# ON HANDLING GEOGRAPHIC DATA OF PRINT AND DIGITAL FORMS IN ACADEMIC LIBRARIES: THE ROLE OF ONTOLOGIES

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# What is a Geolibrary?



- Geolibrary is a library that contains geographically referenced information, i.e. information that relates to a specific “area” and search is done based on the location. The development of the Geolibraries is shaped in the framework of the global economy and the quest for “fast and easy access to the information”.

# What is a Geolibrary?



- More and more data with a geographic extension or reference are available
- The nature of these data is not uniform:
  - Paper maps
  - Old schetches
  - Digital data
- What is a Library's position towards those?
  - Can/should a library: posses, register, manipulate, curate such kind of data?
  - Should a library use internally those data, e.g. should I be able to search based on location (x,y,z) and not just keywords?

# Distributed Geolibraries



- **Geographic information:**
  - can be found everywhere
  - it is by nature distributed
- **Geolibraries:**
  - Should bring together distributed information to complete the search of a user
  - Should allow combined queries
  - Should have the information described uniformly

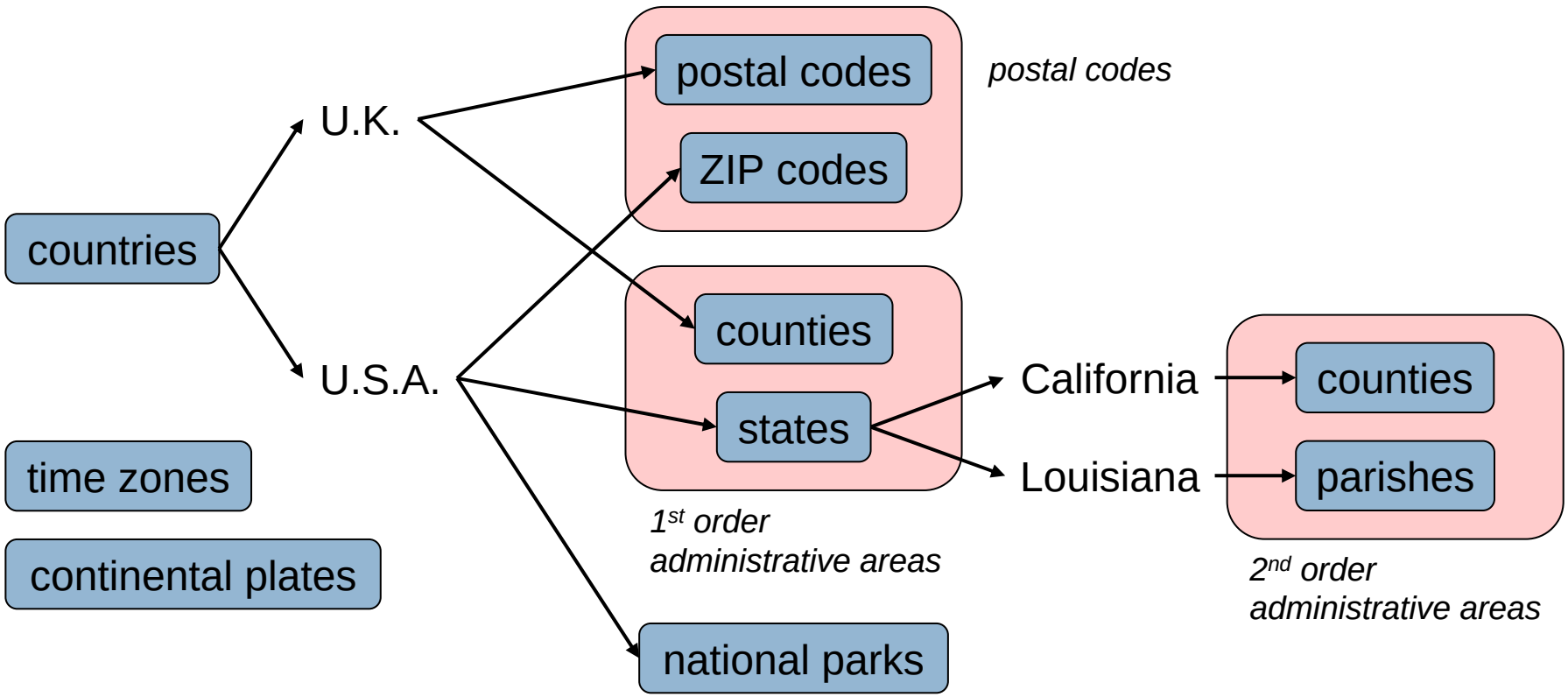
# Related Efforts



- Alexandrian Digital Library (ADL)
  - Alexandria Digital Earth Prototype (ADEPT)
  - Map and Imagery Laboratory of the Davidson Library of the University of California, Santa Barbara, USA
  - Build according to MARC (Machine Readable Cataloguing) and the FGDC (U.S. Federal Geographic data Committee's) : Content Standard for Digital Geospatial Metadata. Its Gazetteer contains around 6.5 million records

