ORACLE

RDF Graphs

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Product Manager

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RDF Graphs in Oracle Database

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Key Features

- Scalable RDF Graph database
  - Scales to billions of nodes and edges
- Full standards support
  - RDF, OWL, SPARQL
- Supports Property Graph analytics

Oracle Spatial and Graph:
Benchmarking a Trillion Edges RDF Graph

ORACLE WHITE PAPER | NOVEMBER 2016

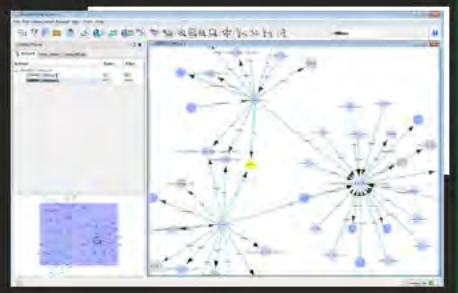
- **Enterprise capabilities** – part of Oracle converged database
  - Manageability, fine-grained security, high availability, and more
  - On premise, on engineered systems and in Cloud database services

RDF Knowledge Graph Architecture

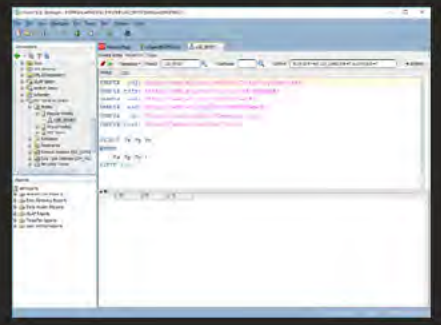
Protégé Plugin

Fuseki Endpoint

Cytoscape Plugin



SQL Developer RDF Support



Enterprise Manager and Other DB Tools

Support for Apache Jena (Java API)

SQL and PL/SQL API

RDF Bulk Loader

Forward-chaining OWL Reasoner

SPARQL-to-SQL Query Translator

SPARQL Update Processor

RDF Data

Oracle SQL Developer RDF Support

Oracle SQL Developer

File Edit View Navigate Run Team Tools Window Help

Connections

- Analytic Views
- Scheduler
- RDF Semantic Graph
  - Models
    - Regular Models
      - MESH_DATA
      - MESH_SCHEMA
      - TEST_MODEL
    - Virtual Models
      - MESH_ALL
      - MESH_ASSERTED
    - RDF Views
      - EMPDB1_MODEL
  - Rulebases
  - Entailments
    - MESH_ENT

Reports

- All Reports
- Analytic View Reports
- Data Dictionary Reports
- Data Modeler Reports
- OLAP Reports
- TimesTen Reports
- User Defined Reports

nesemperf2_vm | EMPDB1_MODEL | EMPDB1_MODEL - R2RML

Refresh Tree | Commit Mapping To: EMPDB1_MODEL | Options CREATE_ANYWAY=T

Tree View | R2RML(nt) | R2RML(ttl)

