Gestione dei diritti (DRM/CPCM): il caso di una grande azienda

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Preface

- ***Currently, the digital-content market is growing very fast and it needs solutions of production, protection and distribution of massive content collections. This is a real challenge for many industries that are discovering the complexity of managing large digital content factories and multichannels distribution chains, including content on demand.***
- **The technology state of the art presents only:**
  - Single channel solutions, for content and DRM
  - Distribution servers without adaptation of protected content
  - Limited capabilities in protecting content.
- **Content producers, providers, aggregators and distributors constantly need to adopt innovative means of**
  - increasing efficiency to reduce cost and to cope with large scale traffic.
  - coping with interoperable content
  - coping with DRM
- **Thus new solutions are needed to automate, accelerate the production and protection processes.**

Experience of the Speaker

- The experience of the speaker mainly refers to a set of international research and development projects such as AXMEDIS, WEDELMUSIC and MUSICNETWORK. In those, projects, innovative technologies for the production, protection and distributions of digital content have been analyzed and developed for the major European industries of the sector

- and, to the working on MPEG forum including:
  - MPEG-21 with AXMEDIS
  - M3W, new standard process

Summary

- Digital Rights Management
- DRM and the value chain
- DRM and the Content Elements
- Limitations and Needs
- Authentication and certification
- Content Packaging
- License definition and processing
- Protection Information
- Protection, low level technologies
- Supervision, Control
- Example of Architectures

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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 digital manifestations, resources, etc.
  - in many solutions DRM is not intended in this way

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:**
  - Focused on security and encryption
  - Prevent unauthorized copying
- **2nd generation of DRM: covers**
  - description, identification, trading, protection,
  - monitoring, and tracking of all forms of rights usages over contents, including management of rights holders relationships

NEW Digital Rights Management

- **To allow accessing at the digital content functionalities in a controlled manner**
  - To who has been **authenticated/certified**
  - To do what (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
  - Authentication of users and tools/terminal/devices
  - Lack of interoperability

Simplified actors for this talk

- **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, etc.
- **Content Integrators, aggregators, B2B**
  - Who is Integ/agg. Resources + metadata ++ , added value, etc., may be add other rights, etc.
- **Content Distributors, B2C, C2C (P2P)**
  - Who is distributing digital content
- **Final Users, C2C**
  - Who is using 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

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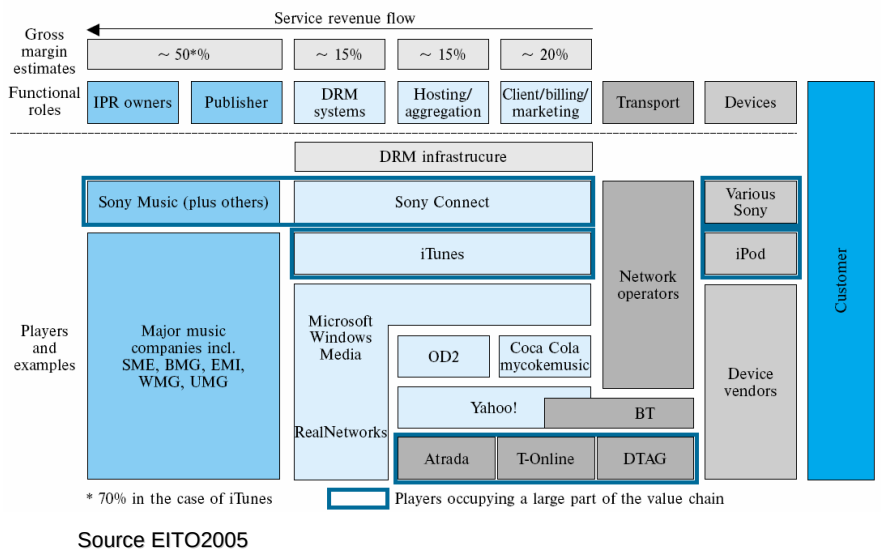
Example: On Line Music Value Chain



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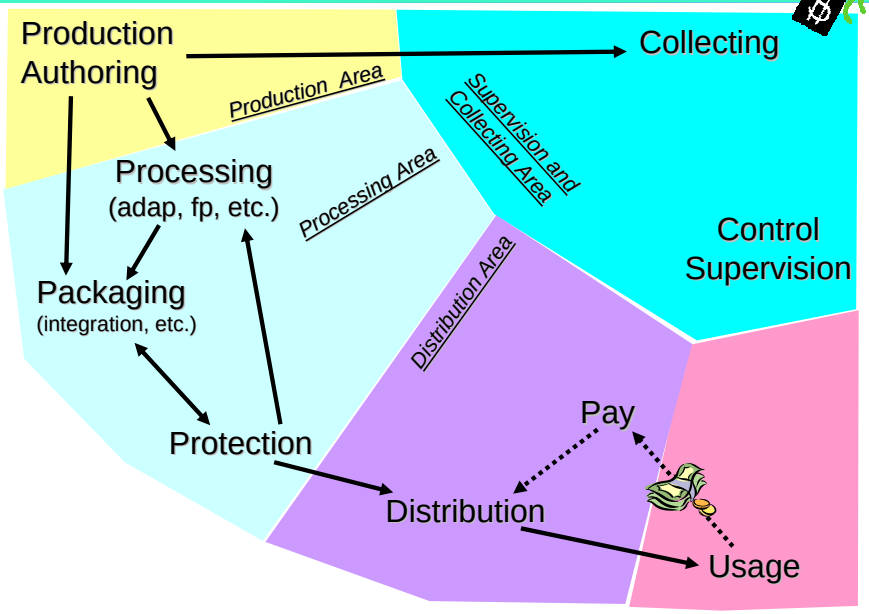
Motivation for Digital Rights Management

- **Prevent access to who has not acquired the rights to access**
- **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 Coll.Soc. in Europe: SIAE, SDAE, SAGEMA, etc.

