Societa'ad alta intensita'di conoscenza: modelli di innovazione e business

seminario per il Corso di Dottorato

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Struttura del Corso

- Sistemi Distribuiti, Middleware
- Sistemi Peer to Peer, P2P
- Sistemi GRID computing
- Sistemi Cooperativi, CSCW
- Social Network
- Sistemi Mobili, Mobile Computing
- DRM e commercio elettronico

http://www.dsi.unifi.it/~nesi

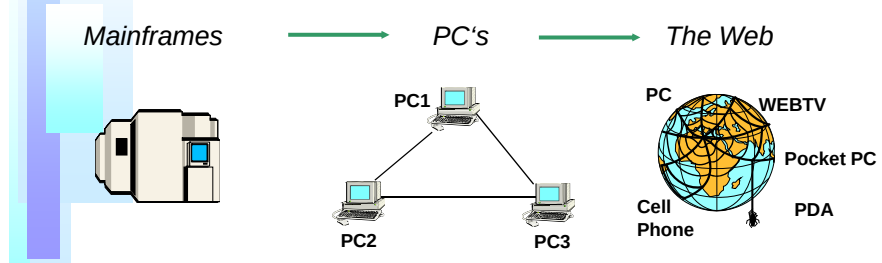
Sistemi Distribuiti

- Un Sistema distribuito è composto da componenti/ strumenti SW messi in relazione tramite una rete di computer, Che comunicano fra di loro tramite messaggi
  - Messaggi portano: controlli, dati
- Esempi di sistemi distribuiti sono:
  - Internet, intranet, mobile and ubiquitous computing
- Tecnologie gestire la
  - Concorrenza, fra processi distribuiti
  - Sincronizzazione temporale: clock comune, assoluto, precisione
  - Fault (fallimenti) in sistemi distribuiti, architetture fault tolerance
- Sistemi tipicamente eterogenei
  - Diversi per: Sistema operativo, interfaccia di comunicazione, potenza, CPU, etc.

DEVICE	Laptop	PDA	Handset		
NETWORK	WLAN	GSM	GPRS	UMTS	
PROTOCOL	SMS	EMS	MMS	I-mode	WAP
LANGUAGE	WML	XML	HTML		
INTERACTION	One way down: Alert	One way down: Download	Two ways: Near real time browsing	Two ways: Real time browsing	
CONSULTATION MODE	Location based	Non-Location based			
SUPPORT	Text	Image	Video	Software	Audio
APPLICATION	Gaming	News	Financial info	Travel	Edutainment
INDUSTRY PROVIDER	Public inst.	Newspapers	....	Software devel.	

Source: Andersen

The Shifting Paradigm



HARDWARE	SOFTWARE	MIDDLEWARE
IBM	MICROSOFT	???
CLOSED PROPRIETARY	CLOSED PROPRIETARY	OPEN STANDARDS

DS Application areas 1/2

- **Content and resource sharing**
  - Network-wide file/document sharing (e.g. Mangosoft, napster, eDonkey, Gnutella, Freenet)
  - Distributed databases: Mariposa
  - knowledge management (e.g. NextPage)
  - Resource sharing: seti@home, Popular power, mojo natio
  - Cascaded content distribution
  - Edge services
  - P2P search and discovery (e.g. www.fedstats.gov)
  - Network bandwidth sharing
- **Distributed computation (GRID)**
  - Internet-based (e.g. United devices, entropia)
  - Intranet-based (www.datasynapse.com, NetBatch of Intel)
  - Web testing (e.g., United devices)
  - Esempio: gridella, etc….

DS Application areas 2/2

- **collaborations → CSCW (Computer Support Cooperative Work)**
  - On-demand, multi-institutional virtual organizations
  - Marketplace (e.g. www.firstpeer.com)
  - Peer communities of common interests
  - Online development projects (e.g. www.oculustech.com)
  - Online games
  - Remote maintenance
  - Examples: Groovem Buzpad, WuWu
  - E-commerce: ebay, B2B market, etc.
- **Social Networks**
  - **PC and mobiles, CSCW**


P2P Main requirements

- **Creation of the P2P community**
  - **Resource discovery**
- **Managing updates in the information shared**
- **Interoperability**
- **Scalability of the P2P solution**
  - **Performance**
  - **Boot**
- **Security and Trust of**
  - **Users, Content, applications**
  - **Management of IPR**
- **Sharing resources: single and multisource**
- **Robustness, Fault tolerance**


Centralized P2P Architettures

- **Concentrated, centralized**
  - One server and N peers, in some cases, more servers
  - Example: Napster (central index)
- **Also called "Server-based"**
  - Log, registrazione peer, etc.
  - Boot: performed asking to the server
  - Search: performed asking to the server
  - Collezione dei dati o/e degli indici, query, etc.
    - tabella per sapere dove sono i file anche i loro duplicati: obj45: n3, n4, n56, n78
  - Server problem: fault, size, performance, cost, etc.
- **Gli scambi dei file/risorse possono essere:**
  - Centralised or P2P


Distributed P2P Architettures

- **Distribuite, decentralized**
- **Also called Pure P2P networks**
  - N peers all identical
  - Example: Gnutella (gnutella hosts), freenet
  - Boot: massive discovery, highly complex
  - Search: fully distributed !, high complexity
  - No problems of fault
    - Redundance of information
  - Problems:
    - performance on search and discovery (distributed), etc.
    - No Administration, no Certification


Hybrid P2P Architettures

- **Hierarchical, hybrid**
  - Mix of centralized and decentralized
  - N peers not all identical (at least in the role)
    - some with the role of local concentrator that can be activated when needed, the so called “super peers”
    - Some with the role for facilitating the starting/booting of the peer network, recovering the list of closer peers
  - Example:
    - Fast Track
    - Emule: with the servers for boot
  - In most cases, the superpeers create a sort of a restricted community around which the content is shared and are marginally connected with others communities
    - In some cases, the link can be established

P2P Layers

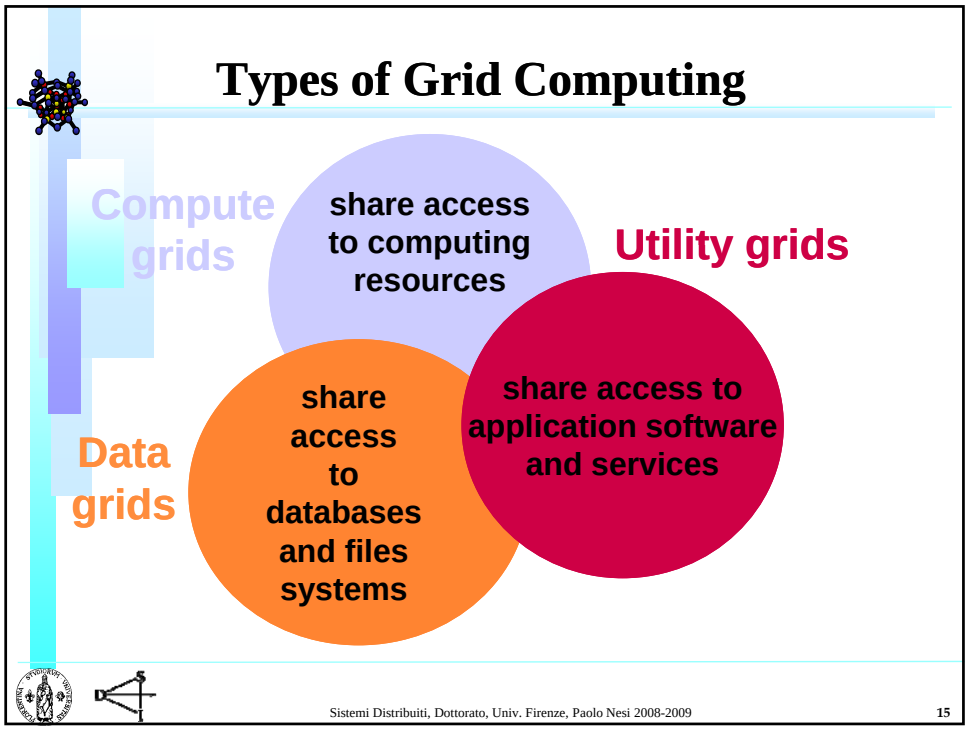
	P2P User Interaction	P2P application	P2P information management
e-Bay	Y	N	N
Napster	Y	Y	N
Gnutella, freenet	Y	Y	Y