# Gazetteer service

- **Geographic namespace:** spatial partition of a region into uniquely named sub-regions



# Related Efforts



- Many universities around the world
  - USA (Univ. of Washington, N. Carolina State, etc)
  - Europe
  - Greece (University of the Aegean)

# Metadata in Geolibraries



- Content Standards for Digital Geospatial Metadata, created from "Federal Geographic Data Committee" (FGDC)
- ISO-TC 211, a generic ISO standard on metadata
- Spatial metadata
  - FIPS 173: Spatial Data Transfer Standard (SDTS),
  - HDF and netCDF,
  - TIFF and GeoTIFF,
  - DIGEST
- Interoperability standards from OGC

# Geolibraries & the (Semantic) Web

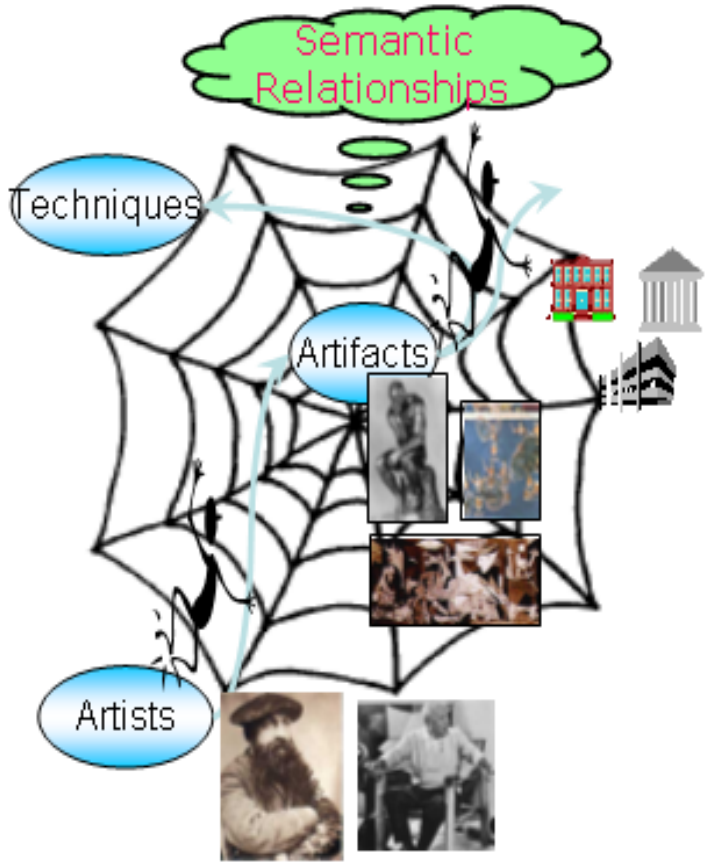


- What is the Semantic Web?
- How can it be used with Geolibraries?
- What is there to gain?

