

Semantic Technologies for Data Access and Integration: Part 2. Systems and Use Cases

Diego Calvanese, **Guohui Xiao**

KRDB Research Centre for Knowledge and Data
Free University of Bozen-Bolzano, Italy



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OBDA is by now a mature technology

Ontology-based querying of relational data sources is supported by several systems, both **open-source** and **commercial**:

- **Mastro** [C., De Giacomo, et al. 2011] ¹
Sapienza Università di Roma & OBDA systems SRL, Italy
- **Morph** [Priyatna, Corcho, and Sequeda 2014] ²
Technical University of Madrid, Spain
- **Ontop** [C., Cogrel, et al. 2017] ³
Free University of Bozen-Bolzano, Italy
- **Stardog** ⁴, Stardog Union, US
- **Ultrawrap** [Sequeda and Miranker 2013] ⁵, Capsenta, US
- **Oracle Spatial and Graph** ⁶

¹<http://www.obdasystems.com/it/mastro>

²<https://github.com/oeg-upm/morph-rdb>

³<http://ontop.inf.unibz.it>

⁴<http://www.stardog.com>

⁵<https://capsenta.com/ultrawrap>

⁶<http://www.oracle.com/technetwork/database/options/spatialandgraph>



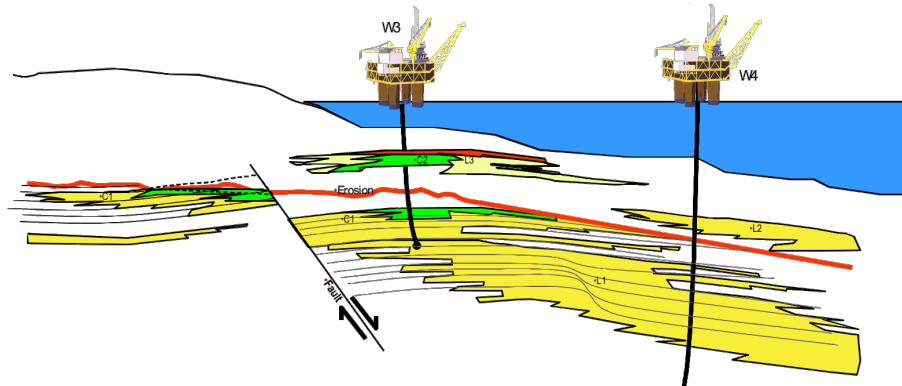
<http://ontop.inf.unibz.it/>

- State-of-the-art OBDA system developed at the Free University of Bozen-Bolzano.
- Compliant with all relevant Semantic Web standards:
RDF, RDFS, OWL 2 QL, R2RML, and SPARQL
- Supports all major relational DBs:
Oracle, DB2, MS SQL Server, Postgres, MySQL, Denodo, Teiid, Exareme, etc.
- **Open-source** and released under Apache 2 license.
- Development of *Ontop*:
 - development started in 2009
 - already well established and widely adopted:
 - +200 members in the mailing list
 - +9000 downloads in last 2 years
 - main development was carried out in the context of the EU project **Optique**

Selected Use Cases of OBDA

- Oil & Gas: Statoil [Kharlamov et al. 2017a]
- Turbine Diagnoses: Siemens [Kharlamov et al. 2017b]
- Development of data integration solutions: SIRIS Academic SL Barcellona [Mosca, Rondelli, and Rull 2017]
- Log Extraction in Process Mining – Euregio financed project KAOS [Calvanese, Kalayci, et al. 2017]
- Cultural heritage: EPNet project [Calvanese, Liuzzo, et al. 2016]
- Maritime security: EMSec project [Brüggemann et al. 2016]
- Manufacturing [Petersen et al. 2017]
- Health care: electronic health records [Rahimi et al. 2014]
- Public debt: the Italian Ministry of Economy and Finance [Antonioli et al. 2014]
- Smart cities: IBM Ireland [López et al. 2015]
- ...

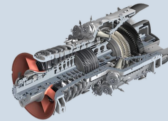
- Optique use case partner
- Exploration domain: analyse existing relevant data in order to find exploitable accumulations of oil or gas
- Improve the efficiency of the information gathering routine for geologists
- Efficient, creative data collection from multiple large volume data sources



Siemens use case

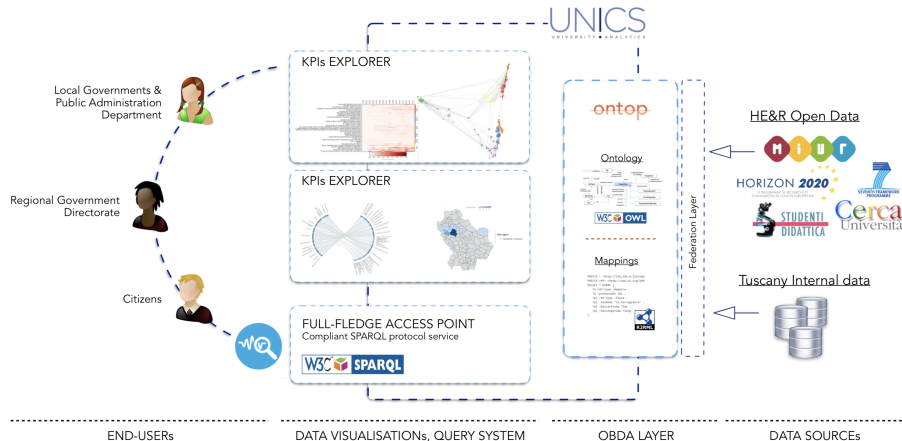
- Optique use case partner
- Siemens energy department
- streaming and temporal data

