Distribuzione Multicnanale di Contenuti Cross Mediali e Multimediali

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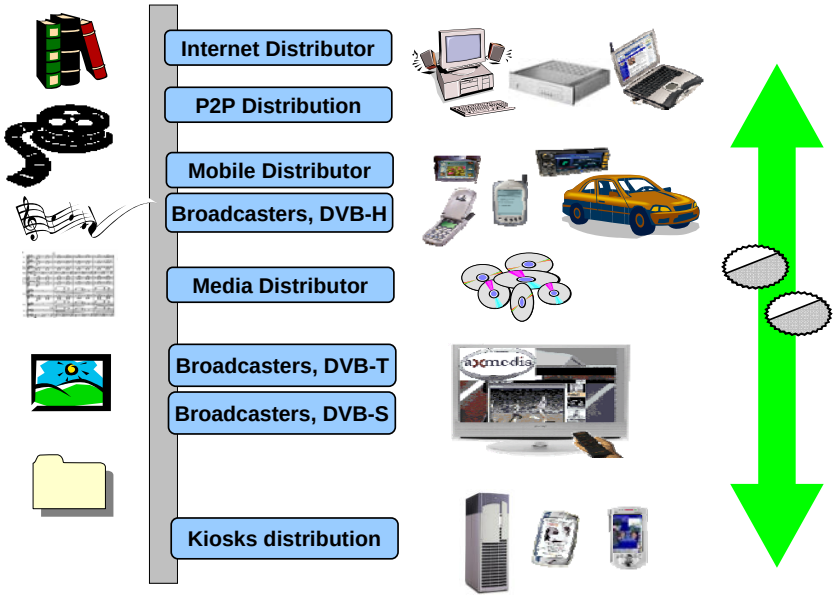
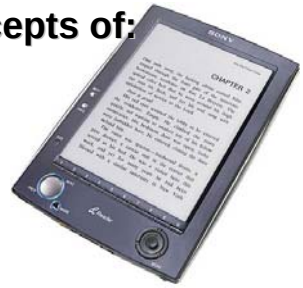
8 Giugno 2007

Convergence, the Interoperable Content



Cross-Media Content

- **Cross-Media content is substantially**
  - a model where digital resources are glued with some XML based document (e.g., HTML, SMIL, SVG, SCORM, MXF, LASER, ….)
  - the latter establishes hyperlinks among them to navigate among them.
- **a generalization of the concepts of:**
  - hypertext
  - e-book, e-literature
  - e-newspaper
  - e-guide
  - electronic school book
  - …



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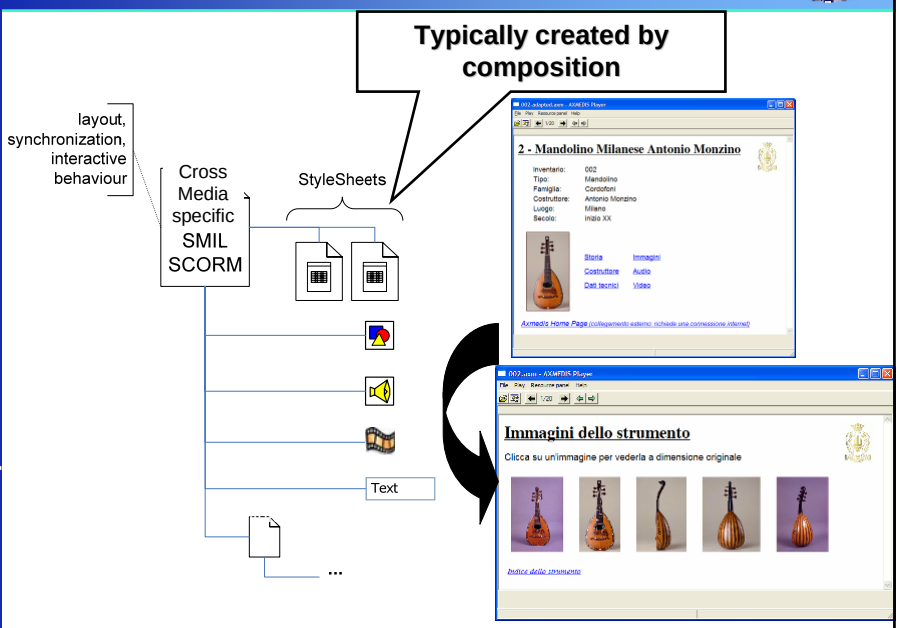
Cross-Media Content



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Why Cross-Media?

- **Cross-media is used in the areas of**
  - educational, edutainment, entertainment, infotainment
  - …
- **Cross-media allows making business delivered in**
  - DVD/CD ROM,
  - HTTP protocol
- **A large number of applications and it is growing**
- **UPT TO Now, they cannot be**
  - Delivered in a single package, shared, streamed
  - Protected
  - Reused as components
- **NEEDS shared among AXMEDIS consortium and other partners of other projects such as IMAESTRO, VARIAZIONI, etc.,**
  - a unified package/format to enable their business
  - about 55 partners with similar requirements

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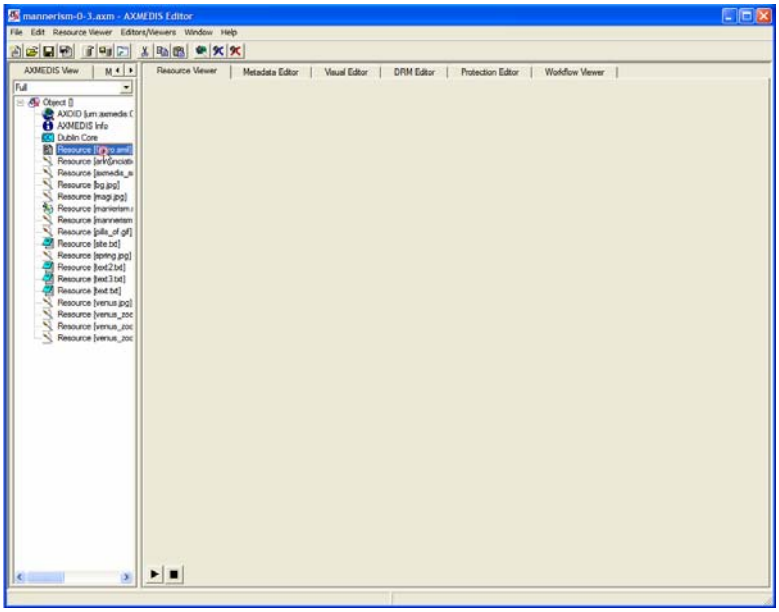
AXMEDIS Editor: an example



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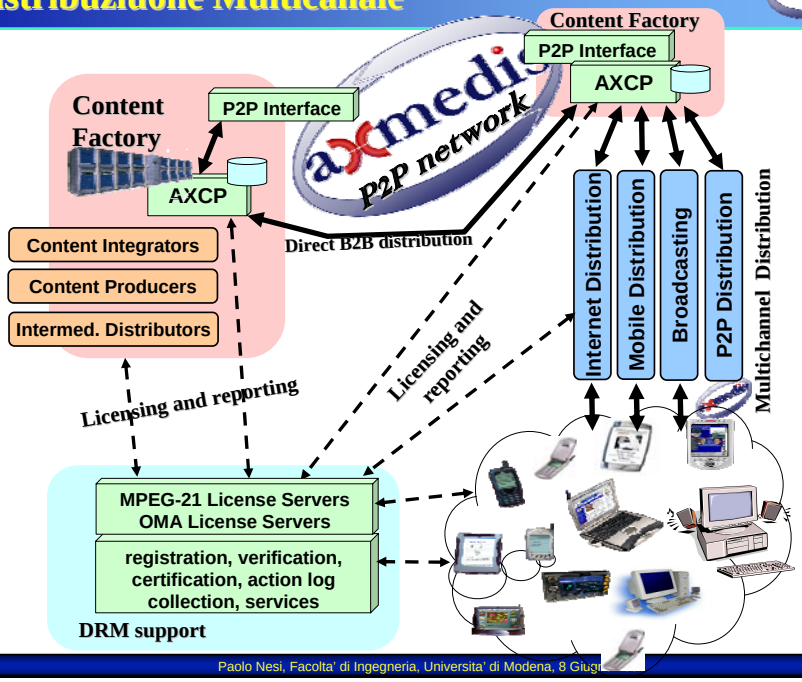
AXMEDIS: is a R&D Integrated project of the EC

