

# **Web Semântica e Processamento de Linguagem Natural na prática**

**Newton Calegari**



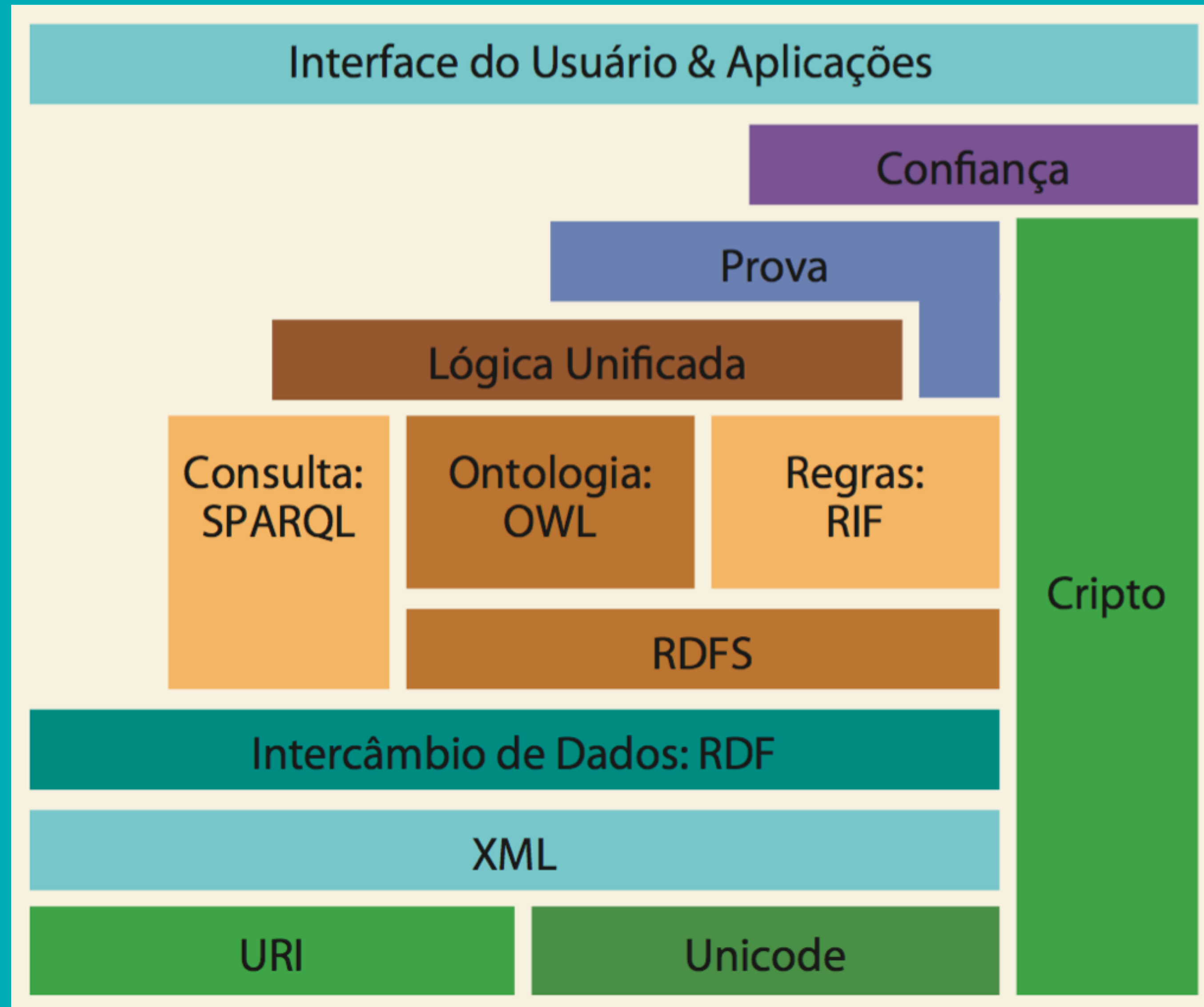
# **RDF, Grafos, Linguagens e SPARQL**

Triplas RDF e Grafos

Linguagens de serialização

Triple stores (Banco de Dados)

