W3C and OGC standards for Data storage, access and sharing Interoperability

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Outline

Introduction

Problem

- Spatial data infrastructures (SDIs) play a major role for searching, accessing and integrating heterogeneous geographic data sets and geographic information (GI) services.
- The standards of the Open Geospatial Consortium (OGC) provide a syntactical basis for data interchange between different user communities. But this is only the first step

Introduction

What about data Semantics?

- In contrast to syntax, which only defines the structure, semantics refer to the meaning of elements
- In SDIs, existing standards fail to address semantic problems that occur due to heterogeneous data content and heterogeneous user communities (using different languages, terminologies and perspectives).

Introduction

Semantic Heterogeneity

- At the metadata level, semantic heterogeneity impedes the discovery of geographic information;
- at the schema level, semantic heterogeneity impedes the retrieval of geographic information; and
- at the data content level, semantic heterogeneity impedes the interpretation, integration and exchange of geographic information.

Geospatial Semantic Web Challenge:Interoperability

- The Geospatial part
  - Maps and map visualization
  - Features and feature geometries
  - Geographic and other relationships
  - Coordinate and other reference systems
- The Web part
  - Distributed data - “own and maintain locally / find and access globally”
  - Shared services, loosely or tightly coupled to geodata
  - Interoperability between technologies, vendors, architectures
- The Semantic part
  - Accessibility of “secret” knowledge
  - Interoperability between communities and domains
  - Softer software
  - Automated (machine to machine) reasoning and inference
- The Geosemantic part
  - Feature discernment
  - Spatial reasoning
  - Representational dissonance
- No particular part
  - Cognitive dissonance
  - Context and viewpoint

Figure: Interoperability Requirement

Motivation

- Development of multidisciplinary applications,
- Achieving GeoLinked Data
- Information search, access, share and reuse

OGC and W3C Standards

W3C and OGC

- W3C and OGC provide standards for data representation, storage, access, transfer and sharing.
- Standards are defined for web services and seamless collaborative use of data.

OGC standards for data storage

Data storage standards

- XML
- GML
- KML (standard by OGC in 2008)
- RDF
- JSON
- GeoJSON

OGC standards for data access

Web service and Geo Web Service standards

- WMS
- WFS
- REST

OGC standards for data sharing

Standards for geo spatial semantic web

- OWL
- RDF
- GeoOWL
- GeoSPARQL

OGC standards for Sensor Web Enablement

OGC standards for Sensor Web Enablement

- http://www.opengeospatial.org/docs/is
- http://corescholar.libraries.wright.edu/cgi/viewcontent.cgi?article=2125&context=knoesis
- http://www.opengeospatial.org/ogc/markets-technologies/swe
- http://corescholar.libraries.wright.edu/cgi/viewcontent.cgi?article=2049&context=knoesis

