SPARQL

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Basic SPARQL

http://www.w3.org/TR/sparql11-query/

SPARQL

SELECT

Get data

ASK

Yes/No questions

CONSTRUCT

Create RDF

DESCRIBE

Get some information

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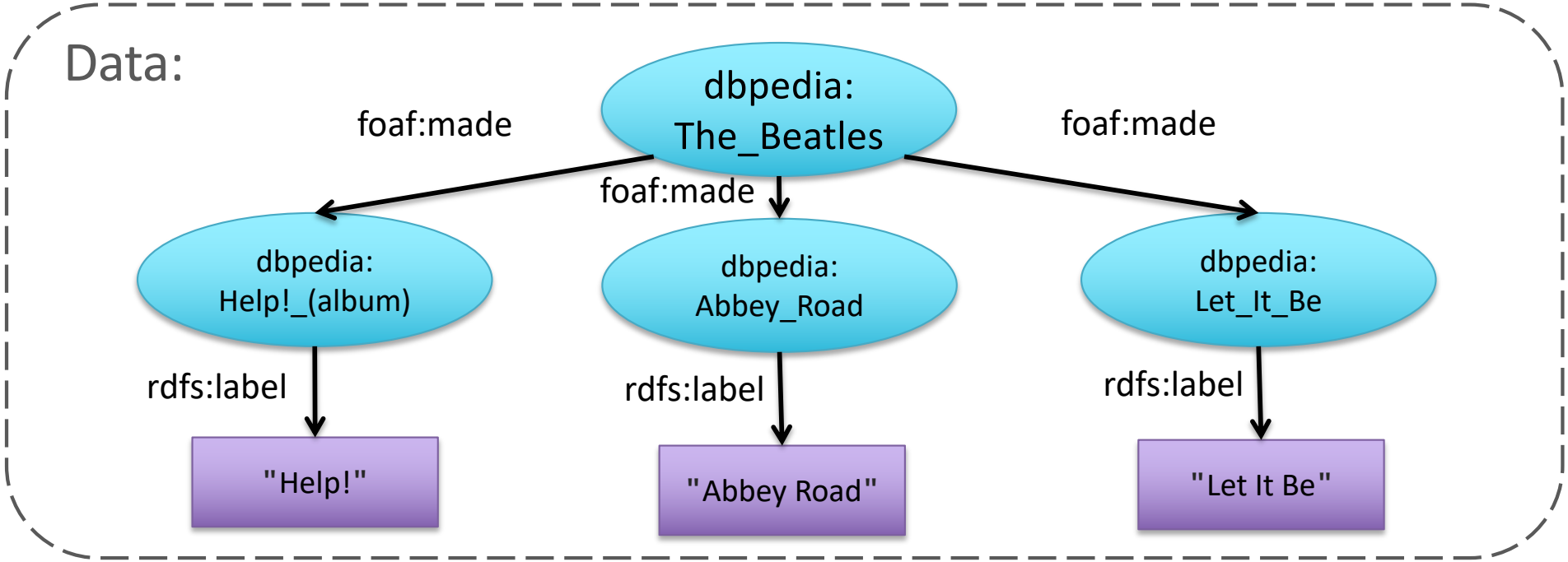
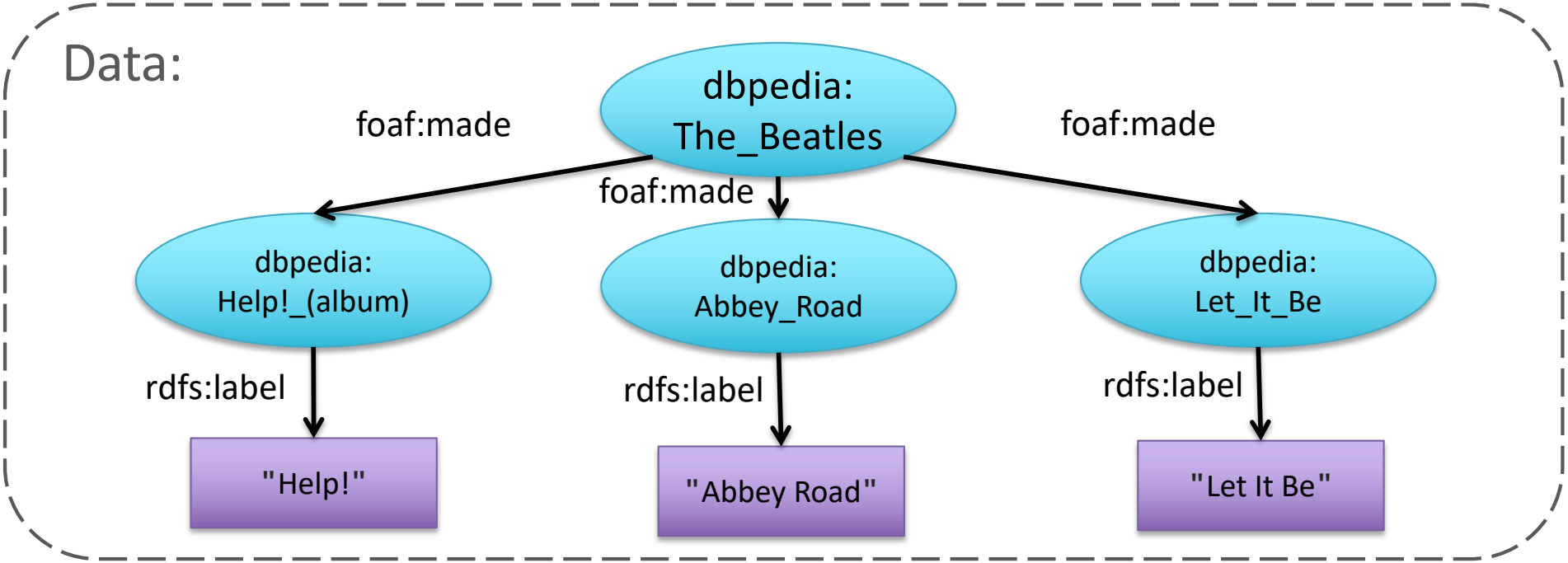
SPARQL Query



SPARQL Query

EUCLID
EdUcational Curriculum for the usage of LInked Data

Data:



Graph patterns:

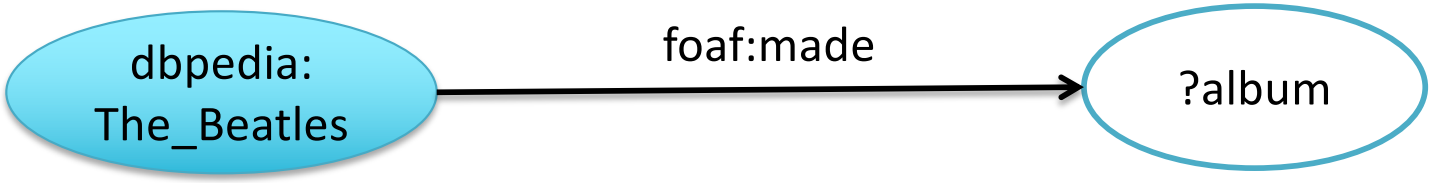
Results:

?album
dbpedia:Help!_(album)
dbpedia:Abbey_Road
dbpedia:Let_It_Be

SPARQL Query

Main idea: **Pattern matching**

- Queries describe sub-graphs of the queried graph
- **Graph patterns** are RDF graphs specified in Turtle syntax, which contain variables (prefixed by either "?" or "$")



- Sub-graphs that match the graph patterns yield a **result**

Simple Query

Data

```
<http://example.org/book/book1>
<http://purl.org/dc/elements/1.1/title>
"SPARQL Tutorial" .
```

Query

```
SELECT ?title
WHERE
{
  <http://example.org/book/book1>
  <http://purl.org/dc/elements/1.1/title>
  ?title .
}
```

Result

title

Multiple Matches

Data

```
@prefix foaf:  <http://xmlns.com/foaf/0.1/> .

_:a  foaf:name   "Johnny Lee Outlaw" .
_:a  foaf:mbox   <mailto:jlow@example.com> .
_:b  foaf:name   "Peter Goodguy" .
_:b  foaf:mbox   <mailto:peter@example.org> .
_:c  foaf:mbox   <mailto:carol@example.org> .
```

