

Models and Tools for Knowledge Reconstruction

*International Conference “Tools and Applications for
the Dissemination of Cultural and Linguistical
Heritage”*

Bologna, 23 April 2014

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Department of Information Engineering
University of Florence

DISIT Lab

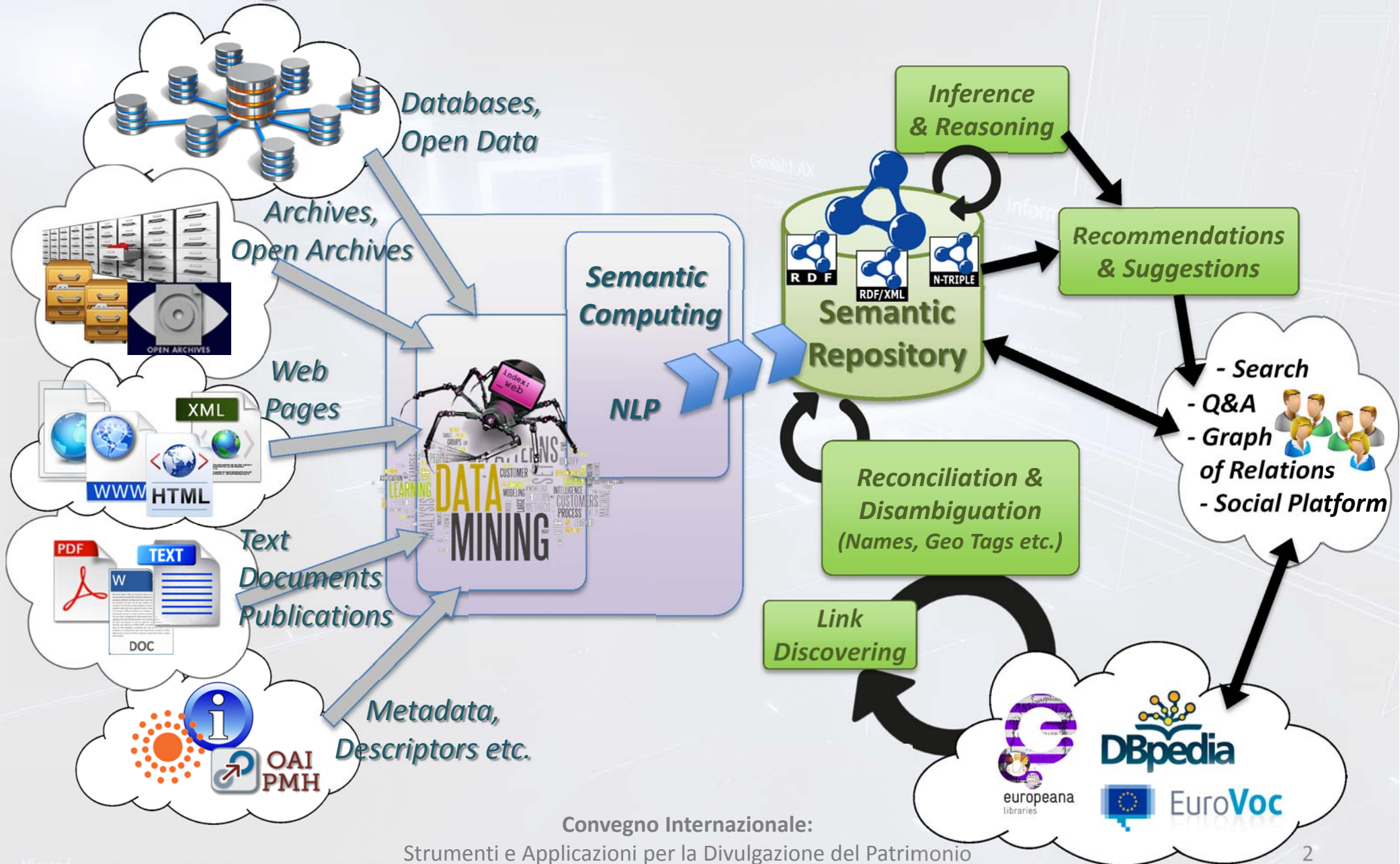
<http://www.disit.dinfo.unifi.it/>



Convegno Internazionale:

Strumenti e Applicazioni per la Divulgazione del Patrimonio
Linguistico e Culturale - Bologna – 23 Aprile 2014

Knowledge Work-flow: from Sources to Final Users



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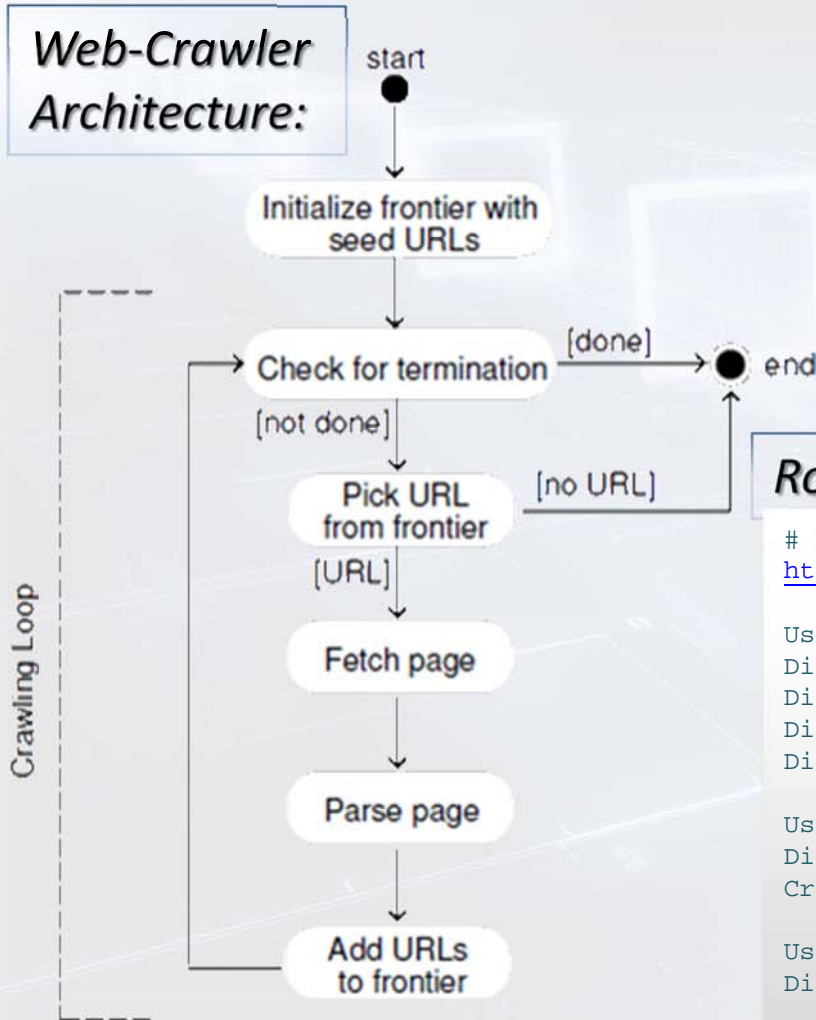
Data Integrity: Accuracy and Reliability of Data

- Big Data Mining issues
- Many different formats
- Ambiguities and inconsistencies of descriptors, metadata etc.
- Unstructured, decontextualized data does not allow to extract high level information
- Several different efforts of structure KBs, ontologies, taxonomies etc. in many fields of Knowledge
- There is necessity of:
 - Reconciliation and disambiguation of ingested data
 - Organize data into proper forms of structured knowledge
 - Standardize definitions, languages, vocabularies etc.
 - Link discovering among different knowledge bases
 - Make inference to produce additional knowledge
 - Detect unexpected correlations, produce suggestions and recommendations
 - Provide semantic interoperability among resources and applications.

