



Sistemi Distribuiti

Corso di Laurea in Ingegneria

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Part 12:

Intro. to e-Commerce and Content Distribution

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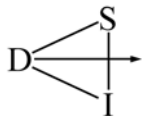
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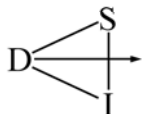
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Introduction to E-Commerce and Content Distribution

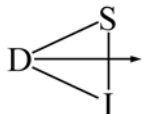
- Physical and digital good
- E-commerce technologies and problems
- Transaction and business Models
- Terminology and Value Chain
- Digital Rights Management
- Content Modeling and Packaging
- Licensing and content distribution
- Example of Microsoft Windows Media
- Example of Apple I-Tune
- Example of AXMEDIS solution
- Secure P2P content Distribution
- Distribution mediate via Kiosks
- Satellite broadcasting





E-Commerce Introduction

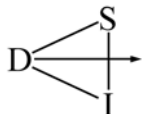
- **Digital promotion and sale of traditional or *physical goods***
 - ♣ Off line delivering of goods
 - ♣ For example: AMAZON, eBay
- **Digital promotion and sale of *digital goods***
 - ♣ Off line delivering, for example:
 - ➔ For example: eBay, AMAZON
 - ♣ On-line delivering, for example:
 - ➔ i-Tune, Sky, Premium, La7, TISCALI, etc.





Physical vs Digital Good

- *The usage of digital world/technology for the commerce of **physical** good*
is a subproblem of
- *The usage of digital world/technology for the commerce of **digital** good*
- **They share the:**
 - ♣ Marketing
 - ♣ Business model, transaction and payment
- **E-Commerce of digital good** has in addition problems of:
 - ♣ Digital distribution
 - ♣ IPR control/supervision, such as DRM or Copy Protection





E-Commerce Services technologies



Architecture for distribution

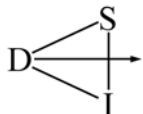
- ♣ Streaming:
- ♣ Downloading, progressive download, VOD, VOIP, ...
- ♣ Broadcasting: DVB-T, DVB-S, DTT, DVB-H,
- ♣ Providing services
- ♣ Paying portals:.....

Content production and protection

- ♣ Content Processing: adaptation, production, etc.
- ♣ GRID for content processing: licenses, content, search, production on demand

Other Technologies

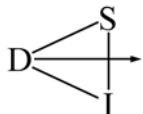
- ♣ Security aspects: certification, authentication, etc.
- ♣ IPR: Intellectually Property Right
- ♣ DRM: Digital Rights Management
- ♣ CP: Copy Protection
- ♣ Fault Tolerance





Content Modeling and Processing

- Production and production process definition
 - ♣ Workflow Management
 - ♣ Cooperative work
- Content gathering and ingestion
- Database management systems, CMS,
 - ♣ query support, distributed queries, etc.
- Content description for
 - ♣ Search, classification, retrieval
- **Content modelling for**
 - ♣ Production, integration, distribution, IPR, DRM
- **Content protection for enforcing respect of**
 - ♣ IPR, DRM
- **Automatic programme production**
 - ♣ EPG, GuidePlus, ShowView, etc.





E-Commerce Services Problems



- **Business Model**

- ♣ How/when to give goods, how/when to give money

- **Transaction Models**

- ♣ Security: certification, smartcards, etc.
- ♣ Mission Critical Applications

- **Payment solutions:**

- ♣ Accounting, banking, micropayments, etc.
- ♣ Prepaid, Credit Card, BOLLETTE, etc.

- **Scalability:**

- ♣ from few to millions of transactions/users

- **Availability:**

- ♣ Discovery on internet
- ♣ Accessibility of the service, broadcast/cellular coverage

- **Privacy of the customers**

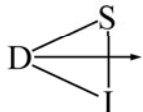
- ♣ User anonymity during transactions

- **Intellectually property protection and management:**

- ♣ IPR, DRM, copy protection

- **Multichannel distribution**

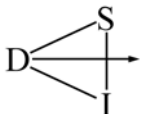
- **Interoperability of content on devices**





Classification of Transaction Models

- **B2B: Business to Business**
 - ♣ Among digital good producer, publishers, integrator, resellers, etc.
 - ♣ They add values and thus ...
- **B2C: Business to Consumer**
 - ♣ From distributors to consumers
- **C2C: Consumer to Consumer**
 - ♣ File sharing
 - ♣ Good sharing
- **B2B2C**
 - ♣ Integrated B2B to B2C

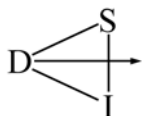




Examples of Business Model

	On Line delivering	Off Line delivering
On Line Payment	Digital good	Any good
Off Line Payment	Digital good	Any good

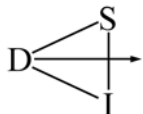
	On Line usage	Off Line usage
Digital good	Yes	Yes
Physical good	No sense	Yes





A Transaction

- What is a transaction?
 - ♣ In the business world, is an action that change the state of an enterprise
 - ♣ In the computer world, is a collection of actions with properties of
 - ➔ Atomicity,
 - ➔ Consistency,
 - ➔ Isolation,
 - ➔ Durability
 - ♣ The so called ACID





Transaction: ACID properties

- **Atomicity:**

- ♣ do all-or-nothing

- **Consistency:**

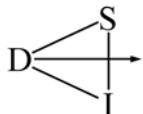
- ♣ transaction must leave the system in a correct state or it must abort

- **Isolation:**

- ♣ Transaction behavior is not effected by other transactions that execute concurrently

- **Durability:**

- ♣ transaction's effects are permanent after it commits. They survive system failures





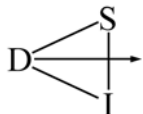
Major Requirements

○ Distributors:

- ♣ Make money on digital/physical good distribution

○ Final user:

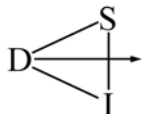
- ♣ Acquisition of physical good, cheaper, faster, etc.
- ♣ Acquisition of digital good
 - ➔ Immediate
 - ➔ At least, with the same features and usage of the physical good:
 - Copy, lend, share, etc.
- ♣ More features in the digital than those usually in the physical world:
 - ➔ For example: buy one and use more: home, car, i-pod, PDA, phone, CD, etc.





Requirements of E-Commerce Applications

- High number of clients/users per applications (millions or more)
 - ♣ the server is on Internet, accessible to every user in the world
 - ♣ The users are connected via broadcast, cellular phones, etc.
- Client has to be suitable for using the digital content if any.
- Integration with legacy applications and heterogeneous databases
 - ♣ probably the enterprise already has legacy applications or DBMS (for internal purpose or because it is already a Commerce Enterprise: catalog/client information, etc.)
 - ♣ with the evolution of the infrastructure, other software may be added to the server (Data Warehouse, OLAP, Data Mining)

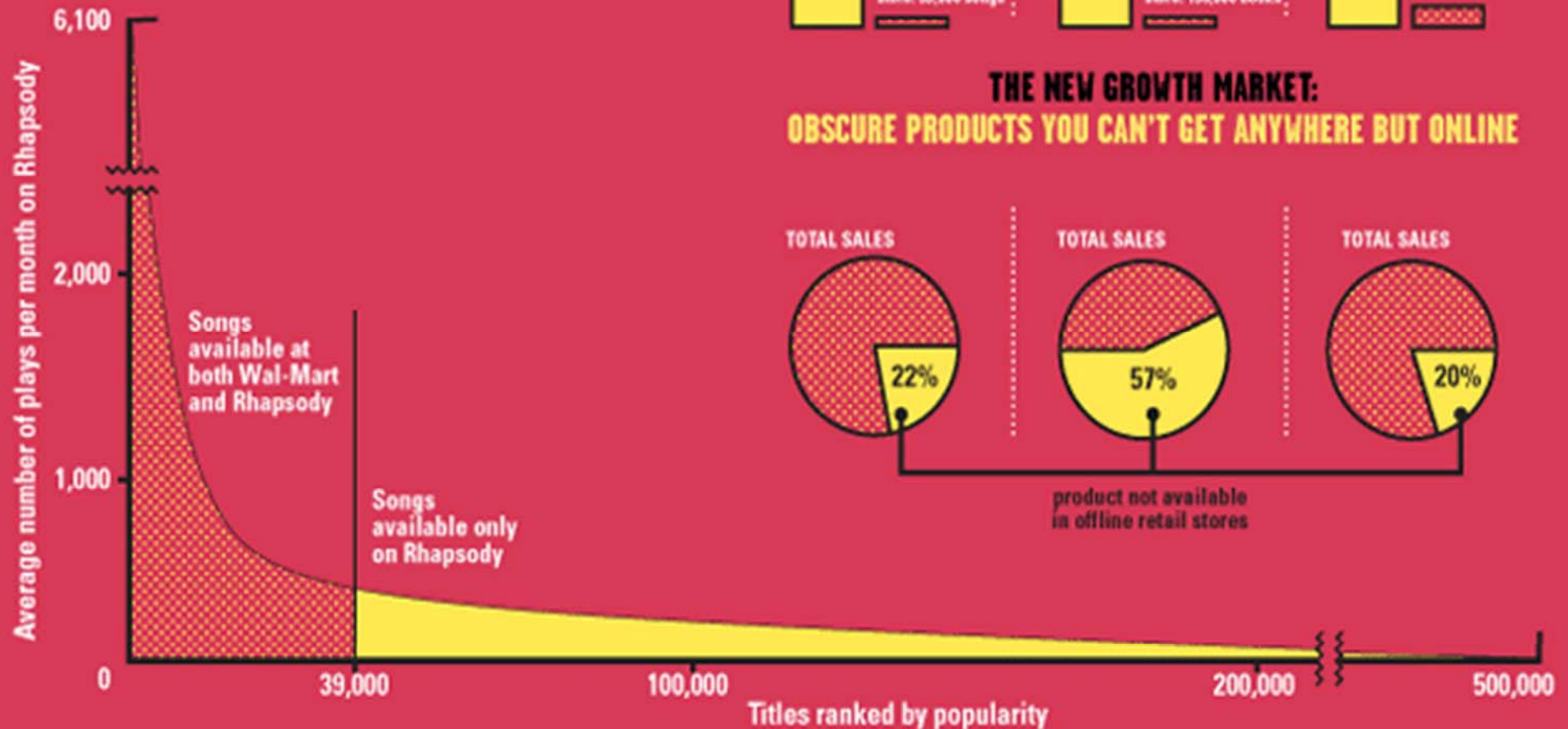




The Long Tail

ANATOMY OF THE LONG TAIL

Online services carry far more inventory than traditional retailers. Rhapsody, for example, offers 19 times as many songs as Wal-Mart's stock of 39,000 tunes. The appetite for Rhapsody's more obscure tunes (charted below in yellow) makes up the so-called Long Tail. Meanwhile, even as consumers flock to mainstream books, music, and films (right), there is real demand for niche fare found only online.



Sources: Erik Brynjolfsson and Jeffrey Ho, MIT, and Michael Smith, Carnegie Mellon; Barnes & Noble; Netflix; RealNetworks

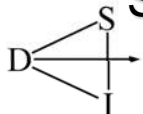




Western European Online Content revenues

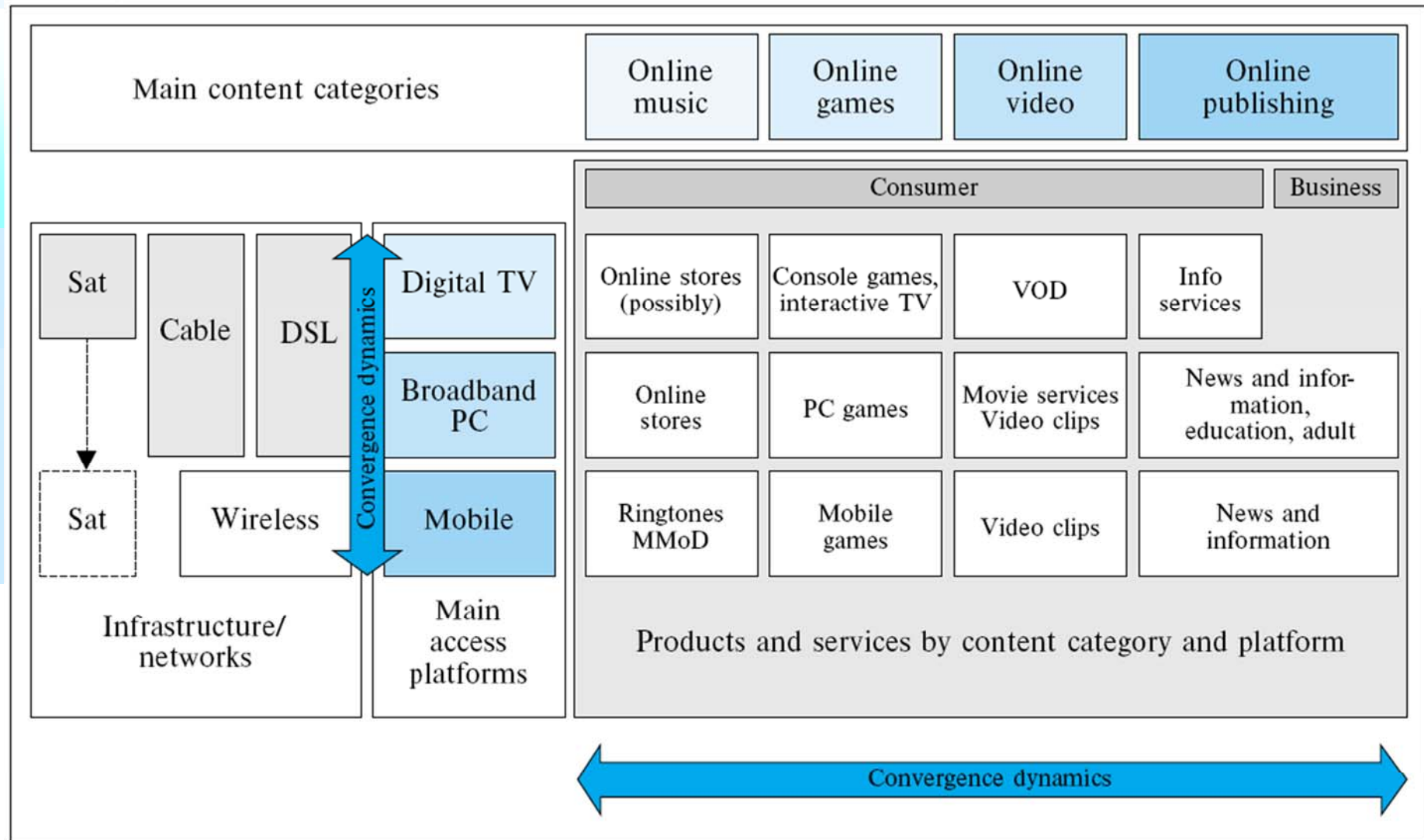
Main content categories	Online music	Online games	Online video	Online publishing	
Main access platforms	Consumer				Business
	€ 0 (no service today)	€ 236 million	€ 166 million	€ 0 (no service today)	
	€ 40 million	€ 82 million	€ 46 million	€ 373 million	€ 8,374 million
	€ 0.6 million	€ 254 million	€ 150 million	€ 288 million	€ 88 million
Products and services by content category and platform					
Offline (in € billion)	7.9	3.5	13.4	80	5
Online (% of total)	0.5	16	2.7	0.8	65

Source EITO2005





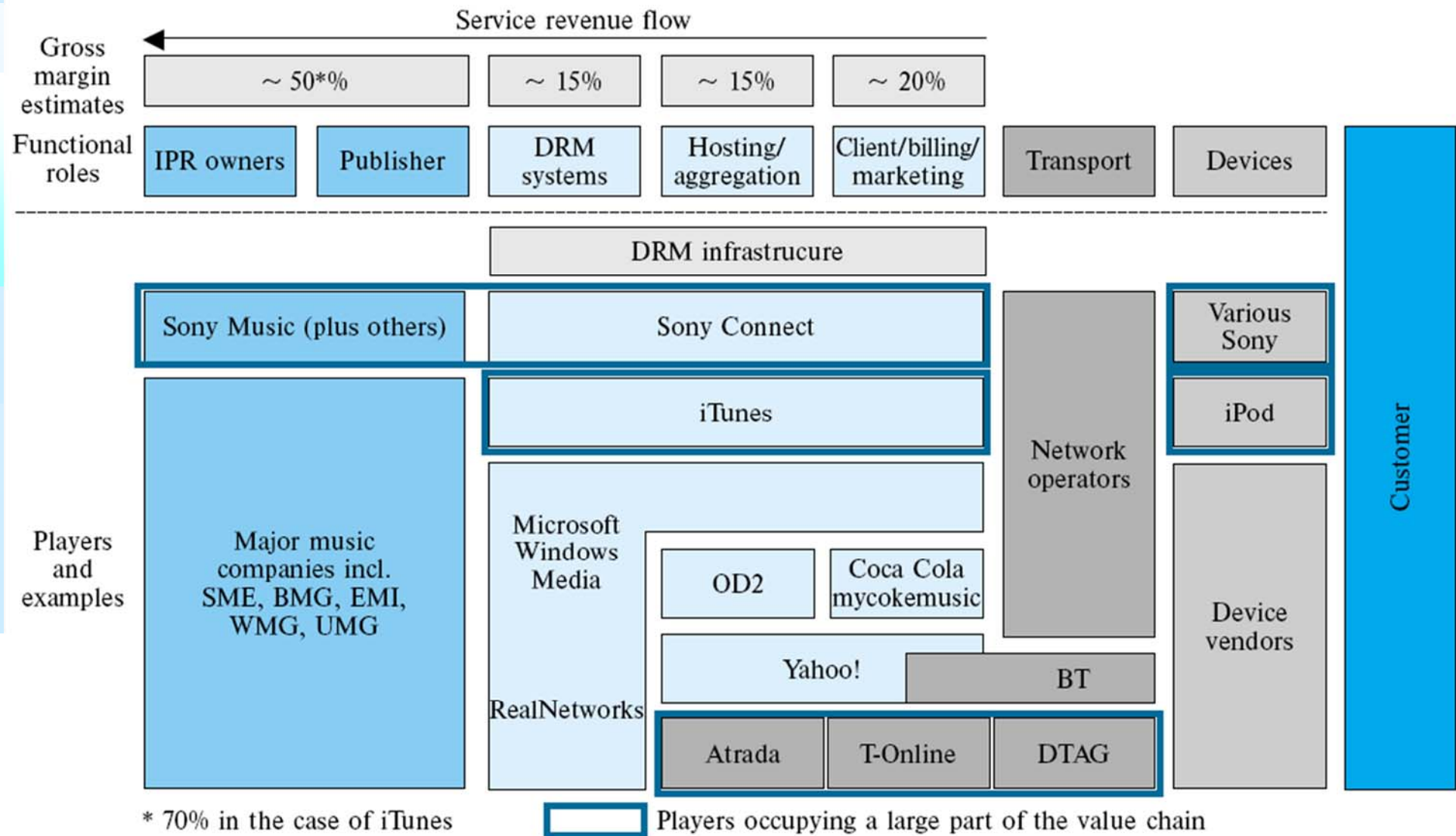
Ex: Content and channels



Source EITO2005



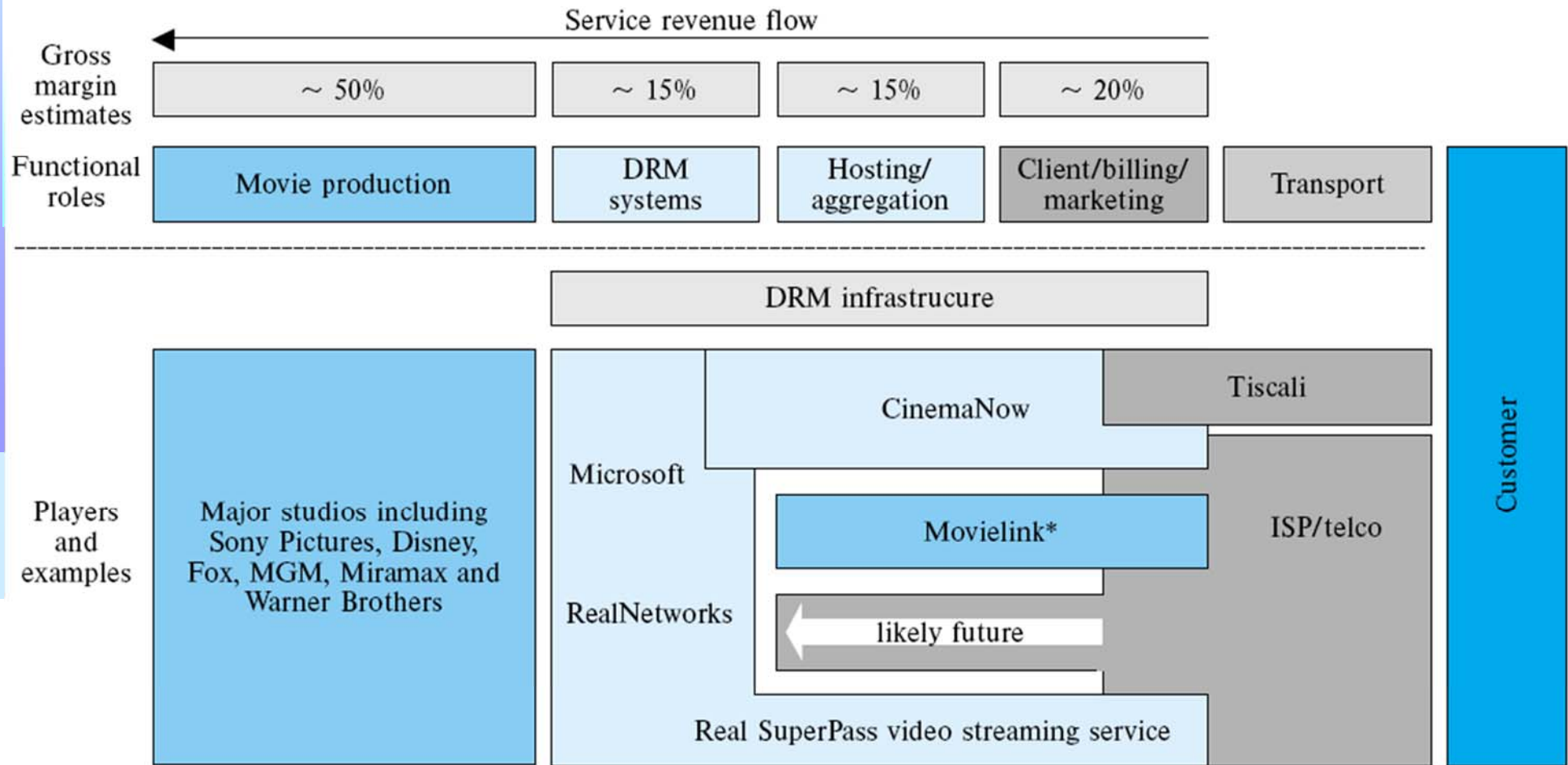
Ex: On Line Music Value Chain



Source EITO2005



Ex: Broadband VOD value chain

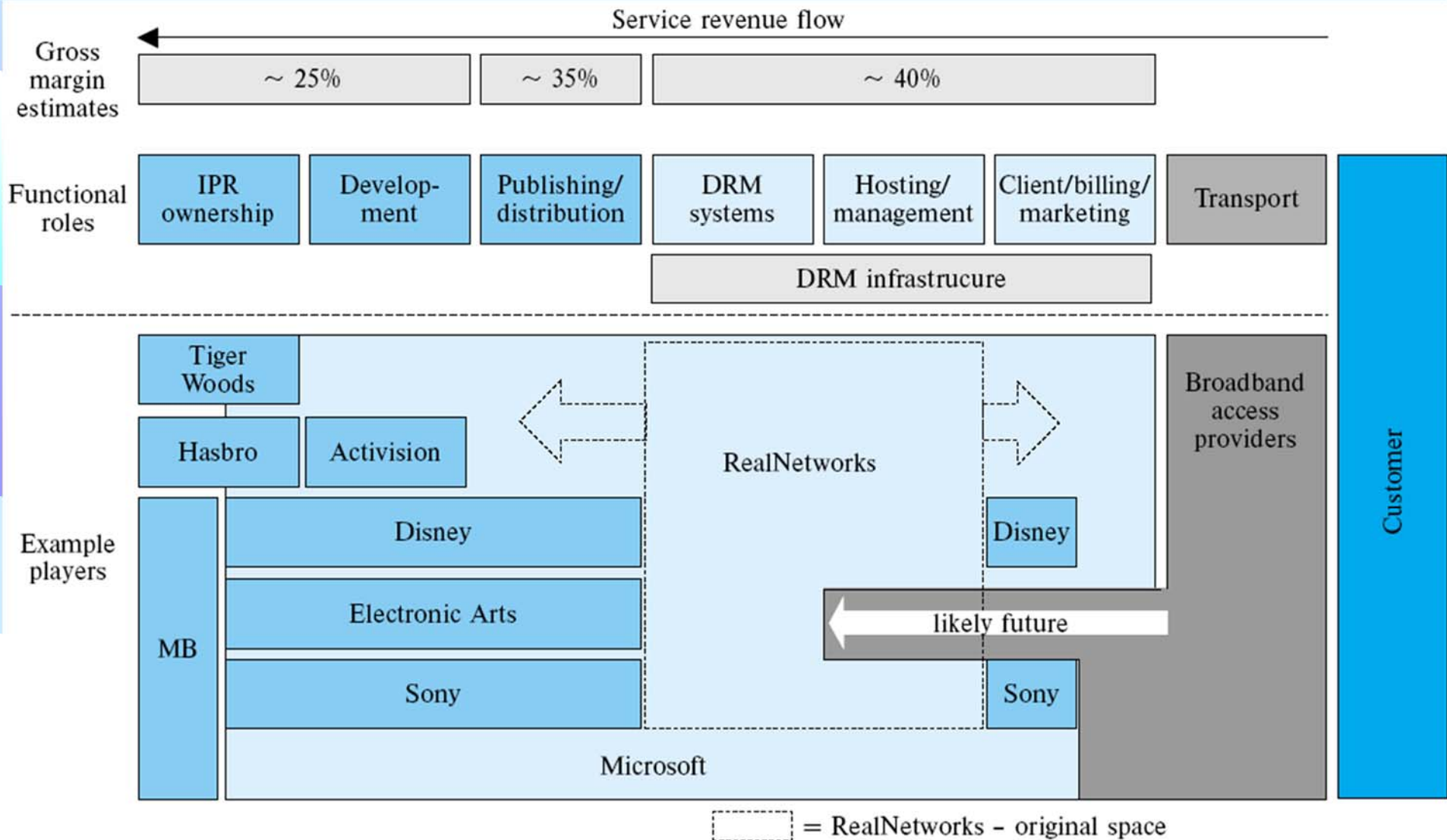


* US only at time of writing

Source EITO2005



Ex: On Line Games value chain



Source EITO2005



User's Trends

○ Younger are abandoning the TV

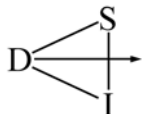
- ♣ More time on PC/games console
- ♣ More on i-TV

○ Market is becoming fragmented

- ♣ Several channels and models:
 - ➔ push, time shifted, tivo, media center, DVD recorders, DVB-S, DVB-T, DVB-H, VOD, etc.
- ♣ Several media: video, audio, i-TV, etc.
- ♣ Personal TV:

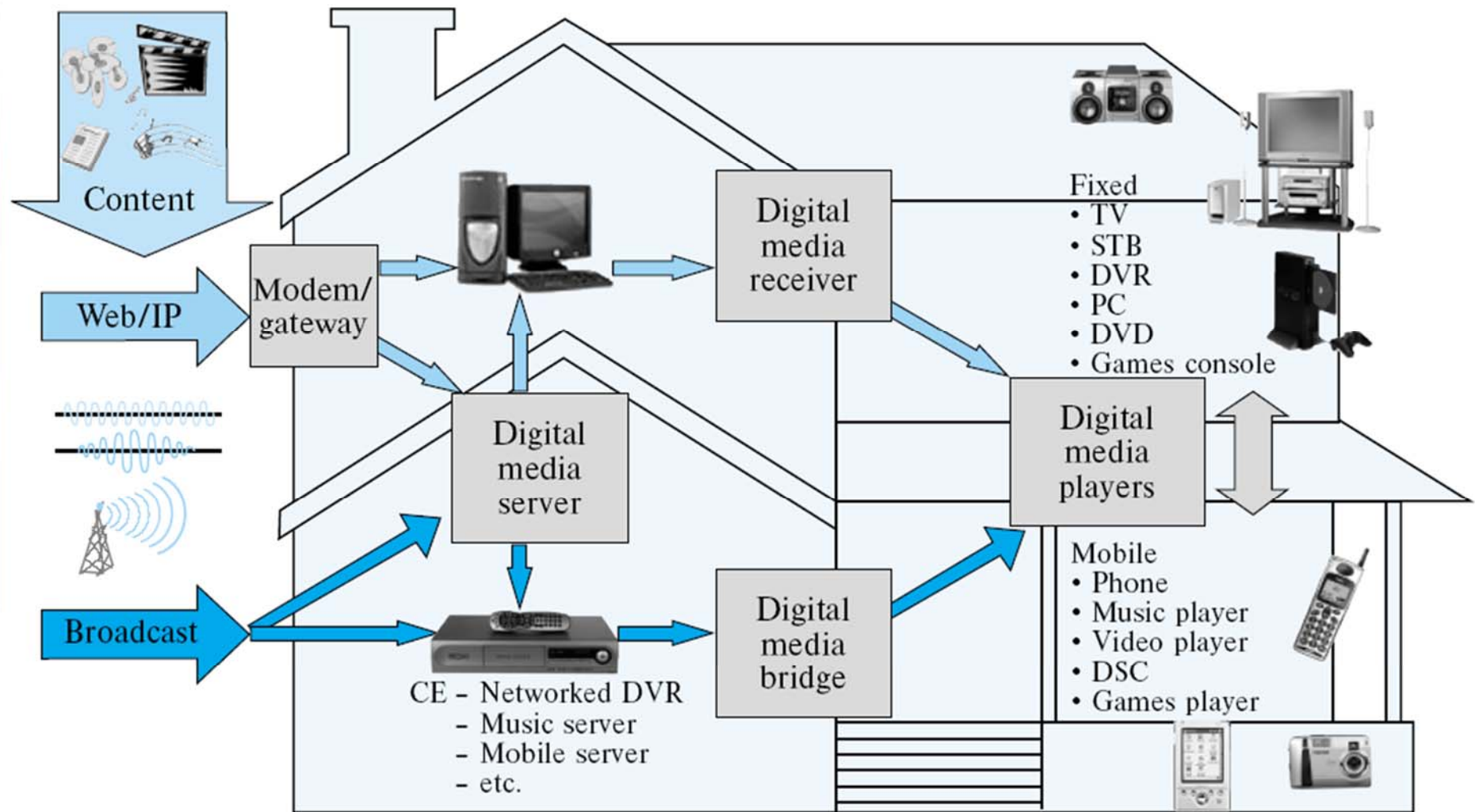
○ Consumers are going to

- ♣ Differentiate each other, more individuality
- ♣ More personal needs
- ♣ Become content producers (see Video-Google)





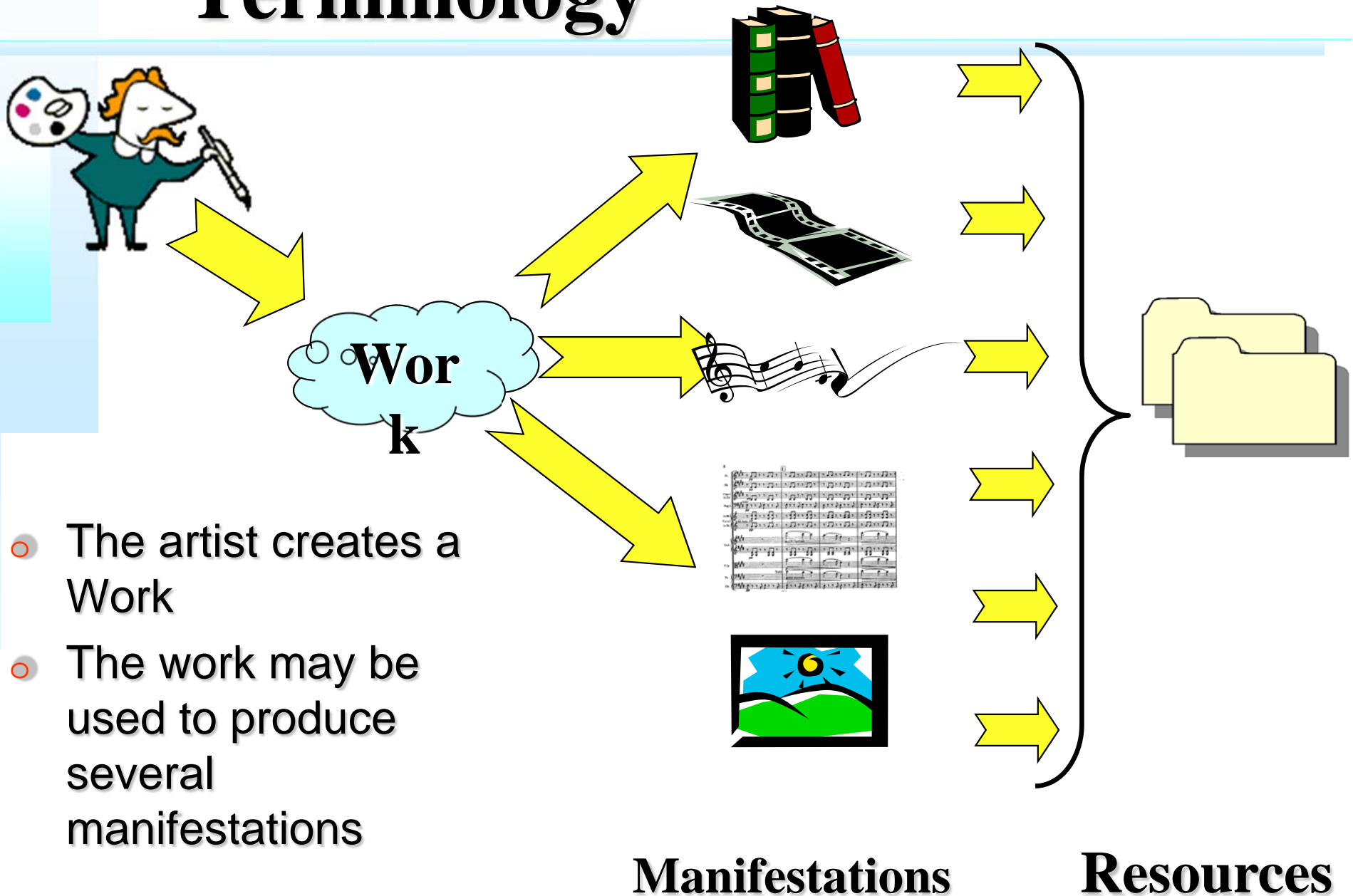
The Media Usage at home



Source EITO2005



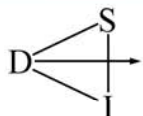
Terminology





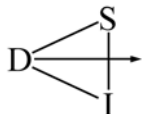
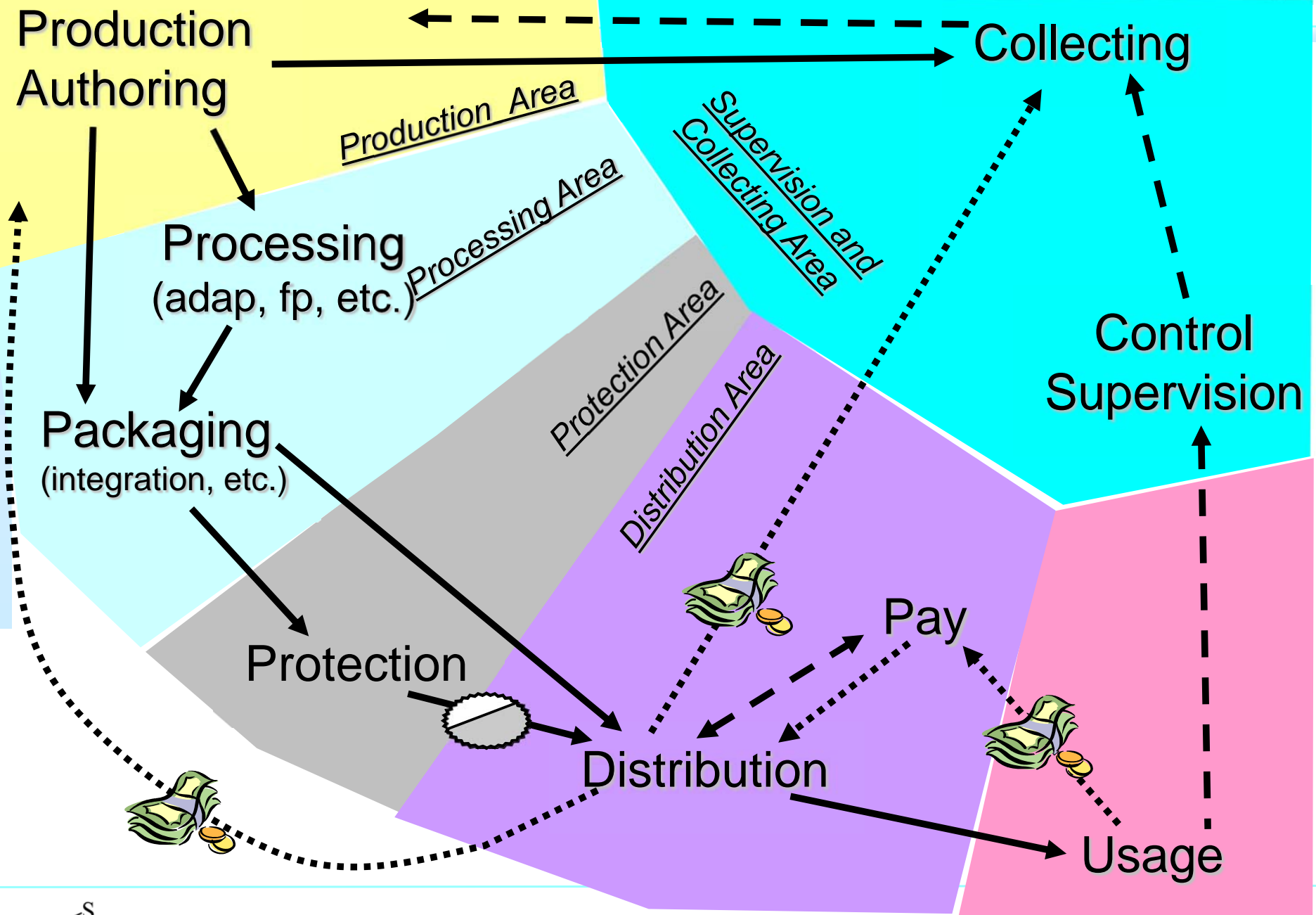
Some Actors of the value chain, “definitions”

- **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





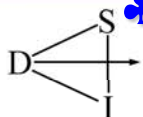
Simplified Traditional value chain





Traditional value chain Issues

- The protection is performed before distribution
 - ♣ By the distributor or
 - ♣ By a specialized third party
- The B2B areas are (production, integration, etc.):
 - ♣ Considered trusted
 - ♣ Based on paper contracts
 - ♣ Contracts are produced on the basis of a limited and not standard terminology, so that they are not easy interpreted and transported on other media, or channels, etc.
- No control about what is done on the content on the B2C:
 - ♣ The author and producers cannot verify, they may ask
 - ♣ The integrators cannot verify, they may ask at the seconds,
 - ♣ Etc.
- The distributor:
 - ♣ controls the selling of content
 - ♣ Does not control/verify the exploitation of each single rights

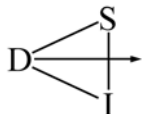




Rights Management



- 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

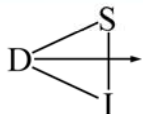




Digital Rights Management

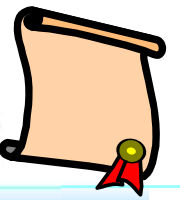


- DRM: Digital Rights Management is
 - ♣ A set of technologies and solution to cope with Digital Management of Rights
- 1st generation of DRM covers:
 - ♣ security and encryption
 - ♣ prevent non authorized copying
- **2nd generation of DRM covers:**
 - ♣ description, identification, trading, protection,
 - ♣ monitoring, and tracking of all forms of rights usages over contents, including management of rights holders relationships

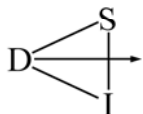




Aim of Digital Rights Management

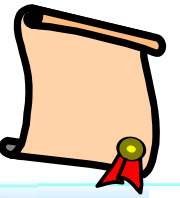


- To allow accessing at the digital content functionalities in a controlled manner
 - ♣ To who has been **authenticated/certified**
 - ♣ To do what (are the rights) is defined in a **license**
 - ♣ **Verifying/Control/Supervise** if the above conditions and others are respected
 - ♣ By using technologies to **protect content** (e.g., encryption, fingerprint, watermark, etc.)
- Cons:
 - ♣ Registration of users (in some case can be relaxed)
 - ♣ Authentic. of users and/or tools/terminal/devices
 - ♣ Control of users
- *It has to be supported by a set of additional technical solutions*

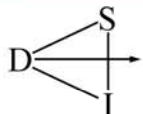




Motivations for Digital Rights Management

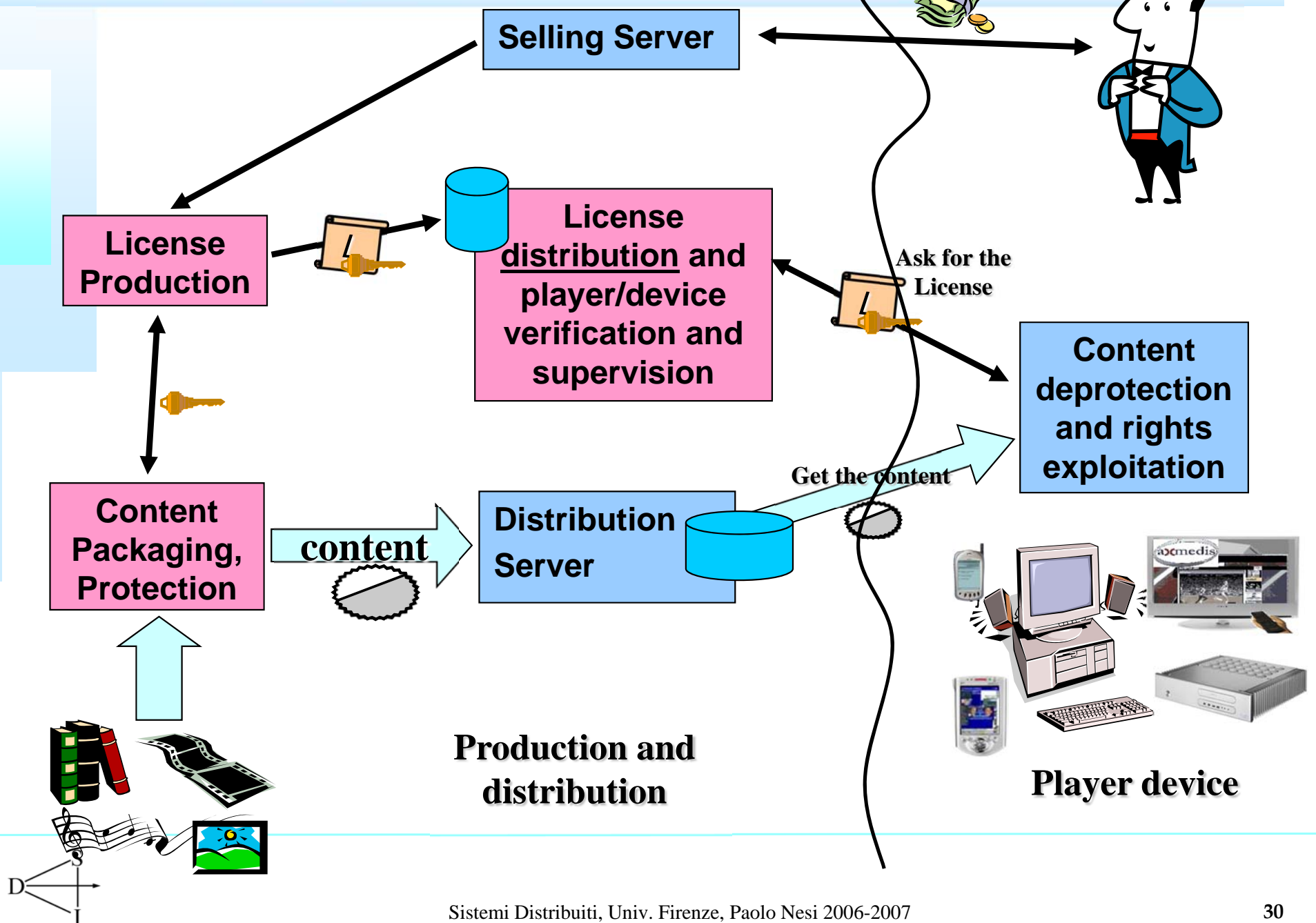


- Prevent the rights exploitation to who has not acquired the rights
- Verifying/Control if the allowed rights are respected:
 - ♣ In the whole value chain or at least at the end users
- This role is traditionally partially covered by Collecting Societies (clearing house) that
 - ♣ Guarantee/protect 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, SGAE, SAGEMA, etc.





Simple protection with Key sending

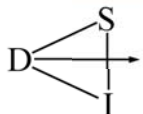




What Should be the DRM



- 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





How is DRM Secure?

○ Encryption

- ♣ DRM may use strong encryption (# bits) never been cracked

○ Digital signatures

- ♣ content header is digitally signed to prevent tampering
- ♣ License is digitally signed, etc.

○ Separation of licenses from content

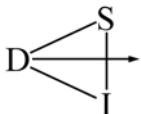
- ♣ Licenses should be kept separate from content,
- ♣ content can be widely and securely distributed, P2P allowed

○ 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

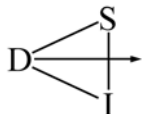
- ♣ To prevent compromised player or non trusting users to receive or distribute other content,
- ♣ Black list of devices





Single Channel Distribution value chain Issues

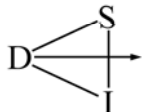
- The protection is performed before distribution
- The B2B areas are (production, integration, etc.):
 - ♣ Considered trusted, based on paper contracts
 - ♣ The authors and producers cannot verify
 - ♣ The integrators cannot verify
- The single channel distributor:
 - ♣ Establishes the business models 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.





Content Elements

- **Content Packaging to contain the following information**
 - ♣ Metadata.....
 - ♣ Digital Resources.....
 - ♣ Protection Information.....
 - ♣ License.....
- **The Package should allow to be**
 - ♣ Protected
 - ♣ Streamed (so called real-time) and/or downloaded,
 - ♣ Shared on P2P, etc..
 - ♣ Ported on physical supports,
 - ♣ Adapted, etc..
 - ♣ Coded in binary and/or XML, etc.
 - ♣ etc.





Content Elements

○ Metadata:

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:

Resource

- ♣ Any digital information: images, doc, txt, video, game, application, file, audio, etc.
- ♣ Hierarchy of digital resources

○ Protection Information:

- ♣ What has to be done to access at a given information/resource
- ♣ Tools used, their parameters, etc.

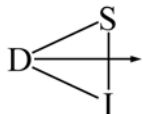
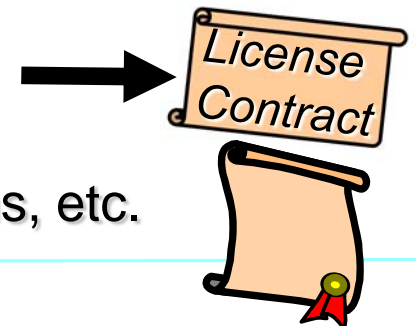
○ Licence:

- ♣ Which rights are provided, who is the recipient, conditions, etc.

Prot-Info Model



License Model

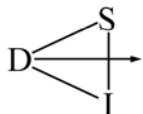




License formal language

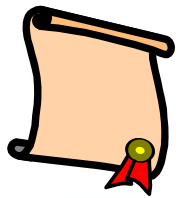


- **Windows Media DRM**
- **MPEG-21:**
 - ♣ REL: Rights Expression Language
 - ➔ Derived from XrML
 - ♣ RDD: Rights Data Dictionary
- **XrML 2.0: eXtensible rights Markup Language**
 - ♣ <http://www.xrml.org/>
 - ♣ General purpose
 - ♣ ContentGuard, Nov. 2001, Microsoft
 - ♣ Derived from DPRL
 - ♣ Usato come base per MPEG-21
- **OMA ODRL: Open Digital Rights Management**
 - ♣ Expression language for mobiles
 - ♣ In some way simpler than MPEG-21 REL
 - ♣ ..