Add Triples Map | Delete

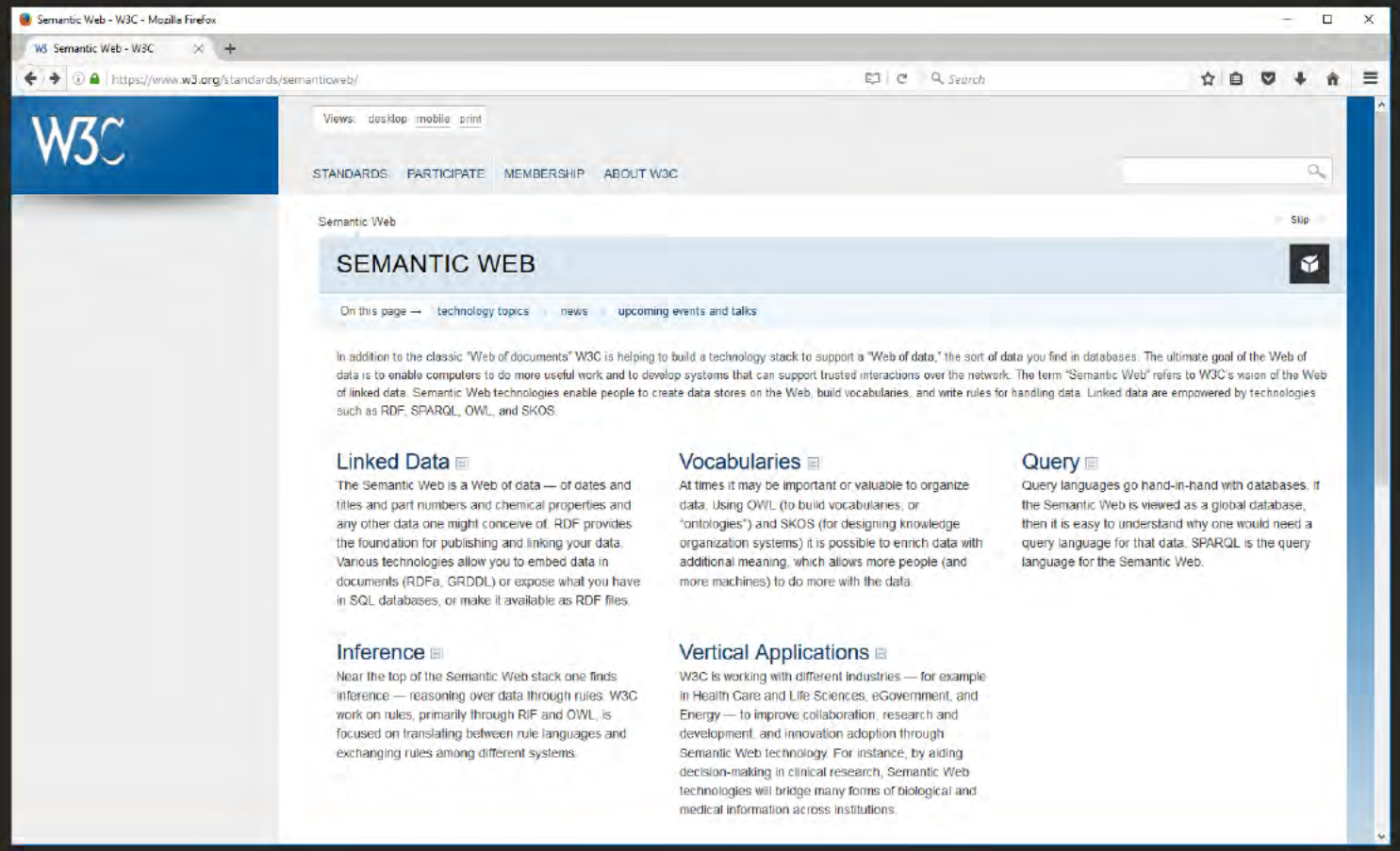
Node	Description/Value	Actions
R2RML Mapping		
Triples Map	Generates triples fromRDFUSER.EMP Table	Edit
Logical Table	RDFUSER.EMP	
Subject Map		
Predicate Object Map	<http://mydb/RDFUSER.EMP#SAL> -> SAL	
Predicate Map	<http://mydb/RDFUSER.EMP#SAL>	
Object map		
Column Name	"\"SAL\""	
Data Type	<http://www.w3.org/2001/XMLSchema#decimal>	
Predicate Object Map	<http://mydb/RDFUSER.EMP#MGR> -> MGR	
Predicate Object Map	<http://mydb/RDFUSER.EMP#ENAME> -> ENAME	
Predicate Object Map	<http://mydb/RDFUSER.EMP#FROM_DATE> -> FROM_DATE	
Predicate Object Map	<http://mydb/RDFUSER.EMP#JOB> -> JOB	
Predicate Object Map	<http://mydb/RDFUSER.EMP#EMPNO> -> EMPNO	
Triples Map	Generates triples fromRDFUSER.WORKED_FOR Table	Edit
Triples Map	Generates triples fromRDFUSER.DEPT Table	Edit

W3C Standards for Knowledge Graphs

The World Wide Web Consortium has defined a suite of standards to support Linked Data and Knowledge Graphs.