- **Perform research on enabling technologies to allow**
  - reduction of distribution and aggregation costs for content production, protection and management
  - using and exploiting new models, methods and tools for content production, protection and distribution
- **Create a unified platform for content production and distribution:**
  - Supporting interoperability among different
    - content formats, cross media and simple resources
    - distribution channels (TV, PDA, mobile, kiosks, broadcasting,..)
    - DRMs (digital rights management) models (e.g., MPEG-21, OMA, Windows DRM, etc.)
  - Supporting massive processing for content production and distribution (on demand), license processing, protection, tracking and DRM, exploitation of legacy CMSs
  - Integration and Harmonization of DRM in B2B and B2C areas
    - Enforcing flexibility in business and transaction models
    - Modeling secure/legal P2P sharing for B2B and B2C
    - Expanding and exploiting MPEG-21 standard

Distribuziuone Multicanale



AXMEDIS Applications

- **Applications of automated content production and protection**
  - Entertainment, edutainment, infotainment, educational, etc.
    - Real-time and non-real-time content distribution
    - Internet, P2P, broadcast, IPTV, mobiles, DVB-T, DVB-S, DVB-H, etc.
  - Other relevant applicative areas are:
    - banking, governmental, military and healthcare
- **Technical solution for**
  - Massive and scalable production of content on demand
  - Content distribution: single and multi-channel
  - Content protection and DRM, tracking and control
  - Content management
  - Content sharing among producers and distributors
  - Content integration and metadata enrichment
  - Etc.
- **AXMEDIS Framework for all**
  - Set up and maintenance of an European Platform for improving the knowledge and tools on e-Commerce of digital goods.
  - Making the AXFW accessible

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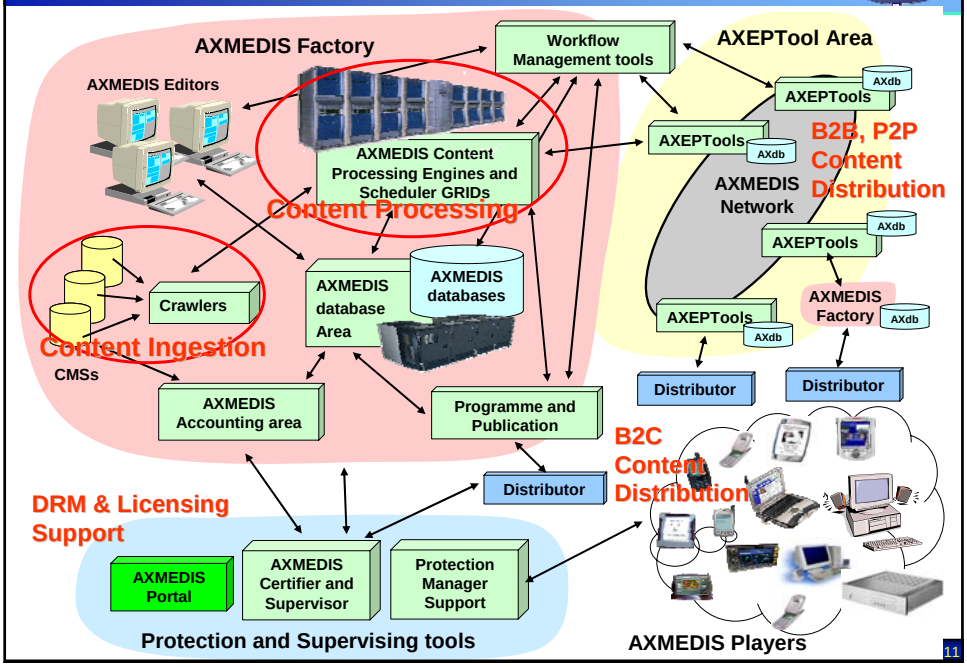
AXMEDIS Architecture

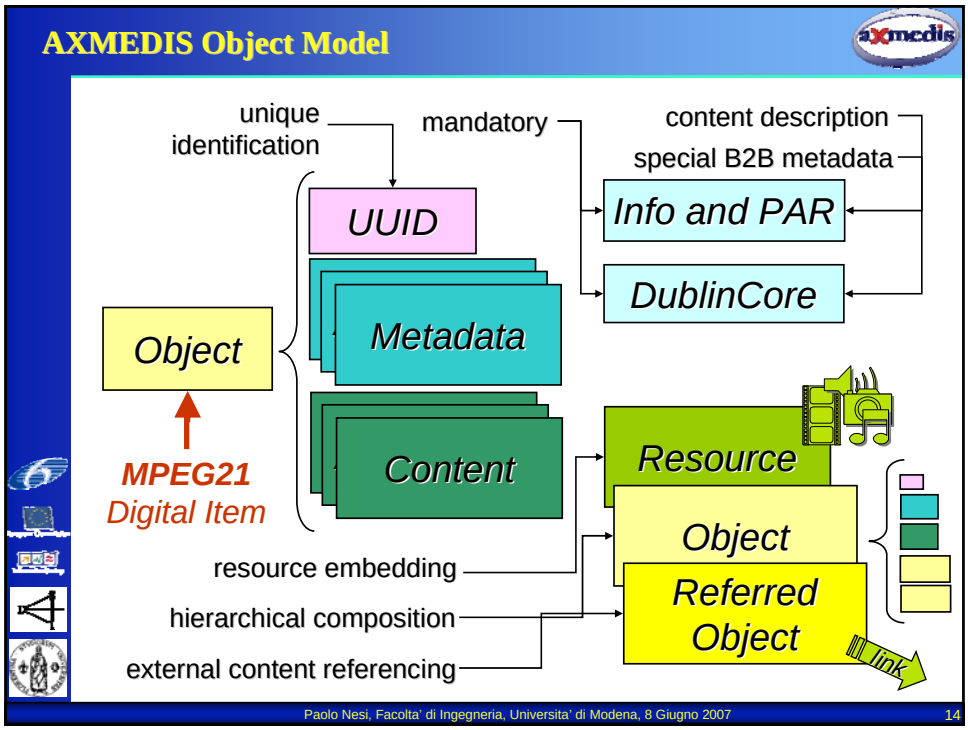


Content

- Cross Media Content
- DRM
- Content Production on Demand, POD
- Content Adaptation
- Content Processing, AXCP GRID architecture
- DRM Interoperability for multichannel
- AXMEDIS framework

AXMEDIS Cross Media Content Model

- **Model supporting B2B-B2C content production and transactions,**
  - for protected and non protected objects
- **Based on MPEG21 Digital Items**
- **Overcoming limitations in content modeling and DRM of Windows Media, I-Tune, Adobe, Google, etc.:**
  - Any kind of metadata and Any kind of IDs, multiple IDs
  - Cross media: any kind of digital resource
    - images, documents, video, audio, games, MPEG-4, etc.;
    - Presentation: HTML, SMIL, SVG, LASER, etc.
  - Content components: composition and reuse;
  - DRM interoperability: MPEG-21 and OMA, etc..
  - DRM Chain of licenses: B2B and B2C integration;
  - Integration of semantics and behavior into the content.
- **Supporting legal/secure P2P for B2B and B2C/C2C**
- **DRM, Digital Rights Management**
  - Modeling licenses for the B2B-B2C areas
  - Algorithms and tools for processing licenses, chains and relationships