MPEG-21 — REL, Rights Expression Language

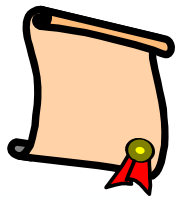


- A machine-readable language, XML
- To declare rights and permissions
- Uses terms defined in the Rights Data Dictionary
- REL consists of licenses and grants that give specific permissions to Users to perform certain actions on certain resources, given that certain conditions are met
 - ♣ **Grants 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

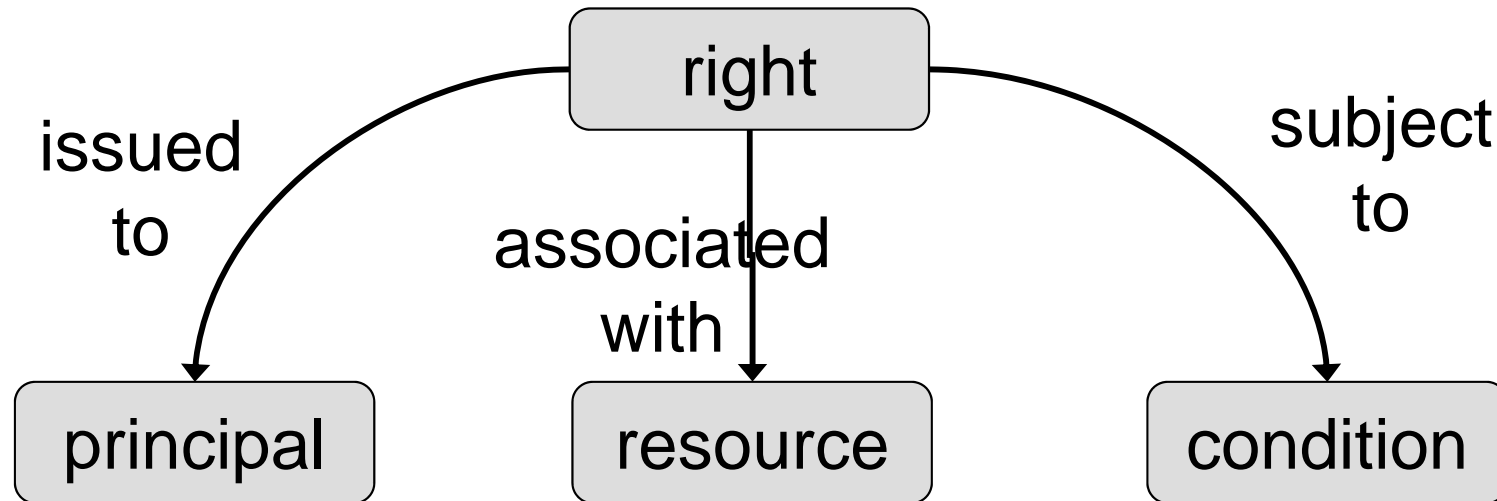
RDD

D
S
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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)





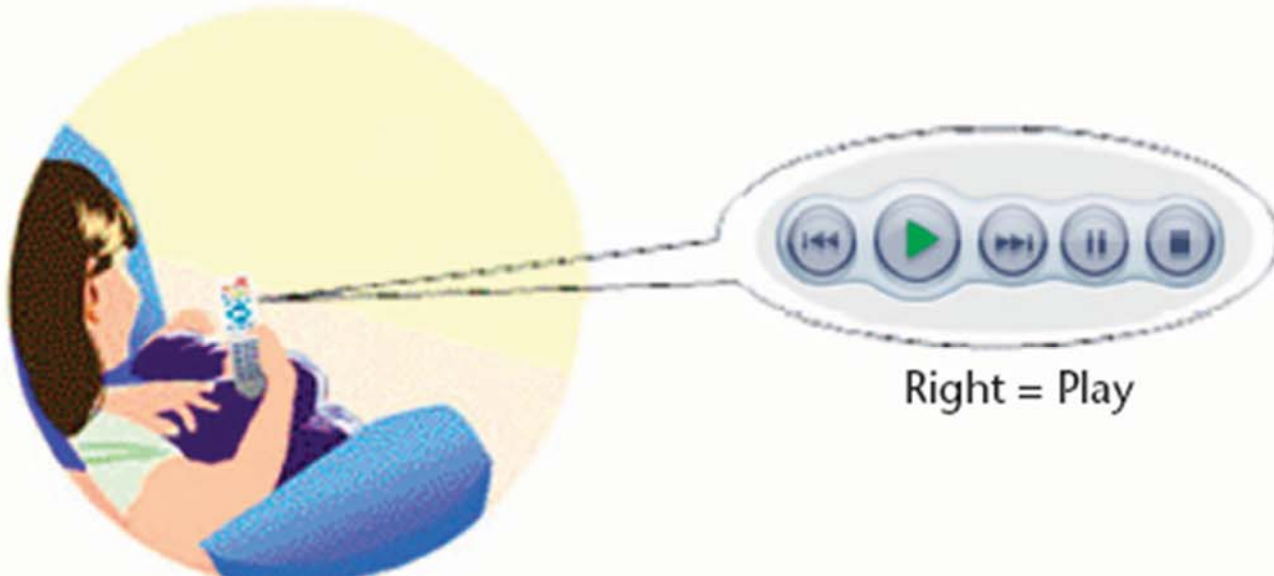
An example of statement



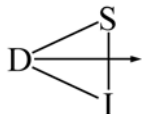
Condition = November 2003



Resource = Ocean Wilds



- 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

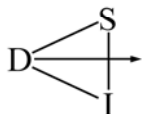
- ValidityIntervalStartsNow

- ValidityTimeMetered

- ValidityTimePeriodic

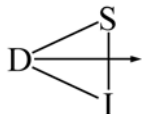
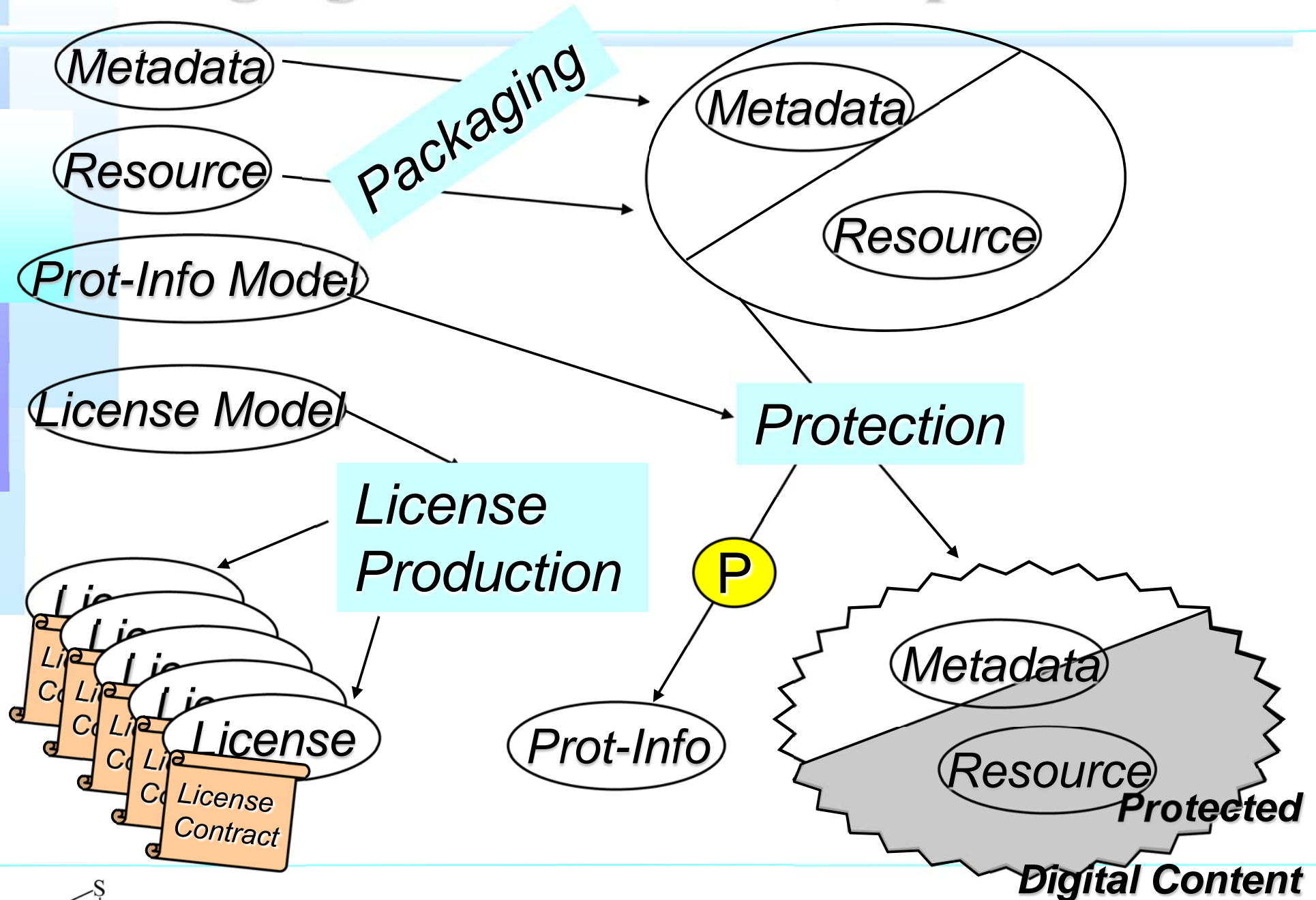
Examples of Rights

- Adapt
- Delete
- Diminish
- Embed
- Enhance
- Enlarge
- Execute
- Install
- Modify
- Move
- Play
- Print
- Reduce
- Uninstall



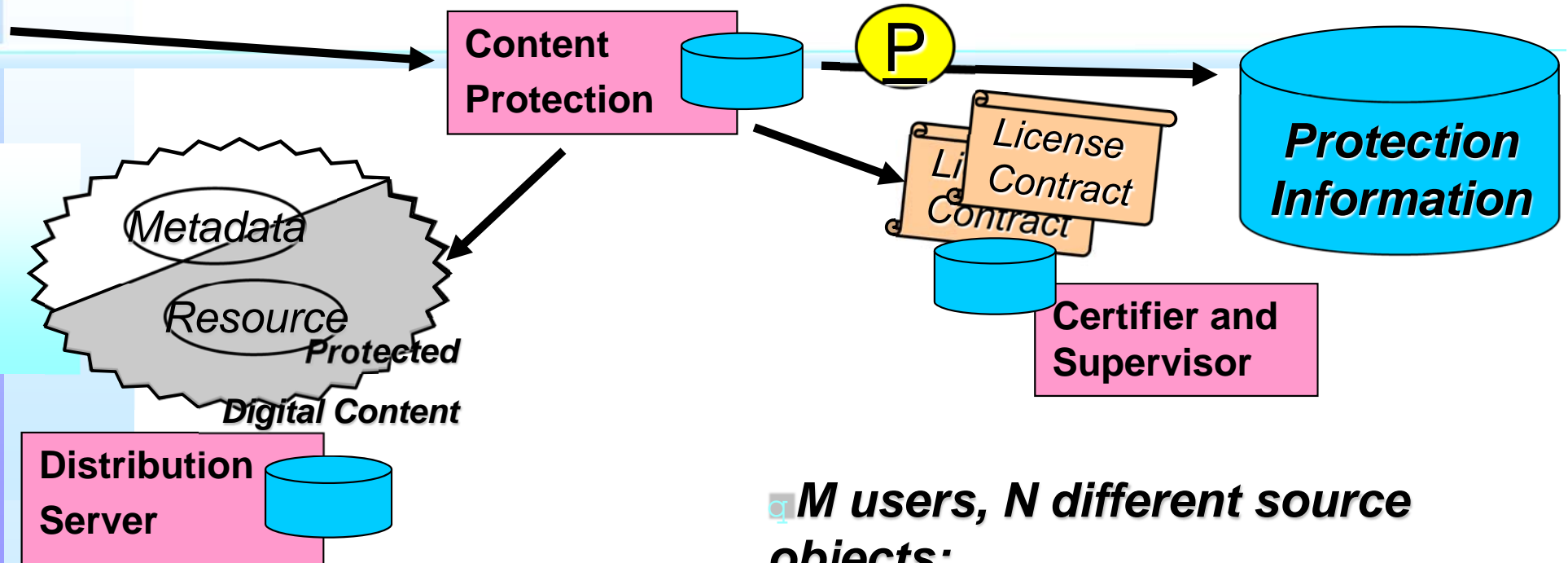


Packaging and Protection, Open Model





General Architecture of content business



Pros:

Simple distribution

P2P supported

Cons:

3 servers

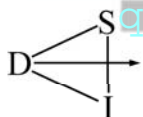
Many Licenses

M users, N different source objects:

N Objects protected only once

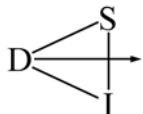
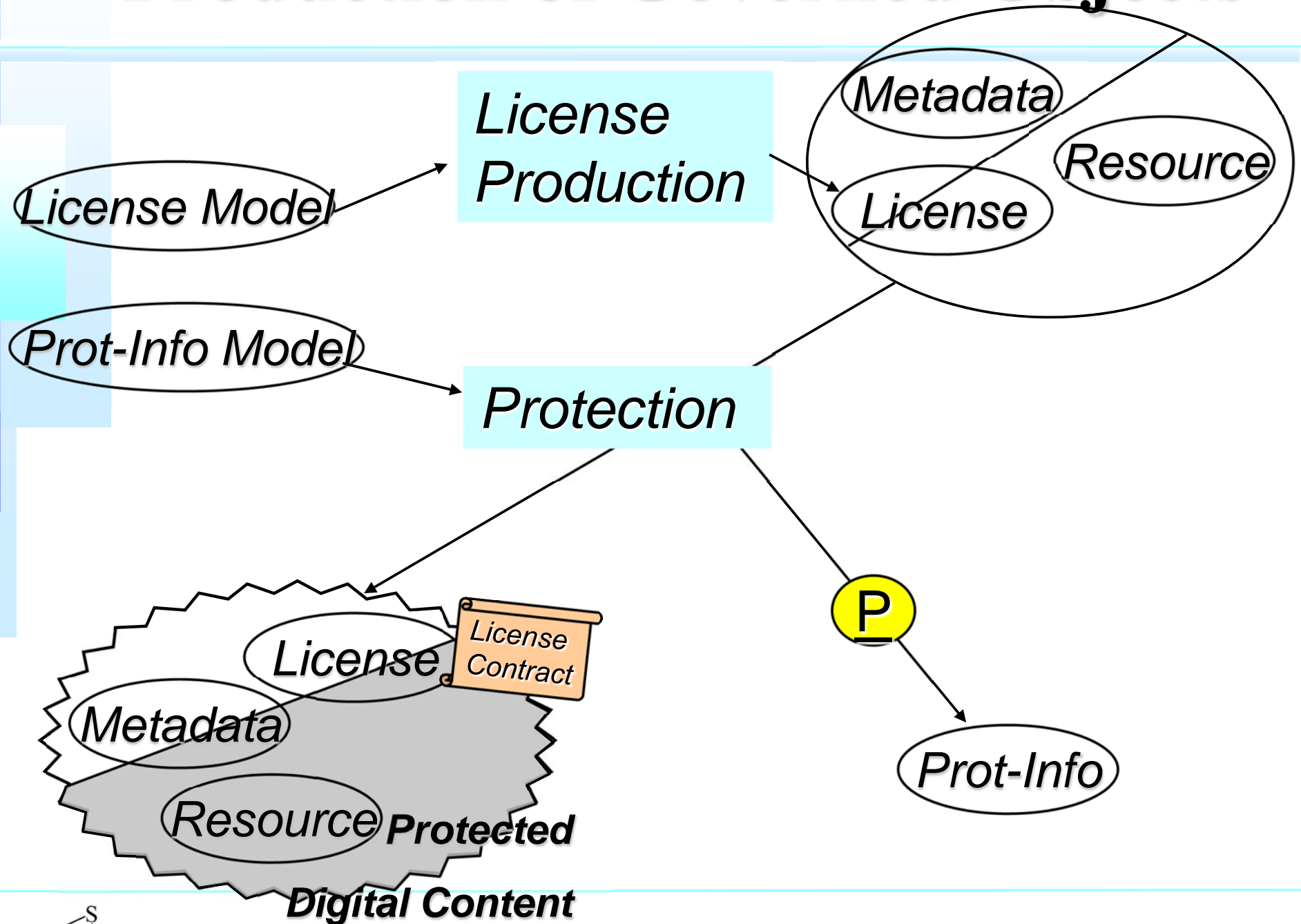
N protection info

$M*N$ licenses maximum since each of them may be interested to have all objects



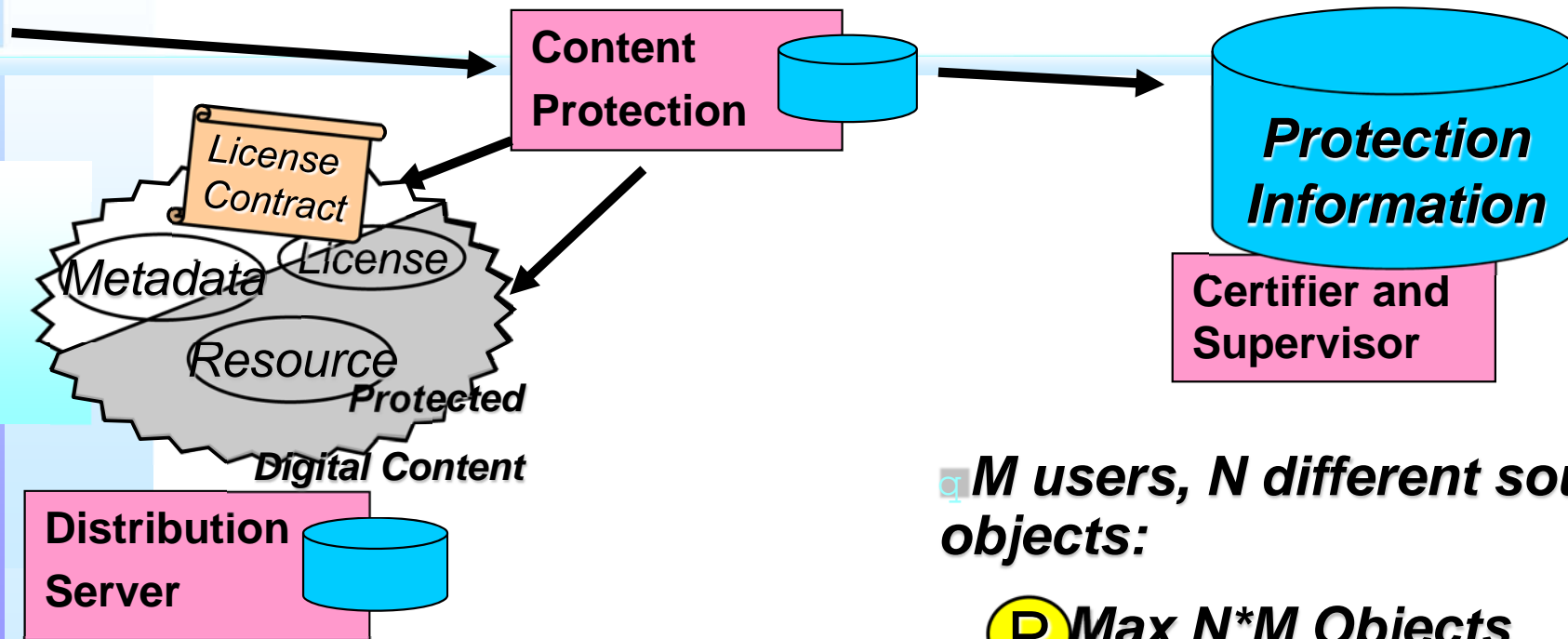


Production of Governed Objects





General Architecture of content business



Pros:

- Simple distribution, 2 servers

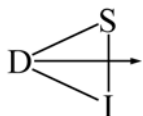
Cons:

- P2P non supported
- Too many different objects, too much space

M users, N different source objects:

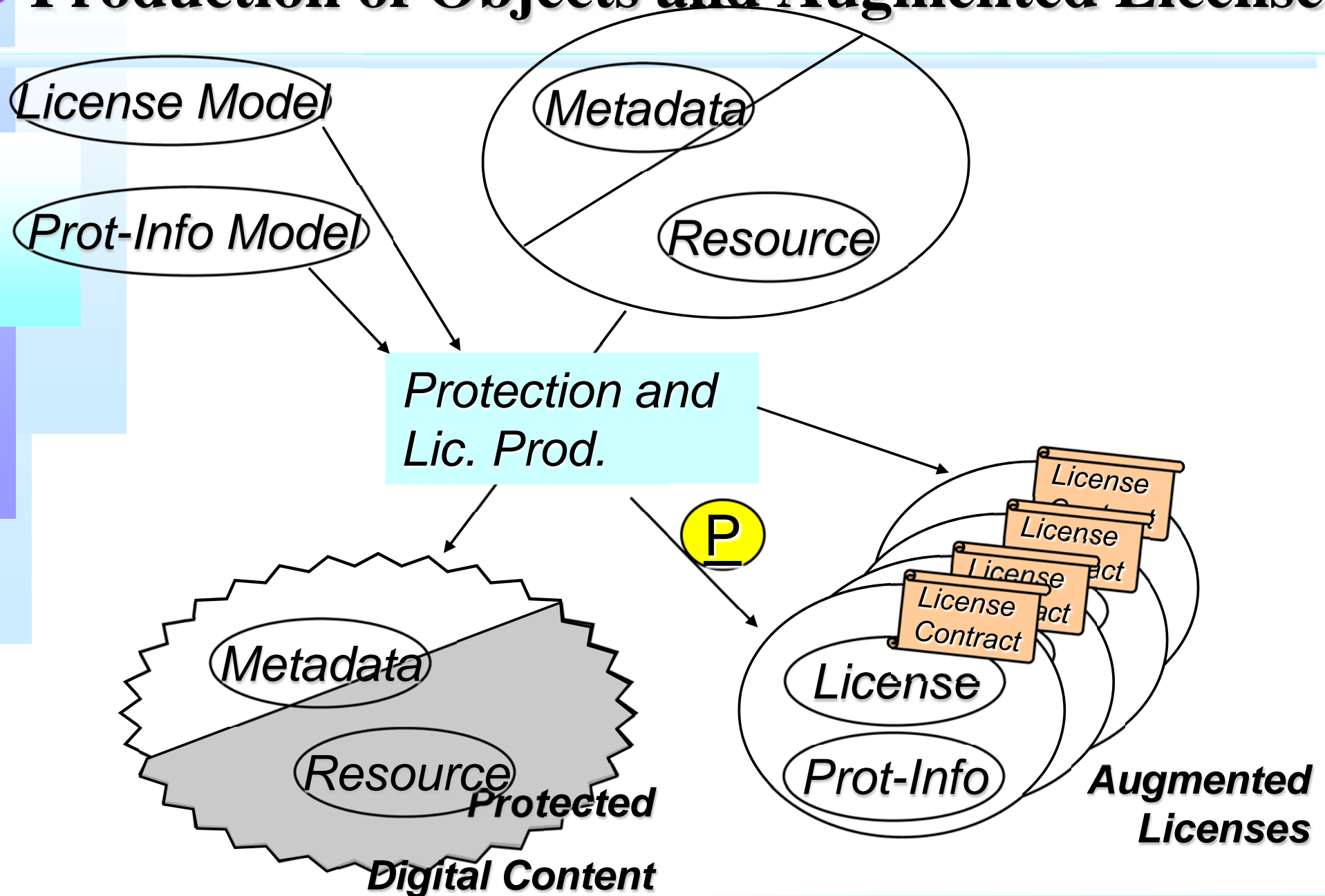
P Max $N \cdot M$ Objects protected, that is for all the N Objects M different protected-licensed versions have to be produced

P $N \cdot M$ protection info



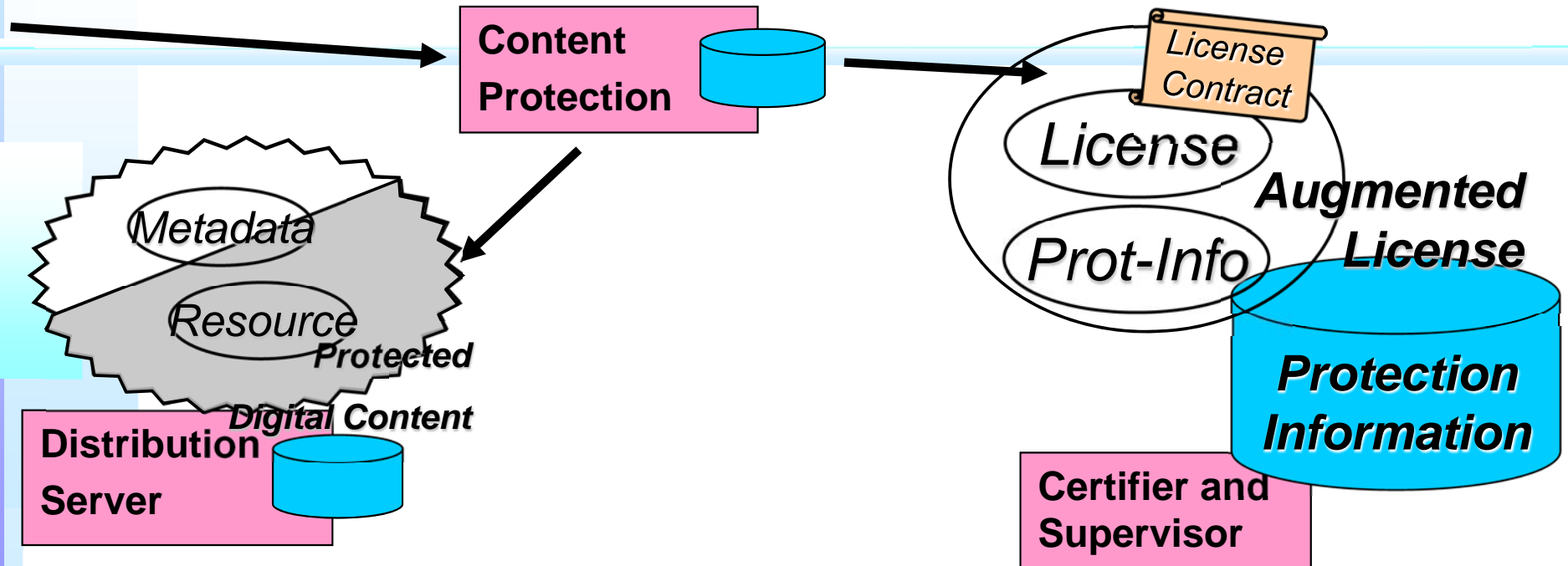


Production of Objects and Augmented License





General Architecture of content business



Pros:

- Simple distribution, 2 servers

- P2P supported

Cons:

- Many information outside

- Diff users have the same protection inform

M users, N different source objects:

P N Objects protected

P N protection information

L $N * M$ protection info included into licenses





Some Considerations

○ **Open Model:**

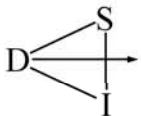
- ♣ Supporting P2P
- ♣ The volume of Objects is acceptable
- ♣ The elements can be independently manipulated
 - ➔ Licenses can be changed, reissued
- ♣ Suitable for B2B and B2C

○ **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

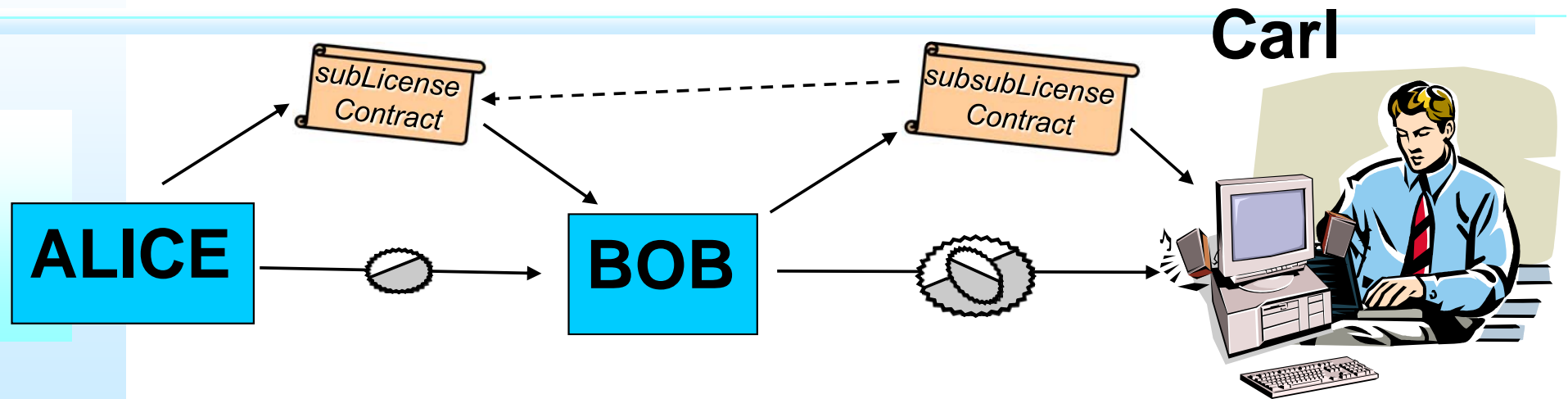
○ **Augmented License:**

- ♣ Supporting P2P
- ♣ The license has to include the same protection information
- ♣ The objects can be substituted independently
 - ➔ Licenses can be changed, reissued

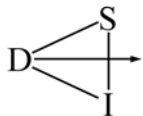
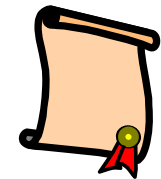




Managing License Chain

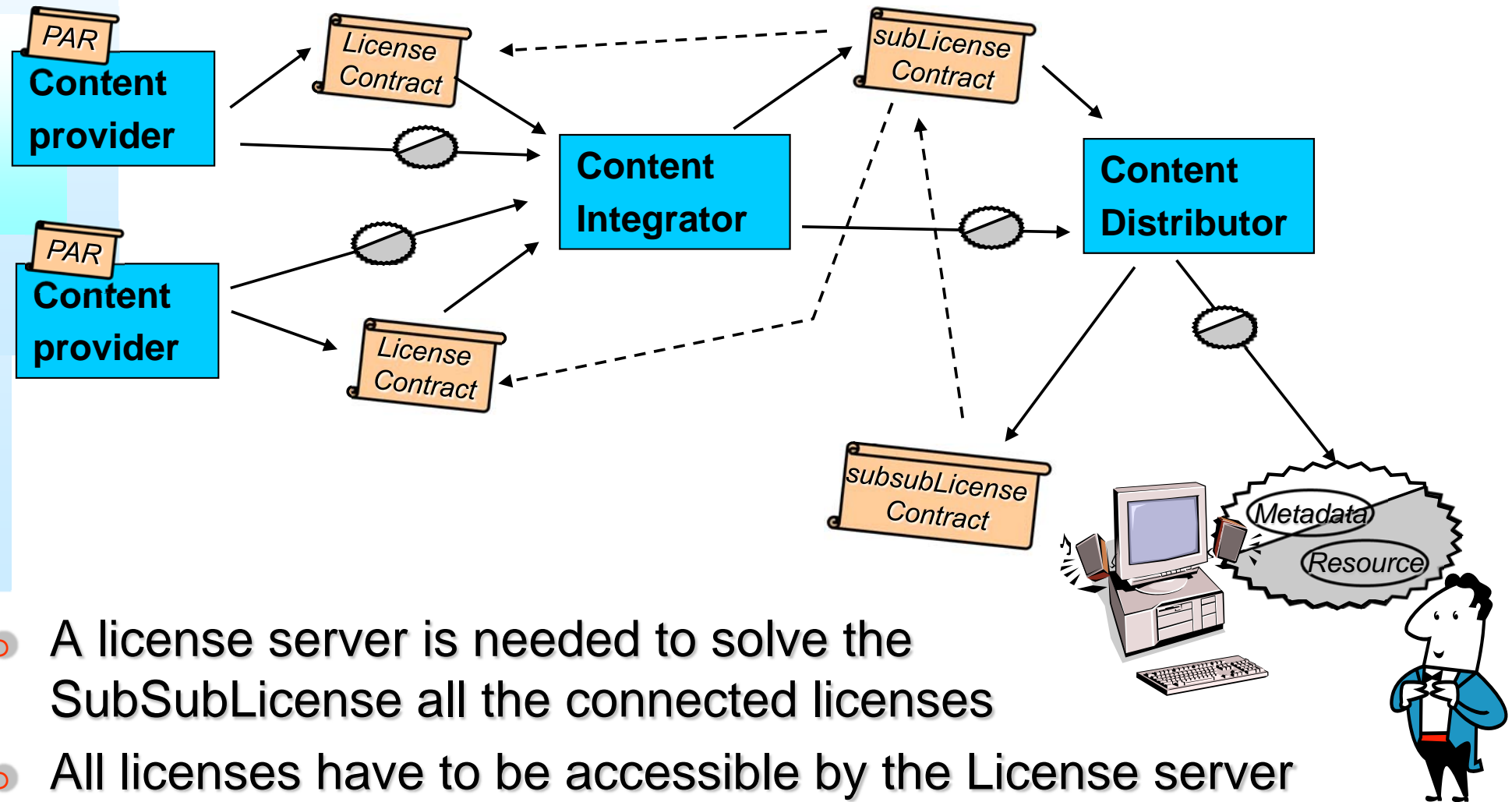


- **Alice states,** *Bob has the right to issue a license to anyone to print the book in Italy*
- **Bob states,** *Carl has the right to print the book in Italy*
- To solve the SubSubLicense for Carl all the connected Licenses are needed
- Licenses have to be accessible on Processing Engine

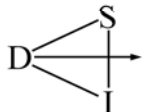




Managing License Chain



- A license server is needed to solve the SubSubLicense all the connected licenses
- All licenses have to be accessible by the License server
 - ♣ This may involve massive processing

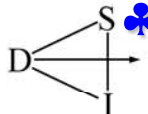






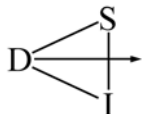
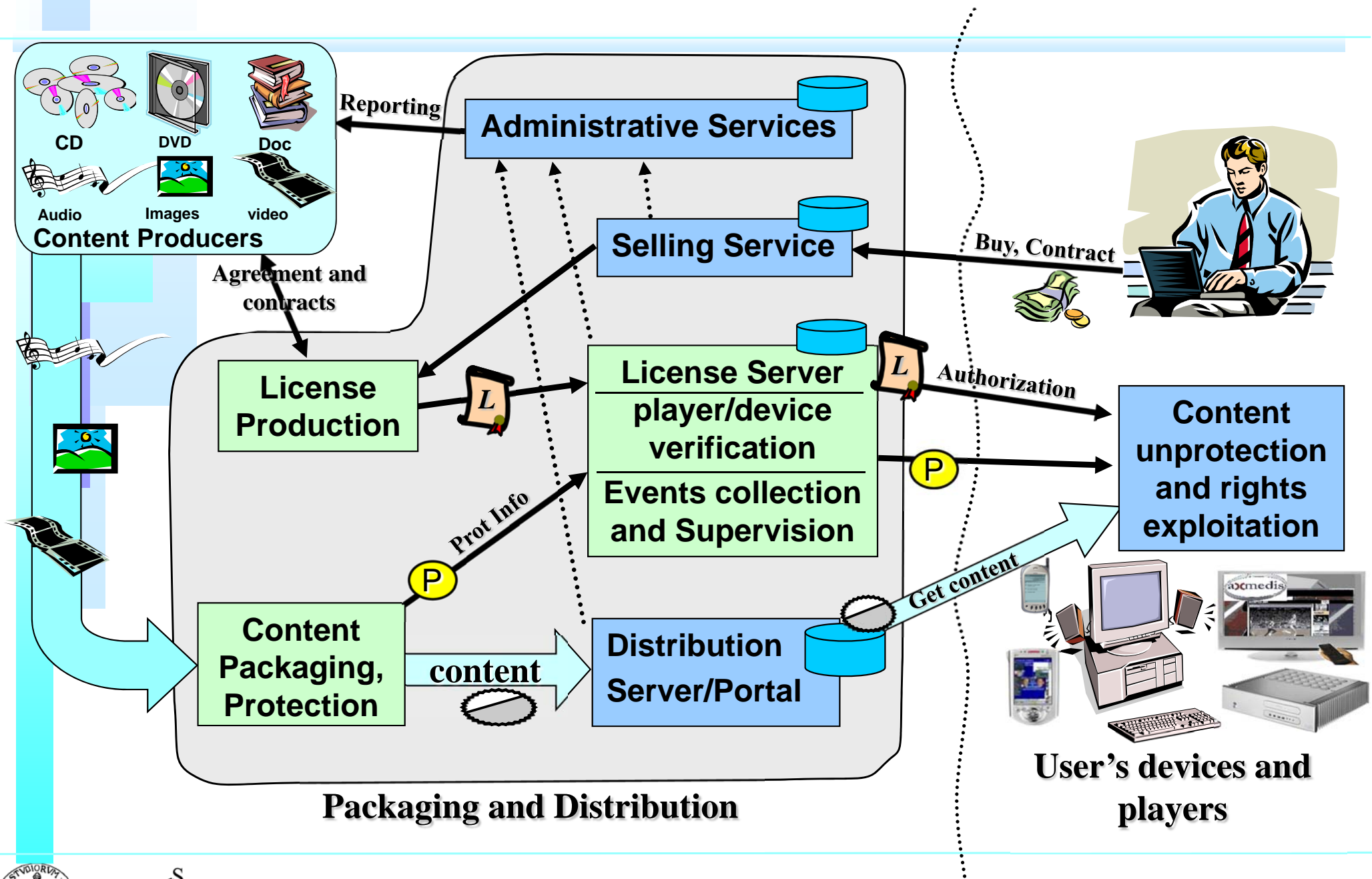
Open Model vs Augmented License

- 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 prot 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





Modello Base di DRM

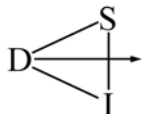




Business Rules, a way to formalize allowed rights

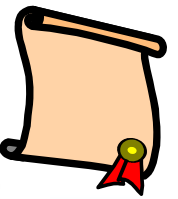


- Exploitation Models (contracts from the consumers to the provider are aligned to the exploitation model):
 - ♣ Subscription to a collection or service
 - ♣ All you can eat
 - ♣ Pay per renting
 - ♣ Pay per use, pay per play, pay per print, etc.
 - ♣ Pay per stream, download, etc...
 - ♣ Pay per minute 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.

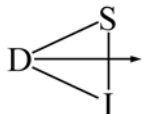




Business Rules, a way to formalize allowed rights

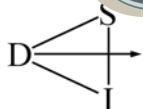
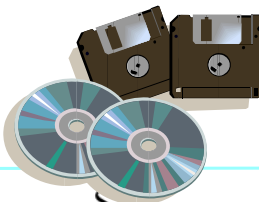


- It may be based on limiting
 - ♣ Number of times you can do an action, and usage
 - ♣ in a temporal window for the exploitation of any rights
 - renting
 - ♣ in a space
 - regional area or
 - domain (set of computers, etc.)
 - ♣ The usage according to the user profile:
 - impaired,
 - student,
 - Archival
 - etc.





Convergence, the Interoperable Content



Internet Distributor

Internet Distributor

Mobile Distributor

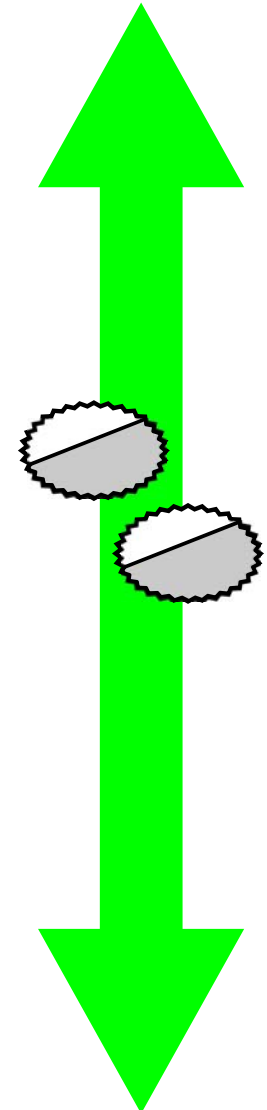
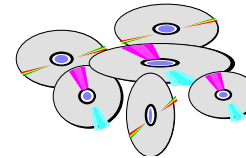
Broadcasters, DVB-H

Media Distributor

Broadcasters, DVB-T

Broadcasters, DVB-S

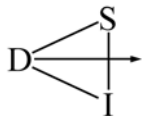
Kiosks distribution





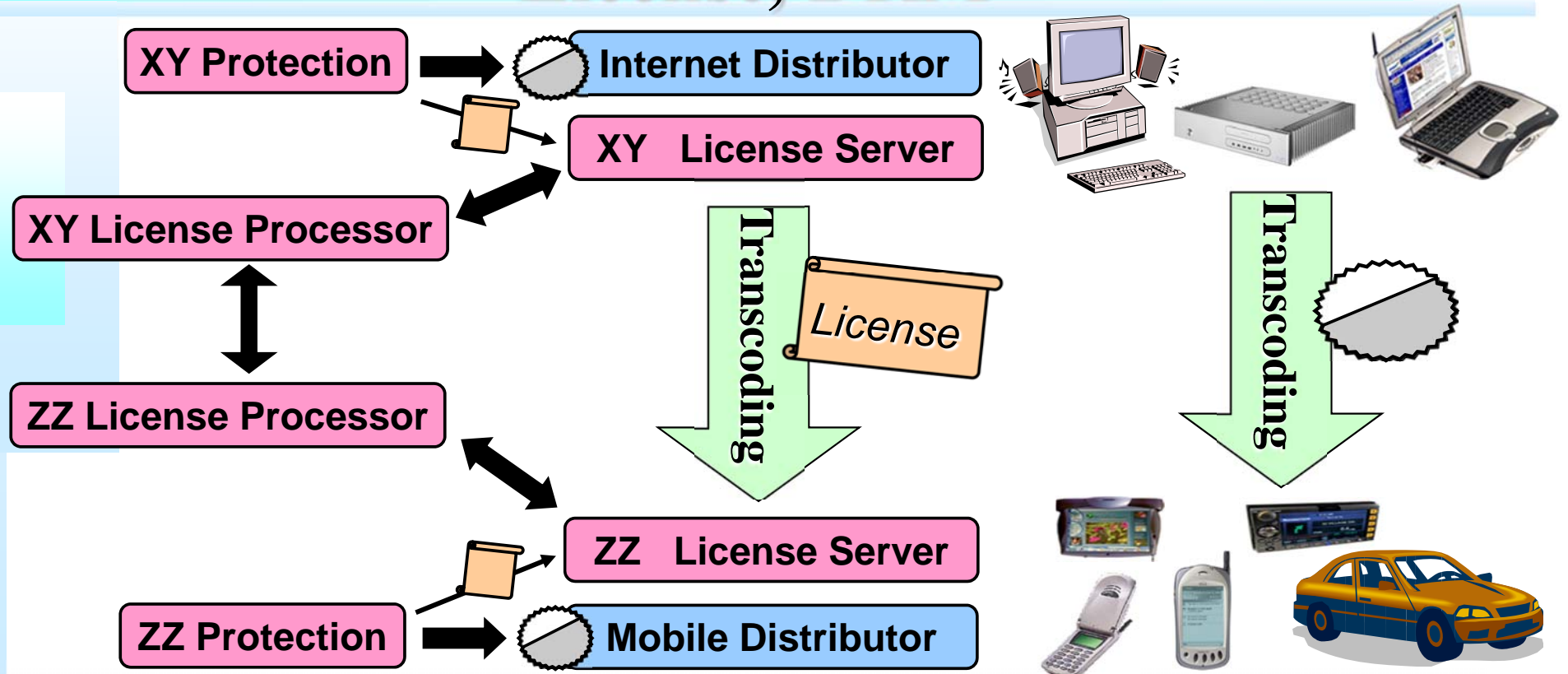
Present Needs for Accessing New Markets

- 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





Es: Convergence, the Interoperable License, DRM

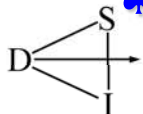


- When interoperable content in terms of format passes from two devices supporting different DRM models and licenses
- License needs to be transcribed and rights semantics preserved
- License chain processing need to be interoperable



Major Related Organisations

- Standardisation Bodies for elements
 - ♣ MPEG-2, MPEG (Motion Picture Expert Group)
 - ♣ OMA (Open Mobile Alliance)
 - ♣ MI3P (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.

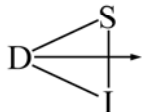




Content Distributors web sites



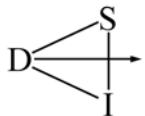
- Apple i-Tune
 - ♣ Audio, video distribution
 - ♣ Proprietary DRM
- TISCALI, 12 portali
 - ♣ Audio tracks of OD2 and videos (MIKADO)
 - ♣ Windows Media DRM
- SKY (OpenSky), EUTELSAT
 - ♣ Video, MPEG4, Smart CARD
- DTT: MHP (MPEG-2 + Java)
 - ♣ Mediaset, La-7, RAI,
 - ♣ Smart Card: IRDETO, NAGRAVISION
- BuyMusic.com
 - ♣ SDMI, Windows Media DRM
- Real Networks
- ROXIO, Napster
 - ♣ Windows Media DRM
- Warner Music UK is using the **Share!**
 - ♣ Windows Media DRM
- Musicmatch.com
 - ♣ 360.000 tracks, Windows Media DRM





Technologies and standards

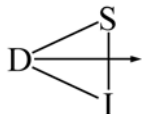
- Technologies for content protection
 - ♣ Microsoft Windows Media, DRM
 - ♣ Apple I-Tune
 - ♣ Media Commerce Suite of Real Network
 - ♣ EMMS of IBM
 - ♣ Liquid Audio
 - ♣ DMD secure
 - ♣ Sealed Media
 - ♣ Intertrust
 - ♣ DMOD
 - ♣ Adobe, mainly limited to documents
 - ♣ AXMEDIS
 - ♣ WEDELMUSIC
- DRM
 - ♣ ODRL, OMA, Open Mobile Association
 - ♣ XrML, Content Guard, related to MPEG-21
 - ♣ MPEG-21





Windows Media

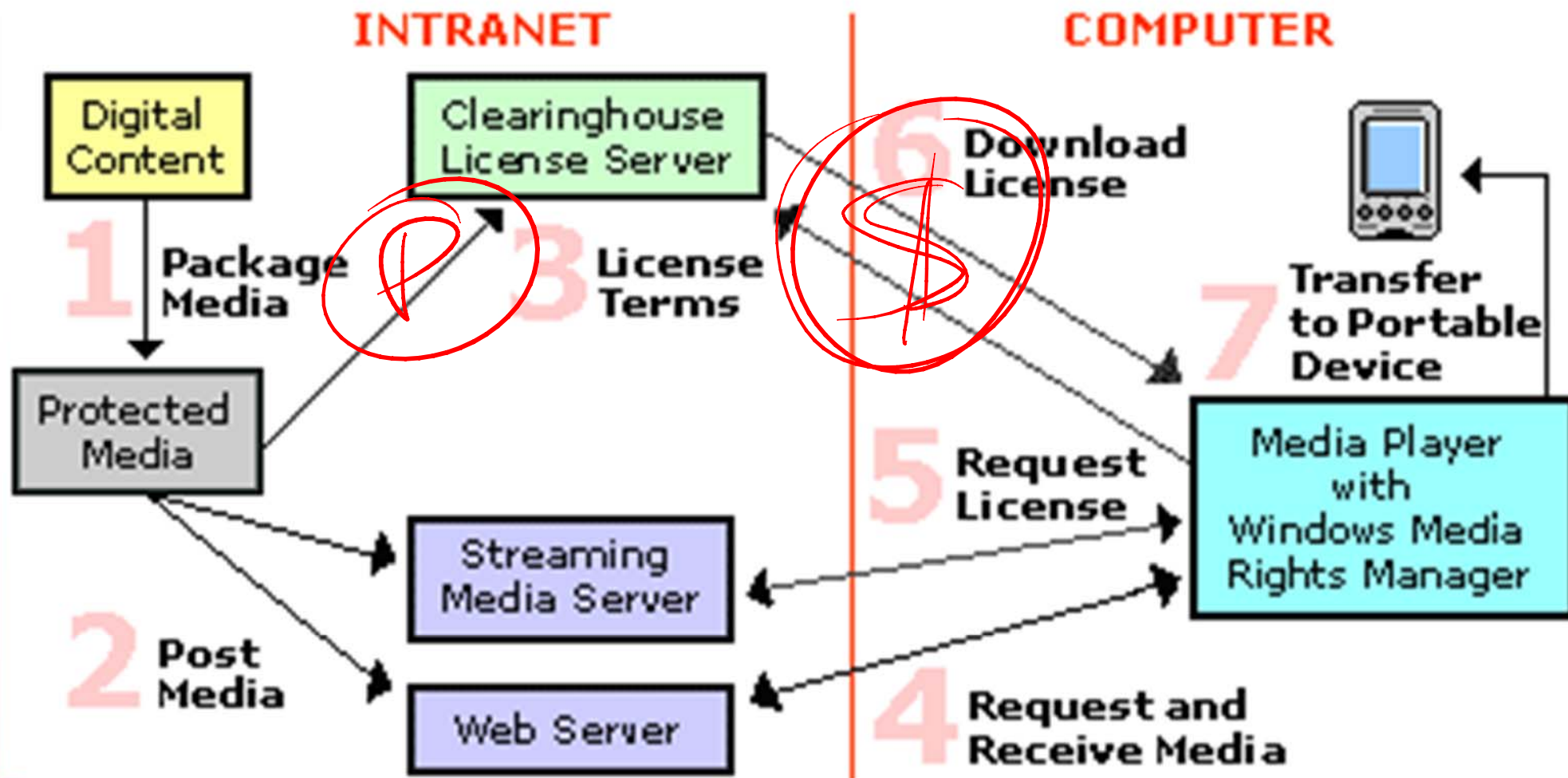
- Composto da:
 - ♣ Player (client)
 - ♣ Encoder/packager (content production)
 - ➔ Uso di codecs vari, MPEG, etc.
 - ♣ Server (distribution Server)
 - ♣ DRM model
 - ♣ Streaming and Download
- Realizzazione di soluzioni varie da 2-tier a n-tier





Windows Media Rights Manager

Windows Media Rights Manager Flow



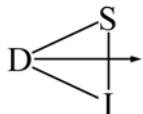


Windows Media Rights Manager



Packaging

- ♣ Windows Media Rights Manager packages the digital media file.
- ♣ The packaged media file has been encrypted and locked with a "key." This key is stored in an encrypted license, which is distributed separately.
- ♣ Other information is added to the media file, such as the URL where the license can be acquired.
- ♣ This packaged digital media file is saved in Windows Media Audio format (with a .wma file name extension) or Windows Media Video format (with a .wmv file name extension).



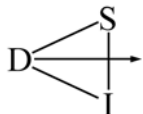


Windows Media Rights Manager



Establishing a License Server

- ♣ The content provider chooses a license clearing house that stores the specific rights or rules of the license and implements the Windows Media Rights Manager license services.
- ♣ The role of the clearing house is to authenticate the consumer's request for a license.
- ♣ Digital media files and licenses are distributed and stored separately, making it easier to manage the entire system.



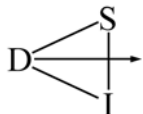


Windows Media Rights Manager



○ License Acquisition

- ♣ To play a packaged digital media file, the consumer must first acquire a license key to unlock the file.
- ♣ The process of acquiring a license begins automatically when the consumer attempts to acquire the protected content, acquires a predelivered license, or plays the file for the first time.
- ♣ Windows Media Rights Manager either sends the consumer to a registration page where information is requested or payment is required, or "silently" retrieves a license from a clearing house.



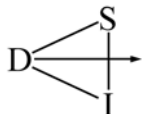


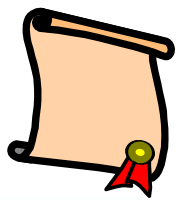
Windows Media Rights Manager



Playing the Media File

- ♣ To play the digital media file, the consumer needs a media player that supports Windows Media Rights Manager.
- ♣ The consumer can then play the digital media file according to the rules or rights that are included in the license.
- ♣ Licenses can have different rights, such as start times and dates, duration, and counted operations. For instance, default rights may allow the consumer to play the digital media file on a specific computer and copy the file to a portable device.
- ♣ Licenses, however, are not transferable. If a consumer sends a packaged digital media file to a friend, this friend must acquire his or her own license to play the file.
- ♣ This PC-by-PC licensing scheme ensures that the packaged digital media file can only be played by the computer that has been granted the license key for that file.





Content owner



License key
seed
+
Key ID =



+



File

→



Packaged
file

Consumer's player



Packaged
file

+



License

↓



Consumer plays music

License clearing house



License key
seed
+
Key ID from
packaged file =

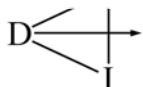


→



License

Windows Media
License Service

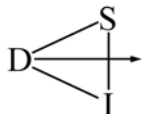




Microsoft Windows Media Rights Manager License



- 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.

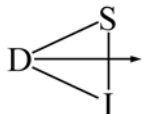




Windows Media DRM?



- Pay per view
 - ♣ Play count
 - Rental
 - ♣ Expiration after first use
Useful for different time zones
 - ♣ Expiration on store
Useful for different time zones
 - ♣ Begin & expiration dates
 - Subscription
 - ♣ Begin & expiration dates
 - Controlled distribution of media assets
 - ♣ Can include any of the above
- ♣ Allow Backup Restore
 - ♣ Allow Burn To CD
 - ♣ Allow Play On PC
 - ♣ Allow Transfer To Non SDMI
 - ♣ Allow Transfer To SDMI
 - ♣ Begin Date
 - ♣ Burn To CD Count
 - ♣ Delete On Clock Roll back
 - ♣ Disable On Clock Rollback
 - ♣ Exclude Application
 - ♣ Expiration After First Use
 - ♣ Expiration Date
 - ♣ Expiration On Store
 - ♣ Minimum App Security
 - ♣ Minimum Client SDK Security
 - ♣ Play Count
 - ♣ PM App Security
 - ♣ PM Expiration Date
 - ♣ PM Rights
 - ♣ Transfer Count

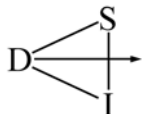




Microsoft License delivering



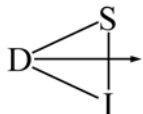
- Licenses can be delivered in different ways and at different times, depending on the business model
 - ♣ Can be delivered before or after the content
 - ♣ Both possible if downloading
 - ♣ Only the first is reasonable in the case of streaming
- Licenses can be delivered with or without the consumer 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

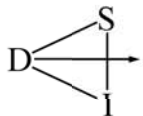






Concept of Super Distribution

- 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*





*Automating Production of Cross Media Content
for Multi-channel Distribution*

www.axmedis.org

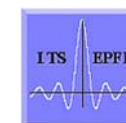
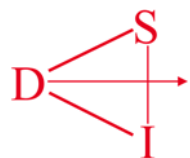
IST-2-511299

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UNIVERSITY OF LEEDS



[rigel][engineering]

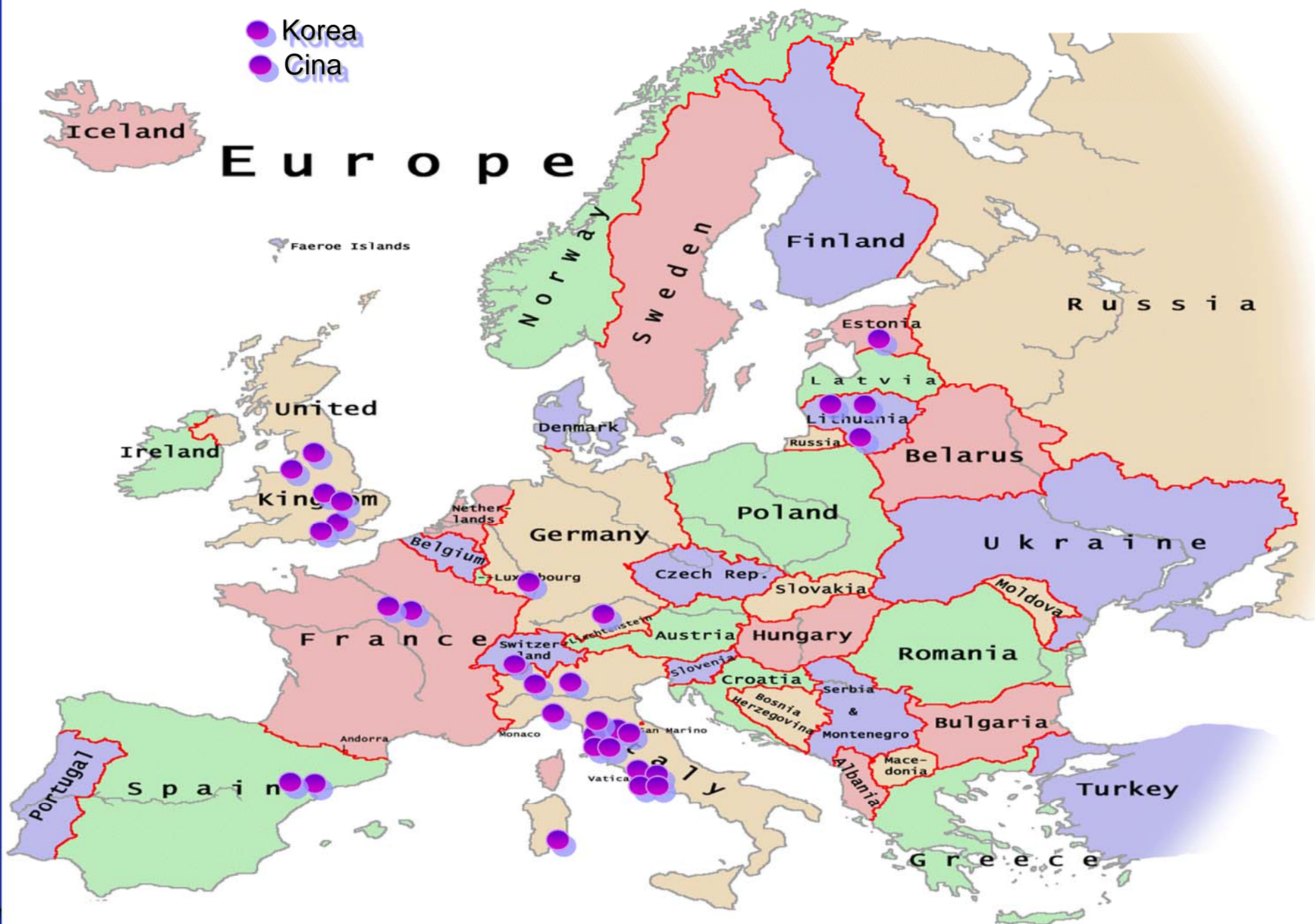


GRUPO GESFOR

AXMEDIS partners

AXMEDIS

-  Korea
-  Cina



- **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

Content:

- Producers
- Providers
- Aggregators
- Packager
- Integrators
- Promoters
- Distributors
- ..