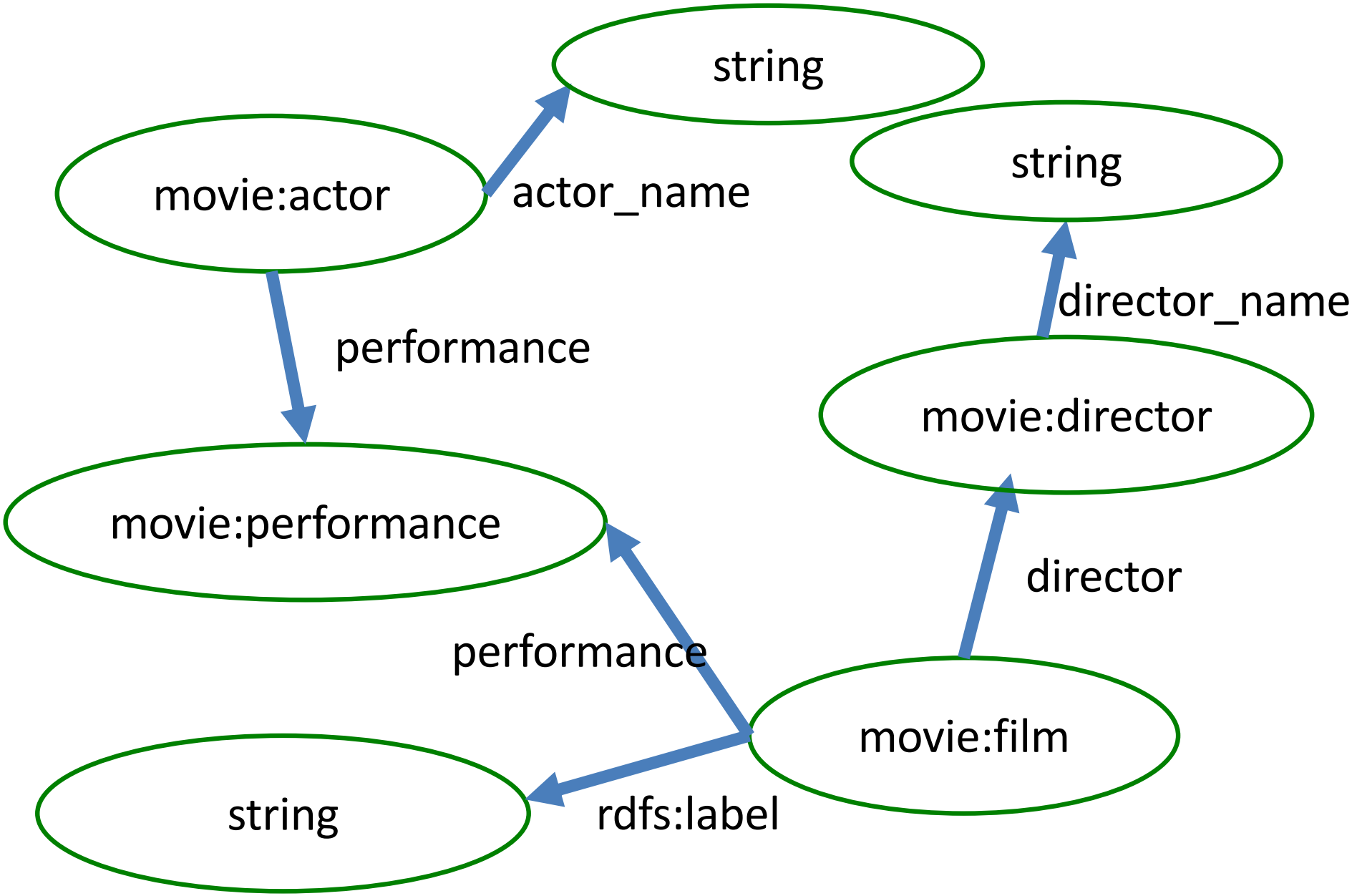
Query

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name ?mbox
WHERE
  { ?x foaf:name ?name .
    ?x foaf:mbox ?mbox }
```

Result

name	mbox

Linked Movie Database



Blank Nodes

Data

```
@prefix foaf:  <http://xmlns.com/foaf/0.1/> .

_:a  foaf:name   "Alice" .
_:b  foaf:name   "Bob" .
```

Query

```
PREFIX foaf:   <http://xmlns.com/foaf/0.1/>
SELECT ?x ?name
WHERE  { ?x foaf:name ?name }
```

Result

x	name
_:c	
_:d	

http://www.w3.org/TR/sparql11-query/

Creating Values with Expressions

Data

```
@prefix foaf:  <http://xmlns.com/foaf/0.1/> .

_:a  foaf:givenName   "John" .
_:a  foaf:surname  "Doe" .
```

Query

```
PREFIX foaf:   <http://xmlns.com/foaf/0.1/>
SELECT ?name
WHERE  {
   ?P foaf:givenName ?G ;
      foaf:surname ?S
   BIND(CONCAT(?G, " ", ?S) AS ?name)
}
```

Result

name

Selection: Restricting the Value of Strings

Data

```
@prefix dc:   <http://purl.org/dc/elements/1.1/> .
@prefix :     <http://example.org/book/> .
@prefix ns:   <http://example.org/ns#> .

:book1  dc:title  "SPARQL Tutorial" .
:book1  ns:price  42 .
:book2  dc:title  "The Semantic Web" .
:book2  ns:price  23 .
```

Query

```
PREFIX foaf:   <http://xmlns.com/foaf/0.1/>
PREFIX  dc:  <http://purl.org/dc/elements/1.1/>
SELECT  ?title
WHERE   { ?x dc:title ?title
          FILTER regex(?title, "^SPARQL")
        }
```

Result

title

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http://www.w3.org/TR/sparql11-query/

Selection: Restricting Numeric Values

Data

```
@prefix dc:   <http://purl.org/dc/elements/1.1/> .
@prefix :     <http://example.org/book/> .
@prefix ns:   <http://example.org/ns#> .

:book1  dc:title  "SPARQL Tutorial" .
:book1  ns:price  42 .
:book2  dc:title  "The Semantic Web" .
:book2  ns:price  23 .
```

Query

```
PREFIX  dc:  <http://purl.org/dc/elements/1.1/>
PREFIX  ns:  <http://example.org/ns#>
SELECT  ?title ?price
WHERE   { ?x ns:price ?price .
          FILTER (?price < 30.5)
          ?x dc:title ?title . }
```

Result

title	price
"The Semantic Web"	

"SPARQL Tutorial" too expensive

http://www.w3.org/TR/sparql11-query/

Some Syntax (Prefix)

Query

```
PREFIX  dc: <http://purl.org/dc/elements/1.1/>
SELECT  ?title
WHERE   { <http://example.org/book/book1> dc:title ?title }
```

URIs in angle brackets as <http://…>

Query

```
PREFIX  dc: <http://purl.org/dc/elements/1.1/>
PREFIX  : <http://example.org/book/>

SELECT  ?title
WHERE   { :book1  dc:title  $title }
```

Empty prefix

Query

```
BASE    <http://example.org/book/>
PREFIX  dc: <http://purl.org/dc/elements/1.1/>

SELECT  ?title
WHERE   { <book1>  dc:title  ?title }
```

Define BASE: no need to write long URIs

More Syntax (Blank Nodes)

Query Fragment

```
?x  a  :Class1 .
[ a :appClass ] :p "v" .
```

Short form

Query Fragment

```
?x    rdf:type  :Class1 .
_:b0  rdf:type  :appClass .
_:b0  :p        "v" .
```

Long form

http://www.w3.org/TR/sparql11-query/

Graph Patterns

- Basic Graph Patterns,
  - where a set of triple patterns must match
- Group Graph Pattern: {}
  - where a set of graph patterns must all match
- Optional Graph patterns: OPTIONAL
  - where additional patterns may extend the solution
- Alternative Graph Pattern: UNION
  - where two or more possible patterns are tried
- Patterns on Named Graphs: GRAPH
  - where patterns are matched against named graphs

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http://www.w3.org/TR/sparql11-query/

Group Graph Patterns

Query

```
PREFIX foaf:    <http://xmlns.com/foaf/0.1/>
SELECT ?name ?mbox
WHERE  {
          ?x foaf:name ?name .
          ?x foaf:mbox ?mbox .
       }
```

One basic graph pattern

Query

```
PREFIX foaf:    <http://xmlns.com/foaf/0.1/>
SELECT ?name ?mbox
WHERE  { { ?x foaf:name ?name . }
         { ?x foaf:mbox ?mbox . }
       }
```

Two group graph patterns

Scope of Filters

Query Fragment

