Ontology Summit 2021
Theme: **Ontology Generation and Harmonization**



Track - **Ontology Landscape**

Ravi Sharma Feb 3, 2021

Introductory Remarks

To understand the Summit 2021 theme

- We list sources from which ontologies can be GERERATED
- We ask possible meanings behind Ontology HARMONIZATION
- Can these two views, Generation and Harmonization, help us create at least an ad-hoc ontology LANDSCAPE?

A view of the Ontology Landscape is being presented by my track's co-champion Todd Schneider in the next session.

Repositories: Sources for Ontology Generation

Texts, Audio and Visual assets including Thesauri, Dictionaries, Vocabularies

Archives (Passive and Active)

RDBMS, Warehouses, Bid Data, Linked Open Data, Data Lakes

Knowledge Bases, Information Bases,

Knowledge Graphs and EKGs, (extract ontologies from …).

World-wide and Semantic Web

Social Media repositories



TOOLS AND TECHNOLOGIES

- **Content, Format and transport related**
- IT and Languages, Systems, Solutions, Architecture and Standards
- Software - Programing – e.g., c, Python
- Query -SQL and variants
- XML, XMI, XBRL, Protégé
- Framework – RDF, RDFS, OWL, SWRL, SPARQL
- Framework – MOF- UML, DOL, Semantic Web Logic Language (SWeLL),
- Logic and Graphs FOL, CL, CL Interface to Predicate calculus (CLIP)

Learning Tools and Technologies

- Early Learning, Visuals, Logic-Reasoning, Models
- Language, Grammar, Dictionary, Predicates
- Information Technology, E-R, Conceptual Data Models
- Vocabularies-Terms, Controlled Languages
- Formal Learning, Math-FOL, NLP, Entity Extraction
- ML, AI, Neural Learning, Semantic interoperability
- Knowledge Representations, Knowledge Bases, KMS, OKN

Previous Summits: Knowledge Graphs, Explanations, Semantics



Generation (Lifecycle)

Example – Gartner style Hype Cycle

- Conceptual, foundational, Upper
- Architecture, Patterns and Standards
- Development
- Implementation
- Extension
- Operational Phase
- Sunset (End of Life)

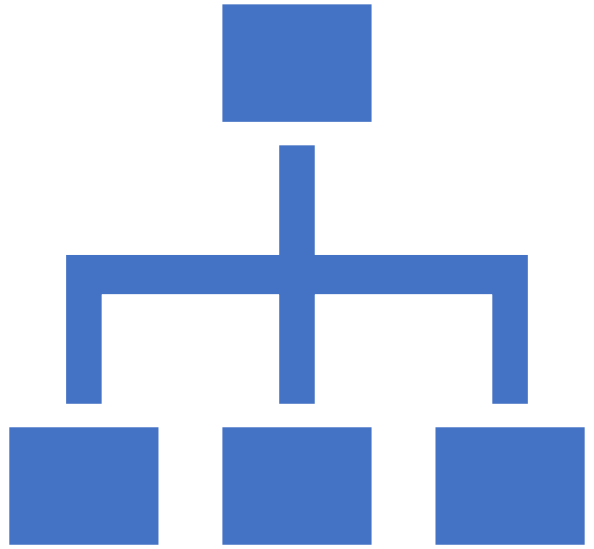
Ontology – Harmonization and Landscape

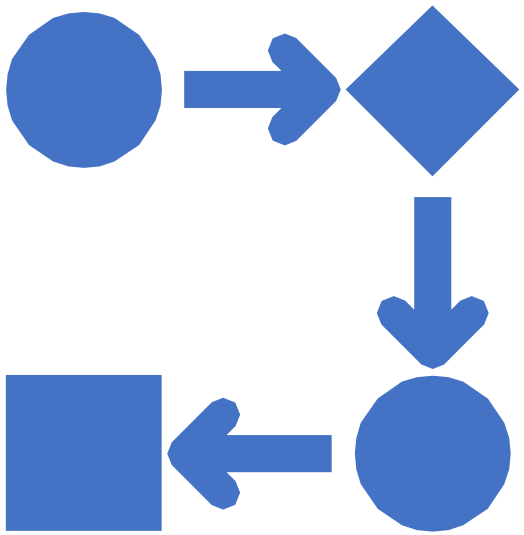
What is meant by Ontology Harmonization?