A simplified value chain



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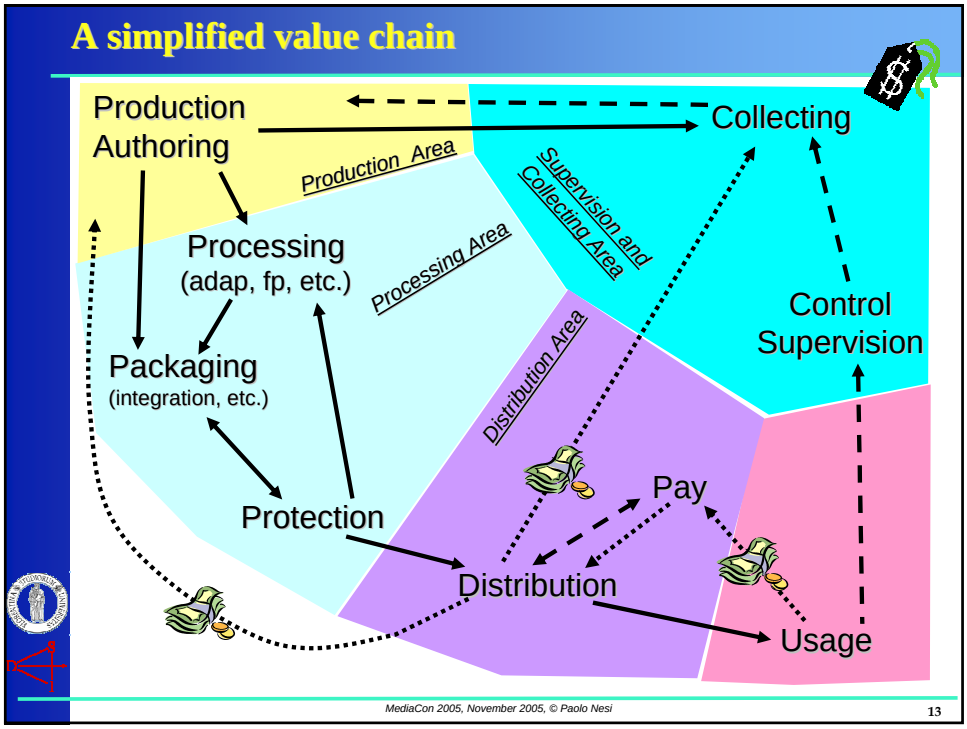
A simplified value chain
Production
Authoring
Collecting
Production Area
Supervision and
Collecting Area
Processing
(adap, fp, etc.)
Processing Area
Control
Supervision
Packaging
(integration, etc.)
Distribution Area
Pay
Protection
Distribution
Usage
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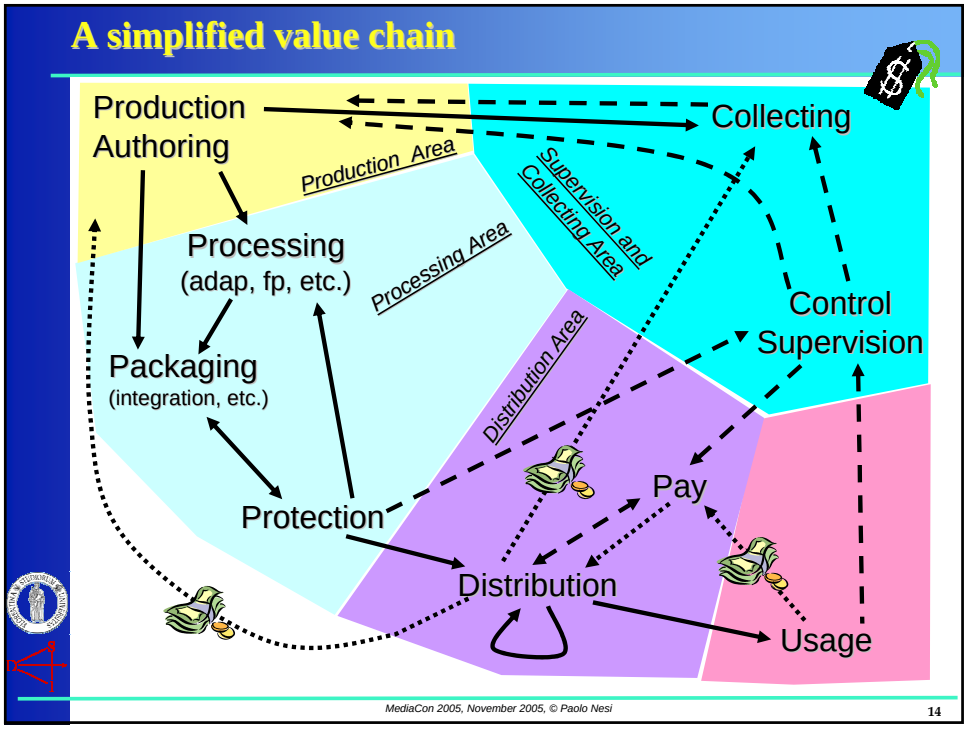
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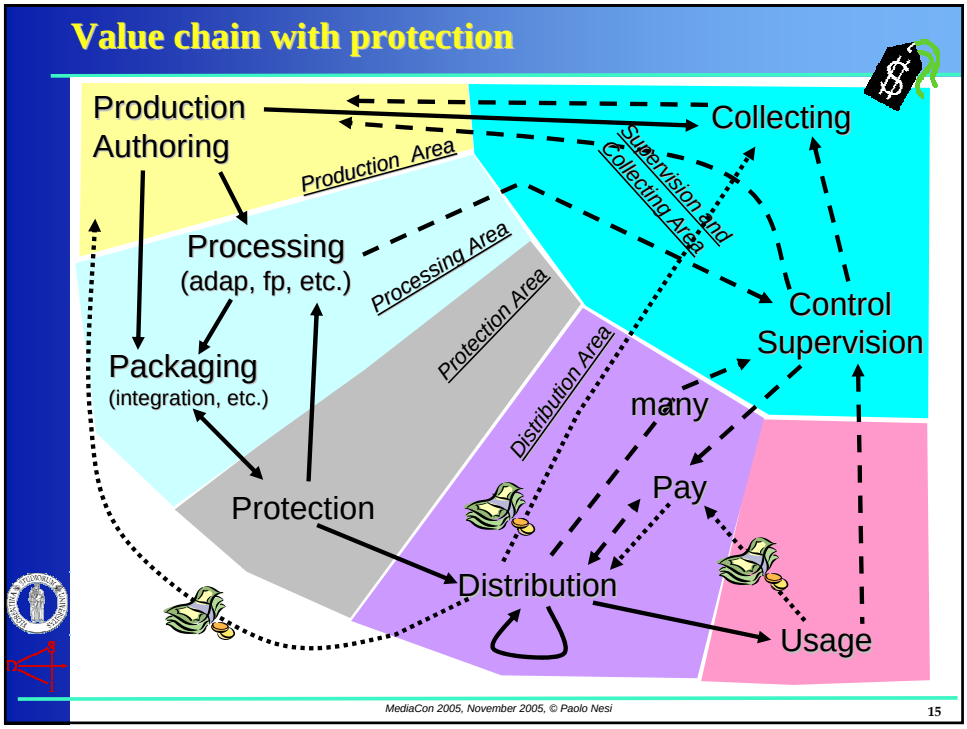
Value chain with protection
Production
Authoring
Collecting
Production Area
Supervision and
Collecting Area
Processing
(adap, fp, etc.)
Processing Area
Protection Area
Control
Supervision
Packaging
(integration, etc.)
Distribution Area
many
Pay
Protection
Distribution
Usage
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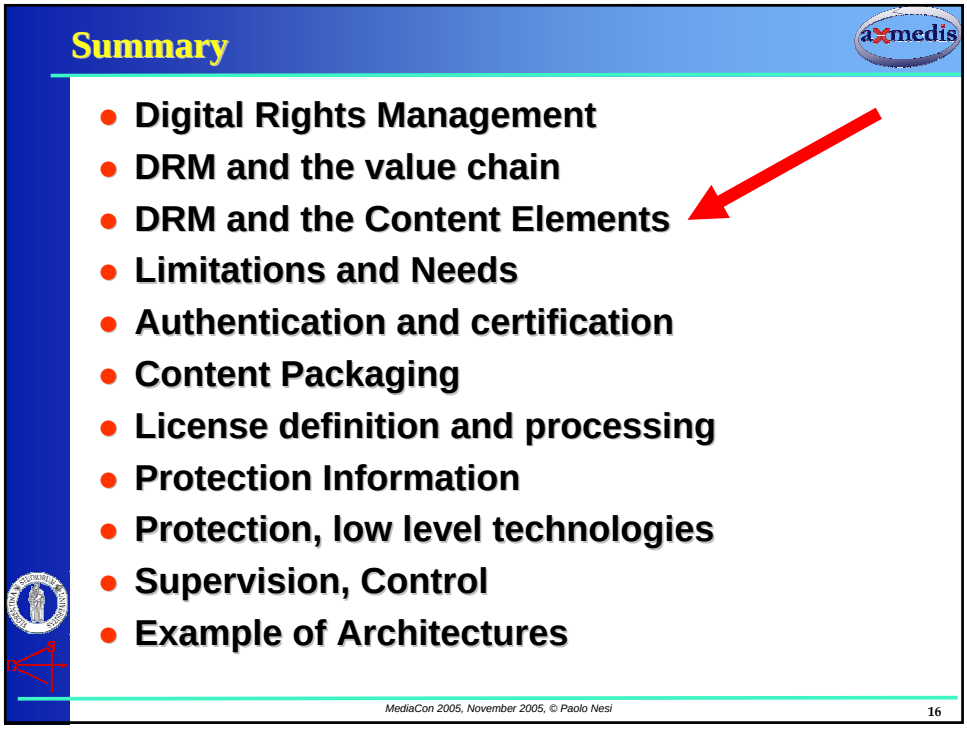
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Digital Rights Management
DRM and the value chain
DRM and the Content Elements
Limitations and Needs
Authentication and certification
Content Packaging
License definition and processing
Protection Information
Protection, low level technologies
Supervision, Control
Example of Architectures
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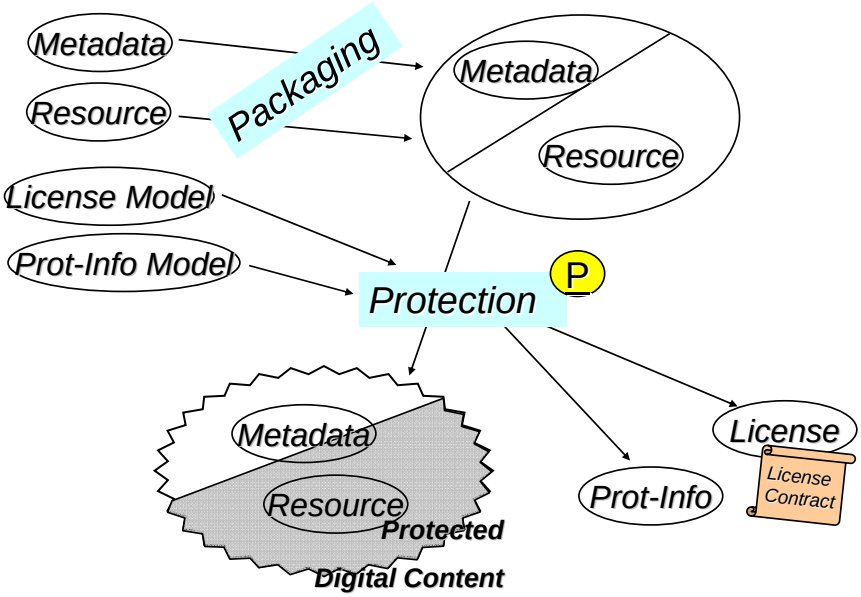
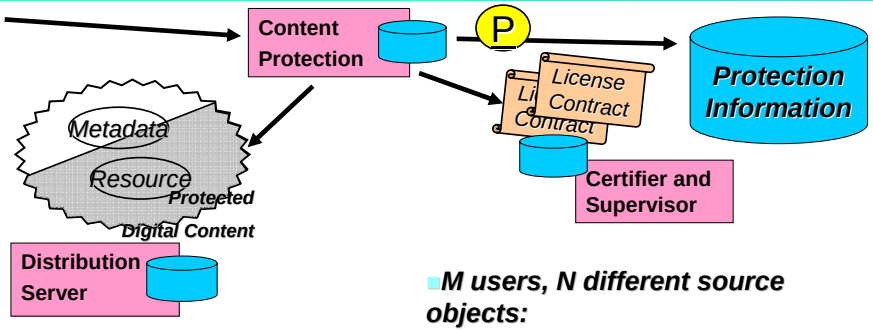
Content Elements

- **Content Packaging**
  - To contain the following information
  - Streaming and/or downloading
  - binary and/or XML, etc.
- **Metadata**
  - Identification information, unique ID, distributor ID, etc.
  - Classification information also for indexing: Dublin core, etc.
  - Descriptors, MPEG-7, for indexing, etc.
  - References to Owner, to distributor, 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.

Packaging and Protection, Open Model



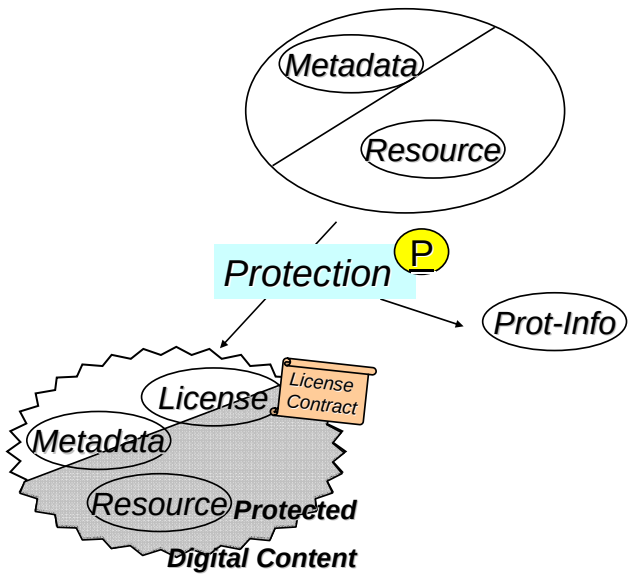
General Architecture of content business



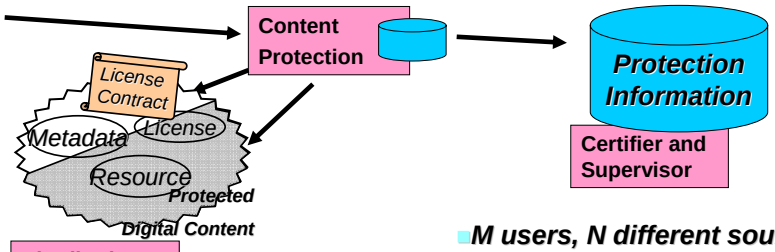
- Pros:
  - Simple distribution
  - P2P supported
- Cons:
  - 3 servers
  - Many Licenses

- M users, N different source objects:
  - P N Objects protected only once
  - P N protection info
  - L M*N licenses maximum since each of them may be interested to have all objects

Production of Governed Objects



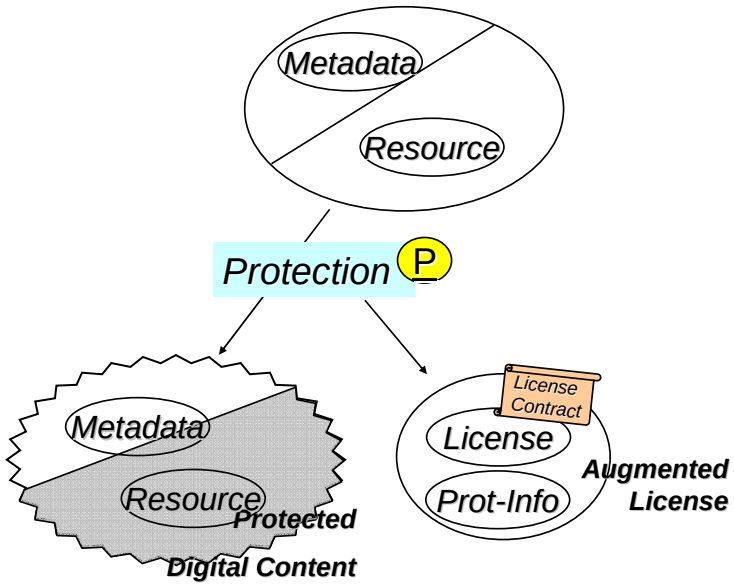
General Architecture of content business



- Pros:
  - Simple distribution, 2 servers
- Cons:
  - P2P non supported
  - Too many different objects, too much space

- M users, N different source objects:
  - P Max N*M Objects protected, that is for all the N Objects M different protected-licensed versions have to be produced
  - P N*M protection info