GRID

- Struttura per il calcolo distribuito
- Meccanismi di scoperta di servizi
  - Virtualizzazione del servizio
  - Organizzazione dinamica dello sfruttamento delle risorse
  - Negoziazione del servizio
- tratta il *distributed supercomputing*, risoluzione di applicazioni ad alta complessità computazionale, sfruttando risorse di calcolo aggregate
- comprende l'*high-throughput computing*, utilizzando processori in *idle* per i propri scopi
- soddisfa l'*on-demand computing*, la necessità di ottenere risorse immediate, di cui non si dispone localmente
- abilita ed intensifica il *collaborative computing*, il calcolo che coinvolge numerosi individui ed organizzazioni.

Applications

- Calcolo parallelo
- Sfruttamento di risorse distribuite a basso costo al posto di supercalcolatori
- Applicazioni di calcolo massivo:
  - Medicali, E.g.: From TAC to 3D real models
  - Profiling and personalization
  - Visione artificiale, E.g.: Composition/mosaicing of GIS images
  - Risoluzione delle license per DRM
  - Adattamento di risorse digitali, coversione di formato
  - Stima di fingerprint di risorse digitali
  - Generazione di descrittori di risorse digitali
  - Distances among users
  - Clustering of content/users
  - Raccomandazioni per utenti e contenuti


Types of Grid Computing
Compute grids
share access to computing resources
Utility grids
share access to application software and services
Data grids
share access to databases and files systems
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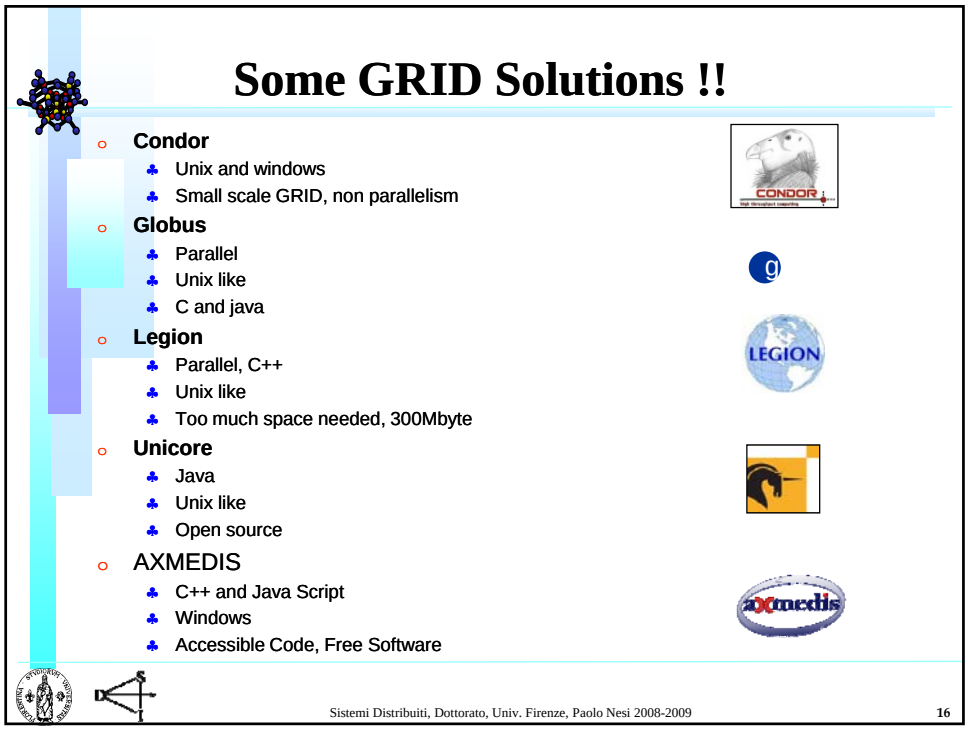
Some GRID Solutions !!
Condor
Unix and windows
Small scale GRID, non parallelism
Globus
Parallel
Unix like
C and java
Legion
Parallel, C++
Unix like
Too much space needed, 300Mbyte
Unicore
Java
Unix like
Open source
AXMEDIS
C++ and Java Script
Windows
Accessible Code, Free Software
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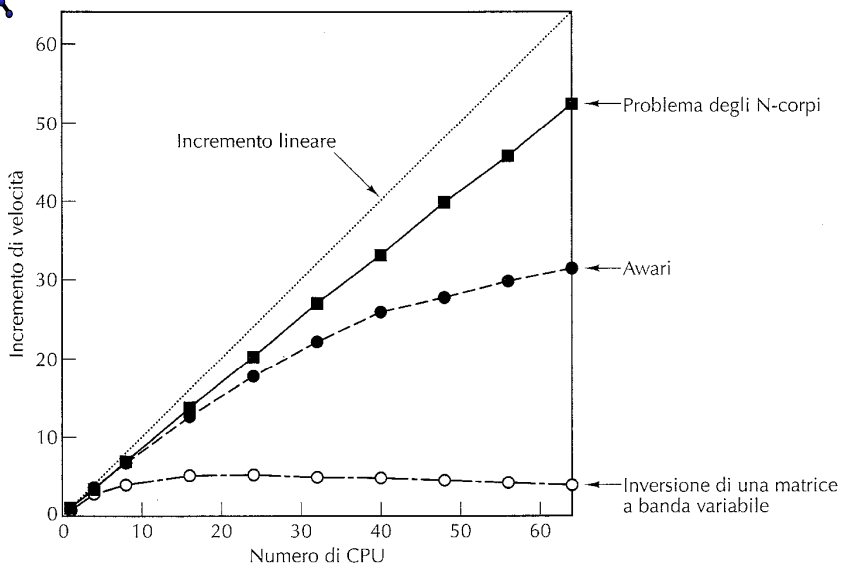
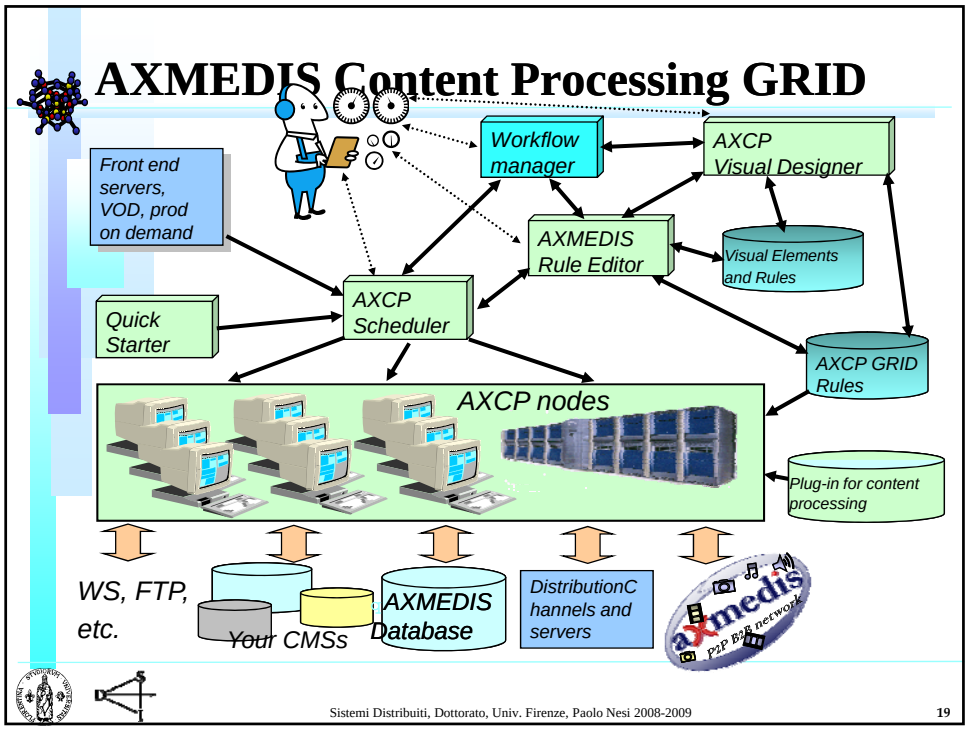
Speed Up



