Ch 5: Resource Description Framework

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Example semantic network

Setting:
- Facebook want to promote a game to Torstein
- Want to use all available information
- Want an automatic process
RDF

- Modeling data by making statements about resources
  - Like entity-relationship -> databases
  - Like class diagram -> object oriented programming
- Organized into triplets
  - Subject, predicate, object
  - Torstein, likes, Age of empires
- A collection of triplets form a RDF graph
- RDF can be serialized to:
  - XML
  - Turtle
  - (subject URI, predicate URI, object URI)
  - JSON-LD
Example triplets

Triplets:
- Torstein, like, Age of Empires
- advertisment1, promoting, Clash of Clans
- advertisment2, promoting, Tetris
- ageofempires.com, tag, strategy
- Clach of Clans, tag, strategy
- Tetris, tag, puzzle
HTML

- Markup language for web pages
- Difficult for machines to read
- Fixed tags - not extensible

```html
<html>
  <head>
    <title>My Page</title>
  </head>
  <body>
    Hello World!
  </body>
</html>
```
XML

- Markup language readable by humans and machines
- Dynamic tags
- Often used in application programming interfaces

```xml
<?xml version="1.0"?>
<!DOCTYPE message [
<!ELEMENT message (#PCDATA)>]

<message>
  Hello World!
</message>
```
RDF Schema

- Mechanism used to describe groups of related resources, RDF
- Uses RDF to describe the data
- Defines basic classes and properties
  - Classes
    - rdfs:resource
    - rdfs:class
  - Properties
    - rdfs:domain
    - rdfs:range
    - rdfs:subClassOf
- Properties describe the relationship between subject resource and object resource
Example classes and properties

- **Class**
  - game
  - person

- **Property**
  - like
  - domain

- **SubClassOf**
  - game
  - person

- **Domain**
  - like
  - domain

- **Type**
  - Age of Empires
  - Torstein

- **SubPropertyOf**
  - like
  - domain
RDF Vocabulary

- A vocabulary defines classes, properties and their meaning
- Enables meaningful communication between computers
- Each vocabulary has its own namespace
- Examples
  - foaf
  - dc
  - rdf
  - rdfs
  - owl
Defining our own vocabulary:
- ga -> http://games.com/ns/
- Classes:
  - game
  - labels
- Properties:
  - tag
XQuery

- Query Language for XML
- XQuery is a W3C query standard
- Inputs/outputs are objects defined by XML-Query data model
- Uses FLWR (“Flower”) Expressions: FOR ... LET... FOR... LET... WHERE...
  RETURN...

Finds all games published after 2002

FOR $x IN document("games.xml")/games
WHERE $x/year/text() > 2002
RETURN $x/title
SPARQL

- Query language designed to access information stored in RDF format
  - Developed by W3C
  - 2008

```sparql
PREFIX ex: <http://example.com/ns#>

SELECT ?capital ?country
WHERE {
  ?x ex:cityName ?capital ;
  ex:isCapitalOf ?y .
  ?y ex:countryName ?country ;
  ex:isInContinent ex:Africa .
}
```
Summary

- Highlighted some characteristics of HTML and XML
- Introduced RDF
- The subject, predicate, and object is defined as the RDF triplet
- RDF Schema
- Live demo of SPARQL
- Conclude that RDF and RDFS can be used in the Semantic web, but lacks expressive power. They cannot for example define:
  - the properties of properties
  - necessary and sufficient conditions for class membership
  - equivalence and disjointness of classes
- Perhaps OWL in the next chapter will provide that