- Siemens
 - produces huge appliances, e.g., turbines
 - installs them in plants
- Siemens service centers
 - offers constant monitoring and diagnostics service
 - over 50 service centers world wide
 - each SC is responsible for several thousands appliances
 - their job: monitoring and diagnostic of turbine
- Monitoring and diagnostic tasks
 - reactive and preventive diagnostics
 - offline, after an issue is detected
 - predictive analyses
 - real-time, to avoid issues



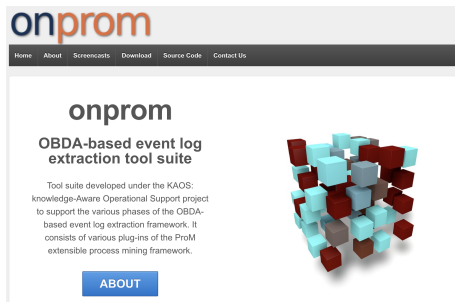
Tuscany's Observatory of Research and Innovation

- Carried out by SIRIS Academic SL Barcellona and the Tuscany Region
- Support the Higher Education and Research system, and promoting innovation in the Tuscan territory [Mosca, Rondelli, and Rull 2017]



Log Extraction in Processing Mining

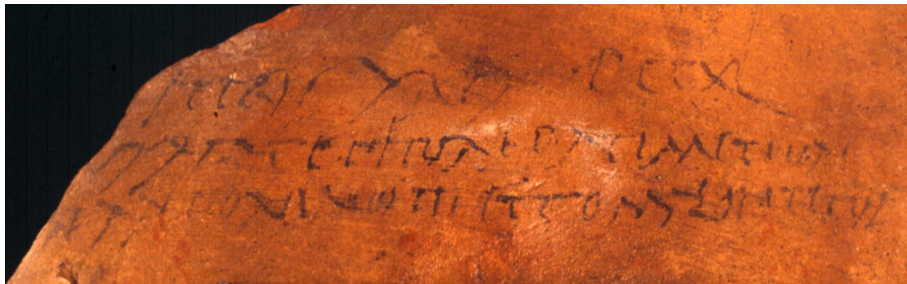
- Process Mining as a way to reconcile model-driven management and the real behaviours
- Processing mining tools (e.g. Disco [fluxicon.com]) require data in a particular format (XES)
- Data preparation is an issue in presence of legacy data
- onprom⁷ is an effective tool chain for extracting event logs from legacy databases



⁷<http://onprom.inf.unibz.it/>

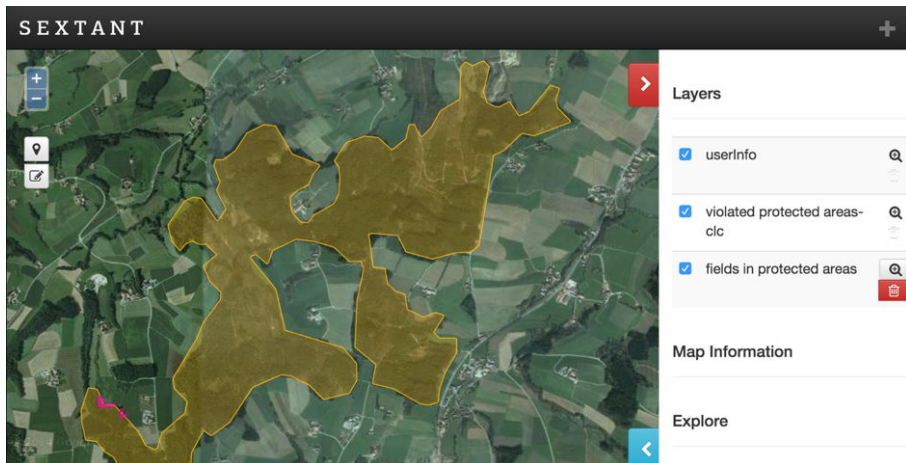
EPNet project

- Ontology-based data integration for humanities and archaeologists
- ERC advanced grant EPNet “Production and distribution of food during the Roman Empire: Economics and Political Dynamics”.
- Linking three datasets:
 - 1 the EPNet relational repository
 - 2 the Epigraphic Database Heidelberg
 - 3 the Pleiades dataset



Melodies project

- EU FP7 Melodies project: working with Open Data, 16 partners.
- Geospatial extension Ontop-spatial used for accessing geospatial data
- Use cases: urban development, land management, disaster management



EMSec project

- German BMBF project EMSec, collaborated with Airbus:
- real-time services for maritime security
- Geo-spatial support by Ontop-spatial (developed as a fork of *Ontop*)
- SPARQL federation to access different kinds of data sources:
 - SPARQL endpoints of *Ontop* over *in situ* data
 - open SPARQL endpoints: Geonames, DBPedia



- Scenario: Integration of the information systems of two universities
- Requirements
 - Java 8
 - H2 with preloaded datasets
 - Protégé bundle with Ontop for editing ontologies and mappings
 - Tomcat bundle with Ontop for deploying a SPARQL endpoint
- Programme
 - Mapping the first data source
 - Mapping the second data source
 - Deploying a SPARQL endpoint
- Instruction: Session 1 of the Ontop Tutorial:
<https://github.com/ontop/ontop-examples/edit/master/ontop-v3-tutorial/>

- Protégé does not work with newer versions (>8) of Java
- Reasoner needs to be restarted whenever ontology or mapping are changed. Reasoner “stop” and “start” is more reliable than “synchronize”.
- The SPARQL endpoint part can be done independently

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