AXMEDIS Object Model
unique identification
mandatory
content description
special B2B metadata
UUID
Info and PAR
DublinCore
Metadata
Object
Content
Resource
MPEG21 Digital Item
Object
Referred Object
link
resource embedding
hierarchical composition
external content referencing
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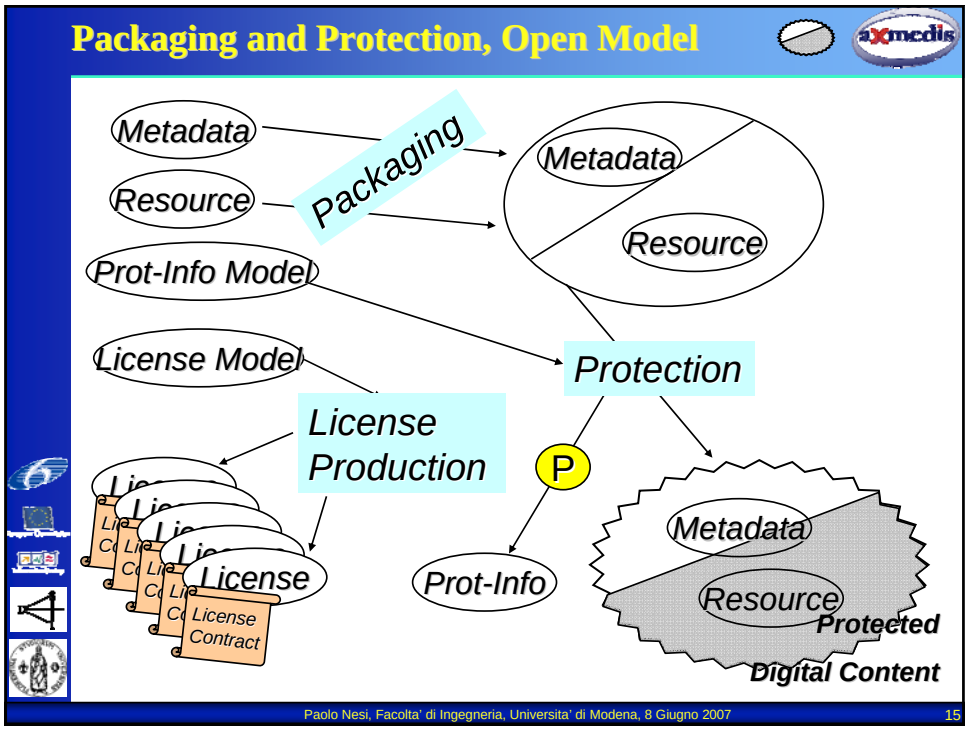
14


Packaging and Protection, Open Model
Metadata
Resource
Packaging
Metadata
Resource
Prot-Info Model
License Model
Protection
License Production
P
License
License Contract
Prot-Info
Metadata
Resource
Protected Digital Content
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15

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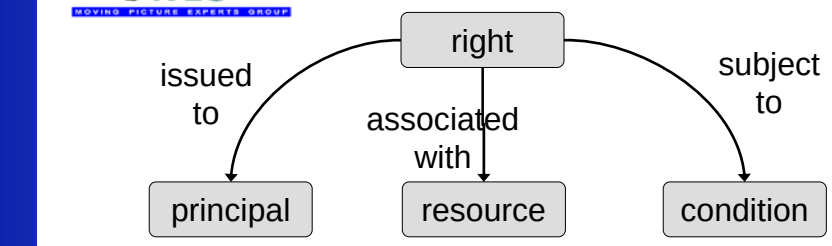
MPEG-21 REL data model

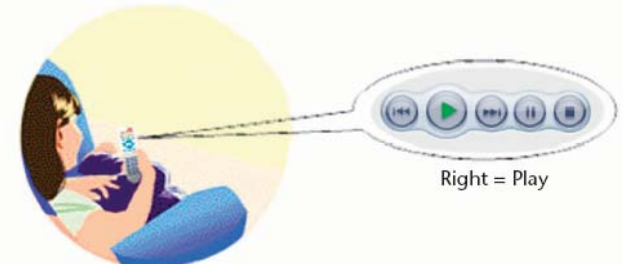


- **REL grant consists of**
  - principal to whom grant is issued
  - rights the grant specifies
  - resource to which right in grant applies
  - condition to be met before grant can be exercised

An example of statement

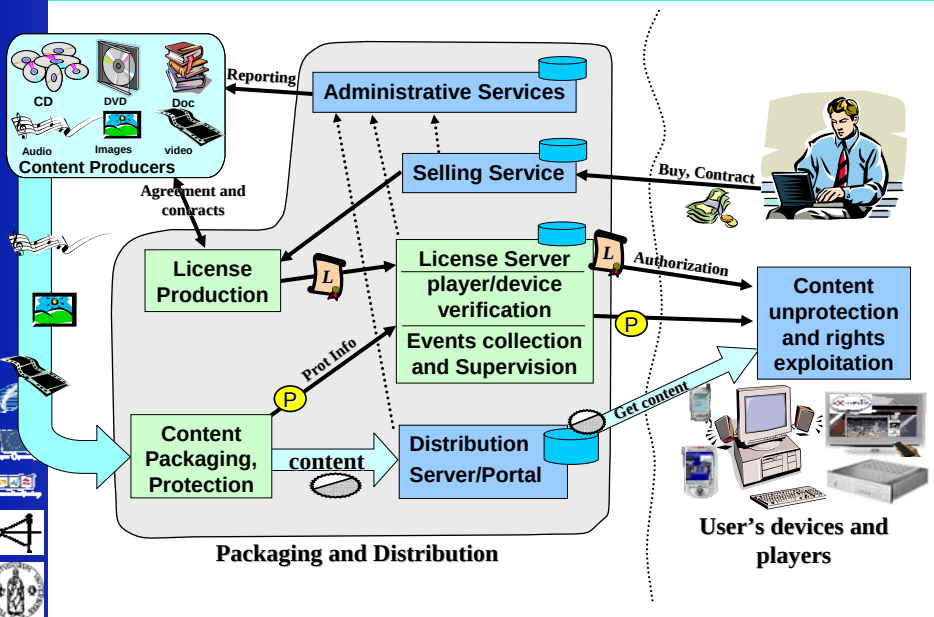
Condition = November 2003

Resource = Ocean Wilds

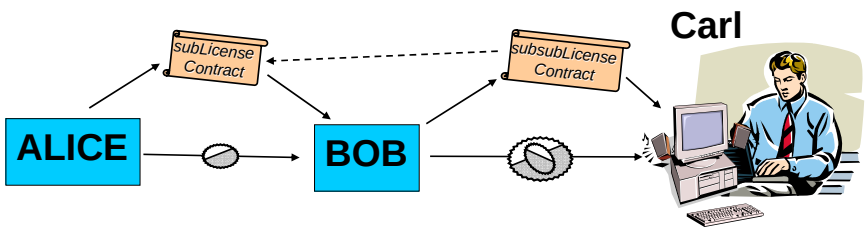


- Rosy can Play 3 times the Ocean Wilds in November 2003.