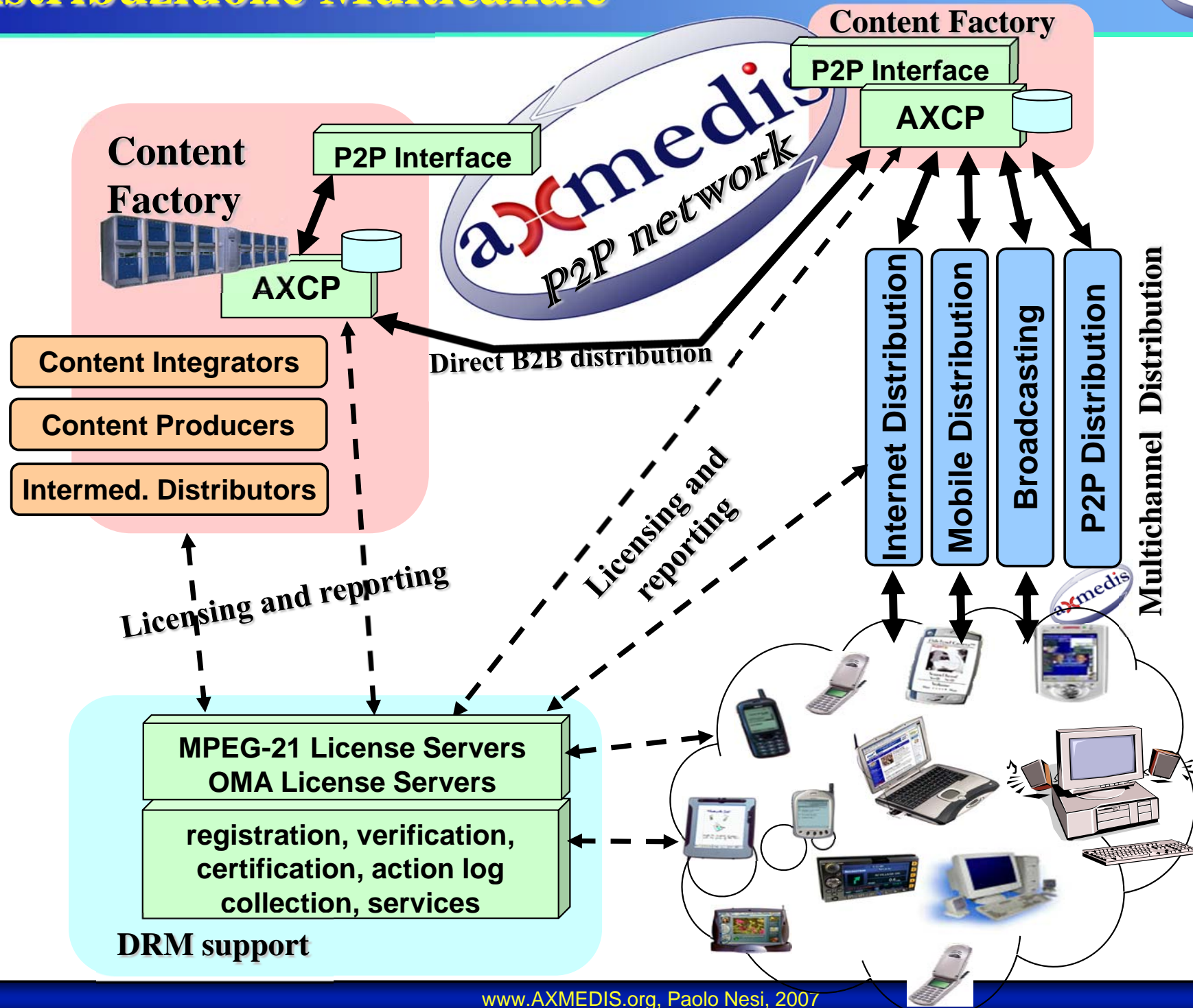


Tools and Solutions
Models and technologies
Content authoring, processing, protection,
distribution, controlling and usage

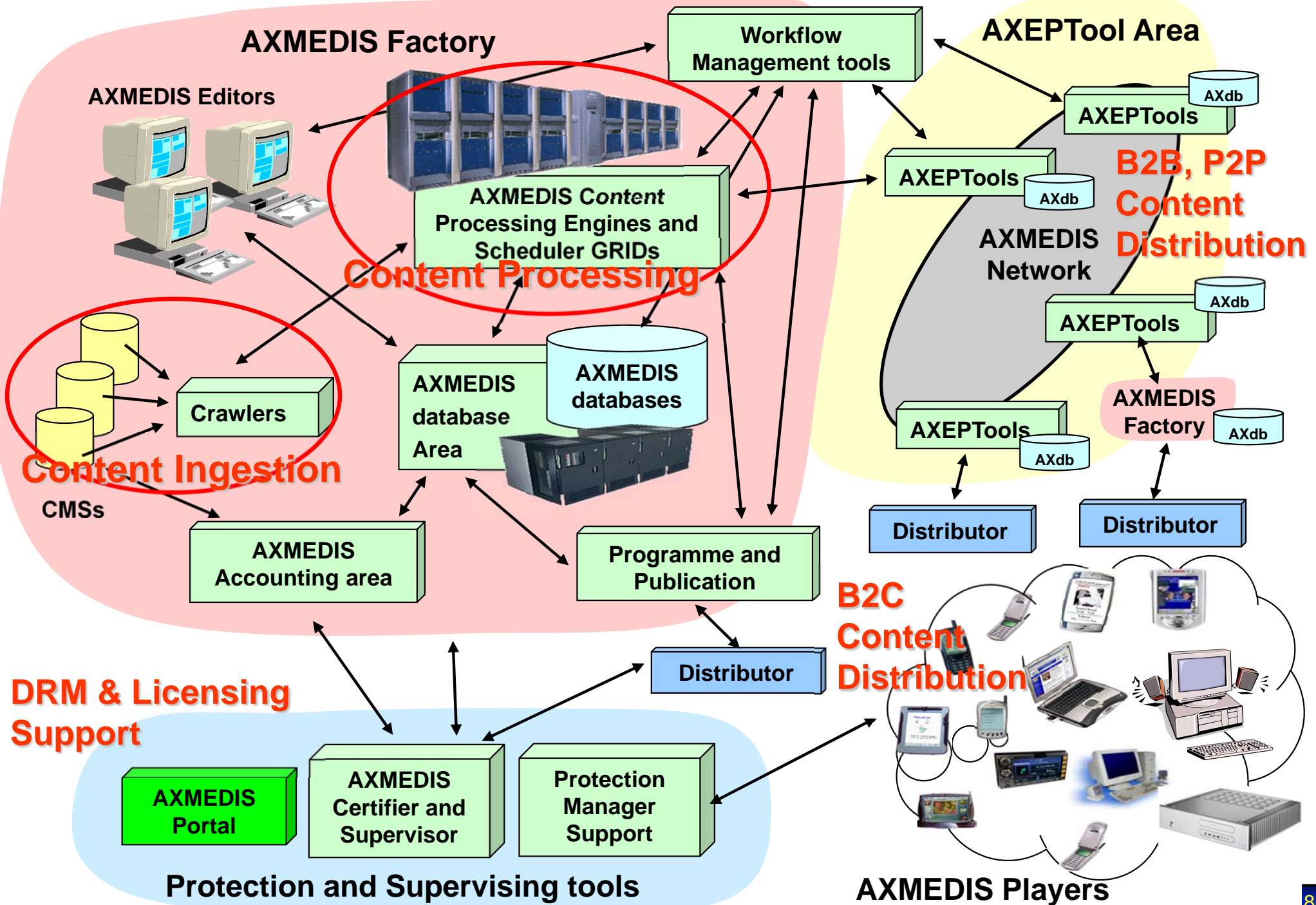
- Supporting both B2B and B2C distribution
- Reducing costs for Content Production, processing, etc
- Enabling Multichannel Distribution
- Enabling Interoperable Distribution of content
- Enabling e-commerce of secure digital content

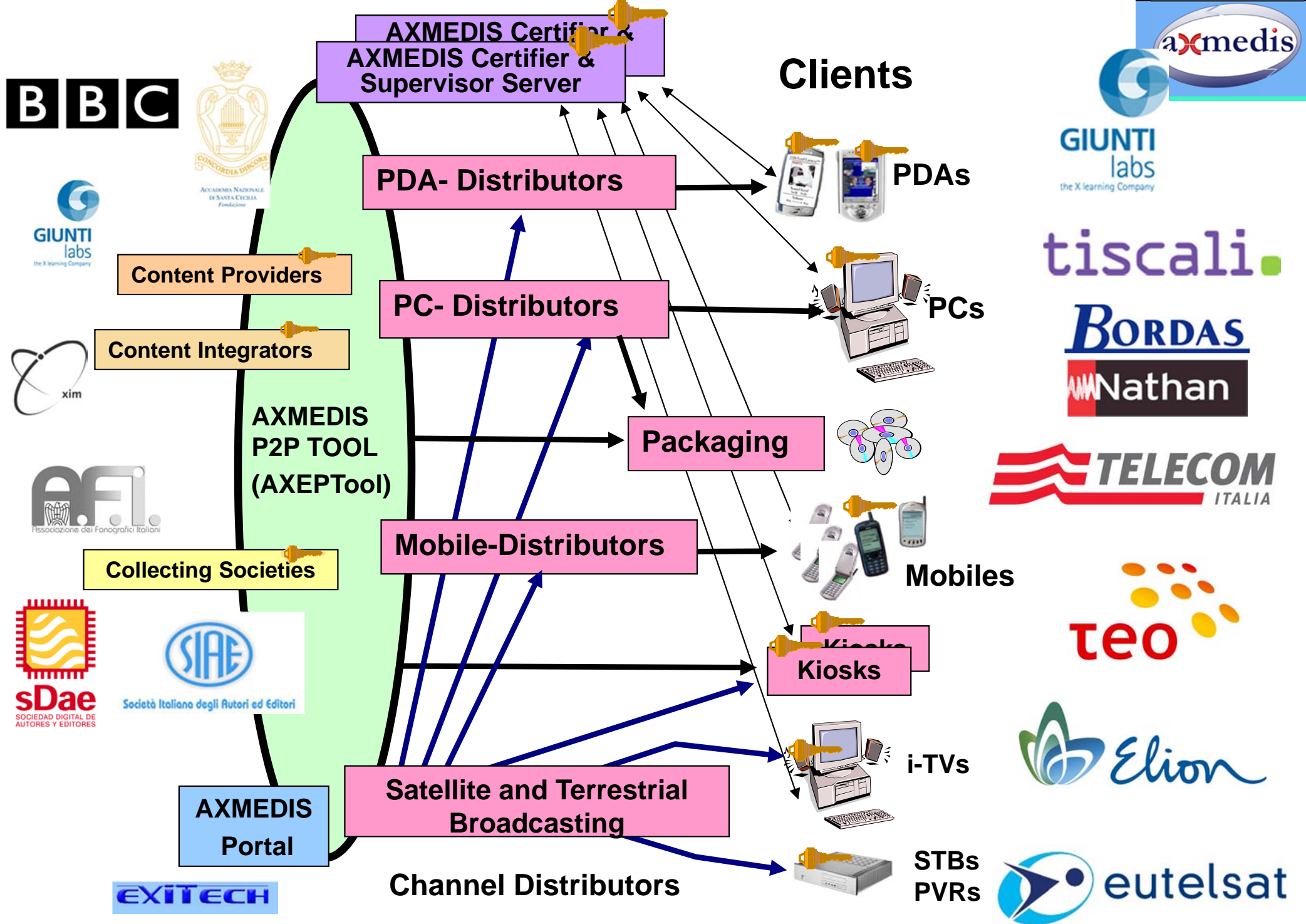
Create a unified European platform for content packaging, protection and distribution in terms of DRM and interoperability (convergence)

Distribuzione Multicanale



- **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



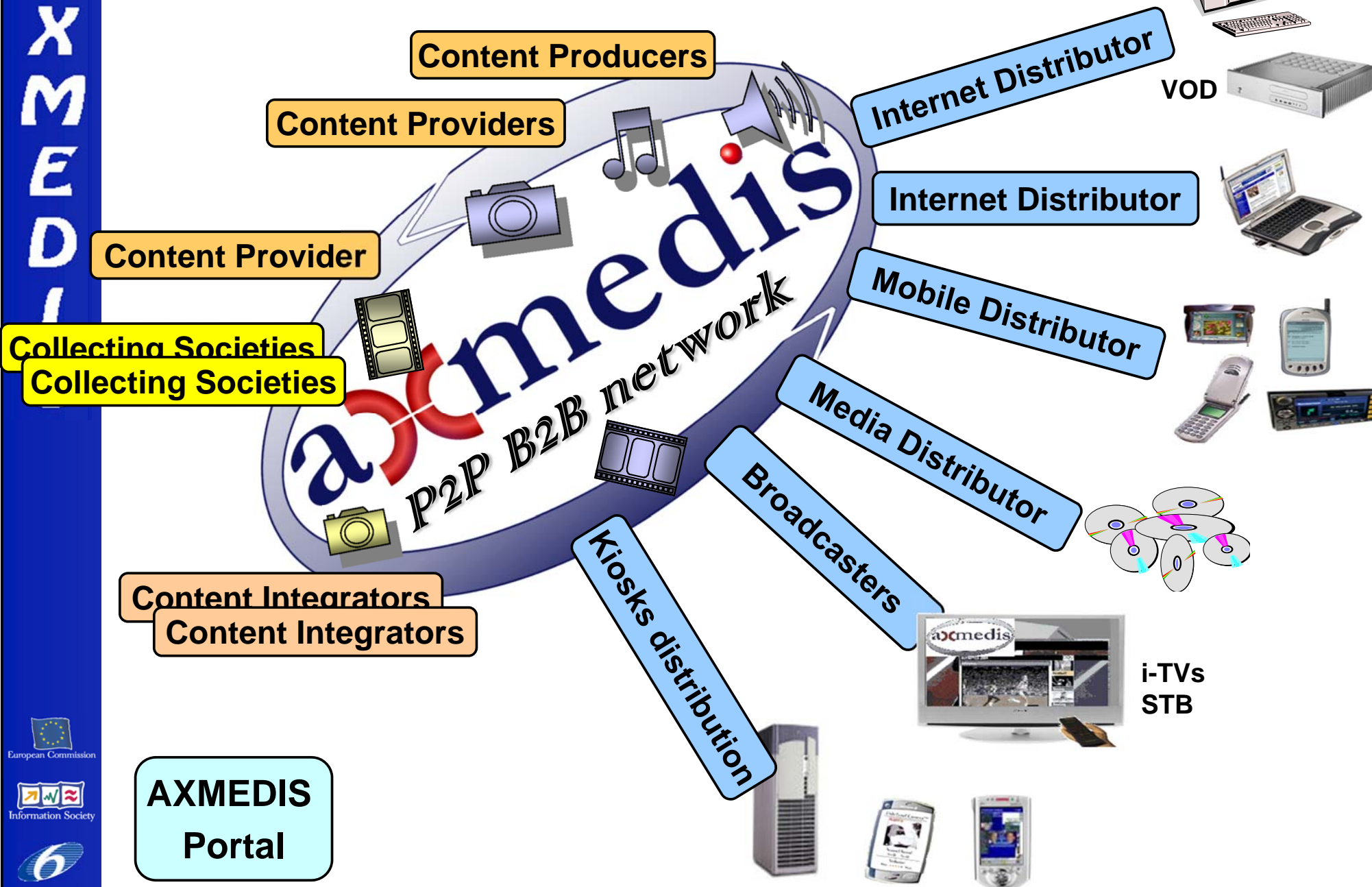


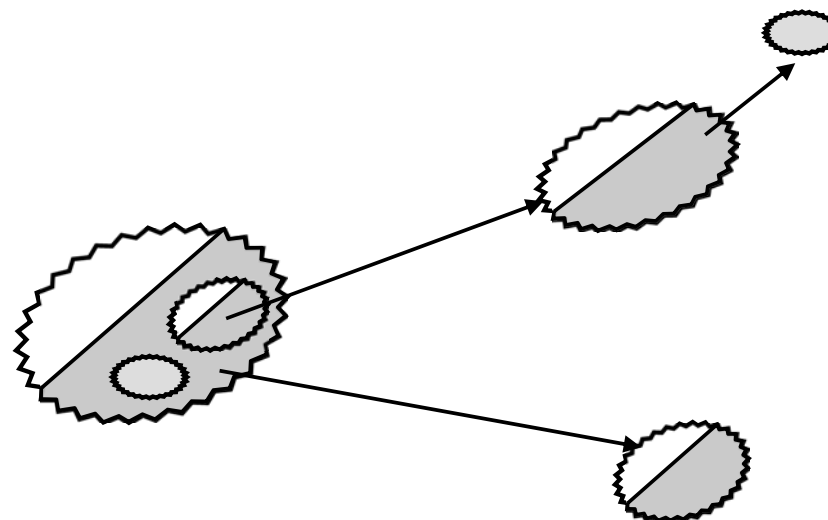
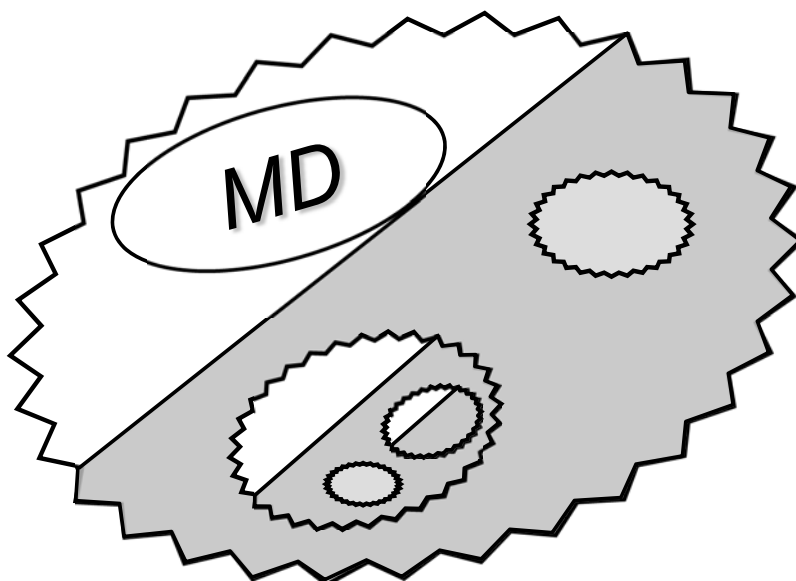
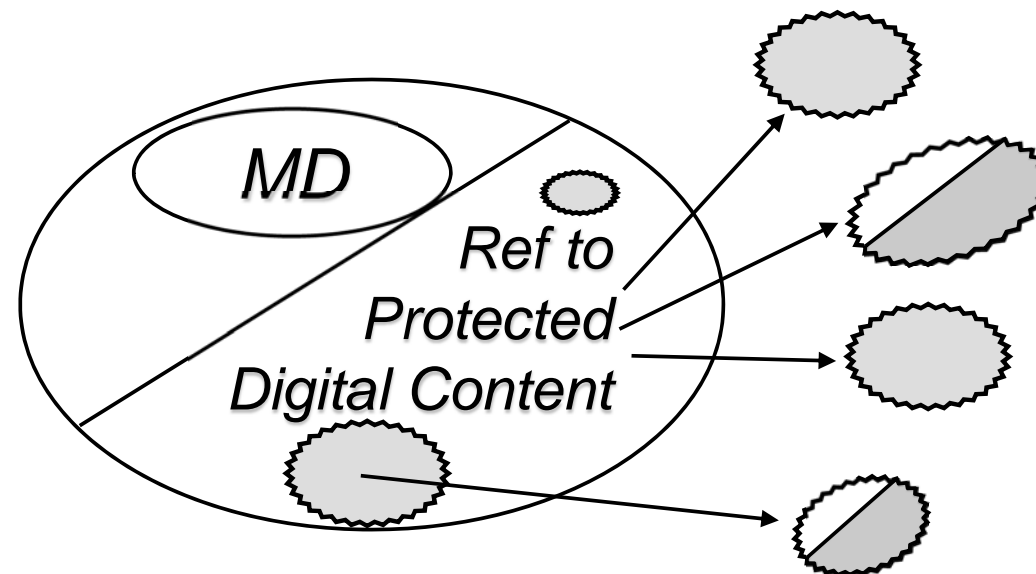
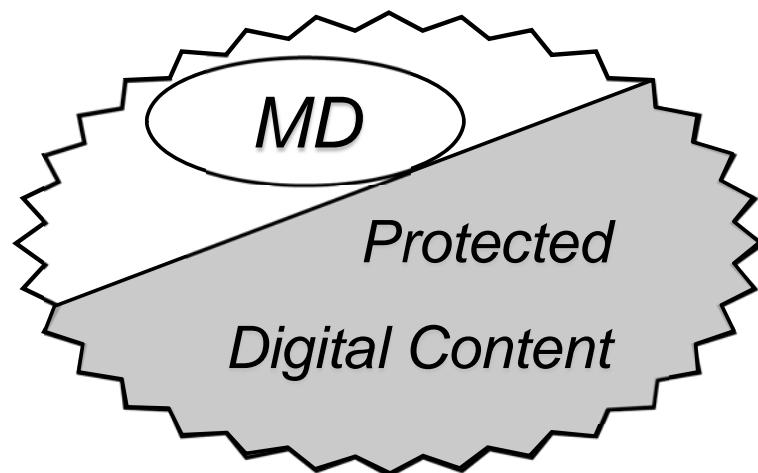
AXMEDIS Multichannel Content Distribution

AXMEDIS B2B Distribution and Sharing



AXMEDIS





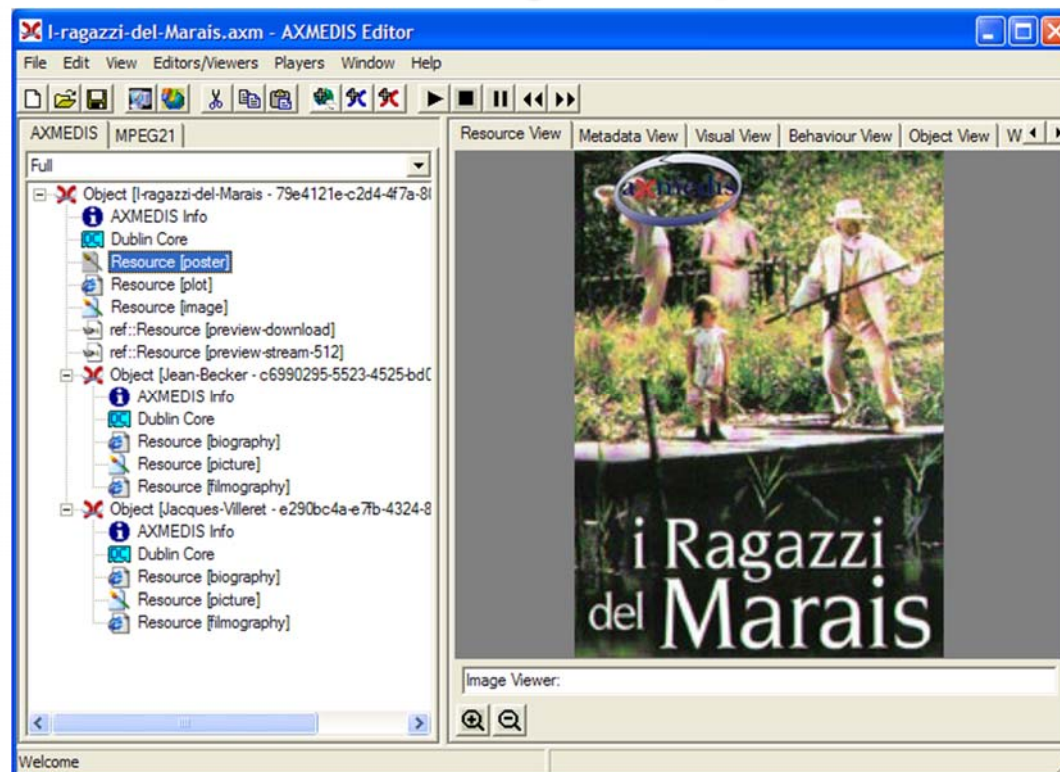


- **Any digital resource**
 - ◆ Any hierarchy can be incorporate and modeled
 - ◆ Nested information
- **Addition of formalized Metadata**
 - ◆ AXMEDIS Information, AXInfo
- **Extension for AXMEDIS objects**
 - ◆ <file name>.axm
- **MPEG-21 based**
 - ◆ DID: Digital Item Declaration
 - ◆ DII: Digital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



- **AxObject**
 - ◆ an MPEG21 DIDL Item (or IPMPDIDL)
 - ➔ 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 IPMPDIDL:ContentInfo
 - ➔ Metadata are reported in clear for protected content

- **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
 - ◆ Workflow
 - ◆ Annotation
 - ◆ ...





AXMEDIS MPEG21

Full

- Object [urn:mpegRA:mpeg21:dii:ax:]
 - Metadata [private_dsc_rel_id]
 - Metadata [private_dsc_type]
 - AXMEDIS Info
 - Metadata [private_dsc_dc]
 - Metadata [private_dsc_mpeg7]
 - Resource [CollineAzzurre]
 - Resource [Inverno]
 - Resource [Ninfee]
 - Resource [Tramonto]
 - Resource [Sinfonia9]

Resource View Metadata View DRM View Workflow View Annotations

```
<ax:AXInfo xmlns:ax="urn:axmedis:01">
  <ax:ObjectCreator>
    <ax:AXCID>... a creator ID ...</ax:AXCID>
    <ax:ObjectCreatorName>J. Doe</ax:ObjectCreatorName>
    <ax:ObjectCreatorURL>mailto:jdoe@invideo.com</ax:ObjectCreatorURL>
    <ax:ObjectCreatorCompany>InVideo</ax:ObjectCreatorCompany>
    <ax:ObjectCreatorCompanyURL>http://www.invideo.com</ax:ObjectCreatorCompanyURL>
    <ax:ObjectCreatorNationality>US</ax:ObjectCreatorNationality>
  </ax:ObjectCreator>
  <ax:AccessMode>read_write</ax:AccessMode>
  <ax:CreationDate>2004-12-27T15:00:00</ax:CreationDate>
  <ax>LastModificationDate>2004-12-27T16:43:00</ax>LastModificationDate>
  <ax:Version>2</ax:Version>
  <ax:Revision>1</ax:Revision>
</ax:AXInfo>
```



AXMEDIS Editor



AXMEDIS MPEG21

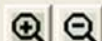
Full

- Object [urn:mpegRA:mpeg21:dii:axoid:A001AGSHDI]
 - Metadata [private_dsc_rel_id]
 - Metadata [private_dsc_type]
 - AXMEDIS Info
 - Metadata [private_dsc_dc]
 - Metadata [private_dsc_mpeg7]
 - Resource [CollineAzzurre]
 - Resource [Inverno]
 - Resource [Ninfee]
 - Resource [Tramonto]
 - Resource [Sinfonia9]

Resource View Metadata View DRM View Workflow View Annotations



Image Viewer:



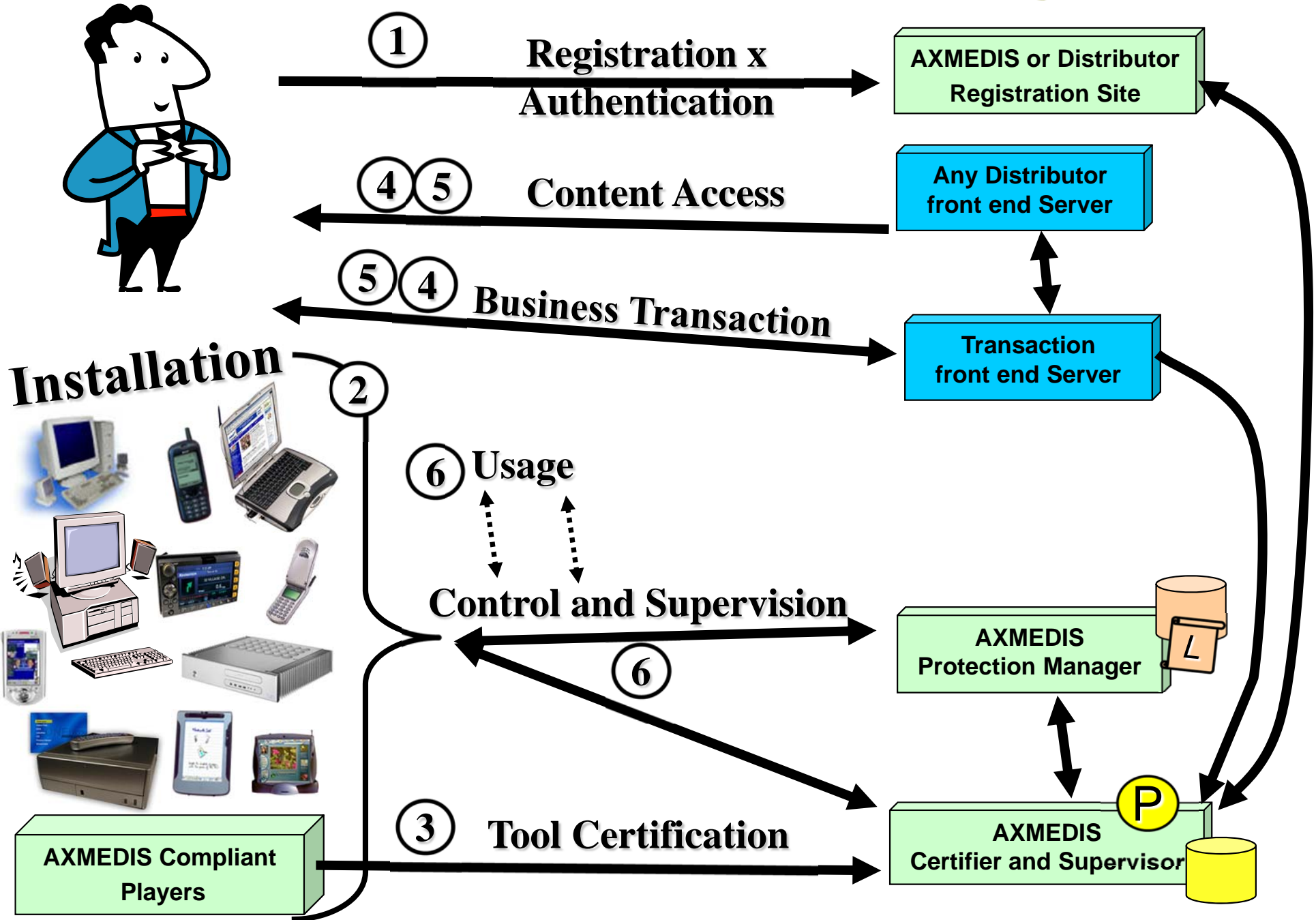
- **AXMEDIS clients tools**

- ◆ 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

The Protection and Control Process



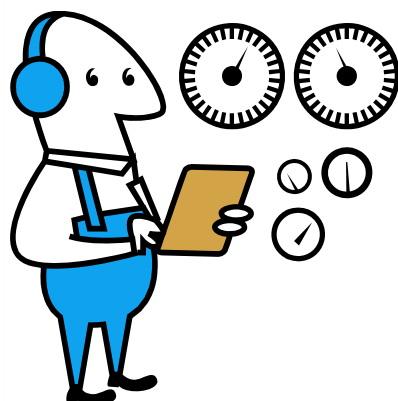
AXMEDIS



- **Content Ingestion and Gathering**
- **Content Retrieval**
- **Content Storage**
- **Content Processing**
- **Content Composition**
- **Content Formatting**
- **Content Protection**
- **Content Licensing**
- **Content Publication and Distribution**

AXMEDIS Content Processing GRID

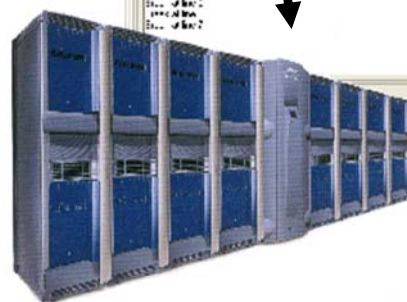
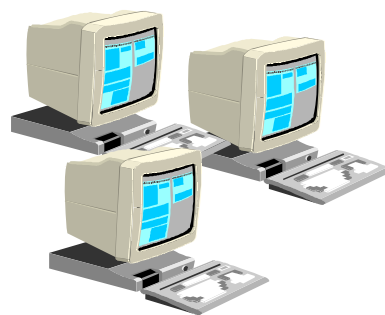
AXMEDIS



**AXMEDIS
Rule Editor**

**AXMEDIS
Scheduler**

**Workflow
manager**



AXMEDIS Rule Editor

```

1  rule job = new JobDefinition()
2  job.Name = "Focus, Set and FFF"
3  job.Type = "Job"
4  job.Priority = "Normal"
5  job.Parameters = "Parameters"
6  job.Query = "Query"
7  job.QueryType = "Query"
8  job.QueryParameters = "QueryParameters"
9  job.QueryParameters = "QueryParameters"
10 job.QueryParameters = "QueryParameters"
11 job.QueryParameters = "QueryParameters"
12 job.QueryParameters = "QueryParameters"
13 job.QueryParameters = "QueryParameters"
14 job.QueryParameters = "QueryParameters"
15 job.QueryParameters = "QueryParameters"
16 job.QueryParameters = "QueryParameters"
17 job.QueryParameters = "QueryParameters"
18 job.QueryParameters = "QueryParameters"
19 job.QueryParameters = "QueryParameters"
20 job.QueryParameters = "QueryParameters"
21 job.QueryParameters = "QueryParameters"
22 job.QueryParameters = "QueryParameters"
23 job.QueryParameters = "QueryParameters"
24 job.QueryParameters = "QueryParameters"
25 job.QueryParameters = "QueryParameters"
26 job.QueryParameters = "QueryParameters"
27 job.QueryParameters = "QueryParameters"
28 job.QueryParameters = "QueryParameters"
29 job.QueryParameters = "QueryParameters"
30 job.QueryParameters = "QueryParameters"
31 job.QueryParameters = "QueryParameters"
32 job.QueryParameters = "QueryParameters"
33 job.QueryParameters = "QueryParameters"
34 job.QueryParameters = "QueryParameters"
35 job.QueryParameters = "QueryParameters"
36 job.QueryParameters = "QueryParameters"
37 job.QueryParameters = "QueryParameters"
38 job.QueryParameters = "QueryParameters"
39 job.QueryParameters = "QueryParameters"
40 job.QueryParameters = "QueryParameters"

```

AXMEDIS - Rule Scheduler

Rule Name	AXRID	Rule Version	Rule Status	Job ID	Executor ID	Start Time	Start Date	Periodicity	Number of Runs
searchBox_...	9	completed	9	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	10	completed	10	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	11	completed	11	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	12	completed	12	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	13	running	13	2	2	16:05:11	09/23/05	0	0
searchBox_...	14	completed	14	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	15	completed	15	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	16	running	16	3	3	16:05:11	09/23/05	0	0
searchBox_...	17	completed	17	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	18	completed	18	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	19	completed	19	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	20	completed	20	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	21	completed	21	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	22	completed	22	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	23	completed	23	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	24	running	24	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	25	completed	25	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	26	completed	26	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	27	completed	27	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	28	completed	28	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	29	completed	29	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	30	completed	30	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	31	completed	31	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	32	completed	32	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	33	running	33	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	34	completed	34	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	35	running	35	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	36	running	36	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	37	delayed	37	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	38	delayed	38	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	39	delayed	39	-1	-1	16:05:11	09/23/05	0	1
searchBox_...	40	delayed	40	-1	-1	16:05:11	09/23/05	0	1

Logs property

Executor IP	Executor ID	Message	Timestamp
192.168.0.42	-1	Job n. 14 launched on executor n. 1	16:09:50 2005-09-23
192.168.0.197	1	TRANSFERRED RULE	16:09:52 2005-09-23
192.168.0.197	1	-> application/vnd.focusseek-fff [845]	16:09:54 2005-09-23
192.168.0.197	1	-> title[10]=guitar flute and string	16:09:55 2005-09-23
192.168.0.197	1	-> artist[10]=moby	16:09:57 2005-09-23
192.168.0.197	1	-> genre[10]=indie/alternative	16:10:40 2005-09-23
192.168.0.197	1	Return: undefined	16:10:42 2005-09-23
192.168.0.197	1	END PROCESS	16:10:43 2005-09-23
192.168.0.42	-1	Job n. 2 launched on executor n. 1	16:12:56 2005-09-23
192.168.0.197	1	TRANSFERRED RULE	16:12:57 2005-09-23
192.168.0.42	-1	Job n. 3 launched on executor n. 2	16:12:58 2005-09-23
192.168.0.42	-1	Job n. 4 launched on executor n. 3	16:12:59 2005-09-23
192.168.0.105	2	TRANSFERRED RULE	16:12:59 2005-09-23
192.168.0.42	-1	Job n. 5 launched on executor n. 4	16:13:00 2005-09-23
192.168.0.197	1	-> application/vnd.focusseek-fff [845]	16:13:01 2005-09-23
192.168.0.42	-1	Job n. 6 launched on executor n. 5	16:13:01 2005-09-23
192.168.0.197	1	-> title[10]=guitar flute and string	16:13:02 2005-09-23
192.168.0.42	-1	Job n. 7 launched on executor n. 6	16:13:02 2005-09-23
192.168.0.42	-1	Job n. 8 launched on executor n. 7	16:13:03 2005-09-23
192.168.0.197	1	-> artist[10]=moby	16:13:04 2005-09-23
192.168.0.197	1	-> genre[10]=unassigned	16:13:05 2005-09-23
192.168.0.52	3	TRANSFERRED RULE	16:13:07 2005-09-23
192.168.0.197	1	-> application/vnd.focusseek-fff [839]	16:13:08 2005-09-23
192.168.0.64	5	TRANSFERRED RULE	16:13:10 2005-09-23
192.168.0.103	6	TRANSFERRED RULE	16:13:11 2005-09-23
192.168.0.49	7	TRANSFERRED RULE	16:13:13 2005-09-23
192.168.0.197	1	-> title[10]=bananas and blow	16:13:14 2005-09-23
192.168.0.105	2	-> application/vnd.focusseek-fff [845]	16:13:16 2005-09-23
192.168.0.197	1	-> artist[10]=ween	16:13:17 2005-09-23
192.168.0.52	3	-> application/vnd.focusseek-fff [845]	16:13:19 2005-09-23
192.168.0.197	1	-> genre[10]=indie/alternative	16:13:20 2005-09-23
192.168.0.52	3	-> title[10]=guitar flute and string	16:13:22 2005-09-23
192.168.0.197	1	-> application/vnd.focusseek-fff [834]	16:13:23 2005-09-23
192.168.0.64	5	-> application/vnd.focusseek-fff [845]	16:13:25 2005-09-23
192.168.0.103	6	-> application/vnd.focusseek-fff [845]	16:13:26 2005-09-23

AXMEDIS Content Processing capabilities

AXMEDIS

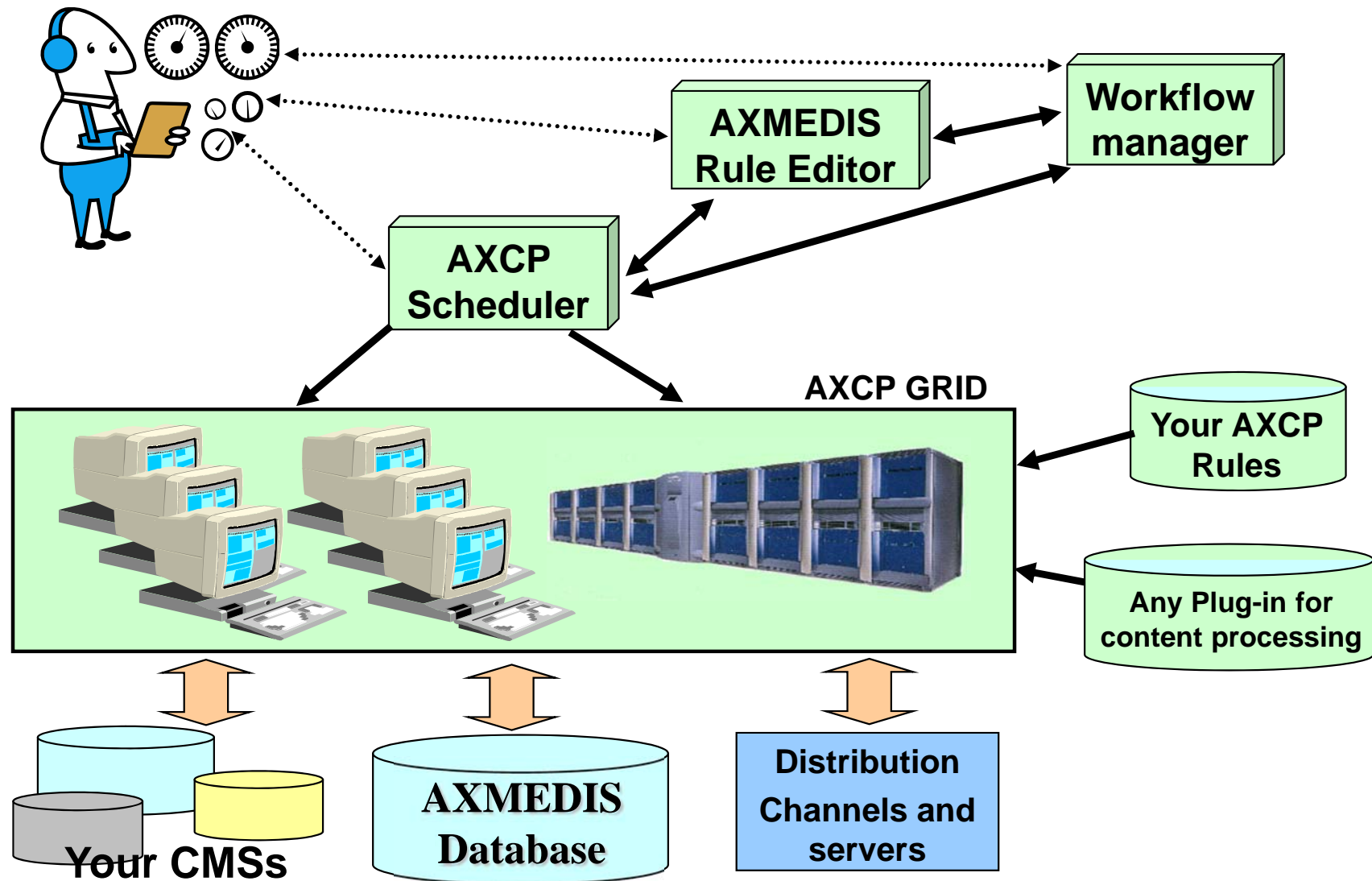
- **Scripts will be produced by Example (recording commands) on the AXMEDIS Authoring Tools**
- **In AXCP Scripts you can manipulate, produce, adapt and process:**
 - ◆ AXMEDIS/MPEG-21 Objects and features
 - ◆ Digital resources in any format
 - ◆ Descriptors, fingerprint, etc.
 - ◆ Metadata, metadata 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 AXEPTool, P2P B2B tools
 - ➔ 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 processing capabilities

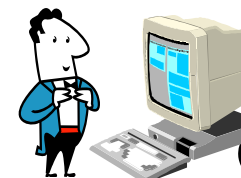
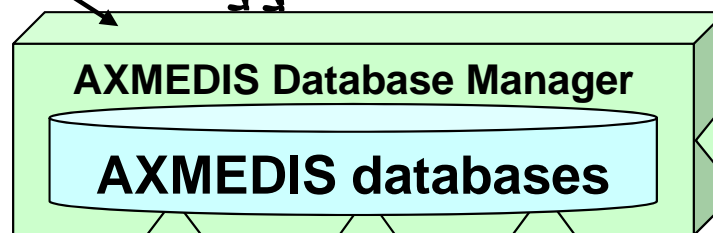
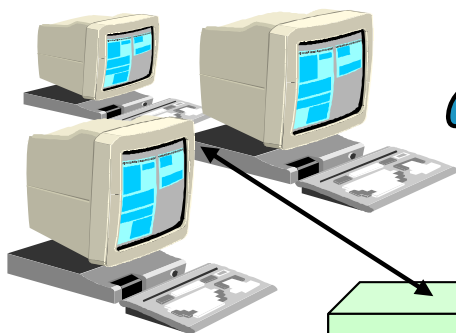
- **Any type of resource in any format**
 - ◆ Also MPEG-21, IMS, SCORM, OMA/ODRL, etc.
- **Processing functionalities:**
 - ◆ Production of new objects: composition, etc.
 - ◆ Formatting: SMIL, XSLT, etc.
 - ◆ Synchronization of media, etc.
 - ◆ Adaptation, transcoding,
 - ◆ Reasoning on device capabilities and user preferences
 - ◆ Production of licenses
 - ◆ Verification of Licenses against them and PAR
 - ◆ Extraction of descriptors and fingerprints
- **Accessing: ODBC, WEBDAV, HTTP, FTP, FileSystem, etc.**
- **Open to any other module with plug-in technology:**
 - ◆ Burning
 - ◆ Etc.

Fast and Continuous Crawling of Content

AXMEDIS

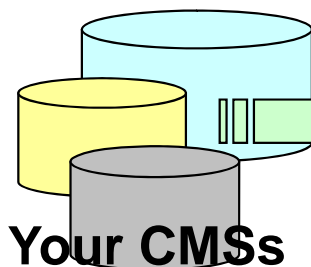


AXMEDIS Editors



Programme and Publication

Distribution Servers

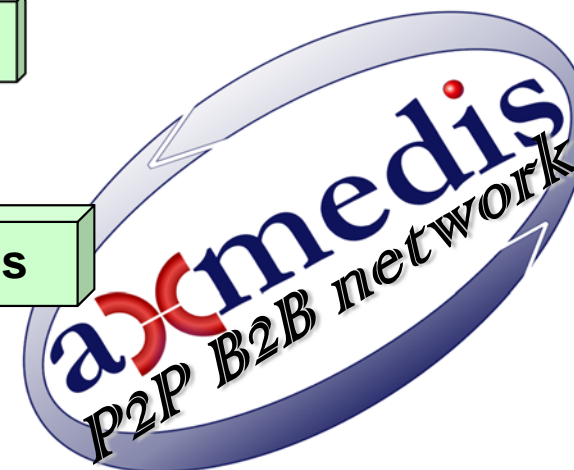


Focusseek
Crawler

AXEPTools



AXMEDIS
AXCP GRID





AXMEDIS Framework

AXMEDIS

**AXMEDIS
database &
administrative
Tools**

**AXMEDIS
Content
Processing
Tools**

**AXMEDIS
Editing
Tools**

**AXMEDIS
Players: PC,
PDA, STB,
Mobiles..**

**AXMEDIS
distribution Tools:
P2P AXEPTool
and Programme and
Publication tools**

**AXMEDIS DRM
Tools: Certifier
& Supervisor, Protection
Manager Supports**

Content for
validation

Doc. Report
and support

Guidelines and
models

Use and Test
Cases

Database
and query
support

**AXMEDIS
database**

Crawling
integration

AXMEDIS
Object Models

Transcoding and
Adaptation algorithms

Fingerprint and
Descriptor extractors

GRID and script
execution support

Composition and
Formatting algorithms

Query support
model and tools

Query search
algorithms

P2P protocols

License models

DRM and
protection
models

Secure
communic.
protocol

Workflow
interfaces

Any CMS, and files

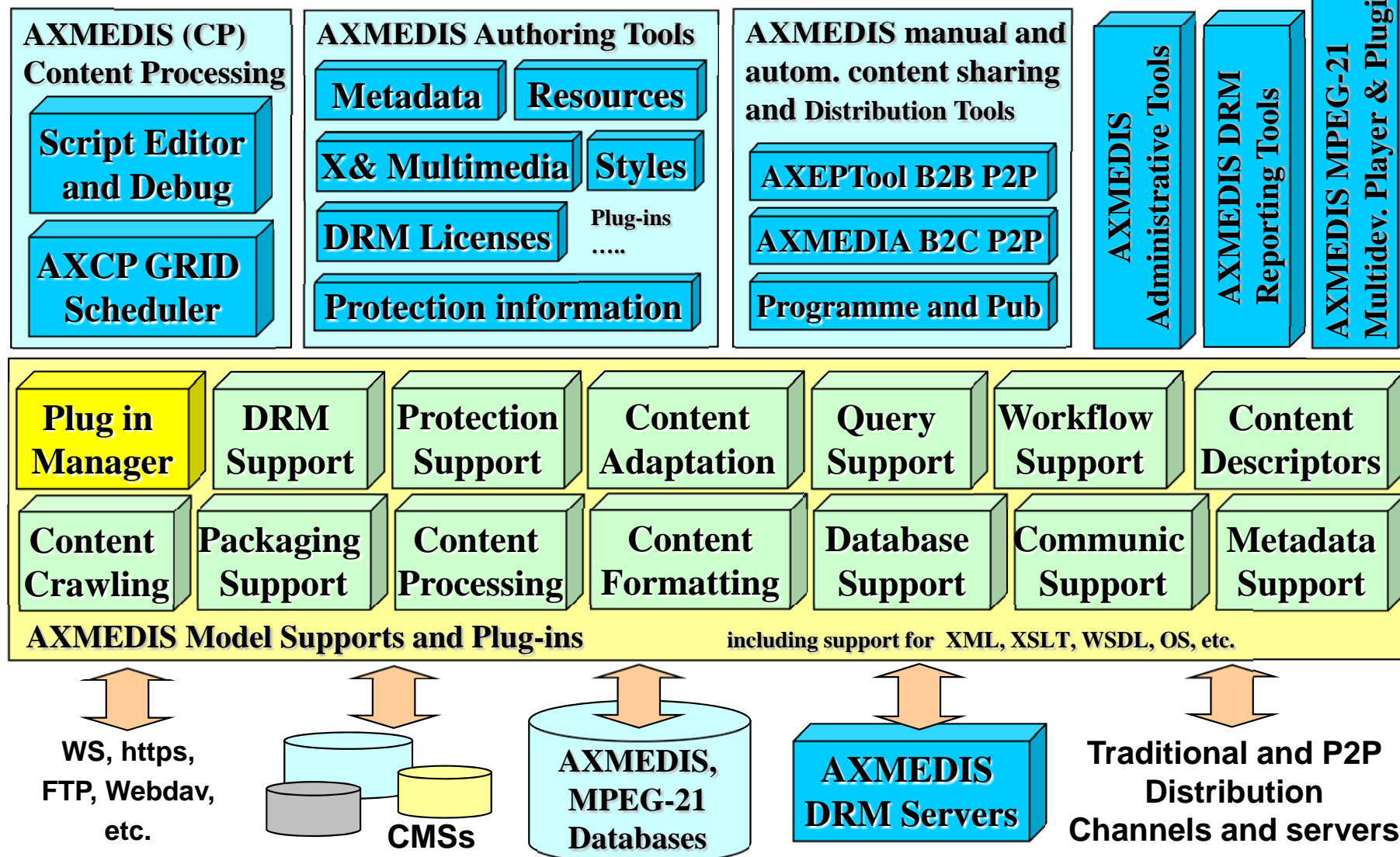
Any Workflow



AXMEDIS Technical Architecture

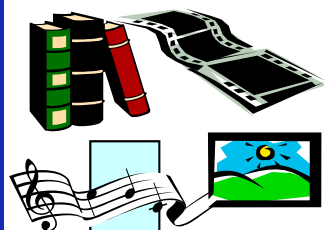
AXMEDIS

User Interaction and/or Automated Control via WSs



AXMEDIS Multichannel Multiformat Management

AXMEDIS



**AXMEDIS
Content
Processing
Tools**

**License
Production**

**Distribution
Server Front-end**

**License distribution
and player/device
verification and
supervision**

**Selling Servers
Front- end**

**License distribution
and player/device
verification and
supervision**

**Distribution
Server Front-end**

Augmented License

Get the content

**Content
deprotection and
rights exploitation**

Ask for the License

**Users
and devices**

Ask for the License

**Content
deprotection and
rights exploitation**

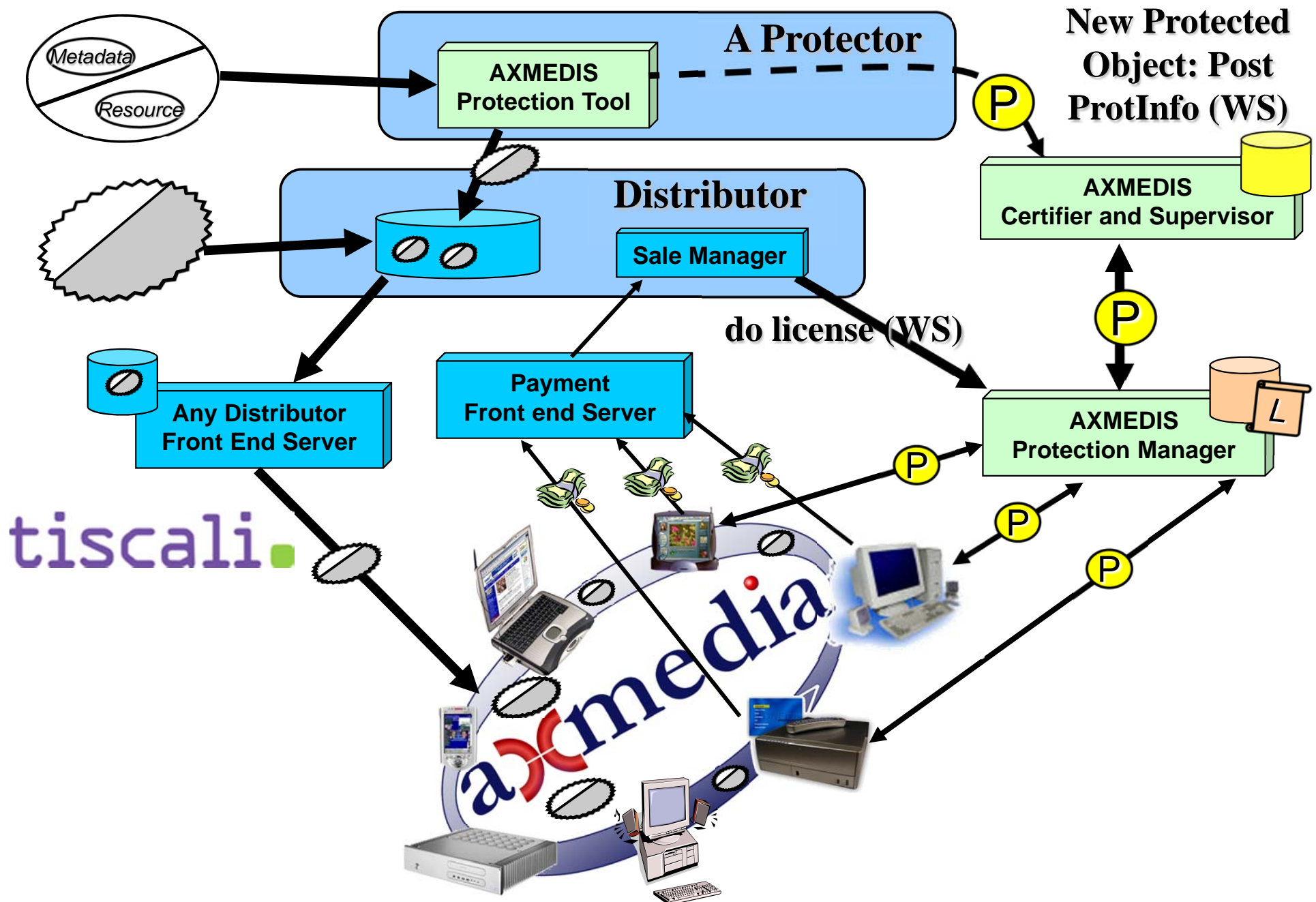
Get the content

Open Model

- | | |
|---|---|
| <ul style="list-style-type: none"> ○ Limited number of BMs ○ ProtMod limited to Key ○ Content and license ○ Signed Content Header ○ Single channel ○ Proprietary License <ul style="list-style-type: none"> ◆ 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 Windows Media ○ Non B2B DRM | <ul style="list-style-type: none"> ○ Larger number of BMs ○ Any Protection Model ○ Content and license ○ Signed Content AXINFO ○ Multichannel ○ MPEG-21 REL license <ul style="list-style-type: none"> ◆ 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 ○ Allowed B2B DRM |
|---|---|