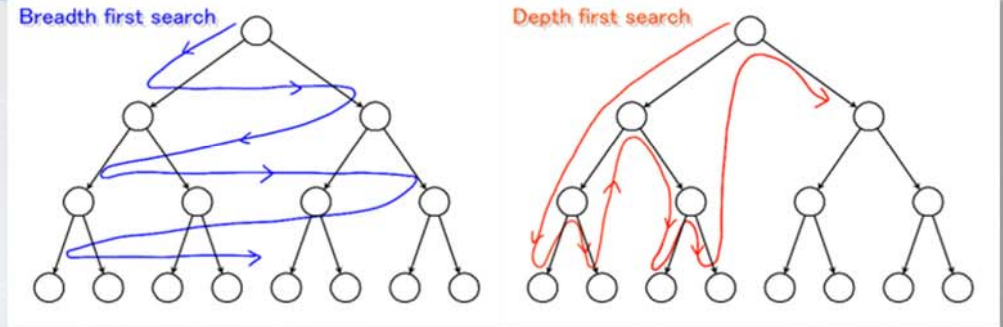
New Approaches - The Semantic Web

- Web of documents (HTML) **VS** Web of data (RDF Triples)
- Relational DBMS **VS** Semantic Datastores (Ontologies etc.)
- Keyword-based Search Engines **VS** NLP Q&A Tools

Web Crawling and Data Mining



Crawling Strategies:



Robot Exclusion Protocol

```

# Robots.txt for
http://www.springer.com (fragment)

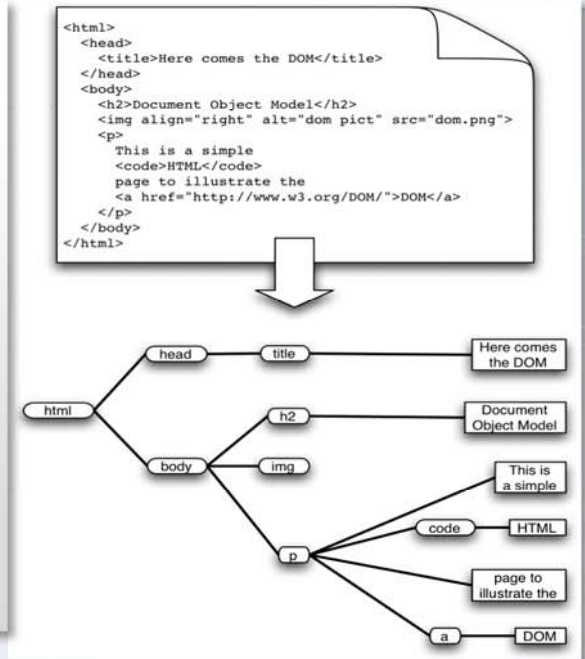
User-agent: Googlebot
Disallow: /ch1/*
Disallow: /uk/*
Disallow: /italy/*
Disallow: /france/*

User-agent: MSNBot
Disallow:
Crawl-delay: 2

User-agent: scooter
Disallow:

# all others
User-agent: *
Disallow: /
    
```

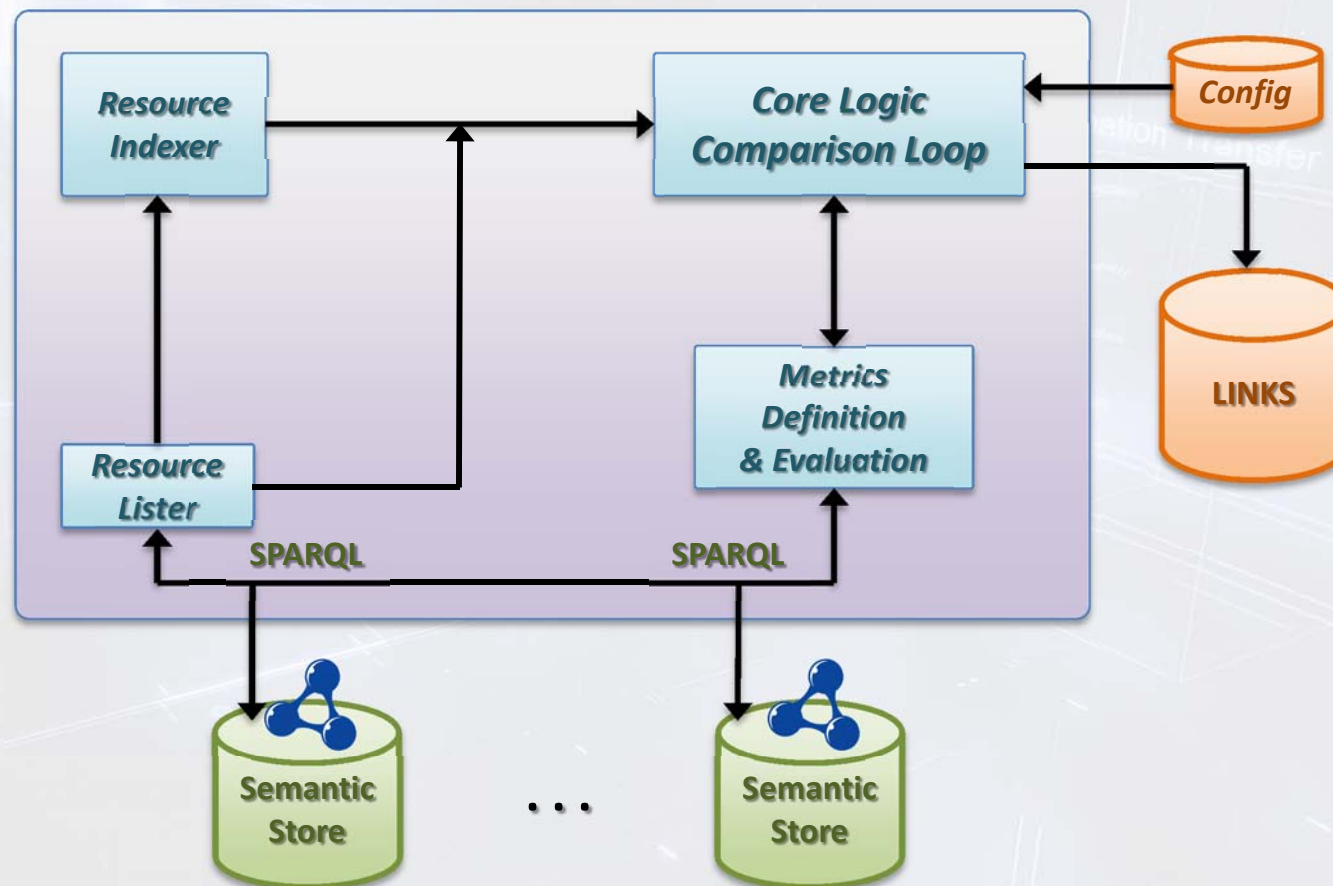
Document / Pages Parsing:



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Link Discovering

- Finding relationships between entities, LODs etc., within different RDF data sources.