AXMEDIS Content Processing GRID

- **GRID per il Content Processing**
  - Creazione di regole
  - Discovery di nodi
  - Valutazione dei nodi
  - Esecuzione di regole/processi, che attivano anche processi locali scritti non in forma di regole
  - Comunicazione con il gestore ma anche fra nodi
  - Allocazione ed ottimizzazione dei processi
  - Tracciamento e controllo dei processi
  - Workflow


AXMEDIS Content Processing GRID
Front end servers, VOD, prod on demand
Workflow manager
AXCP Visual Designer
AXMEDIS Rule Editor
Visual Elements and Rules
Quick Starter
AXCP Scheduler
AXCP GRID Rules
AXCP nodes
Plug-in for content processing
WS, FTP, etc.
Your CMSs
AXMEDIS Database
DistributionChannels and servers
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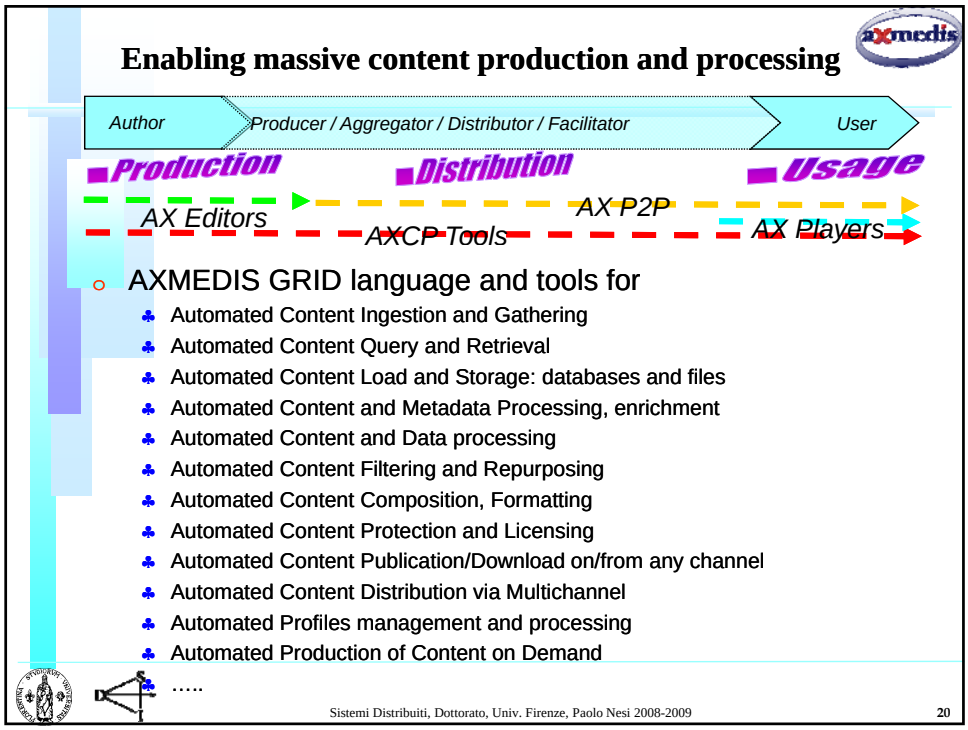
Enabling massive content production and processing
Author
Producer / Aggregator / Distributor / Facilitator
User
Production
Distribution
Usage
AX Editors
AXCP Tools
AX P2P
AX Players
AXMEDIS GRID language and tools for
Automated Content Ingestion and Gathering
Automated Content Query and Retrieval
Automated Content Load and Storage: databases and files
Automated Content and Metadata Processing, enrichment
Automated Content and Data processing
Automated Content Filtering and Repurposing
Automated Content Composition, Formatting
Automated Content Protection and Licensing
Automated Content Publication/Download on/from any channel
Automated Content Distribution via Multichannel
Automated Profiles management and processing
Automated Production of Content on Demand
.....
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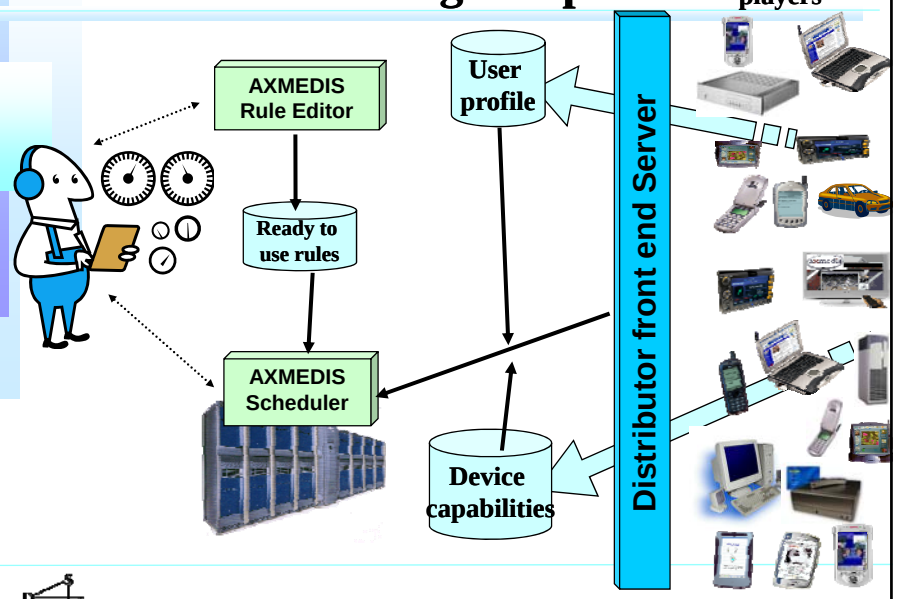
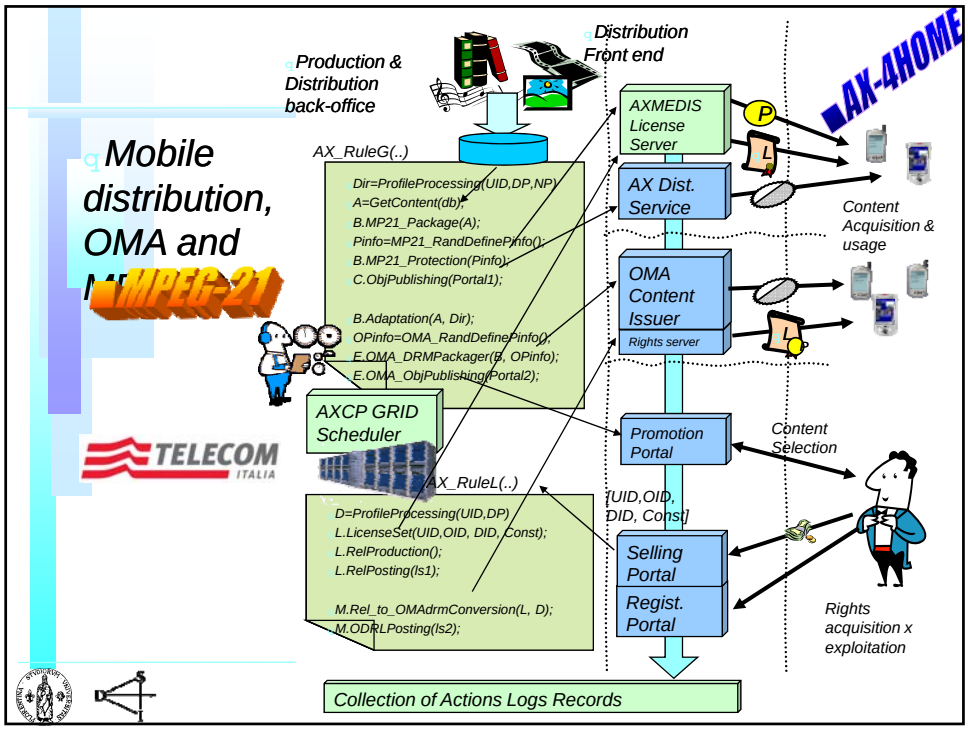
AXCP as Transcoding/Adapt. Platform