```
{   ?x foaf:name ?name .
    ?x foaf:mbox ?mbox .
    FILTER regex(?name, "Smith")
}
```

Query Fragment

```
{   FILTER regex(?name, "Smith")
    ?x foaf:name ?name .
    ?x foaf:mbox ?mbox .
}
```

Query Fragment

```
{   ?x foaf:name ?name .
    FILTER regex(?name, "Smith")
    ?x foaf:mbox ?mbox .
}
```

Scope is whole group where filter appears

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http://www.w3.org/TR/sparql11-query/

Optional Pattern Matching

Data

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .

_:a  rdf:type        foaf:Person .
_:a  foaf:name       "Alice" .
_:a  foaf:mbox       <mailto:alice@example.com> .
_:a  foaf:mbox       <mailto:alice@work.example> .

_:b  rdf:type        foaf:Person .
_:b  foaf:name       "Bob" .
```

Query

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name ?mbox
WHERE  { ?x foaf:name  ?name .
         OPTIONAL { ?x  foaf:mbox  ?mbox }
       }
```

Result

name	mbox
"Alice"	<mailto:alice@example.com>
"Alice"	<mailto:alice@work.example>

Multiple Optional Graph Patterns

Data

```
@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> .
```

Query

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name ?mbox ?hpage
WHERE  { ?x foaf:name  ?name .
         OPTIONAL { ?x foaf:mbox ?mbox } .
         OPTIONAL { ?x foaf:homepage ?hpage }
       }
```

Result

name	mbox	hpage
"Alice"		<http://work.example.org/alice/>
"Bob"	<mailto:bob@work.example>	

UNION

Data

```
@prefix dc10:  <http://purl.org/dc/elements/1.0/> .
@prefix dc11:  <http://purl.org/dc/elements/1.1/> .

_:a  dc10:title     "SPARQL Query Language Tutorial" .
_:a  dc10:creator   "Alice" .
_:b  dc11:title     "SPARQL Protocol Tutorial" .
_:b  dc11:creator   "Bob" .
_:c  dc10:title     "SPARQL" .
_:c  dc11:title     "SPARQL (updated)" .
```

Query

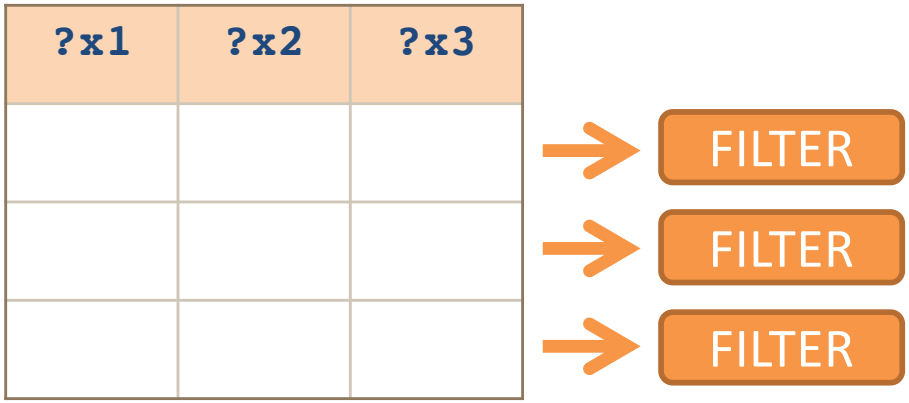
```
PREFIX dc10:  <http://purl.org/dc/elements/1.0/>
PREFIX dc11:  <http://purl.org/dc/elements/1.1/>
SELECT ?title
WHERE  { { ?book dc10:title  ?title } UNION
         { ?book dc11:title  ?title }
       }
```

Result

title
"SPARQL Protocol Tutorial"
"SPARQL"
"SPARQL (updated)"
"SPARQL Query Language Tutorial"

http://www.w3.org/TR/sparql11-query/

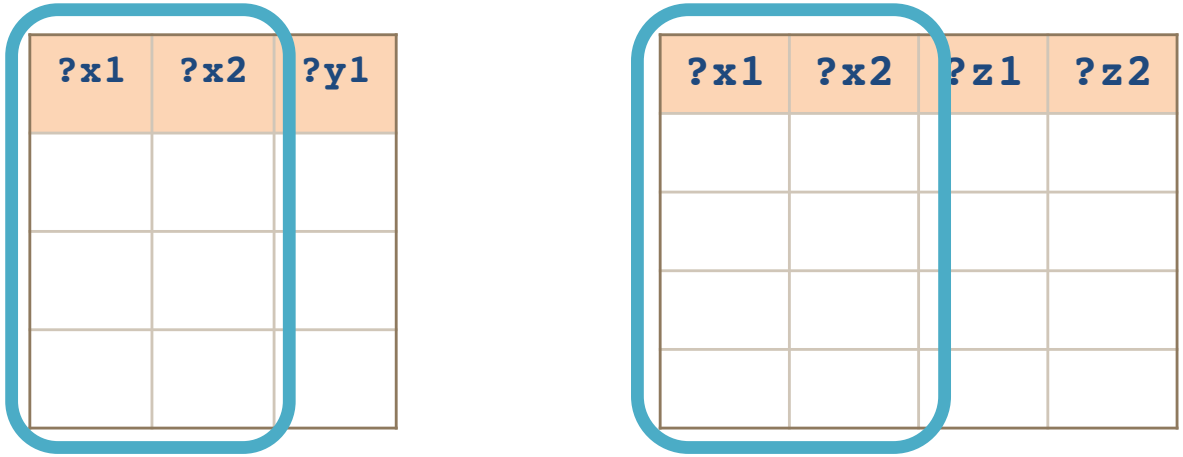
FILTER NOT EXISTS



testing whether a pattern exists
in the data,
given the bindings already
determined by the query pattern

MINUS

Graph Pattern MINUS Graph Pattern



evaluates both its arguments,
then calculates solutions in
the left-hand side that are not
compatible with the solutions
on the right-hand side

Negation: Absence of a Pattern

Data

```
@prefix  :       <http://example/> .
@prefix  rdf:    <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix  foaf:   <http://xmlns.com/foaf/0.1/> .

:alice  rdf:type   foaf:Person .
:alice  foaf:name  "Alice" .
:bob    rdf:type   foaf:Person .
```

Query

```
PREFIX  rdf:    <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX  foaf:   <http://xmlns.com/foaf/0.1/>

SELECT ?person
WHERE
{
    ?person rdf:type  foaf:Person .
    FILTER NOT EXISTS { ?person foaf:name ?name }
}
```

Result

person

Can also do FILTER

http://www.w3.org/TR/sparql11-query/

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Negation: Removing Possible Solutions

```
@prefix :       <http://example/> .
@prefix foaf:   <http://xmlns.com/foaf/0.1/> .

:alice  foaf:givenName "Alice" ;
        foaf:familyName "Smith" .

:bob    foaf:givenName "Bob" ;
        foaf:familyName "Jones" .

:carol  foaf:givenName "Carol" ;
        foaf:familyName "Smith" .
```

Data

Query

```
PREFIX :      <http://example/>
PREFIX foaf:  <http://xmlns.com/foaf/0.1/>

SELECT DISTINCT ?s
WHERE {
   ?s ?p ?o .
   MINUS {
      ?s foaf:givenName "Bob" .
   }
}
```

Result

s

http://www.w3.org/TR/sparql11-query/

See section 8.3

FILTER vs MINUS, Example 1

Query "FILTER"

```
SELECT *
{
  ?s ?p ?o
  FILTER NOT EXISTS { ?x ?y ?z }
}
```

Data

```
@prefix : <http://example/> .
:a :b :c .
```

Result "FILTER"

s	p	o

FILTER vs MINUS, Example 1

Query "FILTER"

```
SELECT *
{
  ?s ?p ?o
  FILTER NOT EXISTS { ?x ?y ?z }
}
```

Data

```
@prefix : <http://example/> .
:a :b :c .
```

Result "FILTER"

s	p	o

Query "MINUS"

```
SELECT *
{
   ?s ?p ?o
   MINUS
     { ?x ?y ?z }
}
```

No shared variables!

