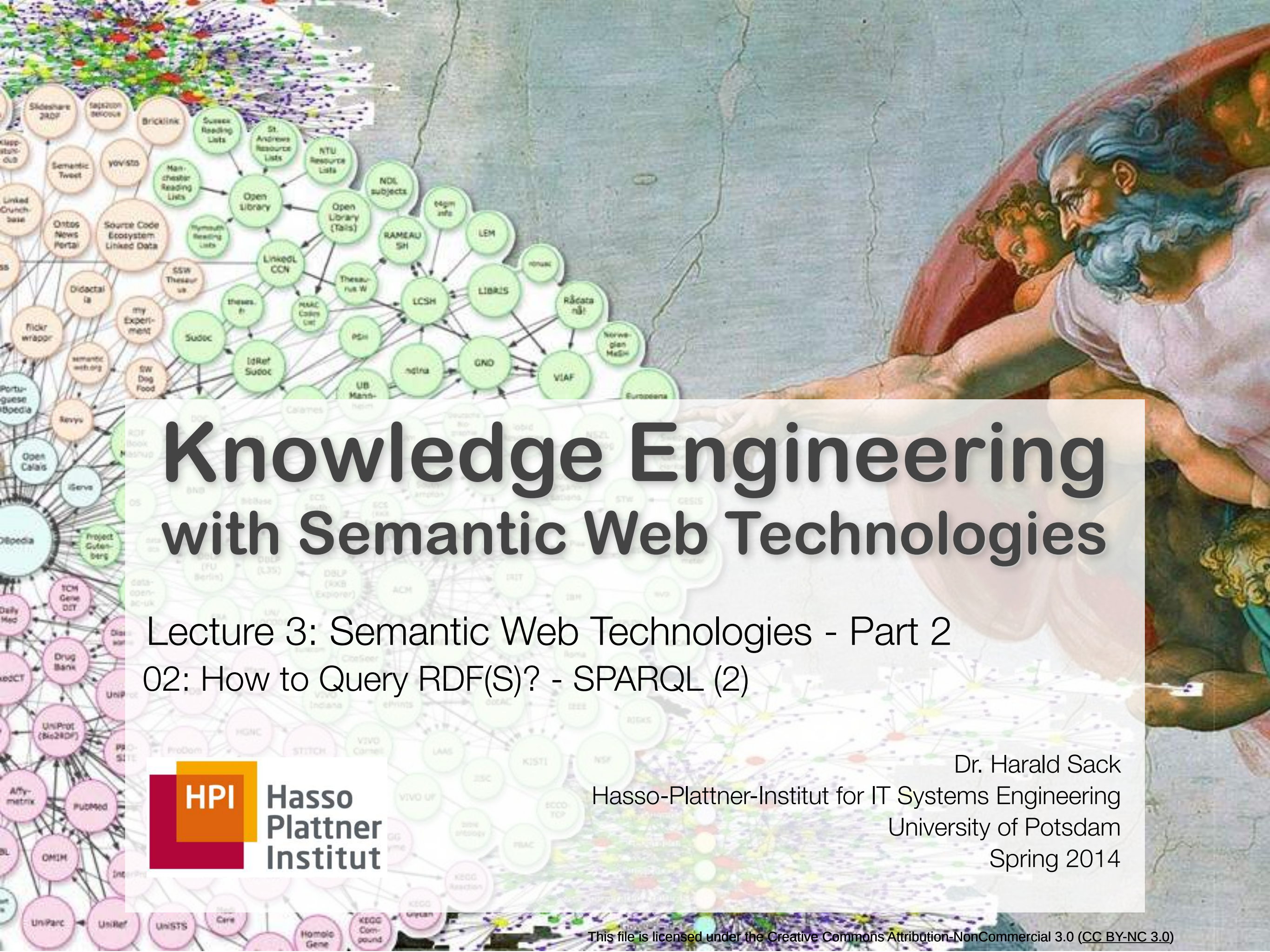


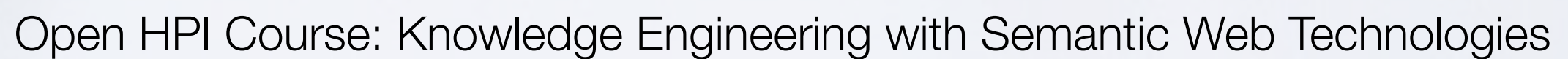


Knowledge Engineering with Semantic Web Technologies

Lecture 3: Semantic Web Technologies - Part 2
02: How to Query RDF(S)? - SPARQL (2)



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02 How to query RDF(S) ? – SPARQL (2)

Open HPI Course: Knowledge Engineering with Semantic Web Technologies
Lecture 03: Semantic Web Technologies Pt.2

SPARQL is not only a Query Language

- **SPARQL Protocol and RDF Query Language** is
 - a **Query Language** for RDF Graph Traversal
(*SPARQL Query Language Specification*)
 - a **Protocol Layer**, to use SPARQL via http
(*SPARQL Protocol for RDF Specification*)
 - an **XML Output Format Specification** for SPARQL Queries
(*SPARQL Query XML Results Format*)

- SPARQL results are given as well formed and valid XML documents

```
<?xml version="1.0"?>
<sparql xmlns="http://www.w3.org/2005/sparql-results#">
  ...
</sparql>
```

- In a **<head>** element all variables of the SPARQL query are listed

```
<head>
  <variable name="x"/>
  <variable name="hpage"/>
  <variable name="name"/>
  <variable name="mbox"/>
  <variable name="blurb"/>
</head>
```