TISCALI Distribution with AXMEDIS Technology

AXMEDIS

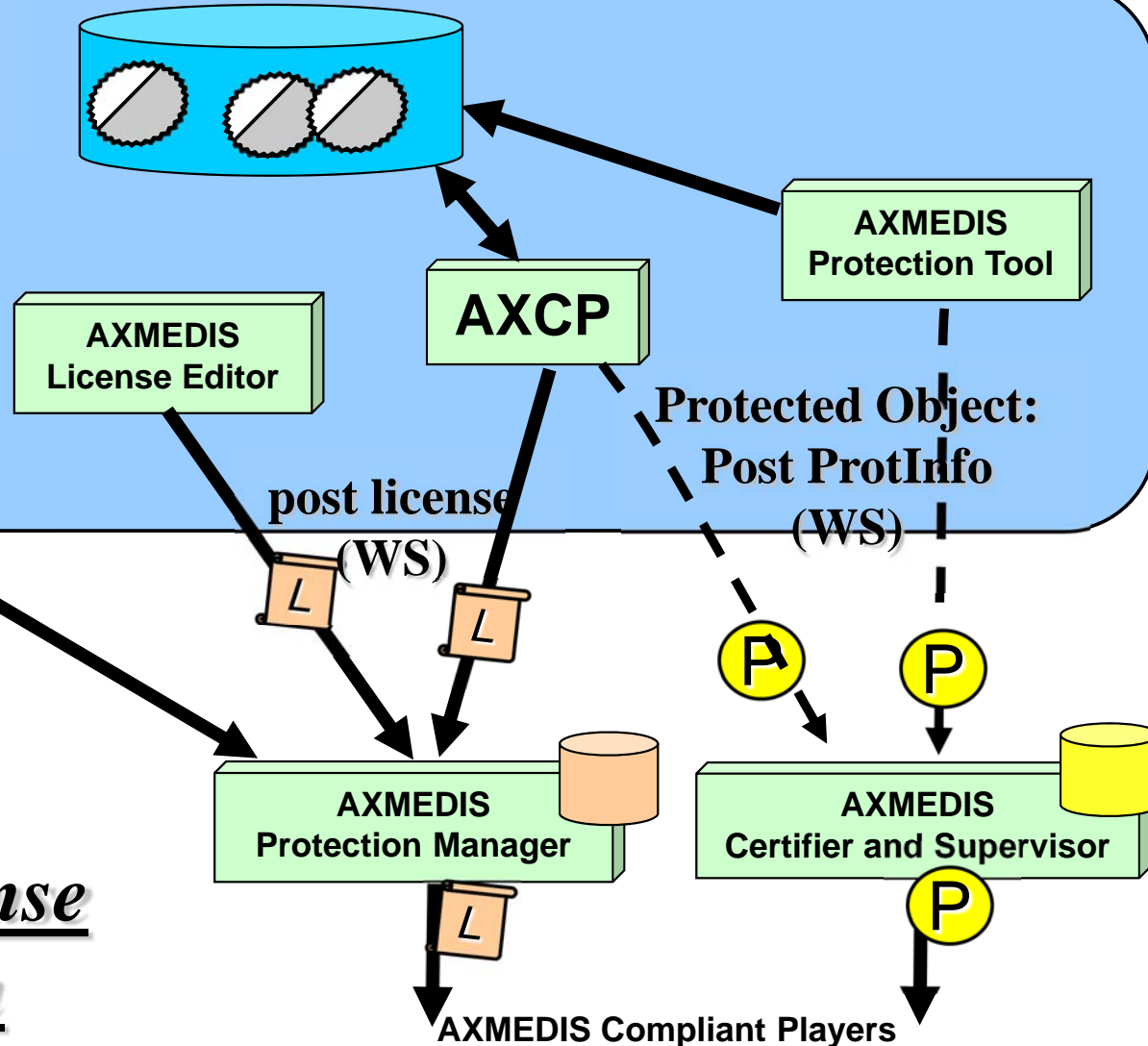
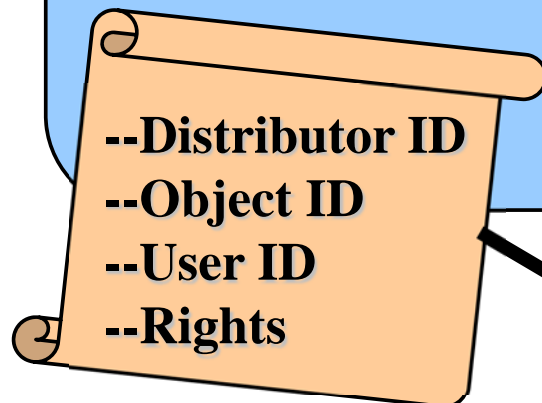


AXMEDIS License Production

AXMEDIS

A Distributor

Requesting license
Production (WS):



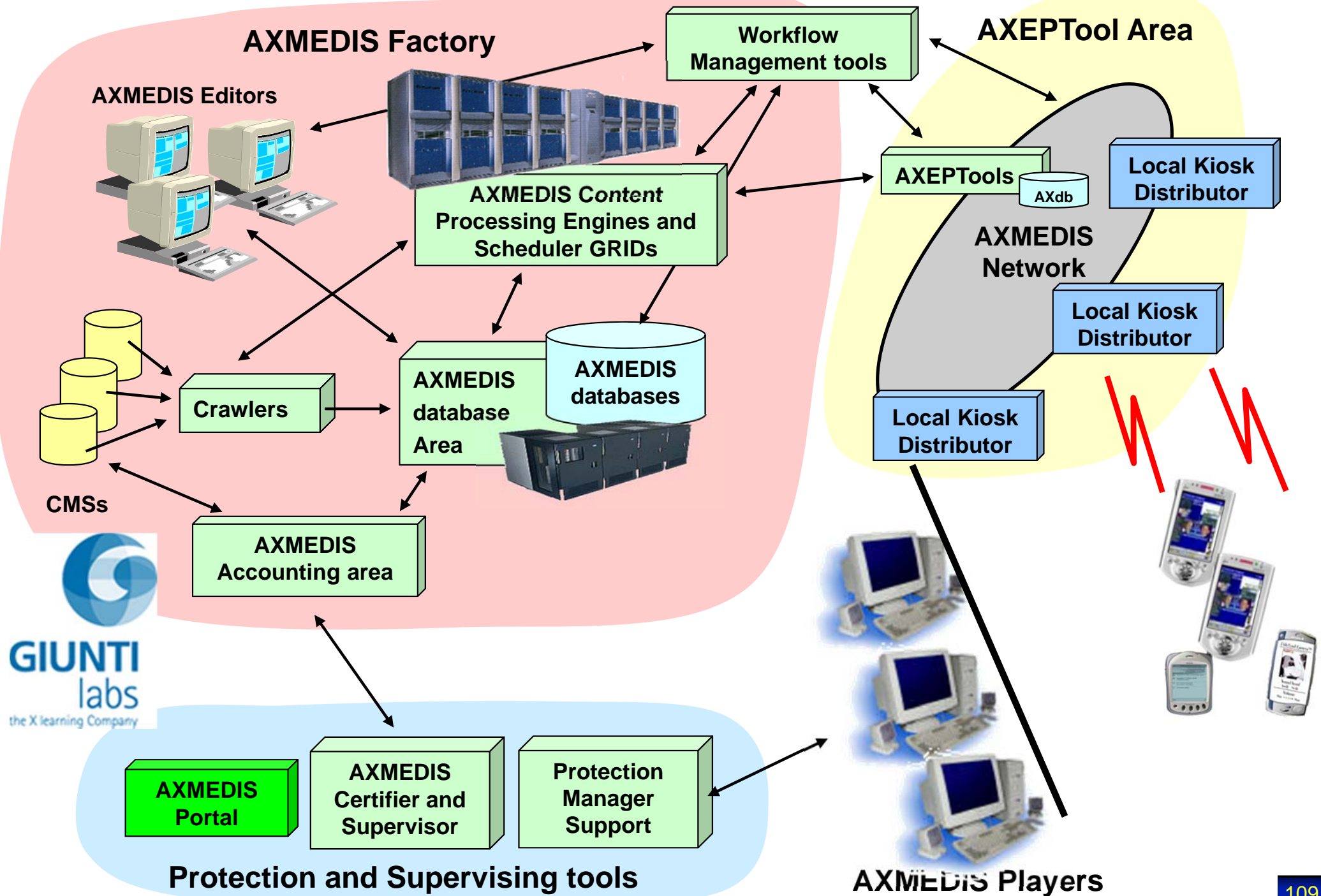
Need of Massive
Production: one License
X each user X each
resource



ILABS Distribution with AXMEDIS technology

AXMEDIS

- **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

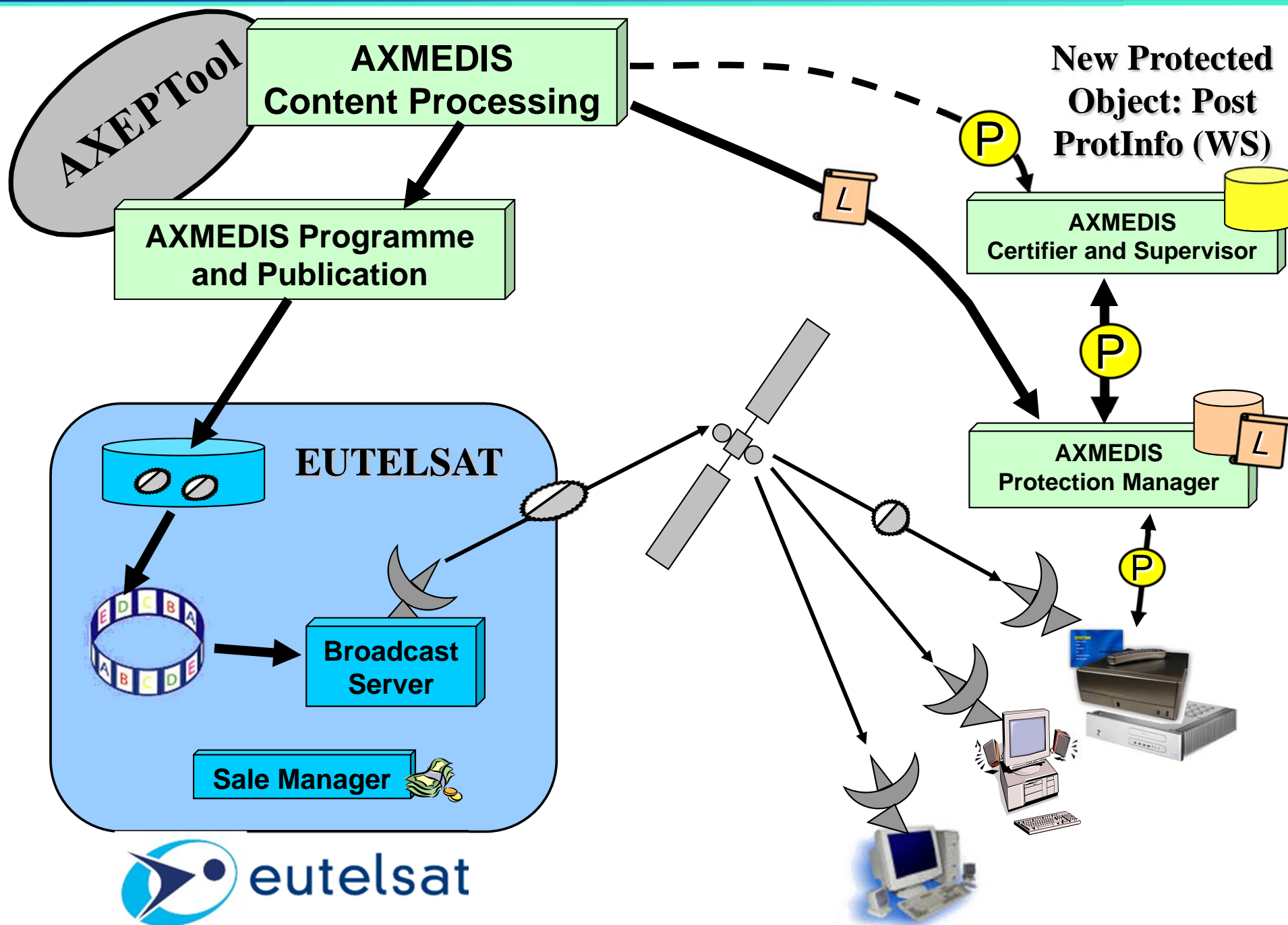




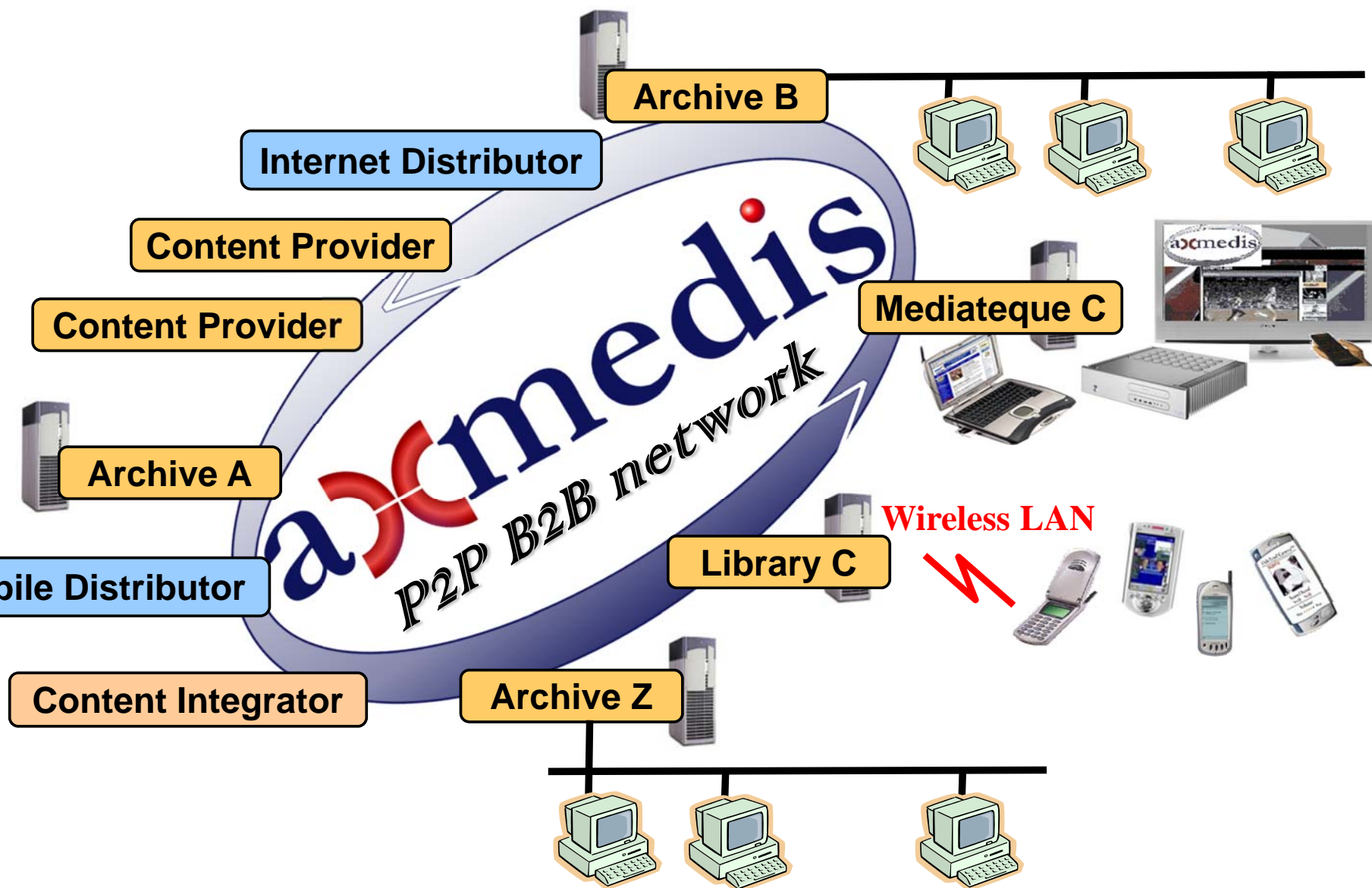
- **B2B and B2C distribution**
- **AXMEDIS objects with**
 - ◆ Any kind of content,...
 - ◆ Video, images, document, audio, animations, etc.
- **Licenses and Protection Information not in the object**
- **The AXMEDIS Objects may be**
 - ◆ Visualized and played on AXMEDIS players free downloaded
- **The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

EUTELSAT Distribution with AXMEDIS Technology

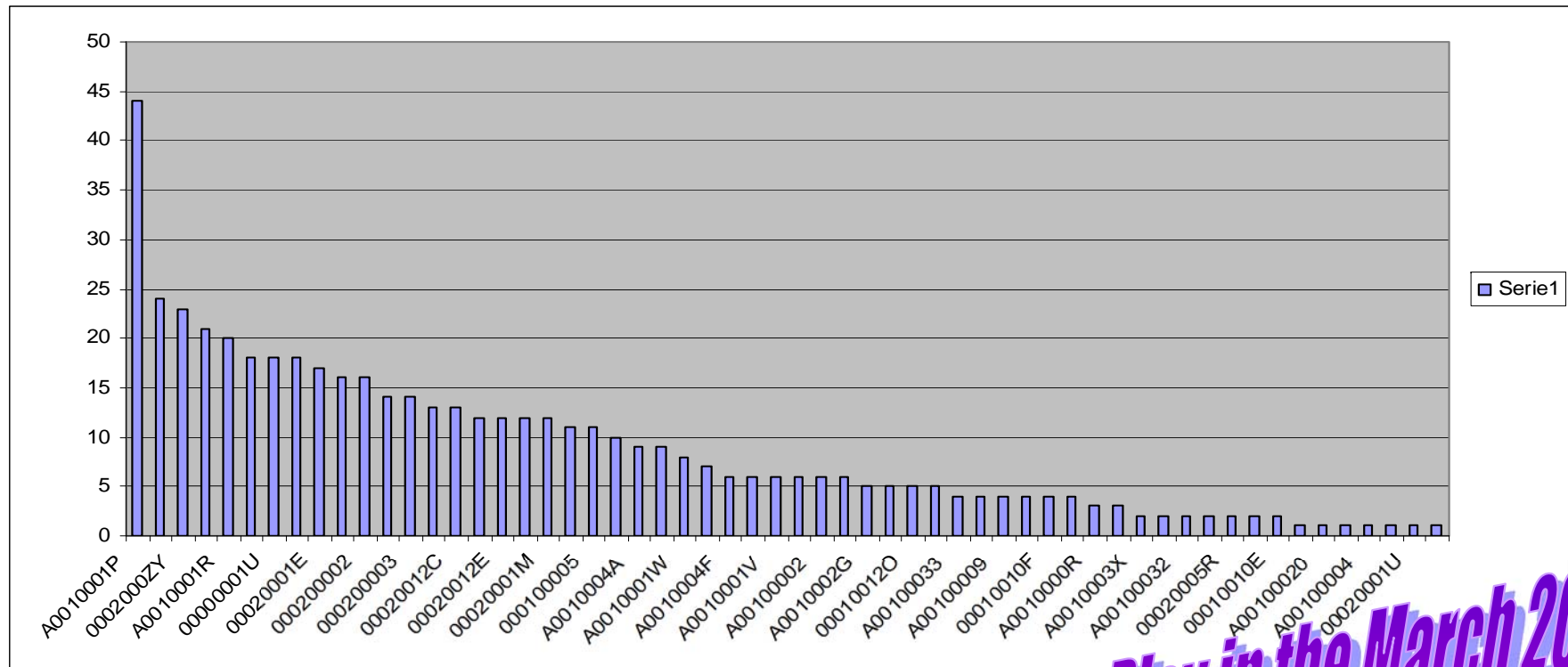
AXMEDIS



Content Sharing among Content Archives

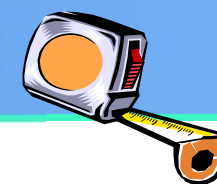


- Single traces, events, etc.
- Statistical data for reporting and analysis

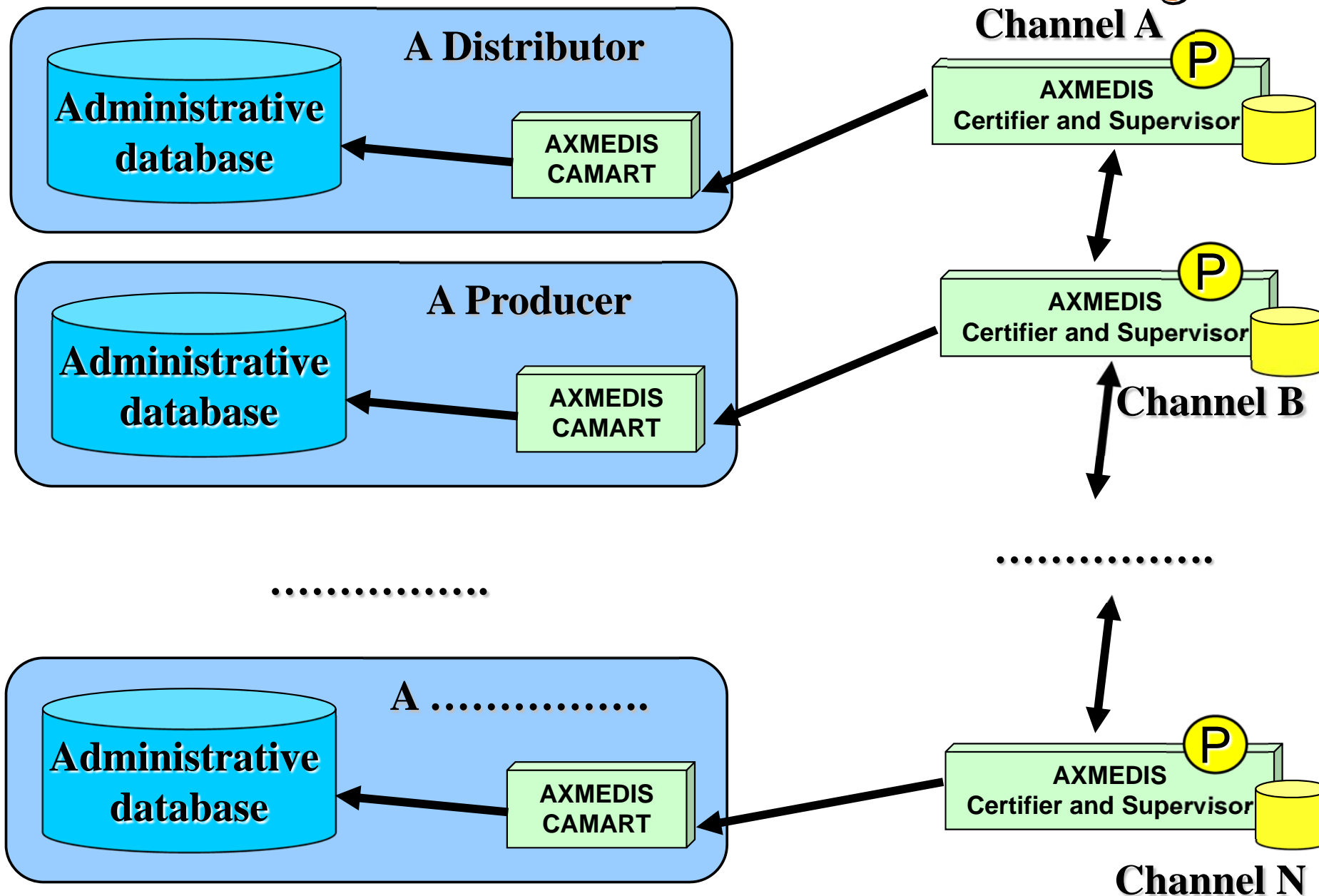


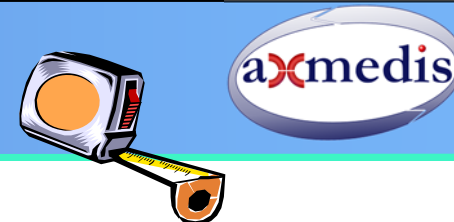
Distribution of exploited objects in Play in the March 2005

Providing Action Log and Statistical Information



AXMEDIS





- **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.**

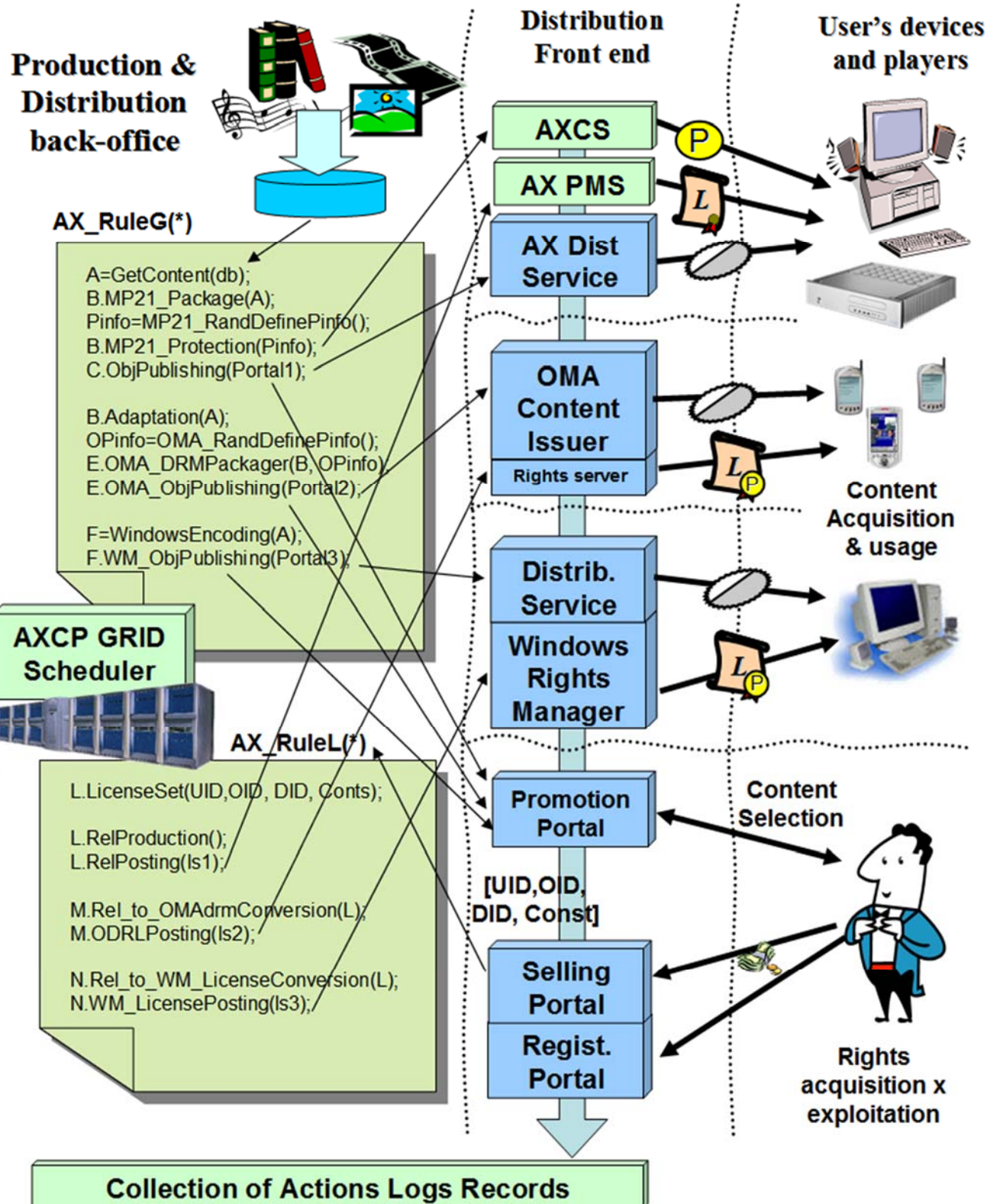
Multichannel

AXMEDIS

Distributors managing different channels

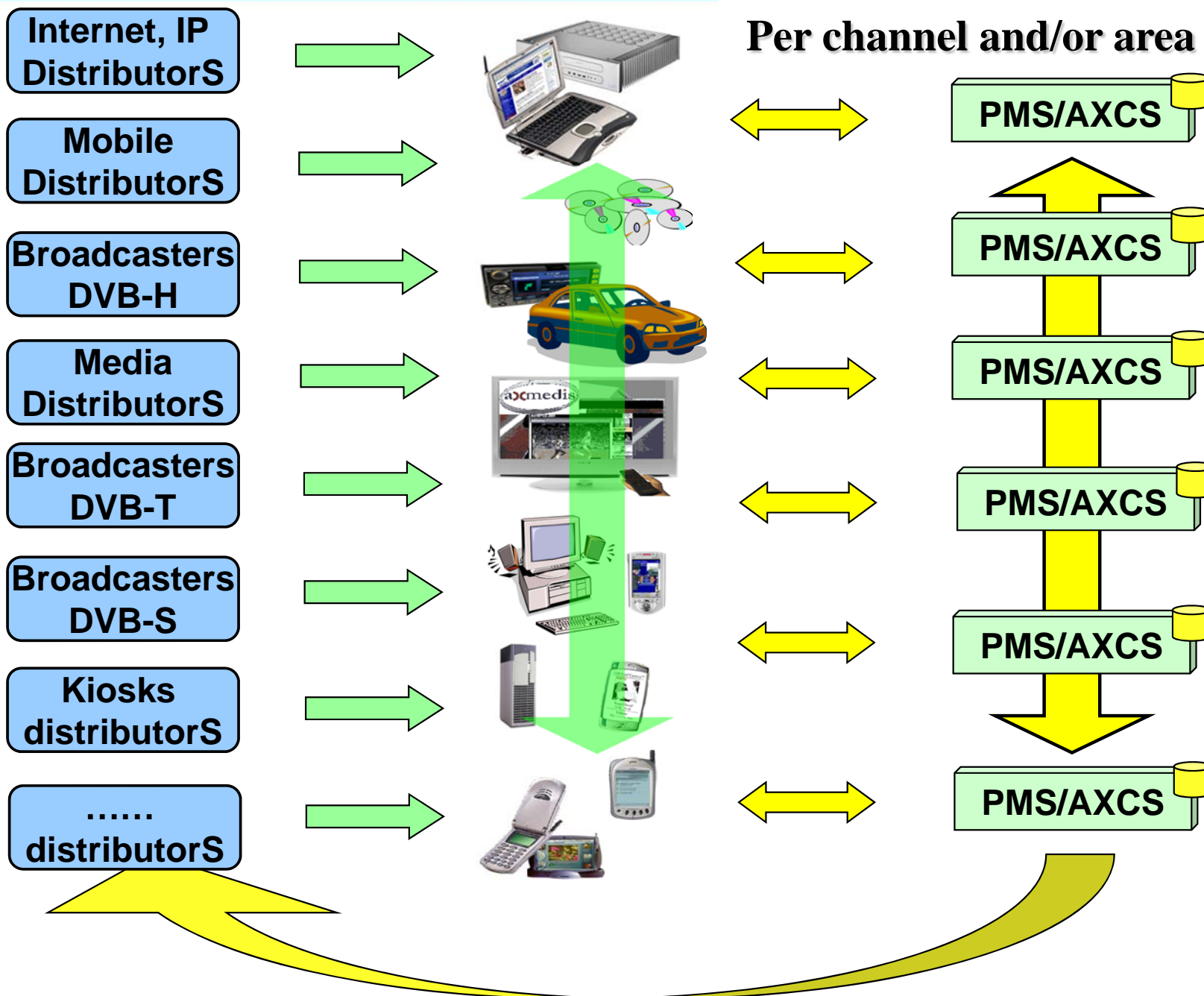
Different DRMs

- ◆ AXMEDIS
- ◆ OMA
- ◆ Windows Media

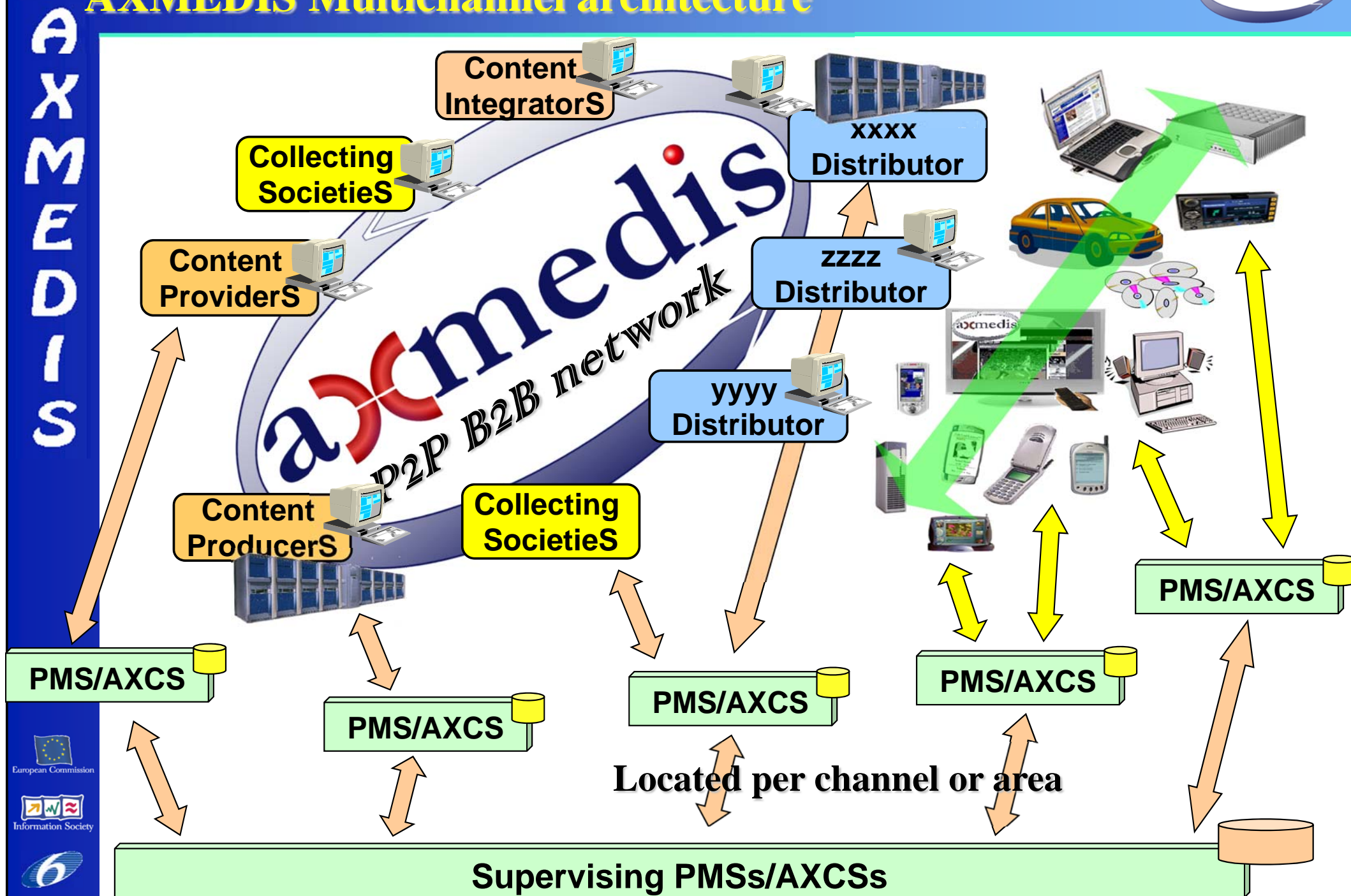


The AXMEDIS Multichannel architecture

AXMEDIS



AXMEDIS Multichannel architecture

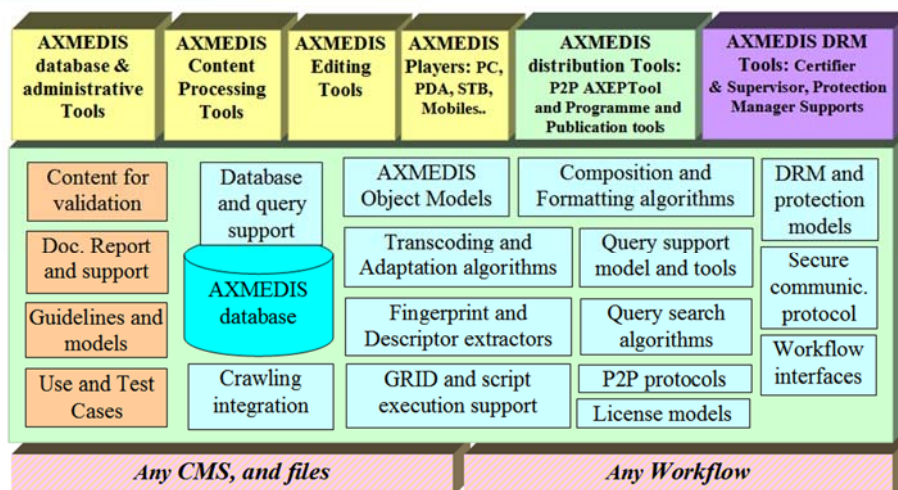




- **Convergence of content distribution and usage**
 - ◆ Interoperable Content and Devices
 - ◆ Interoperable DRM, Licenses
 - ◆ Multichannel solution
- **Real Time content Processing**
 - ◆ Reducing production and distribution costs
 - ◆ Flexible Content Distribution
 - ◆ Content production, protection, 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

As the AXMEDIS Framework can be exploited

AXMEDIS



AXMEDIS
Based solution

Usage of AXMEDIS Framework and Tools by

- ◆ Set up and management of single/multichannel Content Distribution with DRM
- ◆ Customizing AXMEDIS Players (PC, PDA, etc.) for creating YOUR own Players
- ◆ Customising AXMEDIS P2P tools for B2B
- ◆ Exploiting Content Processing tools for (AXMEDIS AXCP GRID)
 - ➔ reducing production costs and time
 - ➔ automating: composition, formatting, protection, feature extraction, distributions, publishing, etc.

Exploiting AXMEDIS Infrastructure

- ◆ Accessing to advanced State of the Art and standards solutions
- ◆ Sharing Content in a B2B Environment (AXEPTool)

AXMEDIS Framework

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



AXMEDIS Framework

Project Partners

Demonstrators,
Take up Actions

- Content Providers, integrator
- IT Companies
- Content Distributors
- Etc.

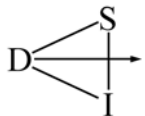
Direct
Affiliation

Any AXMEDIS
Based solution



References

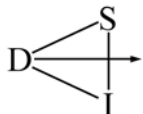
- AXMEDIS: www.axmedis.org
- CRF: Content Reference Forum: <http://www.crforum.org/>
- DMP: Digital Media Project, www.chiariglione.org
- EITO 2005: European Information Technology Observation 2005: <http://www.eito.com/index-eito.html>
- ODRL: <http://odrl.net/>
- OMA: www.openmobilealliance.org
- MI3P, Music Industry Integrated Identifier Project, <http://www.mi3p-standard.org/>
- MPEG, MPEG-21: www.chiariglione.org
- MUSICNETWORK: www.interactivemusicnetwork.org
- WEDELMUSIC: www.wedelmusic.org
- Microsoft Windows Media: <http://www.microsoft.com/windows/windowsmedia/default.aspx>





Organisations

Organisation	URL
AES	www.aes.org
SDMI	www.sdmi.org
MPEG (Motion Picture Expert Group)	www.mpeg.org
OMA (Open Mobile Alliance)	www.openmobilealliance.org
OASIS (Organisation for advancement in Structured Information Standards)	www.oasis-open.org
CRF (Content Reference Forum)	www.crforum.org
OeB (Open eBook Forum)	www.openebook.org
SMPTE (Society of Motion Picture and Television Engineers)	www.smpte.org
WS-I (Web Services Interoperability Organisation)	www.ws-i.org
ISMA (Internet Streaming Media Alliance)	www.isma.tv
TV-Anytime Forum	www.tv-anytime.org
RIAA (Recording Industry Association of America)	www.riaa.com
WIPO (World Intellectual Property Organization)	www.wipo.int
CC (Creative Commons)	http://creativecommons.org/





Major Technology Providers

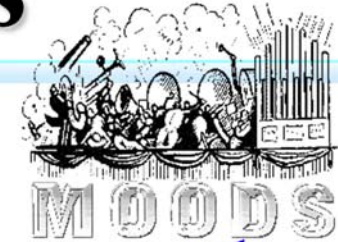
Technology Provider	URL
Adobe	www.adobe.com
Apple	www.apple.com
AXMEDIS	WWW.axmedis.org
Beep Science	www.beepscience.com
ContentGuard	www.contentguard.com
Digital World Services (Bertelsmann)	www.dwsco.com
DMDsecure	www.dmdsecure.com
IBM	www.ibm.com
Intertrust	www.intertrust.com
LiquidAudio	www.liquidaudio.com
Lockstream	www.lockstream.com
Macrovision	www.macrovision.com
Microsoft	www.microsoft.com
NDS	www.nds.com
Panasonic Europe	www.panasonic-europe.com
Philips	www.philips.com
RealNetworks	www.realnetworks.com
Roxio	www.roxio.com
WEDELMUSIC	www.wedelmusic.org
Yacast	www.yacast.com





Some DISIT Projects

- **Multimedia Content Modeling and distribution:**
 - ♣ **MOODS**, cooperative work on Music notation
 - ♣ **WEDELMUSIC** platform (chair), IST Fp5
 - ➔ **WEDELMUSIC** conference series
 - ➔ **WEDELAUTHORING** (chairs)
 - ♣ **MUSICNETWORK** Environment (chair), IST Fp5
 - ➔ **Workshops**, emerging European associations
 - ♣ **IMUTUS**, music tuition, distance learning, IST Fp5
 - ♣ **MPEG-SMR** integration (co-chair)
 - ♣ **MPEG M3W**, Multimedia Middleware
 - ♣ **AXMEDIS**, Automating cont. prod. and protection
 - ♣ **IMAESTRO**, music education, cooperative, gesture, etc.
 - ♣ **Other minor projects**: archives, mobile distribution, etc.



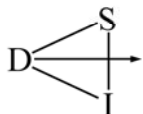
**Interactive
MusicNetwork
Multimedia**

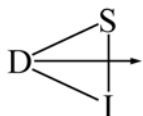


ISO/IEC JTC1/SC29 WG11



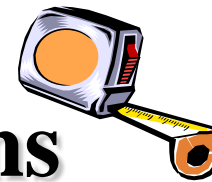
MOVING PICTURE EXPERTS GROUP





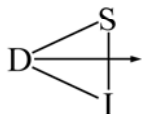


AXMEDIS Considerations



- 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 ??





AXMEDIS Considerations

- In AXMEDIS it is possible to adopt different models for packaging and/or protecting objects

- ♣ Open Model
- ♣ Governed Objects
- ♣ Augmented License

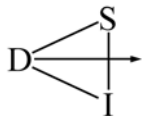


- AXMEDIS provides tools for

- ♣ 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
 - ➔ Accounting and proving traces of what has been consumed

- Any other question/issue ?

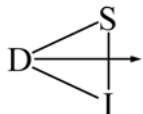






Introduction

- ♣ 2-Tier, 3-Tier, N-tier Architecture
- ♣ Derivati da applicatziioni industriali invece che dal mondo della ricerca
- ♣ many researches on particular themes
- ♣ pochi sui problemi globali del commercio elettronico come sw/hw architecture, DISIT e' in questa nuova are di ricerca
- ♣ criteria to choose a solution?





Requirements of E-Commerce Applications

○ Simplified Management

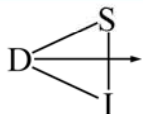
- ♣ we are talking about E-Commerce, i.e. Commerce
- ♣ fault must be soon discovered (it must be an high availability server)

○ Easy to Scale

- ♣ the number of requests (load) may change during the day and in the long time
- ♣ the hardware structure may be upgraded with little effort
- ♣ no mirroring / caching / proxy can be used: **it is a system based on transactions**

○ Thin Client

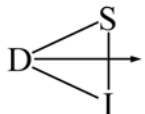
- ♣ little application logic on the client (embedded system)
- ♣ Consumer electronic clients, DVBT, DVBS, set top boxes ,etc.





Business Problem

- Identification of the user for the business
 - ♣ Respect of the privacy for the usages
 - ♣ Modello di pagamento
- Legal contract for the license
 - ♣ Tools for controlling the actions
- Delivering dell'oggetto fisico o digitale
- Controllo dell'uso dell'oggetto secondo il contratto
 - ♣ Action tracking and log, accounting, etc.





Business problems

○ License:

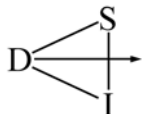
- ♣ Related to the user, device, etc...
- ♣ A set of rights and time
- ♣ Related to other licenses, those of the content distributor
- ♣ Limite in tempo

○ Cancellazione/revocazione della licenza:

- ♣ Cancellazione di alcuni rights

○ Sicurezza:

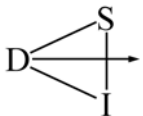
- ♣ Registrazione, certificazione, etc.
- ♣ Identificazione di tentativi di violazione
- ♣ Blocco del dispositivo, utente, licenza, etc
- ♣ ..





Security Aspects

- Certification of
 - ♣ devices,
 - ♣ users, etc.
- Security:
 - ♣ secure protocols for communication of sensible data
 - ♣ certificate, etc.
- Processing Licenses and rights
 - ♣ P2P, GRID solutions, etc.
- Watermarking of content
 - ♣ Hiding a code into the digital content
 - ♣ Recognition and tracking
- fingerprint estimation of content
 - ♣ For unique ID estimation
 - ♣ Recognition and tracking





Technical Solution

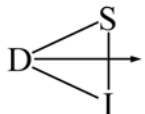
- Distribution models
 - ♣ P2P for content sharing and distribution
 - ♣ Client with respect to a server
- Distribution channels
 - ♣ Internet
 - ♣ Satellite data broadcast
 - ♣ Terrestrial data broadcast
 - ♣ Mobile network
 - ♣ Kiosks
 - ♣ Etc.
- Etc.





Digital Rights Management

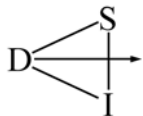
- WEDELMUSIC model
 - Philips Model
 - Microsoft Model
 - Intertrust Model
 - Sealed Media Model
 - Adobe Model
 - MPEG21
 - Etc.
-
- Before is needed to understand the reasons of the Intellectually property rights, see other slides of ECMA, AFI.





Architecture

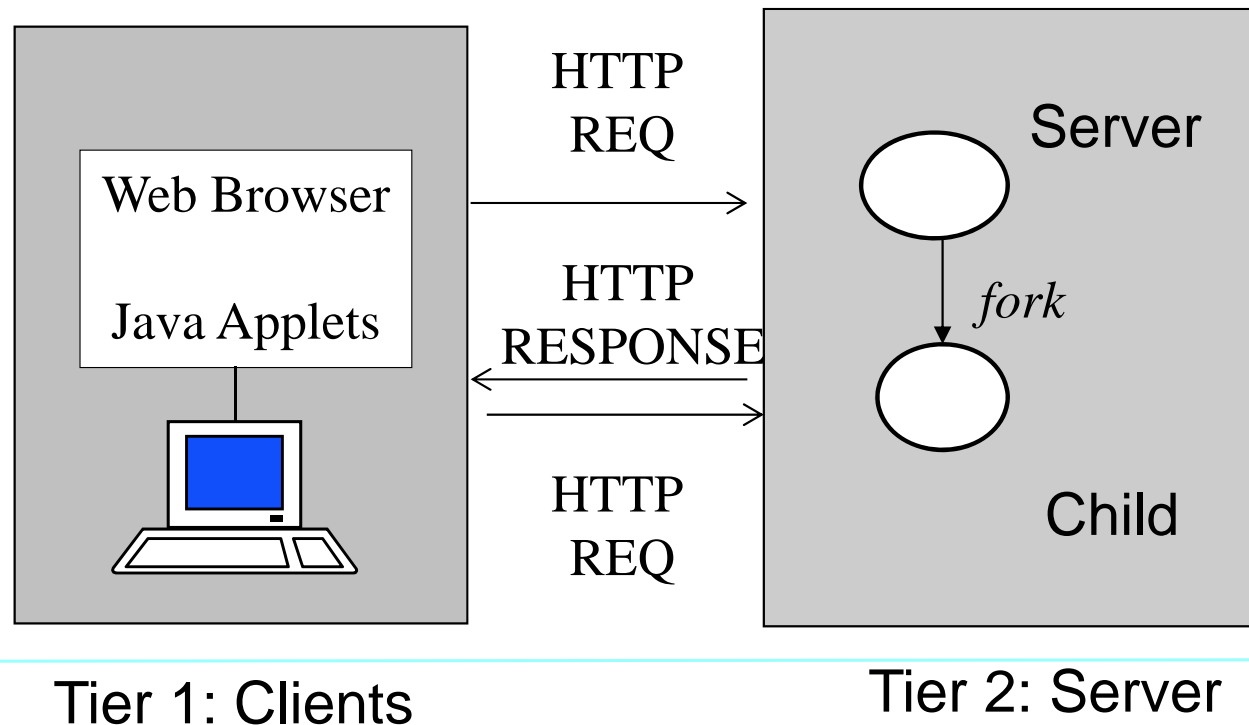
- 2-Tier, Client Server
- 3-tier
- N-Tier....





Client-Server 2-Tier Model

- An example: the HTTP server (Apache daemon)
 - ♣ the client (tier one) sends its requests. It may be an application but most frequently a WEB Browser.
 - ♣ the server (tier two) is a daemon and waits for the user request. Then the server sends the request to a child process. It starts the communication with the client.