Modello Base di DRM



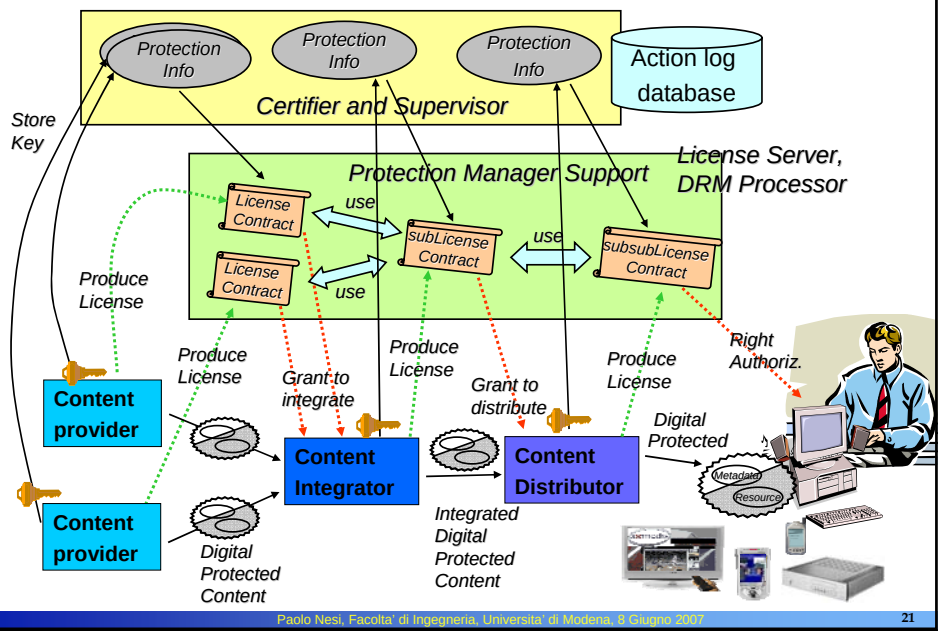
Managing License Chain

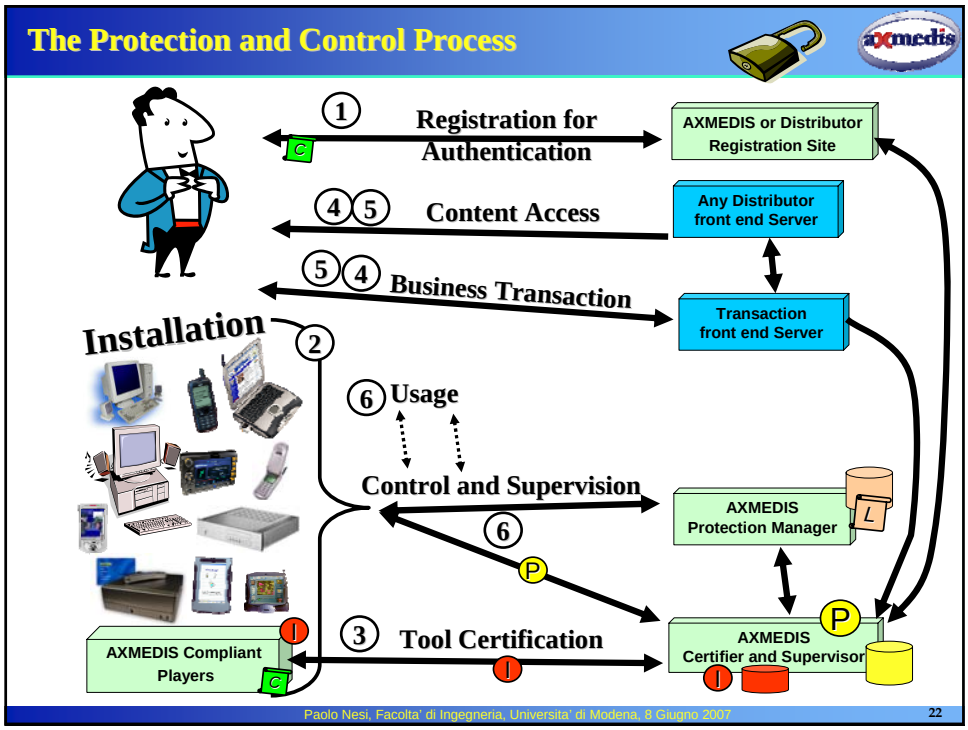


- Alice states "Bob has the right to issue a license to anyone to print the book in Italy"
- Bob states "Carl has the right to print the book in Italy"

- To solve the SubSubLicense for Carl all the connected Licenses are needed
- Licenses have to be accessible on Processing Engine

Managing License Chain and Protection Information




The Protection and Control Process
1
Registration for Authentication
C
AXMEDIS or Distributor Registration Site
4 5
Content Access
Any Distributor front end Server
5 4
Business Transaction
Transaction front end Server
Installation
2
6 Usage
Control and Supervision
AXMEDIS Protection Manager
L
6
P
P
AXMEDIS Certifier and Supervisor
I
I
3
Tool Certification
I
AXMEDIS Compliant Players
C
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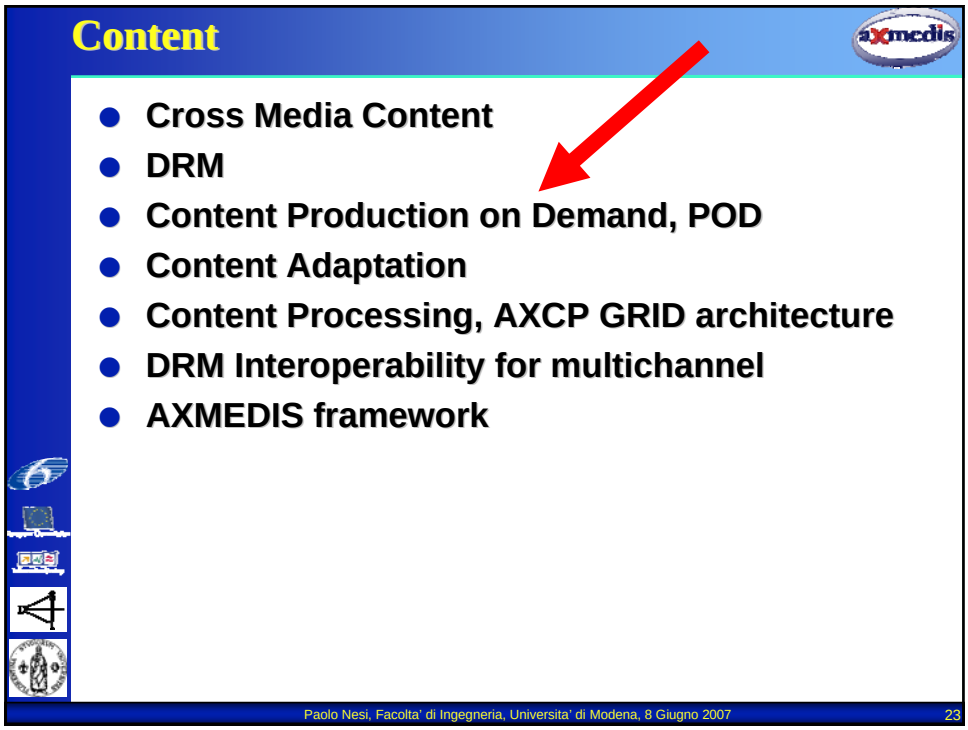
22