# The Semantic Web

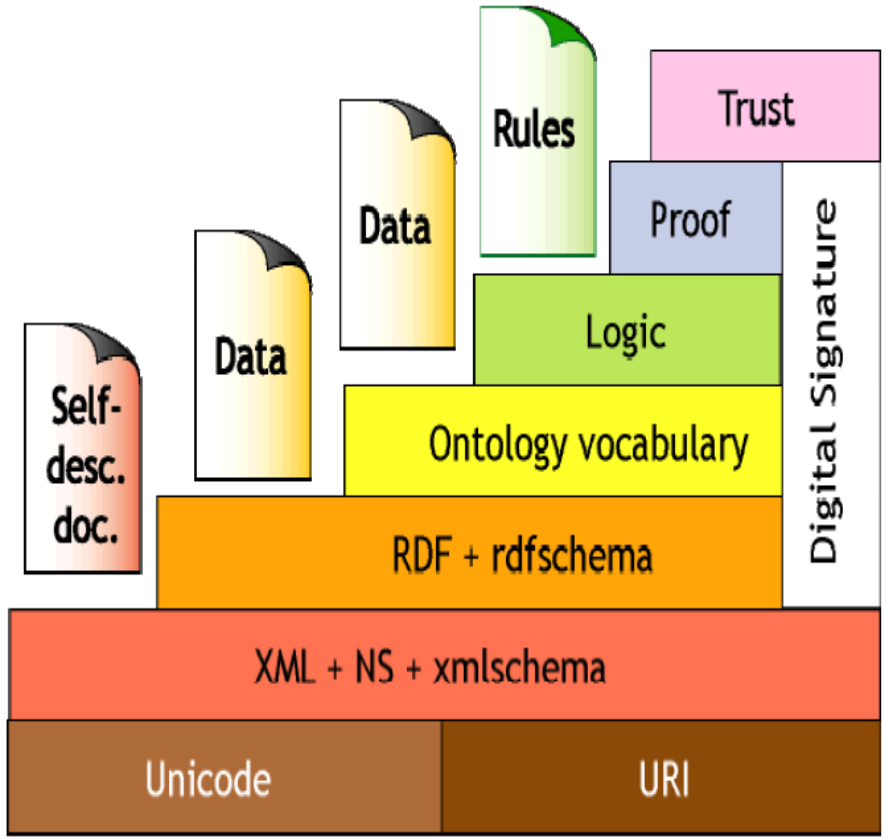


- rich semantic organization
  - resource descriptions
  - description schemata
- different models:
  - RDF/S
  - Topic maps
- navigation based on conceptual relationships
  - semantic hyperlinks



# Describing the information

- **Semantic Web**: meaningful descriptions of data, data becomes searchable by meaning
- XML
- Resource Description Framework (RDF)
- RDF Schema
- Ontology: DAML+OIL, OWL