- Upper and Domain ontologies Integration (drill down)
- Domains, overlap and interoperation (Venn Diagrams)
- Enterprise extension and federation (ontologies)
- Generation of Data Dictionaries and Master Data Management

(that align or are harmonized?)

- Vocabularies alignment and common Terms (Imply Harmonization?)
- Semantic Integration of Ontologies (high relevance and benefits)





Harmonization (Continued)

- What can Landscape (predefined or iteratively) do for easier Generation and Harmonization?
- It is now clear that we have some ways to go before we understand and operationalize Harmonization!
- However, we see John Sowa describing some Harmonization avenues on next slide

From John Sowa – Relevant for Harmonization

- http://jfsowa.com/talks/eswc.pdf Section 7 Slides(#)
- Formal Concepts Analysis (FCA) - slide (56)
- Challenge: Relate diverse ontologies accros domaines. (59)
- Using FCA to Merge Ontologies (60)
- Federated Ontologies (61)

Ontology Landscape

- Based on Lifecycle

Concept, context, development (if Software-SDLC), Use (implement, operationalize), extend, update, retire by replacement

- Based on Generation Source (earlier slide)
- Based on Domain

Bio, Finance, Governance, airspace, themes, geolocation, social media,…

- Based on Value-chain

Data, Information, Knowledge Representations,

- Based on Logic, semantics
- Based on intended results ….Reasoning, Search for Discovery and reporting, analytics, visualizations include spatio-temporal!

Ontology Landscape is a tuple

$\mathcal{L}$ = F(LV, T, D, So, LC, VC, L, Sem, ….)

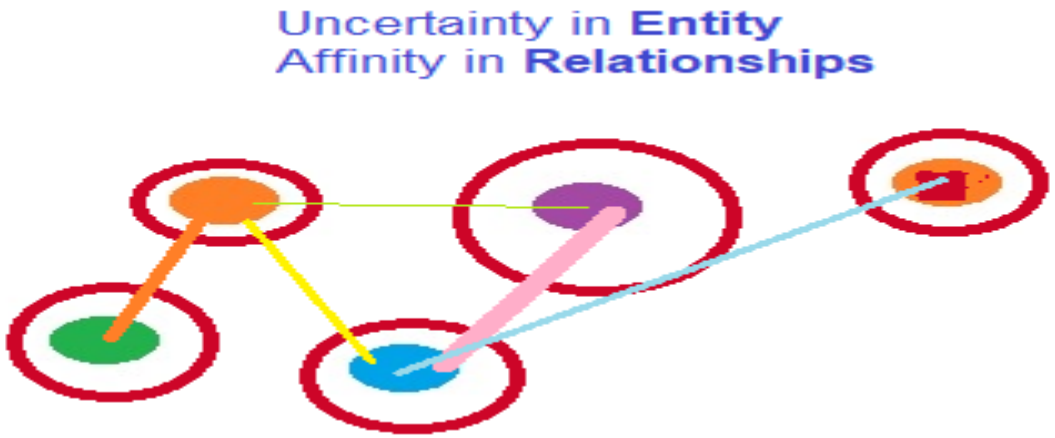
function of:

- **Level (upper, Lower) LV**
- **Time (dynamic) T**
- **Domain D**
- **Source S (see earlier Slides)**
- **Life Cycle LC**
- **Value Chain VC**
- **Logic (FOL) L**
- **Semantics SEM (Very Imp. For Harmonization)**
- **Etc…..**

Ontology Landscape From - Generation and Harmonization

Avenues where progress can be attempted

- Use Logic and Graphs with ease for automated Generation and interoperation
- **My favorite topics:** build Entities with uncertainties (statistical) and Relationships types based on Strengths (weights / Affinity).