Result "MINUS"

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http://www.w3.org/TR/sparql11-query/

FILTER vs MINUS, Example 2

Query "FILTER"

```
PREFIX : <http://example/>
SELECT *
{
  ?s ?p ?o
  FILTER NOT EXISTS { :a :b :c }
}
```

Data

```
@prefix : <http://example/> .
:a :b :c .
```

Result "FILTER"

s	p	o

http://www.w3.org/TR/sparql11-query/

FILTER vs MINUS, Example 2

Query "FILTER"

```
PREFIX : <http://example/>
SELECT *
{
  ?s ?p ?o
  FILTER NOT EXISTS { :a :b :c }
}
```

Data

```
@prefix : <http://example/> .
:a :b :c .
```

Result "FILTER"

s	p	o

Query "MINUS"

```
PREFIX : <http://example/>
SELECT *
{
  ?s ?p ?o
  MINUS { :a :b :c }
}
```

No shared variables!

Result "MINUS"

http://www.w3.org/TR/sparql11-query/

Brain Teaser: Inner Filter

Data

```
@prefix : <…
:a :p 1 .
:a :q 1 .
:a :q 2 .

:b :p 3.0 .
:b :q 4.0 .
:b :q 5.0 .
```

Query "FILTER"

```
PREFIX : <http://example.com/>
SELECT * WHERE {
        ?x :p ?n
        FILTER NOT EXISTS {
                ?x :q ?m .
                FILTER ?n = ?m)
        }
}
```

Result "FILTER"

x	n

Brain Teaser: Inner Filter

Data

```
@prefix : <…
:a :p 1 .
:a :q 1 .
:a :q 2 .

:b :p 3.0 .
:b :q 4.0 .
:b :q 5.0 .
```

Query "FILTER"

```
PREFIX : <http://example.com/>
SELECT * WHERE {
        ?x :p ?n
        FILTER NOT EXISTS {
                ?x :q ?m .
                FILTER (?n = ?m)
        }
}
```

Result "FILTER"

x	n
<http://example.com/b>	3.0

Query "MINUS"

```
PREFIX : <http://example/>
SELECT * WHERE {
        ?x :p ?n
        MINUS {
                ?x :q ?m .
                FILTER (?n = ?m)
        }
}
```

Result "MINUS"

x	n

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http://www.w3.org/TR/sparql11-query/

Property Paths

Query Fragment

```
{ :book1 dc:title|rdfs:label ?displayString }
```

Alternatives: Match one or both possibilities

Query Fragment

```
{
  ?x foaf:mbox <mailto:alice@example> .
  ?x foaf:knows/foaf:name ?name .
}
```

Sequence: Find the name of any people that Alice knows.

Query Fragment

```
{
  ?x foaf:mbox <mailto:alice@example> .
  ?x foaf:knows/foaf:knows/foaf:name ?name .
}
```

Sequence: Find the names of people 2 "foaf:knows" links away.

Query Fragment

```
{
  ?x foaf:mbox <mailto:alice@example> .
  ?x foaf:knows+/foaf:name ?name .
}
```

Arbitrary length match:

Find the names of all the people that can be reached from Alice by “foaf:knows”:

Property Path Semantics

```
{
  ?x foaf:mbox <mailto:alice@example> .
  ?x foaf:knows/foaf:knows/foaf:name ?name .
}
```

=

```
{
  ?x foaf:mbox <mailto:alice@example> .
  ?x  foaf:knows ?a1 .
  ?a1 foaf:knows ?a2 .
  ?a2 foaf:name ?name .
}
```

=

```
{
  ?x foaf:mbox <mailto:alice@example> .
  ?x  foaf:knows [ foaf:knows [ foaf:name ?name ]] .
}
```

BIND: Assigning to Variables

Data

```
@prefix dc:    <http://purl.org/dc/elements/1.1/> .
@prefix :      <http://example.org/book/> .
@prefix ns:    <http://example.org/ns#> .

:book1  dc:title      "SPARQL Tutorial" .
:book1  ns:price      42 .
:book1  ns:discount   0.2 .

:book2  dc:title      "The Semantic Web" .
:book2  ns:price      23 .
:book2  ns:discount   0.25 .
```

Query

```
PREFIX  dc:   <http://purl.org/dc/elements/1.1/>
PREFIX  ns:   <http://example.org/ns#>

SELECT  ?title ?price
{  ?x ns:price ?p .
   ?x ns:discount ?discount
   BIND (?p*(1-?discount) AS ?price)
   FILTER(?price < 20)
   ?x dc:title ?title .
}
```

Result

title	price
"The Semantic Web"	17.25

Aggregation

Data

```
@prefix : <http://books.example/> .

:org1 :affiliates :auth1, :auth2 .
:auth1 :writesBook :book1, :book2 .
:book1 :price 9 .
:book2 :price 5 .
:auth2 :writesBook :book3 .
:book3 :price 7 .
:org2 :affiliates :auth3 .
:auth3 :writesBook :book4 .
:book4 :price 7 .
```

Query

```
PREFIX : <http://books.example/>
SELECT (SUM(?lprice) AS ?totalPrice)
WHERE {
  ?org :affiliates ?auth .
  ?auth :writesBook ?book .
  ?book :price ?lprice .
}
GROUP BY ?org
HAVING (SUM(?lprice) > 10)
```

Bindings

?org	?auth	?book	?lprice
:org1	:auth1	:book1	9
:org1	:auth1	:book2	5
:org1	:auth2	:book3	7
:org2	:auth3	:book4	7

21

7

Aggregation

Query

```
PREFIX : <http://books.example/>
SELECT (SUM(?lprice) AS ?totalPrice)
WHERE {
  ?org :affiliates ?auth .
  ?auth :writesBook ?book .
  ?book :price ?lprice .
}
GROUP BY ?org
HAVING (SUM(?lprice) > 10)
```

Bindings

?org	?auth	?book	?lprice
:org1	:auth1	:book1	9
:org1	:auth1	:book2	5
:org1	:auth2	:book3	7
~~:org2~~	~~:auth3~~	~~:book4~~	~~7~~

21

7

Result

totalPrice
21

Aggregation

Data

```
@prefix : <http://books.example/> .

:org1 :affiliates :auth1, :auth2 .
:auth1 :writesBook :book1, :book2 .
:book1 :price 9 .
:book2 :price 5 .
:auth2 :writesBook :book3 .
:book3 :price 7 .
:org2 :affiliates :auth3 .
:auth3 :writesBook :book4 .
:book4 :price 7 .
```

Query

```
PREFIX : <http://books.example/>
SELECT (SUM(?lprice) AS ?totalPrice)
WHERE {
  ?org :affiliates ?auth .
  ?auth :writesBook ?book .
  ?book :price ?lprice .
}
GROUP BY ?org
HAVING (SUM(?lprice) > 10)
```

Result

totalPrice
21

Subqueries

Data

```
@prefix : <http://people.example/> .

:alice :name "Alice", "Alice Foo", "A. Foo" .
:alice :knows :bob, :carol .
:bob :name "Bob", "Bob Bar", "B. Bar" .
:carol :name "Carol", "Carol Baz", "C. Baz" .
```

Query

```
PREFIX : <http://people.example/>
SELECT ?y ?minName
WHERE {
  :alice :knows ?y .
  {
    SELECT ?y (MIN(?name) AS ?minName)
    WHERE {
      ?y :name ?name .
    } GROUP BY ?y
  }
}
```

Result

y	minName
???	???
???	???
???	???