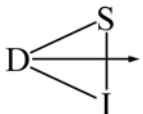




Client-Server 2-Tier Model

○ Benefits

- ♣ many ready to use tools that do it
- ♣ easy to develop
 - ➔ lots of visual tool
- ♣ simple to install
- ♣ Applications for clients can be downloaded in Java
- ♣ perform well for
 - ➔ A low number of clients





Client-Server 2-Tier Model

○ Limitations

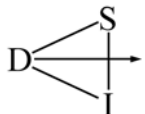
- ♣ Fat client: most of the application logic resides on the client
- ♣ Little reuse of the applications
- ♣ No integration with legacy applications
- ♣ Little scalability and hardware architecture flexibility





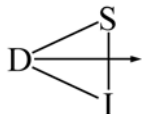
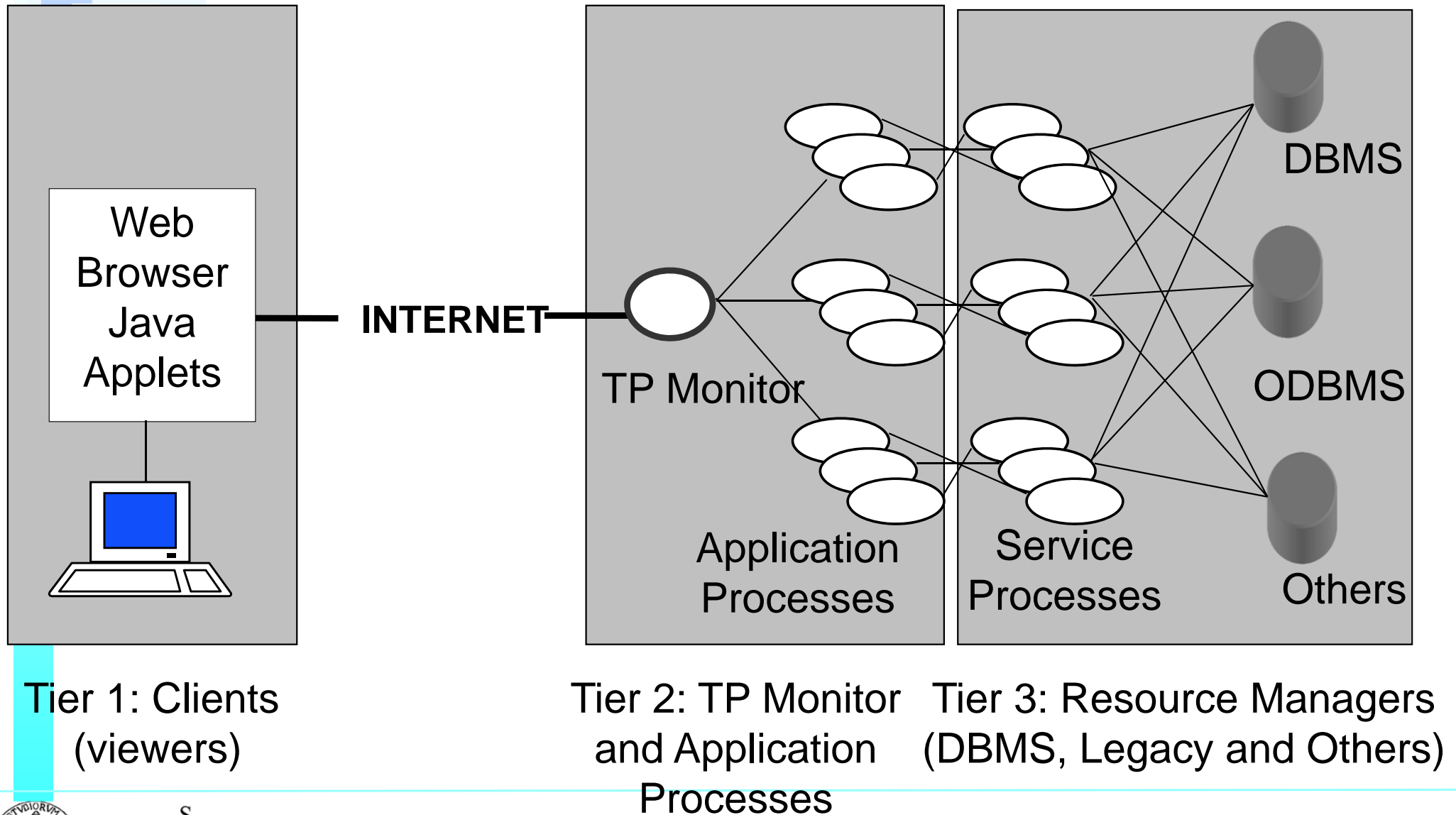
Soluzioni 2-tier diverse

- Java applet
 - ♣ Easy to be violated
 - ♣ Communication with SSL, SHTTP
- Plug in in Internet browser
 - ♣ More robust
 - ♣ Communication with SSL, SHTTP
- Specific application with direct communication with the server
 - ♣ More robust
 - ♣ Communication with SSL, SHTTP
 - ♣ More complex to be maintained





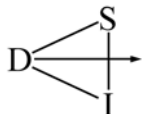
The Solution: 3-Tier model (I)





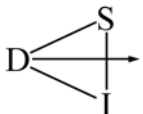
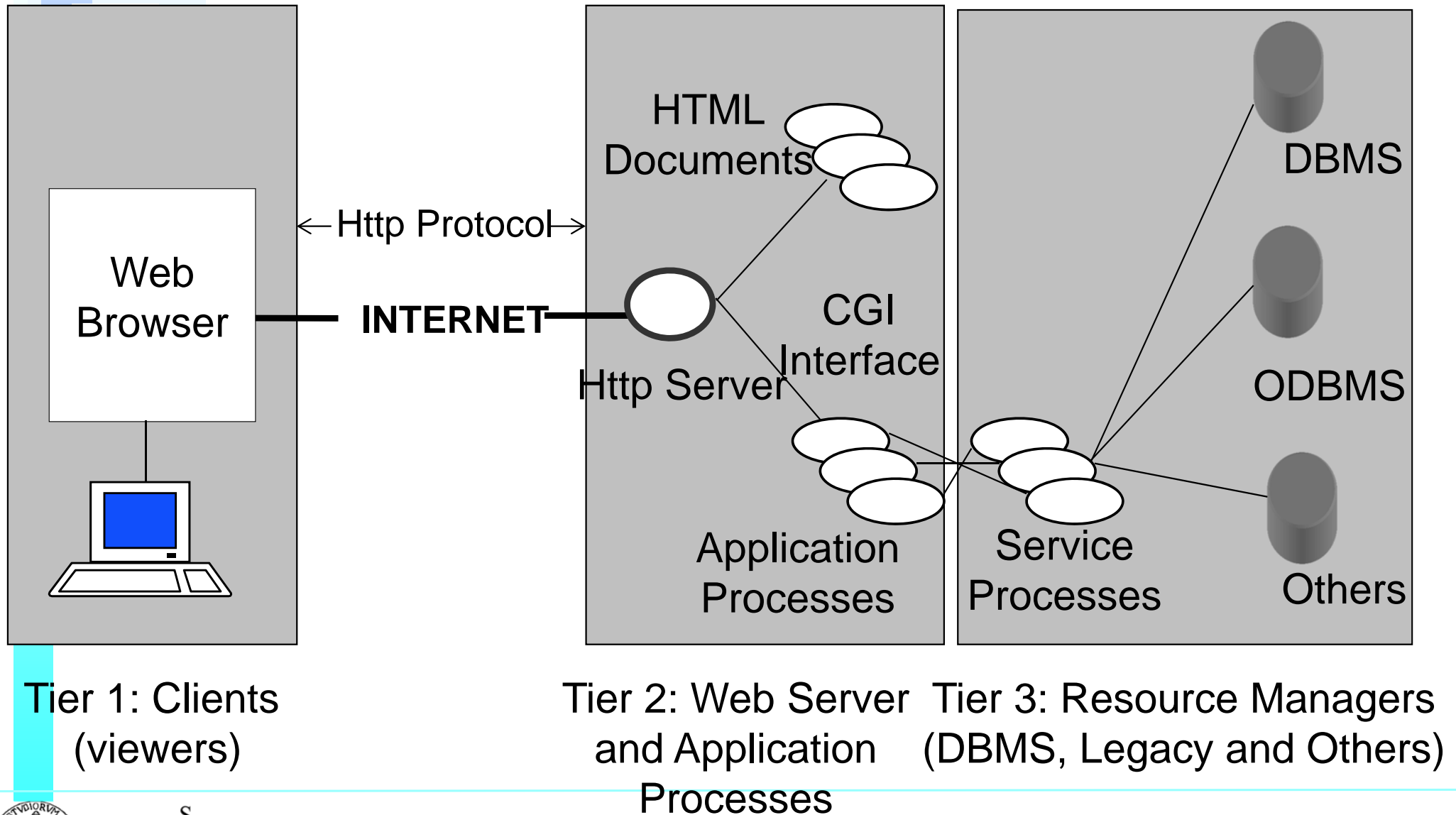
3-Tier model

- Tier 1 is constituted by the clients: they run the Graphical User Interface
 - ♣ typically a Web Browser
- Tier 2 is a “middle tier” added between the classical two tier of a client/server application
- Tier 3 is constituted by the resource managers and the data
 - ♣ DBMS for customer/product/shipping management
 - ♣ Other legacy application (ERP, DSS, etc.)
 - ♣ Service processes may be processes or API





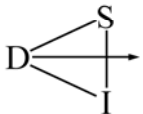
Example: CGI based





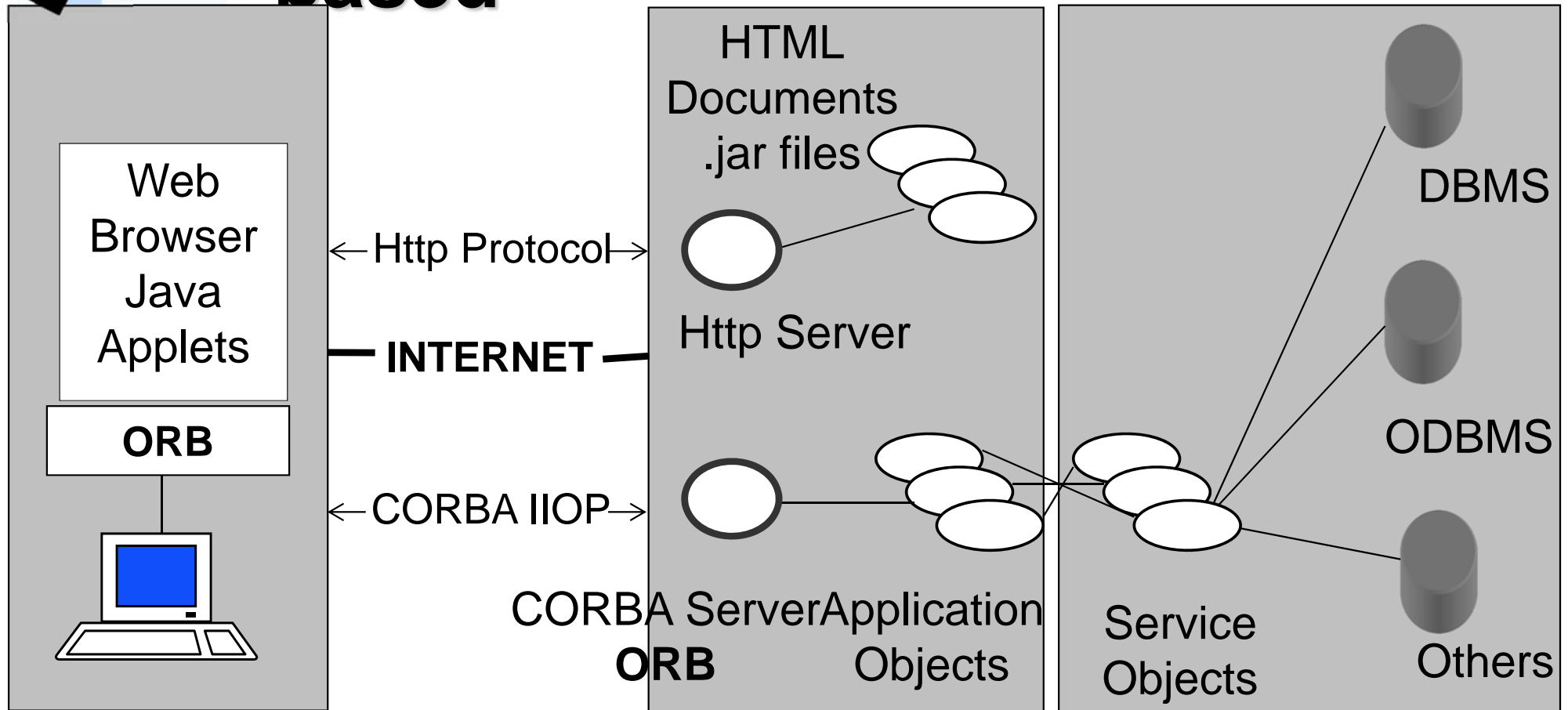
Example: CGI based

- One client - One process instance
 - ♣ great overhead in process creation
- Http and CGI are stateless
 - ♣ we need to use Hidden Fields or Cookies
 - ♣ data are not typed (no idl)
- Poor performance





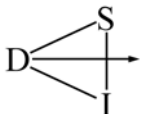
Example: Java and CORBA based



Tier 1: Clients
(viewers)
ORB middleware

Tier 2: Web Server
CORBA Server & OTM(DBMS, Legacy and Others)
Business Logic

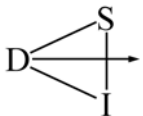
Tier 3: Resource Managers





Example: Java and CORBA based

- Oracle 4.0 Application Sever, BEA M3 and other
- need to add the ORB middleware
- IDL
- CORBA IIOP: CORBA Internet Inter-ORB Protocol: connects ORB over the Internet
- Client and Server exchange state information via the CORBA interface





Content Distributors web sites

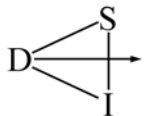
- OD2
 - ♣ Music of all the majors
- MICROSOFT
- i-Tune (200.000 tracks)
 - ♣ Apple, quick time player
 - ♣ OD2 Music
- Sony Connect Music Service
 - ♣ Open Magic gate DRM





Collecting Societies

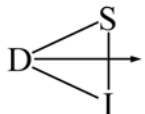
- SIAE
- GEMA
- SACEM
- SGAE
- One for each state
- Etc..
- **ECMA.....**
- **international association for music copyright**
European Music Office (www.musicineurope.org)





Comments on the prominent technologies

- Microsoft with Windows Media 9/10
- Content Guard
 - ♣ Owner of XrML, source for MPEG21 REL
 - ♣ Owned by Microsoft in large part
- Adobe
 - ♣ Mainly for PDF, EBX DRM
- Apple i-Tune and iPod
 - ♣ AAC audio format, DRM prop.
- DWS: Digital World Service, BMG
 - ♣ ADO2RA DRM
- DMDFusion
 - ♣ DRM included
- IBM....
- OMA DRM, Open Mobile Alliance
- ODRL.....
- Sono Open MG.....
- MPEG21.....





Web DELivering of MUSIC scores

<http://www.wedelmusic.org>

Dipartimento Sistemi e Informatica



SCUOLA DI MUSICA
DI FIESOLE
FONDAZIONE



Fraunhofer Institute for
Computer Graphics

Edizioni Suvini Zerboni



Ircam  Centre Georges-Pompidou

Institut
Graphische
Datenverarbeitung

USER GROUPS + Conference

(C) Paolo Nesi-1995-2000



○ ***Mediateques and Libraries***

- ♣ Agreement for free consultation
- ♣ Percentage, forfeit, etc.
- ♣ Collecting content from several content owners and other mediateques

○ ***Mediateques as Content Distributors***

- ♣ pay per play, special contracts, ...
- ♣ *precise DRM*: protection + certification + control of exploited functionalities
- ♣ respect of the privacy

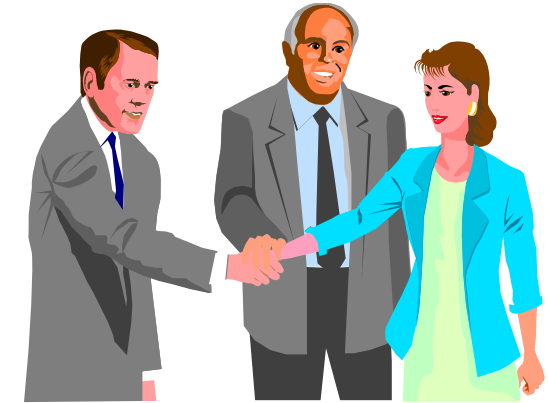


B2B: Distribution Protocols



Great Distribution

- ♣ reducing production costs
- ♣ good vehicle for promotion
- ♣ control on B2C distribution
- ♣ control on functionalities



e-commerce B2B:

- ♣ Shops, Libraries, Orchestras, TV-Network, Music School, Conservatories
- ♣ reducing storage costs
- ♣ reducing delivery terms
- ♣ application software already defined, *ready to print, courses, etc.*



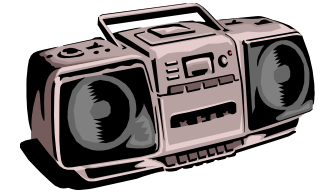


B2C: Distribution Protocols



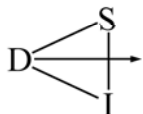
○ ***Aimed at the end-user***

- ♣ prompt delivery, *on-line*
- ♣ Several possible levels of customisation for
 - ➔ “CD”, DVD, or
 - ➔ contents to be inserted in portable media players
- ♣ *e-commerce B2C*: small values great numbers



○ ***Methods and Means of controlling***

- ♣ control on the exploited functionalities
 - ➔ print, listen mode, transposition, etc.
 - ➔ music-card (smart-card)
- ♣ limited range of execution on computer
- ♣ media players compliant to specific protocols
- ♣ client certification, on-line/off-line



Digital Right Management, DRM

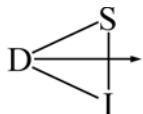


○ ***Different meanings for different partners***

- ♣ Publishers
- ♣ Software tool builder
- ♣ Content distributor
- ♣ Collecting society

○ ***DRM:***

- ♣ content protection
 - ➔ *passive*: watermarking
 - ➔ *active*: encryption, exploration
 - ♣ control of the exploited functionalities
 - ➔ print, playing, copying, etc.
 - ➔ respect of the privacy
 - ♣ program protection, certification
- Diagram illustrating the scope of DRM:
- Audio Files
 - Music Sheets
 - Audio Files
 - Music Sheets
 - MIDI, PS





DRM Models and Solutions

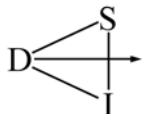


Simple Media: Audio, PDF files, etc.

- Intertrust, Info2clear, Reciprocal, iUniverse, etc.
- **Audio:** Augmented MP3
 - ♣ OD2, Liquid Audio, MOD,
- **Scores:**
 - ♣ SheetMusicNow (AMW), Net4Music, MusicSales, AllegroAssai, etc.
- **Documents:**
 - ♣ Sealed Media, Adobe Solution...

Multimedia Music:

- **Audio + Video:** Real Player, QuickTime, WEB
- WEB Based Solutions: no real integrated multimedia, no prot.
- Macromedia, Director: no protection, no music.
- WEDELMUSIC: protection, integrated multimedia music



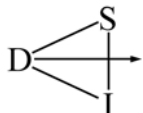


New Markets



- Distribution of multimedia music
- Integrated Multimedia Libraries, shared contents
- Low cost publication for promotion purposes
- Market activity acceleration and incentive to promotion
- Music distance learning and teaching
- More straightforward operations and greater solution effectiveness for Visually Impaired People
- etc.

Sophisticated Models
More Interactivity in Music





Wide-spread distribution of Music



Single Users

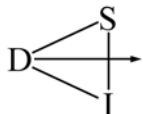
- ♣ *free file*: MP3, WAVE, for the audio
- ♣ *free streaming*: radio and single tracks
- ♣ *free MIDI*, Finale, Score for the symbolic
- ♣ P2P: NAPSTER



Great Distribution

- ♣ theatres, orchestras, recording studios
- ♣ conservatories, music schools
- ♣ *TV network*
- ♣ libraries
- ♣ music shops

partially unsatisfactory formats

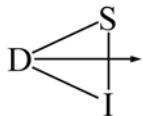




Multimedia Music



- Integration of Music Notation and images, video, documents, animations, etc.
- Good for valorisation, promotion, education,
 - ♣ showing the historical context
 - ♣ low cost promotion and monitoring
 - ♣ comparison with other music pieces
 - ♣ demonstrating how to play an instrument, distance learning
- Training people to listen to music and recognise it

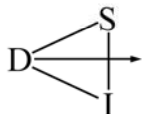




State of the Art



- Publishers/archives have a lot of content which is not well-organized, where single elements are often strongly related one another to complete the information
- To the greatest degree such material has relevant cultural value, once it is integrated in multimedia products
- This content may have high level potentiality if exploited for:
 - ♣ Mediateques
 - ♣ Music schools
 - ♣ off-line distribution: CDs, DVDs, etc.
 - ♣ e-commerce on specific components



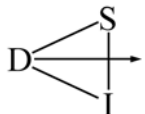


State of the Art: archives



- Accumulation of content
- non protected content/performances
 - ♣ non commercial content
 - ♣ non digitized content
 - ♣ Publishers are not interested due to the lack of economical revenues.
- Interesting for: students, experts, etc.
- Free on-site consultation, no excerpts, no copies (authorized)

This has a restraining effect on both valorization and global spreading out

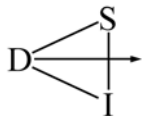




Content

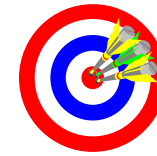


- Classification and historical information
- Tapes
 - ♣ of several different sizes
 - ♣ very fast deterioration
- Disks
 - ♣ of several different formats
- Pictures.....
- Video Tapes.....
- Documents
 - ♣ Music sheets
 - ♣ textual document, etc.





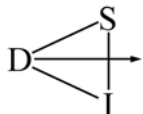
Goals



- *distribution of interactive music via Internet* respecting the owner's rights (DRM) and integrating audio, video, documents, symbolic and image formats in a unified model
- *reliable mechanisms to protect digital music objects*: this will preserve music originality and allow at the same time modifications and processing.
- A model for *distributing music*, taking into account the *different needs* of music consumers and the definition of a set of detailed allowed operations on digital music.
- tools for *distributing music to visually impaired and sighted people in a unified manner*.
- *exploiting new functionalities*, opening a

♣ *new market for new products and solutions*

→ *An open SUPPORT to build WEDEL compliant applications*



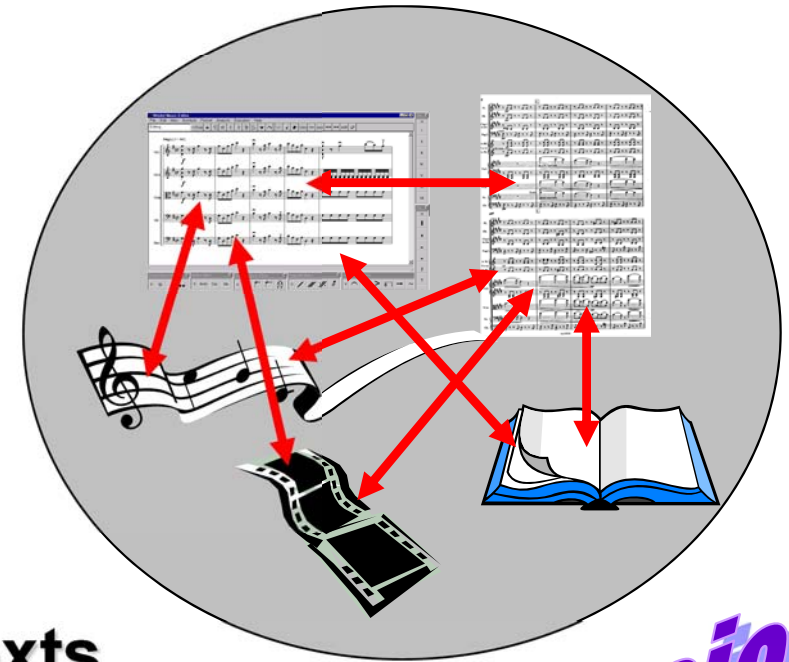


Integrated Libraries



○ Integrating different aspects of “Music”

- ♣ classification and identification of the track
- ♣ Partitura original images
- ♣ different execution audio
- ♣ symbolic encoding of the track
- ♣ several versions of single parts
- ♣ video, images, documents, etc.
- ♣ animations, WEB pages, etc.
- ♣ ***navigation among components***



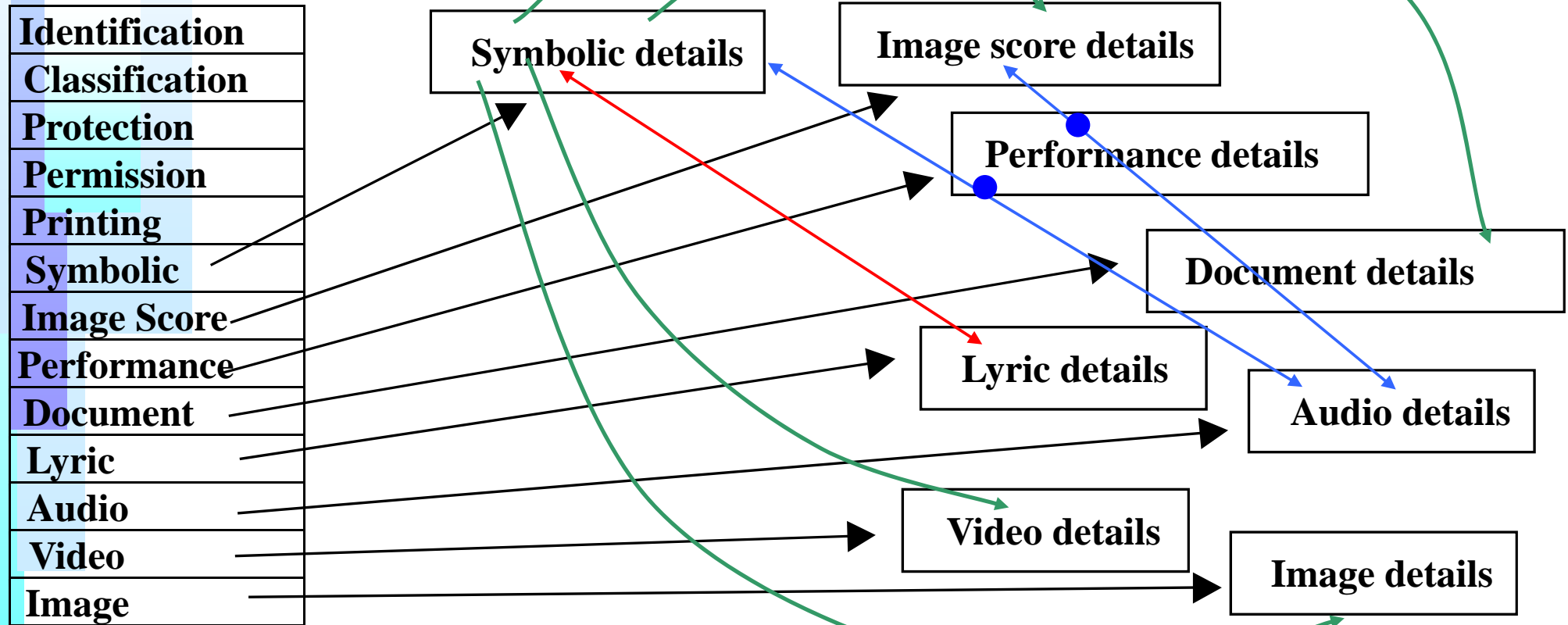
○ linguistics-related aspects of texts

- ♣ analysis, researches, comparisons
- ♣ multilingual versions
- ♣ researches based on the music content

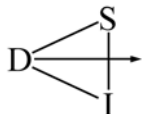
interactive music



WEDEL object structure



XML compliant language

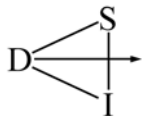




WEDELMUSIC model



- ***New functionalities*** for end-users:
 - ♣ libraries, theatres, music schools, music shops, etc.
- **Vehicle** for
 - ♣ supporting multimedia libraries, performing content sharing
 - ♣ valorisation of historical and modern archives
 - ♣ implementation of integrated music objects
 - ♣ promotion of music
 - ♣ implementation of integrated music objects
- ***protection support***: via a sophisticated DRM
 - ♣ ***precise accounting/control*** of the operations performed on music pieces
 - ♣ managing renting mechanisms
 - ♣ tracing functionalities exploited by end-users

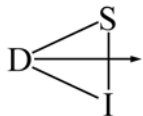




XML WEDELMUSIC Format



- **Open public format: standard process**
 - ♣ XML DTD are on the WEB site
 - ➔ multimedia modeling and integration
 - ➔ music notation format
- **The editor in Trial Version is free**
 - ♣ Any work on protected music is not allowed
 - ♣ If permitted, it is controlled and defined by fees
- **Format will be improved within the activity range of MUSICNETWORK**





WEDEL Editor



○ *Integrated aspects*

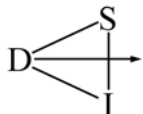
- ♣ Music Identification and Classification
- ♣ Symbolic + image scores + audio files
- ♣ Animations, synchronisation, hyperlink navigation
- ♣ Protection aspects
- ♣ ***Other aspects related to:*** videos, documents, images, lyrics, etc.

○ *Multimedia applications*

- ♣ Hyper-links within the WEDEL object
- ♣ Visualisation of music in **any format on any media** thanks to an automatic intelligent formatting engine

○ *Multilingual aspects*

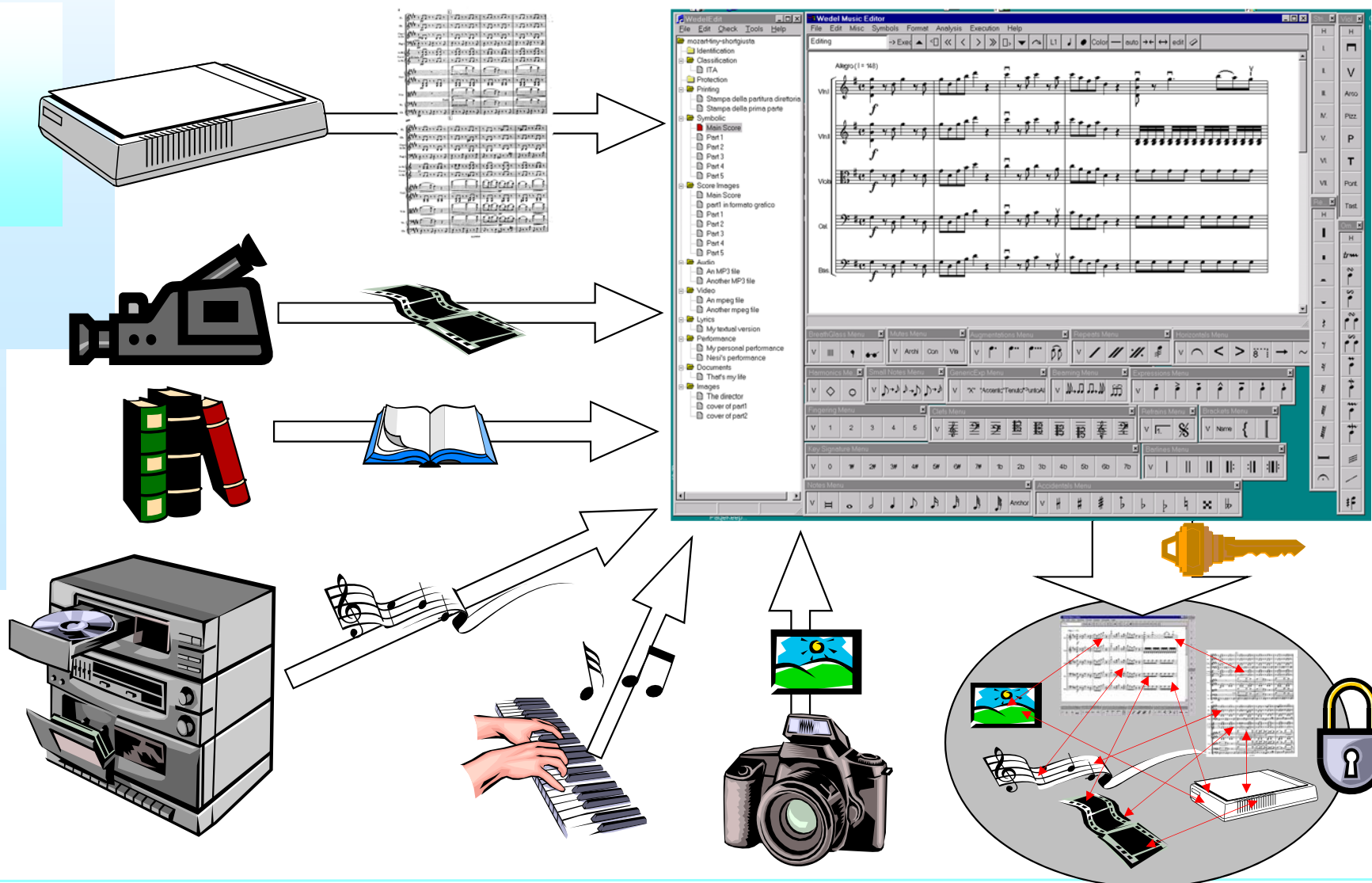
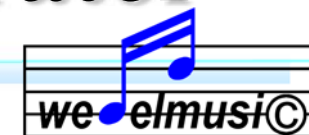
- ♣ lyrics, documents, cataloguing, etc.





WEDELMUSIC Editor and Integrator

To build your WEDELMUSIC objects





Music Processing Tools



○ ***WEDEL Editor***

- ♣ Navigating inside WEDEL Objects
- ♣ Integrating: scores, docs, images, videos, audio, etc.

○ ***WEDEL MUSIC Editor***

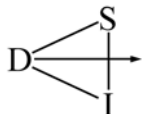
- ♣ editing, transposing, printing music, etc.
- ♣ importing music from MIDI, SCORE, FINALE
- ♣ Music Analysis with IRCAM's Plug-In

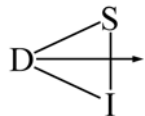
○ ***WEDEL MUSIC Editor for Visually Impaired People***

- ♣ Braille Printing, Spoken Music

○ ***WEDEL Tool Kit, open architecture***

- ♣ Support for compliant TOOLS development





WEDEL Editor
File Edit Check Tools

- uccellinidemo
 - Identification
 - Classification
 - English
 - Protection
 - Printing
 - Symbolic Main Sc
 - Symbolic
 - Main Score
 - Part 1
 - Part 2
 - Score Images
 - Main Score
 - basso
 - violino
 - Other Scores
 - Audio
 - low-quality-demo
 - Video
 - Lyrics
 - Performance
 - Documents
 - CD France
 - CD Eng.
 - CD German
 - Arcadie Eng
 - Arcadie France
 - Arcadie German
 - Biography Eng
 - Biografia
 - Images

Main Score - WEDEL Music Editor
File Edit Misc Symbols Format Analysis Execution Help

Editing --> Exec

we elmusi ©

La Licimia Contenta

adagio (♩ = 150)

Adagio

Main Score - WEDEL Music Editor
File Edit Misc Symbols Format Analysis Execution Help

Editing --> Exec

Sonata quarta a violino solo della Hertensta virtuosa

uccellini_dedica.gif - Anteprima di Imaging
File Visualizza Pagina Zoom ?

SERENISSIMO PRINCIPE

Alutano gli Vccelli col proprio canto il Sole ne fuoi albori, ed io, che da quegli prendo il cognome, riuersico colle mie melodie, quali esse si sieno, l'Altezza vostra Serenissima Che spunta come nuovo sole all'Italia. Prefento, dico, à V. A. colla dovuta sommissione queste mie fatiche de suono, e chiamerolle allora ben concertate, quando arriunno ad esserle punto in grado, & ad aprirmi qualch' adito alla sua ruerita gratia. Di tanto certo par che mi affidi la benignità, che in lei ci scorge, degna del suo gran sangue, e de gli esempi gloriosi, ch' anche in questa parte giornalmente riceue dal Serenissimo Sig. Duca suo Padre, e mio benignissimo Sig. E qui all' A. V. Serenissima profondilamente m' inchino, e prego Dio Sig. che conferui la Serenissima sua persona alle speranze, ed al beneficio pubblico che le conceda continuoate prosperità, e grandezze.

WEDEL Mp3/Wave/MIDI Multirate player
File Help

Slower Faster Normal

File type: wave

playback rate: 0% 01:10 / 01:11 UCCE.wa

uccellini_copertinabassocontinuo.gif - Anteprima di Imaging
File Visualizza Pagina Zoom ?

BASSO CONTINVO
DELLE
SONATE CORRENTI
Et Arie Da Parli con diuersi Stromenti si da Camera, come da Chiesa. à vno à due, & à trè.
OPERA QVARTA.
DI D. MARCO VCCCELLINI
MVSCO, E CAPO DEGL' INSTRUMENTISTI
Del Serenissimo Sig. Duca di Modana
DEDICATA
ALL' ALTEZZA SER^{ma} DEL SIG^{or}
PRENCIPE DI MODANA
CON PRIVILEGIO.

IN VENETIA D
APPRESSO ALESSANDRO VINCENTI MDCXXXV.



WEDEL editor

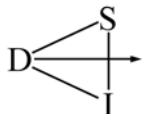


○ ***Integration of multimedia content***

- ♣ Fast build up with drag and drop
- ♣ *Audio*: mp3, wave, snd, etc.
- ♣ *video*: avi, mpeg, mov, qt, etc.
- ♣ *documents*: txt, html, doc, pdf, etc.
- ♣ *images*: tiff, gif, jpg,
- ♣ *scores*: images, Finale, Score, Sibelius, WEDELMUSIC, etc.
- ♣ *animations*: flash via html

○ ***synchronisation of music scores with***

- ♣ audio and/or video with real performance: symbolic, images
- ♣ MIDI generation
- ♣ control of velocity (rate) to learn to listen to music
- ♣ slide presentation: images with audio files



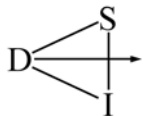


WEDEL MUSIC Editor



- editing, transposing,
- viewing, listening (MIDI)
- converting:
 - ♣ MIDI, SCORE, Finale, Sibelius,
- part combination and generation, tablature generation
- single parts and main score, a unique model
- excerpts, annotating music scores,
- image score visualisation and execution
- automatic reformatting, customisation
- printing, etc.
- support for piano, harp, organ, etc.
- Multilingual lyric management and modelling

No Violation of Rights



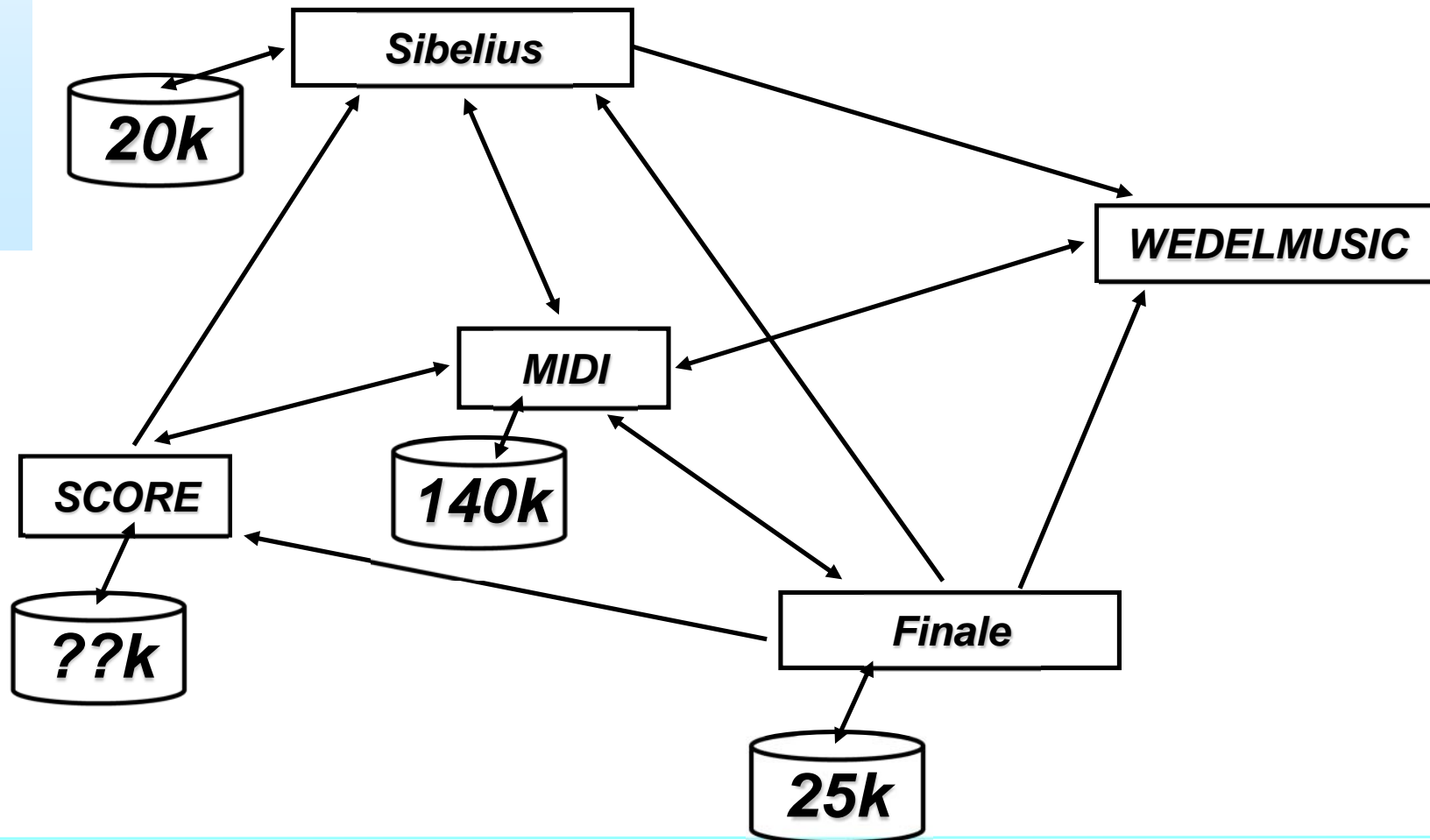


WEDEL music notation format



XML-compliant format for symbolic notation

♣ an emerging standard for Internet

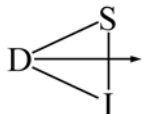




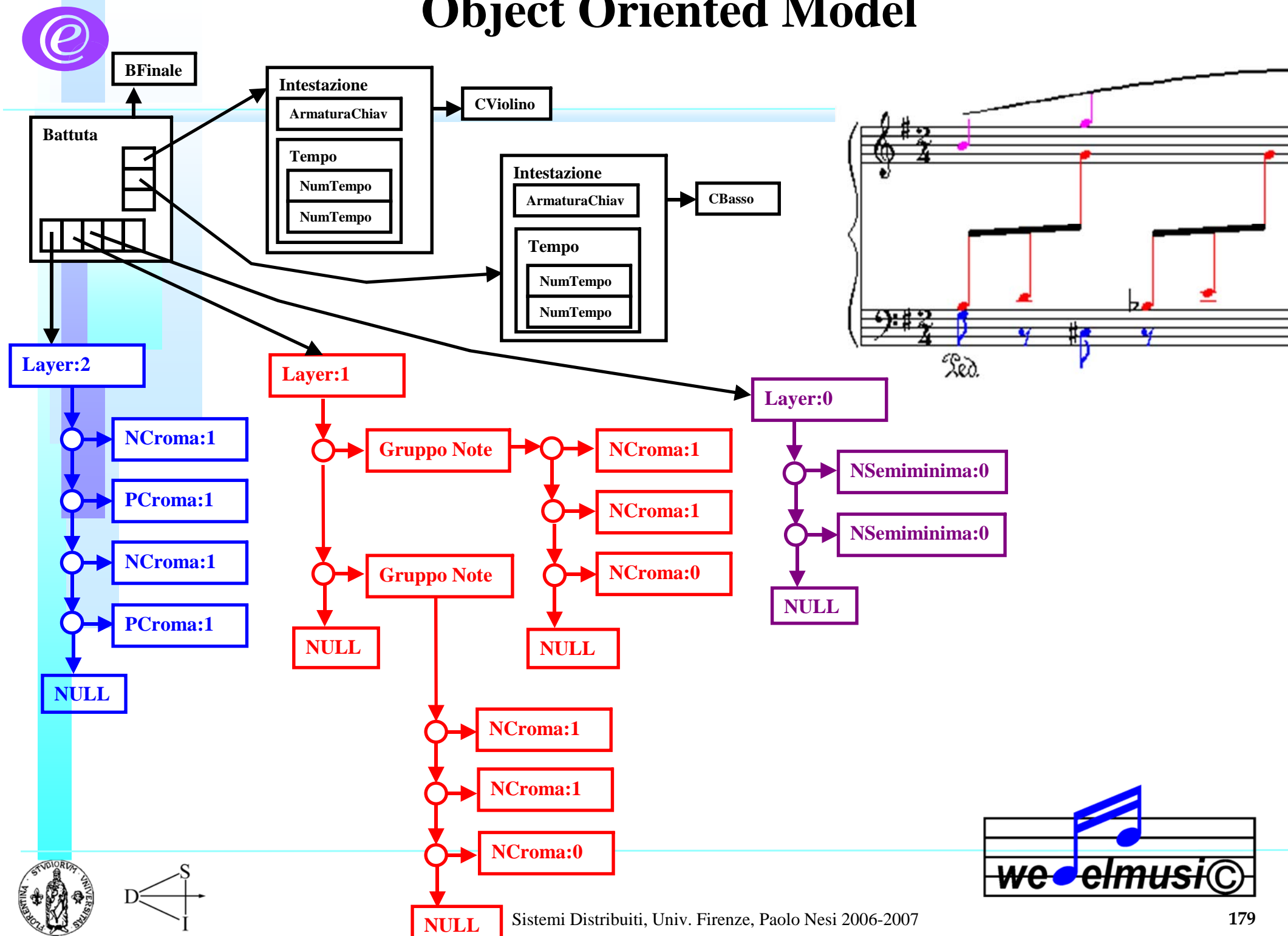
Notazione Musicale



- **Uno dei piu' vecchi linguaggi visuali**
 - ♣ Molte regole, molti dialetti, diverso per strumenti diversi, etc..
 - ♣ Non sufficientemente interattiva
- **Modellazione della notazione**
 - ♣ Relazioni fra simboli... Grafica, etc.
 - ♣ Lirca multilingua
- **Conversioni di Formato**
 - ♣ Modelli diversi (Finale, Sibelius, Score, NIFF, MIDI, etc.)
 - ♣ Simboli diversi (da 500 a 50 simboli..., simboli grafici strani)
- **Formattazione automatica**
 - ♣ Posizionamento (collisioni), giustificazione (problemi di ottimo)
- **Analisi della Musica**
 - ♣ Generazione della musica con algoritmi
 - ♣ Trasposizioni strumentali
 - ♣ Ricerche in base al contenuto
 - ♣ Riconoscimento dello stile ed imitazione



Object Oriented Model





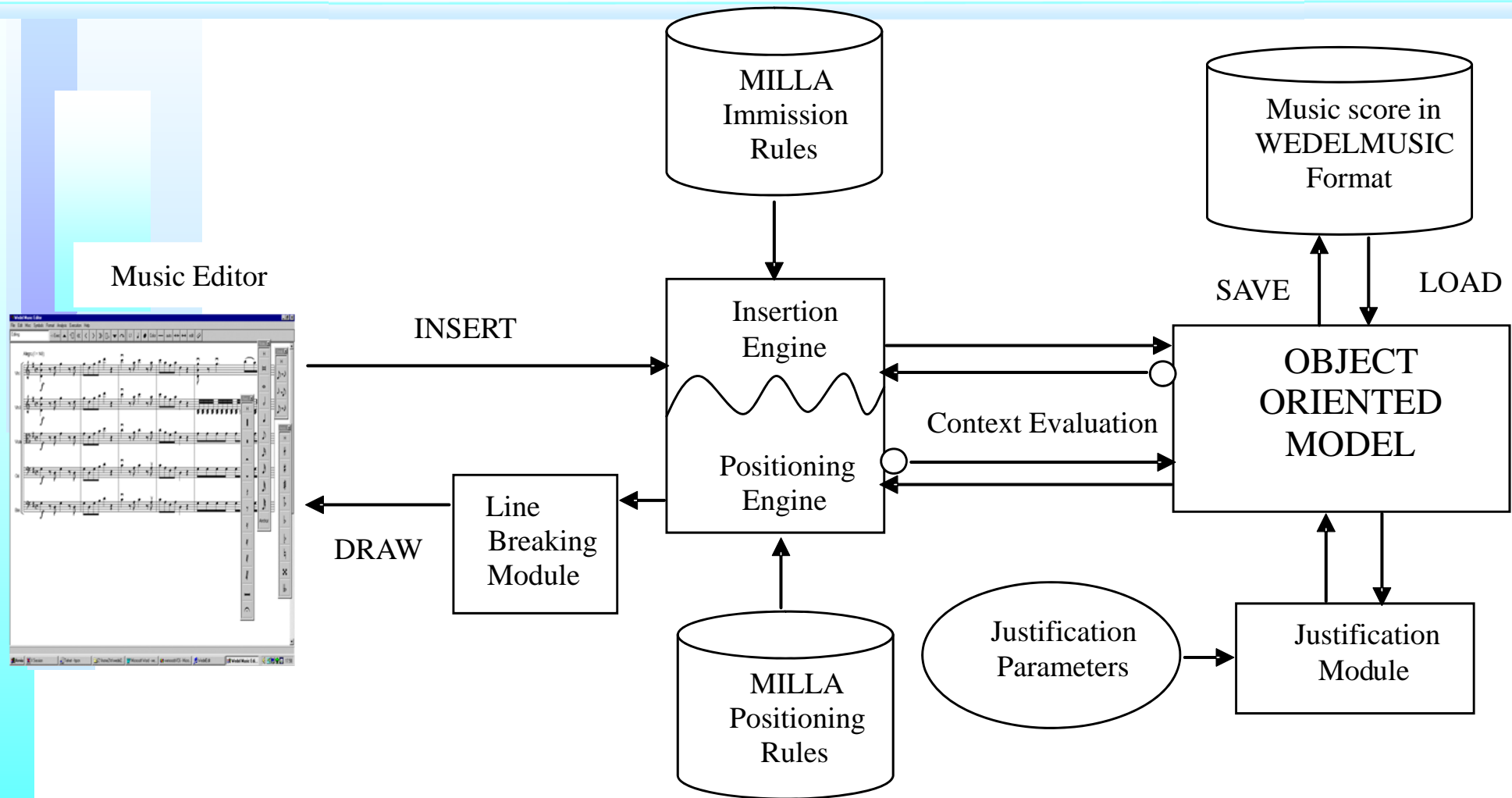
Example 2 (Layers)



```
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  <rest ID="2" DURATION="D1_2" HEIGHT="-4"
    STATUS="HIDDEN"/>
  <beam ID="9" STEMS="DOWN">
    <note ID="3" DURATION="D1_8" HEIGHT="-4"/>
    <note ID="4" DURATION="D1_8" HEIGHT="-5"/>
  </beam>
  <rest ID="8" DURATION="D1_4" HEIGHT="-7"
    STATUS="HIDDEN"/>
</layer>
<barline TYPE="END"/>
</measure>
<horizontal ID="4" TYPE="TUPLE" UPDOWN="UP"
  TUPLENUMBER="3" TUPLELINE="FALSE">
  <address MEASURE="1" LAYER="1" FIGURE="12"
    CHORD.OR.BEAM="1" CHORD.IN.BEAM="0"/>
  <address MEASURE="1" LAYER="1" FIGURE="12"
    CHORD.OR.BEAM="3" CHORD.IN.BEAM="0"/>
</horizontal>
```




Formattazione della Musica





Formattazione della Musica



Orientamento



Travatura



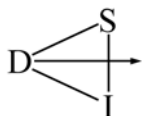
Direzione



Posizione

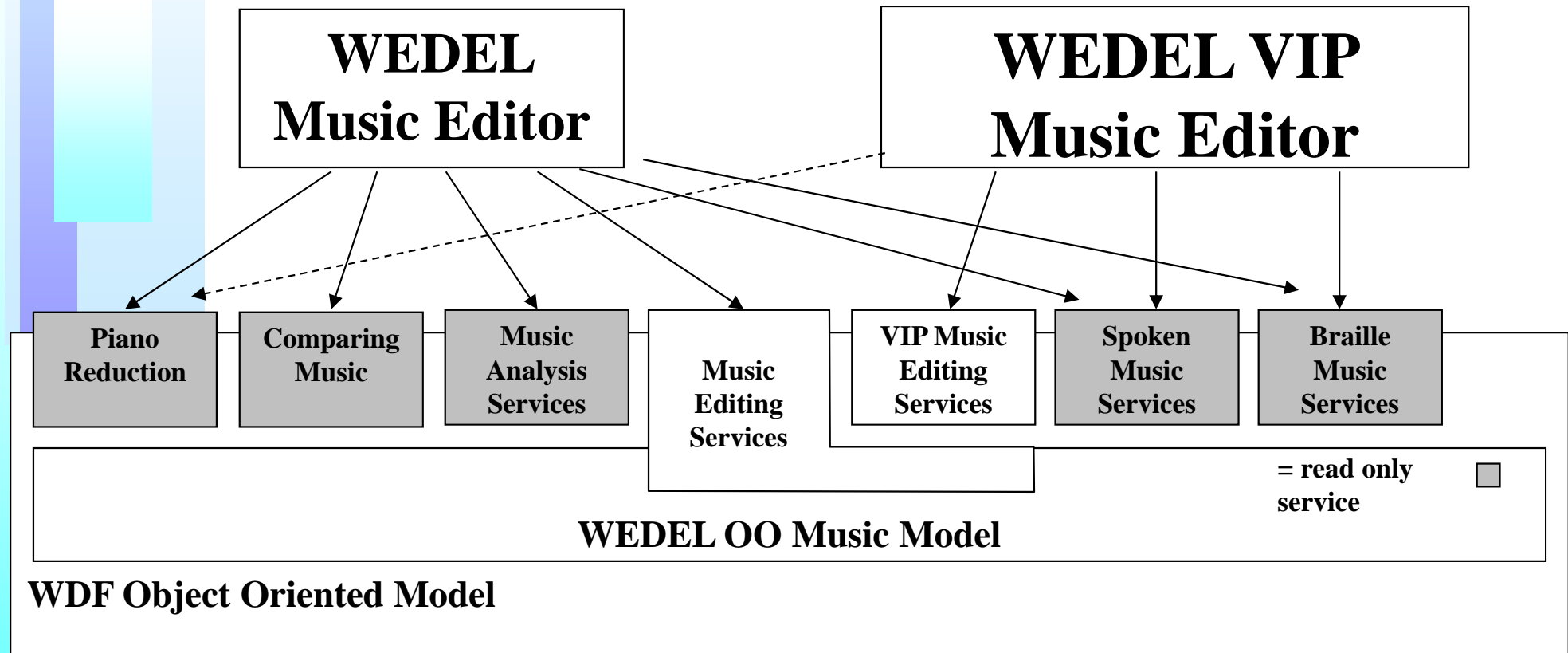


Ordine

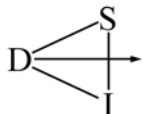




WTK vs other tools



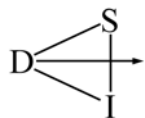
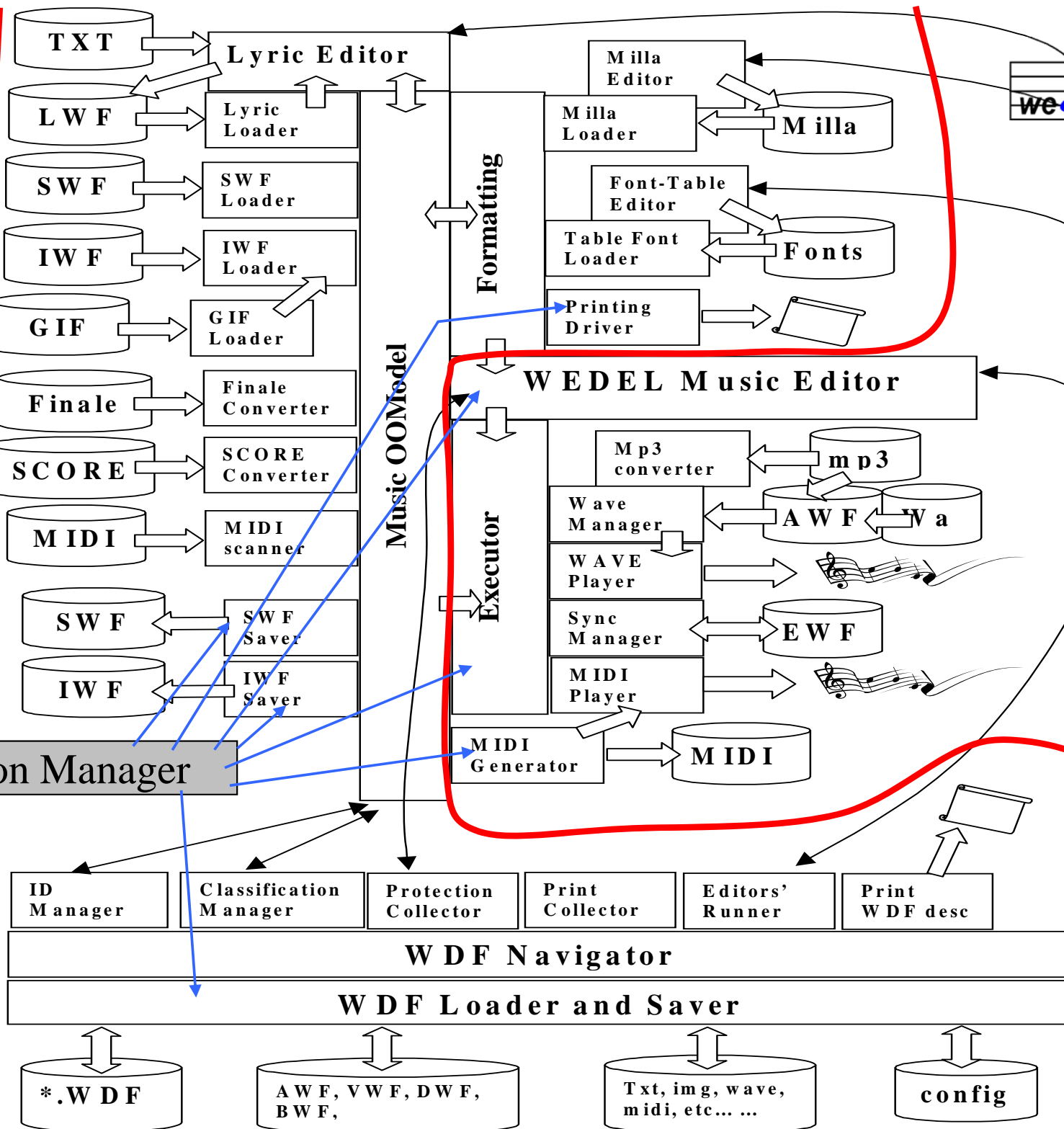
■ = read only service





