RDF & SPARQL

R. Vorburger

Content

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- SPAQRL

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RDF

Resource **D**escription **F**ramework - 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

RDF

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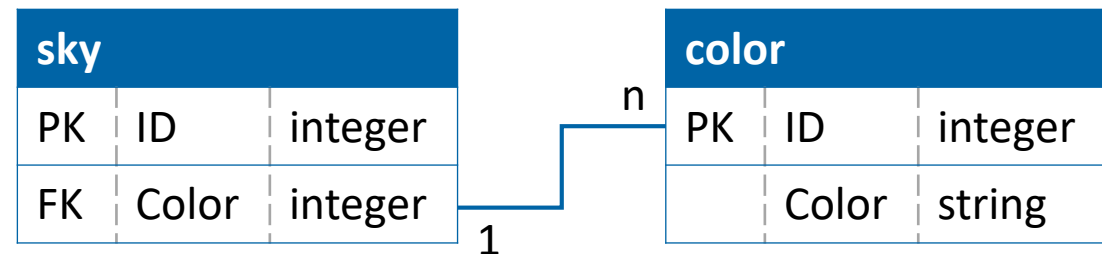
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n

1

RDF

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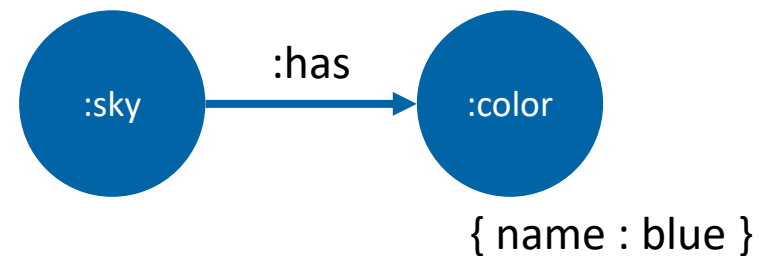
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Labeled Property Graph

- label   : sky
- key   : color
- value   : blue

:sky

{ color : blue }

RDF

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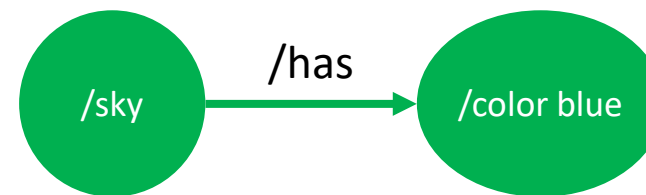
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RDF

- subject   : sky
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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

RDF

- subject   : sky   subject   : blue
- predicate : has   predicate : instance of
- object   : blue   object   : color
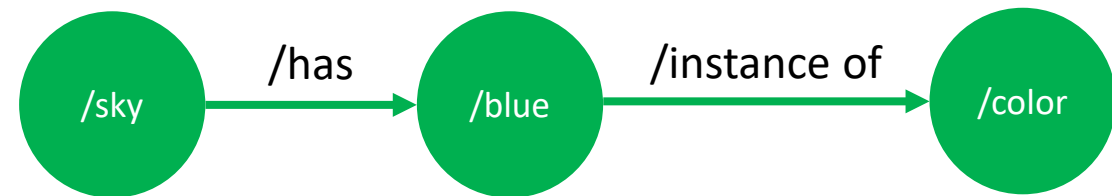
RDF

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 **R**esource **I**dentifier - 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.

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SPARQL

SPARQL **P**rotocol **A**nd **R**DF **Q**uery **L**anguage - 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

SPARQL

Wikidata