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http://www.w3.org/TR/sparql11-query/

Subqueries

Data

```
@prefix : <http://people.example/> .

:alice :name "Alice", "Alice Foo", "A. Foo" .
:alice :knows :bob, :carol .
:bob :name "Bob", "Bob Bar", "B. Bar" .
:carol :name "Carol", "Carol Baz", "C. Baz" .
```

Query

```
PREFIX : <http://people.example/>
SELECT ?y ?minName
WHERE {
  :alice :knows ?y .
  {
    SELECT ?y (MIN(?name) AS ?minName)
    WHERE {
      ?y :name ?name .
    } GROUP BY ?y
  }
}
```


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http://www.w3.org/TR/sparql11-query/

Subqueries

Data

```
@prefix : <http://people.example/> .

:alice :name "Alice", "Alice Foo", "A. Foo" .
:alice :knows :bob, :carol .
:bob :name "Bob", "Bob Bar", "B. Bar" .
:carol :name "Carol", "Carol Baz", "C. Baz" .
```

Query

```
SELECT ?y (MIN(?name) AS ?minName)
WHERE {
  ?y :name ?name .
} GROUP BY ?y
```

Bindings

?y	?name
:alice	"Alice"
:alice	"Alice Foo"
:alice	"A. Foo"
:bob	"Bob"
:bob	"Bob Bar"
:bob	"B. Bar"
:carol	"Carol"
:carol	"Carol Baz"
:carol	"C. Baz"

Result

y	minName
:alice	"A. Foo"
:bob	”B. Bar”
:carol	"C. Baz”

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http://www.w3.org/TR/sparql11-query/

Subqueries

Data

```
@prefix : <http://people.example/> .

:alice :name "Alice", "Alice Foo", "A. Foo" .
:alice :knows :bob, :carol .
:bob :name "Bob", "Bob Bar", "B. Bar" .
:carol :name "Carol", "Carol Baz", "C. Baz" .
```

Query

```
PREFIX : <http://people.example/>
SELECT ?y ?minName
WHERE {
  :alice :knows ?y .
  {
    SELECT ?y (MIN(?name) AS ?minName)
    WHERE {
      ?y :name ?name .
    } GROUP BY ?y
  }
}
```

Subquery Result

y	minName
:alice	"A. Foo"
:bob	"Bob Bar"
:carol	"C. Baz"

http://www.w3.org/TR/sparql11-query/

Subqueries

Data

```
@prefix : <http://people.example/> .

:alice :name "Alice", "Alice Foo", "A. Foo" .
:alice :knows :bob, :carol .
:bob :name "Bob", "Bob Bar", "B. Bar" .
:carol :name "Carol", "Carol Baz", "C. Baz" .
```

Query

```
PREFIX : <http://people.example/>
PREFIX : <http://people.example/>
SELECT ?y ?minName
WHERE {
  :alice :knows ?y .
  {
    SELECT ?y (MIN(?name) AS ?minName)
    WHERE {
      ?y :name ?name .
    } GROUP BY ?y
  }
}
```

Subquery Result

y
:bob
:carol

Subquery Result

y	minName
:alice	"A. Foo"
:bob	"Bob Bar"
:carol	"C. Baz"

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http://www.w3.org/TR/sparql11-query/

Subqueries

Query

```
PREFIX : <http://people.example/>
SELECT ?y ?minName
WHERE {
  :alice :knows ?y .
  {
    SELECT ?y (MIN(?name) AS ?minName)
    WHERE {
      ?y :name ?name .
    } GROUP BY ?y
  }
}
```

Return a name (the one with the lowest sort order) for all the people that know Alice and have a name.

Subquery Result

y
:bob
:carol

JOIN

Subquery Result

y	minName
:alice	"A. Foo"
:bob	"Bob Bar"
:carol	"C. Baz"

=

Result

y	minName
:bob	"B. Bar"
:carol	"C. Baz"

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http://www.w3.org/TR/sparql11-query/

Subqueries

Data

```
@prefix : <http://people.example/> .

:alice :name "Alice", "Alice Foo", "A. Foo" .
:alice :knows :bob, :carol .
:bob :name "Bob", "Bob Bar", "B. Bar" .
:carol :name "Carol", "Carol Baz", "C. Baz" .
```

Query

```
PREFIX : <http://people.example/>
SELECT ?y ?minName
WHERE {
  :alice :knows ?y .
  {
    SELECT ?y (MIN(?name) AS ?minName)
    WHERE {
      ?y :name ?name .
    } GROUP BY ?y
  }
}
```

Result

y	minName
:bob	"B. Bar"
:carol	"C. Baz"

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http://www.w3.org/TR/sparql11-query/

RDF Dataset =

default graph

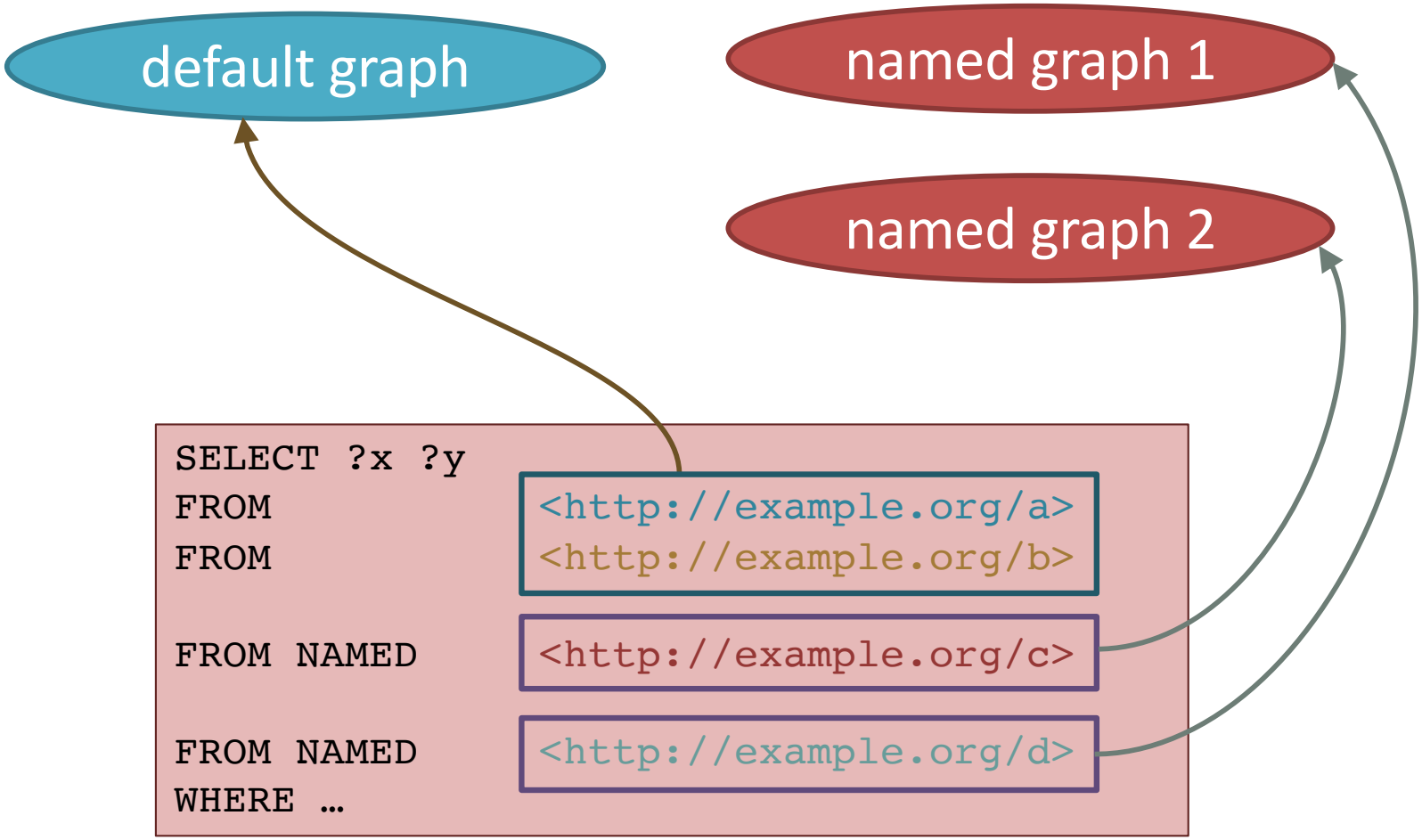
+ named graph 1

+ named graph 2

+ …

… the SPARQL queries seen so far target the default graph

Specifying Datasets Explicitly



Default graph = “RDF merged” graphs in FROM clauses

RDF merge = union N-triples, renaming blank nodes to not conflict

RDF Datasets

Default Graph

```
@prefix dc: <http://purl.org/dc/elements/1.1/> .

<http://example.org/bob>    dc:publisher  "Bob" .
<http://example.org/alice>  dc:publisher  "Alice" .
```

Provenance

Named Graph 1: http://example.org/bob

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .

_:a foaf:name "Bob" .
_:a foaf:mbox <mailto:bob@oldcorp.example.org> .
```

Named Graph 2: http://example.org/alice

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .

_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@work.example.org> .
```

Graphs can be merged

[Note that blank nodes _:a represent different objects in each of the named graphs!]

