COMP318

Ontologies and Semantic Web

SPARQL - Part 4

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Where were we

- SPARQL graph patterns

- Different types of graph patterns for the query pattern (WHERE clause):
    - Basic graph pattern (BGP)
    - `Group` graph pattern
    - `Optional` graph pattern
    - `Union` graph pattern
    - `Graph` graph pattern (Constraints)

Negation

“What volcanoes are not called Beerenberg?”

```
SELECT ?v WHERE {
 ?v rdf:type umbel-sc:Volcano .
    rdfs:label ?name .
 FILTER (STR(?name) != "Beerenberg")
}
```

result

```
?v
==================
dbpedia:Mount_Etna
dbpedia:Mount_Baker
dbpedia:Beerenberg
```

```
@prefix rdf: rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix umbel-sc: <http://umbel.org/umbel/sc/> .
@prefix dbpedia: <http://www.dbpedia.org/> .

dbpedia:Mount_Etna rdf:type umbel-sc:Volcano ;
            rdfs:label "Etna" ;
            p:location dbpedia:Italy .
dbpedia:Mount_Baker rdf:type umbel-sc:Volcano ;
             p:location dbpedia:United_States .
dbpedia:Beerenberg rdf:type umbel-sc:Volcano ;
            rdfs:label "Beerenberg"@en ;
            rdfs:label "Беренберг"@ru .
            p:location dbpedia:Norway .
```

Negation as failure

“What volcanoes are not called Beerenberg?”

```
SELECT ?v WHERE {
 ?v rdf:type umbel-sc:Volcano .
 OPTIONAL { ?v rdfs:label ?name .
           FILTER (STR(?name) = "Beerenberg") }
FILTER ( ! BOUND(?name) )
}
```

result

```
?v
=================
dbpedia:Mount_Etna
dbpedia:Mount_Baker
```

```
@prefix rdf: rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix umbel-sc: <http://umbel.org/umbel/sc/> .
@prefix dbpedia: <http://www.dbpedia.org/> .

dbpedia:Mount_Etna rdf:type umbel-sc:Volcano ;
              rdfs:label "Etna" ;
              p:location dbpedia:Italy .
dbpedia:Mount_Baker rdf:type umbel-sc:Volcano ;
               p:location dbpedia:United_States .
dbpedia:Beerenberg rdf:type umbel-sc:Volcano ;
              rdfs:label "Beerenberg"@en ;
              rdfs:label "Бееренберг"@ru .
              p:location dbpedia:Norway .
```

Negation as failure

- The **`OPTIONAL`** pattern does not generate bindings in the following two cases:
  - There is no **`rdfs:label`** property for **`?v`**
  - There is an **`rdfs:label`** property for **`?v`** but its string value is not “Bareenberg”

- These two cases are then selected for output by the **`FILTER`** condition that uses **`!bound`**.

```
@prefix rdf: rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix umbel-sc: <http://umbel.org/umbel/sc/> .
@prefix dbpedia: <http://www.dbpedia.org/> .

dbpedia:Mount_Etna rdf:type umbel-sc:Volcano ;
                rdfs:label "Etna" ;
                p:location dbpedia:Italy .
dbpedia:Mount_Baker rdf:type umbel-sc:Volcano ;
                 p:location dbpedia:United_States .
dbpedia:Beerenberg rdf:type umbel-sc:Volcano ;
                rdfs:label "Beerenberg"@en ;
                rdfs:label "Бееренберг"@ru .
                p:location dbpedia:Norway .
```

Negation

“Which volcanoes do not have a name (***rdfs:label***)?”

```
SELECT ?v WHERE {
  ?v rdf:type umbel-sc:Volcano .
  OPTIONAL { ?v rdfs:label ?name }
  FILTER( ! BOUND(?name) )
}
```