AXCP processing capabilities

- Any type of resource in any format
  - Also MPEG21, IMS, SCORM, 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



Concepts of C-S-C-W

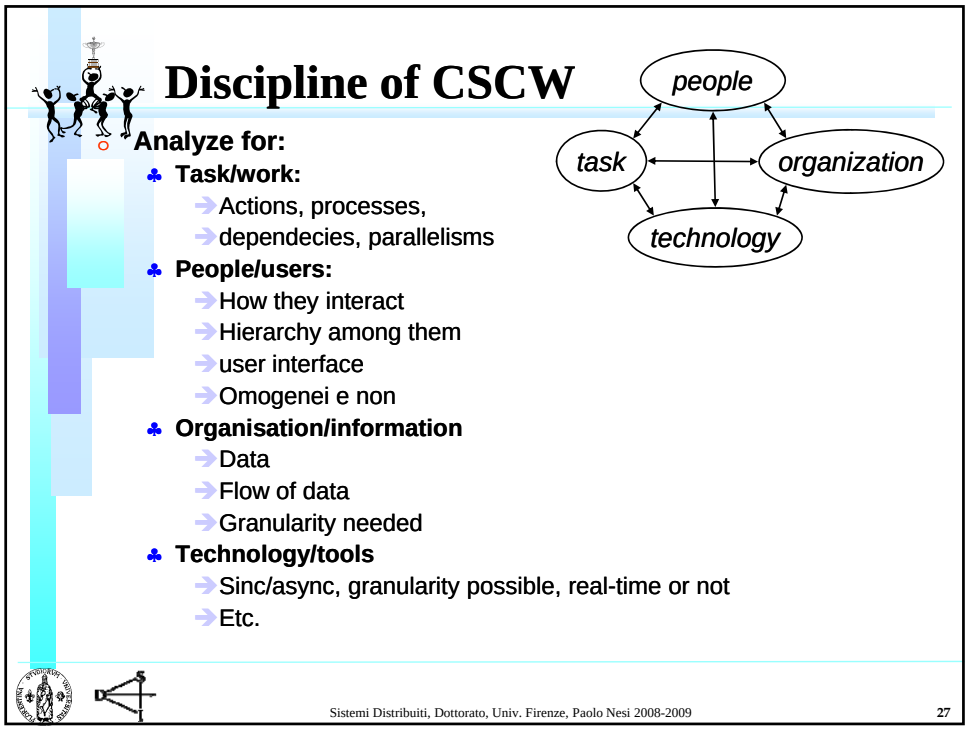
- Computer Supported Cooperative Work
- **Computer**: Computer has the potential to improve the technology of cooperative work
- **Supported**: the support is provided by the computer at the cooperative work, new forms of cooperative work
- **Cooperative**: the execution of task, division and organisation of work, ne forms of cooperation
- **Work**: what is cooperative, the task to be executed in cooperative manner

Perché CSCW, pros

- Incremento della produttività
- Riduzione di tempi
  - Tempi di modifica e integrazione dei dai
  - Tempi di convergenza ad un comprensione comune…
- Riduzione dei costi
  - Costo di comunicazione e' minore del costo di viaggio
  - Costo del controllo e monitoraggio e' minore se effettuato sul supporto SW per il CSCW rispetto a chiedere alle persone o analizzare il loro lavoro tramite documenti
- Incremento della qualità
- Piu' divertimento ed interesse, piu' motivazioni
- Crescita culturale e professionale delle persone
  - Soddisfazione, piu' motivazioni


Examples of CSCW Applications

- Email
- NewGroups
- Mailing Lists
- Web Pages
- Common Calendar
- Wiki Portals
- White and life boards
- Virtual/remote meetings
- Workflow tools
- Multiplayer game
- Decision Support Systems
- Chat lines
- Cooperative Editors (real time and for development)
- Distributed database, connected archives, P2P
- Social networks



Discipline of CSCW
people
task
organization
technology
Analyze for:
Task/work:
Actions, processes,
dependecies, parallelisms
People/users:
How they interact
Hierarchy among them
user interface
Omogenei e non
Organisation/information
Data
Flow of data
Granularity needed
Technology/tools
Sinc/async, granularity possible, real-time or not
Etc.
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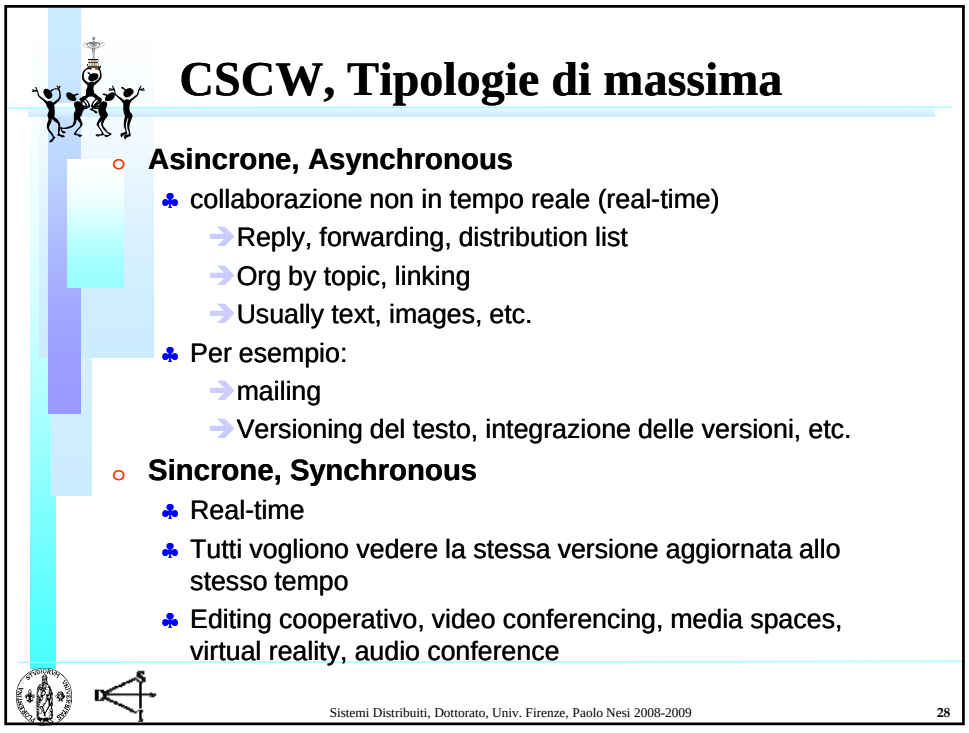
CSCW, Tipologie di massima
Asincrone, Asynchronous
collaborazione non in tempo reale (real-time)
Reply, forwarding, distribution list
Org by topic, linking
Usually text, images, etc.
Per esempio:
mailing
Versioning del testo, integrazione delle versioni, etc.
Sincrone, Synchronous
Real-time
Tutti vogliono vedere la stessa versione aggiornata allo stesso tempo
Editing cooperativo, video conferencing, media spaces, virtual reality, audio conference
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CSCW, other Applications