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Separate graphs enable you to reason about who said what and when

(provenance)

Provenance Reasoning

prefixes omitted to save space

Default Graph

```
g:graph1 dc:publisher "Bob" .
g:graph1 dc:date "2004-12-06"^^xsd:date .

g:graph2 dc:publisher "Bob" .
g:graph2 dc:date "2005-01-10"^^xsd:date .
```

Named Graph 1

RDF collected on 2004-12-06

```
_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@work.example> .

_:b foaf:name "Bob" .
_:b foaf:mbox <mailto:bob@oldcorp.example.org> .
```

Named Graph 2

RDF collected on 2005-01-10

```
_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@work.example> .

_:b foaf:name "Bob" .
_:b foaf:mbox <mailto:bob@newcorp.example.org> .
```

Default Graph

```
g:graph1 dc:publisher "Bob" .
g:graph1 dc:date "2004-12-06"^^xsd:date .

g:graph2 dc:publisher "Bob" .
g:graph2 dc:date "2005-01-10"^^xsd:date .
```

Named Graph 1

```
_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@work.example> .

_:b foaf:name "Bob" .
_:b foaf:mbox <mailto:bob@oldcorp.example.org> .
```

Named Graph 2

```
_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@work.example> .

_:b foaf:name "Bob" .
_:b foaf:mbox <mailto:bob@newcorp.example.org> .
```

?

Result

name	mbox	date
“Bob”	<mailto:bob@oldcorp.example.org>	"2004-12-06"^^xsd:date
“Bob”	<mailto:bob@newcorp.example.org>	"2005-01-10"^^xsd:date

Default Graph

```
g:graph1 dc:publisher "Bob" .
g:graph1 dc:date "2004-12-06"^^xsd:date .
g:graph2 dc:publisher "Bob" .
g:graph2 dc:date "2005-01-10"^^xsd:date .
```

Named Graph 1

```
_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@work.example> .
_:b foaf:name "Bob" .
_:b foaf:mbox <mailto:bob@oldcorp.example.org> .
```

Named Graph 2

```
_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@work.example> .
_:b foaf:name "Bob" .
_:b foaf:mbox <mailto:bob@newcorp.example.org> .
```

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX dc:   <http://purl.org/dc/elements/1.1/>
SELECT ?name ?mbox ?date
FROM NAMED <http://example.org/alice>
FROM NAMED <http://example.org/bob>
WHERE
  {  ?g dc:publisher ?name ;
        dc:date ?date .
     GRAPH ?g
       { ?person foaf:name ?name ; foaf:mbox ?mbox }
  }
```

from Default Graph

from Named Graphs

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http://www.w3.org/TR/sparql11-query/

Default Graph

```
g:graph1 dc:publisher "Bob" .
g:graph1 dc:date "2004-12-06"^^xsd:date .
g:graph2 dc:publisher "Bob" .
g:graph2 dc:date "2005-01-10"^^xsd:date .
```

Named Graph 1

```
_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@work.example> .
_:b foaf:name "Bob" .
_:b foaf:mbox <mailto:bob@oldcorp.example.org> .
```

Named Graph 2

```
_:a foaf:name "Alice" .
_:a foaf:mbox <mailto:alice@work.example> .
_:b foaf:name "Bob" .
_:b foaf:mbox <mailto:bob@newcorp.example.org> .
```

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX dc:   <http://purl.org/dc/elements/1.1/>
SELECT ?name ?mbox ?date
FROM NAMED <http://example.org/alice>
FROM NAMED <http://example.org/bob>
WHERE
  {  ?g dc:publisher ?name ; dc:date ?date .
     GRAPH ?g
       { ?person foaf:name ?name ; foaf:mbox ?mbox }
  }
```

from Default Graph

from Named Graphs

name	mbox	date
"Bob"	<mailto:bob@oldcorp.example.org>	"2004-12-06"^^xsd:date
"Bob"	<mailto:bob@newcorp.example.org>	"2005-01-10"^^xsd:date

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http://www.w3.org/TR/sparql11-query/

Take the following four named graphs...

```
<http://grapha.com> = { <a1> <p> <a2> . }
<http://graphb.com> = { <b1> <p> <b2> . }
<http://graphc.com> = { <c1> <p> <c2> . }
<http://graphd.com> = { <d1> <p> <d2> . }
```

```
SELECT ?s WHERE { ?s <p> ?o }
```

will often give <a1>, <b1>, <c1>, <d1>, but this depends on what the default graph is implicitly defined as.

http://answers.semanticweb.com/questions/11509/what-is-the-difference-between-from-and-from-named

Take the following four named graphs...

```
<http://grapha.com> = { <a1> <p> <a2> . }
<http://graphb.com> = { <b1> <p> <b2> . }
<http://graphc.com> = { <c1> <p> <c2> . }
<http://graphd.com> = { <d1> <p> <d2> . }
```

```
SELECT ?s WHERE { ?s <p> ?o }
```

will often give <a1>, <b1>, <c1>, <d1>, but this depends on what the default graph is implicitly defined as.

```
FROM <http://grapha.com>
SELECT ?s WHERE { ?s <p> ?o }
```

should give <a1>.

http://answers.semanticweb.com/questions/11509/what-is-the-difference-between-from-and-from-named

Take the following four named graphs...

```
<http://grapha.com> = { <a1> <p> <a2> . }
<http://graphb.com> = { <b1> <p> <b2> . }
<http://graphc.com> = { <c1> <p> <c2> . }
<http://graphd.com> = { <d1> <p> <d2> . }
```

```
SELECT ?s WHERE { ?s <p> ?o }
```

will often give <a1>, <b1>, <c1>, <d1>, but this depends on what the default graph is implicitly defined as.

```
FROM <http://grapha.com>
SELECT ?s WHERE { ?s <p> ?o }
```

should give <a1>.

```
FROM NAMED <http://grapha.com>
SELECT ?s WHERE { ?s <p> ?o }
```

should give nothing.

http://answers.semanticweb.com/questions/11509/what-is-the-difference-between-from-and-from-named

Take the following four named graphs...

```
<http://grapha.com> = { <a1> <p> <a2> . }
<http://graphb.com> = { <b1> <p> <b2> . }
<http://graphc.com> = { <c1> <p> <c2> . }
<http://graphd.com> = { <d1> <p> <d2> . }
```

```
SELECT ?s WHERE { ?s <p> ?o }
```

will often give <a1>, <b1>, <c1>, <d1>, but this depends on what the default graph is implicitly defined as.

```
FROM <http://grapha.com>
SELECT ?s WHERE { ?s <p> ?o }
```

should give <a1>.

```
FROM NAMED <http://grapha.com>
SELECT ?s WHERE { ?s <p> ?o }
```

should give nothing.

```
FROM <http://grapha.com>
FROM <http://graphb.com>
FROM NAMED <http://graphc.com>
FROM NAMED <http://graphd.com>
SELECT ?s WHERE { ?s <p> ?o }
```

should give <a1>, <b1>.

http://answers.semanticweb.com/questions/11509/what-is-the-difference-between-from-and-from-named

Take the following four named graphs...

```
<http://grapha.com> = { <a1> <p> <a2> . }
<http://graphb.com> = { <b1> <p> <b2> . }
<http://graphc.com> = { <c1> <p> <c2> . }
<http://graphd.com> = { <d1> <p> <d2> . }
```

```
SELECT ?s WHERE { ?s <p> ?o }
```

will often give <a1>, <b1>, <c1>, <d1>, but this depends on what the default graph is implicitly defined as.

```
FROM <http://grapha.com>
SELECT ?s WHERE { ?s <p> ?o }
```

should give <a1>.

```
FROM NAMED <http://grapha.com>
SELECT ?s WHERE { ?s <p> ?o }
```

should give nothing.

```
FROM <http://grapha.com>
FROM <http://graphb.com>
FROM NAMED <http://graphc.com>
FROM NAMED <http://graphd.com>
SELECT ?s WHERE { ?s <p> ?o }
```

should give <a1>, <b1>.

```
FROM <http://grapha.com>
FROM <http://graphb.com>
FROM NAMED <http://graphc.com>
FROM NAMED <http://graphd.com>
SELECT ?s WHERE { GRAPH ?g { ?s <p> ?o }}
```

should give <c1>, <d1>.

http://answers.semanticweb.com/questions/11509/what-is-the-difference-between-from-and-from-named