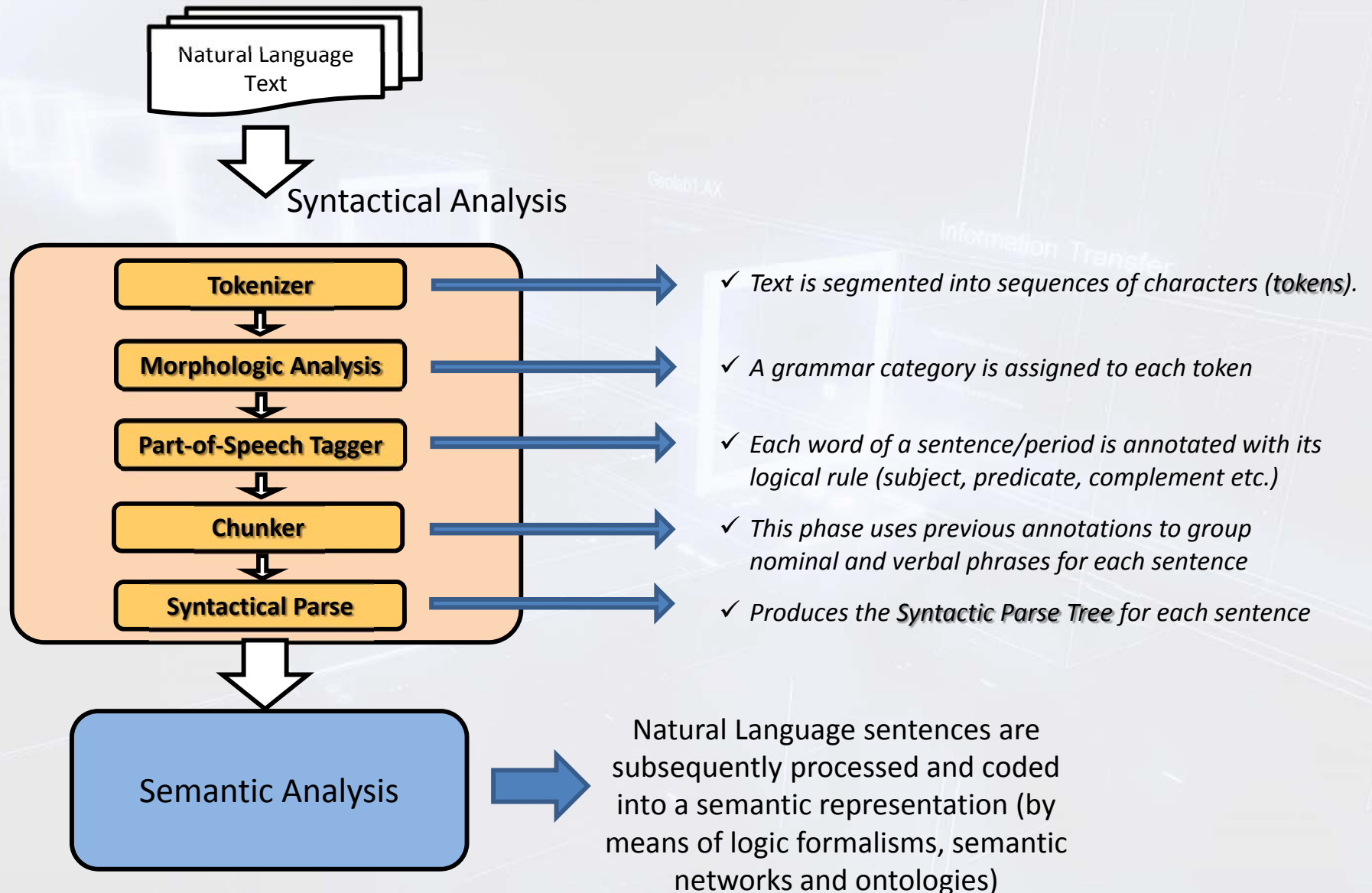


Source: SILK - http://events.linkeddata.org/ldow2009/papers/ldow2009_paper13.pdf

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NLP - Natural Language Processing Phases



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Models for Knowledge Representation

- Explicit typologies of Knowledge which can be made *machine-readable* and *machine-understandable*:
 - ♣ Structured Knowledge (Ontologies, Taxonomies etc.)
 - ♣ Semi-structured (DBMS)
 - ♣ Weakly structured (HTML, Tables etc.)
 - ♣ Not structured (Natural Language unstructured text, images, drawings etc.)

Web Ontologies and Languages

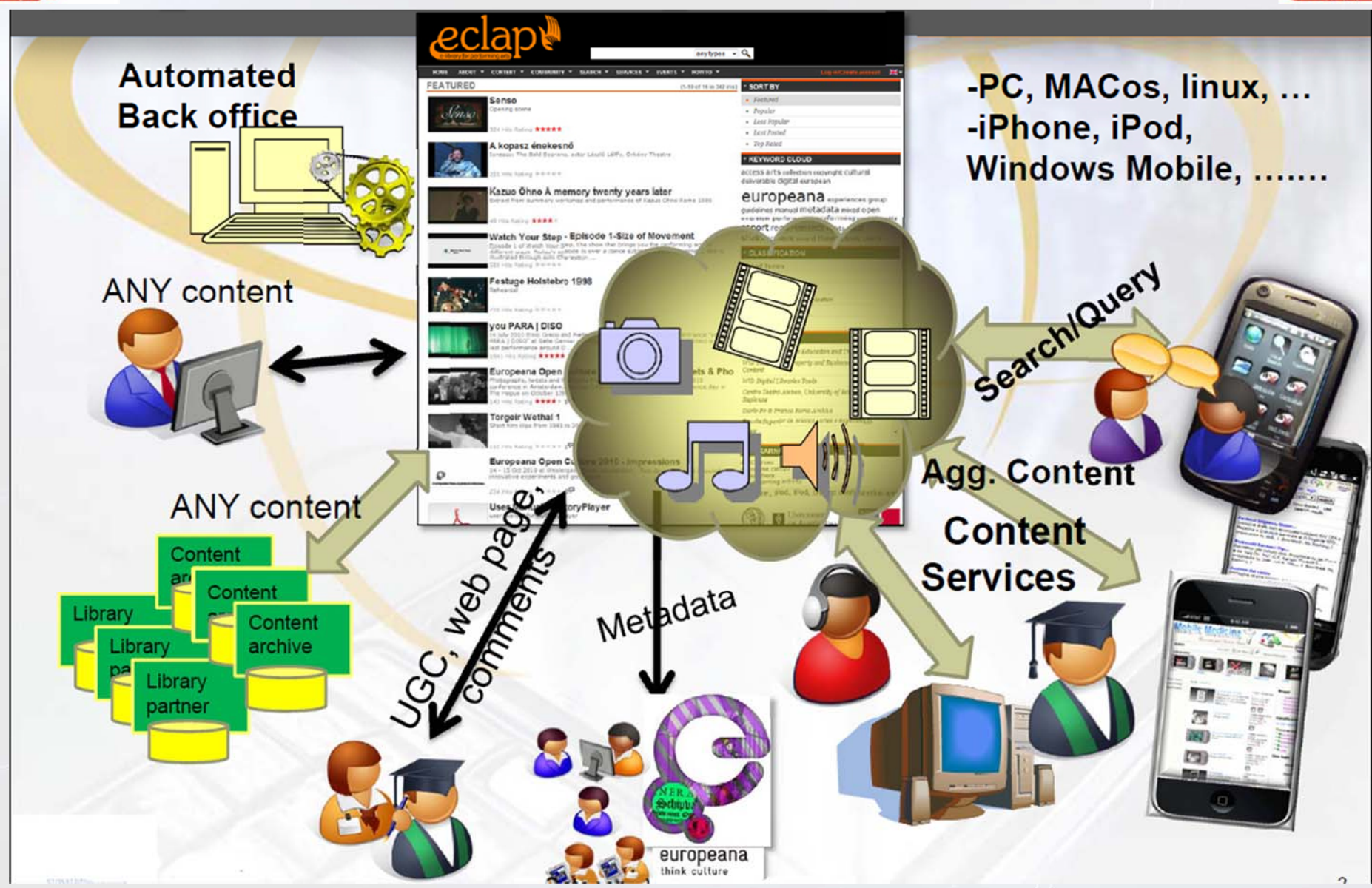
- In Computer/Information Science, an Ontology is defined as the conceptualization of a specific domain of interest, expressed through entities (**Classes**), descriptors (**Attributes**), relationships (**Properties**) and a pre-defined rule corpus (**Semantics**).
- Representation syntax can be equivalently expressed in *XML-based* formats, as well as in the following *triple* format: `<subject> <predicate> <object>`.
- Language used for Ontologies representation:
 - ♣ **OWL (*Web Ontology Language*)** is the W3C standard for Ontology definition for Semantic Web.
 - ♣ **RDF/XML**
 - ♣ **N-triples, N3** etc.
- Interrogation / Query languages:
 - ♣ **SPARQL**
 - ♣ **SERQL**