Production of Objects and Augmented License



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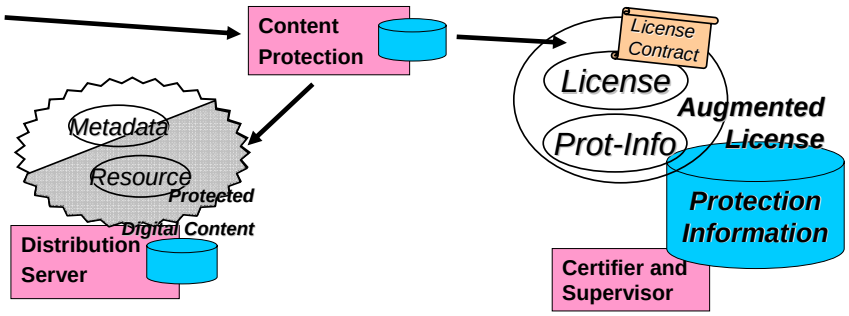
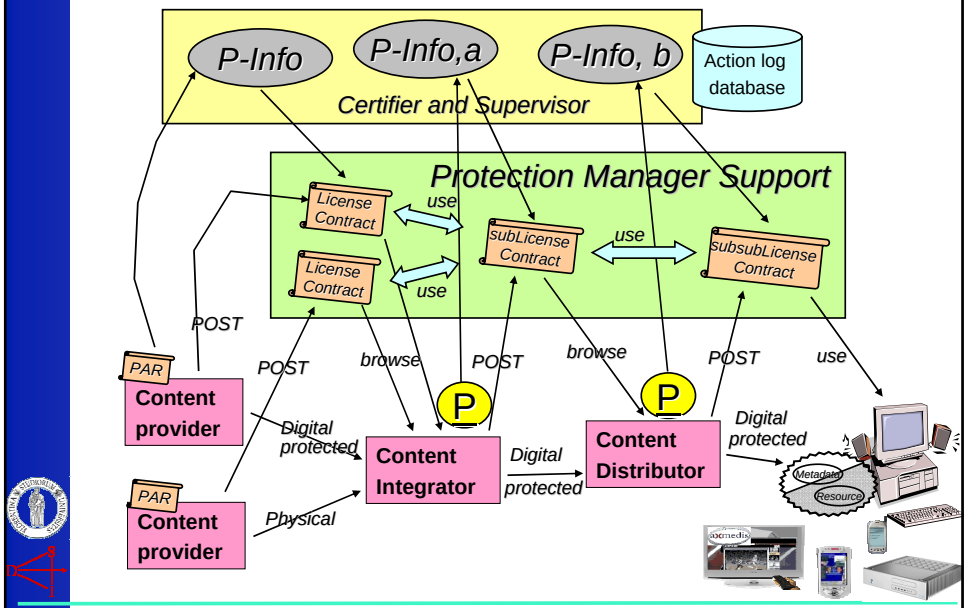


- **Pros:**
  - **Simple distribution, 2 servers**
  - **P2P supported**
- **Cons:**
  - **Many information outside**
  - **Diff users have the same protection inform**

- **M users, N different source objects:**
  - **N Objects protected**
  - **N protection information**
  - **N*M protection info included into licenses**

Managing License Chain in AXMEDIS



Super Distribution Concepts

- **What is intended**
  - 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 Protection Information, while the License can be in the object or not
  - *A Solution in which the Certifier and Supervisors and/or the device are capable of detecting violations thus activating some recovering activity*

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- **Protection Information**
- **Protection, low level technologies**
- **Supervision, Control**
- **Example of Architectures**

Multichannel Problems

- **Different channels means:**
  - Different formats to be produced
    - Different content type: video, audio, multimedia, etc.
  - Need of Content on demand ??
    - Needs of Real Time Adaptation
  - Large number of final user devices, need of profiling for users and devices with channel
  - Different methods for payments
  - Different methods of delivering
  - Different business and transaction models
  - Need of interoperable DRM

Limitations of Present DRM solutions

- **DRM is typically added only in the Integration or distribution phases**
  - **DRM is seen mainly for B2C**
    - Added by distributors
    - Owners demand to producers
    - Producers demand to integrators or distributors
    - Some 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 multichannel, no convergence**
    - no interoperability of content
    - Partially solved producing content in several formats for several channels and terminals, very complex and expensive
  - **Large Limitations for the final users**
  - **Limitations for the business and markets**

Present Needs for Accessing New Markets

- **Needs of Interoperable Content that may Migrate from**
  - one terminal to another
  - one user to another
  - one channel to another
  - etc.
- **Transcoding/Adaptation problems**
  - Content is packaged
  - Content is protected
  - Content contains several type 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

Present Needs for Accessing New Markets

- **DRM models supporting different:**
  - Business models: pay per play, subscription, etc.
  - Payment methods: fixed or dynamic price, etc.
  - Delivering models: streaming, download, broadcast, P2P, etc.
  - Assigned rights: fixed or dynamic rights assigment
- **Interoperable DRM:**
  - Migrazione di contenuti protetti fra canali e terminali che supportano DRM diversi
    - license Interoperabili, interscambiabili, traducibili
    - Architettura DRM interoperabile, interscambiabile
- **Massive processing and GRID architectures for**
  - Content production/adaptation
  - Transcoding/adaptation platforms for distribution
  - Processing of rights, solving license chains
    - for managing information related to rights

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B2B Rights Management

- **Advantages of B2B DRM**
  - Automation of contract-based deals
  - usage metering
  - User Demographics compilation
  - Allowing integration
  - Try and buy
  - Free try for Business users
- **P2P distribution**
  - sharing of content
  - lower costs to access content
  - Lower costs to promote/distribute content
  - Increment of accessible content

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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 or as unified elements
  - typically concluded with the emission of a **Certificate**
- **Certificate:**
  - typically Hidden in the computer/device hosting the terminal
  - Contains:
    - the Unique ID
    - One or more Passwords for establishing protected communications and thus to proof the authenticity of the User/Device/Terminal/Tool during transactions

Certification and verification

- **Certification and Verification is the process:**
  - In which an authenticated User/Device/Terminal/Tool is confirmed to be still valid
  - 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.

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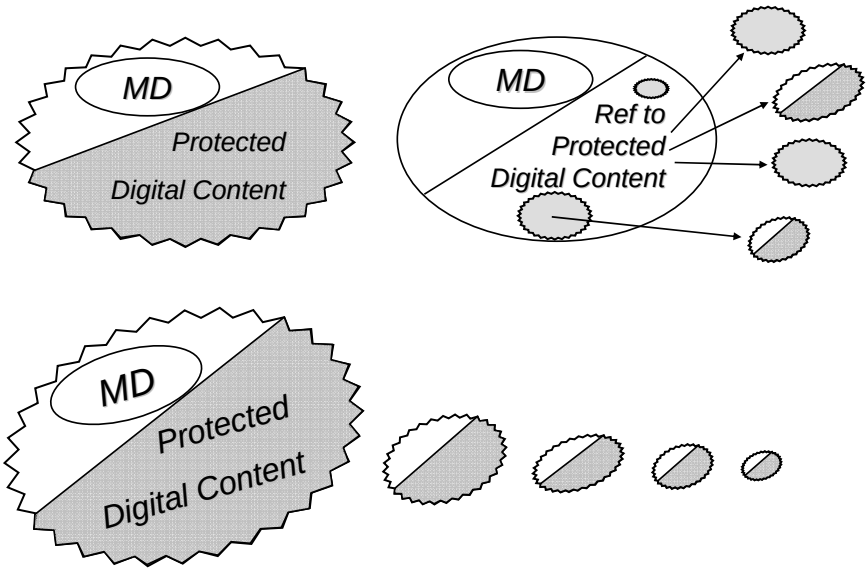
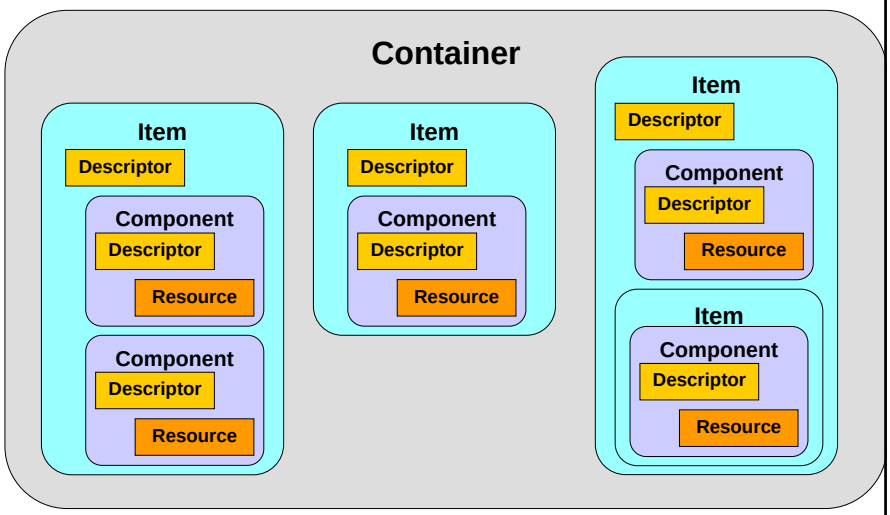
Content representation



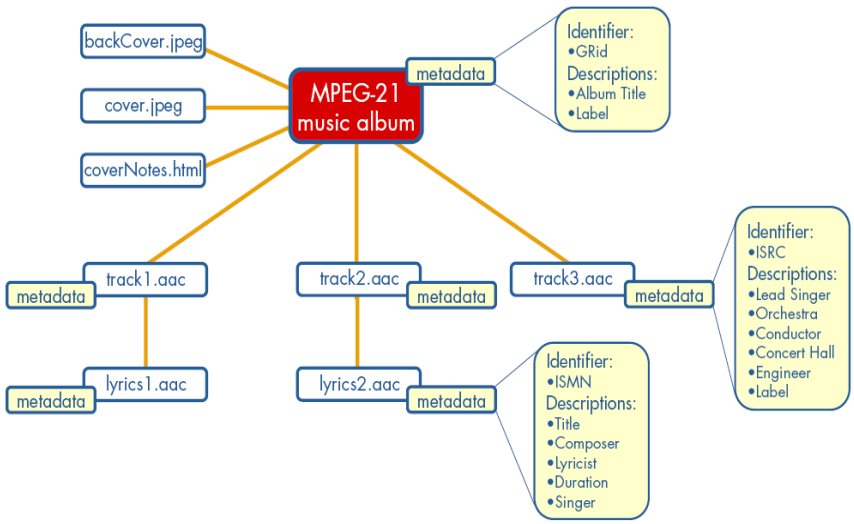
Possible Solutions

- **Packaging**
  - MPEG-21:
    - DID: Digital Item Declaration
    - DII: Digital item Identification
    - XML, binarization
    - DIA: Digital Item Adaptation
    - Any digital resource
    - IPMP
  - SCORM
    - Mainly on educational content
  - WEDELMUSIC
    - XML
    - Only download
    - Package compress and protected
    - Any digital resource
  - OPENSKY Package
    - …

Digital Item Declaration example



DII example: MPEG-21 music album



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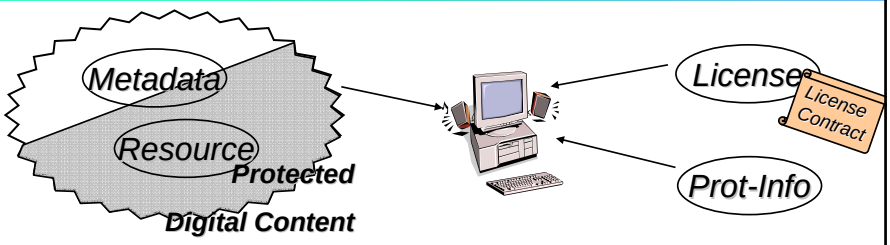
License Definition and Processing 1/2