- Multiple-players Games
  - See example on Microsoft XP
  - Sincrono bidirezionale
  - Messaggi real-time, sincroni
  - Discovery di altri potenziali utenti tramite un server centrale
- Decision Support Systems
  - Collaborative environment to produce data for decision and reach a consensus
  - Asincrone e sincrone, n:m, bidirezionale


CSCW, Editing Applications

Editing Cooperativo (Writing Collaborative systems):

- di programmi software o testi
  - RCS: Revision Control System
  - CVS: Version Control System
- di testo, grafica, shared drawings
  - Editing modale, bidirezionale sincrono
  - Wiki
- di notazione Musicale,
  - MOODS


Space and time taxonomy (Borghoff-98)

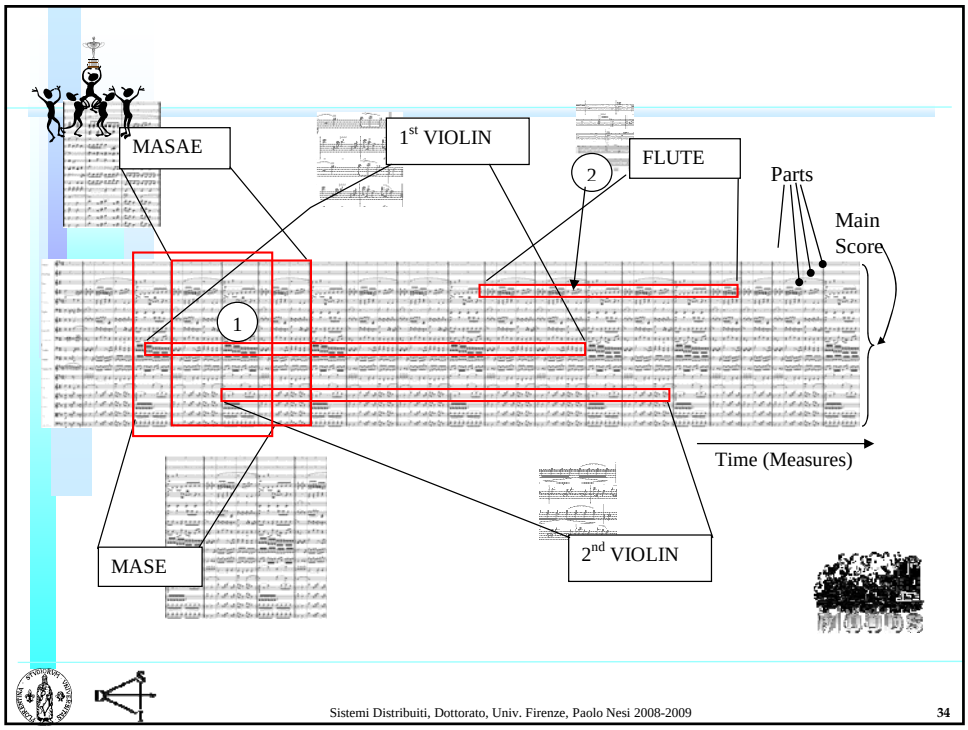
Space/time	Same time (sync)	Diff time (async) predictable	Diff time (async) Unpredictable
Same place	Face to face meeting, games, class rooms	Shift work	Blackboard, posti it note
Different place (predictable)	Video conference, chat	Email, RCS, netnews	Joint editing of documents
Different place (unpredictable)	Mobile phone conference	Non real time computer conference	Workflow management, letter


CSCW, User Interface

- Protocollo di Visualizzazione
  - What You See Is What I See
  - What You See Is What I May See
- In caso di conflitto
  - Vince chi arriva prima
  - Vince chi ha la priorità
  - Si cancella il comando a tutti e due
- Controllo accessi
  - Controllo azioni
  - Controllo modifiche
  - Undo delle azioni