ECLAP: E-Library for Performing Arts

- Multimedia Archive of Performing Arts: <http://www.eclap.eu/>
 - ♣ EU project to provide content for **Europeana**;
 - ♣ content from 31 European content providers;
 - ♣ descriptive metadata in 13 languages;
 - ♣ interface in 21 languages;
 - ♣ about 172,000 content items;
 - ♣ accessed from 184 Countries mainly from: Italy, UK, Spain, US, NL, B, SI, Hu, Fr, Pl, Pt, Gr, D, Bz, Ind, Sw, Au, Rs, Ca, etc.;
 - ♣ more than 500 different file formats: video, audio, images, documents, 3D, Braille music scores, epub, crossmedia...
- Best practice network / Social network on Performing Arts:
 - ♣ IPR issues;
 - ♣ Performing Arts Education;
 - ♣ Digital Libraries for Performing Arts.



ECLAP Framework



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Eclap Content

- Content kind
- Metadata model: exporting in LOD and OAI-PMH
 - Metadata Editor
 - ECLAP Semantic model, Social Graph
 - Content Aggregation: playlists, collections, courses
 - AudioVisual relationships among content MyStoryPlayer
 - Content Enrichment: Geonames, QR, IPR, relationships
- Indexing and Search
 - Faceted, multilingual, advanced
- Web and Mobile Player, Content Organizer
- Content IPR modeling

Eclap Metadata

- **Describe the ECLAP content**
 - **Dublin Core:** general, multilingual and multi-instances (e.g., title, authors, description, subjects, ..)
 - **Semantic:** content description, taxonomy, tags, annotations, etc., multilingual & multi-instances
 - **Groups:** one or more groups
 - **Technical:** duration, file format, dimension, editor, publisher, any IDs, etc. etc.
 - **Augmented Reality:** GPS, QR,..
 - **Intellectual Property:** IPR, licences for metadata, licences for profiling the conditional access
 - Workflow metadata: status, dates, versioning, etc.
 - Etc.

Vittorio Gassman Macbeth nascosto/3



00:15 / 12:48 MD

RELOAD ⏸ ⏹ 💬 1 ACTIONS

METADATA

Metadata languages

Title
Vittorio Gassman Macbeth nascosto/3

Description
Colore Videoregistrazione in tempo reale delle prove per la messinscena del Macbeth di Shakespeare tradotto, diretto e interpretato da Vittorio Gassman. E' probabilmente l'unica registrazione del metodo di lavoro di Gassman, dalla prima prova a tavolino fino alla prova generale in costume. La prima dello spettacolo, prevista per il 30 giugno a Firenze, Palazzo Pitti Maggio Musicale Fiorentino, non ha luogo, causa rottura di due costole di Gassman durante le ultime prove. Debutta quindi a Verona, al teatro romano il 14 luglio 1983. "Vittorio Gassman - Macbeth: attore e regista", a cura di Valentina Valeri

Technical

Classification

IPR information

Performing arts metadata

Location

ACTIONS

All tags: None

Login or register to tag items

Average: ☆☆☆☆☆
Your rating: None

Recommend

Add to Playlist

View for PC

View MPEG21 for PDA Windows Mobile 6.5

View MPEG21 for PC

View QR code for this content

RELATED OBJECTS BY TEXT

Vittorio Gassman Macbeth nascosto/4

Vittorio Gassman Macbeth nascosto/2

Vittorio Gassman Macbeth nascosto/5

Vittorio Gassman Macbeth nascosto/1

Vittorio Gassman prova Macbeth/1

[MORE](#)

POPULAR IN THE PERIOD

(1-10 of 387 in 2276 ms)

C. Bene, E. De Filippo: Incontro con gli studenti/1

Colore Stereo Videoregistrazione in tempo reale dell'incontro-dibattito con Carmelo

Technical

N° accesses 28

Format video

Type video

Duration 00:12:48.0

Video quality available LD MD

Available platforms PC, iPhone/iPad, Android, Windows Phone 7, Windows Mobile 6.5

Upload date Sun, 2012-01-15 04:08

Group

Centro Teatro Ateneo, University of Rome La Sapienza, UNIROMA, Italia

Published by CTA-UNIROMA

Upload user marcomaci

Original filename ITUR1CTAVGA09074.mov

Workflow type Europeana

Content-url link to this content

QR code



axoid urn:axmedis:00000:obj:03b7454d-6b7f-464a-9050-1d42e98cff88

Classification

IPR information

Performing arts metadata

Technical

Classification

Type Videosintesi e materiali di prove dello spettacolo, a cura di Valentina Valentini

Language Ita

Source BVU

isPartOf Vittorio Gassman

Original metadata language it

IPR information

Rights

Ferruccio Marotti, Centro Teatro Ateneo - "Sapienza" Università di Roma, Eredi Gassman

IPR owner page link to page

Europeana rights Europeana: Unknown copyright status

Public No

PC permission

	Public	Group	Educ.	Trusted
Download HD PC	No	No	No	Yes
Play HD PC	Yes	Yes	Yes	Yes
Download LD/MD PC	No	No	No	Yes
Embed	No	No	No	Yes
Play LD/MD PC	Yes	Yes	Yes	Yes

Mobile permission

	Public	Group	Educ.	Trusted
Download mobile browser	No	No	No	Yes
Play mobile browser	Yes	Yes	Yes	Yes
Download mobile app	No	No	No	Yes
Play mobile app	Yes	Yes	Yes	Yes

Performing arts metadata

Location

nti e Applicazioni per la Divulgazione del Pa
guistico e Culturale - Bologna - 23 Aprile 2

Performing arts metadata

First performance date 1983-07-

Performance place Teatro Ateneo

Performance city Roma

Performance country Italia

Performing Arts Group Compagnia del Teatro Manzoni diretta da Vittorio Gassman, con la collaborazione del 46° Maggio Musicale Fiorentino, della Bottega Teatrale di Firenze e dell'Estate Teatrale Veronese

Performers and crew Riprese: A. Muschietti; Tecnico audio e video: S. Casaluci; Interpreti e personaggi: Alessandro Esposito (Duncan, re di Scozia, un portiere), Danilo De Girolamo (Malcom), Roberto Medina (Donalbain), Vittorio Gassman (Macbeth), Carlo Montagna (Banquo), Luciano Virgilio (Macduff), Gian Franco Baroni (Lennox), Stefano De Sando (Ross), Luca Lazzareschi (Angus), Sergio Basile (Siward, conte di Northumberland, un capitano, un sicario), Lorenzo Gioielli (figlio di Siward, Fleance, figlio di Banquo), Alessandro Nisivoccia (un medico), Sergio Meogrossi (primo sicario), Federico Grassi (un sicario), Annamaria Guarnieri (Lady Macbeth), Giovanna Carcasci (Lady Macduff), Regina Senatore, Gabriella Chiari, Francesca Tardella, Franco Concilio, Franco Felici, Federico Grassi, Luca Lazzareschi, Stefano Molinari, Guido Paternesi (streghe). Scene e costumi: Paolo Tommasi; Musiche: Gianandrea Gazzola; Regia: Vittorio Gassman