- 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/it 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 you need the license to know what you can do on it, which Right you have acquired**
- **On the License you can get a reference to the Protection Information that for each Right and Resource provide the information to Unprotect the object**
- **During all these phases the Device can be verified with its SW, HW, users, etc.**
- **Similarly if the Object is Governed (if the license is included into the object)**
- **License and Protection Information are typically located in external and remotely located Servers that are called Certifier and Supervisors**

Additional features and security issues

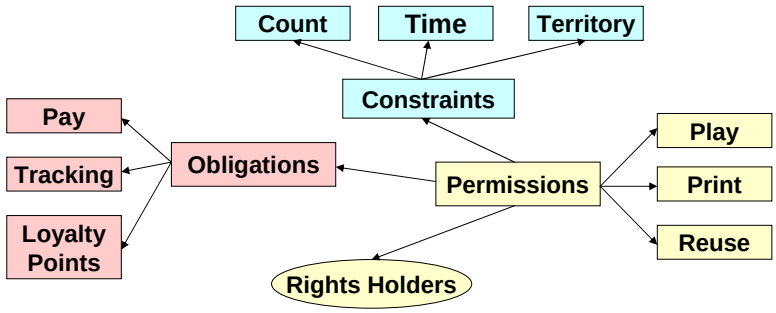
- **The devices and the Servers providing License and/or Protection Information may have algorithms and tools for**
  - detecting infringement and violations
  - Counting the usage, for instance how many times a music piece has been played, how many print out have been produced, etc.
    - ➔Dynamic definition of price for example…
  - Collecting every event for further reporting
  - etc..
- **Thus black lists of License, Objects, Devices, Users have to be managed**

License formal language

- **MPEG-21:**
  - REL: Rights Expression Language
    - ➔Derived from XrML
  - RDD: Rights Data Dictionary
- **XrML 2.0: eXtensible rights Markup Language**
  - http://www.xrml.org/
  - General purpose
  - ContentGuard, Nov. 2001, Microsoft
  - Derived from DPRL
- **OMA ODRL: Open Digital Rights Management**
  - Expression language for mobiles
  - Simpler than MPEG REL
  - ..

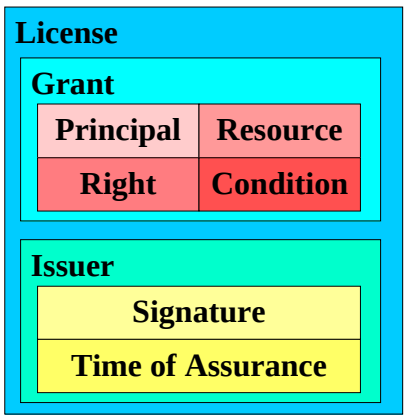
Rights Expression Model

- **Rights expressions should consist of:**
  - *Permissions*: what you're allowed to do
  - *Constraints*: restrictions on permissions
  - *Obligations*: what you have to do/provide/accept
  - *Rights holders*: who is entitled to what



MPEG-21 REL License

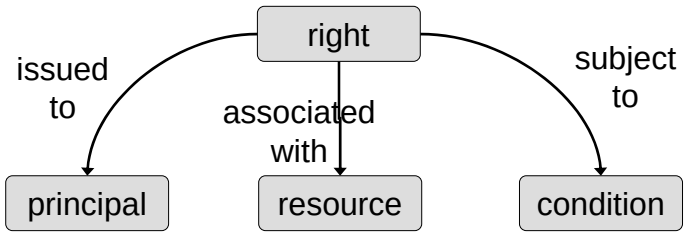
- **The basic MPEG-21 REL element is the license.**
  - one o more grants,
  - the license issuer, that gives the grants that the license contains, and
  - additional administrative information



MPEG-21 — REL, Rights Expression Language

- A machine-readable language, XML
- To declare rights and permissions
- Uses terms defined in the Rights Data Dictionary
- REL consists of licenses and grants that give specific permissions to Users to perform certain actions on certain resources, given that certain conditions are met
  - Grants can also allow Users to delegate authority to others
- User's system device has to
  - parse and validate the RE
  - check permissions before any further action is done
- DID parser is responsible for discovering and identifying where to gather licenses
- REL licenses are wrapped in Digital Items when the object if governed

REL data model



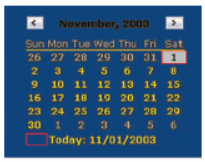
- REL grant consists of
  - principal to whom grant is issued
  - rights the grant specifies
  - resource to which right in grant applies
  - condition to be met before grant can be exercised

REL – Principal and Rights

- **Principal: Party to whom a grant conveys usage rights.**
  - authentication mechanism by which the principal can prove its identity.
  - a principal that must present multiple credentials, all of them must be simultaneously valid, to be authenticated.
- **Right:**
  - Action or activity that a principal may perform using a resource under some condition.
- **Resource:**
  - Object to which the principal can be granted a right.
- **Condition:**
  - Terms under which rights can be exercised.

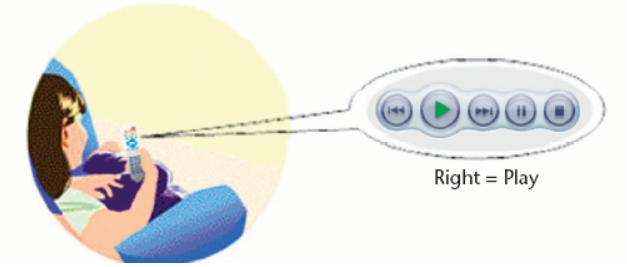
- **MPEG REL provides a right element to encapsulate information about rights and provides a set of commonly used, specific rights, notably rights relating to other rights, such as issue, revoke and obtain. Extensions to MPEG REL could define rights appropriate to using specific types of resource. For instance, the MPEG REL content extension defines rights appropriate to using digital works (e.g., play and print)**

An example of statement



Condition = November 2003

Resource = Ocean Wilds



Right = Play

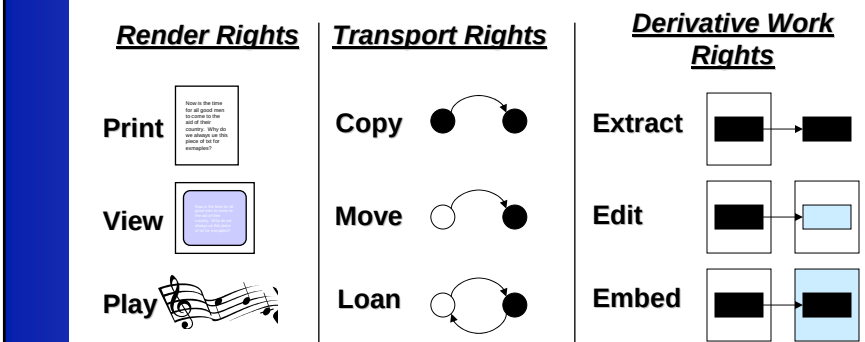
- Rosy can Play 3 times the Ocean Wilds in November 2003.

Possible values for terms

- Principal
  - AllPrincipals and KeyHolder
- Rights
  - Issue, Obtain, PossesProperty and Revoke
- Resources
  - DigitalResource, Revocable and ServiceReference
- Conditions
  - AllConditions, ExerciseMechanism, ExistsRight, Fullfiler, PrerequisiteRight, RevocationFreshness, ValidityInterval
  - CallForCondition
  - ExerciseLimit
  - FeeFlat
  - FeeMetered
  - FeePerInterval
  - FeePerUse
  - FeePerUsePrePay
  - SeekAproval
  - Territory
  - TrackQuery
  - TrackReport
  - TransferControl
  - ValidityIntervalFloating
  - ValidityIntervalStartsNow
  - ValidityTimeMetered
  - ValidityTimePeriodic

- **Examples of Rights**
  - Adapt
  - Delete
  - Diminish
  - Embed
  - Enhance
  - Enlarge
  - Execute
  - Install
  - Modify
  - Move
  - Play
  - Print
  - Reduce
  - Uninstall

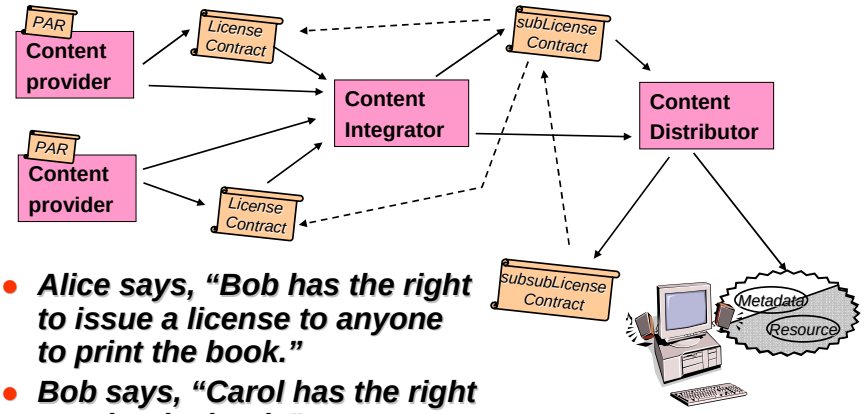
Rights Models: Types of Rights



MPEG-21 Part 6 — Rights Data Dictionary

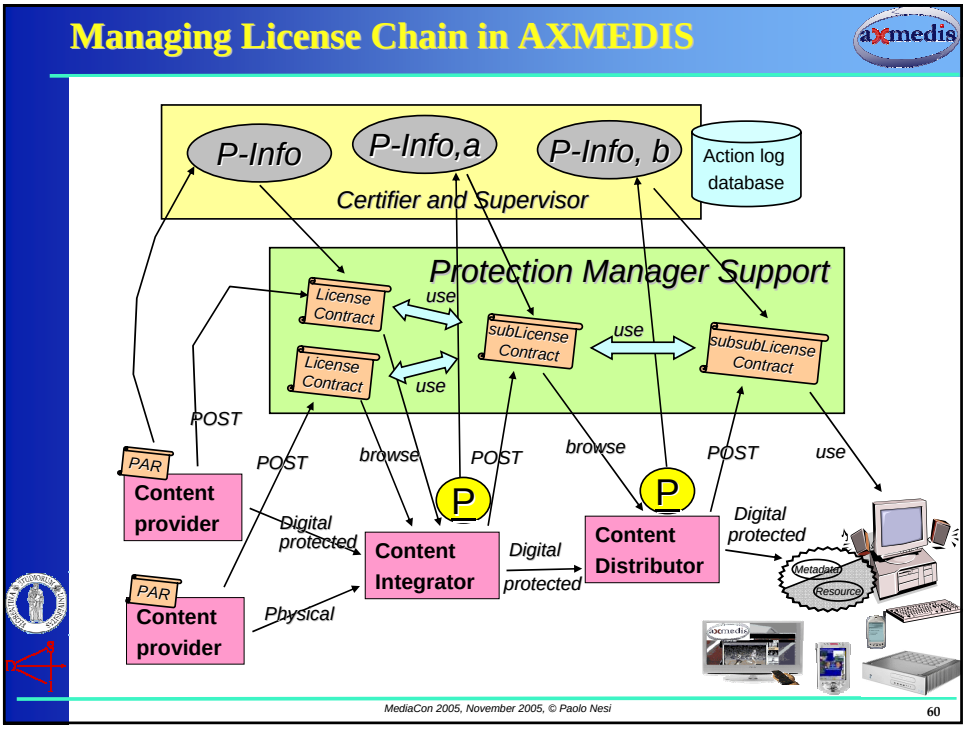
- Set of clear, consistent, structured, integrated and uniquely identified Terms to support REL
- Specification of dictionary structure and methodology to create dictionary
- Dictionary is prescriptive, inclusive, and has audit provisions
- Legal definitions are mapped from other Authorities
- Supports mapping & transformation of metadata from terminology of one namespace (or Authority) into that of another namespace in automated or partially-automated way
- Dictionary is based on a logical model, the Context Model, which is the basis of the dictionary ontology