result

```
?v
=================
dbpedia:Mount_Baker
```

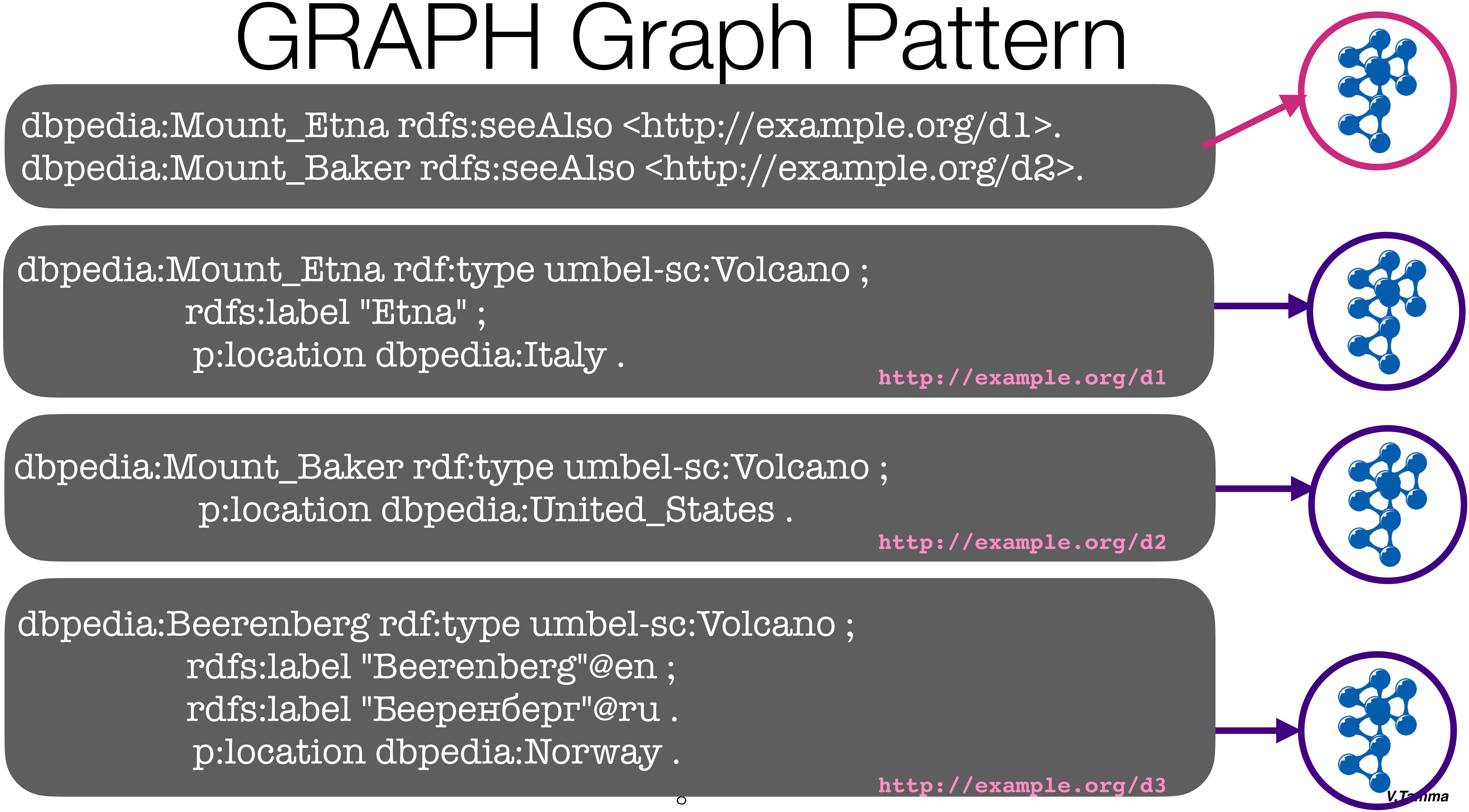
```
@prefix rdf: rdf: <http://www.w3.org/1999/02/22-
rdf-syntax-ns#> .
@prefix umbel-sc: <http://umbel.org/umbel/sc/> .
@prefix dbpedia: <http://www.dbpedia.org/> .

dbpedia:Mount_Etna rdf:type umbel-sc:Volcano ;
              rdfs:label "Etna" ;
              p:location dbpedia:Italy .
dbpedia:Mount_Baker rdf:type umbel-sc:Volcano ;
               p:location dbpedia:United_States .
dbpedia:Beerenberg rdf:type umbel-sc:Volcano ;
              rdfs:label "Beerenberg"@en ;
              rdfs:label "Бееренберг"@ru .
              p:location dbpedia:Norway .
```

GRAPH Graph patterns

- SPARQL queries are executed against RDF datasets
    - the default graph and zero or more **named graphs**
        - identified by a URI
- Named graphs
    - hardwired in a particular endpoint
    - or specified through the `FROM NAMED` clause
        - which allows us to scope the query being asked (e.g. to the graphs that comprise an application's user-data storage).
    - the `GRAPH` keyword allows portions of a query to match against the named graphs in the dataset
        - Anything outside the scope of `GRAPH` clause matches only against the default graph