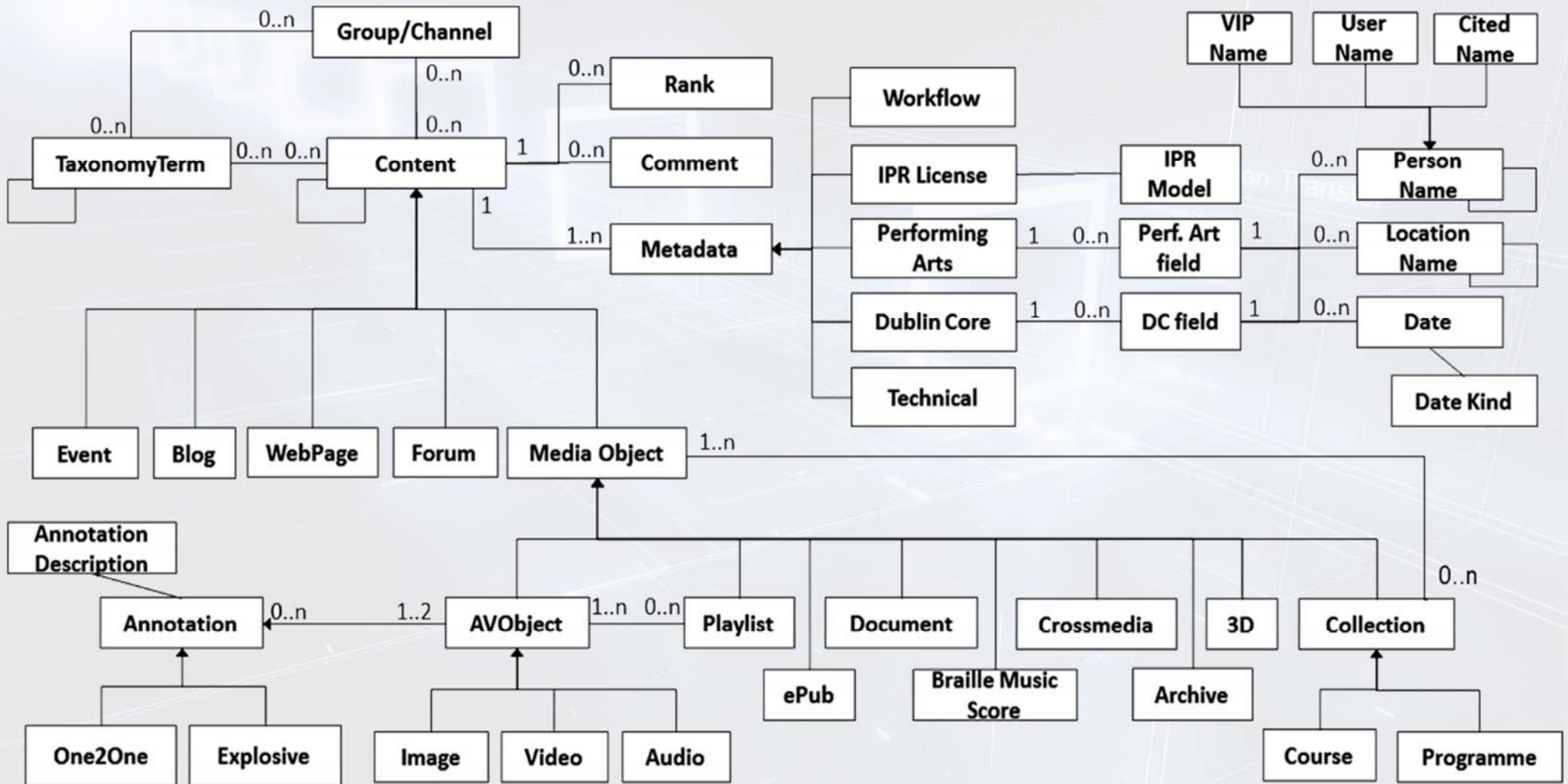
Genre Teatro

Historical period XX Secolo

Location



Eclap Semantic Model



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Linking ECLAP Data

- Performing Arts Metadata use a custom vocabulary with properties defined as specializations of *Dublin Core* properties:

♣ performancePlace	→	dcterms:spatial
♣ performanceCity	→	dcterms:spatial
♣ performanceCountry	→	dcterms:spatial
♣ performanceDate	→	dcterms:issued
♣ performingArtsProfessional	→	dcterms:contributor
♣ dancer	→	performingArtsProfessional
♣ actor	→	performingArtsProfessional

- Links to *Geonames* for Geographical names:

- ♣ Metadata have been analyzed to match with geographical names from the *GeoNames* archive;
- ♣ About 40,000 relations found;

- Named Entity Recognition:

- ♣ A supervised procedure to find People names into metadata fields, names are matched with dbpedia and ECLAP users;
- ♣ About 23000 names found, 2712 found on dbpedia, 169 Eclap users.

ECLAP Name Mining Manager

Synonyms

Enter here a new name

a b c **D** e f g h i j k l m n o p q r s t u v w x y z X

'D' Pages: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#) [12](#) [13](#) [14](#) [15](#) [16](#) [17](#) [18](#) [19](#) [20](#) [21](#)
[22](#) [23](#) [24](#) [25](#) [26](#) [27](#)

All Dbpedia
 EclapU Both
 Norm

STATISTICHE
SETTINGS

Daria Guerrini	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Daria Marušića	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Daria Menichetti	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Daria Panettieri	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Darimonde Odette	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Abela	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Aggioli	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Antiseri	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Argento	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Benedetti	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Cincillà	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Di Donato	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Ferrara	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Fo	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Fo	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Dario Fo	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Fo Dario	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Dario Gessati	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Giannozzi	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dario Giannini	<input checked="" type="radio"/>	<input type="checkbox"/>	<input type="checkbox"/>

140544(20 mostrate) occorrenze di: Dario Fo

Axoid: urn:axmedis:00000:obj:e75313b5-90ab-4176-baab-aab19375eafc
 Field: Group
 Value: **Dario Fo** & Franca Rame Archive, CTFR, Milano, Italia
 Link: <http://www.eclap.eu/urn:axmedis:00000:obj:e75313b5-90ab-4176-baab-aab19375eafc>

Axoid: urn:axmedis:00000:obj:e3edb41e-cb17-4ed5-a973-d516b000749b
 Field: Group
 Value: **Dario Fo** & Franca Rame Archive, CTFR, Milano, Italia
 Link: <http://www.eclap.eu/urn:axmedis:00000:obj:e3edb41e-cb17-4ed5->

