Semantic Days 2011 Tutorial
Semantic Web Technologies

Lecture 5: Presenting Relational Databases as RDF

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Department of Informatics

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Outline

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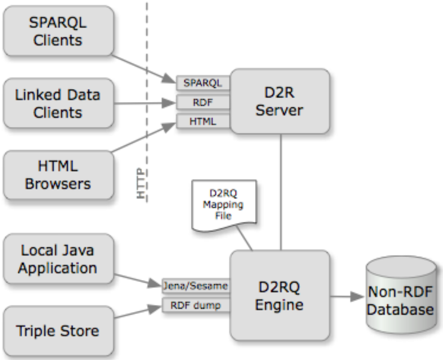
    - Drawback: need to keep "old-fashioned" DB backend

Outline

D2R/D2RQ

- Allows to treat relational databases as RDF



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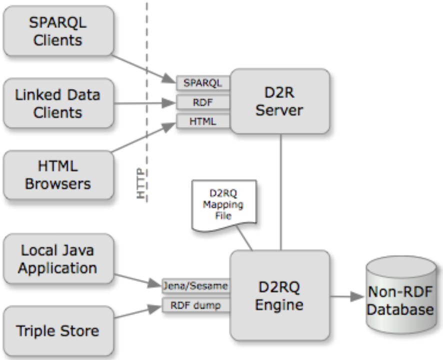

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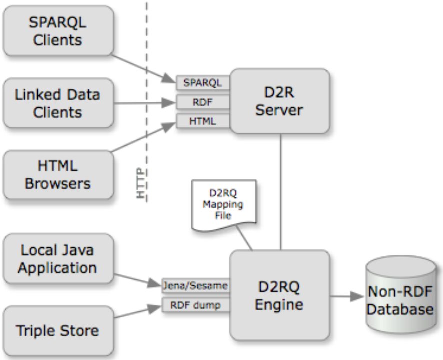

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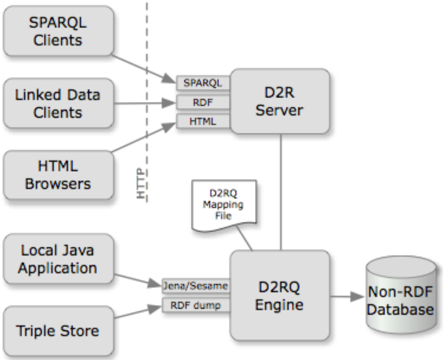

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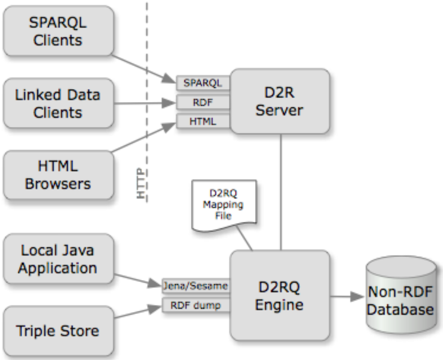
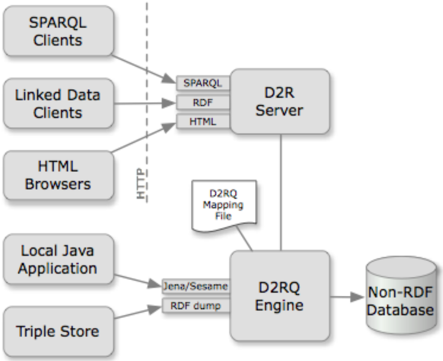
- Also on-demand RDF/HTML pages following LOD protocol



D2RQ Engine

- Reads a “Mapping File”



D2RQ Engine

- Reads a “Mapping File”
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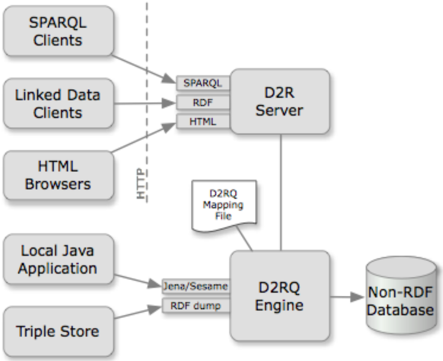

D2RQ Engine

- Reads a "Mapping File"
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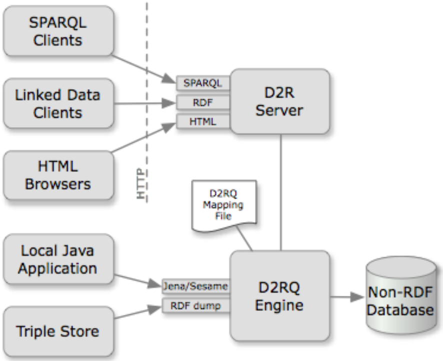
  - Row → Resource



