Developing an RDF4J Adapter for Oracle Spatial and Graph

SPARQL Focus
Your speaker

Timea Turdean
Software Engineer at Semantic Web Company

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TechCast objective

- Oracle RDF4J Adapter usage for SPARQL
  - Adapter work towards SPARQL on Oracle
  - Use case
 Semantic Web & RDF Databases

<subject> <predicate> <object>
<https://example.com/hr/Manuela>
a onto:Employee ;
dcterms:title "Manuela Spencer" ;
dcterms:description "Manuela works..." ;
onto:bin-salary onto:110000 .
What makes a store RDF ready?

It implements at least one of the RDF ready libraries/frameworks:

▸ Eclipse RDF4J
▸ Apache Jena

It offers a SPARQL endpoint to query the database using SPARQL

Source: Oracle Spatial and Graph website
Oracle Spatial and Graph - Apache Jena

Oracle Database Release 18c offers support for:

- Apache Jena 3.1
- Apache Jena Fuseki 2.4
- Protege 5.2

Available adapters:

- Download Oracle Database 19c Support for Apache Jena 3.1.0, Apache Jena Fuseki 2.4, and Protégé Desktop 5.2 (March 2019—ZIP - 166 MB)
- Download Oracle Database 12c Release 12.1.0.2 Support for Apache Jena 3.1, Apache Jena Fuseki 2.4, and Protégé Desktop 5.0 (September 2018—ZIP - 140.6 MB)
- Download Oracle Database 12c Release 12.1.0.2 Support for Apache Jena 2.11.2, Apache Jena Fuseki, and Protégé Desktop 4.3 (June 2016—ZIP - 101.3 MB)
- Download Oracle Database 12c Release 12.1.0.2 Support for Apache Jena 2.11.1, Apache Jena Fuseki, and Protégé Desktop 4.3 (Feb. 2016—ZIP - 74.5 MB)
- Download Oracle Database 12c Release 12.1.0.1 Support for Apache Jena 2.11.1, Apache Jena Fuseki, and Protégé Desktop 4.3 (Oct. 2015—ZIP - 77.5 MB)

Source: [Oracle Spatial and Graph downloads](#)
Oracle Spatial and Graph - RDF4J

Collaboration work between Semantic Web Company and the Oracle A-Team to create a new adapter for the Java based RDF4J library.

Kudos to: Derek Kam and Emma Thomas from Oracle A-Team!

RDF4J capabilities brings:

▸ Community opportunity - RDF4J GitHub repo
▸ More RDF skilled developers
▸ PoolParty Semantic Suite
Repository repository = new OracleRepository("jdbc:oracle...", "PPARTYRDFDEV", "pass", "HRdemo");
RepositoryConnection connection = repository.getConnection();
Repository repository = new OracleRepository("jdbc:oracle...", "PPARTYRDFDEV", "pass", "HRdemo");
RepositoryConnection connection = repository.getConnection();

TupleQueryResult rs = connection.prepareStatement("SELECT (COUNT(*) AS ?count) WHERE {?s ?p ?o}"").evaluate();
BooleanQuery queryResult = connection.prepareStatement("ASK {?x foaf:name "Alice"}"");
Learnings
Repository repository = new OracleRepository("jdbc:oracle...", "PPARTYRDFDEV", "pass", "HRdemo");
RepositoryConnection connection = repository.getConnection();
Repository repository = new OracleRepository("jdbc:oracle...", "PPARTYRDFDEV", "pass", "HRdemo");

RepositoryConnection connection = repository.getConnection();

connection.add(dataset,"",RDFFormat.TRIG);

→ → →

this.oracleSailConnection.getBulkUpdateHandler().addInBulk(...);
SPARQL query methods check

- `prepareTupleQuery(String query)`
- `prepareTupleQuery(QueryLanguage ql, String query)`
- `prepareBooleanQuery(String query)`
- `prepareBooleanQuery(QueryLanguage ql, String query)`
- `prepareGraphQuery(QueryLanguage ql, String query)`
- `prepareGraphQuery(String query)`
- `prepareUpdate(QueryLanguage ql, String query)`
- `prepareUpdate(String query)`
- `prepareQuery(QueryLanguage ql, String query)`
- `prepareQuery(String query)`
@Test

public void count() {
    String query = "SELECT (COUNT(*) AS ?count) WHERE { ?s ?p ?o }";

    TupleQueryResult rs = connection.prepareTupleQuery(query).evaluate();
    assertTrue(rs.hasNext());
    BindingSet bs = rs.next();
    assertEquals(someValue, bs.getBinding("count").getValue().stringValue());
}
SPARQL SYNTAX

- `COUNT(*)`
- `COPY ?g1 To ?g2`
- `COALESCE`
  - `BIND(COALESCE(?definition, ?commenty, ?description) AS ?entityDescription )`
  - Literals which can contain more than 4000 characters -> CLOB datatype
    - Patch for Oracle database 18c
- `CONSTRUCT`
- Variable names same as Oracle reserved words and keywords

Source: Oracle SQL reserved words and keywords
@Test
public void variableBinding() {
    String query = "SELECT ?s WHERE {
    { SELECT ?p ?super WHERE {
        ?s <http://www.w3.org/2000/01/rdf-schema#subPropertyOf>+ ?super. }
    }
    ?s ?p ?o "};

    GraphQuery graphQuery = connection.prepareGraphQuery(QueryLanguage.SPARQL, query);
    graphQuery.setBinding("s", VF.createIRI("http://example.com/124314"));
    graphQuery.setBinding("p", VF.createIRI("http://example.com/served"));
    graphQuery.evaluate();
}
USE CASE
As an HR manager, for upcoming training programmes, I want to identify employees who:

- have a certain skill set
- have a specific degree
- have skills that are increasingly important on the labour market
- fall into a specific salary range
HR Analytics

Now I can identify employees along many dimensions.
Prepare your OCI database for RDF Graphs

Steps described on the A-Team blog post: Set up RDF Graph Database in OCI
## Connecting to ORACLE

<table>
<thead>
<tr>
<th>Name</th>
<th>Oracle GraphSearch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Graph Databases</td>
</tr>
<tr>
<td>Type</td>
<td>Oracle</td>
</tr>
<tr>
<td>URL</td>
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<td>HRdemo</td>
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<td>Use Credentials</td>
<td>✔️</td>
</tr>
<tr>
<td>User Name</td>
<td>PPARTYRDFDEV</td>
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<tr>
<td>Password</td>
<td></td>
</tr>
</tbody>
</table>
Demo - Oracle RDF4J Adapter with PoolParty
Catch us at SEMANTiCS 2019 Conference

- **Michael Sullivan** keynote speaker about “Try not to move the data”

- **Emma Thomas** presentation and demo [Building and Visualising Enterprise-Ready Knowledge Graphs in the Cloud](#) using the Oracle RDF4J Adapter
Next steps

- Knowledge Graphs and more: [Semantic Web Company resources](#)
- Use case/application gallery: [Semantic Web Company demos](#)
- Semantic Web e-learning and certification: [PoolParty Academy](#)
- Oracle Spatial and Graph: [Graph Features](#)
- Intro to Graphs at Oracle: [blog post by Michael Sullivan](#)
- Link to the webinar for this slides: [https://bit.ly/2Y08bm3](https://bit.ly/2Y08bm3)
Connect

Timea Turdean
Software Engineer at Semantic Web Company

- timea.turdean@semantic-web.com
- https://at.linkedin.com/in/timeaturdean
- https://twitter.com/semwebcompany

Q&A