Berners-Lee, 2000

# What is a Resource Description ?

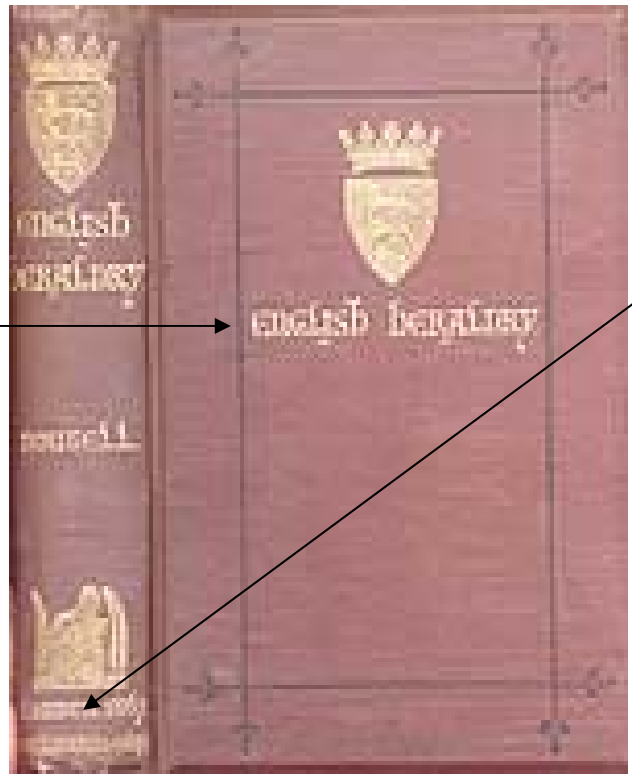


**Resource Description**

author

title

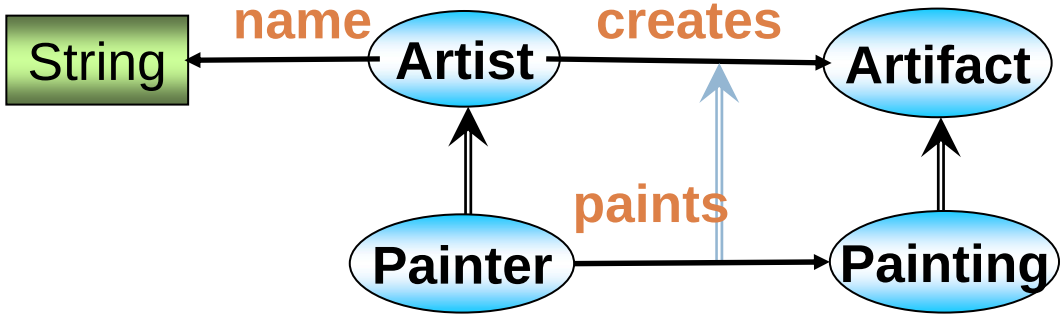
publisher



**Resource**

# A First Step Towards the Semantic Web: RDF and RDFS





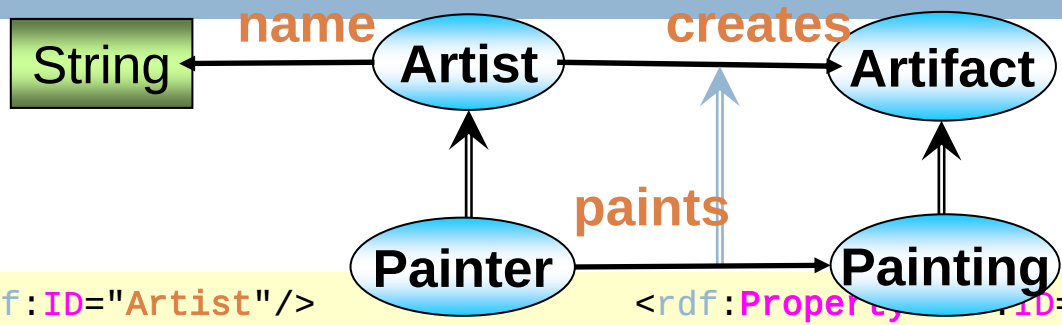

```
<Artist rdf:about="picasso132">
  <name>Pablo Picasso</name>
  <creates>
    <Artifact rdf:about=
    http://www.artchive.com/woman.jpg/>
  </creates>
</Artifact>
```

```
<Artist rdf:about="picasso132"
        name ="Pablo Picasso">
  <creates Artifact =
    http://www.artchive.com/woman.jpg/>
</Artifact>
```

```
<Painter rdf:about="picasso132">
  <name>Pablo Picasso </name>
  <paints>
   <Painting rdf:about=
   "http://www.artchive.com/woman.jpg"/>
 </paints>
 <paints>
   <Painting rdf:about="http://
    museoreinasofia.mcu.es/guernica.gif">
    </Painting>
 </paints>
</Painter>
```

# A First Step Towards the SW: RDF and RDFS






```
<rdfs:Class rdf:ID="Artist"/>

<rdfs:Class rdf:ID="Artifact"/>

<rdfs:Class rdf:ID="Painter">
 <rdfs:subClassOf rdf:resource="#Artist"/>
</rdfs:Class>

<rdfs:Class rdf:ID="Painting">
 <rdfs:subClassOf
rdf:resource="#Artifact"/>
</rdfs:Class>

<rdf:Property rdf:ID="name">
 <rdfs:domain rdf:resource="#Artist"/>
 <rdfs:range
rdf:resource="http://www.w3.org/
                  rdf-
datatypes.xsd#String"/>
</rdf:Property>
```

```
<rdf:Property rdf:ID="creates">
 <rdfs:domain rdf:resource="#Artist"/>
 <rdfs:range rdf:resource="#Artifact"/>
</rdf:Property>

<rdf:Property rdf:ID="paints">
 <rdfs:domain rdf:resource="#Painter"/>
 <rdfs:range rdf:resource="#Painting"/>
 <rdfs:subPropertyOf
                rdf:resource="#creates"/>
</rdf:Property>

<rdf:Property rdf:ID="created">
 <rdfs:domain rdf:resource="#Painting"/>

<rdfs:rangerdf:resource="http://www.w3.or
g/
                    rdf-
datatypes.xsd#Date"/>
</rdf:Property>
```

# Integrate Geolibraries and the Semantic Web



- **Capability to ask "smart" queries**
  - Not only keywords or authors
  - Capability to connect information about the author, the place, the keywords, etc
- **Capability to extend or restrict information:**
  - E.g. places are parts of other places, if you are looking related info on e.g. Chania, maps of Crete might be another source of information. This procedure becomes now automated.

# Steps towards connection



- Prepare ontologies to describe georeferenced information
- Use semantic web tools and languages (SPARQL, RQL) to perform queries instead of databases and SQL
- Provide prototype systems to evaluate actual deployment

# Conclusions and Future Work



- We established the need for Geolibraries, either as independent entities or as integral parts of the existing libraries
- Efforts highly connected with the Digital Libraries initiatives
- Standards on metadata used
- Additional ones especially for Geolibraries needed
- Semantic Web can help identify and boost the capabilities of Geolibraries based on meaning (semantics)