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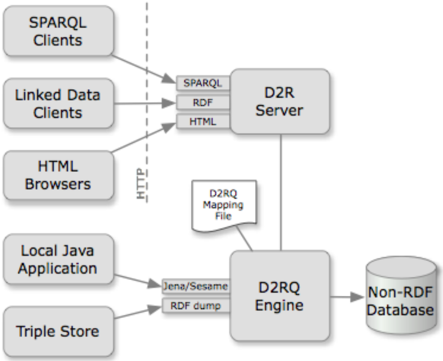

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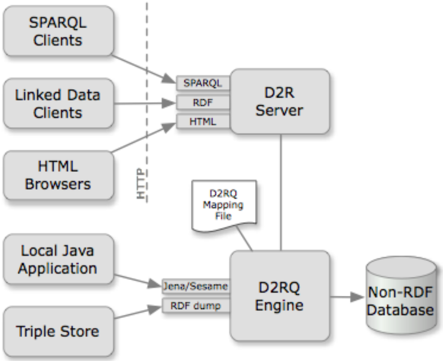

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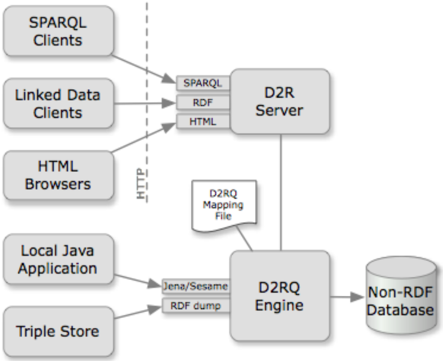

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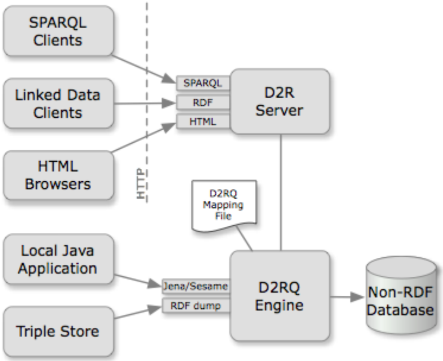

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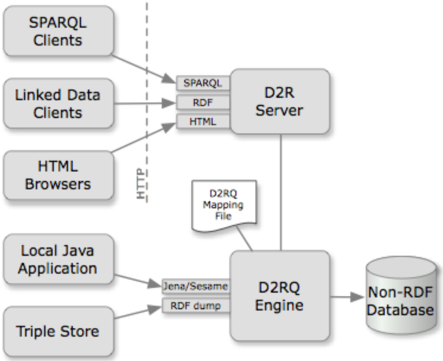

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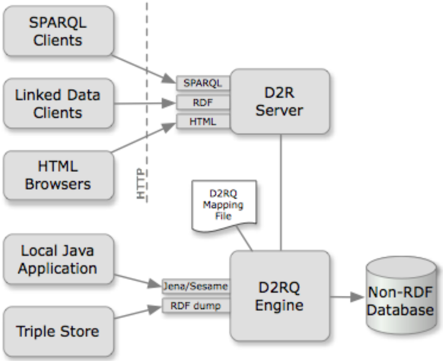
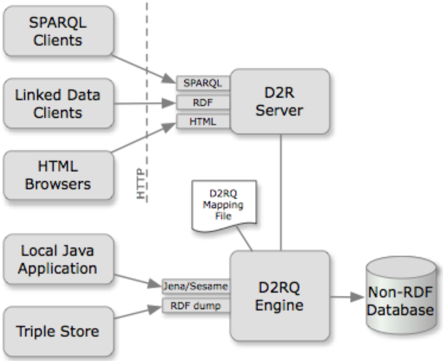
- Can also export whole DB



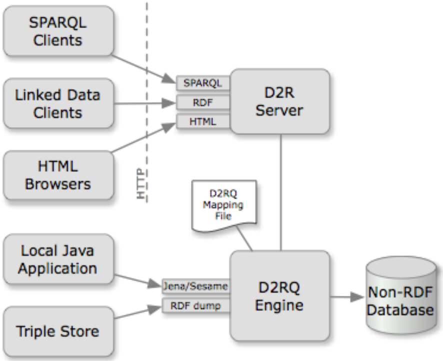
D2R Server

- Provides WWW-frontend



D2R Server

- Provides WWW-frontend
- SPARQL Endpoint



D2R Server

- Provides WWW-frontend
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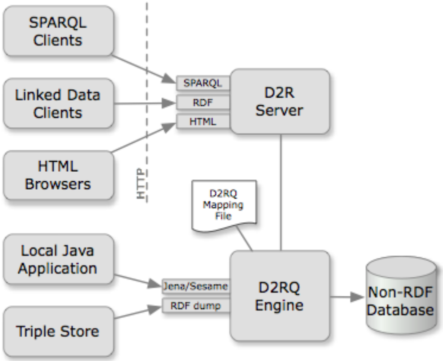