Managing License Chain



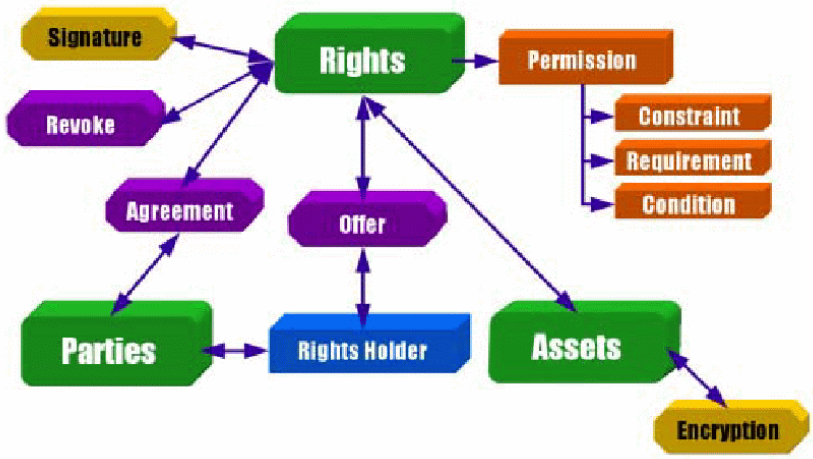
- *Alice says, "Bob has the right to issue a license to anyone to print the book."*
- *Bob says, "Carol has the right to print the book."*
- To solve the SubSubLicense al the connected Lincenses are needed
- They have to be accessible on Processing Engine
- This may involve massive processing

Managing License Chain in AXMEDIS



Open Digital Rights Language (ODRL)

- http://odrl.net/
- by R. Iannella, specification version 1.1 freely available



Prof. Paolo Nesi, nesi@dsi.unifi.it

OMA DRM – Stakeholders

- **OMA DRM is developed by the entire mobile value chain for the mobile industry**
  - Content Providers
  - Information Technology Companies
  - Mobile Operators
  - Wireless Vendors
- **About 50 Companies participating in monthly meetings and weekly conference calls**
- **Consolidated from DRM standardization at 3GPP, WAPForum etc.**
- **Liasons created with industry organizations such as MPEG, RIAA, 3GPP, etc.**

ODRL viz 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.

ENTITY	ODRL	MPEG-21 REL
Subject	Party	Principal
Object	Asset	Resource
Right (action)	Permission (Right)	Right
Condition (terms)	Constraint (Right)	Condition

Summary

- Digital Rights Management
- DRM and the value chain
- DRM and the Content Elements
- Limitations and Needs
- Authentication and certification
- Content Packaging
- License definition and processing
- Protection Information
- Protection, low level technologies
- Supervision, Control
- Example of Architectures

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 and streaming
  - References to other IPMP models and information
    - for example into an MPEG-21 object MPEG-4 IPMPX are included
  - Etc.

Protection information Model

- **MPEG-21: Intellectual Property Management and Protection, IPMP**
  - The means to enable content to be persistently and reliably managed and protected across a wide range of networks and devices

Summary

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Different Levels of Protection

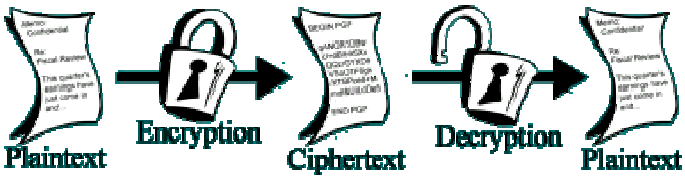
- **System Security**
  - Authentication, Password
  - Access Control
    - Access rights for (object, people, location, time)
  - Auditing, Event logging
- **Data Security**
  - Encryption
  - Fingerprinting
  - Watermarking
  - Rights enforcement
    - For enforcing embedded rights information
- **Network Security**
  - Protected protocols
  - Preventing the access via communications

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.
- **Watermark**
  - Hiding into the digital resource some information, transforming the digital resource
- **Fingerprint**
  - Estimating a code (may be unique) from the digital resource data

Encryption, Cryptography

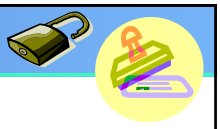
- **Symmetric: 1 key**
  - Ex: DES, AES, …
  - Key management (secret sharing)
- **Asymmetric: 2 keys (public, private)**
  - Ex: RSA, …
  - Public key cryptography



Watermark

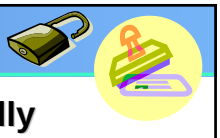
- **What is the watermark (also called steganographic)**
  - a technology to embed an information in the content: image, video, text, audio, etc
- **Which information is watermarked:**
  - Object ID
  - Owner ID
  - Distributor ID
  - Eventual coding of the license (governed object)
  - Etc.
- **Once read it can be used**
  - to hide IDs to demonstrate the ownership of the content
  - To hide a sort of license

Watermark features



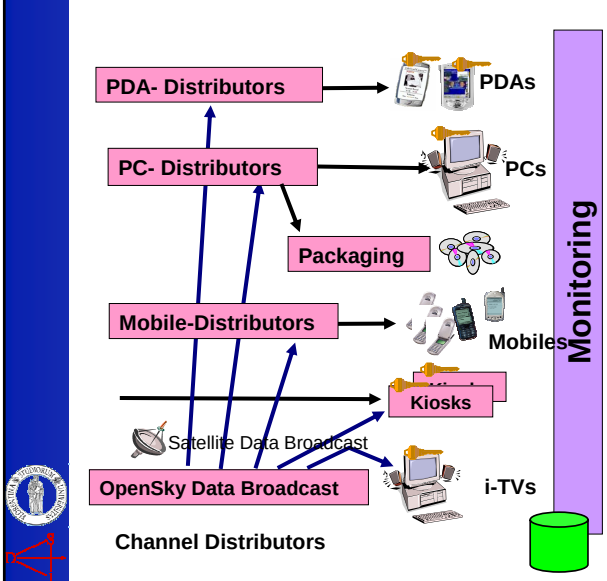
- **Transparency: visible, invisible**
- **Robustness: tolerance to attacks**
  - Adaptation, DA-AD
- **Capacity: amount of information embedded**
- **Blindness: reference to the source image Hidden or visible**
- **Removable or not:**
  - when it is separable from the digital resource obtaining the original digital resource
- **Single of multiple:**
  - when more than one WM is present
- **Readable**
  - by all or only by the owner: when there is not need to have a special key/parameters to read it
  - with an absolute certainty or with some statistical confidence
  - To be estimated during streaming
- **Etc.**

Usage of Watermark



- **Content Producers/Distributor typically watermark the content (images, audio, video, etc.)**
- **Content integrators and distributors are informed and may add one more watermark with their code or reference**
- **End users are not aware about that, if it is undetectable is easy**
- **The terminal may or may not be capable to read it**

Usage of Watermark



- **Then Content Owners, may monitor**
  - distribution channels
  - published content collection
  - Etc.
- **Reading the WM**
  - To detect the passage of their content
  - To verifying the presence of violations of IPR

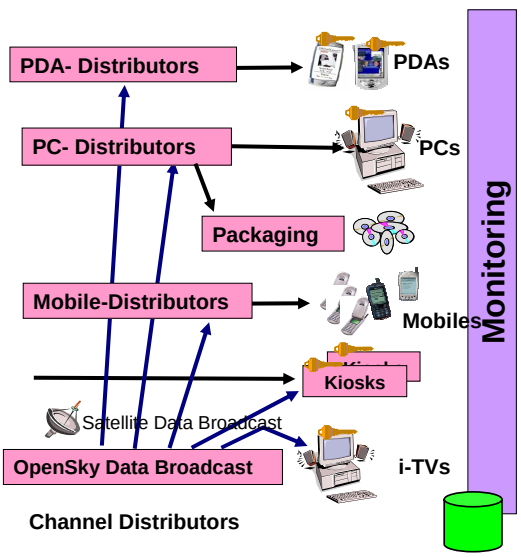
Fingerprint and descriptors

- **What is the Fingerprint**
  - It is an ID-code estimated on the digital content or resource that present in practical an high probability to be unique for that content with respect to other similar content
  - To make the recognition of the digital content possible
    - Indexing into the database
- **FP as a high level content descriptor**
  - Resources
    - Audio: Rhythm, tonality, duration, genre, etc.
    - Video: number of scenes, description of the scene, etc.
    - Text: main keywords, summary, topics, etc.
  - Collected as MPEG-7 descriptors
  - Vectors of those features, etc.
  - Independent on the resolution, format, etc.
  - May be Computationally intensive
  - Etc.

Fingerprint Features

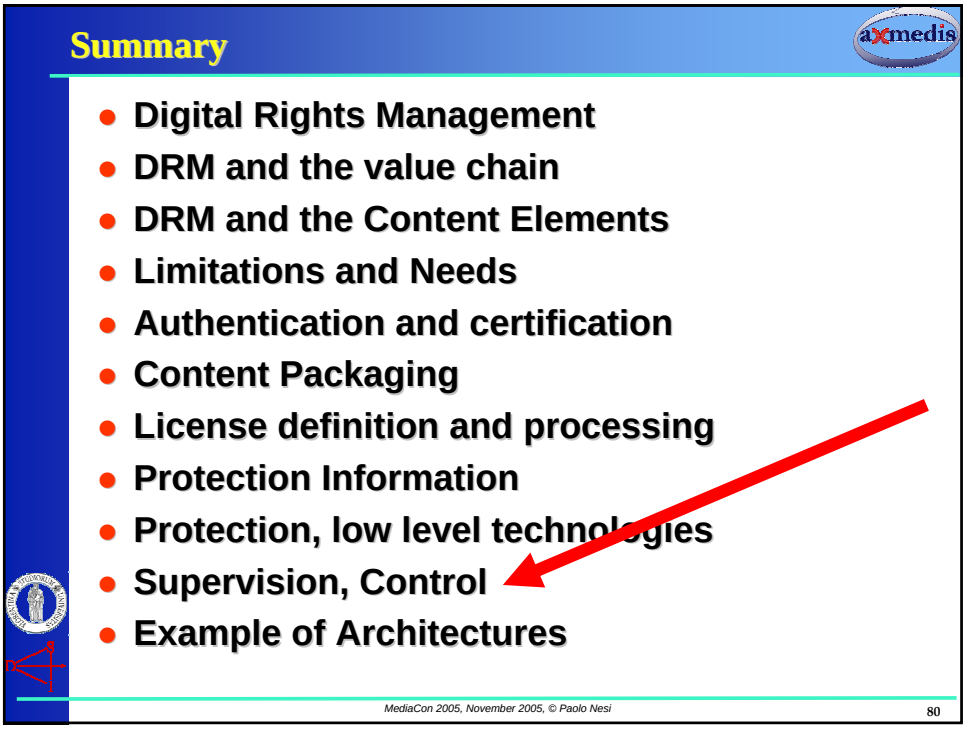
- **Features:**
  - Never included with the content if its aim is the usage for content protection
  - Included in the content (package) only if it is used as content descriptor
  - Robust to adaptation processing: Scaling: time, space, color, etc.
  - Short and concise
  - Repeatable
  - Light to be estimated
    - ➔ estimable during streaming, on the basis of a short duration of the content streaming
  - Robust to eventual watermark addition
  - Etc.
- **Typically more computational intensive with respect to WM:**
  - The WM code is read/extracted from the content
  - The FP code has to be estimated from the content