1 info di: Dario Fo

DBpedia Eclap

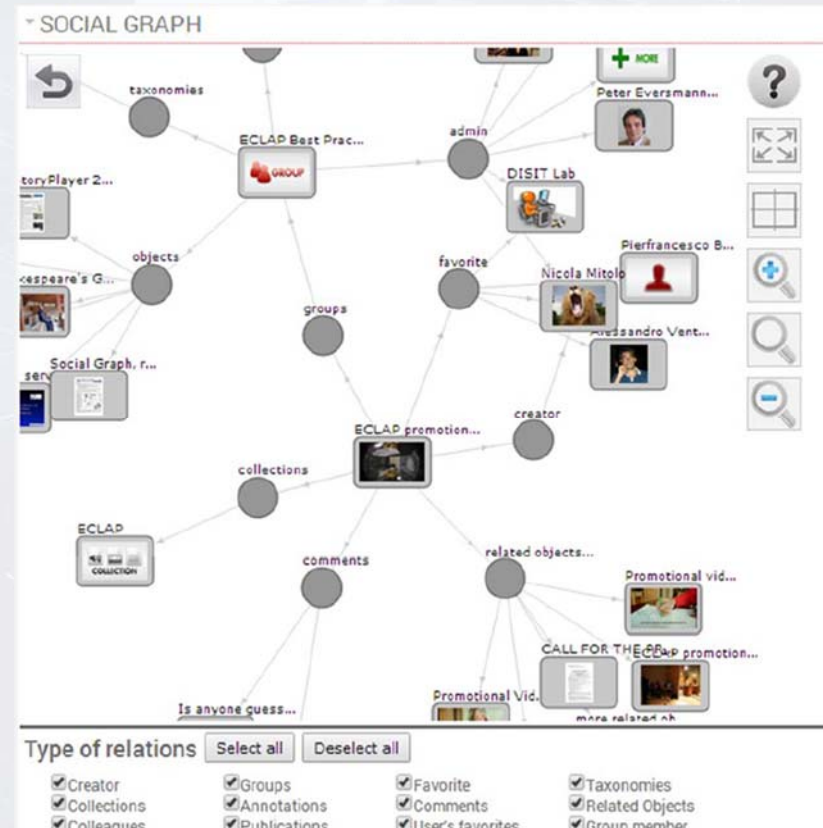
http://dbpedia.org/resource/Dario_Fo

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ECLAP Social Graph

- The Social Graph proposes a new approach for navigation within content and related resources and also improves social interaction among users. It can be enriched using the content directly created or generated by users.
- The social graph has been selected by **Europeana** and posted on the Europeana professional portal:
- It shows the relations of the user/content with other entities.
 - ♣ Shown at user login or below the content when playing
- The user can:
 - ♣ Navigate (*Expand, Focus, Open, Back*)
 - ♣ Filter relations
 - ♣ Zoom In / Out, Pan, Drag objects



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ECLAP Recommendations

		Recipient of the suggestions		
		User	Content (played by a user)	Group (leader or members)
Suggested elements	Users	Proposing to a user possible colleagues / friends $D(U(s,d);U(s,d))$	--no sense--	Proposing to a group responsible possible interested colleagues to be invited
	Contents	Proposing to a user possible interesting contents	Proposing similar content items when a content is played $D(C(s);C(s))$	Proposing to a group members possible interesting content (not much different with respect to C-C combination)
	Groups	Proposing to a user possible interesting groups	Proposing (at content play) interesting groups in which similar contents are discussed	--no sense--
	Ads	Proposing to a user possible interesting ads	Proposing (at content play) possible interesting ads	Proposing at a/all group member/s possible interesting ads

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Recommendations & Suggestions

U → U Recommendations

$$suggestion(A, B) = proximity_{dynamic}(A, B) \times \gamma_d + proximity_{static}(A, B) \times \gamma_s$$

$$proximity_{static}(A, B) = F(v_{language}(A, B), v_{location}(A, B), v_{friends}(A, B), v_{groups}(A, B), v_{age}(A, B), v_{taxonomy}(A, B))$$

$$y(A, B) = v_{language}(A, B) \cdot P_{language} \cdot \gamma_{language} + v_{location}(A, B) \cdot P_{location} \cdot \gamma_{location} + v_{friends}(A, B) \cdot P_{friends} \cdot \gamma_{friends} + v_{groups}(A, B) \cdot P_{groups} \cdot \gamma_{groups} + v_{age}(A, B) \cdot P_{age} \cdot \gamma_{age} + v_{taxonomy}(A, B) \cdot P_{taxonomy} \cdot \gamma_{taxonomy} + proximity_{dynamic}(A, B) \cdot P_{proximity_{dynamic}} \cdot \gamma_{proximity_{dynamic}}(A, B)$$

Hyp:

- Acceptance of Static based suggestions: age, location, language, ...
- Acceptance of Dynamic Suggestions based on similarity of interests
- Acceptance of Random Suggestions
- Acceptance of Strategic Suggestions based on # of connections....

C → C Recommendations

- **Similarity by taxonomical classification**
 - Hierarchical clustering solutions
- **Similarity by Text, MD**
 - Frequency of keywords
- **Similarity by Content, CBIR**
 - Several algorithms
- **Next Steps**
 - combinations



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Content Based Information Retrieval

CBIR Tool

DISIT CBIR Demo
 Distributed Systems and Internet Technology Laboratory
 Documentation - Validation

1257.62 ms

Search results for 'CEDD':

2.294	2.188	2.114	2.1	2.037
2.021	2.014	2.013	1.973	1.962
1.948	1.936	1.929	1.911	1.902
1.9	1.895	1.883	1.881	1.88
1.861	1.859	1.856	1.853	1.851
1.85	1.848	1.841	1.836	1.834

DISIT CBIR Demo
 Distributed Systems and Internet Technology Laboratory
 Documentation - Validation

1092.07 ms

Search results for 'DISIT2':

1.2049796	0.89767384	0.89139628	0.81641936	0.8108337
0.7859342	0.7819109	0.74730504	0.72368228	0.72218204
0.7017734	0.70064556	0.69588948	0.66441644	0.6325419
0.62471176	0.61127854	0.58755172	0.58343076	0.57726716
0.56828284	0.56663	0.56489814	0.5633782	0.55872512
0.5379462	0.53387296	0.53032196	0.529945	0.5130342

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CBIR Back-End Technology

- The algorithms used in this tools are mainly:
 - **Auto Color Correlogram**: Huang, J.; Kumar, S. R.; Mitra, M.; Zhu, W. & Zabih, R. (2007) «*Image Indexing Using Color Correlograms*», IEEE Computer Society
<http://doi.ieeecomputersociety.org/10.1109/CVPR.1997.609412>
 - **CEDD**: Savvas A. Chatzichristofis and Yiannis S. Boutalis, «*CEDD: Color and Edge Directivity Descriptor. A Compact Descriptor for Image Indexing and Retrieval*», A. Gasteratos, M. Vincze, and J.K. Tsotsos (Eds.): ICVS 2008, LNCS 5008, pp. 312-322, 2008.
 - **FCTH**: Savvas A. Chatzichristofis and Yiannis S. Boutalis, «*FCTH: Fuzzy Color and Texture Histogram - A Low Level Feature for Accurate Image Retrieval*», in Proc. of the 9th Int. Workshop on Image Analysis for Multimedia Interactive Services, IEEE, Klagenfurt, 2008.
 - **Gabor**: http://en.wikipedia.org/wiki/Gabor_filter
 - **JCD**: (CEDD + FCTH)
 - **Jpeg Coefficients Histogram**:
<http://www.sciencedirect.com/science/article/pii/S0031320301001820>
 - **Simple Color Histogram**: http://en.wikipedia.org/wiki/Color_histogram
 - **Tamura**: Deselaers T. et al., «*Features for Image Retrieval: An Experimental Comparison*», German Research Center for Artificial Intelligence (DFKI), Kaiserslautern, Germany, 2007
 - **Color Layout, Edge Histogram, Scalable Color (MPEG-7)**:
http://en.wikipedia.org/wiki/Visual_descriptors
 -
- **Mix of CBIR and text based similarities**

The OSIM Project - *Open Space Innovative Mind*

- **OSIM** (*Open Space Innovative Mind*, <http://openmind.disit.org/>) is a framework for Knowledge production and management within the University of Florence research fields and domains. It has been designed and developed by the DISIT Lab as a development project for a software web framework connecting the University of Florence and SMEs in Tuscany.
- The **OSIM** main objective is the realization of a web portal through which companies, researchers and students can make searches and pose queries (*full-text* queries as well as *assisted* queries), in order to find resources, competences, skills in terms of: research and teaching personnel, departments and research groups, publications and courses taken in the University of Florence. More specifically:
 - ♣ Skills earned by research groups, laboratories and University staff.
 - ♣ Competences offered by specific courses and faculties.
 - ♣ Relations among different skills, people, academic structures and entities in general
 - ♣ Scientific publications and relations of collaborations among authors.
 - ♣ Relations of mutual acquaintance and collaborations among research and teaching staff.