D2R Server

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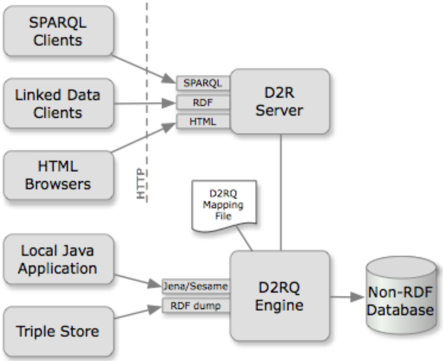

D2R Server

- Provides WWW-frontend
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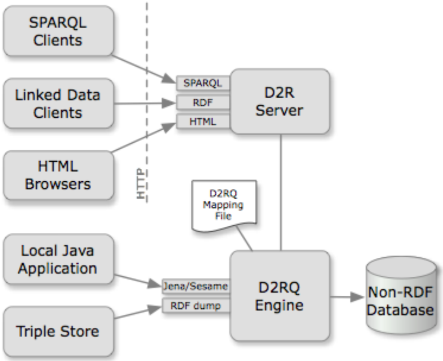
- Pages of data for HTTP browsers
- All requests translated to SPARQL



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  - Capital: the City ID of the country's capital

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  - Continent: the Continent the country lies in
  - Capital: the City ID of the country's capital
  - ...

Example: World Database (cont.)

- Table City:

ID	**Name**	**CountryCode**	...
	...		
2806	Kingston	NFK	...
2807	Oslo	NOR	...
2808	Bergen	NOR	...
	...		

Example: World Database (cont.)

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- Table Country:

Code	**Name**	**Continent**	**Capital**	...
...				
NLD	Netherlands	Europe	5	...
NOR	Norway	Europe	2807	...
NPL	Nepal	Asia	2729	...
...				

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Where Classes Come From

- From a mapping file for the World database:

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  - `<http://.../City/2808> a vocab:City.`

Resources for Countries and Continents

- The same for countries:

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- …generate a resource with URI `.../Continent/...`
- …removing spaces from “North America”, etc.

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- For everything in the `Continent` column of `Country`...
- ...generate a resource with URI `.../Continent/...`
- ...removing spaces from “North America”, etc.
- E.g. `http://.../resource/Continent/North_America`

Where Properties Go To

- A mapping for city names:

```
map:City_Name a d2rq:PropertyBridge ;
    d2rq:belongsToClassMap map:City ;
    d2rq:property vocab:name ;
    d2rq:propertyDefinitionLabel "name" ;
    d2rq:column "City.Name" .
```

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- Identify a “property bridge”

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- Also possible to define literals with patterns containing columns

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    d2rq:property vocab:inCountry ;
    d2rq:refersToClassMap map:Country ;
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- From countries to capitals:

```
map:Country_Capital a d2rq:PropertyBridge;
    d2rq:belongsToClassMap map:Country;
    d2rq:property vocab:capital;
    d2rq:refersToClassMap map:City;
    d2rq:join "Country.Capital=>City.ID";
```

Resulting Graph

After adding similar mappings for country names and `inContinent`:

```
<http://.../City/2807> a vocab:City ;
         vocab:name "Oslo" ;
         vocab:inCountry <http://.../Country/NOR> .

<http://.../Country/NOR> a vocab:Country ;
         vocab:name "Norway" ;
         vocab:capital <http://.../City/2807> ;
         vocab:inContinent <http://.../Continent/Europe> .
```

Linking to DBpedia

- Add property bridge:

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map:Country_DBpedia a d2rq:PropertyBridge;
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- Careful: Generating links like this often fails for some cases:
  - World DB country name: `Sao Tome and Principe`
  - DBpedia URI: `http://.../São_Tomé_and_Príncipe`
- Better in general to have a DB table with corresponding URIs

Adding Reasoning

- Given an ontology saying that
  - Every Country is a Place
  - Every Contintent is a Place
- A SPARQL Query that asks for all places with "ica" in the name should find
  - South America, Africa,...
  - Costa Rica,...
- Not possible to attach reasoning to D2R (yet)
- Need to do some programming to connect reasoner and D2R
- See exercises to play with this!...

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- Only partial, experimental implementations so far
- Full implementations will come, and replace D2R

Exercise: D2R Server

- Install D2R server.
- Generate mapping.
- Start server.
- Change mapping.
- Run Java program querying D2R data after reasoning.

Go to `http://sws.ifi.uio.no/semdays2011/` for the full exercise text.