TEATRO ALLA SCALA
MOODS
Shylock Progetti
ELSEL


MASAE
1st VIOLIN
FLUTE
2
Parts
Main
Score
1
Time (Measures)
MASE
2nd VIOLIN
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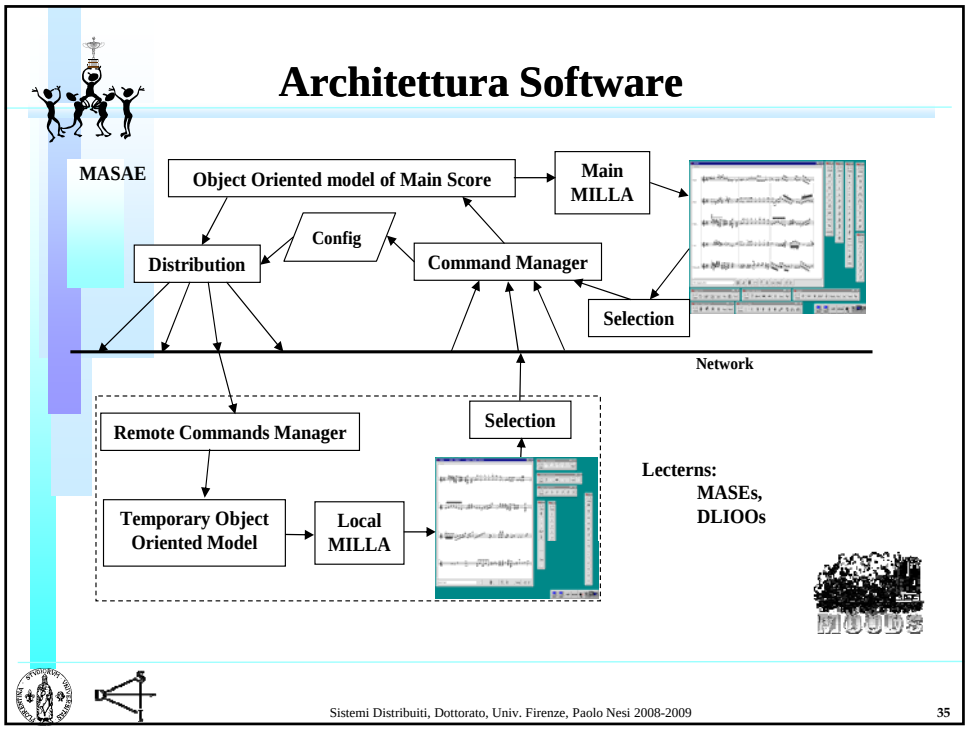
Architettura Software
MASAE
Object Oriented model of Main Score
Main MILLA
Config
Distribution
Command Manager
Selection
Network
Remote Commands Manager
Selection
Temporary Object Oriented Model
Local MILLA
Lecterns:
MASEs,
DLIOOs
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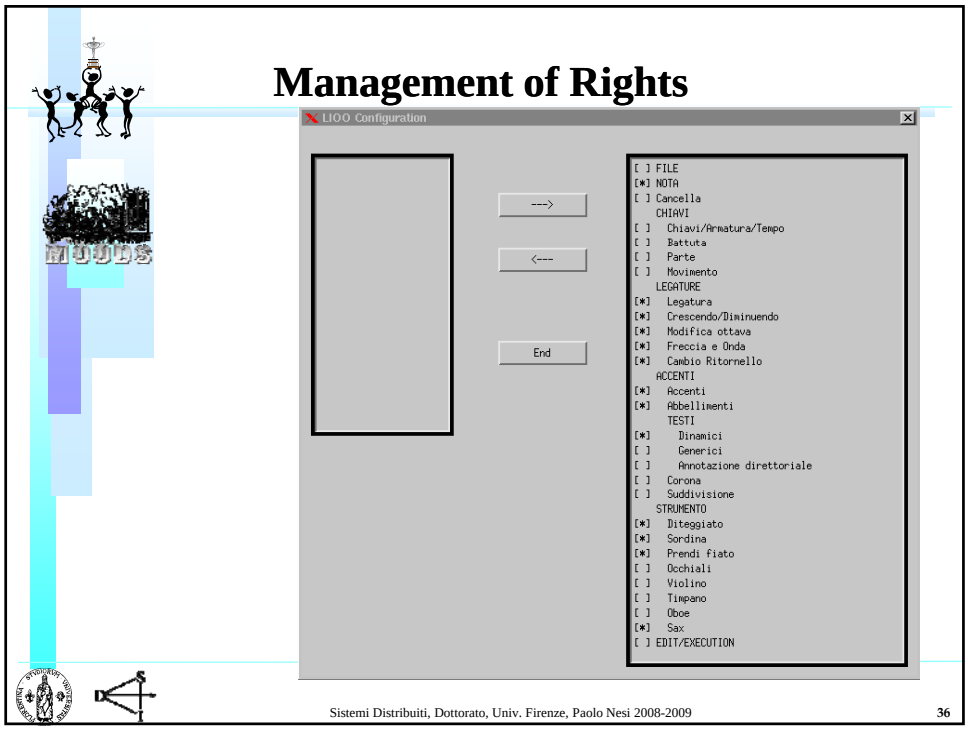
Management of Rights
LIOO Configuration
--->
<---
End
[ ] FILE
[*] NOTA
[ ] Cancella
CHIAVI
[ ] Chiavi/Armatura/Tempo
[ ] Battuta
[ ] Parte
[ ] Movimento
LEGATURE
[*] Legatura
[*] Crescendo/Diminuendo
[*] Modifica ottava
[*] Freccia e Onda
[*] Cambio Ritornello
ACCENTI
[*] Accenti
[*] Abbellimenti
TESTI
[*] Dinamici
[ ] Generici
[ ] Annotazione direttoriale
[ ] Corona
[ ] Suddivisione
STRUMENTO
[*] Diteggiato
[*] Sordina
[*] Prendi fiato
[ ] Occhiali
[ ] Violino
[ ] Timpano
[ ] Oboe
[*] Sax
[ ] EDIT/EXECUTION
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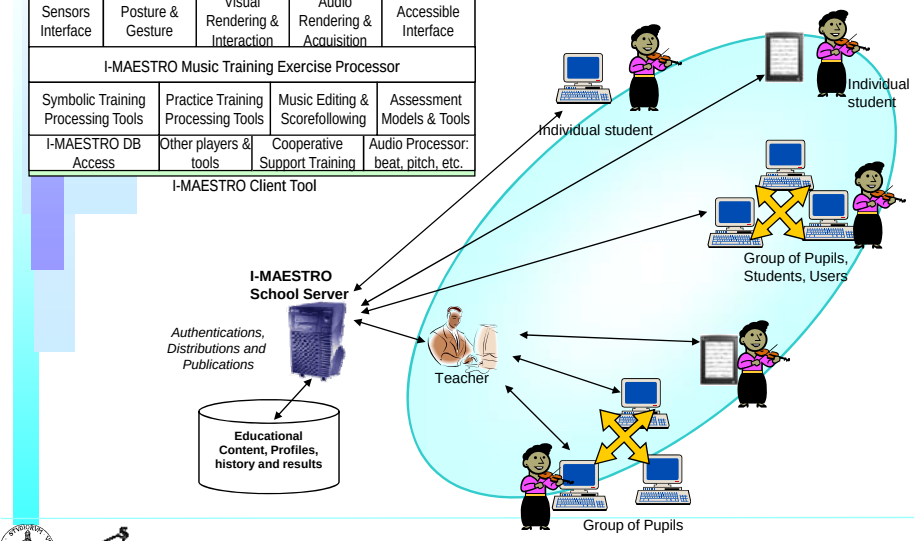
I-MAESTRO Overview

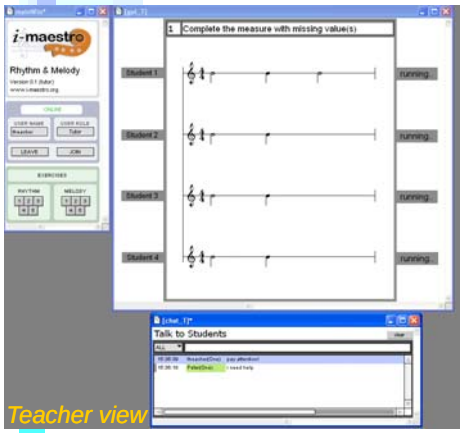
Sensors Interface	Posture & Gesture	Visual Rendering & Interaction	Audio Rendering & Acquisition	Accessible Interface
I-MAESTRO Music Training Exercise Processor				
Symbolic Training Processing Tools	Practice Training Processing Tools	Music Editing & Scorefollowing	Assessment Models & Tools	
I-MAESTRO DB Access	Other players & tools	Cooperative Support Training	Audio Processor: beat, pitch, etc.	

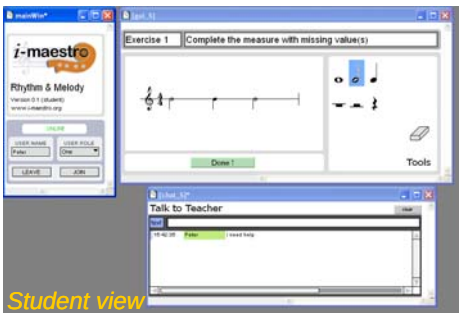
I-MAESTRO Client Tool



Max/MSP Cooperative exercise

Example of cooperative exercises for theory training: students have to aswer to a number of questions on music theory