Content
Cross Media Content
DRM
Content Production on Demand, POD
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Content Processing, AXCP GRID architecture
DRM Interoperability for multichannel
AXMEDIS framework
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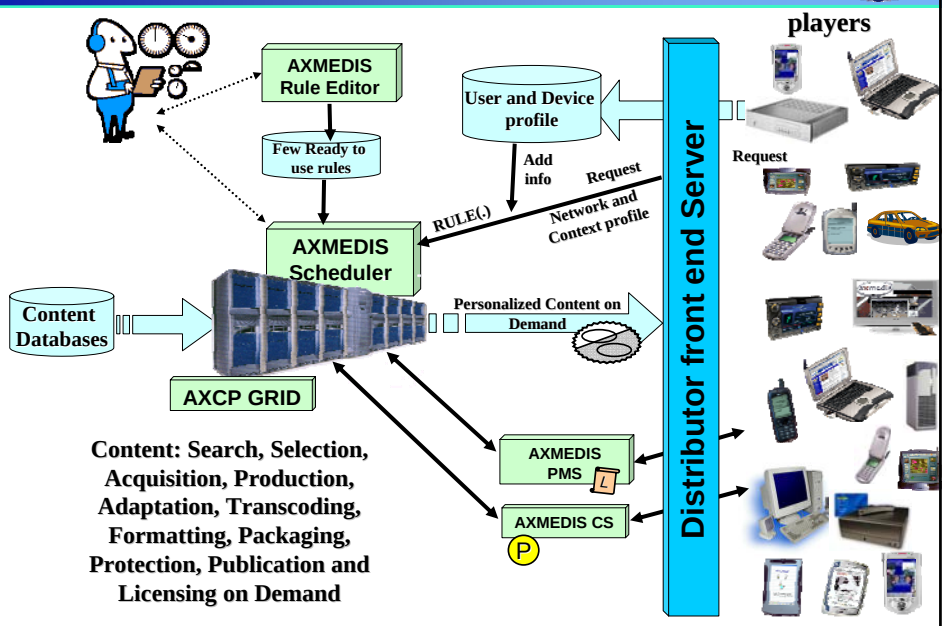
23

AXCP as Transcoding/Adapt., POD, solution



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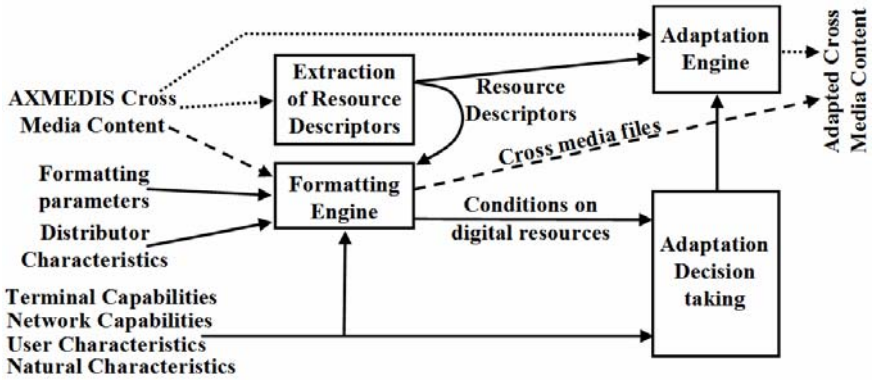
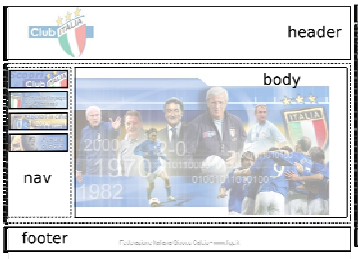
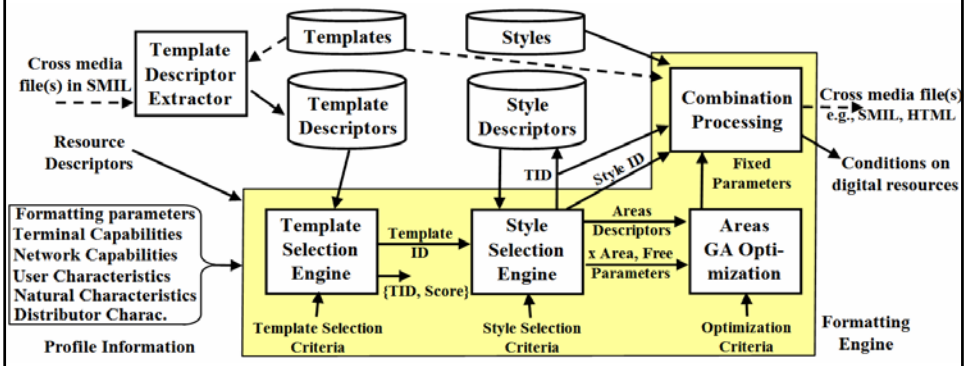
Cross media Content Adptation



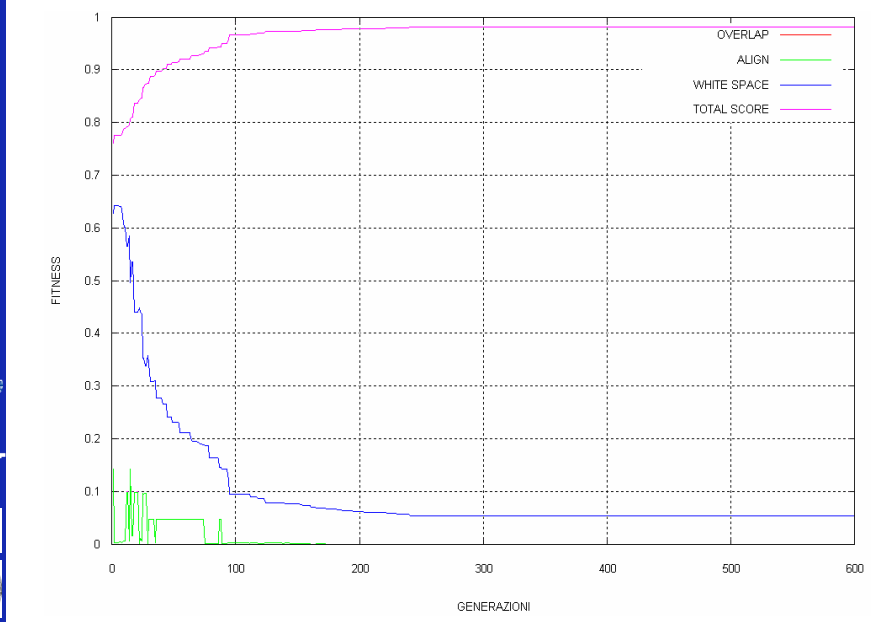
Examples of Cross media Adapation



Formatting Engine



Convergenza della formattazione con GA



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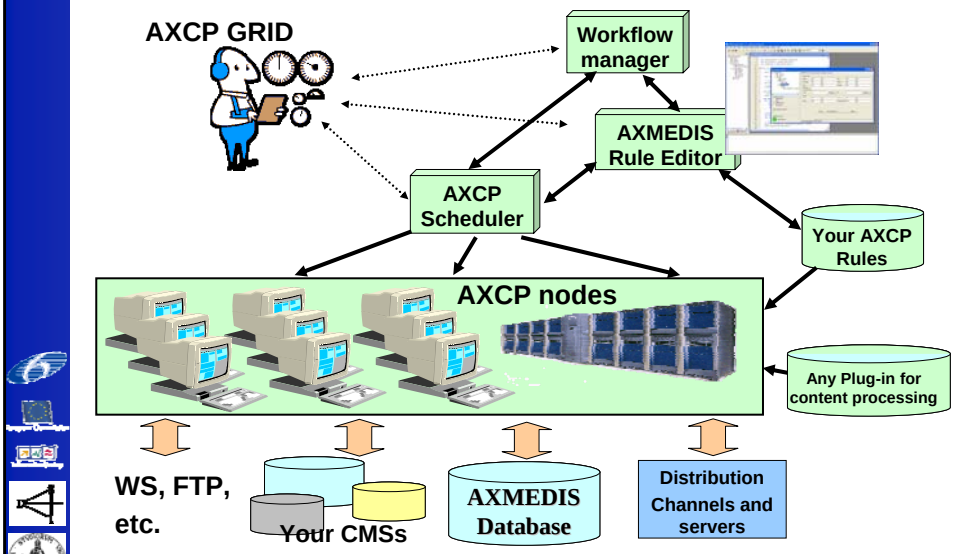
The Content Processing