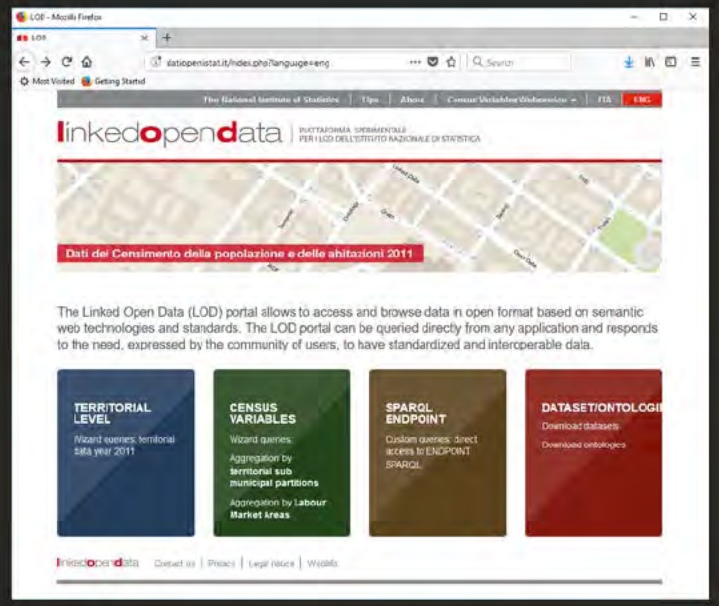
Fundamental Concepts are:

- URIs
- Links to other resources
- Standard Data Model (RDF)
- Standard Ontology Language (OWL)
- Standard Query (SPARQL)

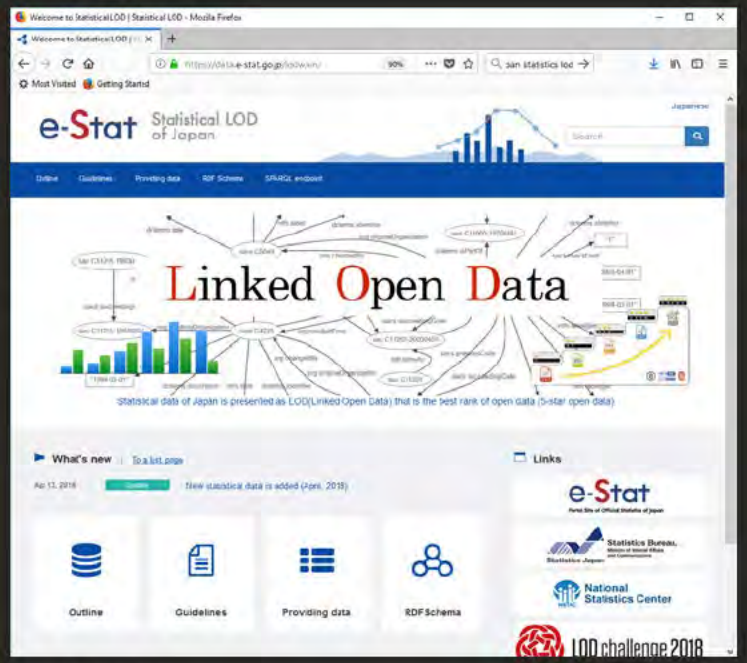


Use Case: Linked Data Publishing

- Publishing data in a standard way so that it can be more easily consumed
- Popular way for government agencies to publish public data
- Why RDF?
  - URIs
  - Flexible data model
  - Standard vocabularies
  - Standard protocols