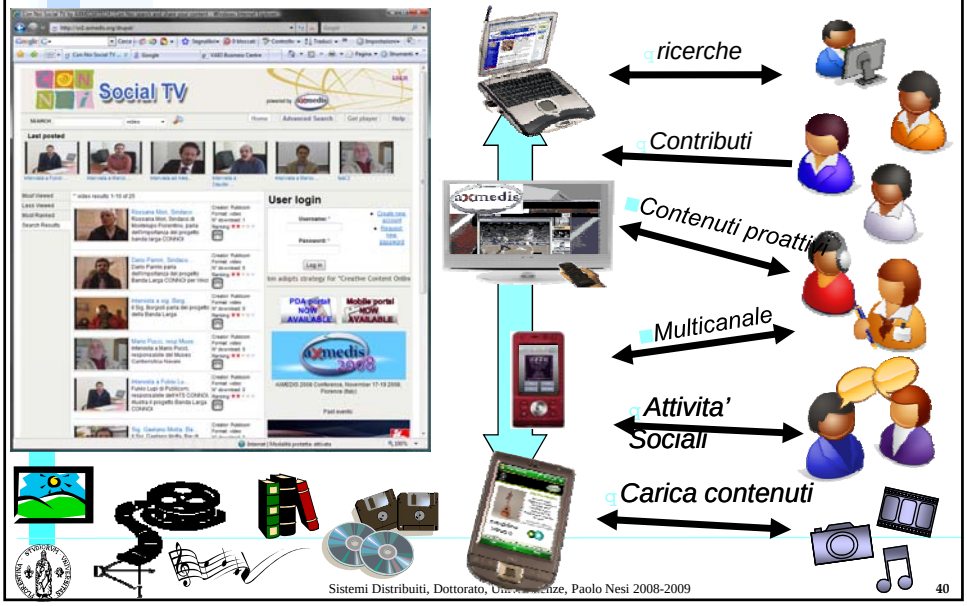




Social Networks

- YouTube, Flickr, myspace, etc…
- Knowledge:
  - Profilo utente e descrittore contenuti
  - User friends, user comments, etc.
  - Processing capabilities
  - User Generated Content, collection of content and use data
  - Raccomandazionii: U->U, U->O, O->O, U->G, O->G, …
  - Misregarded IPR and privacy needs
- Processing, Web 2.0, Web 3.0
  - Semantic processing on users
  - Semantic search on ccontent
- Huge Data trend
  - Costs grow more than linearly, while revewnues are linearly growing with the users.

Social network evolute



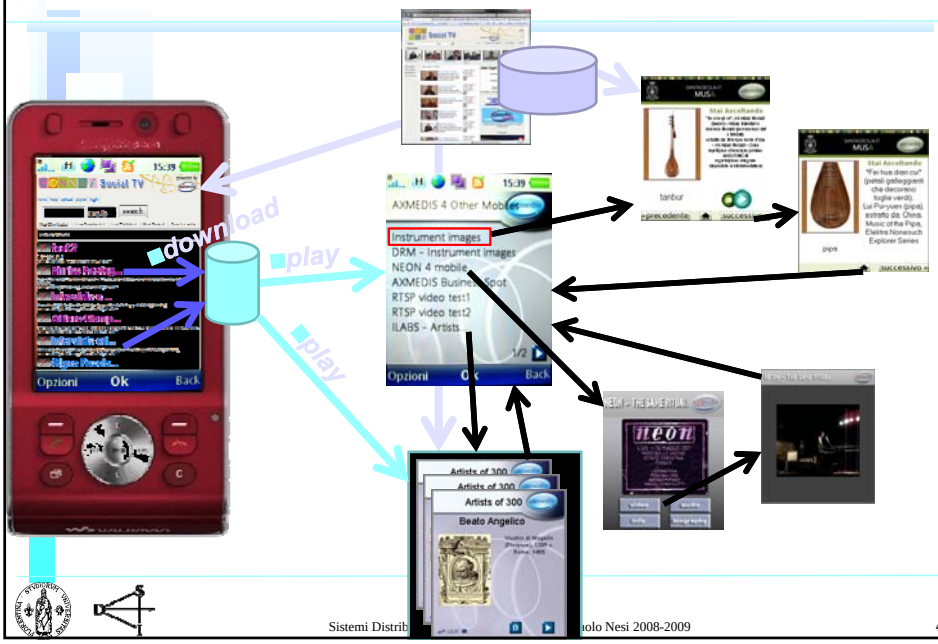
Feature principali, http://xmf.axmedis.org

- **Contenuti**:
  - file singoli con metadati: video, audio, immagini, documenti, animazioni, …
  - contenuti multimediali complessi: multimedia, grappoli di file
  - contenuti intelligenti e proattivi: servizi, applicazioni, wizard, guide, …
  - play, stop, pause, play large, play full screen, …
  - ricerche per trovare contenuti
  - ranking sui contenuti, contenuti più scaricati, contenuti meno scaricati, news, …
- **Distribuzione Multicanale:**
  - IPTV, webTV, PC,
  - Mobili: PDA (windows mobile), sistemi mobili (Nokia, Sony Ericsson, etc..)

Feature principali

- **Utenti e Servizi:**
  - registrazione via email, profilo utente, …
  - ricerche di altri utenti per stabilire relazioni sociali, …
  - upload di contenuti, User Generated Content, UGEsperiences, …
  - conversioni automatiche dei loro contenuti per la distribuzione multicanale, …
- **Aspetti Sociali, Social Network:**
  - commenti su contenuti, creazioni di discussioni sui contenuti, etc.
  - gestione Contenuti Preferiti, visione dei contenuti caricati/preferiti da/di amici, …
  - gestione dei propri Amici, Gruppi (non attivo), …
  - ricezione raccomandazioni per trovare altri amici e per trovare contenuti, …
  - ……

Mobile Content



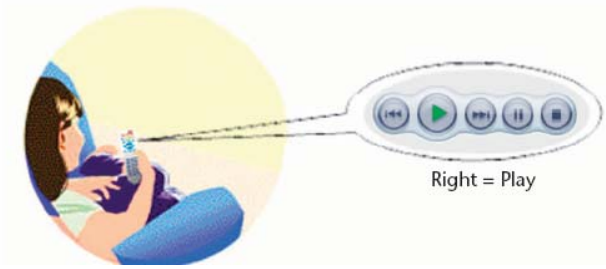
Possibili Contenuti

- **File singoli**:
  - audio, video, documenti, immagini, etc..
- **Contenuti interattivi**:
  - HTML o SMIL come tecnologi di interazione
  - Guide, giochi, etc.
  - Valoriz. Beni Culturali
  - Contenuti educazionali
- **Wizard proattivi**:
  - Registra video messaggio
  - Upload assistito di liste di fil
  - Emissione licenze
  - ….

An example of statement

Condition = November 2003

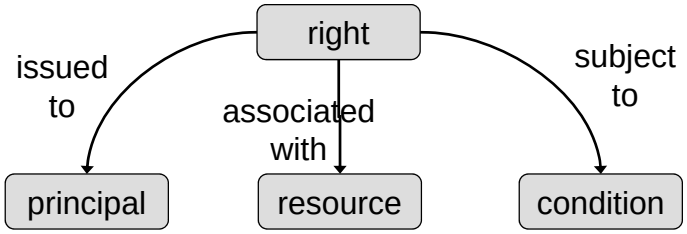
Resource = Ocean Wilds



Right = Play

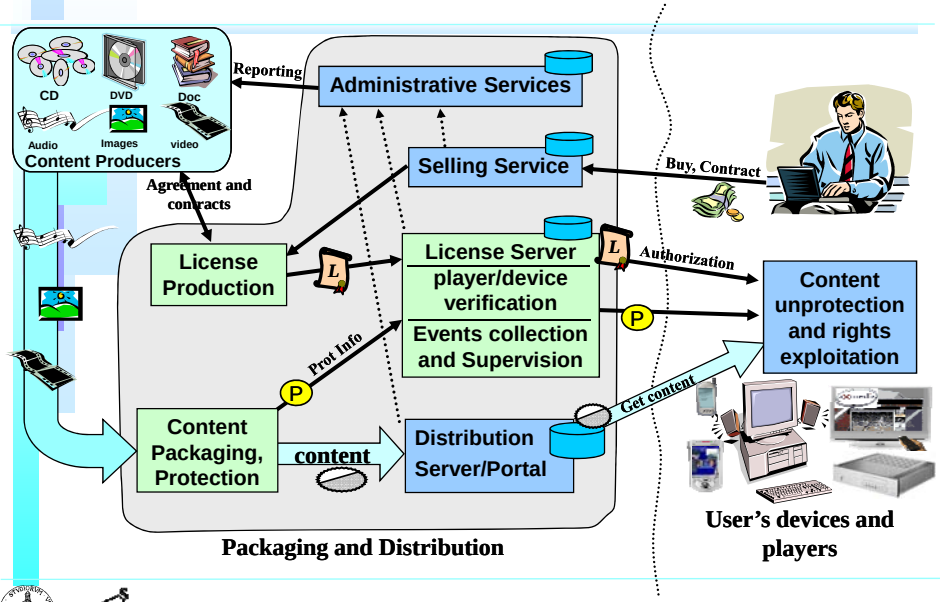
- Rosy can Play 3 times the Ocean Wilds in November 2003.