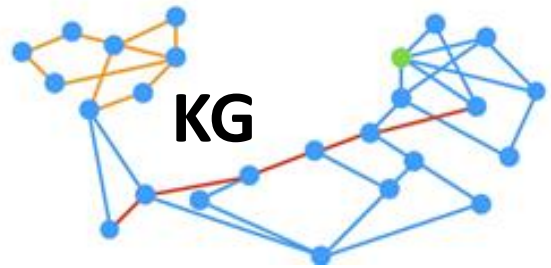
Ontology Landscape

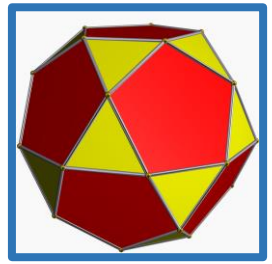
Generated Ontologies

VISUAL

Tools/ Technologies

Software Languages





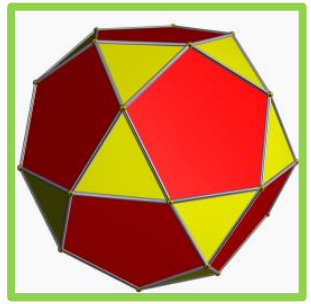
TEXT



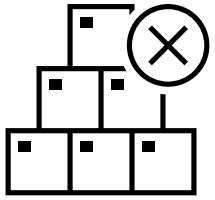
NL and NLP

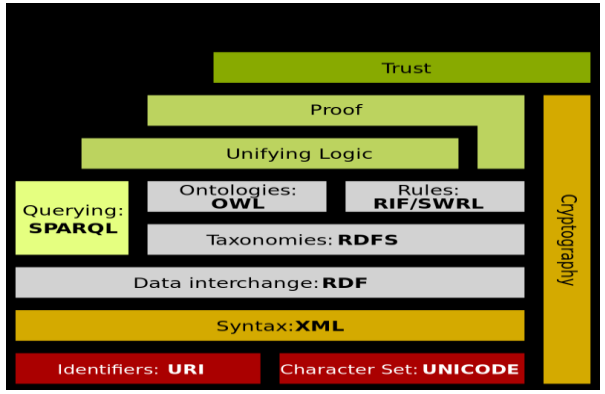
Ontology relevant Languages e.g. OWL, DOL, SWeLL, FOL, CL, CLIP

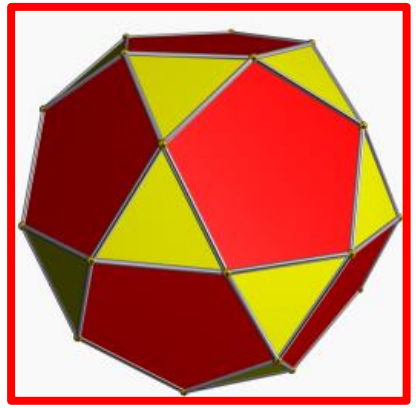
Generation

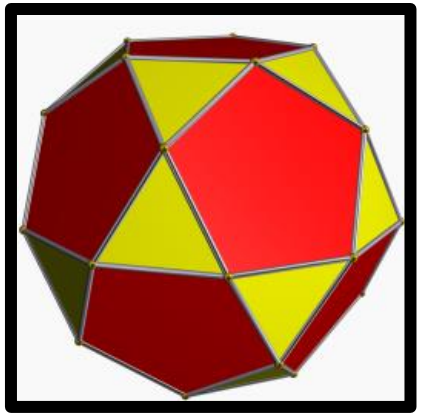


Repositories Metadata Archives









WWW

Knowledge Bases