OSIM Search Engine

OSIM Open Space Innovative Mind TESTING BETA Università degli Studi di Firenze

Home Documentation Search Managing Knowledge Browsing People & Publications Contact DISIT

italiano

Question Answer Query Wizard

Full Text Search



Assisted Search



Wizard

Quale Persona o Struttura ha questa competenza ?

Quale ha questa competenza ?

Elenca le competenze relazionate con

Elenca le competenze

Elenca le Persone del di

Elenca le Pubblicazioni

Dal Al

Elenca con Area CUN

e settore scientifico disciplinare (SSD)

dal al

Quale persona o corso presenta aspetti legati a ?

Quali competenze legate all'attività di ?

OSIM Functionalities

[Paolo Nesi](#) (full professor)

Informazioni

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Corsi di Laurea

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Corsi

[sistemi cooperativi e di protezione](#) (cod. b010488)

[sistemi distribuiti](#) (cod. b003734)

Links

[Penelope web page](#)

[Information page](#)

Competenze

[DRM](#) (10/10)

[Wedelmusic](#) (9/9)

[Windows](#) (1/22)

[accessibilità](#) (5/302)

[adattamento](#) (3/11)

[aggregazione](#) (1/2)

[algoritmo](#) (1/108)

[analisi](#) (11/253)

[applicazione](#) (1/31)

Pubblicazioni

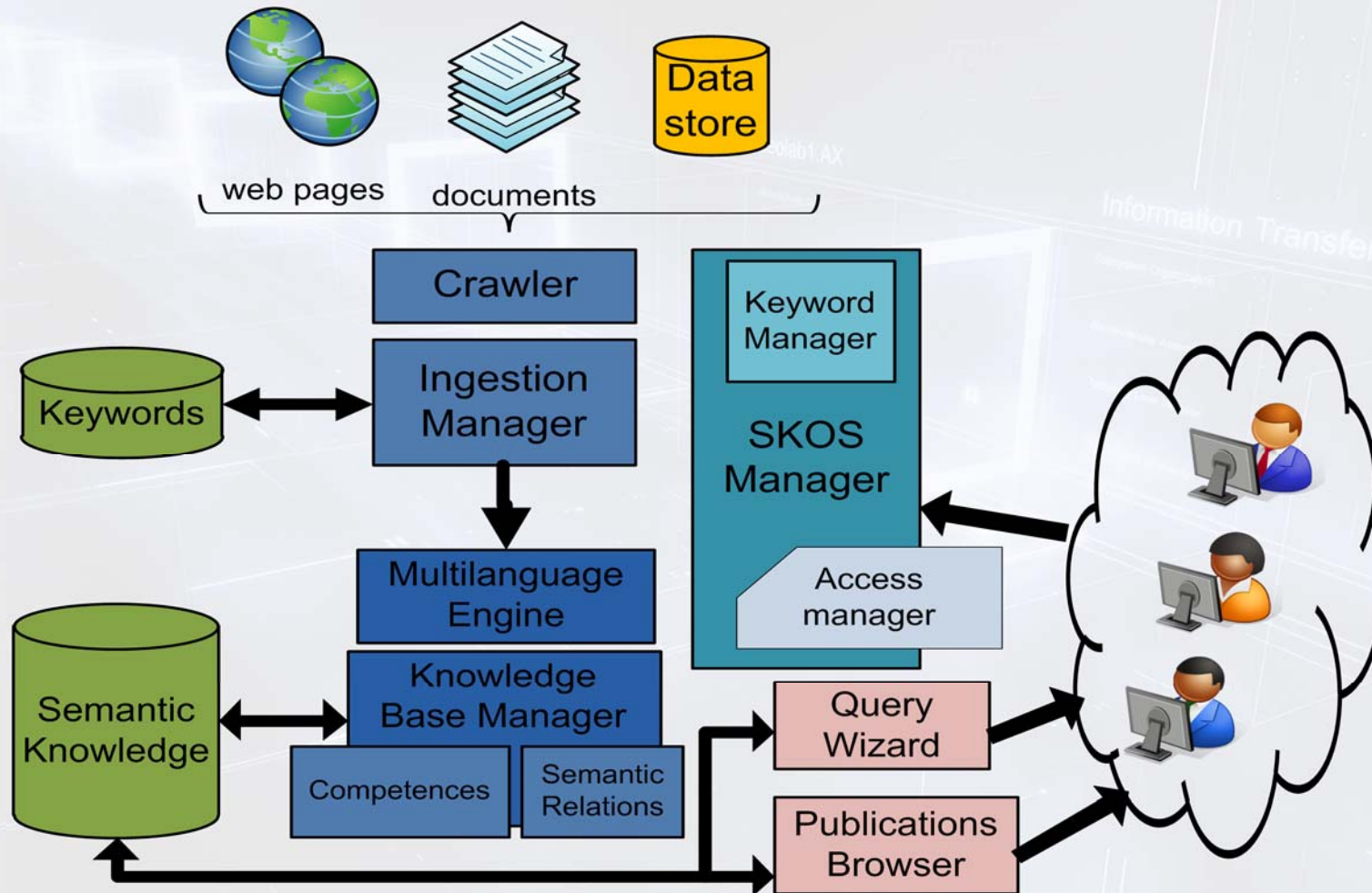
[Link alle pubblicazioni](#)