Italy
National Institute of Statistics



Japan
National Statistics Center

2.1 billion triples queried in 1.27 secs on Oracle Cloud

Use Case: Semantic Data Integration

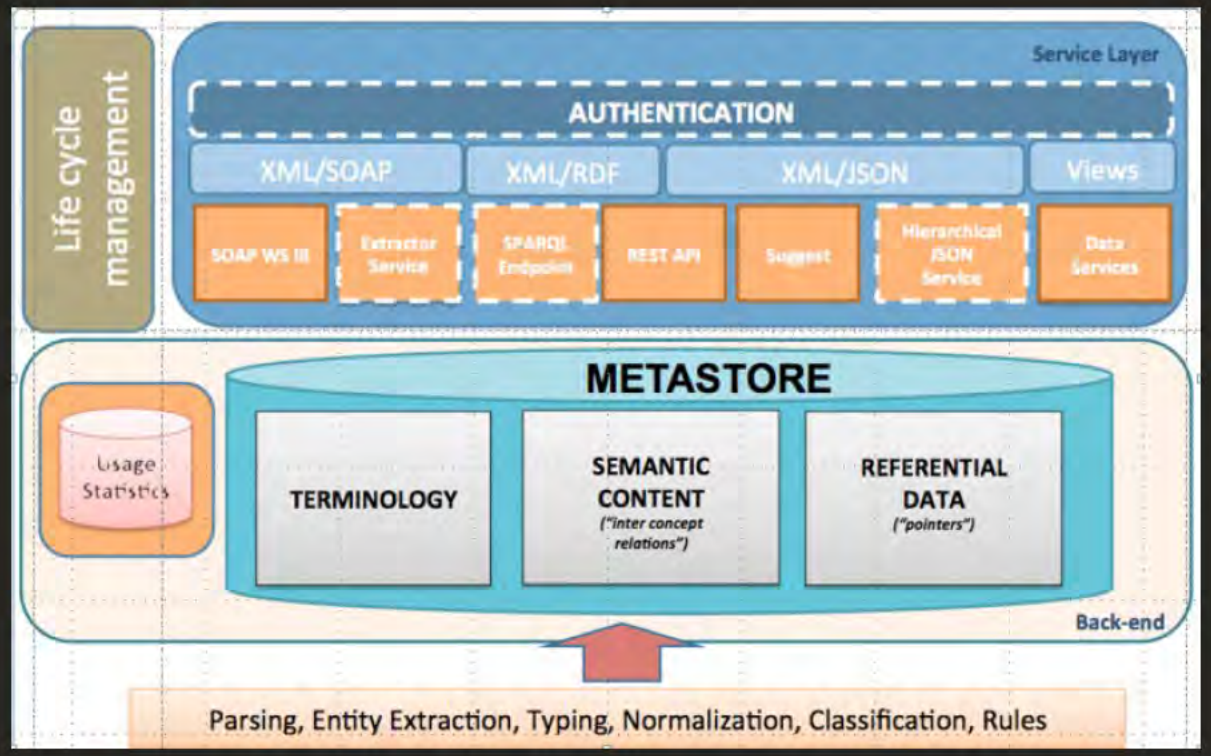
Novartis Institutes for BioMedical Research (NIBR)

Business Challenge

- Link database information on genes, proteins, metabolic pathways, compounds, ligands, etc. to original sources.
- Increase productivity for accessing, sharing, searching, navigating, cross-linking, analyzing internal /external data

Solution

- Semantic integration layer on RDF graph
- Rich domain-specific terminology (biology, chemistry and medicine) 1.6 M terms
- Terminology Hub: 8 GB of referential data that cross-references between data repositories.



Use Case: Smart Engineering/Construction

Build Order

PDF

Engineering Standards

PDF

Government Regulations

PDF

Product Specifications

PDF

Manual assessment by discipline-specific engineers

Requirements and Specifications Ontology

Automated reasoning and queries

Summary

- RDF Graph query and data management
  - Extreme scalability
  - Feature-rich
  - Standards compliant
  - Fully integrated as feature of Oracle converged database