- **Automating massive processing, applications**
  - For the on-demand problem:
    - Adaptation, transcoding, processing, ….
    - Advertisement insertion
    - Managing profiling (user device, network, etc.), etc.
  - Multi-channel distribution:
    - multiple interoperable DRMs, license chain processing/reasoning
  - Content recognition for monitoring
    - broadcast and networks,
    - P2P, Web sites, etc.
- **Automating back office content production/protection and distribution**
  - Open, secure and scalable architecture for content processing, GRID
  - Language for content processing and GRID
  - Uses plugins for content adaptation/transcoding for multi-channel production, fingerprinting, processing profiles, etc.
  - Algorithms for automated formatting of content: SMIL, style, Genetic Algorithms

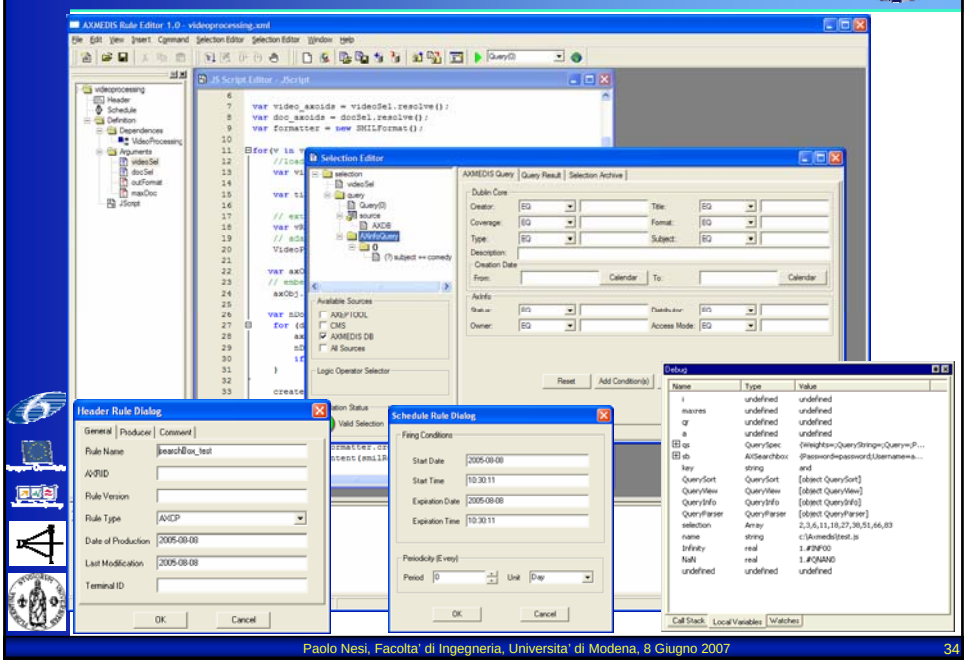
AXMEDIS Content Processing GRID



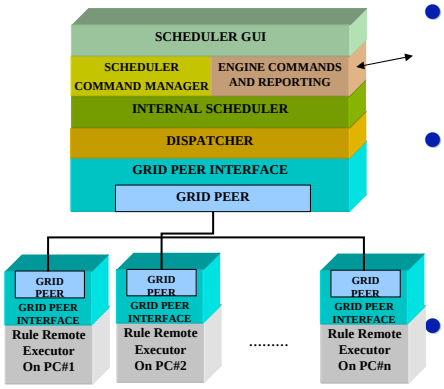
AXCP processing capabilities

- **Access**
  - Content and metadata Ingestion and Gathering
  - Access to databases and communication channels
  - WEB Service, Op. System access, etc.
- **Profiling:**
  - Profile management: device/terminal, user, environment and network
  - Decision taking and processing
- **Protection:**
  - MPEG-21 IPMP, OMA, etc.
- **Licensing**
  - Production and processing, verification, querying, etc.
  - MPEG-21 REL, OMA ODRL, etc.
- **Content production/Processing**
  - Metadata, integration, augmentation and extraction
  - Content Processing: adaptation, transcoding, filtering, analysis, recognition, etc..
  - Content Composition and Formatting (SMIL, XSLT)
  - Packaging: MPEG-21, OMA, MPEG-4
- **Supporting security**
  - Using protected content and DRM support, content processing is performed in secure manner even on the GRID nodes according to the DRM rules/licenses

AXCP Rule Editor

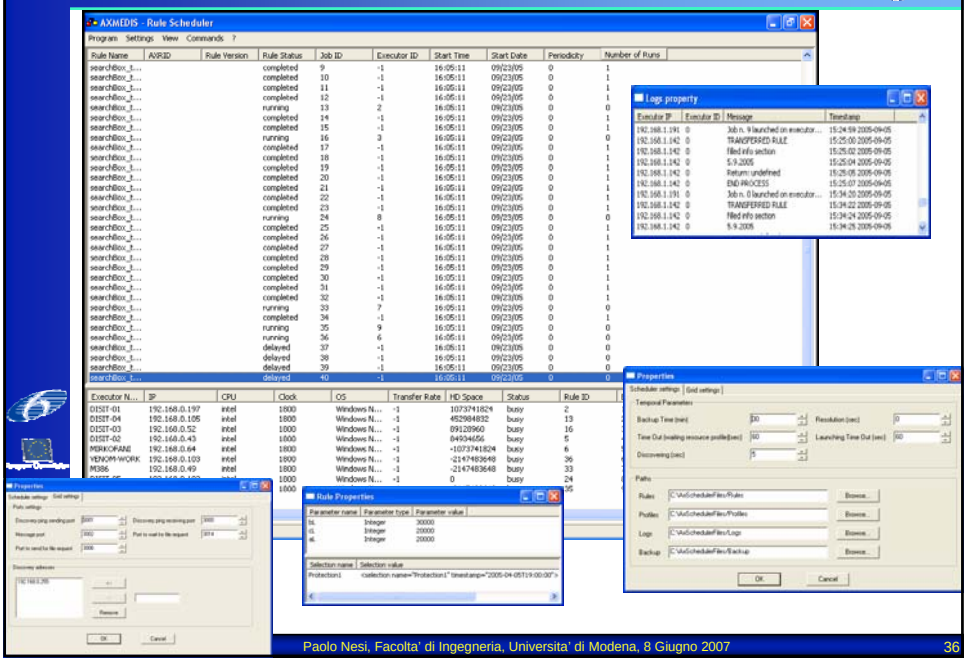


AXCP Rule Engine: Rule Scheduler



- The Rule Scheduler manages the rules and available remote executors.
- Each Rule Remote Executor has a corresponding counterpart image on the Rule Scheduler side to represents its capabilities and status.
- Knowing the availability and capabilities of a Remote Executor is mandatory to verify the suitability of the computer that will execute the rule.

AXCP Rule Engine: Rule Scheduler GUI

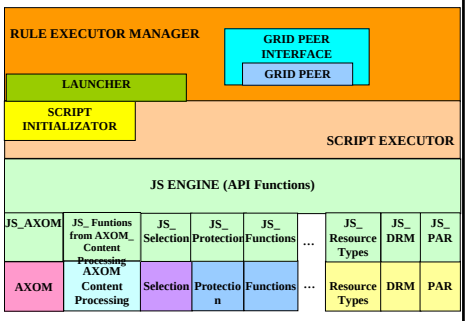


AXCP Rule Format

- **Formally, an AXCP Rule signature is:**
- $$R = f(S_1, S_2, .., S_n, P_1, \ldots, P_m)$$
- **Where:**
- S_i is a *Selection* (sequence of queries), to be sent to the AXMEDIS Database to retrieve digital object (content) IDs, such parameter is exploded in terms of list of objects IDs during the execution of the rule
- P_i is a parameter (basic type as integer, string, XML string, Boolean, etc.), it could represent, for example, the scale factor or the MIME type of the output format, the number of object collections to be created, name of the author, etc.
- *f* is the identifier of a rule (e.g., the Rule ID);
- *R* is the consumptive result of the rule application. It could be a status, a new AXMEDIS object, or a metadata manipulation result, the license of an AXMEDIS object, a message to be returned to the AXMEDIS Content Processing Area, etc.