Encryption
Decryption
Tools

Protection Manager

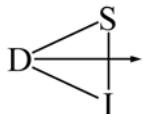
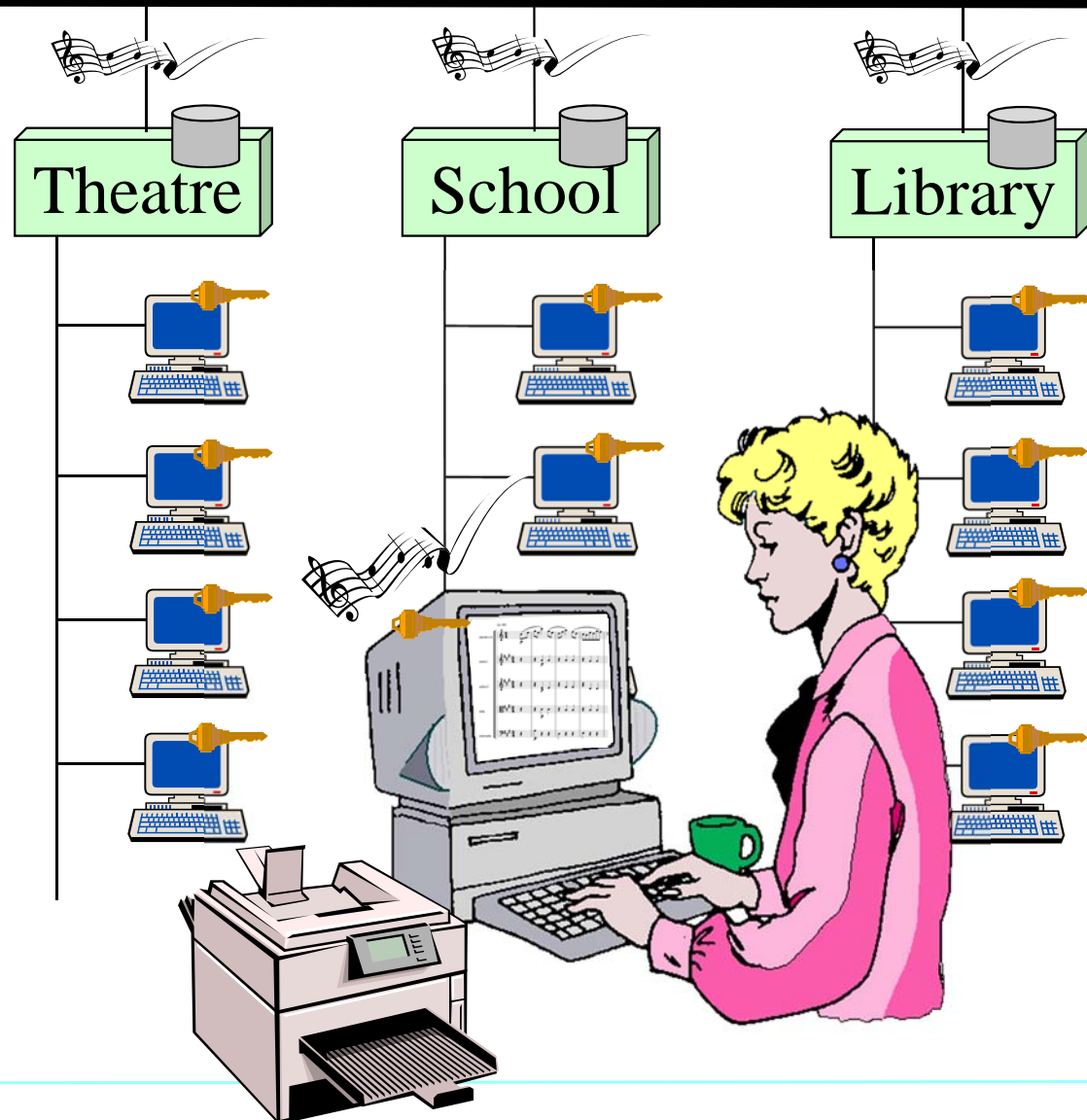
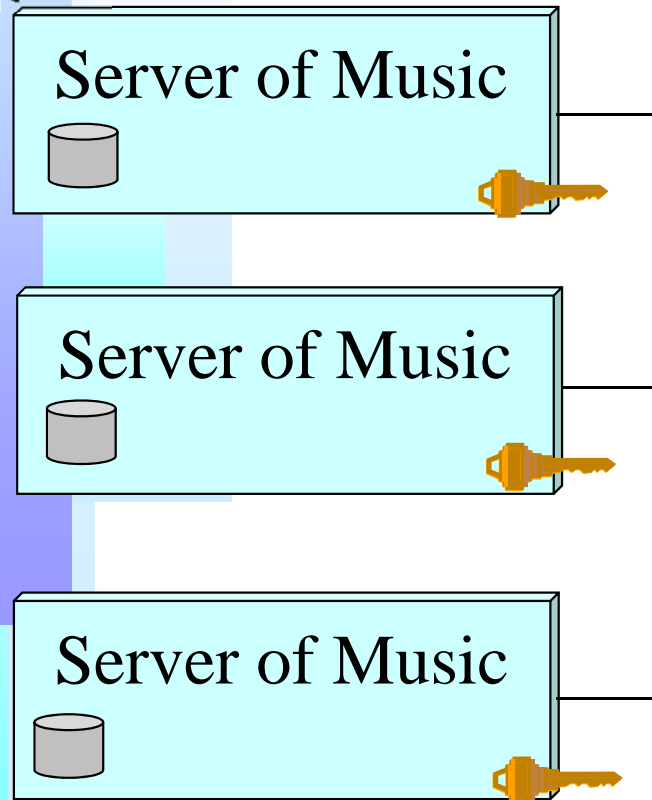




Reference Model, B2B and B2C



Internet

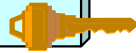


Reference Model, B2B and B2C

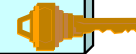


Internet

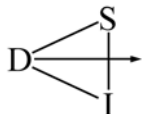
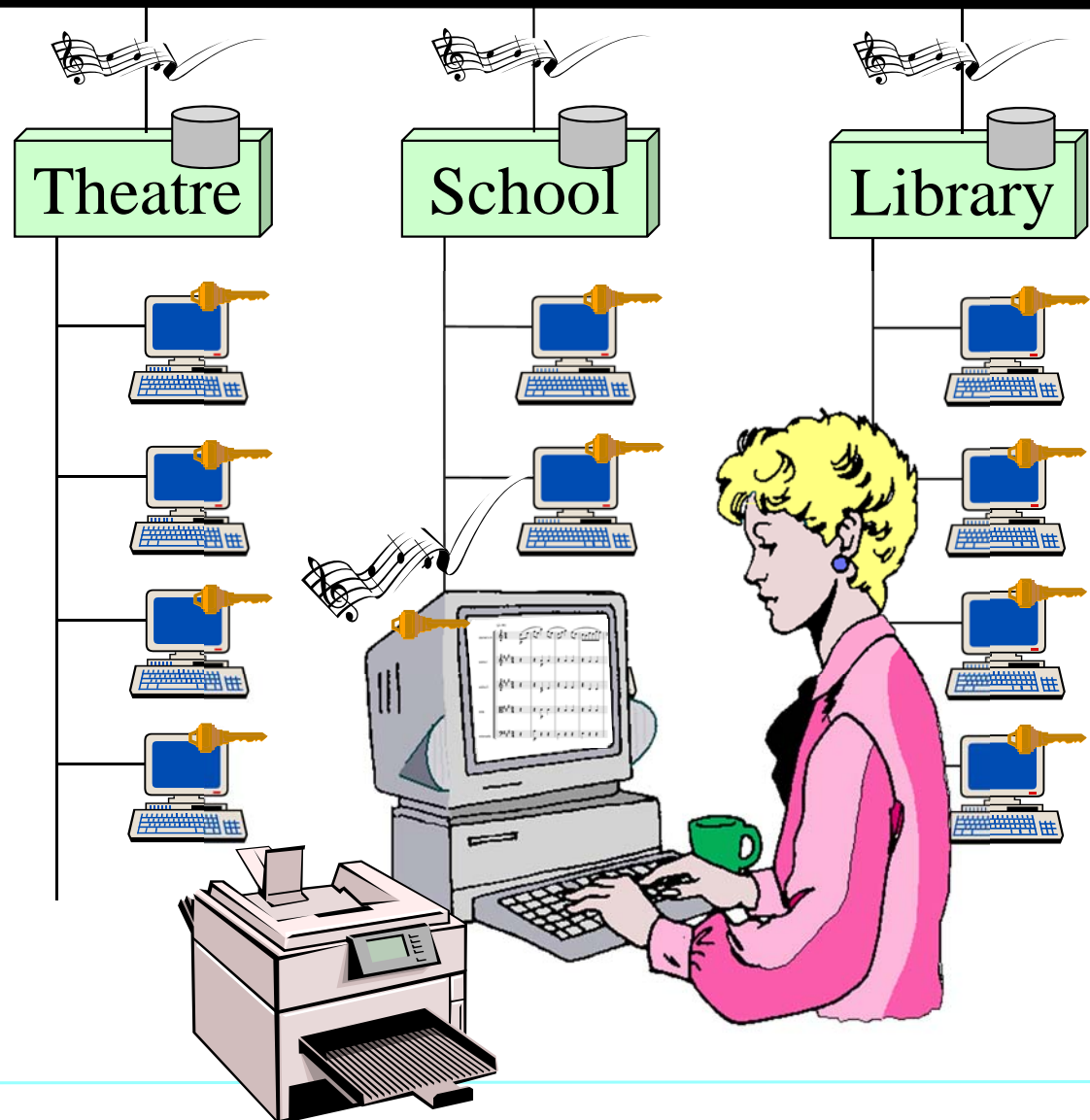
Content Distributor



Content Distributor



Content Distributor





Music Distribution

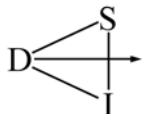


Transaction model

- ♣ B2B2C model
- ♣ Publishers \Rightarrow Multimedia libraries and schools
- ♣ Among Music Schools
- ♣ Among Mediateques
- ♣ From Schools, Mediateques, etc. \Leftrightarrow students at home
- ♣ on-line and off-line transaction
- ♣ protected and unprotected transactions
- ♣ controlled and uncontrolled transactions of Music

Protection

- ♣ DRM, content protection and functionality tracking
- ♣ Certification of Clients and Local Distributors





WEDELMUSIC Local Distributor

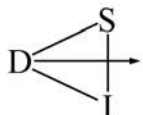


- From Local Distributor to end-users, consumers

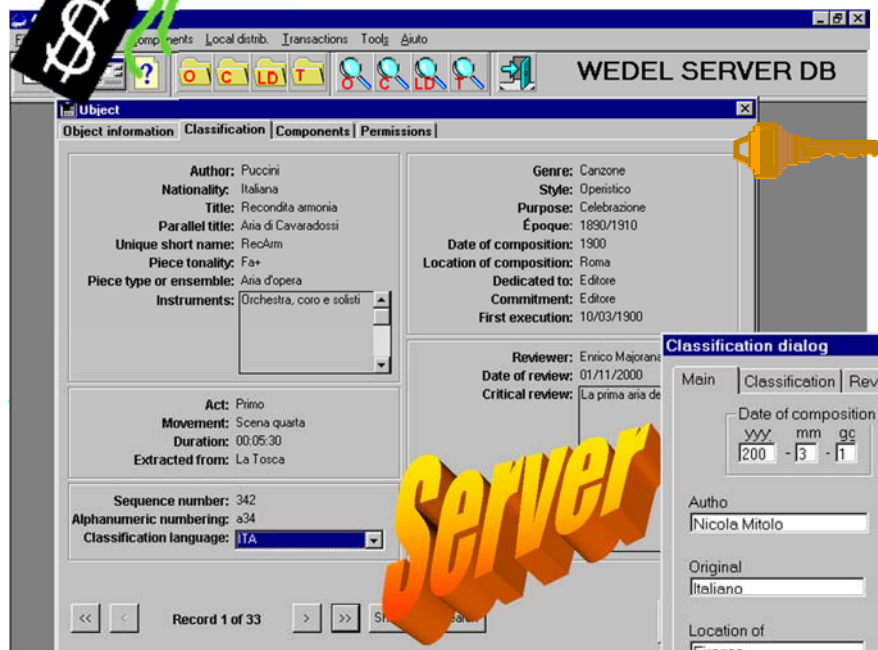
Microsoft Internet Explorer window showing a catalog page:

Address: [http://vivier/catalog/phpui/index.phtml?template=list2&select\[publisher\]=2&levellist2=advanced](http://vivier/catalog/phpui/index.phtml?template=list2&select[publisher]=2&levellist2=advanced)

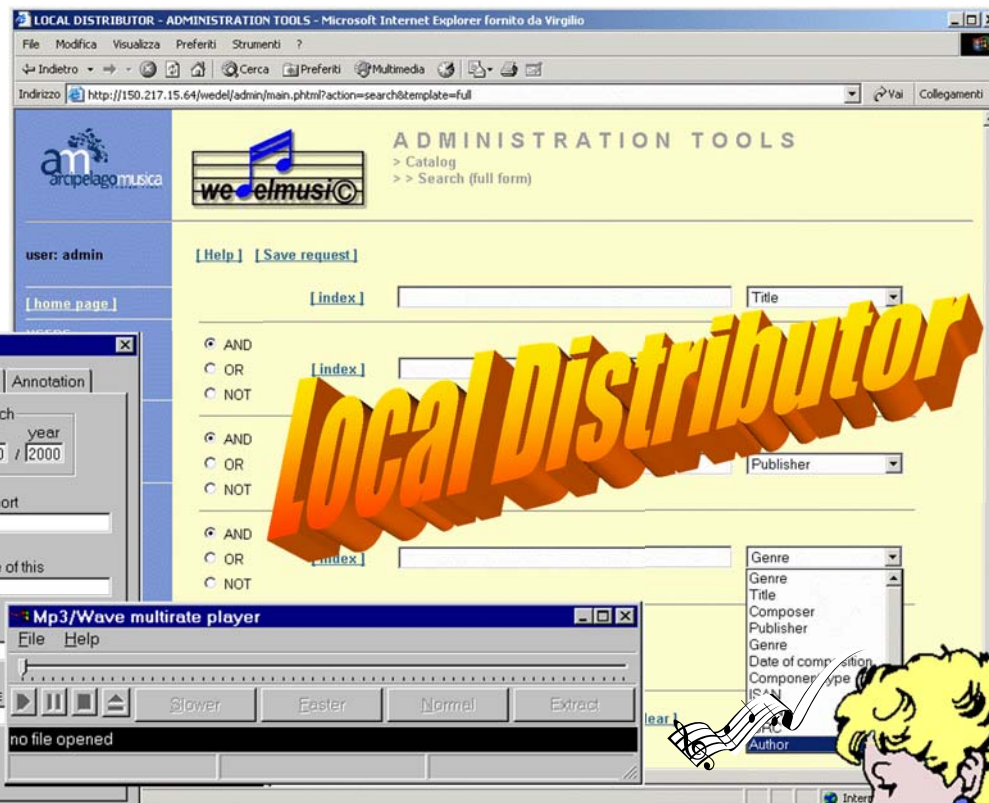
Title	Version	Date of composition	Author	Publisher	Genre
sonata 1			Bach	My publisher	sonata
sonata 2			Bach	My publisher	sonata
titre3			Bartok	My publisher	genre
titre4			Berlioz	My publisher	e1



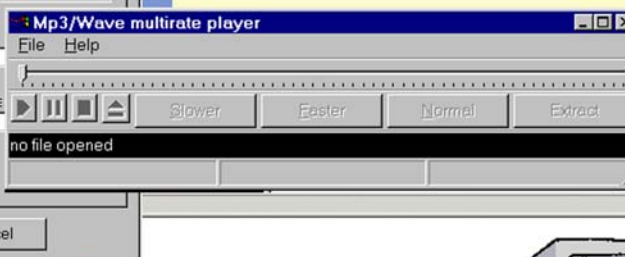
WEDELMUSIC Tools



Server



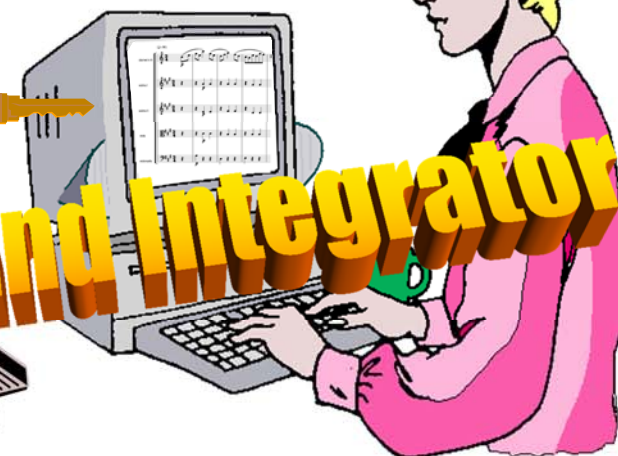
Local Distributor



WATERMARKING



Music Editors, visualizers, analysers and Integrator

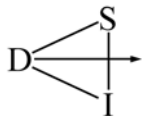




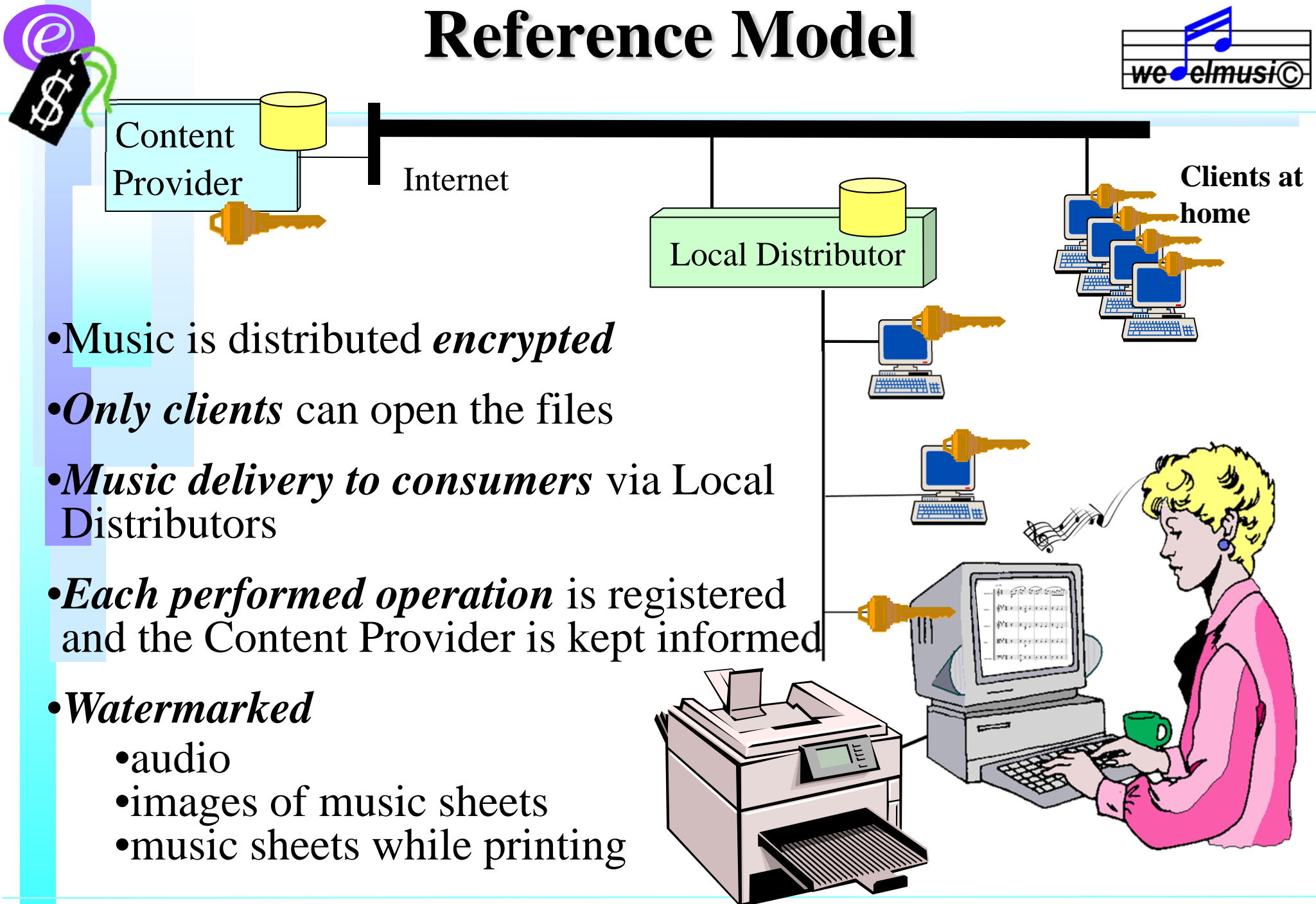
WEDELMUSIC Protection model

- protect the data flow, data authentication, ensuring data safety: **Encryption**
- make evident the ownership: **fingerprint, public watermark**
- detect and identify the path of the illegal operations: **fingerprint, private watermark**
- demonstrate the ownership: **fingerprint, private watermark**

Beyond the limits of SMDI



Reference Model



- Music is distributed *encrypted*
- *Only clients* can open the files
- *Music delivery to consumers* via Local Distributors
- *Each performed operation* is registered and the Content Provider is kept informed
- *Watermarked*
 - audio
 - images of music sheets
 - music sheets while printing



Watermarking

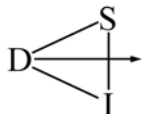


Diagram illustrating watermarking techniques applied to musical notation. The diagram shows a musical score with various elements highlighted by orange boxes and connected to corresponding watermarking techniques shown in separate boxes on the left.

The musical score is titled "Adagio e dolce" with a tempo marking of $\text{♩} = 60$. It consists of two systems of staves. The first system shows a treble and bass staff with a 3/8 time signature. The second system shows a treble and bass staff with a 4/8 time signature.

The watermarking techniques shown on the left are:

- A box with horizontal lines, connected to a box in the first system of the musical score.
- A box with a vertical line, connected to a box in the first system of the musical score.
- A box with a slanted line, connected to a box in the first system of the musical score.
- A box with a wavy line, connected to a box in the second system of the musical score.
- A box with a black oval, connected to a box in the first system of the musical score.





Watermarking

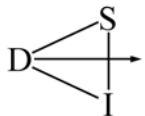


○ **The CODE**

- ♣ **Il codice puo' essere utilizzato per dimostrare la proprietà del brano musicale se viene riconosciuto in sede legale.**

○ **CODE, puo' includere direttamente o con un riferimento**

- ♣ **Publisher ID**
- ♣ **Music piece ID**
- ♣ **Local Distributor ID**
- ♣ **Customer ID**

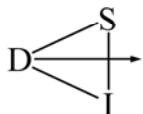




WEDELMUSIC Server



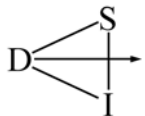
- ***Collecting WEDELMUSIC objects and Music Components, Digital Asset Management, For***
 - ♣ Publishers or
 - ♣ Generic Content Distributors
- ***Delivering music to Local Distributors***
 - ♣ On-Line, Internet
 - ♣ Off-line, CDs, DVDs, etc.
 - ♣ distributing on-line cataloguing updates
 - ♣ delivering promotional WEDELMUSIC objects
 - ♣ demo period, renting period
- ***Tracing performed operations***
 - ♣ defining allowed operations, DRM, profiling
 - ♣ managing the accounting mechanism for the LDs
 - ♣ getting feedback from the Local Distributors



WEDELMUSIC Local Distributor



- **For:** Libraries, conservatories, music shops, foundations, music schools, TV Networks, etc.
- **Collecting Music** from several content distributors
 - ♣ WEDELMUSIC objects more or less complete
 - ♣ local score files, audio, video, etc.
 - ♣ local generation of WEDELMUSIC objects
- **WEB lookup for local clients**
 - ♣ sophisticated queries,
 - ♣ cataloguing and content retrieval
- **Administration and management of clients**

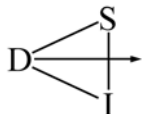




WEDELMUSIC Local Distributor



- **Getting music from Publishers**
 - ♣ on line or off-line on CD Roms
- **Updating** classification information
 - ♣ on-line or off-line
- **Delivering music to**
 - ♣ internal clients/attendees, and
 - ♣ external certified end-users.
- **Tracing** performed operations on WEDEL objects
 - ♣ presenting bills to end users for fee based services
 - ♣ statistical analysis: *service tuning, selecting music for the mass market*

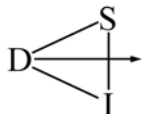




Music Multimedia Mediateques

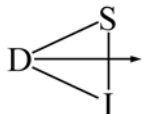
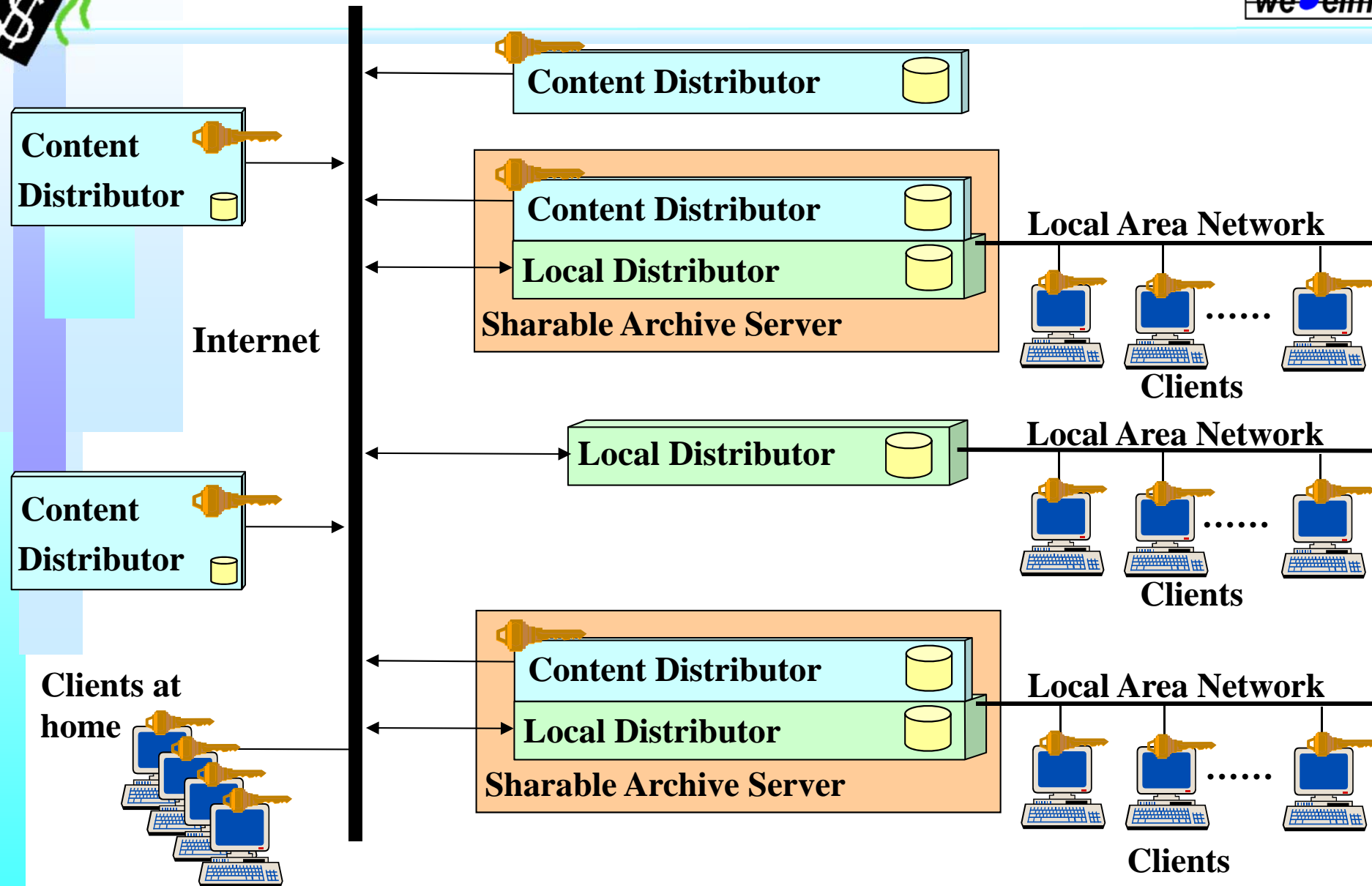


- WEDELMUSIC solution for mediateques
- Cataloguing, searching based on contents
- Contents sharing with other multimedia libraries using the same format, controlling content exploitation
- Every kind of research on multimedia contents
- Internet Publication of the contents owned by mediateques
- WEB interface for query, secure support for transactions
- B2C model from Local Distributor to Clients/students
- Protection of music and contents in general
- Control on the number of access
- Statistics: operations per user, tracing on both the work done and the functionalities used, time, etc..



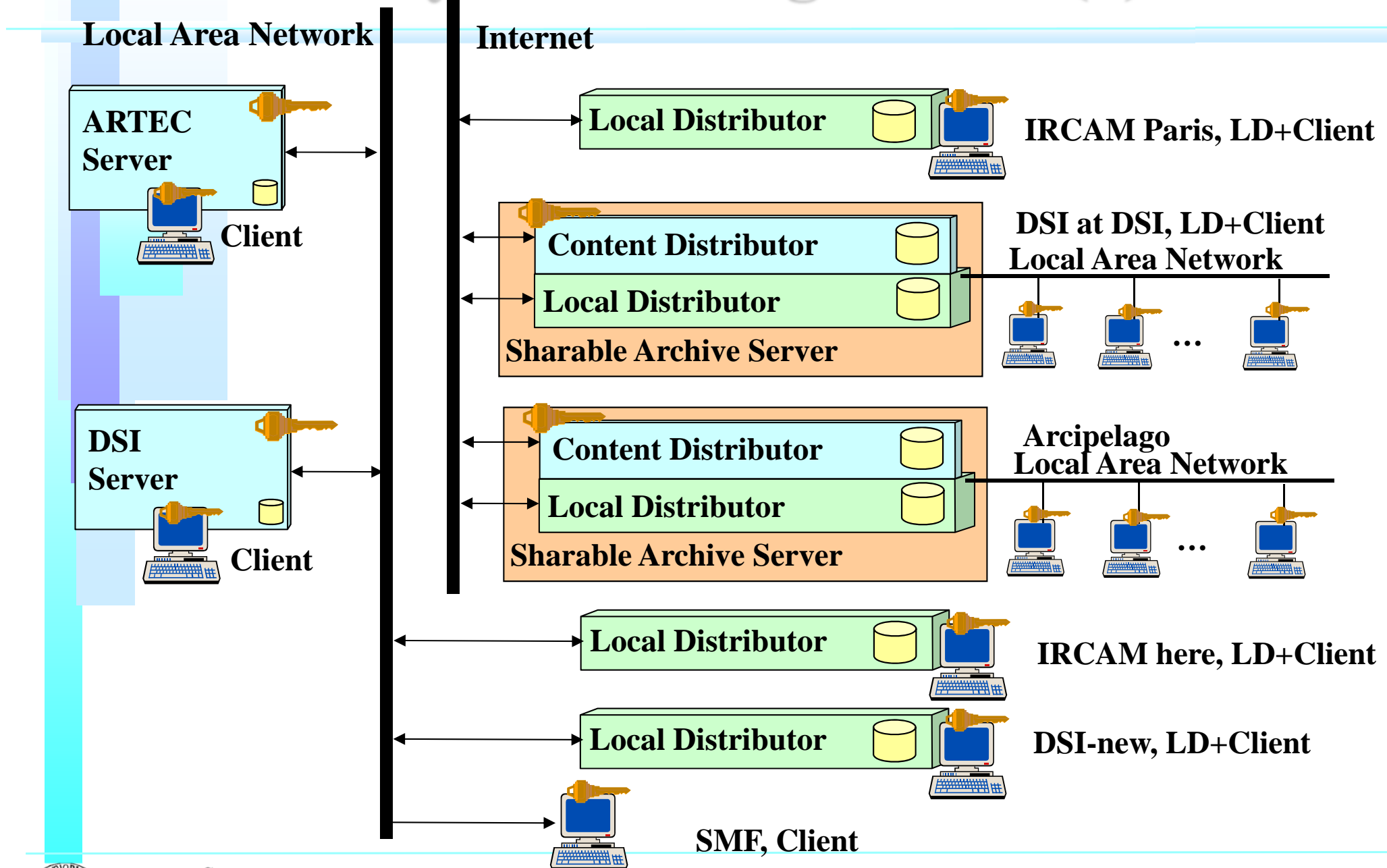


Sharing Content Model



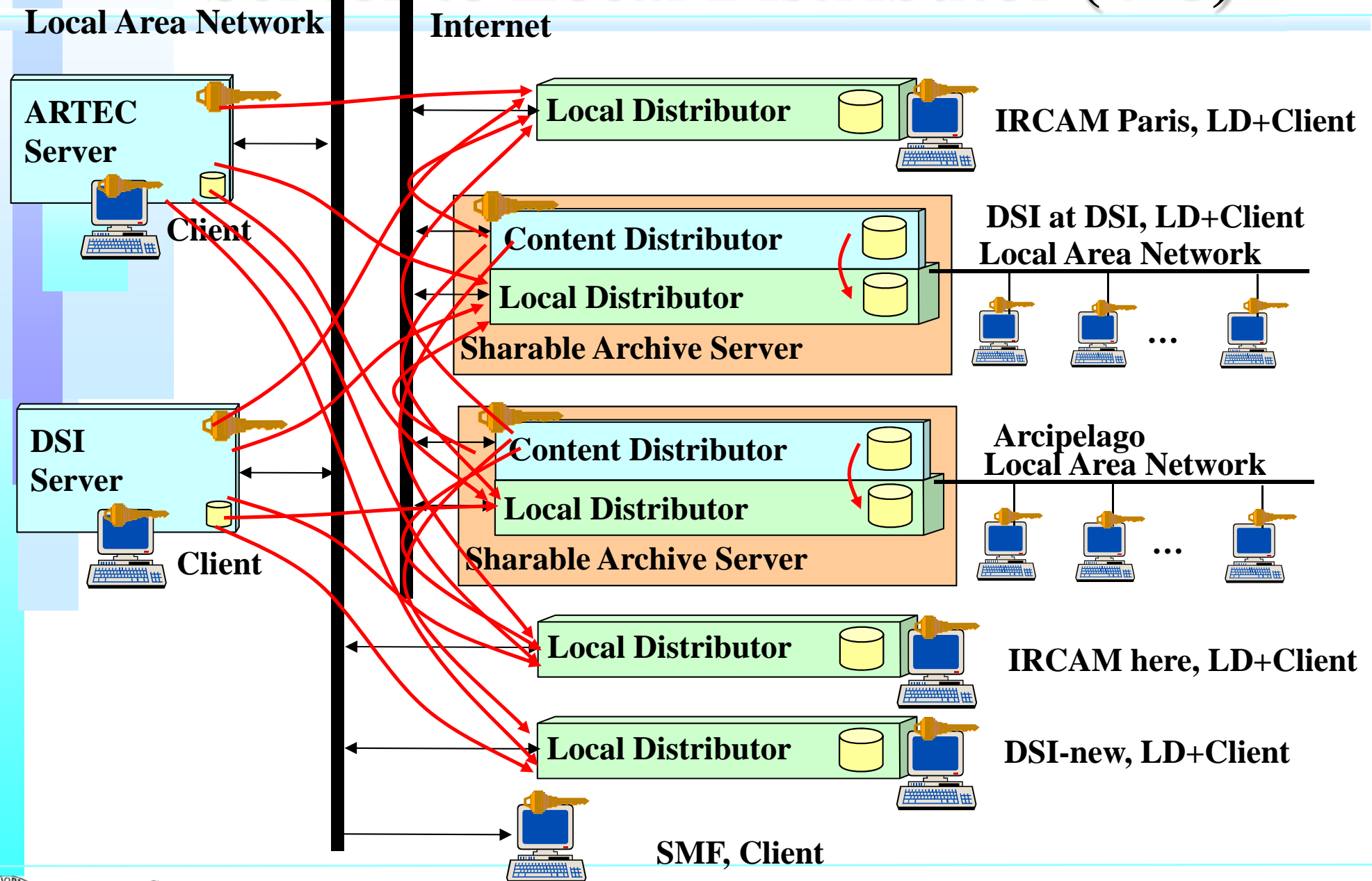


Physical Configuration (1)



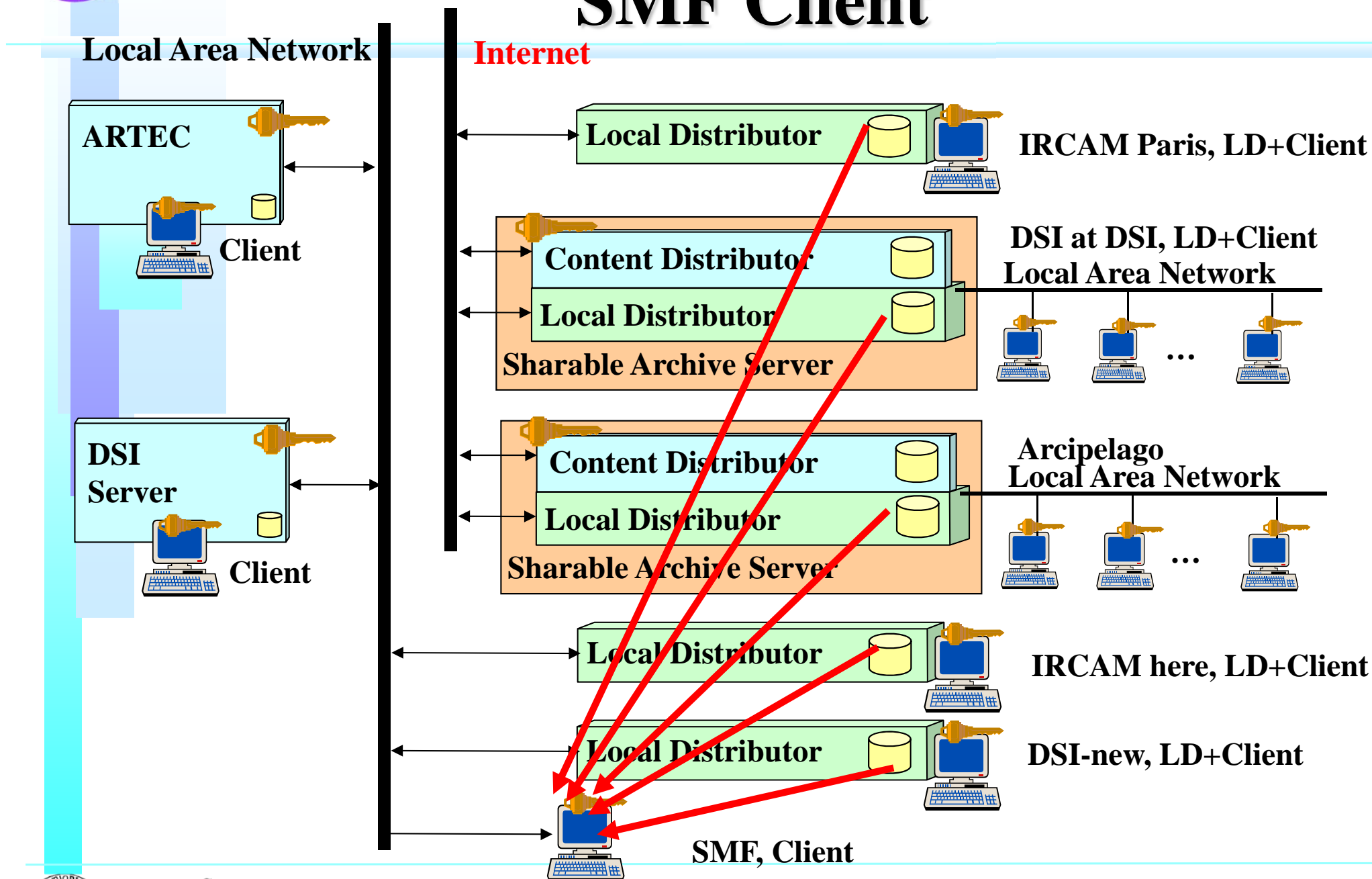


Server to Local Distributor (4*5)



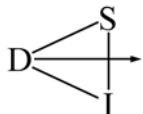
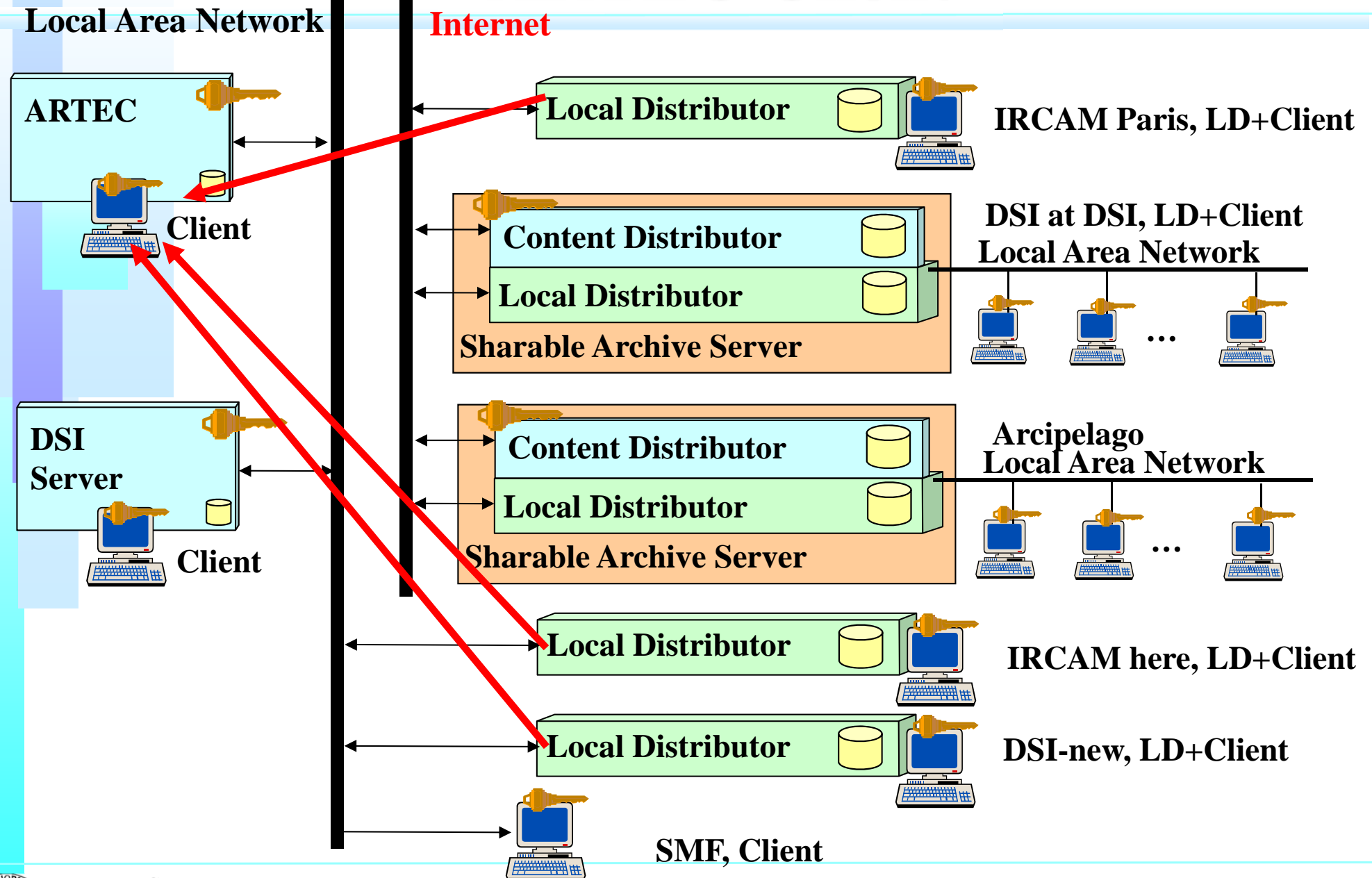


SMF Client





ARTEC Client





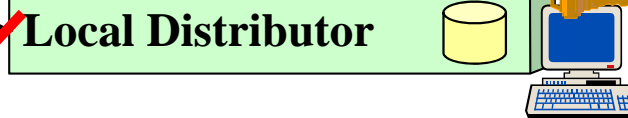
DSI Client

Local Area Network

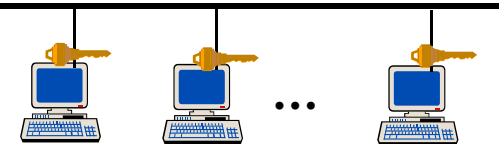
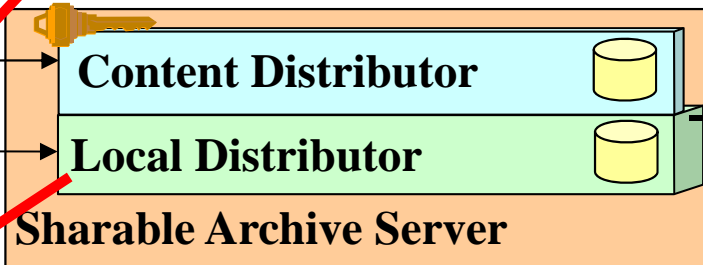
Internet



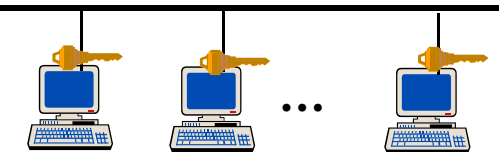
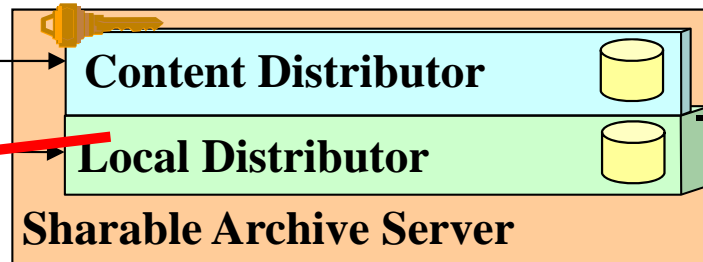
IRCAM Paris, LD+Client



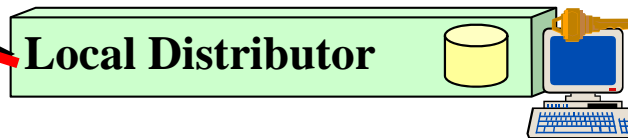
DSI at DSI, LD+Client
Local Area Network



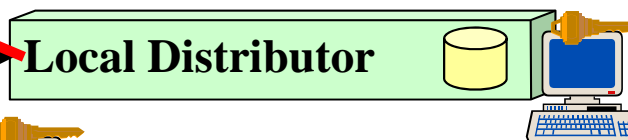
Arcipelago
Local Area Network



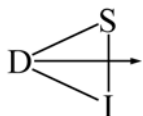
IRCAM here, LD+Client



DSI-new, LD+Client

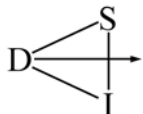
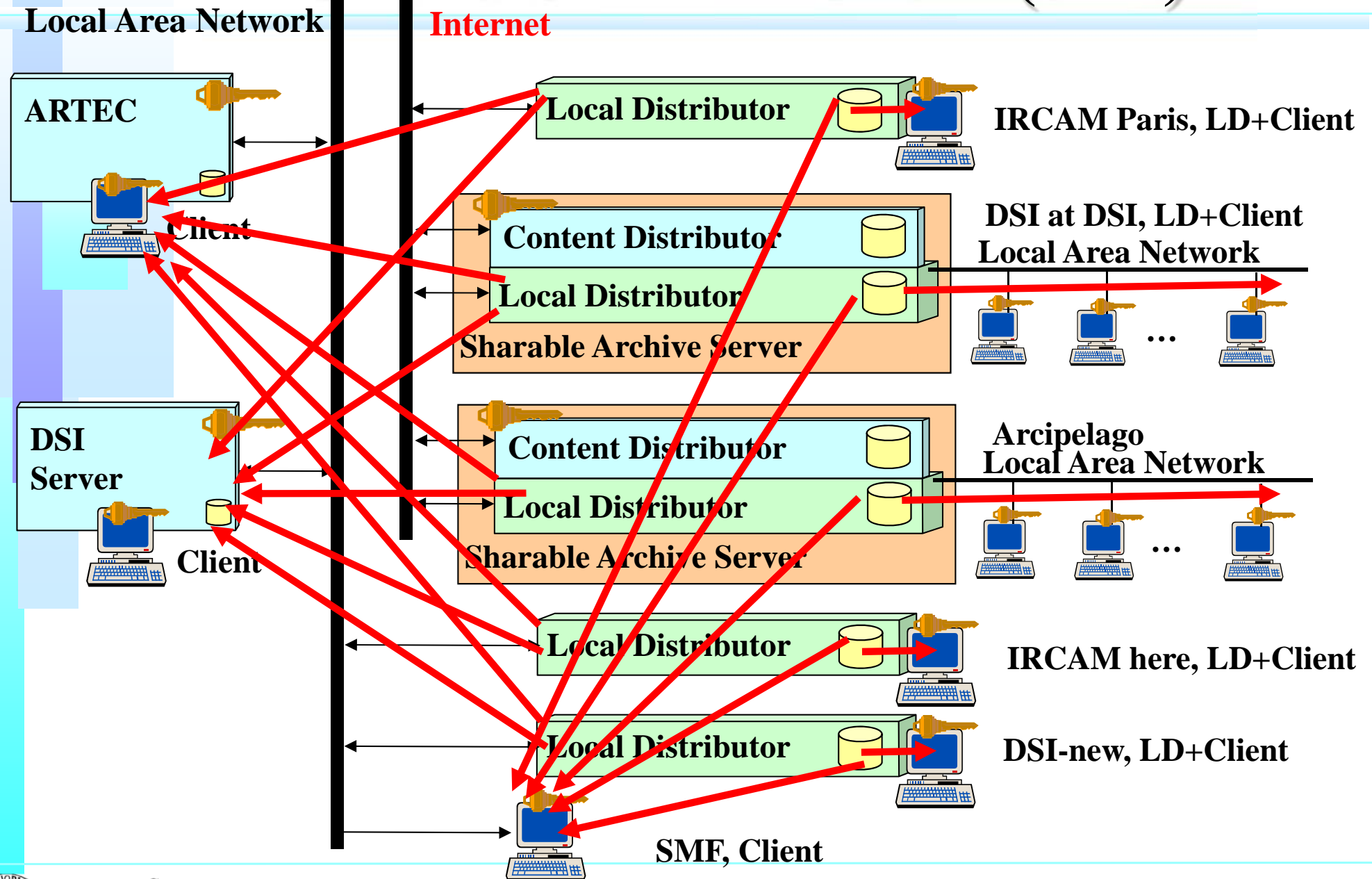