Usage of Fingerprint



- **Then Content Owners, may monitor**
  - distribution channels
  - published content collection
  - Etc.
- **To detect the passage of their content by**
  - estimating in real time the fingerprint the
  - searching into the database

Summary



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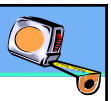
Supervision and Control about Rights Exploitation



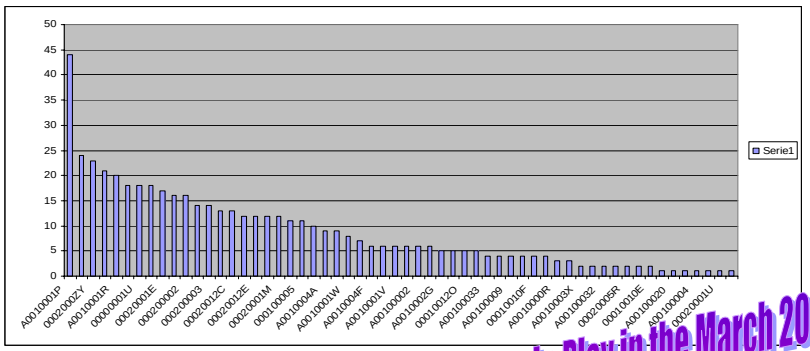
- **To:**
  - Collect Events/Actions
  - certify the trusting level of the Tool/Device/Terminal
  - Allow the implementation of black lists for Tools/Devices/Terminals
- **Events/Actions collection to**
  - provide the evidence about the exploitation of rights
  - provide the billing information to the final user
  - provide the statistical information about the exploitation of rights to: content owners, producers, collecting societies, distributors, etc.
- **MPEG-21 Event Reporting**
  - Specifies how to express ER-Request and Event Report and how they are represented as digital item

Problems for digital convergence

- **Limitations**
  - Present solutions are mainly based on the unification of Supervision and Control Server (CS) with the License Server (LS)
- **Issues**
  - CS collects the events/actions performed by the users and allow the authentication and certification
  - LS collects the licenses and process the grants
  - If the Protection Information is contained into the License CS and LS can be the same Server, in the other cases NO
- **Interoperability and multichannel**
  - Several CS and LS
  - Some of the activities have to be guaranteed by a superpartes authority

Event reporting

- **Single traces**
- **Statistical data for reporting and analysis**

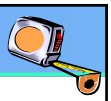


Distribution of exploited objects in Play in the March 2005

Reporting, accounting manager and tool, examples

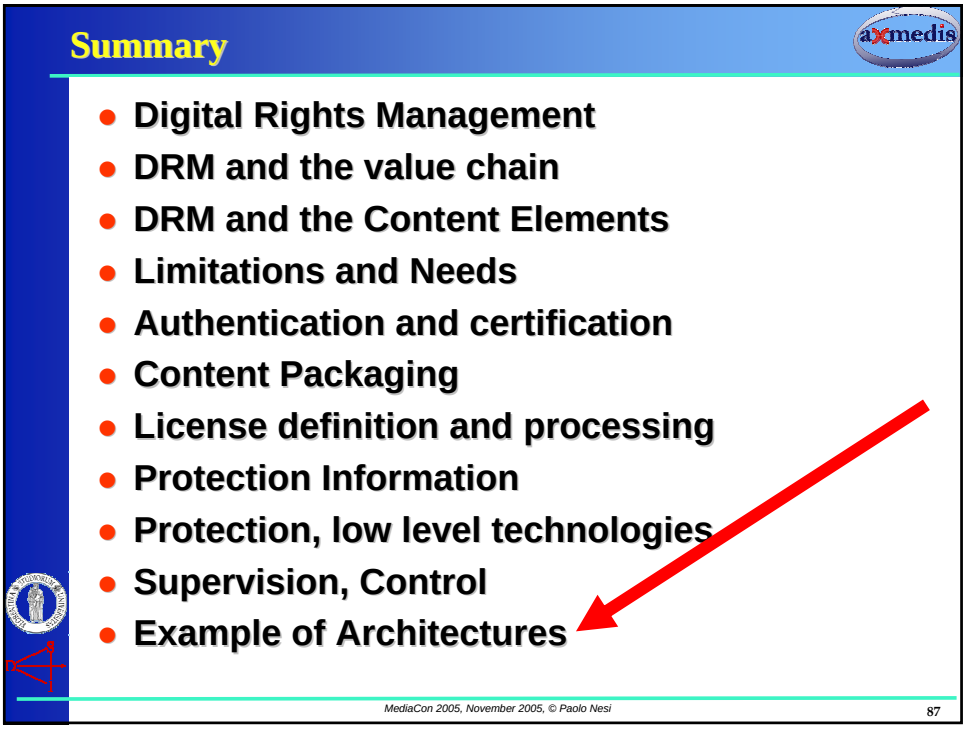
- **Reporting to Distributor**
  - Each exploited right with references to the User-ID for each distributed object (objects that contains its Dist-ID)
- **Reporting to the Integrator/creator**
  - Who create new object from other objects of from scratch
  - The number of exploited rights for each object 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

MPEG-21 Part 15 — Event Reporting



- **Standardise information for all reportable events in MPEG-21;**
- **Provide a means of capturing and containing these metrics and interfaces that refers to identified Digital Items, environments, processes, transactions and Users.**
- **Such metrics and interfaces will enable Users to understand precisely the performance of all reportable events within the framework. “Event Reporting” must provide Users a means of acting on specific interactions, as well as enabling a vast set of out-of-scope processes, frameworks and models to interoperate with MPEG-21.**

Summary



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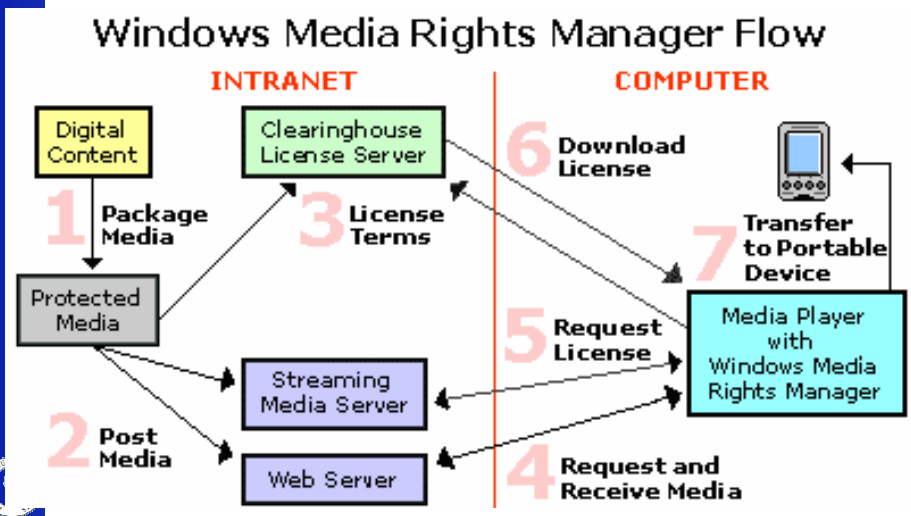
Comments on the prominent technologies

- Microsoft with Windows Media
- AXMEDIS: www.axmedis.org
- Content Guard
  - Owner of XrML, source for MPEG21 REL
  - Owned by Microsoft in large part
- Adobe
  - Mainly for PDF, EBX DRM
- DMDFusion
  - DRM included
- ODRL: Open Digital Rights Language
  - Accepted by OMA, Open Mobile Alliance
- DWS: Digital World Service, BMG
  - ADO2RA DRM

Windows Media Rights Manager



Windows Media Ecosystem

Windows Media viz AXMEDIS

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

Information Society

European Commission

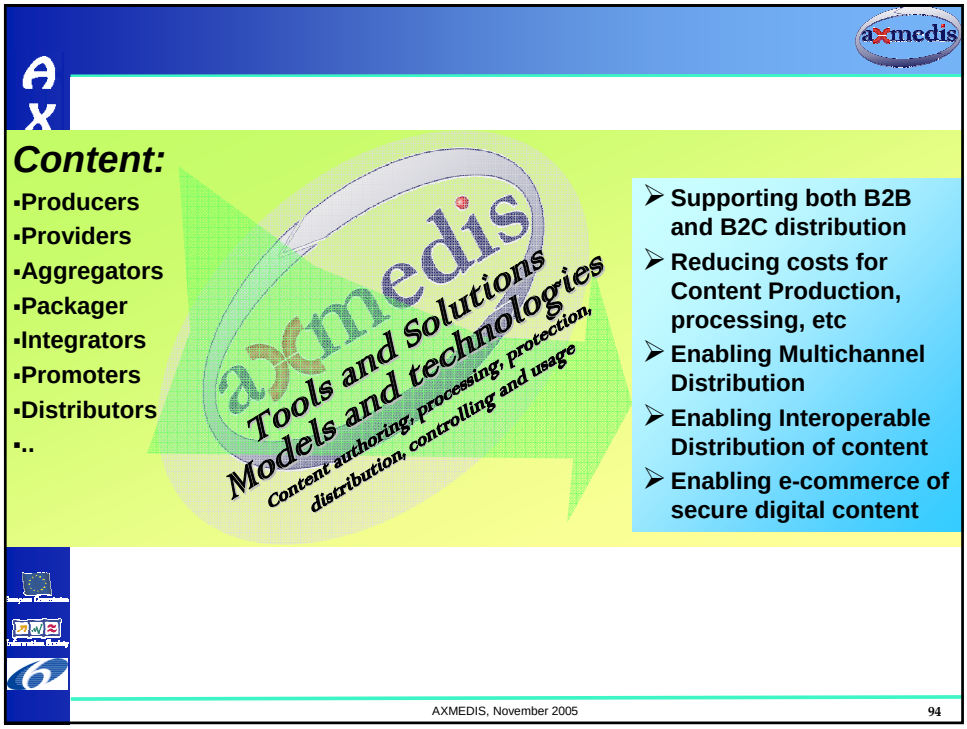
Automating Production of Cross Media Content for Multichannel Distribution