GRAPH Graph Pattern



```
dbpedia:Mount_Etna rdfs:seeAlso <http://example.org/d1>.
dbpedia:Mount_Baker rdfs:seeAlso <http://example.org/d2>.
```

```
dbpedia:Mount_Etna rdf:type umbel-sc:Volcano ;
                   rdfs:label "Etna" ;
                    p:location dbpedia:Italy .
```

http://example.org/d1

```
dbpedia:Mount_Baker rdf:type umbel-sc:Volcano ;
                    p:location dbpedia:United_States .
```

http://example.org/d2

```
dbpedia:Beerenberg rdf:type umbel-sc:Volcano ;
                   rdfs:label "Beerenberg"@en ;
                   rdfs:label "Беерeнберг"@ru .
                    p:location dbpedia:Norway .
```

http://example.org/d3

GRAPH graph pattern

“Find all the volcanoes and the dataset they are described in”

```
SELECT ?g ?v
 WHERE
 GRAPH ?g {
   ?v rdf:type umbel-sc:Volcano . }
```

result:

```
          ?v                 name
============================================
dbpedia:Mount_Etna    http://example.org/d1
dbpedia:Mount_Baker   http://example.org/d2
dbpedia:Beerenberg    http://example.org/d3
```

GRAPH graph pattern

“Find all the volcanoes and the dataset they are described in”

```
SELECT ?g ?v
 FROM NAMED http://example.org/d1
 FROM NAMED http://example.org/d2
 WHERE
 GRAPH ?g {
   ?v rdf:type umbel-sc:Volcano . }
```

```
          ?v                 name
============================================
dbpedia:Mount_Etna    http://example.org/d1
dbpedia:Mount_Baker   http://example.org/d2
```

SPARQL

- SPARQL is the query language for querying RDF. It allows users to:
  - Pull values from ***structured*** and ***semi-structured*** data
  - Explore data by querying ***unknown relationships***
  - Perform ***complex joins*** of ***disparate databases*** in a single, simple query
  - ***Transform RDF data*** from one vocabulary to another

Result formats

- The results of SPARQL queries can be returned and/or rendered in a variety of formats:
    - ***XML***. SPARQL specifies an XML vocabulary for returning tables of results.
    - ***JSON***. A JSON "port" of the XML vocabulary, particularly useful for Web applications.
    - ***RDF***. Certain SPARQL result clauses trigger RDF responses, which in turn can be serialized in a number of ways (RDF/XML, N-Triples, Turtle, etc.)
    - ***HTML***. When using an interactive form to work with SPARQL queries.
        - Often implemented by applying an XSL transform to XML results.

Query Result Forms

- `SELECT`: Projection of query result
- `CONSTRUCT`: Returning RDF Graph
- `DESCRIBE`: Returning descriptions of RDF resource
  - not treated here
- `ASK`: “yes/no” query

Reconstructing an RDF Graph: CONSTRUCT

- `CONSTRUCT { basic triple pattern* }`
- Query result is an RDF graph
- Form of RDF Graph described using graph template
  - Construct graph for each pattern solution
  - Triples with unbound variables discarded
  - Illegal RDF triples discarded

CONSTRUCT Query Answers: example

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX vcard: <http://www.w3.org/2001/vcard-rdf/3.0#>
CONSTRUCT
{ <http://example.org/person#Alice> vcard:FN ?name }
WHERE { ?x foaf:name ?name }
```

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@example.org> .
```

Result

```
=================================================================
@prefix vcard: <http://www.w3.org/2001/vcard-rdf/3.0#> .
<http://example.org/person#Alice> vcard:FN "Alice" .
```

Boolean Queries: Ask

- `ASK { graph pattern }`

- “Does the query have an answer?”
  - `ASK` replaces `WHERE`
  - Queries without variables are meaningful

ASK Query Answers: example

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
ASK { ?x foaf:name "Alice" }
```

Result

```
=============================================
yes
```

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
_:a foaf:name "Alice" .
_:a foaf:homepage
            <http://work.example.org/alice/> .
_:b foaf:name "Bob" .
_:b foaf:mbox <mailto:bob@work.example> .
```

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End of SPARQL - Part 4

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