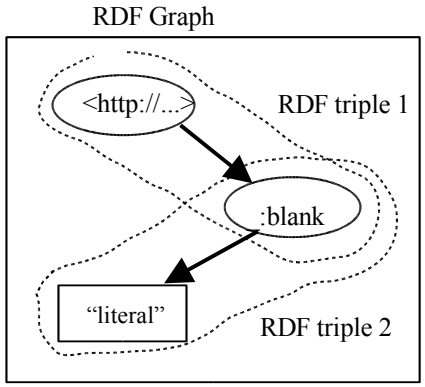
SPARQL RDF Query Language Reference v1.6

Latest version: <http://www.ilrt.bris.ac.uk/people/cmdjb/2005/04-sparql/>
Comments to: dave.beckett@bristol.ac.uk

1. RDF Model and SPARQL RDF Terms Syntax



RDF Graph: A set of RDF Triples

RDF Triple: A triple (3-tuple) of:

- Subject: URI or Blank Node
- Predicate: URI
- Object: URI or Blank Node or Literal

URI: An absolute URI which may include a # fragment.

```
<http://www.w3.org/>
<http://example.org/#fragment>
<abc.rdf>      Relative URI resolved against base URI.
<>             Base URI, usually the query document URI
ex:name        URI shorthand using XML-style prefix ex and local name.
               Declared with PREFIX (SPARQL) or @prefix (Turtle)
```

RDF Literal: A Unicode string with an optional language tag.

```
"hello"      "bonjour"@fr
```

RDF Typed Literal: A Unicode string and datatype URI for encoding datatypes.

```
"abc"^^<http://example.org/myDatatype>
```

abbreviated with an XML QName style as:

```
"10"^^xsd:integer
```

Short forms for several common datatypes:

```
10                  "10"^^xsd:integer
1.2e3               "1.2e3"^^xsd:double
true                "true"^^xsd:boolean
```

Blank Node: A node in a graph with a local name. The scope of the name is the RDF graph.

```
_:node
```

2. Common RDF Namespaces and Prefixes

Namespace	Common Prefix	Namespace URI
RDF	rdf:	http://www.w3.org/1999/02/22-rdf-syntax-ns#
Dublin Core	dc:	http://purl.org/dc/elements/1.1/
FOAF	foaf:	http://xmlns.com/foaf/0.1/
XML Schema Datatypes	xsd:	http://www.w3.org/2001/XMLSchema#
RDFS	rdfs:	http://www.w3.org/2000/01/rdf-schema#
OWL	owl:	http://www.w3.org/2002/07/owl#

3. SPARQL Language Reference

Based on SPARQL WD 19 Apr 2005 <http://www.w3.org/TR/2005/WD-rdf-sparql-query-20050419/>.

RDF Term: A part of an RDF Triple. A URI, Blank Node or a Literal.

```
<uri> _:b1 "Literal"@en "abc123"^^my:datatype
```

Query Variable: Identifiers for binding to RDF Terms in matches.

```
?a / $b
```

or in lists: `$name $title $place`

Triple Pattern: An RDF Triple with Query Variables allowed in each term:

```
<http://example.org/abc> ?x "Hello"
?subject ?predicate ?object
```

Turtle abbreviations can be used for Triple Patterns, see **Section 4**.

Graph Pattern: A block that matches part of the queried RDF graph.

Basic Graph Pattern: A set of Triple Patterns which binds RDF Terms in the graph to variables. Written as a `{..}` block with '`.`' separating the triple patterns:

```
{ <http://example.org/abc> ?y "Hello" .
 ?subject $predicate "Literal" }
```

Group Graph Pattern: A graph pattern that contains multiple graph patterns which must all match to provide a result.

```
{ { ?person  rdf:type foaf:Person }
  { ?person foaf:name "Dave" } }
```

Optional Graph Pattern: A graph pattern which may fail to match and provide bindings but not cause the entire query to fail. Written with the `OPTIONAL` keyword before a graph pattern.

```
OPTIONAL { ?person foaf:nick ?nick }
```

Union Graph Pattern: A pair of graph patterns any of which may match and bind the same variables. Written with the `UNION` keyword between two graph patterns.

```
{ ?node ex:name ?name } UNION
{ ?node vcard:FN ?name }
```

Graph Graph Pattern: A keyword for specifying a graph name to use or to return a graph name as a binding. Written with the `GRAPH` keyword before a graph pattern.

```
GRAPH <http://example.org/myfoaf>
  { ?person foaf:name ?name }
GRAPH ?graph { ?person foaf:name ?name }
```

Value Constraints: A boolean expression in a graph pattern over query variables that constrains matched graph patterns.

```
{ ?item ex:size $size .  FILTER $size < 10 }
```

4. SPARQL Query Structure

Prologue (optional)

```
BASE <uri>
PREFIX prefix: <uri> (repeatable)
```

Query Result forms (required, pick 1)

```
SELECT (DISTINCT) sequence of ?variable
SELECT (DISTINCT)*
DESCRIBE sequence of ?variable or <uri>
DESCRIBE *
CONSTRUCT { graph pattern }
ASK
```

Query Data Sources (optional)

```
Set the background graph:
FROM <uri>

Add a named graph (repeatable):
FROM NAMED <uri>
```