preReview Meeting

www.AXMEDIS.org

22 September 2005, Luxembourg

Ver.:2.8


AX
Content:
▪Producers
▪Providers
▪Aggregators
▪Packager
▪Integrators
▪Promoters
▪Distributors
▪..
axmedis
Tools and Solutions
Models and technologies
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
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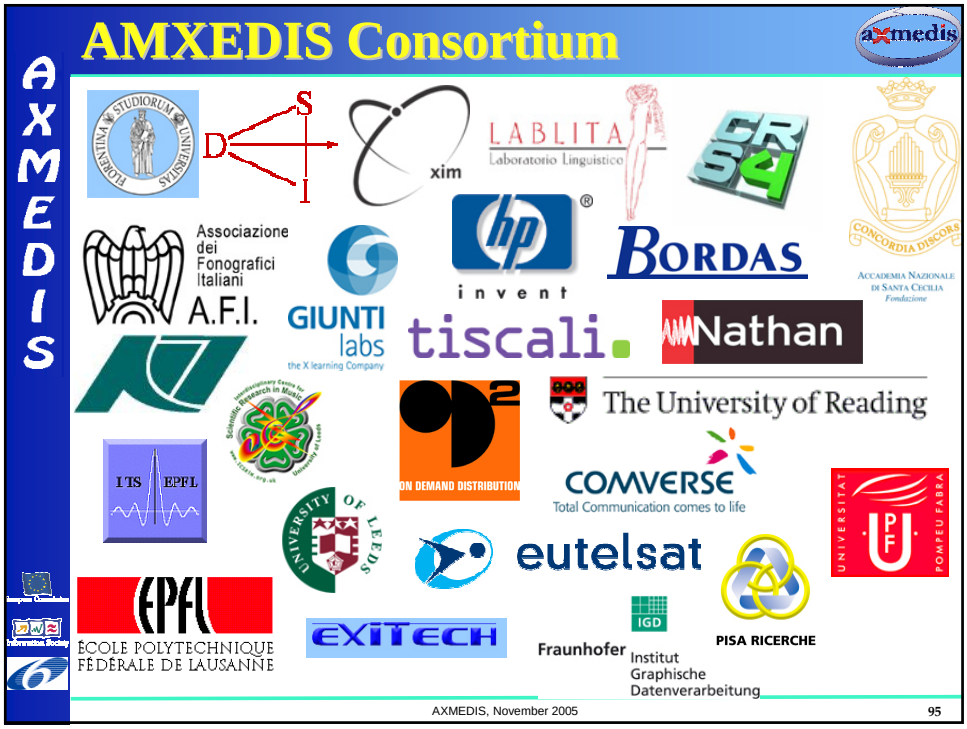
AXMEDIS
AMXEDIS Consortium
xim
LABLITA
Laboratorio Linguistico
CR S4
Associazione dei Fonografici Italiani
A.F.I.
GIUNTI labs
the X learning Company
tiscali
Nathan
BORDAS
invent
The University of Reading
COMVERSE
Total Communication comes to life
ON DEMAND DISTRIBUTION
ITS EPFL
eutelsat
EXITECH
Fraunhofer
Institut Graphische Datenverarbeitung
PISA RICERCHE
ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE
AXMEDIS, November 2005
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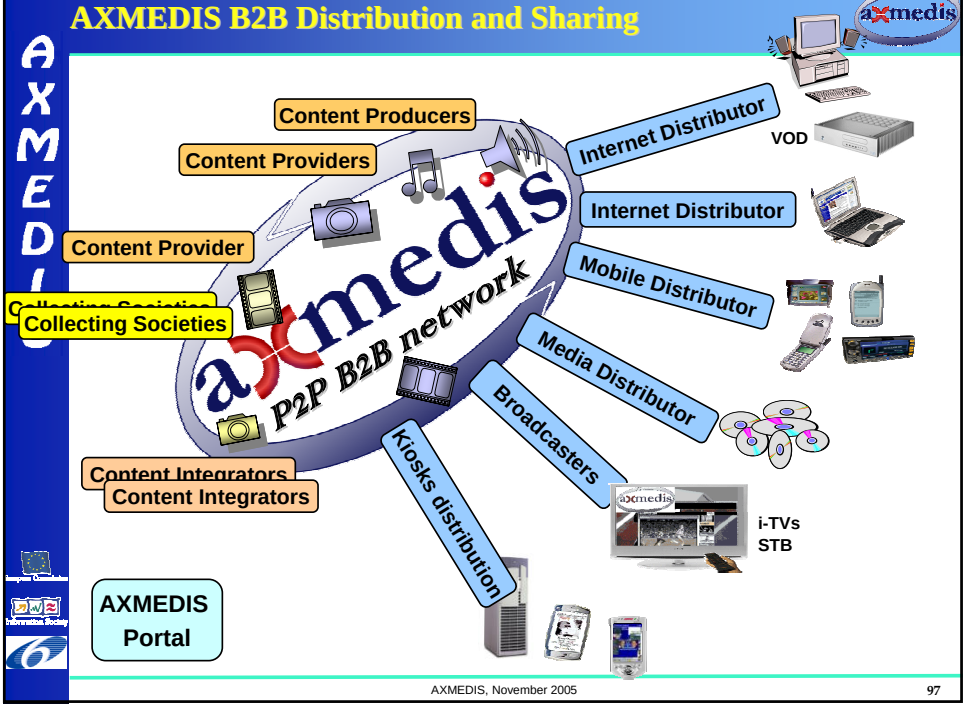
Main general Objectives

AXMEDIS

- Produce and distribute cross media content in protected manner, integrating B2B and B2C sides
- Allowing the content distribution and collaborative production at B2B level
- Create a unified European platform for content distribution in terms of DRM and interoperability
- Increase accessibility to the European audio visual content for its exploitation for entertainment, valorization, etc.

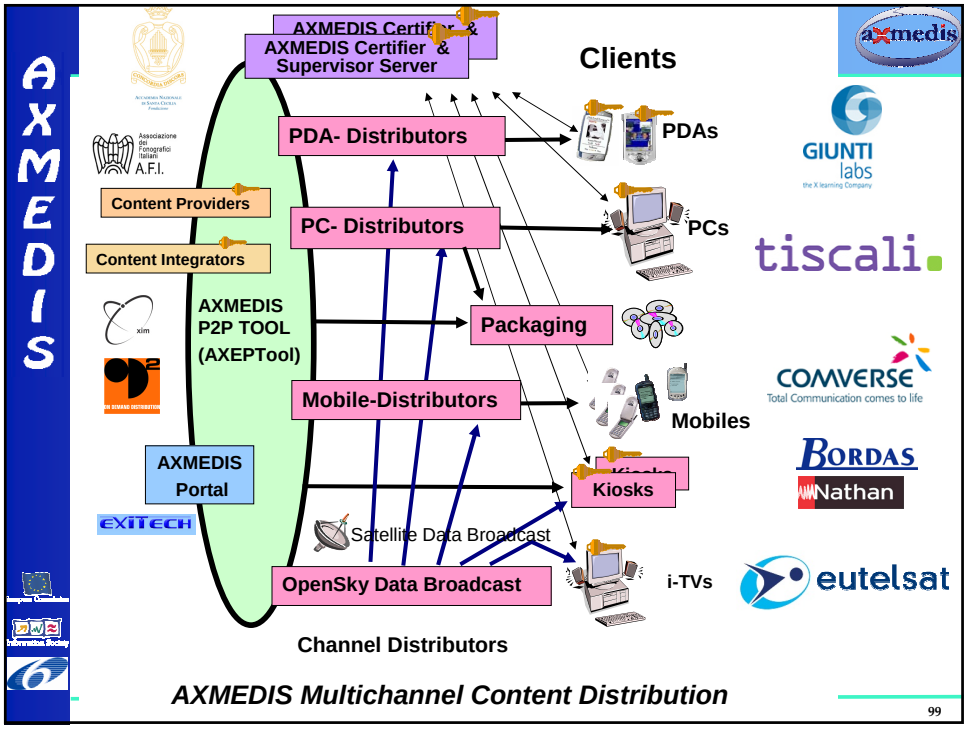
AXMEDIS B2B Distribution and Sharing



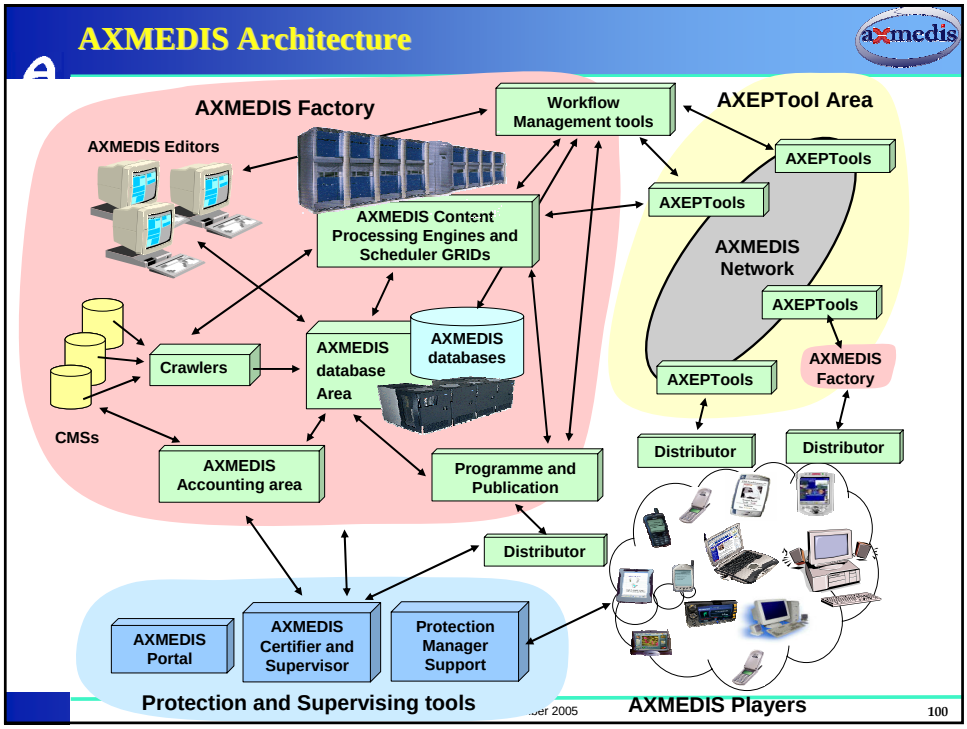
Main technical Objectives

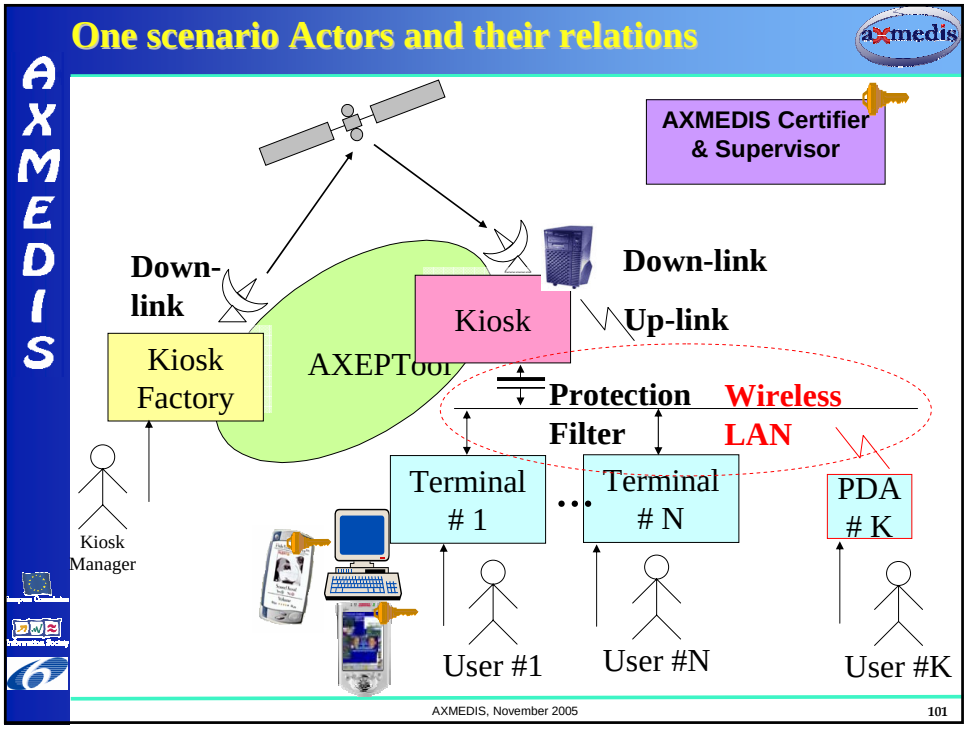
AXMEDIS

- reducing costs for content production and management by applying innovative techniques to content creation, representation (format) and workflow;
- reducing distribution and aggregation costs in order to increase accessibility with a Peer-to-Peer (P2P) platform at Business-to-Business (B2B) level, which can integrate content management systems and workflows;
- developing and providing new methods and tools for innovative and flexible Digital Rights Management (DRM), including the exploitation of MPEG-21 and overcoming its limitations and support different business and transaction models.
- Integrating present CMSs with AXMEDIS framework and tools
- Creating a technical AXMEDIS framework for all



