Obliterate Silos with Knowledge Graphs

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CS 520 Knowledge Graphs

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Who Am I?

- Michael Uschold
- 25 years experience as ontologist and trainer
- Built commercial ontologies in numerous industries
  - Finance, Service level agreements, Electrical products, Digital asset management, Manufacturing, Legal research, Healthcare, Consumer products and Corporation registration.
- Recent author
Who is Semantic Arts?
Example: Building and Using a Knowledge Graph for Risk

- Build ontology to cover the operational risk subject.
- Convert selected data to triples.
- Combine with enterprise-wide reference data on employees, organizations and places.
- Build applications driven by the knowledge graph.

In Addition:
- Equity Research
- Technology Assets
- Information Management
Applications Driven by Knowledge Graphs

- Use a Triple Store instead of an RDB
- Use same Ontology for multiple TS's
- Use same TS for multiple applications
- More flexible
- Fewer silos
Data and Ontology in Same Store

- Serves multiple applications
- Can be federated across multiple stores
- Data-centric rather than Application-centric
Some Benefits

• Global IRIs: enhance data integration and reuse
• Avoids silos
• Existing applications more flexible
• Meaning first approach: enhances reuse

You cannot reuse what you don’t understand.
Wide Variety of Projects at Semantic Arts

- Product data and configuration
- Information & Application Integration
- Ontology driven chat-bot.
  - Modeling conversations.
  - A taxonomy of ‘intents’
- Expertise modeling for a major consultancy
- Gaming industry: moving beyond taxonomies
Information Providing Companies

- Strong metadata focus
- Retail products and services across many industries
- Commodity markets
- Faceted search is a common theme
- Industry Building Blocks to Capture the Global Economy
Experiences and Recommendations

- Whither schema
- The role of SHACL
- The Siren Call of Semantic Silos
- Change management
Whither Schema

- A lot of people prefer to not have a schema
- One major graph tool vendor says: you cannot have one
- You can build systems this way, but you cannot express meaning
- Defeats the original purpose of an ontology-driven approach
- Undermines understanding and reuse and drives more silos

SCHEMA: always use one, the earlier the better.
The Purpose of SHACL

- SHACL was designed to do many things
- A key one is to enable separation of the meaning of the subject matter (represented in OWL) from the needs of a particular application.
- One OWL ontology can be the basis for many triple stores and applications by using different SHACL constraints
- This helps avoid silos.
What About Using SHACL instead of OWL?

Although it can work for point solutions, it has major down sides

- Blurs the distinction between
  - What is true in the **real word**, which is relatively stable.
  - What is true for an **application** which can change frequently
- Limits reuse/sharing of an ontology for different applications.
- Undermines the core purpose of an ontology
- Encourages paving the cowpaths with Semantic Silos
Semantic Silos: Beware of Paving the Cow Paths

Layering semantic technology over silos is like paving over the cow paths.

Get short term benefit but lose out on the bigger gains.

Solution: Build an Enterprise Ontology
Agile Creation of an Enterprise Ontology (1/2)

Phase 1:

- Identify questions you want answers to as initial requirements.
- Build the ontology and triple store to meet those requirements.
- Build out applications that use the data.
Phase 2: a second iteration

- Broaden scope by identifying another set of questions as requirements
- Extend the ontology to meet the requirements.
- Coordinate with other ontology authors in the enterprise
- Make data and ontology available as triples.
- Extend existing and/or build out additional applications
Modularity, Reuse & Federated Queries

- HR Department:
  - Exempt employee
    - Salary
  - Hourly worker
    - Pay rate
  - Home Office
  - Jurisdiction

- IT Department:
  - User
  - Database
  - Server
  - Datacenter
  - City

- How to do a federated query to identify all Personnel?
Example: connect to generic schema

- HR Department:

- IT Department:

> Identical concepts will collapse into one.
- Personnel
- Building
Example: as a single graph

- Federated query to identify all Personnel becomes possible.
- Jurisdiction, City and Country are all GeoRegions

KEY
- Green: general
- Yellow: HR
- Pink: IT

URIs for Classes and Properties Enable Schema Reuse
There’s No Free Lunch

- It’s a lot of work. It’s worth it.
  - Agreeing on terminology & minting patterns
  - Evolution and extension
- Managing impacts of ontology changes
Ontology Update Pipeline

- With traditional RDB-driven applications updating the schema is rarely an option. A major driver for rigidity.
- We can do this, but there is no free lunch.
- Must inform all downstream users of ontology changes
Ontology Update Pipeline

Semantic technology specialists must:

• Update all their ontologies
• Update all the triple-creating code (e.g. TARQL)
• Re-create all the triples
• Re-load all the triples into productions stores
• Update all the SPARQL that drives application functionality.
Spreading Across the Enterprise

Adding new scope means adding more to the mix
- more people & more opinions
- more terms used in different ways
- more independently developed taxonomies & ontologies

How to cope?
- Create a Semantic Modeling and Ontology consortium
- Establish and maintain consistent standards
- Meet regularly
Summary & Conclusions

- Semantic technology is going mainstream
- Drive applications from a Knowledge Graph not an RDB
- Enterprise ontology silences the siren call of semantic silos
- Beware of using SHACL instead of OWL
- Ontology evolution pipeline requires care

Developing production systems driven by ontology and knowledge graphs is now repeatable and fairly predictable
Links

- Semantic Arts projects

- TALK: Automated Knowledge Base creation in a large financial services organization
  - By Nic Seyot of Morgan Stanley
  - Upcoming Knowledge Graphs Conference May 4 - 7

- 20% off code: Demystifying OWL for the Enterprise