affiliation provides access to a large amount of information and knowledge, and source code related to the AXMEDIS Framework.
- If you are interested in the affiliation please contact P. Nesi at nesi@dsi.unifi.it. The benefits of the affiliation include the possibility of using the AXMEDIS specification and technology for your business.
- You are invited to:
  - contribute to the improvement of AXMEDIS documents and specification by sending the contribution to P. Nesi at nesi@dsi.unifi.it
  - attend AXMEDIS meetings that are open to public, for additional information see WWW.axmedis.org or contact P. Nesi at nesi@dsi.unifi.it.

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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Thanks to all AXMEDIS partners