AXCP Rule Engine: Rule Executor

- It is a computational unit in the distributed environment that executes the rule.
- **Rule Executor Manager** is the command interface to the SpiderMonkey Javascript engine.
- **Script Executor** hosts an instance of SpiderMonkey Javascript Engine (called JS Engine).
- **Launcher and Initializator** prepare the JS Enviroment and create the context for the script



- **GRID Node Executor Profile**
  - Identity of the executor (computer name, IP address, location, etc…)
  - Computational capabilities: (CPU, RAM, Clock, Disk Space, network costs for the communication with the database, etc…)
  - Provided Functionalities:
    - AXMEDIS Plug-In installed (For each plug in the name and version are provided).
    - External tools Plug-In installed (For each plug in the name and version are provided).

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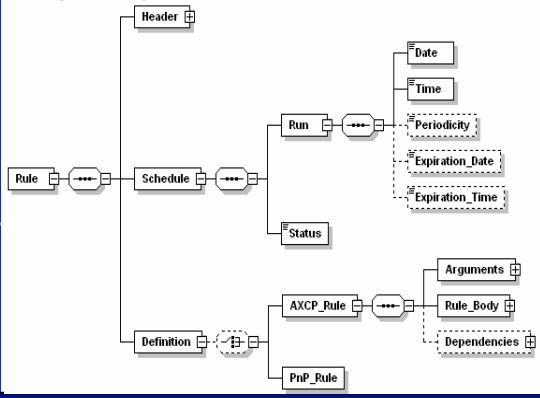
AXCP Rule XML description

- General metadata regarding: rule name, AXRID (rule identifier), rule version, rule type, software name, version of software, date of production, time of production, author, affiliation, URL, comment, last modification and terminal ID. (*Header*), etc…



- Temporal metadata describing conditions for firing the rule, expiration time, periodicity and the rule status (“active” or “inactive”) and (*Schedule*)
- List of arguments (parameters and selections), list of dependences (required AXMEDIS plug-ins) and the rule body (the JavaScript code to run).(*Definition*)

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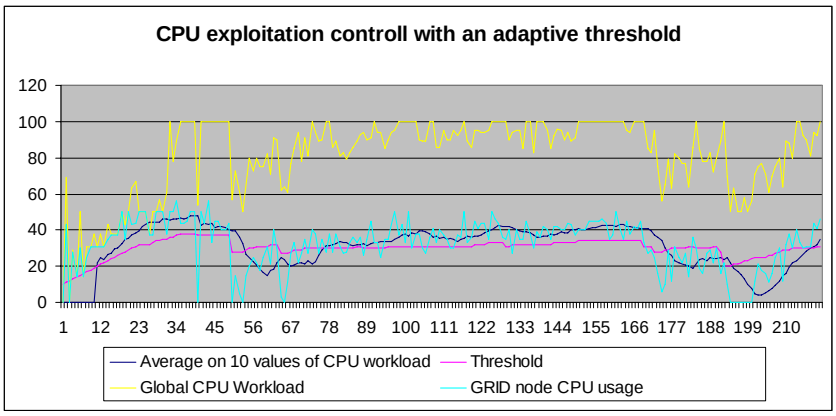
Planning and Exploiting Node capabilities



- **GRID node has a profile describing its capabilities: time profile, memory, HD, communication, tools and plug ins, etc.**

Script per l'adattamento di Cross Media

```
// acquisition of profiles, content to be adapted
Directives=GetUpdatedProfileInformation(UserID, Terminal, Network, Distributor, Natural);
A=GetCrossMediaContent(database, ObjectID);
ResourceDescriptors =ExtractingResourceDescriptors(A); // extracting res. descriptors

// production and publication for MPEG-21/AXMEDIS distribution channel
FormattingParameters=MPEG21_Channel; // in this case a PC…..
FA=CMC_Adaptation(A, FormattingParameters, ResourceDescriptors, Directives);
OB=MP21_Package(FA); // packaging the cross media content into MPEG-21/AXMEDIS format
AXOID=OB.RegisteringSetAXOID(AXCS);
If  (OB is not protected)  {
    Pinfo=MP21_RandDefinePinfo(); // define protection information
    OB.MP21_Protection(Pinfo);  // protection
    }
OB.ObjPublishing(Portal1); // publishing on MPEG-21 distribution channel

// production and publication for OMA channel
FormattingParameters=Mobile_OMA_Channel; // in this case a general Mobile…
FB= CMC_Adaptation(A, FormattingParameters, ResourceDescriptors, Directives);
OMAPinfo=OMA_RandDefinePinfo(); // define protection information
OC=OMA_Package(FB); // packaging the cross media content
OC.ObjPublishing(Portal2); // publishing on OMA distribution channel
```

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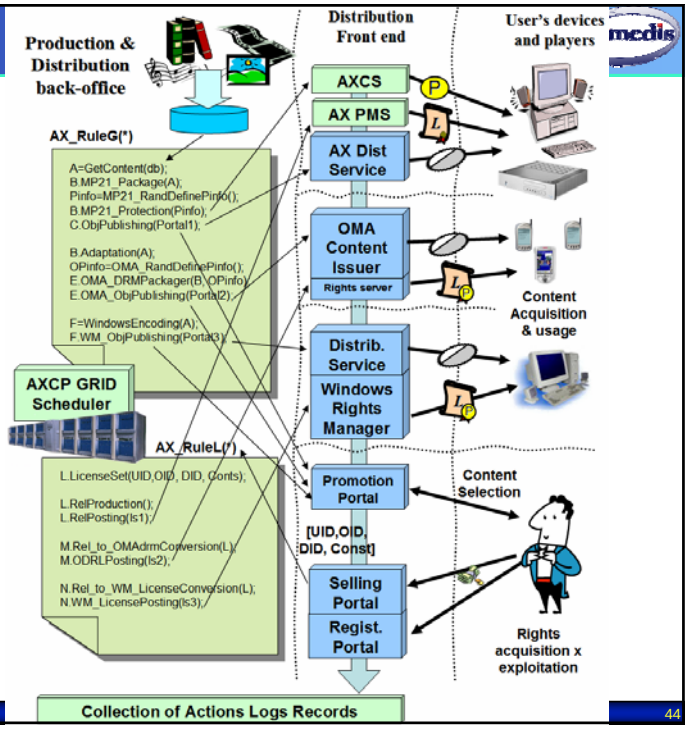
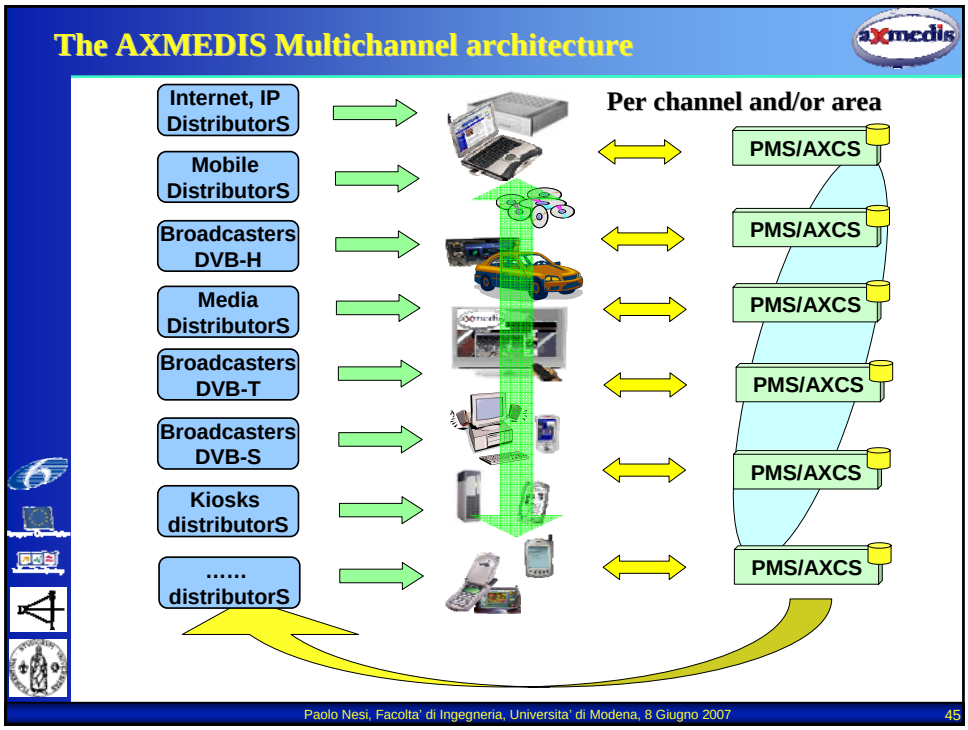
Multichannel