Queries SPARQL



# Semantic Web Stack

# RDF



**sujeito**

**predicado**

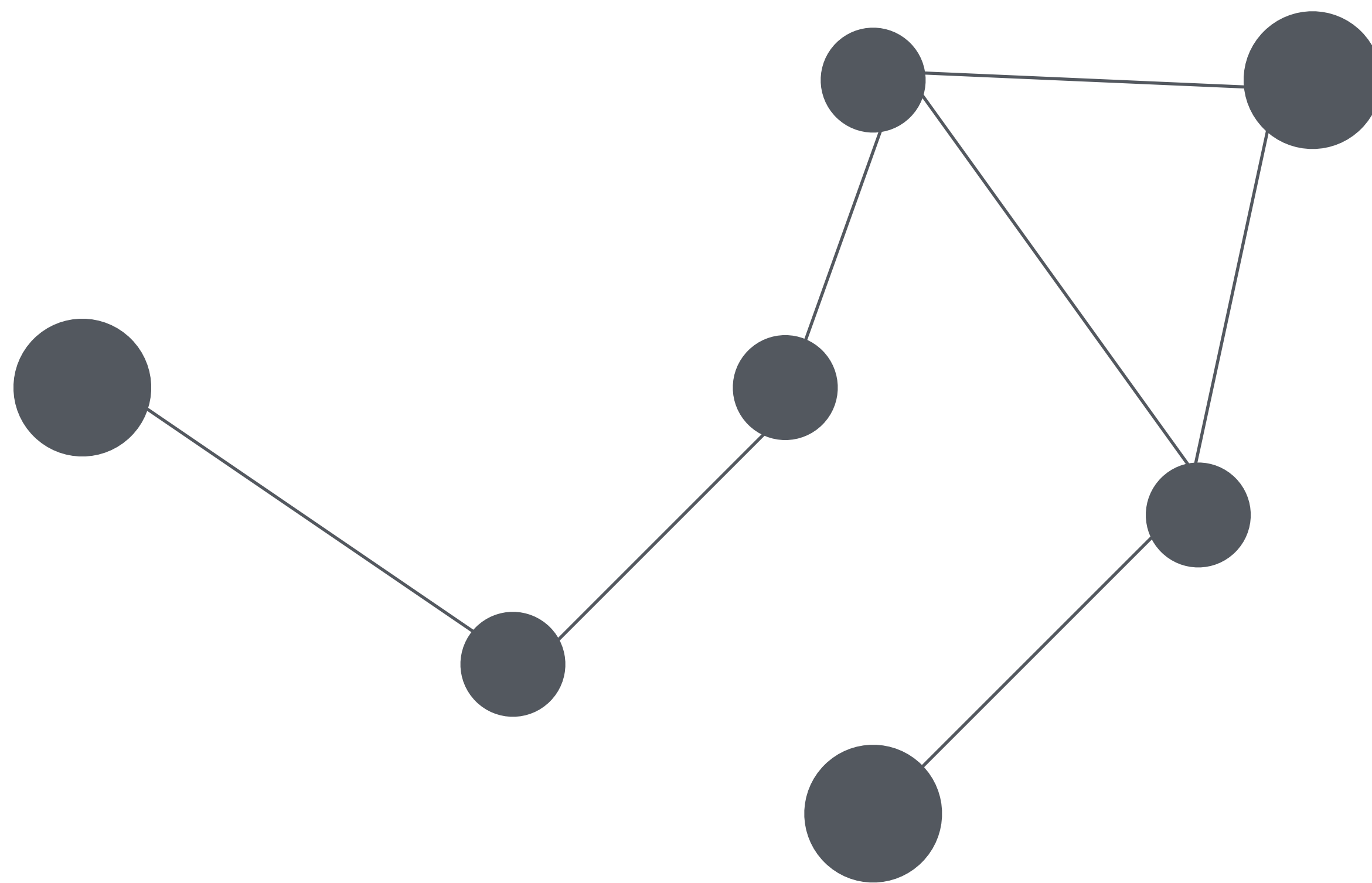
