



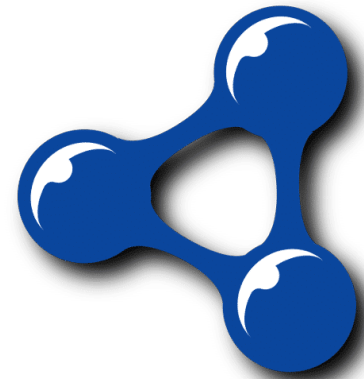
# RDF & SPARQL





# Content

- RDF
- SPARQL





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# RDF

## Resource Description Framework - RDF

- Family of World Wide Web Consortium (W3C) specifications
- Originally designed as a metadata data model
- Used as a general method for conceptual description or modeling of information
- The RDF data model is similar to classical conceptual modeling approaches (such as entity–relationship or class diagrams)





# RDF

## Tripels

RDF is based on statements about resources in expressions of the form **subject–predicate–object**, known as **triples**.

Example: *The sky has the color blue*

- subject : sky
- predicate : has
- object : the color blue





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## Relational

- entity : sky
- attribute : color
- value : blue

## ERM

sky		
PK	ID	integer
	Color	string

## Table: sky

ID	Color
1	Red
2	Green
3	Blue



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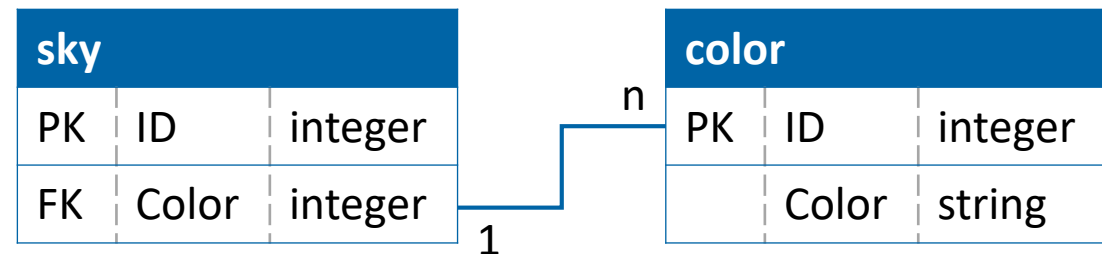
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Labeled Property Graph

- label : sky
- key : color
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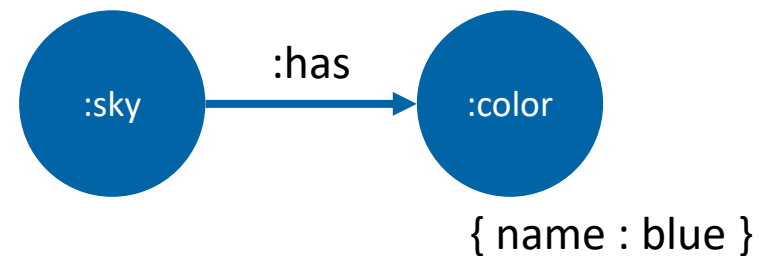
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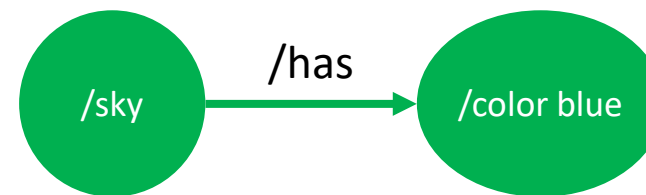
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RDF

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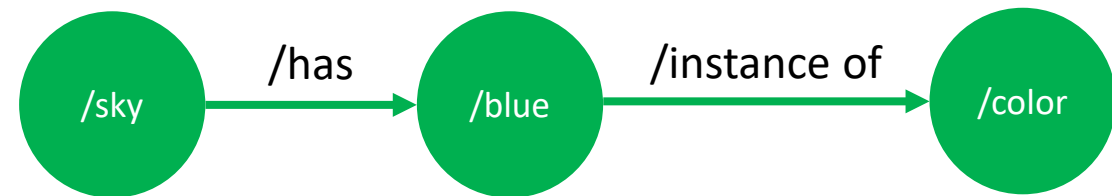
Example: *The sky has the color blue*

- subject : sky
- predicate : has
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RDF

- |                   |                         |
|-------------------|-------------------------|
| • subject : sky   | subject : blue          |
| • predicate : has | predicate : instance of |
| • object : blue   | object : color          |





# RDF

## Ontology

An ontology is the formal naming and definition of the categories, properties, and relations between these. In other words, the list of all defined resources in a RDF (for subjects, predicates and objects)

Can be defined

- directly in RDF
- using a formal ontology description language, such as OWL (Web Ontology Language)

New ontologies can/should make use of existing ontologies.