AXMEDIS Multichannel Content Distribution


AXMEDIS Architecture
AXMEDIS Factory
AXMEDIS Editors
Workflow Management tools
AXEPTool Area
AXEPTools
AXEPTools
AXMEDIS Content Processing Engines and Scheduler GRIDs
AXMEDIS Network
AXEPTools
AXMEDIS Factory
AXEPTools
Crawlers
AXMEDIS database Area
AXMEDIS databases
CMSs
AXMEDIS Accounting area
Programme and Publication
Distributor
Distributor
Distributor
AXMEDIS Portal
AXMEDIS Certifier and Supervisor
Protection Manager Support
Protection and Supervising tools
AXMEDIS Players
100


One scenario Actors and their relations
AXMEDIS Certifier & Supervisor
Down-link
Down-link
Kiosk
Up-link
Kiosk Factory
AXEPTool
Protection Filter
Wireless LAN
Terminal # 1
Terminal # N
PDA # K
Kiosk Manager
User #1
User #N
User #K
AXMEDIS, November 2005
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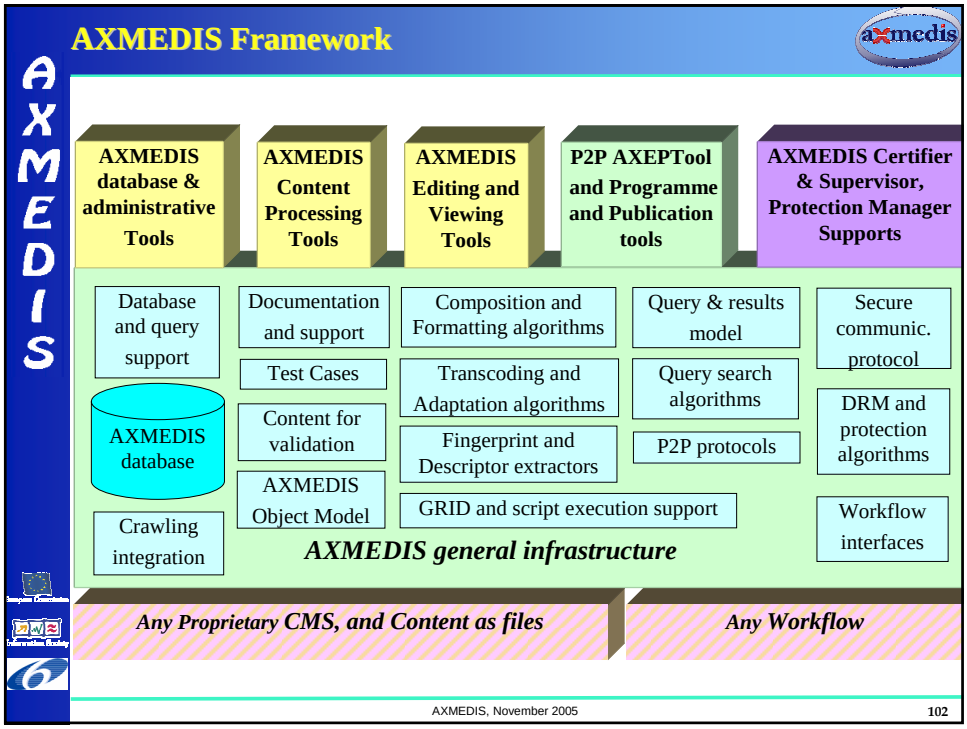
AXMEDIS Framework
AXMEDIS database & administrative Tools
AXMEDIS Content Processing Tools
AXMEDIS Editing and Viewing Tools
P2P AXEPTool and Programme and Publication tools
AXMEDIS Certifier & Supervisor, Protection Manager Supports
Database and query support
AXMEDIS database
Crawling integration
Documentation and support
Test Cases
Content for validation
AXMEDIS Object Model
Composition and Formatting algorithms
Transcoding and Adaptation algorithms
Fingerprint and Descriptor extractors
GRID and script execution support
Query & results model
Query search algorithms
P2P protocols
Secure communic. protocol
DRM and protection algorithms
Workflow interfaces
AXMEDIS general infrastructure
Any Proprietary CMS, and Content as files
Any Workflow
AXMEDIS, November 2005
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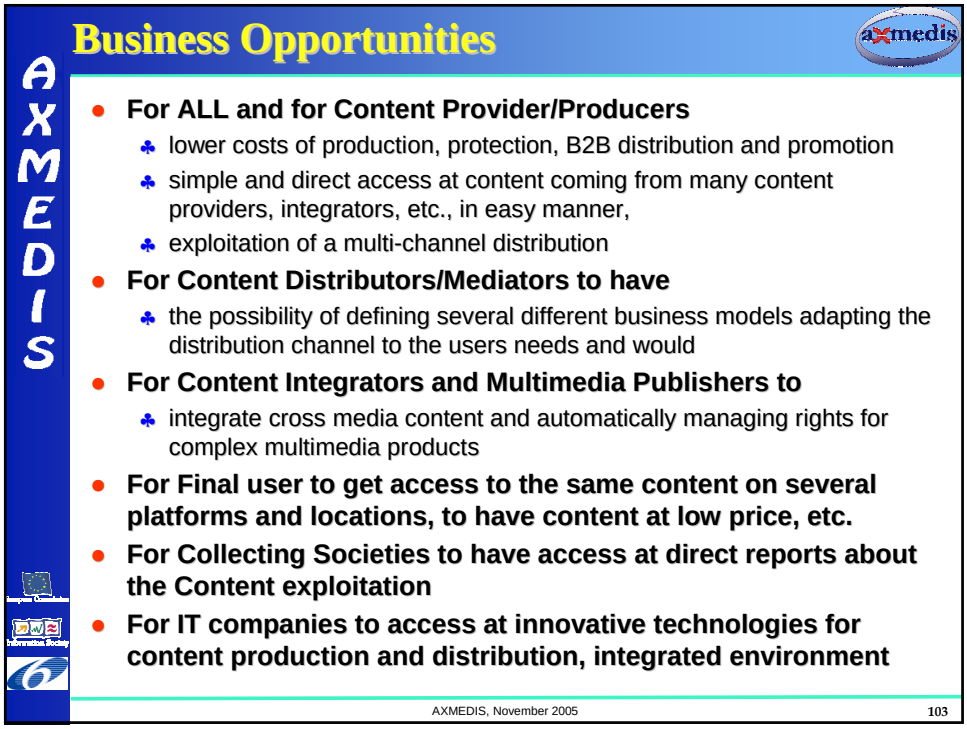
Business Opportunities
For ALL and for Content Provider/Producers
lower costs of production, protection, B2B distribution and promotion
simple and direct access at content coming from many content providers, integrators, etc., in easy manner,
exploitation of a multi-channel distribution
For Content Distributors/Mediators to have
the possibility of defining several different business models adapting the distribution channel to the users needs and would
For Content Integrators and Multimedia Publishers to
integrate cross media content and automatically managing rights for complex multimedia products
For Final user to get access to the same content on several platforms and locations, to have content at low price, etc.
For Collecting Societies to have access at direct reports about the Content exploitation
For IT companies to access at innovative technologies for content production and distribution, integrated environment
AXMEDIS, November 2005
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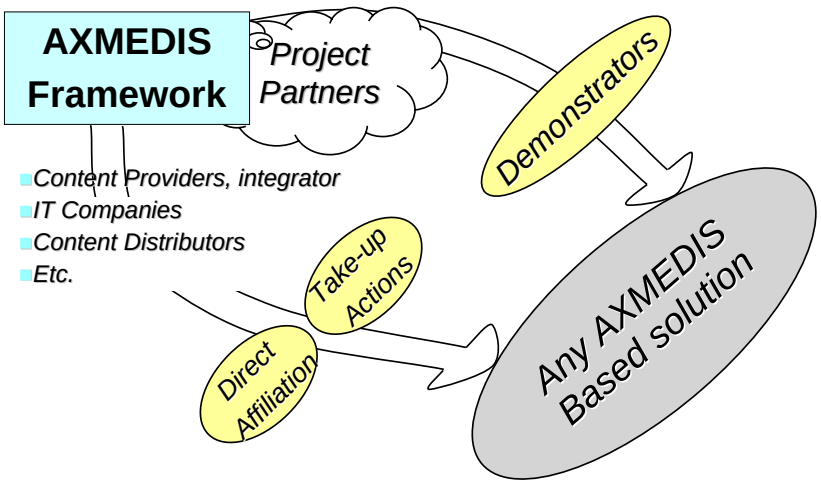
AXMEDIS features

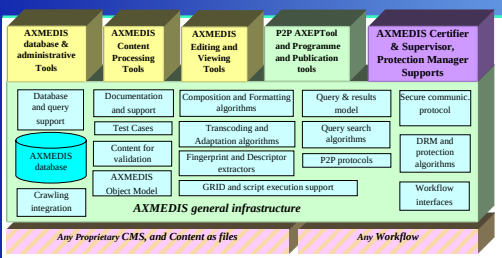
- **Technical solutions related to the above mentioned technical objectives:**
  - Integration with legacy
  - Interoperability of content and DRM, multichannel, etc.
  - Reduction of production costs
  - DRM improvement, tracking of events
  - Innovative technologies in Fingerprinting, modeling, P2P, DRM, authoring, production, etc.
- **AXMEDIS framework for all**
  - European platform for common exploitation of results

AXMEDIS Framework

- **Exploitation of AXMEDIS research and innovation**
- **To guarantee the return of investment**



As the AXMEDIS Framework can be exploited



- **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)

Short Biography of Paolo Nesi

- Full Professor at the University of Florence, Department of Systems and Informatics, and chair of the Distributed Systems and Internet Technology Lab.
- He is working on technologies related to content production, protection, security and distribution since several years: (i) languages and tools for the specification of real time systems by means of interval temporal logic; (ii) metrics and tools for the assessment of software systems; (iii) languages and tools for the co-operative work; (iv) protection and security tools and solutions (IMP, MPEG21, certification of devices, etc), (v) distributed systems, P2P, GRID, etc.; (vi) distributed architectures for automatic control, optimisation, industrial applications, supervision, etc.
- He has been Chair of several international conferences (CSMR'98; CSMR'99; WEDELMUSIC2002), General Chair of IEEE ICSM2001, WEDELMUSIC2001, IEEE ICECCS 2004. He has published more than 170 papers on journals and on conference proceedings.
- He has been the project manager several multipartner international projects (see those in the reference for example), and co-chair of MPEG AHG on SMR, coordinating projects with partner companies and research institutions, such as: AFI, ANSC, BMG RICORDI, EUTELSAT, COMVERSE, CRS4, EPFL, FHG-IGD, GIUNTI, HP, IRCAM, OD2, SEJER BORDAS and NATHAN, SUGARMUSIC, CRS4, TISCALI, Univ, Readings, Univ. Pompeo Fabra, etc.

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AXMEDIS2005 Conference

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Thanks for your attention!