SMF, Client



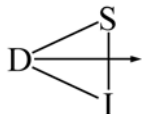
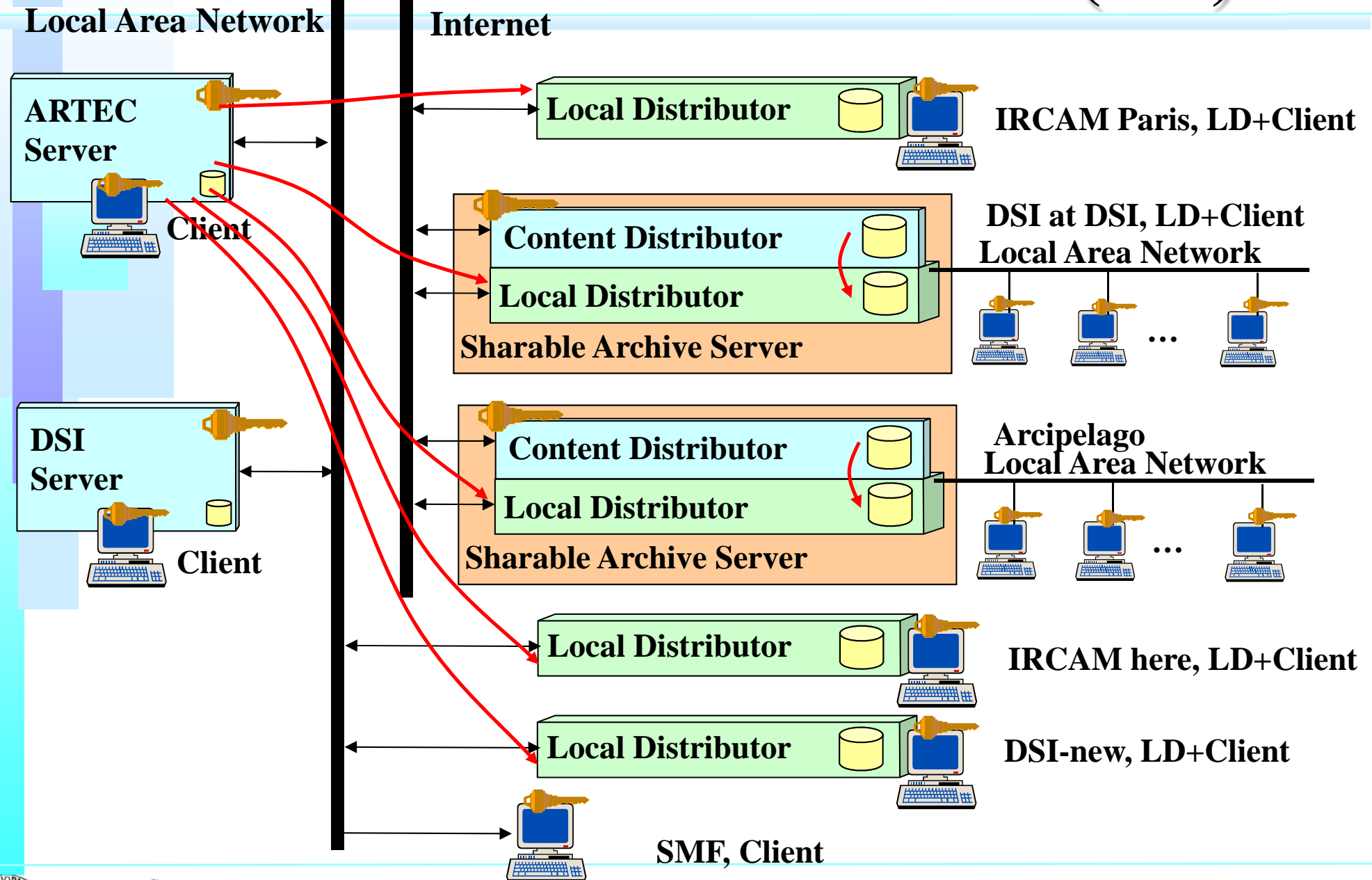


DSI and SMF ++ Client (5*N)





Server to Local Distributor (4*5)

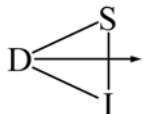
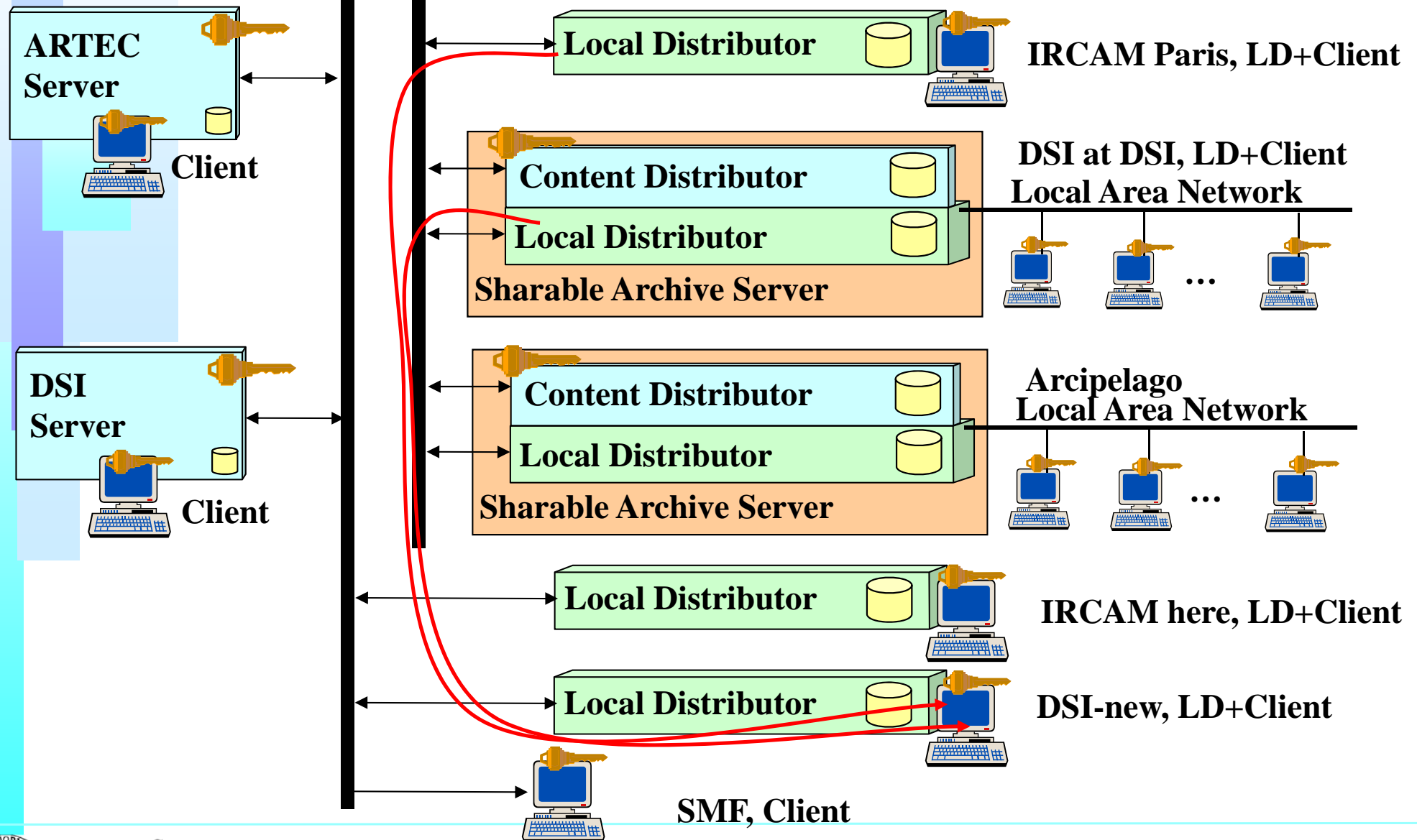




B2C, Internet Connection

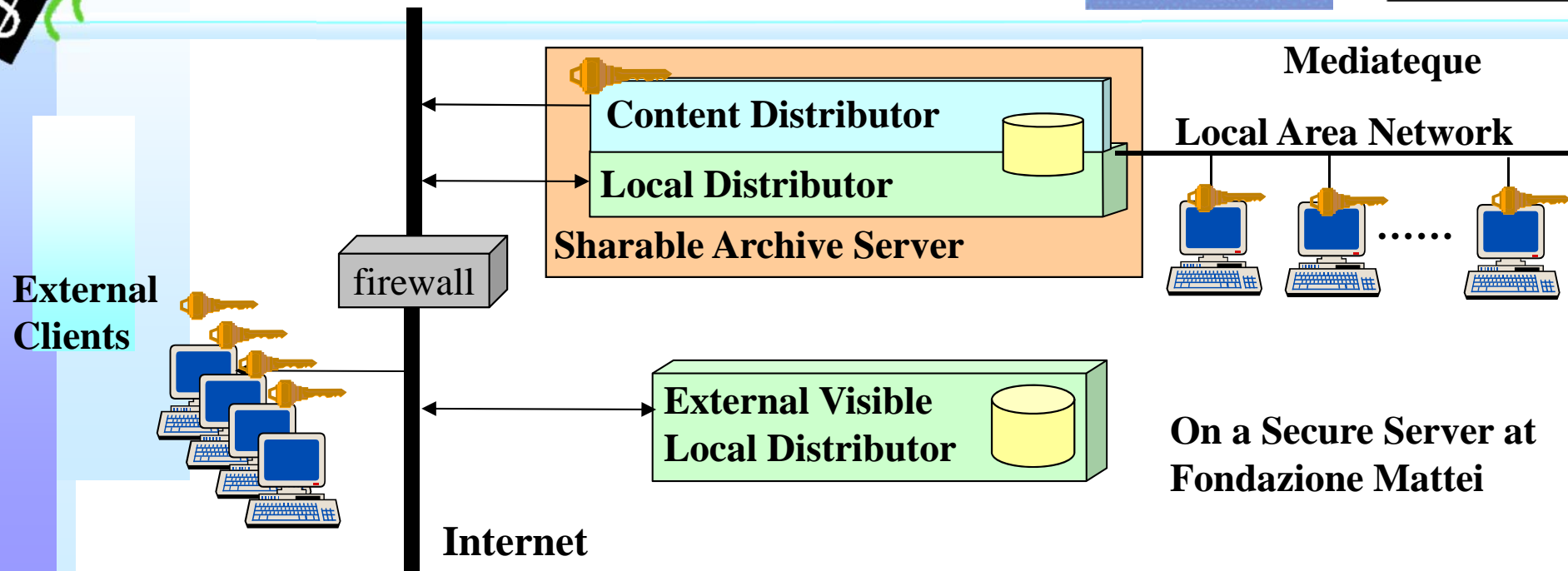
Local Area Network

Internet by MODEM

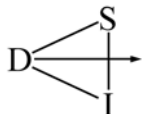




Arcipelago Musica

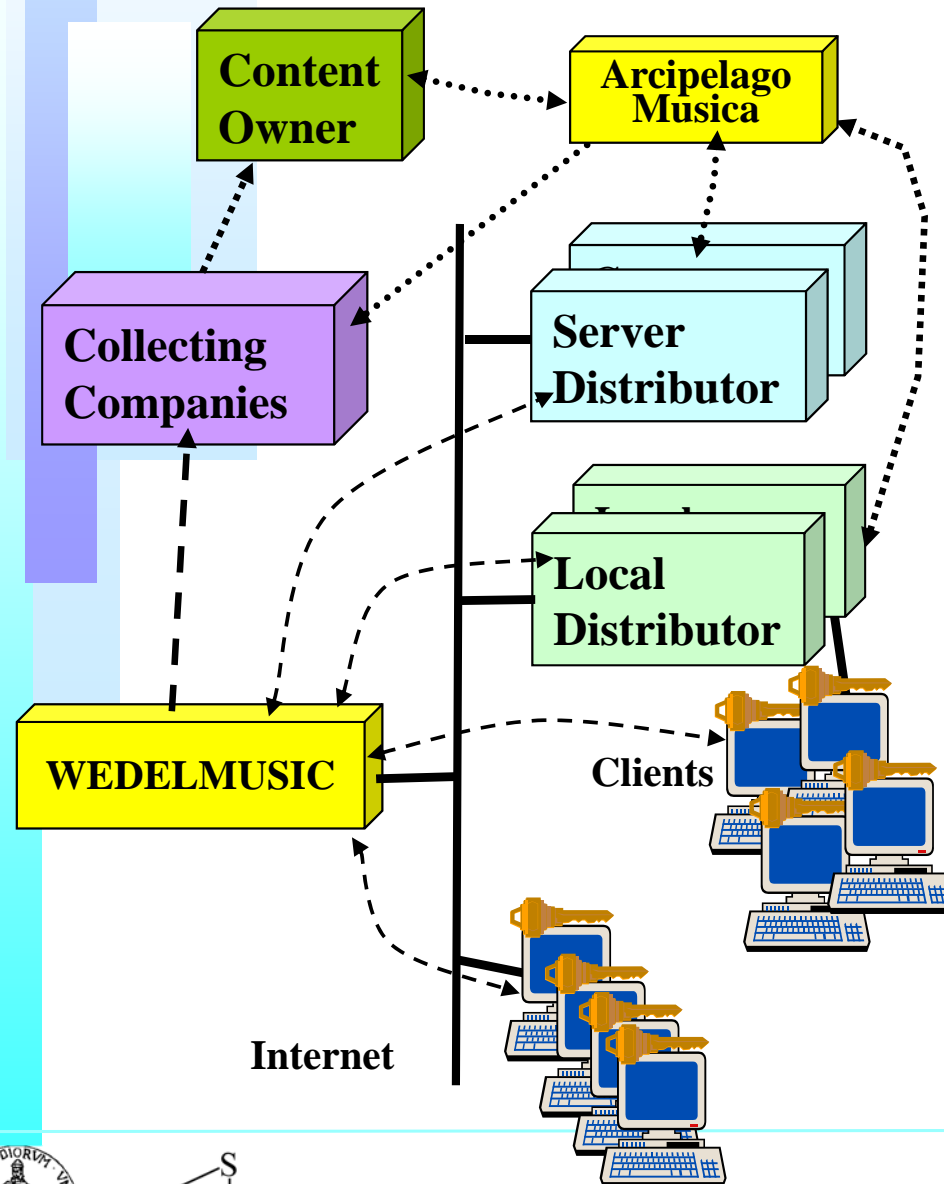


- Secure Distribution
- Selected WEDELMUSIC objects can be placed in the External Visible Local Distributor, while others can bear some constraints, allowing any use and fruition only at the Mediateque site.





Role of WEDELMUSIC and Collecting soc.



Super partes:

- Certification of WEDELMUSIC Components
- Collection and analysis of trace reports
- Communication to Collecting Companies

Preserving privacy:

Who provides the service is kept as a different element from the one who takes the registrations



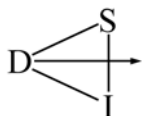
Activity Tracing



- Date and time
- Local Distributor
- User (to fit only the trace on Local Distributor)
- session, computer, object, component
- action (open, print, play, etc....)
- charged fee



*** TIME=14:45:14	SESSID=12	HOST=user2	WDFID=A0010001P	WDFCID=A0011100004D	ACTION=OpenExt_Op	INFO=	PRICE=1.00 EURO
*** TIME=14:58:33	CLOSE SESSION	SESSID=12	HOST=user2 (131.175.228.245)	USER=test			
.....							
*** TIME=15:23:00	SESSID=11	HOST=ntserver	WDFID=A0010001P	WDFCID=A0011100004D	ACTION=OpenExt_Op	INFO=	PRICE=0.00 EURO
*** TIME=15:30:47	SESSID=11	HOST=ntserver	WDFID=0002000ZU	WDFCID=00020000007R	ACTION=View_Op	INFO=	PRICE=0.20 EURO
*** TIME=15:31:03	SESSID=11	HOST=ntserver	WDFID=0002000ZU	WDFCID=00021100007Z	ACTION=OpenExt_Op	INFO=	PRICE=0.00 EURO
*** TIME=15:39:23	SESSID=11	HOST=ntserver	WDFID=0002000ZU	WDFCID=00020000007R	ACTION=View_Op	INFO=	PRICE=0.20 EURO
*** TIME=15:51:06	OPEN SESSION	SESSID=13	HOST=user4 (131.175.228.247)	USER=test			
*** TIME=15:47:42	SESSID=13	HOST=user4	WDFID=00020003P	WDFCID=000211000007	ACTION=Execute_Op	INFO=	PRICE=0.00 EURO
*** TIME=15:49:01	SESSID=13	HOST=user4	WDFID=00020001E	WDFCID=000201000059	ACTION=View_Op	INFO=	PRICE=0.00 EURO
.....							
*** TIME=16:05:42	OPEN SESSION	SESSID=13	HOST=user4 (131.175.228.247)	USER=test			
.....							

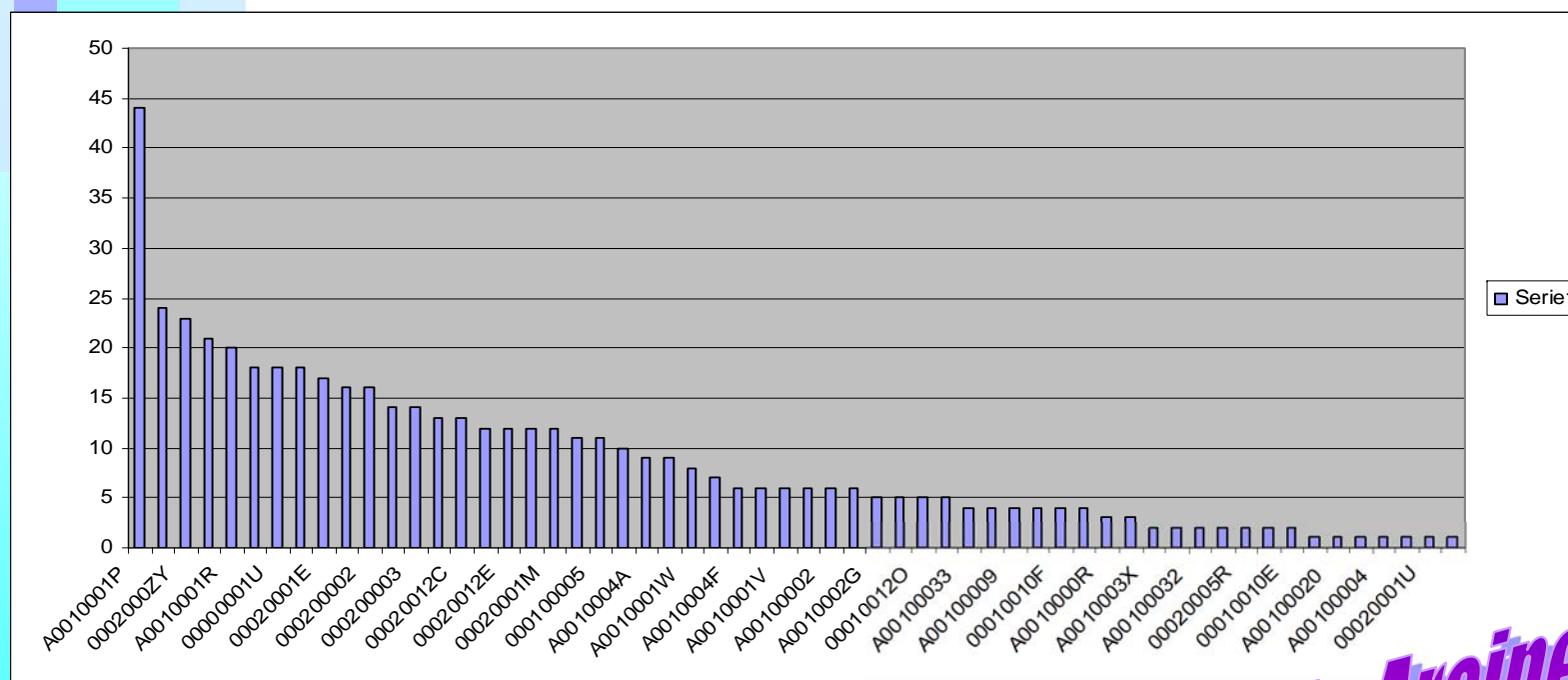




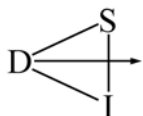
Controllo dell'operato



- Tracciamento delle funzionalità
- Identificazione delle più richieste
- Aggiustamento del servizio e della produzione



Componenti in Arcipelago Musica

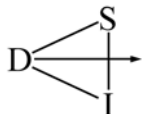




Arcipelago Musica



- WEDELMUSIC Server
- WEDELMUSIC Local Distributor
- 7 WEDELMUSIC Editors/Clients
- B2B with:
 - ♣ DSI
 - ♣ RIGEL
 - ♣ IRCAM
 - ♣ Musica Attiva Mediateque
- B2C with:
 - ♣ Their attendees at home





Multimedia Libraries and Trial

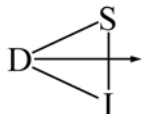


- Arcipelago Musica, Milano, Italy
- Musica Attiva (ONLUS), Fiesole, Scuola di Musica di Fiesole
- IRCAM Paris



- **Trial:**

- ♣ Music Australia, Australia
- ♣ University of Leeds, UK
- ♣ University of Osnabruck, Germany
- ♣ 1800 downloads in the latest 5 months
- ♣ 800 CDs distributed



General Architecture



Content Providers

Content Distributors

Local Distributor

Local Distributor

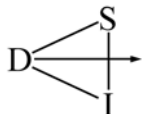
Local Distributor

Local Distributor

Arcipelago Musica

WEDELMUSIC

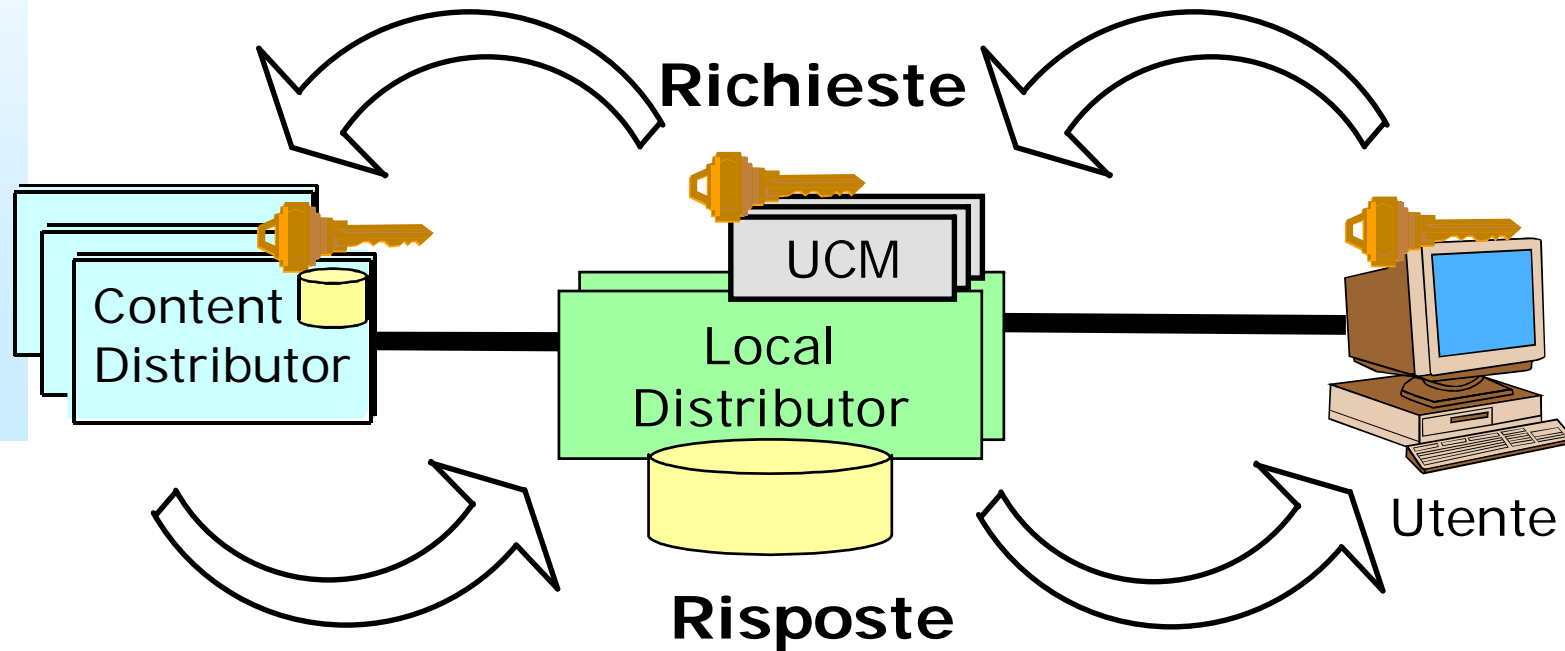
EXITECH





Wedelmusic: architettura attuale

(distribuzione delle chiavi)

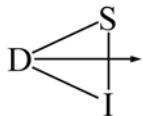


- Le chiavi vengono distribuite on-line, richieste dal Client non appena tenta di utilizzare l'oggetto
- La distribuzione delle chiavi avviene tramite UCM, un componente che si trova presso il Local Distributor
- L'UCM fa da tramite fra il Content Distributor ed il Client ed effettua il caching delle chiavi



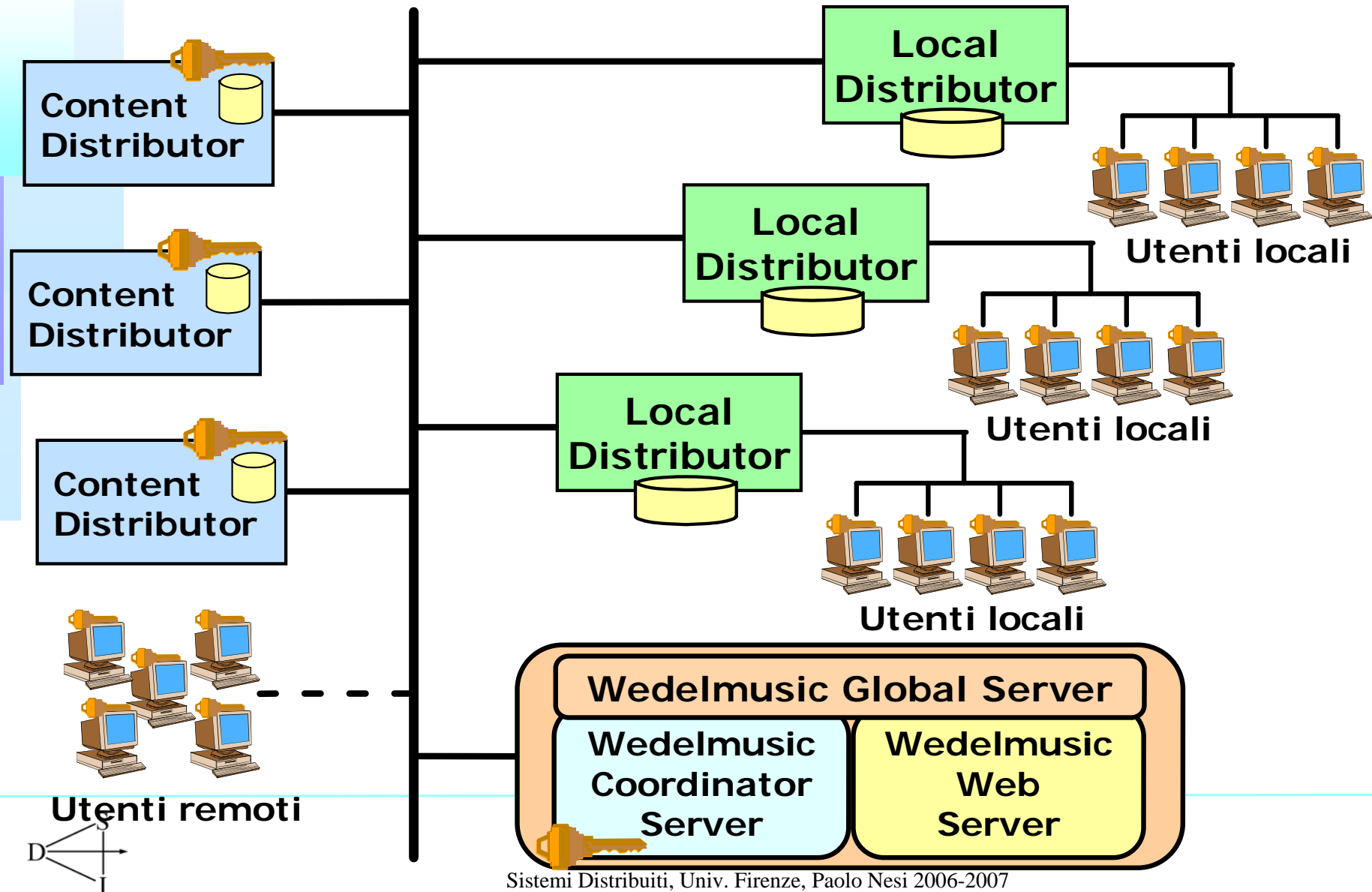
Wedelmusic: limiti dell'attuale architettura

- Non esiste un indice unico degli oggetti disponibili nelle varie mediateche
- Il processo di distribuzione delle chiavi non è centralizzato ma smistato presso ogni Local Distributor di ogni mediateca
- L'insieme delle chiavi salvate sugli UCM realizza un database distribuito per il quale non esistono strumenti automatici di coordinamento e protezione





Una nuova architettura per Wedelmusic





Nuova architettura di Wedelmusic: il Wedelmusic Global Server (WGS)

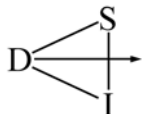
Svolge funzioni di armonizzazione tra tutti gli altri soggetti del sistema. E' formato da due componenti:

➤ **Wedelmusic Coordinator Server (WCS):**

gestisce il DRM (Digital Rights Management)

➤ **Wedelmusic Web Server (WWS):**

realizza il Global Catalog, il catalogo di tutti gli oggetti presenti nei singoli cataloghi dei Local Distributor





Wedelmusic Coordinator Server (WCS)

(servizi svolti)

➤ Servizi agli utenti:

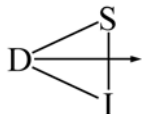
- ➔ Fornitore delle chiavi necessarie per utilizzare gli oggetti
- ➔ Registrazione delle azioni svolte sugli oggetti (Action Log)
- ➔ Gestione dei dati di registrazione degli utenti abilitati all'utilizzo del sistema

➤ Servizi ai Local Distributor:

- ➔ Servizio di notifica dell'Action Log ai Local Distributor

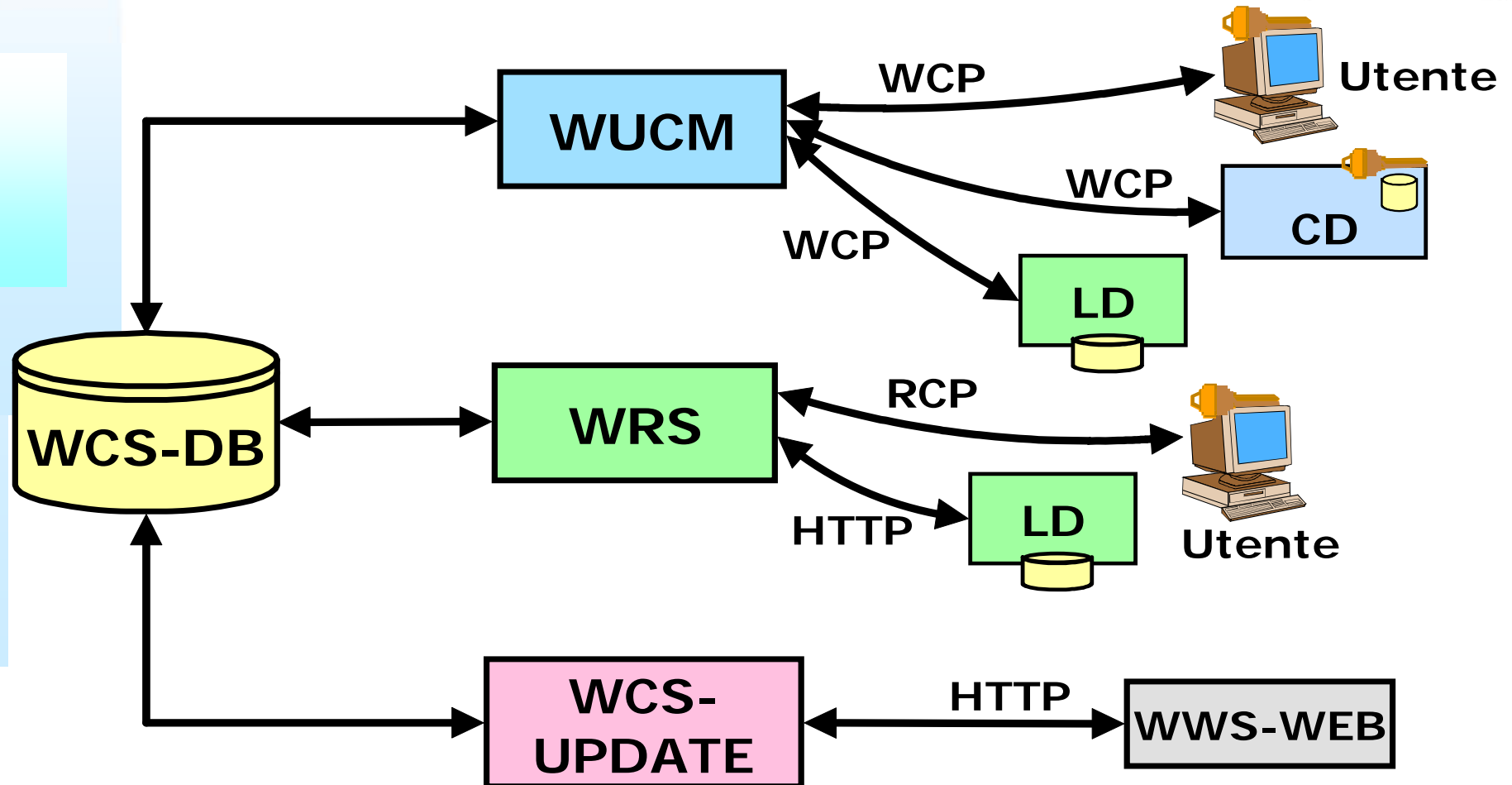
➤ Servizi ai Content Distributor:

- ➔ Servizio di notifica dell'Action Log ai Local Distributor
- ➔ Richiesta delle chiavi ai Content Distributor



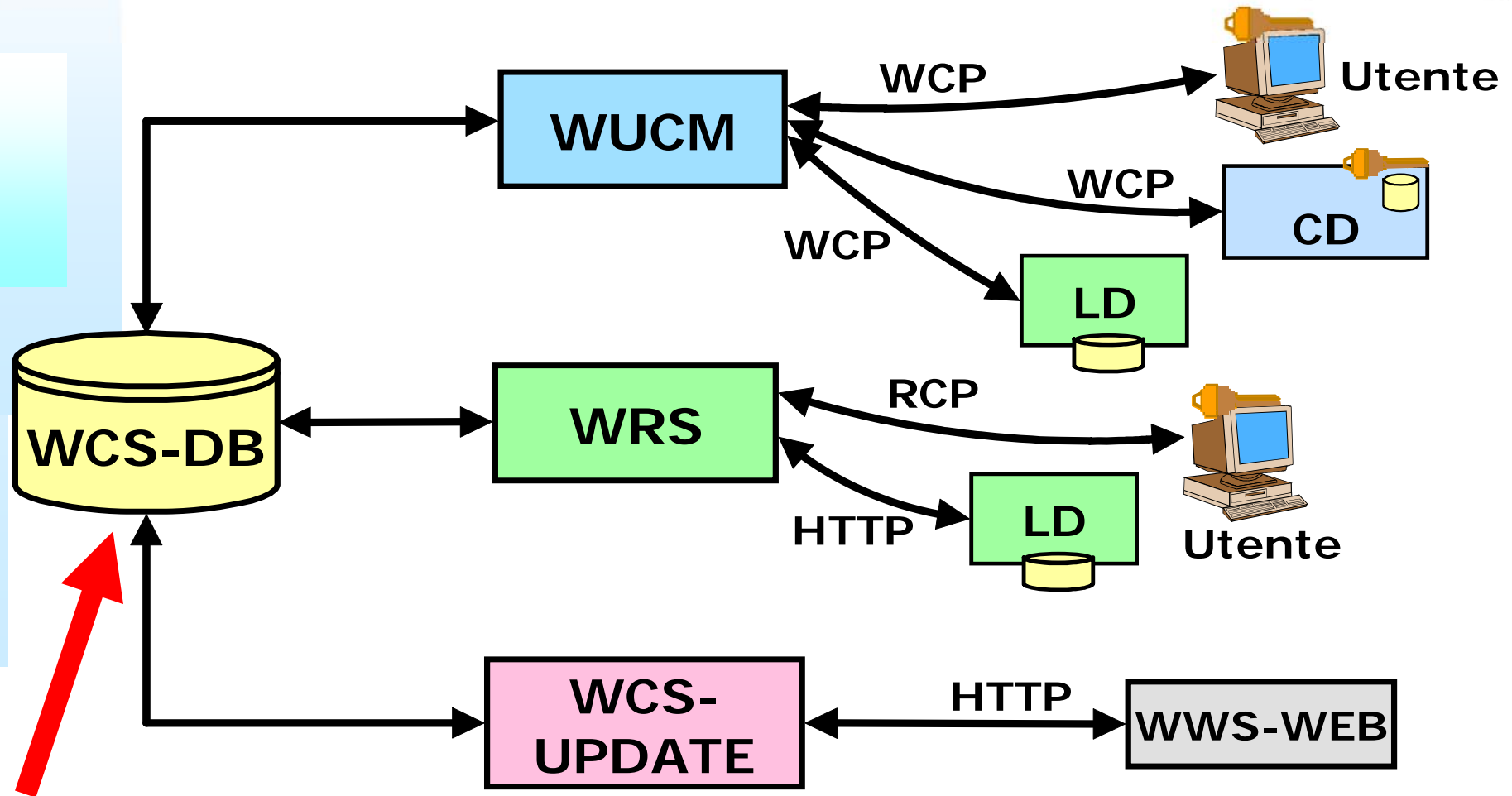


Wedelmusic Coordinator Server (WCS)





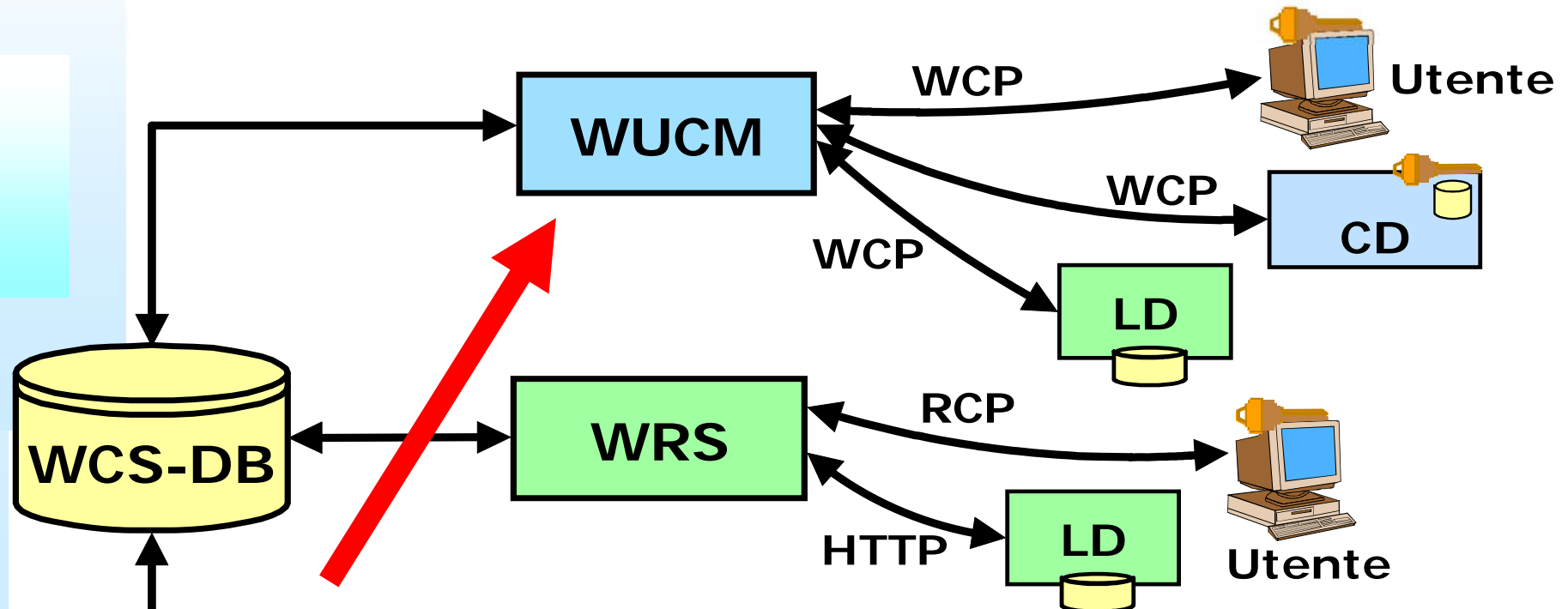
Wedelmusic Coordinator Server (WCS)



WCS-DB: è il database del WCS. Contiene le chiavi necessarie ad utilizzare gli oggetti ed i dati di registrazione dei Client.



Wedelmusic Coordinator Server (WCS)



WUCM: è il gestore del DRM.

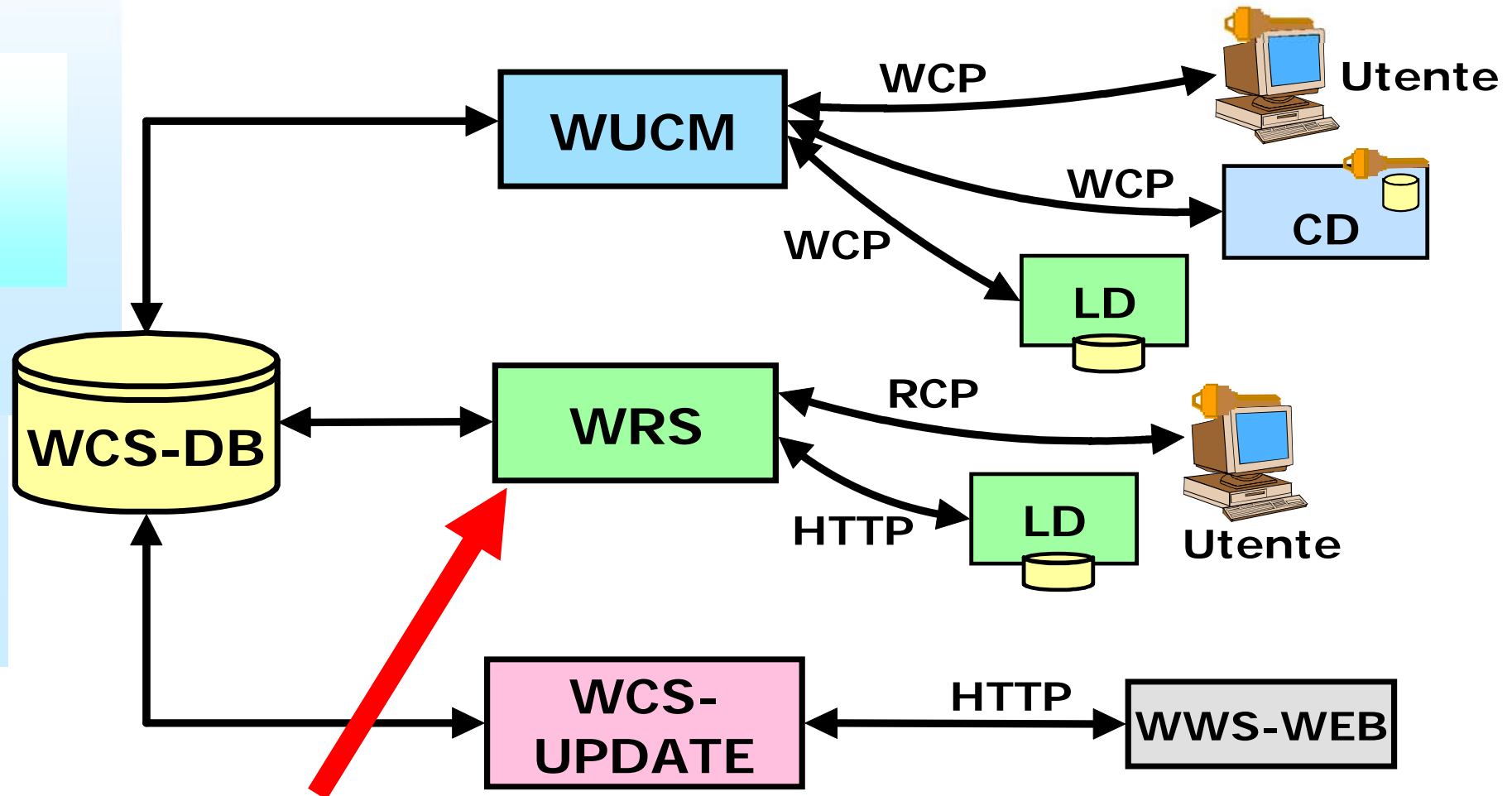
Le comunicazioni viaggiano su un protocollo proprietario (WCP) attraverso un canale codificato con algoritmo di tipo TRIPLE-DES.

Compiti principali:

- ➔ distribuzione delle chiavi
- ➔ gestione del log delle azioni (Action Log)



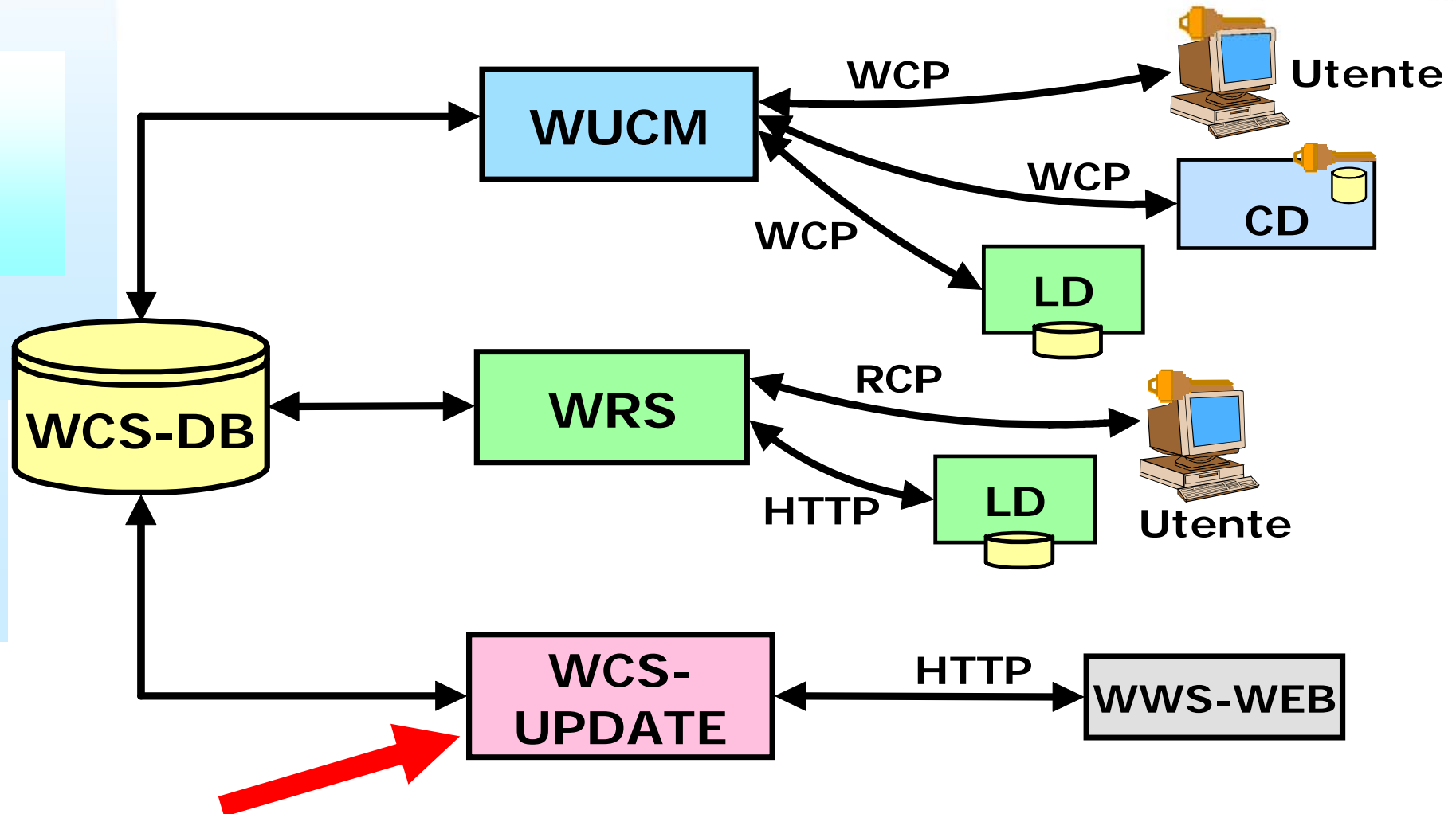
Wedelmusic Coordinator Server (WCS)



WRS: è il gestore della registrazione dei Client. Le comunicazioni viaggiano su un protocollo proprietario (RCP).



Wedelmusic Coordinator Server (WCS)



WCS-Update: si occupa della sincronizzazione tra WCS-DB e WWS-DB.