**objeto**

Demi Getschko

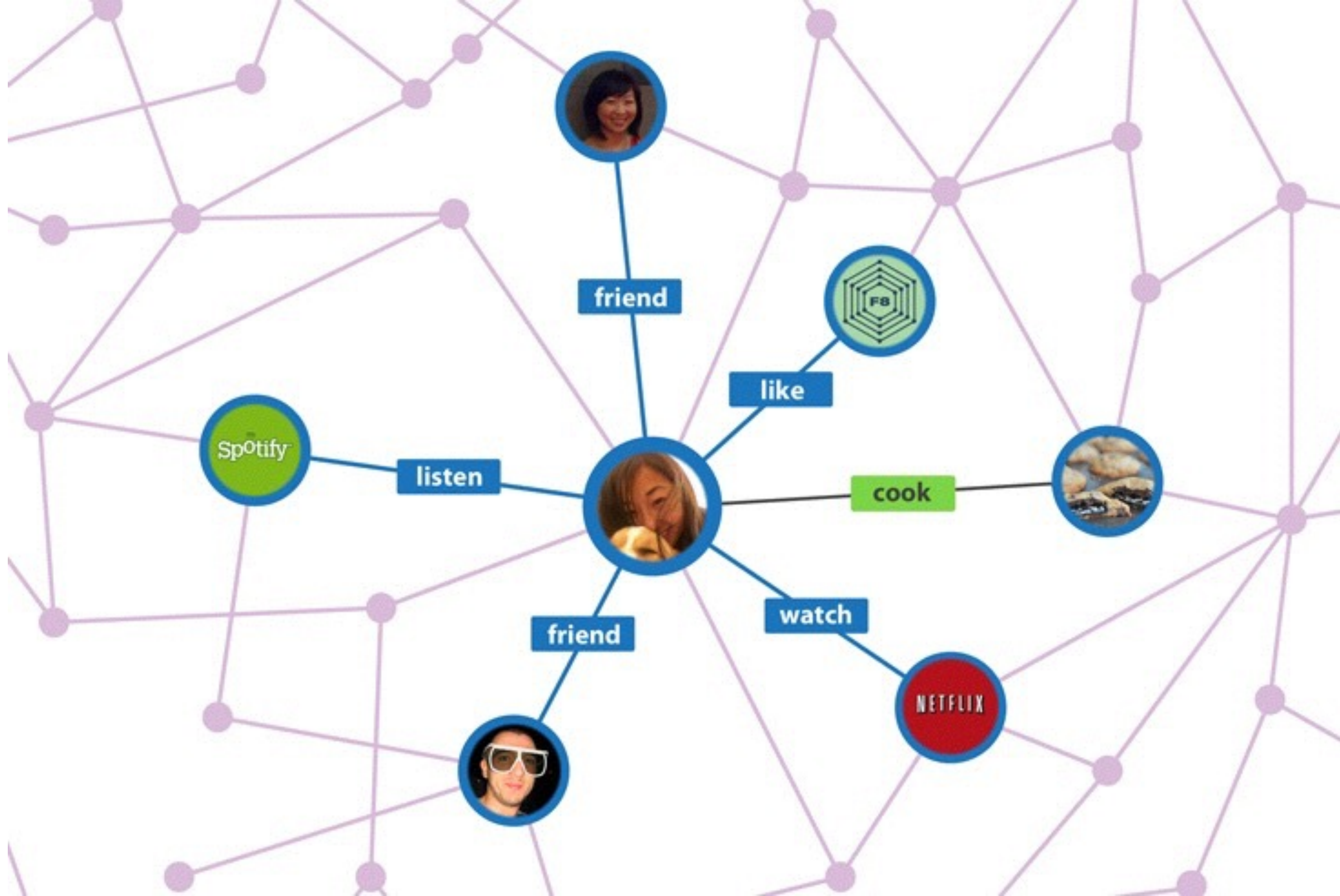
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Newton