- For each SPARQL Query result exists a **<result>** element

```
<?xml version="1.0"?>
<sparql xmlns="http://www.w3.org/2005/sparql-results#">
  <head>
    <variable name="x"/>
    ...
  </head>
  <results>
    <result>
      <binding name="x"> ... </binding>
      <binding name="hpage"> ... </binding>
    </result>

    <result> ... </result>
    ...
  </results>
</sparql>
```

— *single
SPARQL
query result*

- Within a **<binding>** element a **<head>** variable is bound to a result

```
<result>
  <binding name="x">
    <bnode>r2</bnode>
  </binding>
  <binding name="hpage">
    <uri>http://work.example.org/bob/</uri>
  </binding>
  <binding name="name">
    <literal xml:lang="en">Bob</literal>
  </binding>
  <binding name="age">
    <literal datatype="http://www.w3.org/2001/XMLSchema#integer">
      30
    </literal>
  </binding>
  <binding name="mbox">
    <uri>mailto:bob@work.example.org</uri>
  </binding>
</result>
```

*variable
bound to a
result*

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- Method to query/respond of SPARQL queries via http
- A SPARQL URI consists out of 3 parts:
 1. URL of a SPARQL endpoint
(e.g. <http://example.org/sparql>)
 2. RDF Graph(s) to be queried
(optional, part of the query string,
z.B. [named-graph-uri=http://example.org/testrdf.rdf](http://example.org/testrdf.rdf))
 3. Query string
(part of the query string, e.g. [query=SELECT...](#))

```
http://example.org/sparql?named-graph-uri=http%3A%2F%2Fexample.org%2Ftestrdf&
query=SELECT+%3Freview_graph+WHERE+%7B%0D%0A++GRAPH+%3Freview_graph+%7B%0D%0A+++++%3Freview+rev%3Arating+10+.%0D%0A++%7D%0D%0A%7D
```

SPARQL Protocol - Example

• Simple SPARQL Query

```
PREFIX dc: <http://purl.org/dc/elements/1.1/>  
SELECT ?book ?who  
WHERE { ?book dc:creator ?who }
```

• HTTP Trace of the SPARQL Query

```
GET /sparql/?query=EncodedQuery&default-graph-uri=http://  
www.other.example/books HTTP/1.1  
Host: www.other.example  
User-agent: my-sparql-client/0.1
```

- HTTP Trace of the SPARQL Response

```
HTTP/1.1 200 OK
Date: Fri, 06 May 2008 20:55:12 GMT
Server: Apache/1.3.29 (Unix) PHP/4.3.4 DAV/1.0.3
Connection: close
Content-Type: application/sparql-results+xml
<?xml version="1.0"?>
<sparql xmlns="http://www.w3.org/2005/sparql-results#">
  <head>
    <variable name="book"/>
    <variable name="who"/>
  </head>
  <results ordered="false" distinct="false">
    <result>
      <binding name="who">
        <literal>Bob Hacker</literal>
      </binding>
      <binding name="book">
        <literal>The Art of Hacking</literal>
      </binding> ...
    </result>
  </sparql>
```

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- In addition to **SELECT** queries SPARQL allows:

- **ASK**

- Check whether there is at least one result
- Result: true or false
- Result is delivered as XML or JSON

```
PREFIX rdf:    <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
```

```
PREFIX dbpedia-owl: <http://dbpedia.org/ontology/>
```

```
ASK
```

```
FROM <http://dbpedia.org/>
```

```
WHERE {
```

```
    ?author rdf:type dbpedia-owl:Writer .
```

```
    ?author dbpedia-owl:notableWork ?work .
```

```
}
```

- In addition to **SELECT** queries SPARQL allows:
 - **DESCRIBE**
 - Result: an RDF graph with data about resources
 - Result is RDF/XML or Turtle

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>  
PREFIX dbpedia-owl: <http://dbpedia.org/ontology/>
```

```
DESCRIBE ?author ?work  
FROM <http://dbpedia.org/>  
WHERE {  
    ?author rdf:type dbpedia-owl:Writer .  
    ?author dbpedia-owl:notableWork ?work .  
} LIMIT 10
```

- In addition to **SELECT** queries SPARQL allows:

- **CONSTRUCT**

- Result: an RDF graph constructed from a template
- Template: graph pattern with variables from the query pattern
- Result is RDF/XML or Turtle

```
PREFIX rdf:    <http://www.w3.org/1999/02/22-rdf-syntax-ns#>  
PREFIX dbpedia-owl: <http://dbpedia.org/ontology/>
```

```
CONSTRUCT { ?author <http://example.org/hasWritten> ?work .}  
FROM <http://dbpedia.org/>  
WHERE {  
    ?author rdf:type dbpedia-owl:Writer .  
    ?author dbpedia-owl:notableWork ?work .  
} LIMIT 100
```

Popular SPARQL Endpoints

- <http://sparql.org/sparql.html> --
General Purpose SPARQL Endpoint
- <http://dbpedia.org/sparql> --
DBpedia SPARQL Endpoint
- <http://dblp.rkbexplorer.com/sparql/> --
DBLP (Computer Science Bibliographies) SPARQL Endpoint
- <http://linkedmdb.org/sparql> --
Linked Movie Database SPARQL Endpoint
- <http://www.w3.org/wiki/SparqlEndpoints> --
W3C supported list of active SPARQL endpoints
- ...

SPARQL



03 Complex queries with SPARQL

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