- Distributors managing different channels
- Different DRMs
  - AXMEDIS
  - OMA
  - Windows Media




The AXMEDIS Multichannel architecture
Internet, IP DistributorS
Mobile DistributorS
Broadcasters DVB-H
Media DistributorS
Broadcasters DVB-T
Broadcasters DVB-S
Kiosks distributorS
…… distributorS
Per channel and/or area
PMS/AXCS
PMS/AXCS
PMS/AXCS
PMS/AXCS
PMS/AXCS
PMS/AXCS
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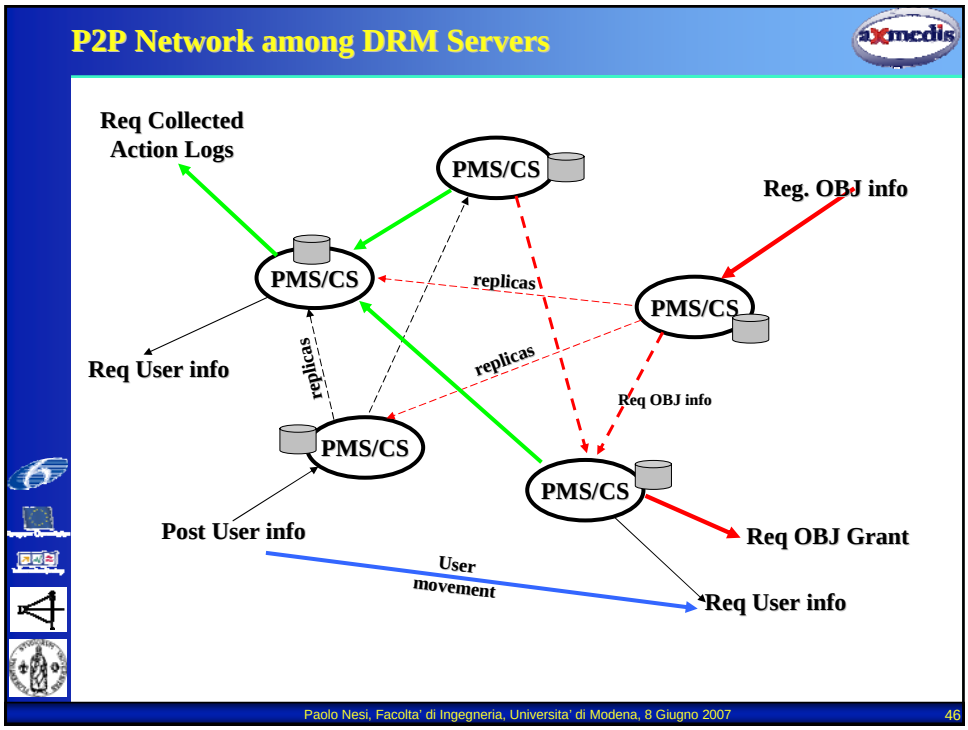
45


P2P Network among DRM Servers
Req Collected Action Logs
PMS/CS
Reg. OBJ info
PMS/CS
replicas
PMS/CS
Req User info
replicas
replicas
Req OBJ info
PMS/CS
PMS/CS
Post User info
Req OBJ Grant
User movement
Req User info
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46

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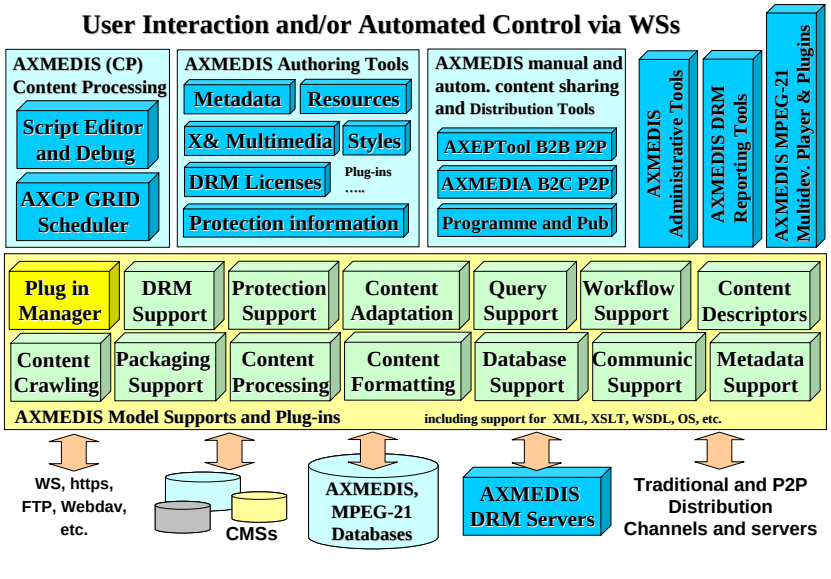
- Content Adaptation
- Content Processing, AXCP GRID architecture
- DRM Interoperability for multichannel
- AXMEDIS framework and demonstrators

AXMEDIS Technical Architecture



AXMEDIS Applications/Demonstrators

- **P2P distribution with AXMEDIS**
  - B2B content distribution
  - C2C content distribution and sharing
  - Sharing content among archives and mediateques
- **Distribution towards:**
  - PC players:
    - via Internet+P2P: TISCALI Media Club, DSI
    - via Satellite data broadcast: EUTELSAT, ILABS, DSI
  - PDA via Kiosks: ILABS + ANSC Kiosks, TISCALI, DSI
  - STBs:
    - DVB-T, VOD: TEO, VRS (telecom Lithuania)
    - STB/PVRs via Satellite data broadcast: EUTELSAT, MBI
  - Mobiles:
    - MPEG-21 distribution to mobiles: ILABS, TISCALI, DSI
    - OMA based distribution to mobiles: Telecom Italia, BBC, DSI
  - IPTV players: Telecom Estonia, TEO, VRS
  - DVB-T + home domains/media center: BBC, SDAE, ETRI, UPC
- **Content Enrichment and sharing via P2P:**
  - VARIAZIONI (other 10 partners): GERMINUS, RIGEL, ALBENIZ, UPC, etc. (www.variazioni.org)
- **Content Posting Portal for Authors and Editors**
  - Trial: SIAE, DSI, UPC, EXITECH

AXMEDIS Partners

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