

9. Direct Mapping with D2RQ

The purpose of this lab is to let you learn how to publish RDF data from relational databases using D2RQ.

D2RQ

Direct Mapping¹ defines a simple transformation from relational data that can be used to materialize RDF graphs or define virtual graphs, which can be queried by SPARQL. Direct Mapping takes as input a relational database (data and schema), and generates an RDF graph that is called the direct graph.

D2RQ² is a system for accessing relational databases as virtual, read-only RDF graphs. It supports the W3C Direct Mapping and offers RDF-based access to the content of relational databases without having to replicate it into an RDF store.

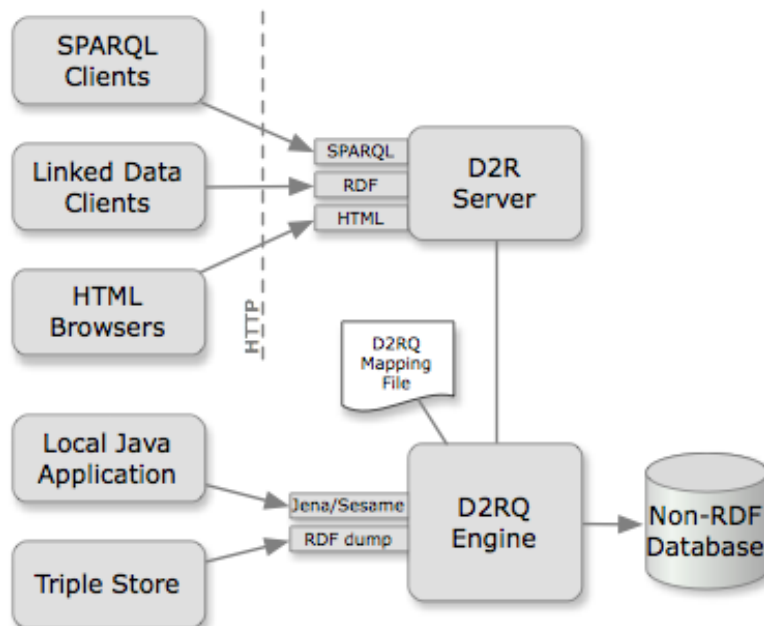


Figure 1: D2RQ Architecture

The D2RQ platform consists of:

- D2RQ Mapping Language, a declarative mapping language for describing the relation between an ontology and a relational data model.

¹<http://www.w3.org/TR/rdb-direct-mapping/>

²<http://d2rq.org/>

- D2RQ Engine, a SPARQL-to-SQL rewriter that can evaluate SPARQL queries over your mapped database. It extends ARQ, the query engine that is part of Apache Jena.
- D2R Server, an HTTP server that provides a Linked Data view, an HTML view for debugging and a SPARQL Protocol endpoint over the database.

Direct Mapping over Databases from Lecture Slides

Recall the exercises from the last part of the lecture slides about Direct Mapping. There are three databases, each of which consists of the Source and Target tables. Use D2RQ to transform each of the databases into RDF.

1. D2RQ supports databases such as Oracle, MySQL, HSQLDB and PostgreSQL. Install one of them.
2. Each database is provided in the SQL folder at <http://bit.ly/1uKja8V> with the filenames `case1.sql`, `case2.sql` and `case3.sql`. Load them into separate databases.

D2RQ is available as a ZIP archive at <http://bit.ly/1qXy13o>. Download and extract the archive into a suitable location. Then, download a JDBC driver from your database vendor. Place the driver's JAR file into D2R Server's `/lib/db-drivers/` directory.³

3. For each of the databases, run the generate-mapping tool provided by D2RQ with the command:

```
generate-mapping -o $mapping-filename$ --w3c -d $driver-class-name$ -u $db-user$ -p $db-password$ $jdbc:url-to-database$
```

The command creates a D2RQ mapping file by analyzing the schema of an existing database. This mapping file can be used as-is. The parameters are defined as follows:

- `-o $mapping-filename$`
The generated mapping will be stored in this file in Turtle syntax.
- `--w3c`
Generate a mapping file that is compatible with W3C Direct Mapping.
- `-d $driver-class-name$`
The fully qualified Java class name of the database driver.
- `-u $db-user$`
The login name of the database user.
- `-p $db-password$`
The password of the database user.
- `$jdbc:url-to-database$`
JDBC connection URL for the database.

³For MySQL, PostgreSQL, and HSQLDB, the D2RQ platform already includes the drivers.

4. Start the D2RQ server with the command:

```
d2r-server $mapping-filename$
```

The command runs the D2R Server as a stand-alone server application that includes its own web server. The parameter `$mapping-filename$` should be set to the D2RQ mapping file you just created.

5. Open `http://localhost:2020/` in a web browser to test the server. You can browse the database content or use the SPARQL Explorer to execute queries and display results in a number of formats.
6. Give the results of the query:

```
SELECT * { ?s ?p ?o } LIMIT 10
```

Direct Mapping over Books Database

Transform a database about books (`books.sql`) into RDF using the similar steps. Choose five generated RDF triples. Explain how they can be generated with respect to the Direct Mapping technique.⁴

Additionally, provide and execute SQL and SPARQL queries of the following:

1. How many affiliated writers are there?
2. Which books were authored by Kate Pearce?
3. What genre is the book Amberville?
4. Which books have the genre horror?
5. Which books were published after 2009?

⁴Use the lecture slides as your reference.