Basic ontologies:

- [RDF Schema](#)
- [FOAF Vocabulary Specification](#)
- [SKOS Simple Knowledge Organization System Primer](#)

### 2. Classes

Resources may be divided into groups called classes. The members of a class are known as *instances* of the class. Classes are themselves resources. They are often identified by [IRIs](#) and may be described using RDF properties. The [rdf:type](#) property may be used to state that a resource is an instance of a class.

RDF distinguishes between a class and the set of its instances. Associated with each class is a set, called the class extension of the class, which is the set of the instances of the class. Two classes may have the same set of instances but be different classes. For example, the tax office may define the class of people living at the same address as the editor of this document. The Post Office may define the class of people whose address has the same zip code as the address of the author. It is possible for these classes to have exactly the same instances, yet to have different properties. Only one of the classes has the property that it was defined by the tax office, and only the other has the property that it was defined by the Post Office.

A class may be a member of its own class extension and may be an instance of itself.

The group of resources that are RDF Schema classes is itself a class called [rdfs:Class](#).

If a class C is a *subclass* of a class C', then all instances of C will also be instances of C'. The [rdfs:subClassOf](#) property may be used to state that one class is a subclass of another. The term super-class is used as the inverse of subclass. If a class C' is a super-class of a class C, then all instances of C are also instances of C'.

The RDF Concepts and Abstract Syntax [RDF11-CONCEPTS] specification defines the RDF concept of an [RDF datatype](#). All datatypes are classes. The instances of a class that is a datatype are the members of the value space of the datatype.

#### 2.1 rdfs:Resource

All things described by RDF are called *resources*, and are instances of the class [rdfs:Resource](#). This is the class of everything. All other classes are *subclasses* of this class. [rdfs:Resource](#) is an instance of [rdfs:Class](#).

#### 2.2 rdfs:Class

This is the class of resources that are RDF classes. [rdfs:Class](#) is an instance of [rdfs:Class](#).



# RDF

## Uniform Resource Identifier - URI

A URI is a string of characters designed for unambiguous identification of resources and extensibility via the URI scheme.

```
URI = scheme:[//authority]path[?query][#fragment]
```

```
authority = [userinfo@]host[:port]
```

Such identification enables interaction with representations of the resource over a network, typically the World Wide Web, using specific protocols (e.g. http, ftp).

One type of an URI is the Uniform Resource Locator (URL) which identifies the resource of a webpage.

→ IRIs  
International Resource  
Identifiers  
extends allowed character set

RDF: subject, predicate, and object are resources identified by a URI.



# Content

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- SPARQL





# SPARQL

## SPARQL Protocol And RDF Query Language - SPARQL

SPARQL (pronounced "sparkle") is an RDF query language, that is a semantic query language for databases, able to retrieve and manipulate data stored in the Resource Description Framework (RDF) format.

### Example

"What are all the country capitals in Africa?"

```
PREFIX ex: <http://example.com/exampleOntology#>
SELECT ?b
WHERE
{
  ?a    ex:instanceOf      ?country .
  ?a    ex:isInContinent  ex:Africa .
  ?b    ex:isCapitalOf    ?a      .
}
```

expressive:

a is country

a is in continent Africa

b is capital of a



# SPARQL

## SPARQL in 11 minutes

Query

```
PREFIX vcard: <http://www.w3.org/2006/vcard/ns#>
PREFIX sm: <http://www.smea.com/hr/>

SELECT ?givenName ?familyName ?fullName
WHERE
{
  ?person vcard:given-name ?givenName .
  ?person vcard:family-name ?familyName .
  BIND(concat(?givenName," ",?familyName) AS ?fullName)
}
```

Result

?givenName	?familyName	?fullName
John	Smith	John Smith
Heidi	Smith	Heidi Smith
Jane	Berger	Jane Berger
Francis	Jones	Francis Jones





# SPARQL

## Wikidata

The screenshot shows the Wikidata main page. At the top right, there are links for language (English), login status (Not logged in), and actions (Talk, Contributions, Create account, Log in). Below this is a navigation bar with tabs for Main Page, Discussion, Read, View source, and View history, followed by a search bar labeled 'Search Wikidata'. On the left side, there is a sidebar with the Wikidata logo and a list of links: Main page, Community portal, Project chat, Create a new Item, Create a new Lexeme, Recent changes, Random Item, Query Service, Nearby, Help, and Donate. The main content area features a large grey box with the text 'Welcome to Wikidata' and 'the free knowledge base with 85,291,371 data items that anyone can edit.' Below this is a link to 'Introduction • Project Chat • Community Portal • Help'. At the bottom, there is a call to action: 'Want to help translate? Translate the missing messages.' A network diagram is overlaid on the page, with red lines connecting to the word 'open' and 'multilingual', green lines connecting to 'free', and blue lines connecting to 'collaborative' and 'anyone can edit'.