Take the following four named graphs...

```
<http://grapha.com> = { <a1> <p> <a2> . }
<http://graphb.com> = { <b1> <p> <b2> . }
<http://graphc.com> = { <c1> <p> <c2> . }
<http://graphd.com> = { <d1> <p> <d2> . }
```

```
SELECT ?s WHERE { ?s <p> ?o }
```
will often give <a1>, <b1>, <c1>, <d1>, but this depends on what the default graph is implicitly defined as.

```
FROM <http://grapha.com>
SELECT ?s WHERE { ?s <p> ?o }
```
should give <a1>.

```
FROM NAMED <http://grapha.com>
SELECT ?s WHERE { ?s <p> ?o }
```
should give nothing.

```
FROM <http://grapha.com>
FROM <http://graphb.com>
FROM NAMED <http://graphc.com>
FROM NAMED <http://graphd.com>
SELECT ?s WHERE { ?s <p> ?o }
```
should give <a1>, <b1>.

```
FROM <http://grapha.com>
FROM <http://graphb.com>
FROM NAMED <http://graphc.com>
FROM NAMED <http://graphd.com>
SELECT ?s WHERE { GRAPH ?g { ?s <p> ?o }}
```
should give <c1>, <d1>.

```
FROM <http://grapha.com>
FROM NAMED <http://graphb.com>
SELECT ?s WHERE {
   GRAPH <http://grapha.com> { ?s <p> ?o }}
```
should give nothing. ...etc.

http://answers.semanticweb.com/questions/11509/what-is-the-difference-between-from-and-from-named

Controlling the Output

```
SELECT ?name
WHERE { ?x foaf:name ?name ; :empId ?emp }
ORDER BY ?name DESC(?emp)
```

Ordering the solutions

```
PREFIX foaf:    <http://xmlns.com/foaf/0.1/>
SELECT DISTINCT ?name
WHERE { ?x foaf:name ?name }
```

Eliminating duplicates

```
SELECT   ?name
WHERE    { ?x foaf:name ?name }
LIMIT    5
OFFSET   10
```

Selecting a range of results

SPARQL

SELECT

Get data

ASK

Yes/No questions

CONSTRUCT

Create RDF

DESCRIBE

Get some information

http://www.w3.org/TR/sparql11-query/

SELECT vs CONSTRUCT

SELECT

Result: table of bindings

x	n
<http://example.com/b>	3.0
<http://example.com/a>	1

CONSTRUCT

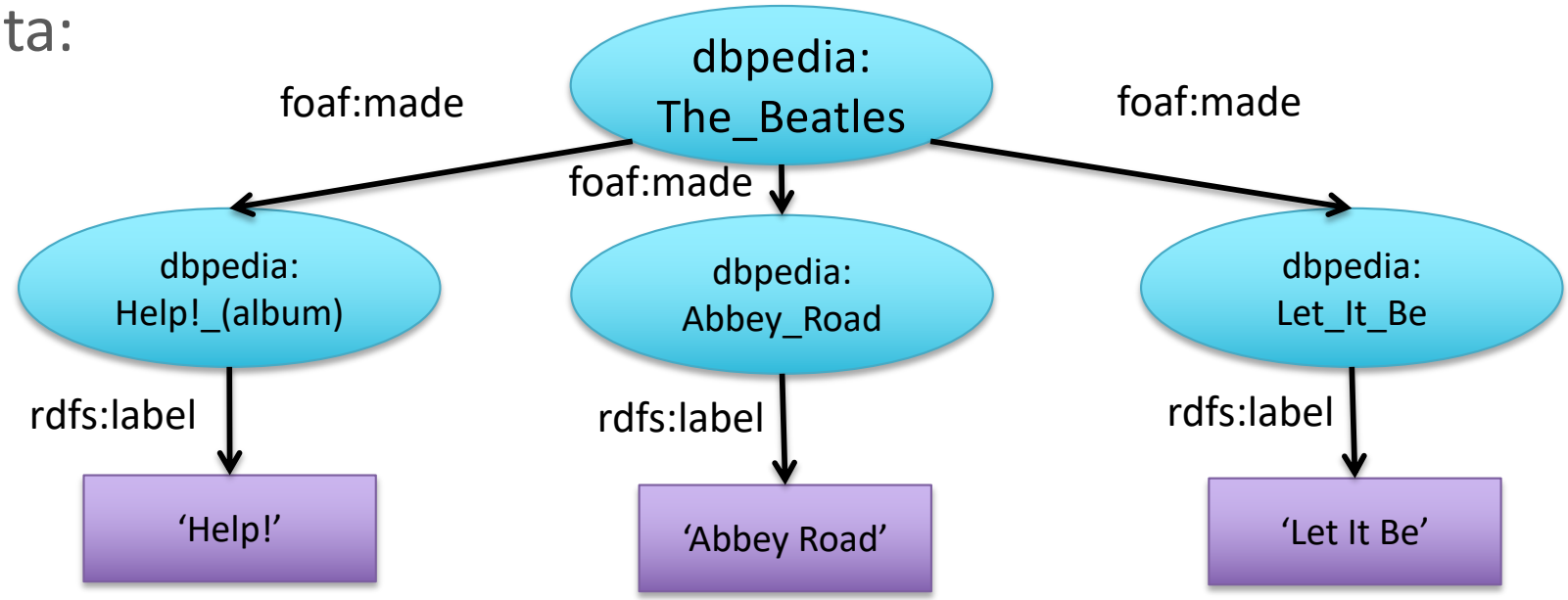
Result: RDF

```
@prefix vcard: <http://www.w3.org/2001/vcard-rdf/3.0#> .

_:v1 vcard:N          _:x .
_:x vcard:givenName   "Alice" .
_:x vcard:familyName  "Hacker" .

_:v2 vcard:N          _:z .
_:z vcard:givenName   "Bob" .
_:z vcard:familyName  "Hacker" .
```

Query Form: CONSTRUCT

EUCLID
EdUcational Curriculum for the usage of LInked Data

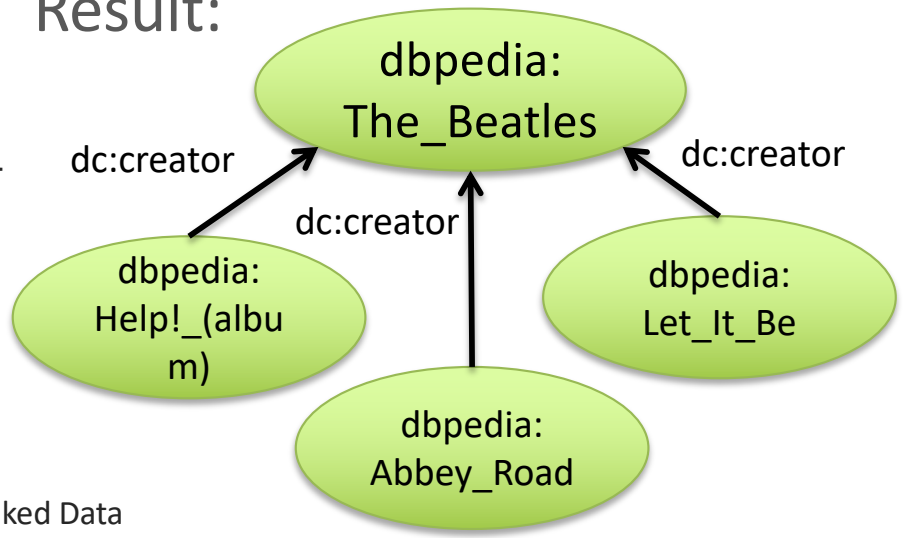
Data:



Query:

```
CONSTRUCT {
  ?album dc:creator dbpedia:The_Beatles .}
WHERE {
  dbpedia:The_Beatles foaf:made ?album .}
```

Result:



Query Form: CONSTRUCT

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Subsets of results

- It is possible to combine the query with **solution modifiers** (`ORDER BY`, `LIMIT`, `OFFSET`)

Query: *Create the dc:creator descriptions for the 10 most recent albums and their tracks recorded by 'The Beatles'.*

```
PREFIX dbpedia: <http://dbpedia.org/resource/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX music-ont: <http://purl.org/ontology/mo/>
PREFIX dc: <http://purl.org/dc/elements/1.1/>
CONSTRUCT {
  ?album dc:creator dbpedia:The_Beatles .
  ?track dc:creator dbpedia:The_Beatles .}
WHERE {
  dbpedia:The_Beatles foaf:made ?album .
  ?album music-ont:track ?track ;
         dc:date ?date .
} ORDER BY DESC(?date)
  LIMIT 10
```

Query Form: CONSTRUCT

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Assigning Variables

- The value of an expression can be added to a solution mapping by binding a new variable (which can be further used and returned)
- The BIND form allows to assign a value to a variable from a BGP