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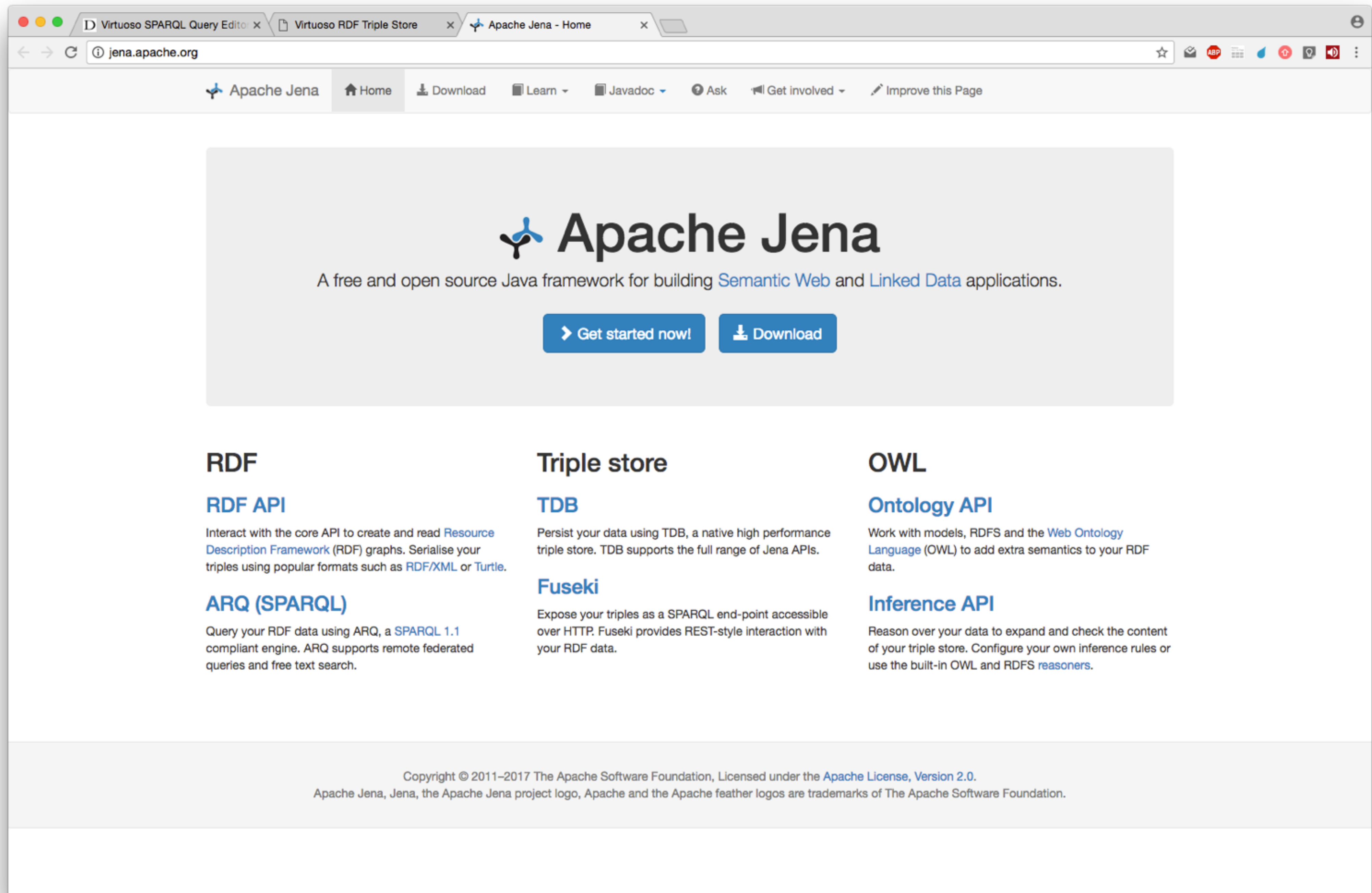
Tim Berners-Lee

fundou

W3C

# **RDF TRIPLE STORE**





A free and open source Java framework for building [Semantic Web](#) and [Linked Data](#) applications.

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⬇️ [Download](#)

## RDF

### RDF API

Interact with the core API to create and read [Resource Description Framework](#) (RDF) graphs. Serialise your triples using popular formats such as [RDF/XML](#) or [Turtle](#).

### ARQ (SPARQL)

Query your RDF data using ARQ, a [SPARQL 1.1](#) compliant engine. ARQ supports remote federated queries and free text search.

## Triple store

### TDB

Persist your data using TDB, a native high performance triple store. TDB supports the full range of Jena APIs.

### Fuseki

Expose your triples as a SPARQL end-point accessible over HTTP. Fuseki provides REST-style interaction with your RDF data.

## OWL

### Ontology API

Work with models, RDFS and the [Web Ontology Language](#) (OWL) to add extra semantics to your RDF data.

### Inference API

Reason over your data to expand and check the content of your triple store. Configure your own inference rules or use the built-in OWL and RDFS [reasoners](#).