REL data model

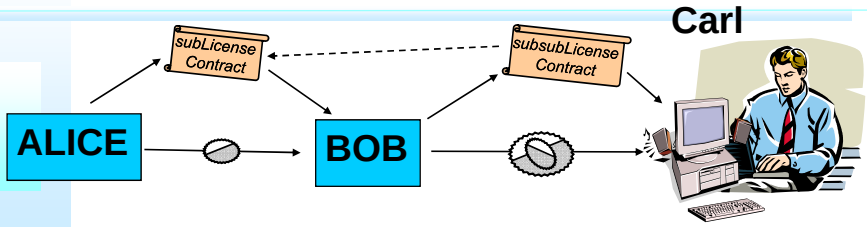


- REL grant consists of
  - principal to whom grant is issued
  - rights the grant specifies
  - resource to which right in grant applies
  - condition to be met before grant can be exercised

Modello Base di DRM

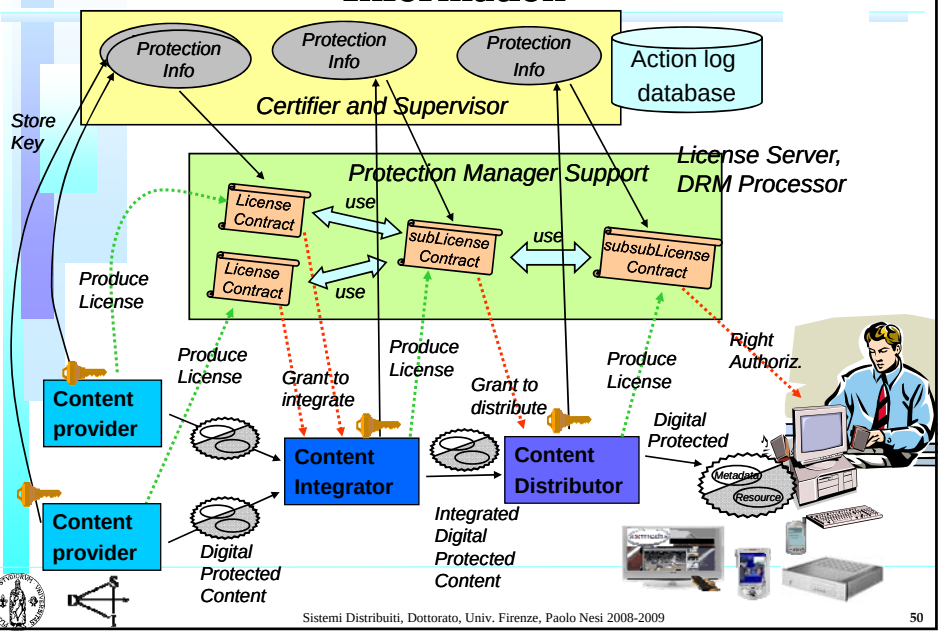


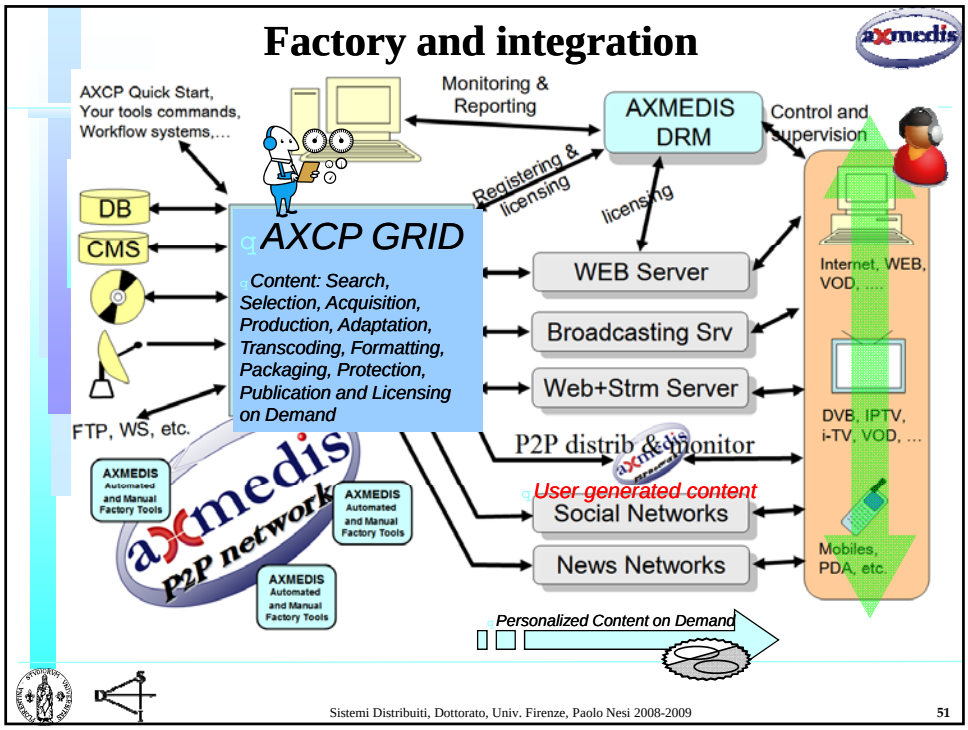
Managing License Chain



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

Managing License Chain and Protection Information





Market solutions viz AXMEDIS

Business Models	Larger number of Business Models
B2C DRM	B2B, B2C, B2B2C DRM solution
Proprietary / Standard DRM and model	Standard DRM: MPEG-21, OMA, etc.
Non interoperable DRM	Allowed Interoperable DRM: MPEG-21, OMA, etc.
Fixed/Flexible Protection Model	Any Protection Model, key, algorithms, etc.
Separation among Content and license	Separation among Content and license
Signed Content Header	Signed Content AXINFO, any Metadata
Channel distribution	Multichannel with the same license
Players and Devices	Players and Devices: PC MS-Windows, PDA Windows Mobile, STB, Linux OS, Apple MAC (in progress), Java Mobiles
License Proprietary: number of rights	Licenses MPEG-21 REL: Expandable dictionary, any type of rights, licenses OMA, domains
Authentication of Player	Authentication of device, user, domain, etc.
Revocation per Player	Revocation per device, user, etc,
Revocation per license	Revocation per license
Source code non accessible	Source Code Acessible
Limited Metadata	Any metadata, custom metdata, any ID, any Descriptor
Media content, simple content, not intelligent	Any digital format, of any type: audio, video, image, games, doc, and Cross media: SMIL, HTML, MPEG-4,… INTELLIGENT content
Customizable Tools	Customizable Tools: servers and player clients

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.