Query: *Calculate the duration of the tracks from ms to s, and store the value using the dbpedia-ont:runtime property .*

```
PREFIX dbpedia: <http://dbpedia.org/resource/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX music-ont: <http://purl.org/ontology/mo/>
PREFIX dbpedia-ont: <http://dbpedia.org/ontology/>
CONSTRUCT { ?track dbpedia-ont:runtime ?secs .}
WHERE {
  dbpedia:The_Beatles foaf:made ?album .
  ?album music-ont:track ?track .
  ?track music-ont:duration ?duration .
  BIND((?duration/1000) AS ?secs) .}
```

CONSTRUCTing a Graph

Data

```
_:a    foaf:givenname   "Alice" .
_:a    foaf:family_name "Hacker" .
_:b    foaf:firstname   "Bob" .
_:b    foaf:surname     "Hacker" .
```

Query

```
PREFIX foaf:    <http://xmlns.com/foaf/0.1/>
PREFIX vcard:   <http://www.w3.org/2001/vcard-rdf/3.0#>
CONSTRUCT { ?x  vcard:N _:v .
            _:v vcard:givenName ?gname .
            _:v vcard:familyName ?fname }
WHERE {
    { ?x foaf:firstname ?gname } UNION { ?x foaf:givenname   ?gname } .
    { ?x foaf:surname   ?fname } UNION { ?x foaf:family_name ?fname } .
 }
```

Result Data

```
@prefix vcard: <http://www.w3.org/2001/vcard-rdf/3.0#> .

_:v1 vcard:N          _:x .
_:x vcard:givenName   "Alice" .
_:x vcard:familyName  "Hacker" .

_:v2 vcard:N          _:z .
_:z vcard:givenName   "Bob" .
_:z vcard:familyName  "Hacker" .
```

Convert from
“foaf”
to
“vcard”

slide by Pedro Szekely

Query Form: ASK

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- Namespaces are added with the 'PREFIX' directive
- Statement patterns that make up the graph are specified between brackets ("{}")

Query: *Is Paul McCartney member of 'The Beatles'?*

```
PREFIX dbpedia: <http://dbpedia.org/resource/>
PREFIX dbpedia-ont: <http://dbpedia.org/ontology/>
ASK WHERE { dbpedia:The_Beatles dbpedia-ont:bandMember
                                dbpedia:Paul_McCartney.}
```

Results:

true

Query: *Is Elvis Presley member of 'The Beatles'?*

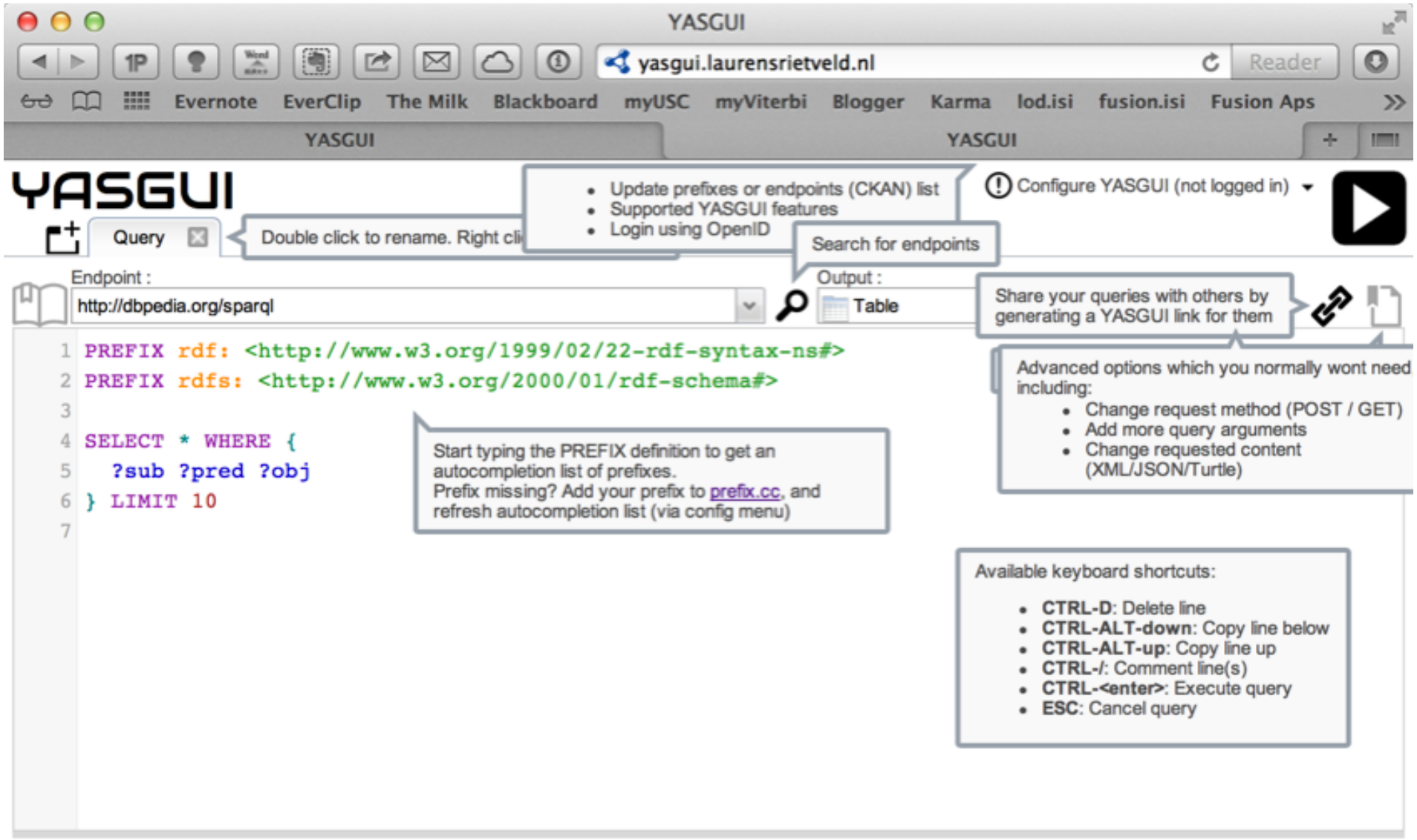
```
PREFIX dbpedia: <http://dbpedia.org/resource/>
PREFIX dbpedia-ont: <http://dbpedia.org/ontology/>
ASK WHERE { dbpedia:The_Beatles dbpedia-ont:bandMember
                                dbpedia:Elvis_Presley.}
```

Results:

false

Executing SPARQL Queries

https://yasgui.triply.cc/



Example Query

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX dbpediaowl: <http://dbpedia.org/ontology/>
PREFIX dbpedia: <http://dbpedia.org/resource/>

# People born in Bogota
SELECT * WHERE {
  ?sub a dbpediaowl:Person .
  ?sub dbpediaowl:birthPlace <http://dbpedia.org/resource/Bogot%C3%A1>
} LIMIT 100
```

YASGUI

yasgui.laurensrietveld.nl

Evernote EverClip The Milk Blackboard myUSC myViterbi Blogger Karma lod.isi fusion.isi Fusion Aps

YASGUI | YASGUI | dbpedia.org/data/Bogotá.n3

YASGUI

Configure YASGUI (Pedro Szekely)

Query | Query(1) | Query(2)

Endpoint : http://dbpedia.org/sparql

Output : Simple Table

Configure request

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX dbpediaowl: <http://dbpedia.org/ontology/>
PREFIX dbpedia: <http://dbpedia.org/resource/>

# People born in Bogota
SELECT * WHERE {
  ?sub a dbpediaowl:Person .
  ?sub dbpediaowl:birthPlace <http://dbpedia.org/resource/Bogot%C3%A1>
} LIMIT 100
```

#	sub
1	dbpedia:Andr%C3%A9s_Pastrana_Arango
2	dbpedia:Antanas_Mockus
3	dbpedia:Clara_Rojas
4	dbpedia:Julio_C%C3%A9sar_Turbay_Ayala
5	dbpedia:Laura_Restrepo
6	dbpedia:Juan_Pablo_Montoya
7	dbpedia:Mart%C3%ADn_Ram%C3%ADrez_(cyclist)
8	dbpedia:Eliot_Halverson
9	dbpedia:Per-Olov_Kindgren
10	dbpedia:Daniel_Samper_Ospina
11	dbpedia:Fernando_Cepeda_Ulloa
12	dbpedia:Jos%C3%A9_Fernando_Bautista_Quintero
13	dbpedia:Patricio_Samper_Gnecco