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Virtuoso SPARQL Query Editor

Virtuoso RDF Triple Store

Apache Jena - Home

Secure

https://virtuoso.openlinksw.com/rdf/

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### RDF Triple Store

Many relational databases have been used for storing RDF triples and graphs. Also dedicated non-relational approaches, such as using bitmap indices as primary storage medium for triples have been implemented.

At present, there is no industry consensus on what constitutes the optimum storage format and set of indices. The answers to these questions will probably remain workload dependent, so that RDF stores have to leave these choices to application developers.

Virtuoso offers the IRI as a built-in data type, distinct from any other data. This plus the use of Virtuoso's ANY type allows for a single-column representation of a triple's object. The graph, subject and predicate are always IRI's, so they can be declared as such. Since an ANY value is a valid key part with a well-defined collation order between non-comparable data types, indices can be built using the object of a triple.

In selected cases, text indexing may be desired for objects of some triples. This is not directly supported in SPARQL but is a foreseeable need. Virtuoso's existing support of text indexing makes this a simple extension.

Type cast rules of SPARQL and SQL differ. Where SQL expects to signal an error, SPARQL expects a silent failure. Virtuoso deals with this by offering a special SQL compiler directive. With these features in place, SPARQL can be efficiently translated into SQL without introducing needless extra type tests or other clutter.

Many graphs can either be stored in a single table or graph specific tables may be used. This depends on the expected number and size of graphs. In some cases, the graph component will not have to be written in the table at all, saving time and space if dealing with very large single graphs. Virtuoso can provide for a mix of all these storage options.

Work on a system for declaring storage formats per graph is ongoing. For now, Virtuoso puts triples in a single table with the graph IRI as a key part. Future extensions will involve mapping existing relational tables into RDF on the fly, allowing efficient SPARQL access of legacy data and more

### Related Links

- Virtuoso [RDF & SPARQL Implementation Documentation](#)
- [W3C SPARQL Specification](#)

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https://virtuoso.openlinksw.com/rdf/#

**SPARQL**

**SPARQL** é uma linguagem de consultas a fontes de dados no padrão RDF ou em formatos que possam ser convertidos para RDF, por meio de alguma outra aplicação *middleware*.



**SELECT** . . .

**WHERE** { . . . }

```
PREFIX dbo: <http://dbpedia.org/ontology/>
```

```
PREFIX dbp: <http://dbpedia.org/property/>
```

```
PREFIX dbr: <http://dbpedia.org/resource/>
```

```
SELECT ?obra
```

```
WHERE {
```

```
    ?obra dbp:artist dbr:Vincent_van_Gogh
```

```
}
```



PREFIX foo: <http://example.com/resources/>

...

FROM ...

SELECT ...

WHERE {

...

}

ORDER BY ...



VOCABS

TERMS

AGENTS

SPARQL/DUMP

# Friend of a Friend vocabulary (foaf)

## Metadata

URI	<a href="http://xmlns.com/foaf/0.1/">http://xmlns.com/foaf/0.1/</a>
Namespace	<a href="http://xmlns.com/foaf/0.1/">http://xmlns.com/foaf/0.1/</a>
homepage	<a href="http://www.foaf-project.org/">http://www.foaf-project.org/</a>
Description	FOAF is a project devoted to linking people and information using the Web. Regardless of whether information is in people's heads, in physical or digital documents, or in the form of factual data, it can be linked. @en
Language	

Libby Miller

<http://data.semanticweb.org/person/libby-miller>



n3

## Statistics

Classes	13
Properties	62
Datatypes	0
Instances	0

## Expressivity

RDF

RDFS

<http://sparql.org/sparql.html>

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

```
SELECT ?name
```

```
FROM <http://dig.csail.mit.edu/2008/webdav/timbl/foaf.rdf>
```

```
WHERE {  
    ?person foaf:name ?name .  
}
```

DBpedia

wiki.dbpedia.org

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RelFinder

PROJECT

RelFinder

Are you interested in how things are related with each other? The flash-based RelFinder helps to get an overview: It extracts and visualizes relationships between given objects in RDF data and

```
SELECT ?pais, ?nome
```

```
WHERE {
```

```
    ?pais a dbo:Country .
```

```
    ?pais dbp:commonName ?nome
```

```
}
```