Geospatial Semantic Web Challenge:Interoperability

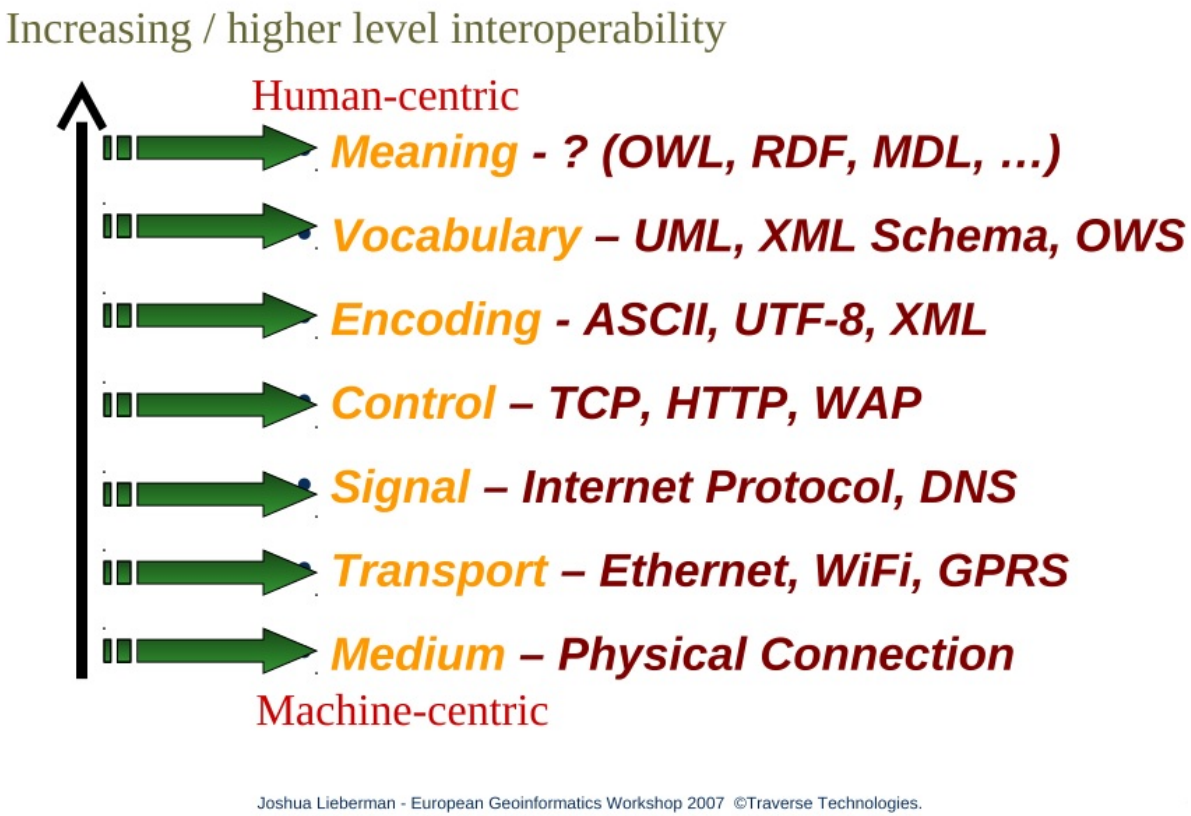
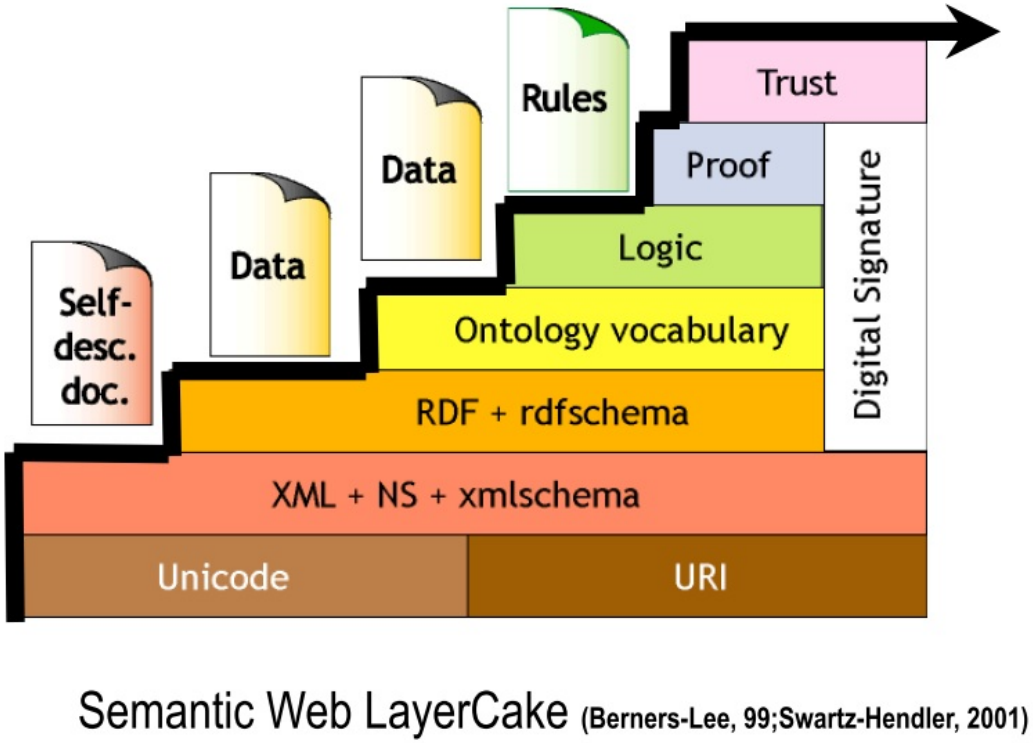


Figure: Interoperability Stack

Semantic Web Layer Cake



Semantic Web LayerCake (Berners-Lee, 99;Swartz-Hendler, 2001)

Figure: Semantic Web Layer Cake

Limitations of RDBMS

- Data integration is complex,
- Logical reasoning on data is not possible,
- Inferencing can not be performed.

Conclusions

For efficient spatial data integration we need to clarify and formalize the relevant standards landscape.In particular:

- to determine how spatial information can best be integrated with other data on the Web;
- to determine how machines and people can discover that different facts in different data-sets relate to the same place, especially when 'place' is expressed in different ways and at different levels of granularity;
- to identify and assess existing methods and tools and then create a set of best practices for their use;
- where desirable, to complete the standardization of informal technologies already in widespread use.

Conclusions

- We need to develop domain ontologies for a common understanding of data from different organizations,
- GeoOWL Ontologies development in Indian context
- Storing and processing RDF triples efficiently
- Sharing data using cloud computing platform

References

Important URI

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3. http://corescholar.libraries.wright.edu/cgi/viewcontent.cgi?article=2049&context=knoesis

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Important Research Articles

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2. Sheth, Amit, Cory Henson, and Satya S. Sahoo. "Semantic sensor web." IEEE Internet computing 12.4 (2008).
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4. Li, Wenwen, Chaowei Yang, and Robert Raskin. "A Semantic Enhanced Search for Spatial Web Portals." AAAI Spring Symposium: Semantic Scientific Knowledge Integration. 2008.

Thank You