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OSIM Architecture



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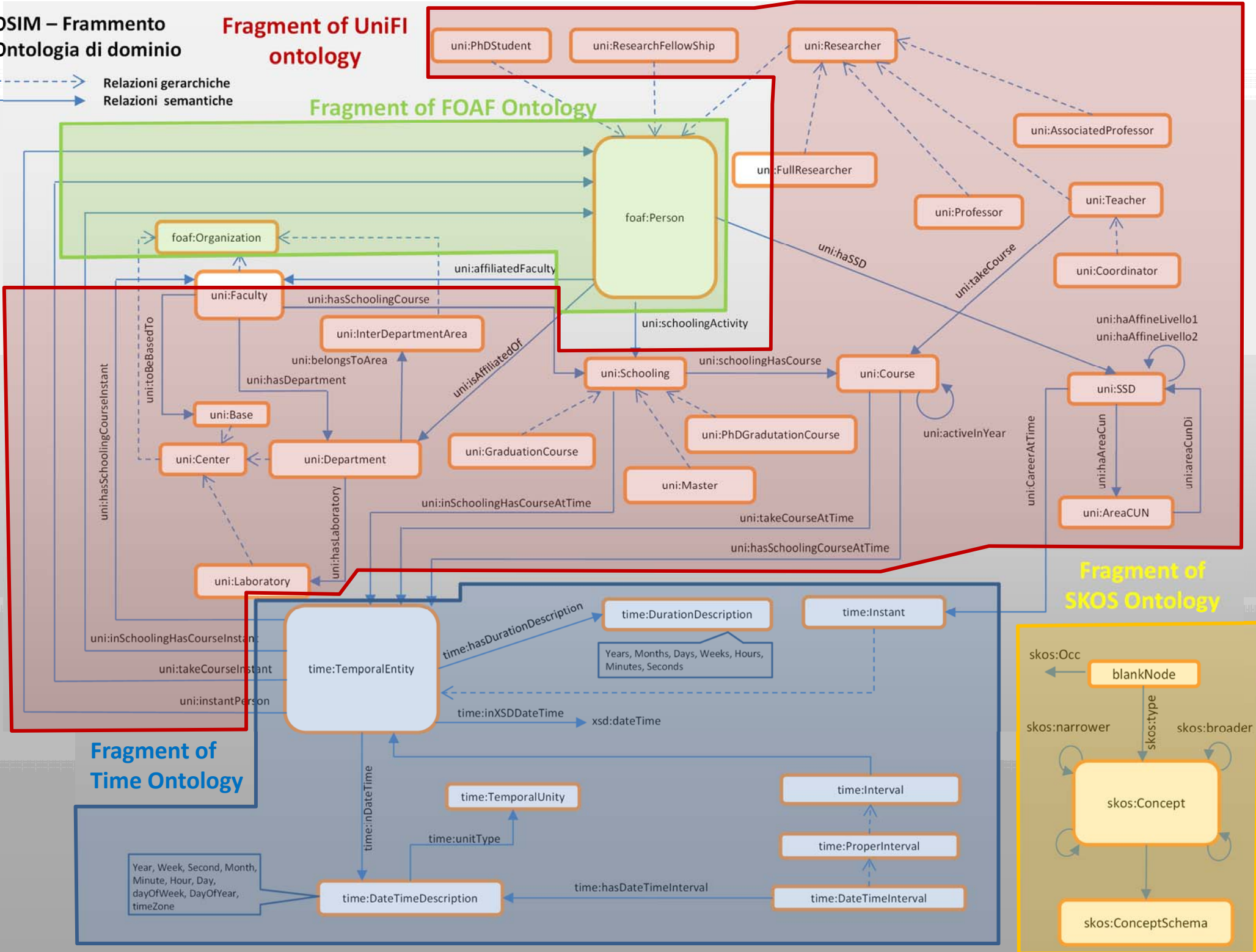
OSIM – Frammento Ontologia di dominio

Fragment of UniFI ontology

Fragment of FOAF Ontology

Fragment of SKOS Ontology

Relazioni gerarchiche
Relazioni semantiche



Linked Open Graph <http://log.disit.org/>

LINKED OPEN GRAPH

RT04800102991TO Close

Identifier:
<http://www.disit.dinfo.unifi.it/SiiMobility/RT04800102991T>

Image:

Info:

[http://purl.org/dc/terms/title:](http://purl.org/dc/terms/title)
VIA GIACOMO MATTEOTTI,V. GIACOMO MATTEOTTI,V GIACOMO MATTEOTTI

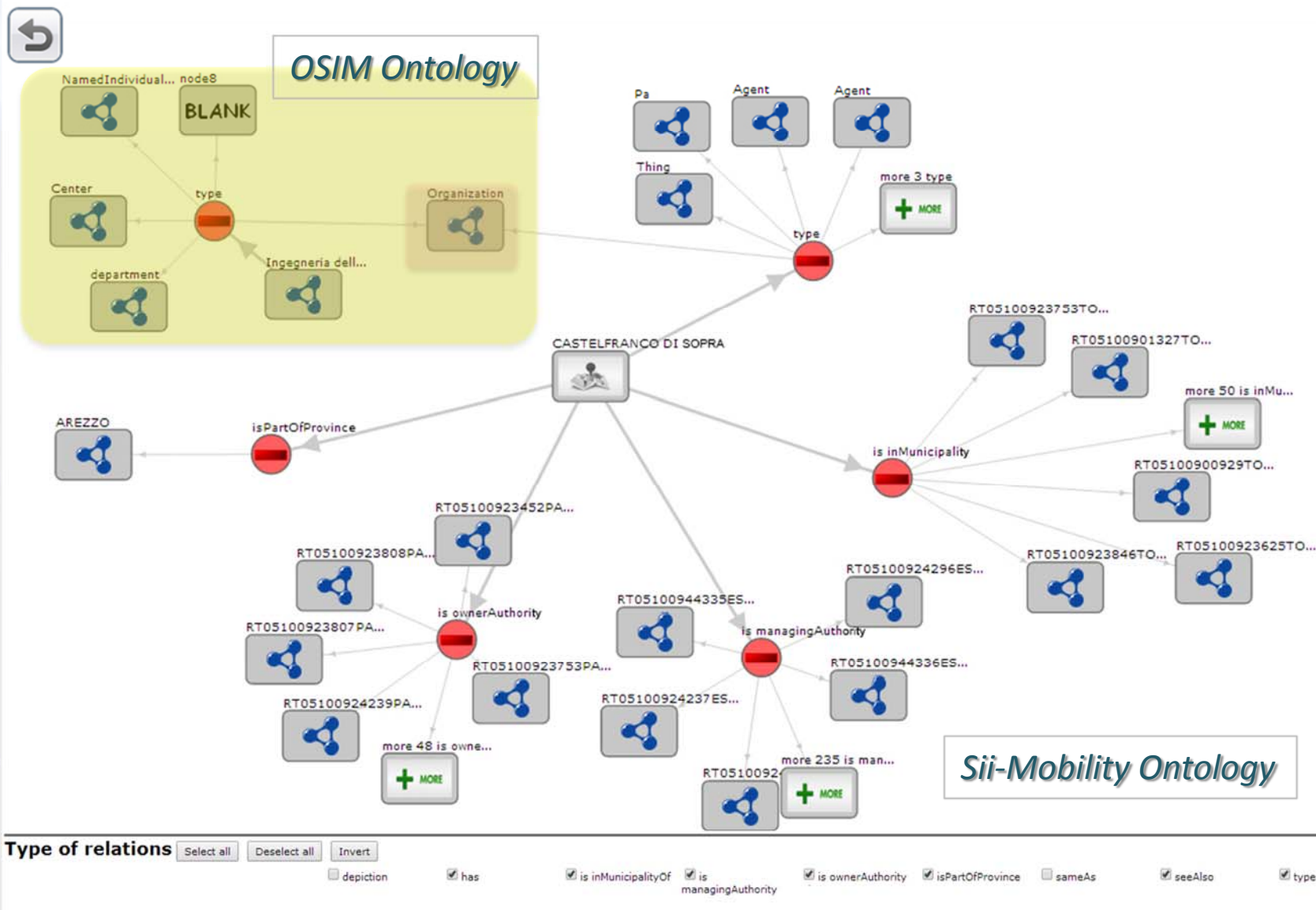
[http://purl.org/dc/elements/1.1/title:](http://purl.org/dc/elements/1.1/title)
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LOG Main Functionalities

Linked Open Graph

The screenshot shows the LOG interface. On the left, a dropdown menu is open, displaying a list of LODs: dbpedia live, LinkedGeoData, Europeana, British Museum, Cultura Italia, LOD Comune Firenze, SiiMobility (by DISIT), ICARO cloud (by DISIT), MyStoryPlayer (by DISIT), and OSIM (by DISIT). The 'OSIM (by DISIT)' option is highlighted in blue. To the right, the 'Your data' panel contains a 'sparql endpoint:' label, a text input field with the URL 'http://openmind.disit.org:8080/openrdf-sesame/repos', and a 'uri:' label with a text input field containing 'http://...' and a 'Send' button. On the far right, there is a vertical toolbar with icons for saving, help, zooming, and search.

- List with different LOD and supported Ontologies supported
- Multiple SPARQL end-points
- Search (*URIs and keywords / keyphrases*)
- Save and load graphs
- Pruning relations
- Navigate links

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