Graph Pattern (optional, required for `ASK`**)**

```
WHERE { graph pattern }
```

Query Results Controls (optional)

```
LIMIT n, OFFSET m, ORDER BY ...
```

5. SPARQL Query Result Forms

Variable Bindings: A sequence of (set of variable bindings) for each query pattern match.

```
SELECT *
WHERE {$a rdf:type $b}
```

to ask for bindings for all variables mentioned in the query and

```
SELECT $a ?b
WHERE {$a rdf:type ?b}
```

to list them explicitly

RDF Graph:

Describe Resources: An RDF graph describing resources either given by URI

```
DESCRIBE <http://example.org/thing>
```

or by binding variables using the same syntax as `SELECT`.

```
DESCRIBE ?person
WHERE  { ?person foaf:name "Dave" }
```

Build an RDF graph An RDF graph made by substituting variables into a triple template.

```
CONSTRUCT { ?a foaf:knows ?b }
WHERE { ?a ex:KnowsQuiteWell ?b }
```

Boolean: True if the query pattern could be answered.

```
ASK
WHERE { ?a rdf:type foaf:Person }
```

6. Query Results Controls and Sorting

The optional controls on query results are optionally performed in the following order:

1. `DISTINCT` to ensure solutions in the sequence are unique
1. `ORDER BY` ordering solutions sequences by variable or function call:
   `ORDER BY DESC[?date] ?title ASC[?familyName]`
   in descending order by date, by title, by familyName ascending
2. `LIMIT` *n* to restrict the number of solutions to *n*
3. `OFFSET` *m* to start the results in the solution from item *m*

7. Values – datatypes, expressions and operators

Supported datatypes: RDF Terms, `xsd:boolean, xsd:string, xsd:double, xsd:float, xsd:decimal, xsd:integer` and `xsd:dateTime`

Logical operators:	Logical:	*A* || *B*, *A* && *B*, !A
	Comparison (*A op B*):	=, !=, <, >, <=, >=
Arithmetic operators:	Unary:	*+A*, *-A*
	Binary (*A op B*):	*+, -, *, /*
RDF operators:	Boolean:	`BOUND`(*A*), `ISURI`(*A*), `ISBLANK`(*A*), `ISLITERAL`(*A*)
	String:	`STR`(A), `LANG`(*A*), `DATATYPE`(*A*)
String Match operator:		`REGEX(`*string*, *pattern* [,*flags*] `)`
Extension Functions and Explicit Type Casting:		*QName*`(` *expression*, *expression*, ...`)`
Automatic Type Promotion:	from `xsd:decimal`	to `xsd:float`
	from `xsd:float`	to `xsd:double`

8. Turtle RDF Syntax Reference

Turtle (Terse RDF Triple Language) describes triples in an RDF graph and allows abbreviations. Triple Patterns in SPARQL can use the same abbreviations.

This description is based on Turtle 2004-12-23 from <http://www.ilrt.bris.ac.uk/discovery/2004/01/turtle/>

RDF Terms:

URI	< *URI* >	(<> is the base URI, often the document URI)
Literal:	*"string"* or *"string"@language* or ^^< *datatype URI* >	
Blank Node:	`_:` *name* or `[]` for an anonymous blank node	

`@prefix` operator: URIs can be written as XML-style QNames by defining a prefix / URI binding:

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

Triples: Written as 3 RDF terms with whitespace separating them as necessary, and '`.`' between triples:

```
<> dc:title "SPARQL Reference" .
<> dc:date "2005-04-19"^^xsd:dateTime .
```

`,` operator: Triples with the same subject and predicate may be abbreviated with '`,`':

```
<http://example.org/mybook> dc:title "My Book", "Mein Buch"@de .
```

`;` operator: Triples with the same subject may be abbreviated with '`;`':

```
<http://work.example.org/> dc:title "My Workplace";
                           dc:publisher "My Employer" .
```

`[ ... ]` operator: A sequence of (predicate object) pairs may be put inside `[` ... `]` and a blank node subject will be assigned to them:

```
<> dc:creator [ foaf:name "Dave"; foaf:homePage <http:...> ] .
```

`[]` operator: A blank node:

```
[] a ex:Book [ dc:title "Thing"; dc:description "On the shelf" ] .
```

`a` predicate: The often-used `rdf:type` QName may be abbreviated by the keyword `a` as a predicate:

```
<> a Foaf:Document .
```

Integers: Decimal integers 0 or larger can be written directly as literals (type `xsd:integer`)

```
<> ex:sizeInBytes 12345 .
```

`( ... )` collections: RDF collections can be written inside `(` ... `)` as a space-separated list of the contents:

```
<> ex:contents ( ex:apple ex:banana ex:pear ) .
```

9. Example SPARQL Query

```
BASE <http://example.org/>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
# This is a relative URI to BASE above
PREFIX ex: <properties/1.0#>

SELECT DISTINCT $person ?name $age
FROM <http://rdf.example.org/people.rdf>
WHERE {  $person a foaf:Person ;
                 foaf:name ?name.
         OPTIONAL { $person ex:age $age } .
         FILTER ! REGEX(?name, "Bob")
       }
LIMIT 10 OFFSET 20 ORDER BY ASC[?name]
```