Wedelmusic Web Server (WWS)

(servizi svolti)

↘ Servizi agli utenti:

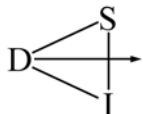
- Indicizzazione degli oggetti posti nei cataloghi dei vari Local Distributor; formazione del **Global Catalog**

↘ Servizi ai Local Distributor:

- Indicizzazione degli oggetti posti nei cataloghi dei vari Content Distributor
- Gestione dei dati di registrazione dei Local Distributor
- Aggiornamento del catalogo dei Local Distributor

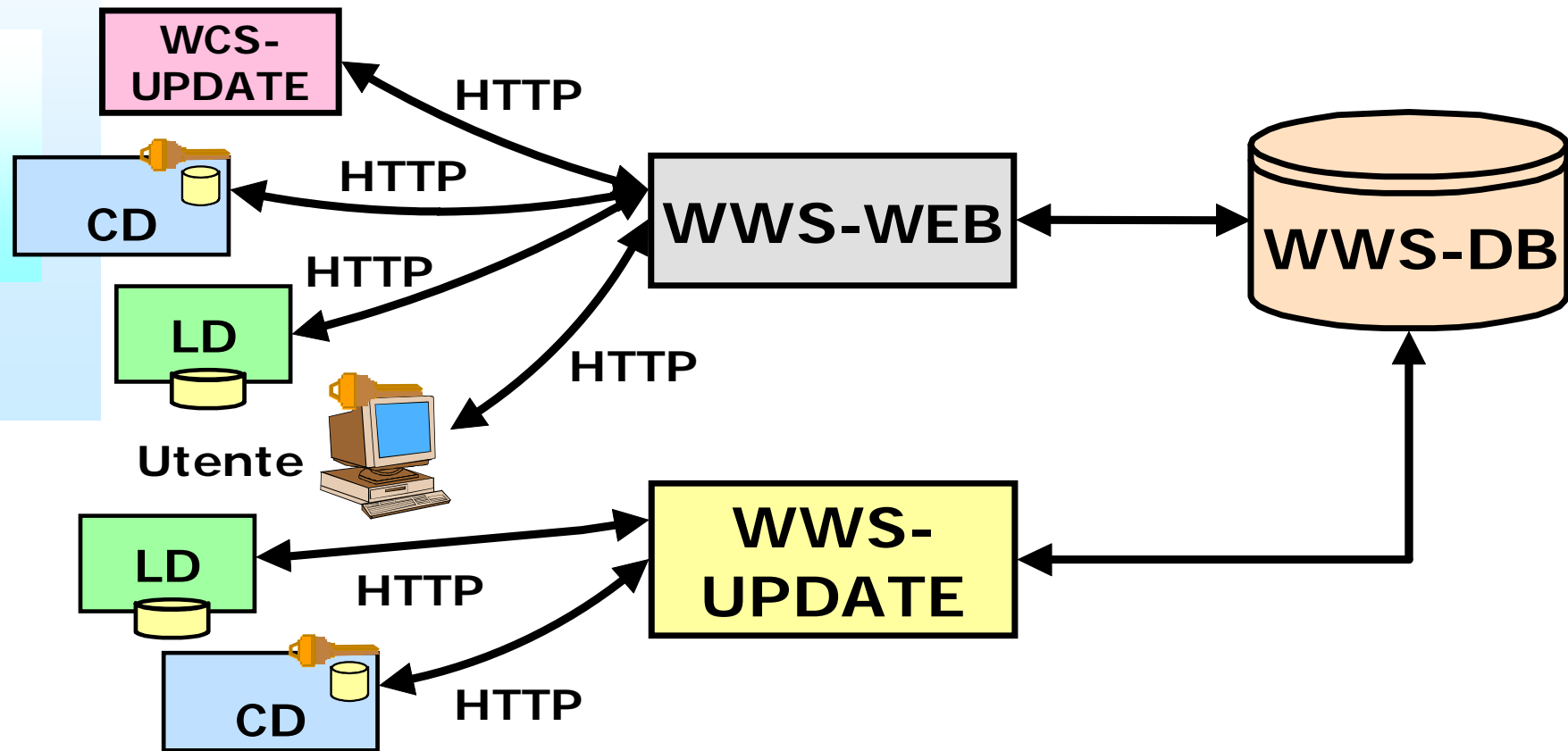
↘ Servizi ai Content Distributor:

- Gestione dei dati di registrazione dei Content Distributor
- Aggiornamento del catalogo dei Content Distributor



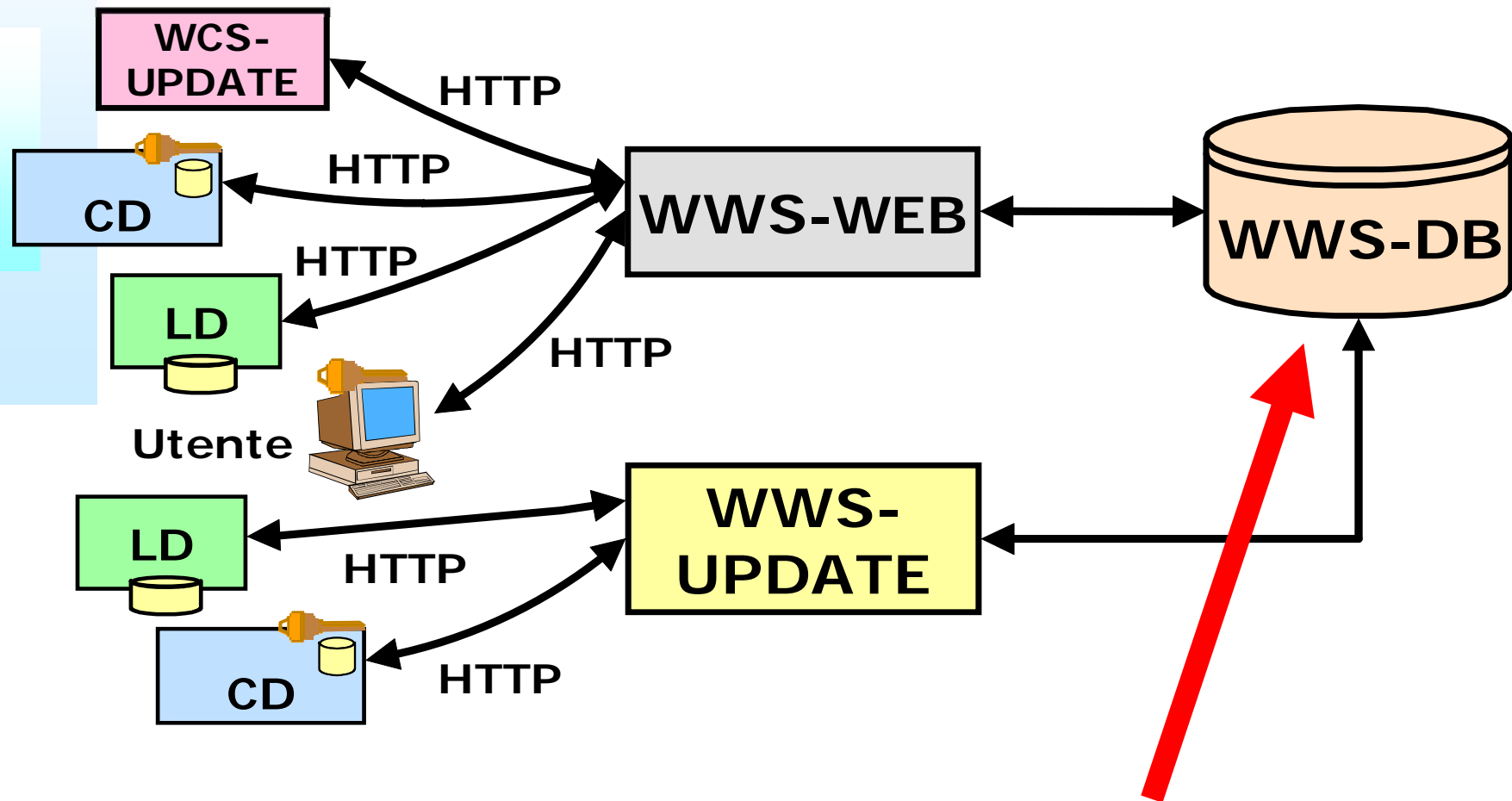


Wedelmusic Web Server (WWS)





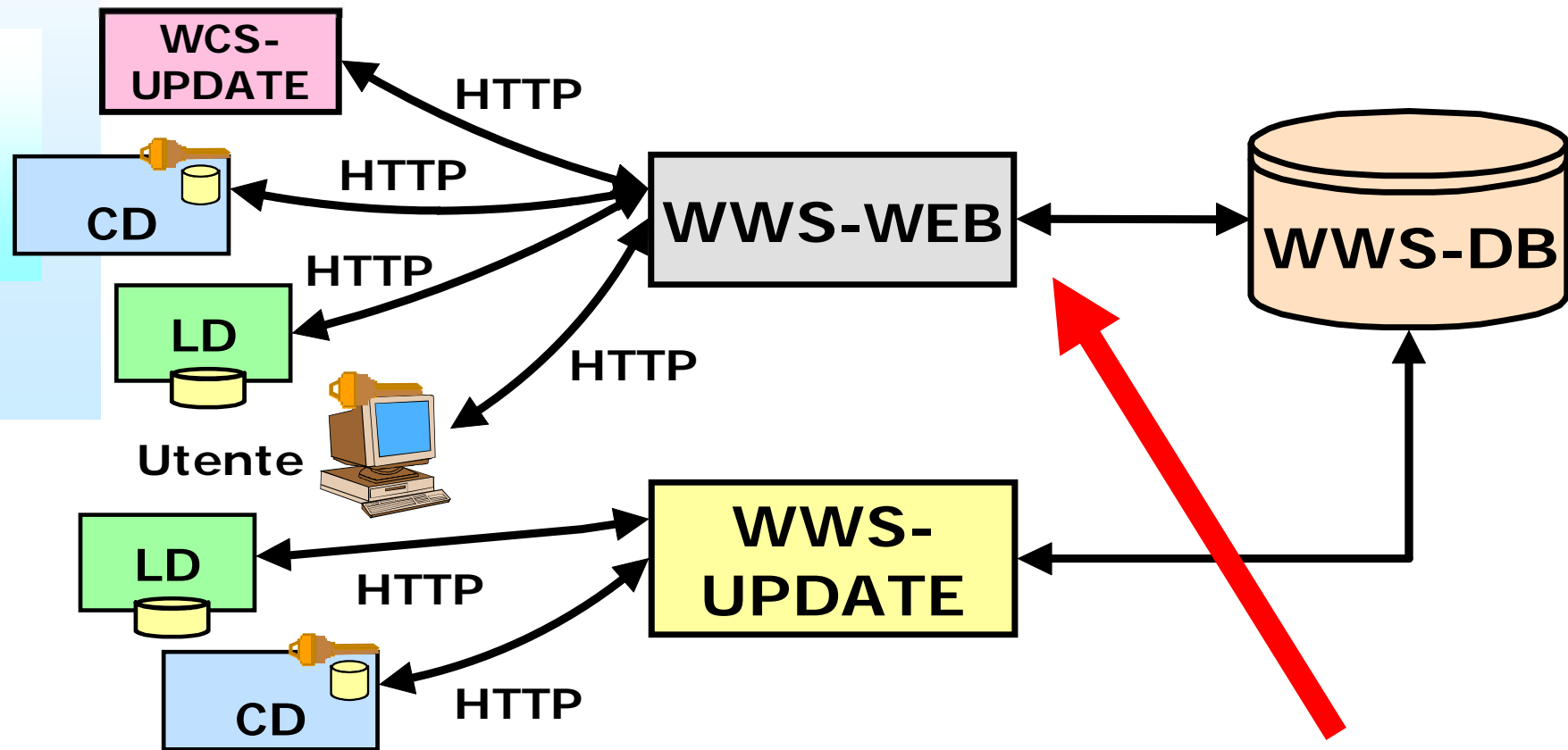
Wedelmusic Web Server (WWS)



WWS-DB: è il database del WWS. Contiene i meta-dati sugli oggetti necessari alla realizzazione del Global Catalog



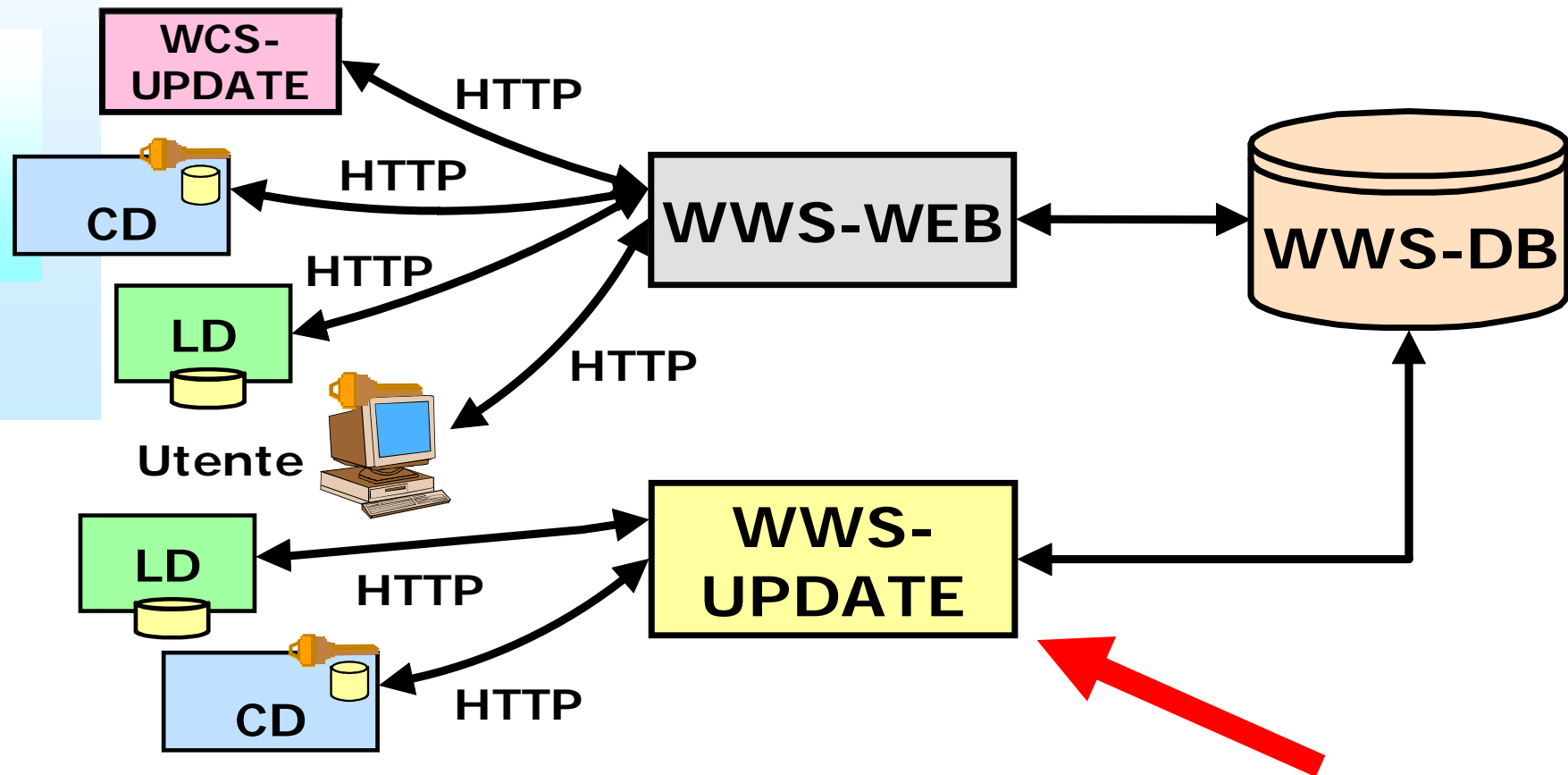
Wedelmusic Web Server (WWS)



WWS-WEB: è l'applicazione web che realizza il catalogo globale degli oggetti disponibili presso i Local Distributor (Global Catalog). Si tratta di un vero e proprio motore di ricerca degli oggetti.



Wedelmusic Web Server (WWS)



WWS-Update: tiene aggiornato il WWS-DB.

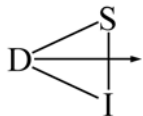
Compiti principali:

- ➔ Aggiornamento del catalogo dei Local Distributor
- ➔ Aggiornamento del catalogo dei Content Distributor



Implementazione

- E' stato realizzato un prototipo del Wedelmusic Global Server tale da implementarne le funzionalità più importanti o più critiche per il sistema
- In particolare sono stati realizzati:
 - ➔ **WWS-WEB**: realizza il Global Catalog
(Apache, PHP, MySQL)
 - ➔ **WWS-Update**: mantiene aggiornato il Global Catalog
(Visual C++, wxWindows, MySQL)
 - ➔ **WRS**: gestore della registrazione dei Client
(Visual C++, wxWindows, MySQL)
 - ➔ **WUCM**: server di certificazione distributore delle chiavi
(Visual C++, wxWindows, WMCrypto API DLL, MySQL)
 - ➔ Sono stati modificati gli altri soggetti in modo da interagire con il Wedelmusic Global Server (WGS)



WWS-WEB



WedelMusic Web Server -> Global Catalog - Mozilla Firefox

File Modifica Visualizza Vai Segnalibri Strumenti ?

http://porta_5/wws2/enduser/main.phtml?action=browse&type=object&wdfid=00020013C

[home page]

BROWSE BY

- [composers]
- [publishers]
- [genres]

SEARCH

- [simple form]
- [adv. form]
- [full form]

Wltzing Matilda

Composer > Banjio Paterson/Marie Cowan

Perform Search in Local Distributor Catalogs

Search

Component 1 > Main Score [\[view\]](#)

Component 2 > piano arrangment [\[view\]](#)

Component 3 > Larry Sitsky [\[view\]](#)

Component 4 > Waltzing Matilda [\[view\]](#)

Component 5 > s3 [\[view\]](#)

Component 6 > s2 [\[view\]](#)

Component 7 > Cover Pi

WEDEL Editor

File Edit Check Tools Help

- Waltzing Matilda for Piano and voice by Thom...
- Identification
- Classification
 - ENG
- Protection
- Score Images
 - Main Score
- Audio
 - Waltzing Matilda by Peter Dawson.mp3
- Performance
 - piano arrangment
 - Larry Sitsky
- Images
 - S3
 - S2
 - Cover Piano Arrang
 - S4
 - S5
 - Full slide piano arrang
 - waltz.mat.fasc.tif
 - 12-Conv_nla.mus-an11595927-s012-(
 - 9-Conv_nla.mus-an11595927-s009-0(
 - 10-Conv_nla.mus-an11595927-s010-(
 - 11-Conv_nla.mus-an11595927-s011-(
 - 8-Conv_nla.mus-an11595927-s008-0(

Objects Search in Local Distributor DBs -> Wedelmusic - Mozilla Firefox

Wltzing Matilda

Composer > Banjio Paterson/Marie Cowan

Available from the following LDs:

Mediateca di Vigevano	Editor
Scuola di Musica di Fiesole	Editor
Università di Firenze - DSI	Editor



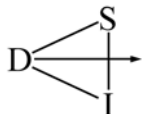
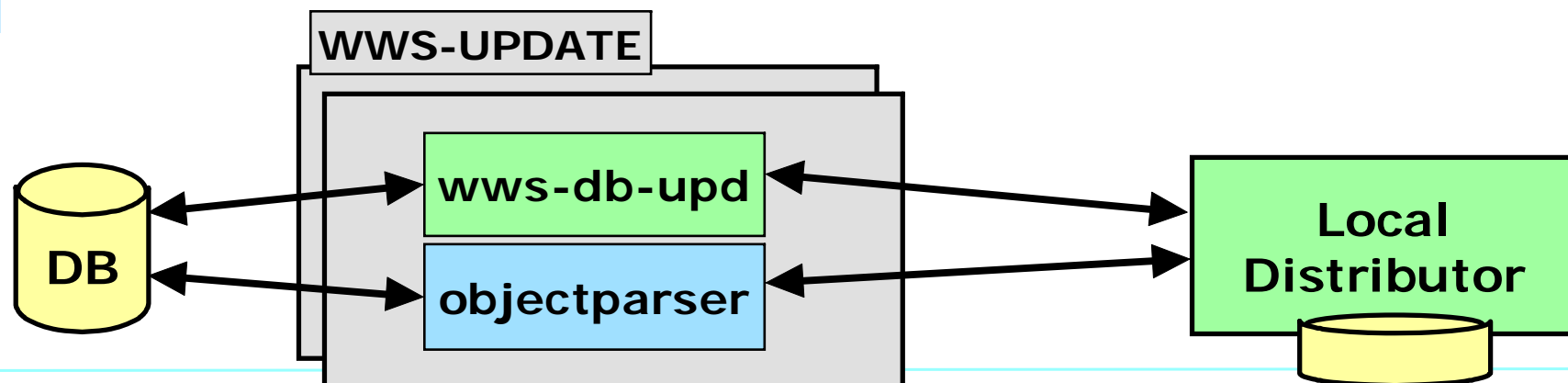
WWS-Update



➤ Aggiorna il WWS-DB per tenere sincronizzato il Global Catalog con i cataloghi dei Local Distributor. E' formato da due componenti:

➔ **wws-db-upd**: contatta ogni Local Distributor e recupera l'elenco degli oggetti aggiunti (o aggiornati) nel catalogo. La lista dei contatti è gestita tramite una coda a priorità.

➔ **objectparser**: scorre l'elenco formato dal wws-db-upd e, collegandosi al Local Distributor, recupera le informazioni sull'oggetto

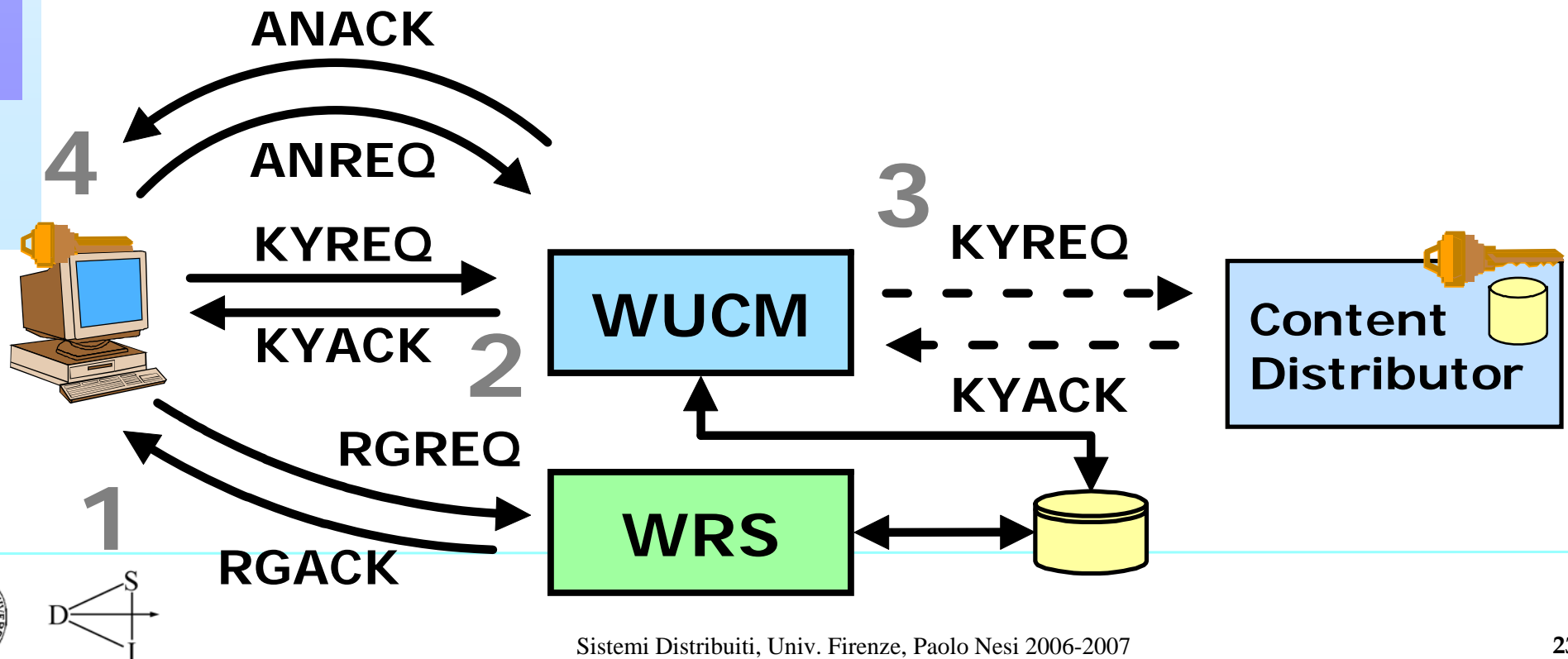




WUCM e WRS

(certificazione e registrazione)

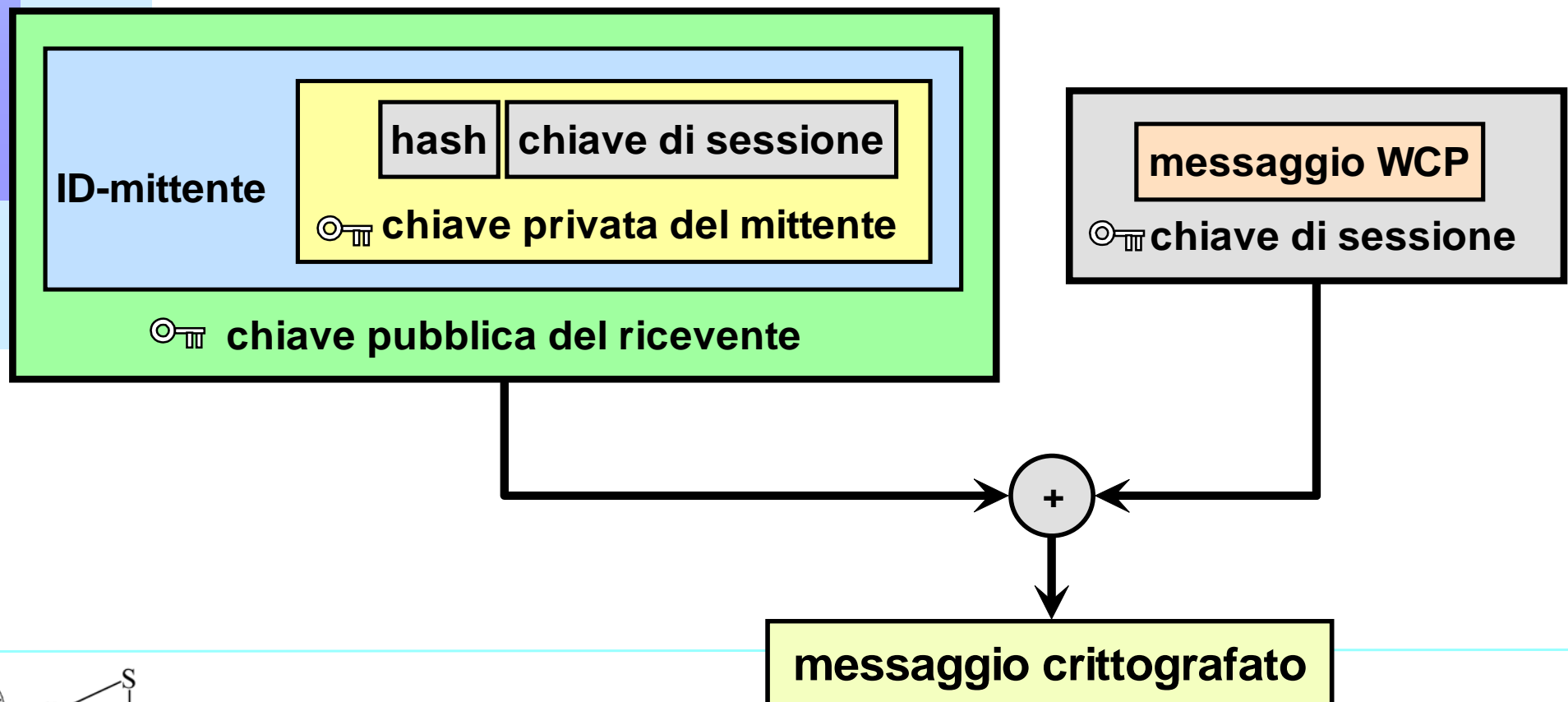
1. Registrazione del Client (RGREQ)
2. Richiesta di chiave del Client (KYREQ)
3. Eventuale richiesta al Content Distributor (KYREQ)
4. Action Log dell'azione sul componente (ANREQ)





La comunicazione del WUCM

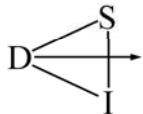
➤ Il WUCM dialoga esclusivamente tramite protocollo WCP (Wedelmusic Control Protocol) su canale codificato con algoritmo TRIPLE-DES.

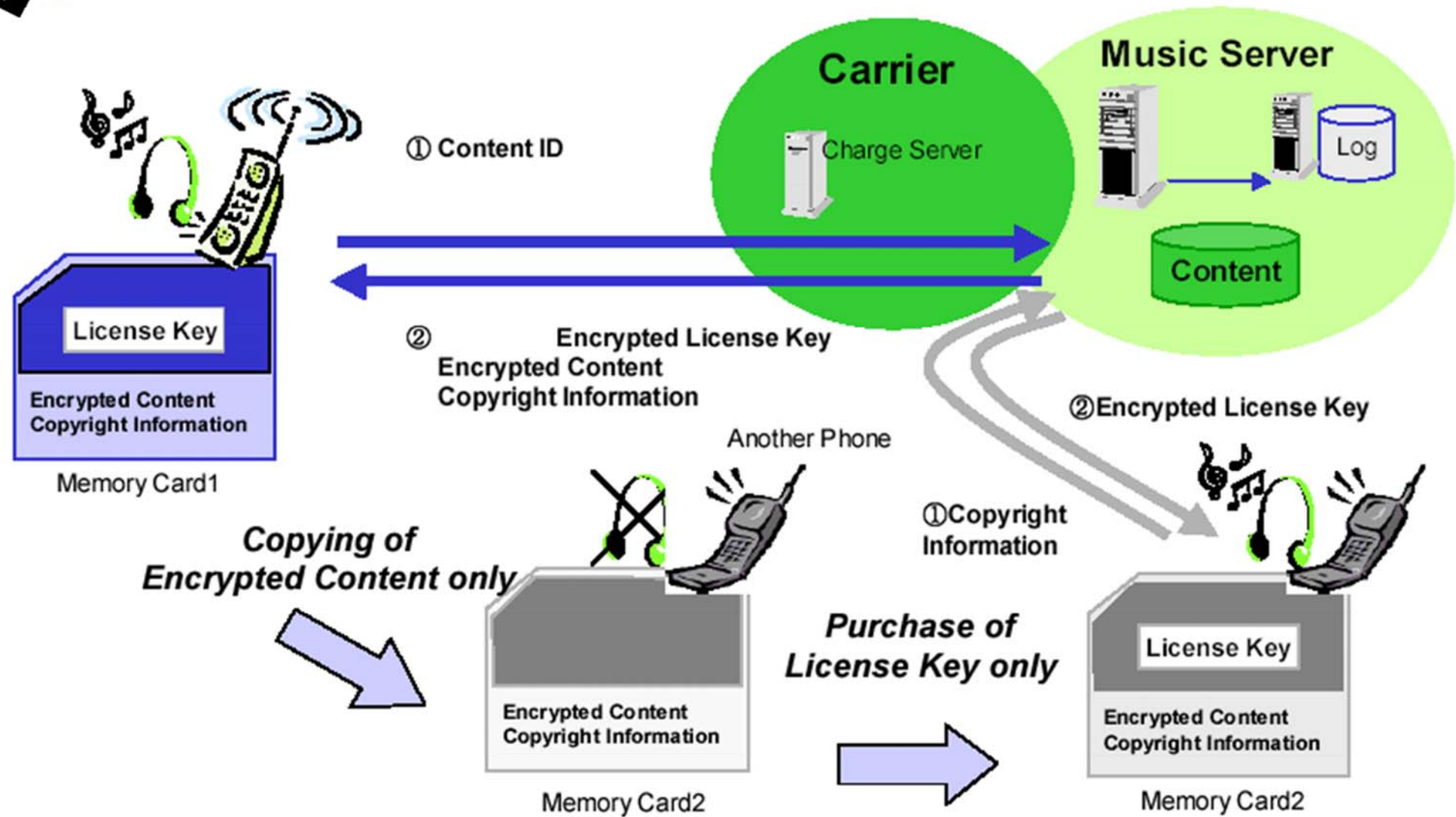




Key facts

- **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.)**

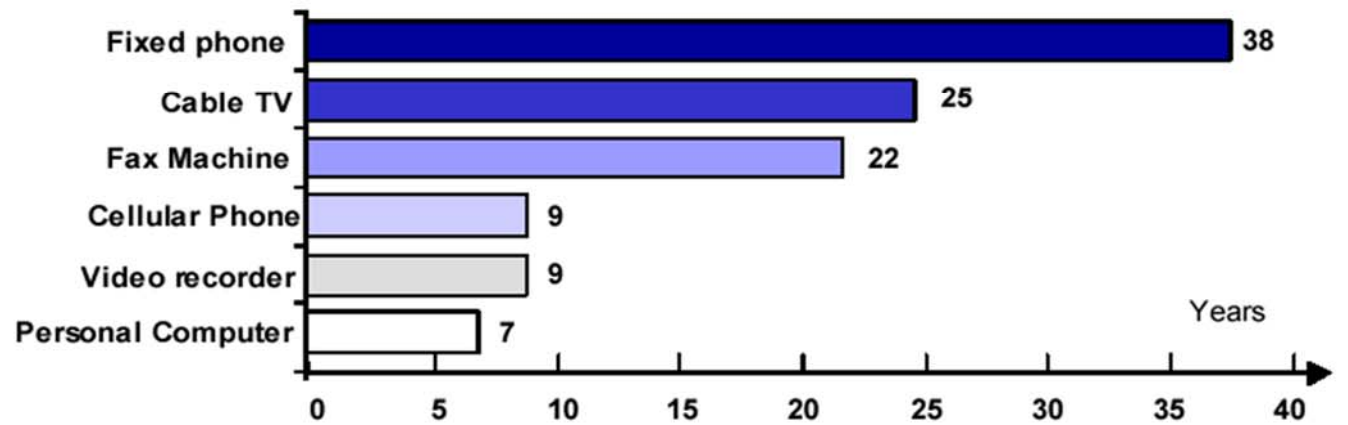




Source: Keitaide Music



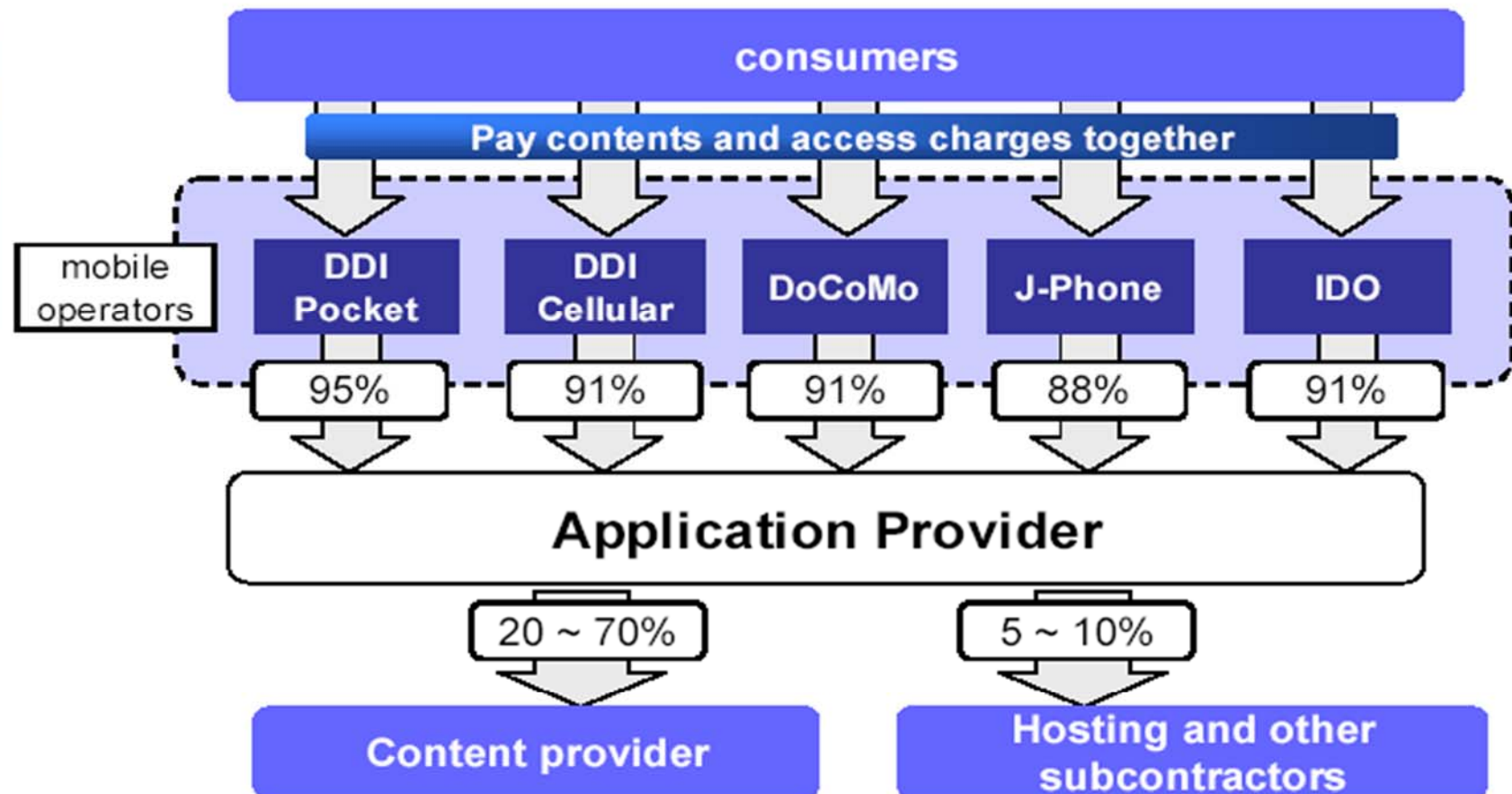
Chart 3 – Time (years) between first commercial launch and penetration of 10 million persons / households



Source: Andersen



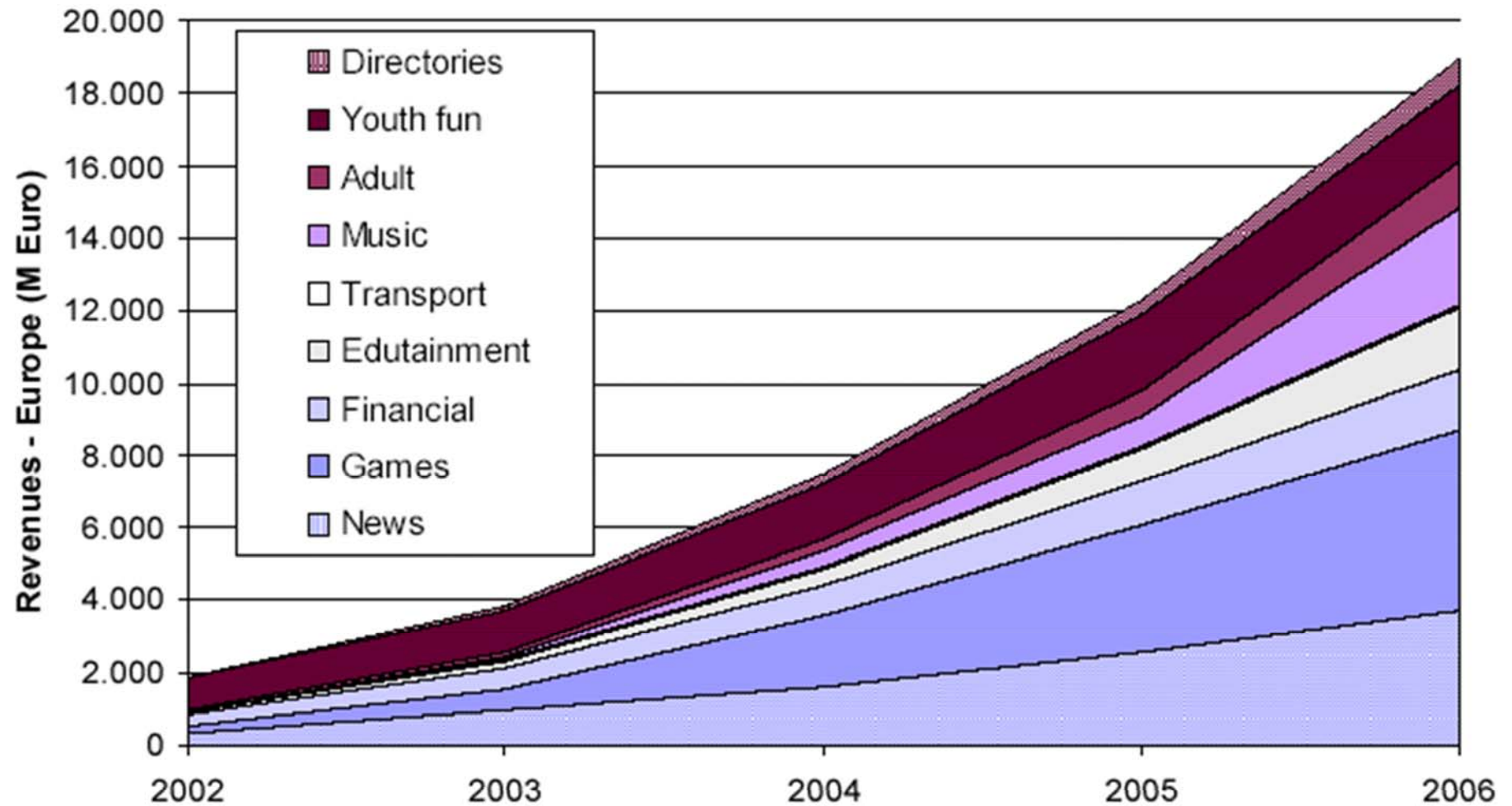
- Revenue sharing in Japan



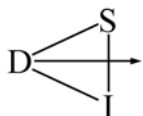
Source: NTT DoCoMo



Total market revenues split between content-based applications



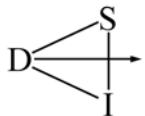
Source: Andersen





Facts

- Internet has a penetration of about 30% in US and about the 8% in Europe. In the 2002 there will be 75 Millions of Internet subscribers in Europe.
- In the 1999 the market of off-line music was of 9.8 Billion Euro for Europe and 13.4 Euro for US
- Jupiter stated: The European market of on-line music will move from 333 Million \$ to 2 Billion \$ in 2006.
- Music on line represents about 37% of the off-line market.
- According to estimates by Andersen Consulting: 1400 Billions \$ for the US market of B2B commerce in the 2003, in 1998-99 the US e-market was 15 Billions \$, only 15% of total retail.
- Europe represents only 34% of the total world wide music market, US percentage is 36%. Publishing and authors revenues in the 1998 were about 3 billion € in Europe.



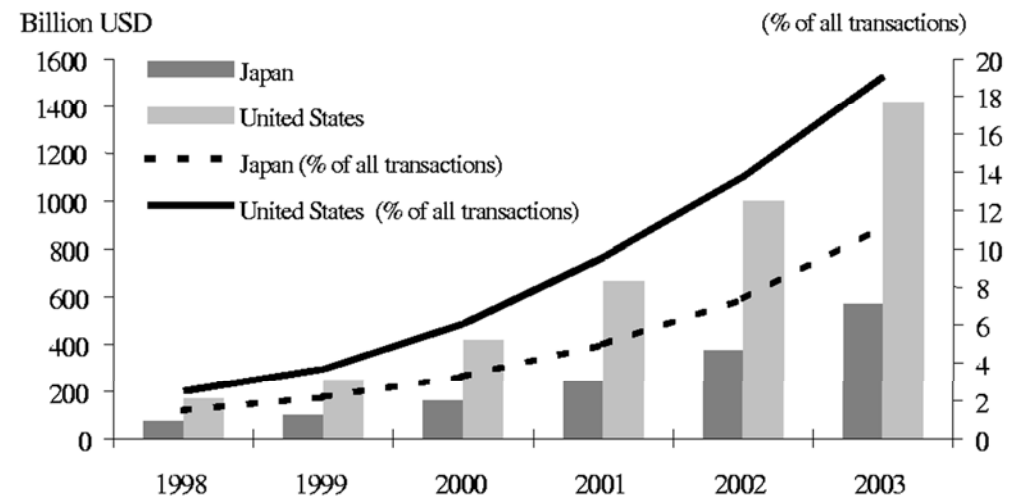


Market Environment

- Growth of Internet market
- The cost of digitising music content
- The interest by archives
- Publishers do not have any interest in dated music or new classical music
- The high requests of specific users
- B2B is 80% of the market

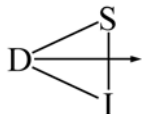
Projected growth of Internet-based business-to-business electronic commerce in the United States and Japan, 1998-2003

(in billion of USD, and as a percentage of all transactions)



1. Wide definition of electronic commerce covering exchange of goods, services, information using TCP/IP technology.

Source: Andersen Consulting, *Report for the MITI* (Japan), p. 41, March 1999.





e-music: Music and Internet

○ Main Internet Subjects:

♣ free	96 Mhit	(I, 2.9 Mhit)	168Mhit	
♣ family	52 Mhit	(I, 0.36 Mhit)	59Mhit	
♣ music	45 Mhit	(I, 2 Mhit)		58Mhit
♣ image	38 Mhit		51Mhit	
♣ sex	38 Mhit		64Mhit	
♣ Multimedia	---			13Mhit

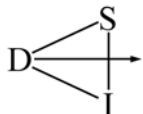
2000

2002

○ File distribution:

♣ MP3		9 Mhit		18,3Mhit
♣ WAVE	4 Mhit		7,3Mhit	
♣ MIDI		3.6 Mhit	5,6Mhit	
♣ Partiture	28 Khit		262Khit	

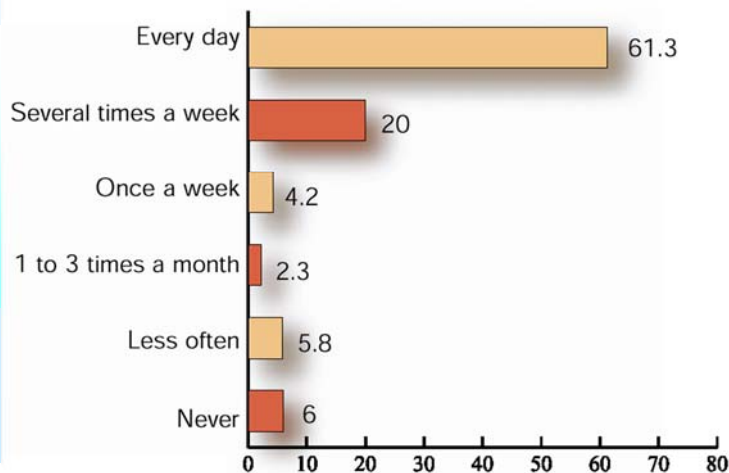
poorly interactive music



Some data about Europe

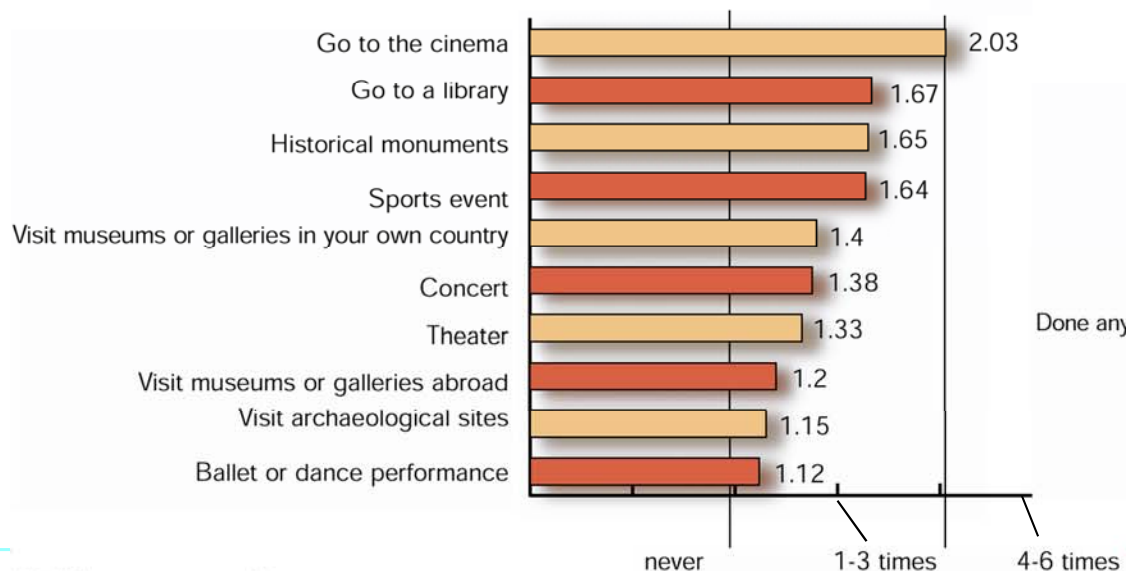


How frequently do Europeans listen to music?
(AS A % OF THE EU POPULATION)

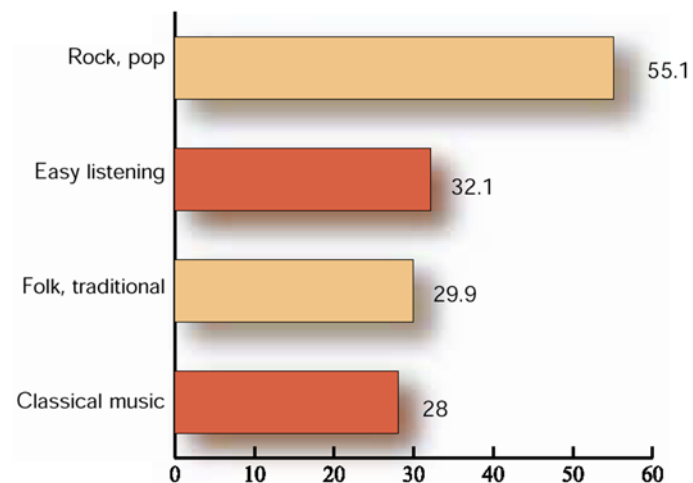


Europeans' cultural activities

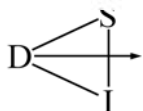
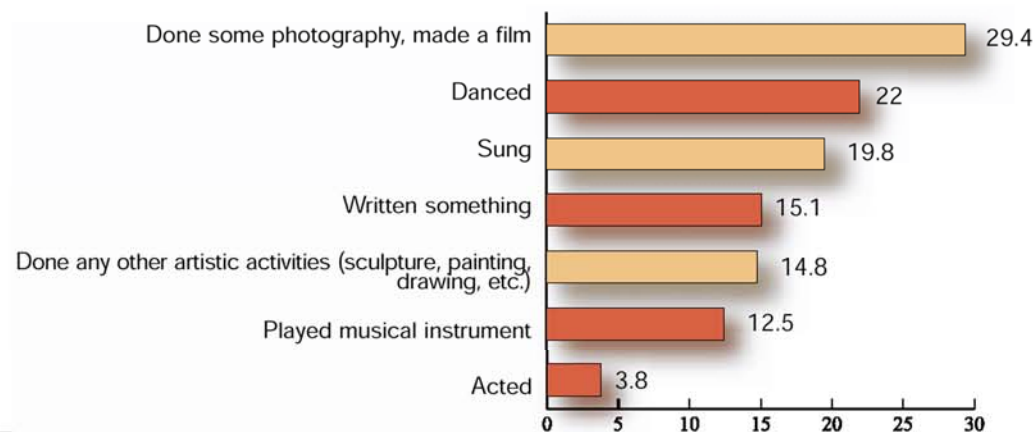
base: 16162



Type of music listened to by Europeans
(AS A % OF THE POPULATION LISTENING TO MUSIC)



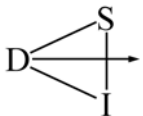
Practicing artistic activities in the European Union
(AS A % OF THE EU POPULATION)





Corporate-Users and Facts

- Conservatories, music schools, archives and educational archives in Europe range to about 5000.
- Most of them are not in the digital world
- 20-25% of them can be considered as having a sort of digital archive somehow
- Strong bullish tendency, self evident trend to digitising music sheets and reusing them in degree courses
- Govern support for technology updating...

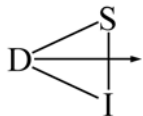




Market Accelerators

Analysing the impediments preventing a free access to the market

- Credible formats and standards
- Protection support and distribution support
- Digitising Actions
 - ♣ Local range projects
 - ♣ Joint/multipartner projects & thematic projects
- Community Projects on instruments suitable for digitising, distribution and fruition





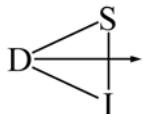
Background

○ **WEDELMUSIC IST (*completed at June 2002*):**

- ♣ Delivering of Music Scores plus Multimedia information
- ♣ Transaction model (B2B) and Digital Right Management
- ♣ Protection aspects: encryption, watermarking, certification
- ♣ 10 partners: publishers, industries, libraries, etc.
- ♣ 80 user group members: mainly experts
- ♣ International Conference:...next WEDELMUSIC 2002, Germany
- ♣ Market analysis,

○ **MUSICNETWORK Network of Excellence (*under negotiation*):**

- ♣ Bringing Music Industry towards the Multimedia Interactive age
- ♣ Analyzing the state of the art, standards, etc., and proposing new solutions, guidelines, and areas of work
- ♣ Organizing workshops and conferences
- ♣ 15 partners: publishers, industries, libraries, etc.
- ♣ 7 working groups..... contributors are welcome





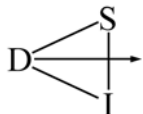
Multimedia Music Distribution and Fruition

To guarantee the rights of content owners with protection supports and DRM models is mandatory to start activities of massive content digitization and distribution:

- ♣ Music and Multimedia Publishers..
- ♣ Content Distributors...
- ♣ Authors...
- ♣ users...

- **Content Models**
- **Transaction Models**
- **Supporting Tools**

Technology Evolution

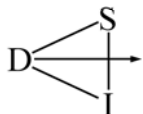




Multimedia Interactive Music

- *Music is evolving towards Multimedia Interactive Music*
 - ♣ *excerpting*
 - ♣ *content customization (transposition, editing), versioning*
 - ♣ *adding notes, expressions, fingerings, etc.*
 - ♣ *adding bookmarks, hyperlinks, etc.*
- *Integration of:*
 - ♣ *cataloguing information: metadata, etc..*
 - ♣ *audio, video, scores, images, lyric, etc.*
 - ♣ *synchronizations, animations, histories, authoring, etc.*
 - ♣ *new functionalities for integration and interactivity*
 - ♣ *new rights to be controlled with DRM, every day....*
 - ♣ *DRM rules have to be included in the model*

➔ *SDMI, WEDELMUSIC, etc.*

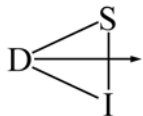




Content Models and Formats

- Content renovation (format and functionalities):
 - ♣ providers
 - a way to expand the market
 - a need to combat the obsolescence
 - ♣ users
 - *conversion problems*
 - *impossible if protected.....license expiration !!!*
- Content has to be (i) good for old mechanisms and (ii) ready for m-commerce and personal content migration:
 - ♣ on different media
 - ♣ on different devices, on different context...
 - ♣ by different users, content and rights migration, ...

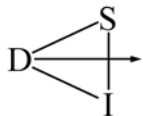
This flexibility has to be supported by new solutions for protection, DRM and personalization for Mobiles





Standards and Content

- **Present standards** are not ready for the mentioned new models
- **Lack of real standardization** reduces the confidence of content providers and thus limit the investment
- **Standards the facto** do not guarantee the control for the lack of complete DRM models:
 - ♣ Audio: mp3, wave, MIDI, etc.
 - ♣ Image Score: TIFF, GIF, PS, PDF, etc.
 - ♣ Music Scores: Finale, Sibelius, XML-like, MIDI, etc.
- *Non-open formats limit the:*
 - ♣ *searching of content, impeding to enter inside*
 - ♣ *end-users' renovation of the content*

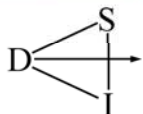




Transaction Models

- Transaction
 - ♣ B2B, B2C, B2B2C, etc.
- Content Distribution and Migration
 - ♣ on-line, off-line
 - ♣ supporting Peer to Peer, free distribution --> fruition payment
- Payment Models
 - ♣ on-line, off-line (fax, email, etc.)
 - ♣ pay per use-play, subscriptions, etc.
- DRM and protection
 - ♣ offline: DVD, CD, VHS, MC, renting
 - ♣ "Internet": PC, Phone, UMTS, Tablet-PC, PDA, etc.

The new trends are in favor of integrated solutions that cope with the above aspects in the same transaction model



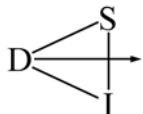


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Different business models

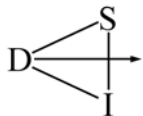
- *Technical solutions for supporting:*
 - ♣ *migration among users, P2P*
 - ♣ *content mobility with that of the user*
 - ♣ *renting and demo periods*
 - ♣ *“try and buy”*
- *with or without tracking of exploited functionalities*
 - ♣ *respecting privacy*
 - ♣ *the presence of certification partners may permit to respect the privacy and to provide certification*





Supporting Tools

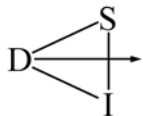
- Content prod. tools have to support protection and DRM
 - ♣ proprietary formats and solutions do not give guarantees
 - ♣ open, integrated and a standard DRM model is needed
 - ♣ *some experiments have been done in this sense for the lack of consensus*
- certification and protection of player tools (trusting environments)
 - ♣ hardware based: smart cards, active CDs, etc.
 - ♣ software based: hardware identification, etc.
 - ♣ *more portable and flexible solutions are needed*





Supporting Tools

- Security assessment and monitoring
 - ♣ transaction and protection models
 - ♣ client certification and classification
 - ♣ content analysis browsing the network
 - ♣ on-line continuous certification and localization
 - ➔ privacy problems
- Watermarking: audio, music sheets, video, etc.
 - ♣ demonstration of ownership
 - ♣ searching fraudulent situations





***Thanks for
your
attention !***



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