

The Meta Workshop

By Veronika Heimsbakk



The Meta Workshop

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Capgemini 

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 veronikaheim

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Why?

- › Outreach the wonders of semantic knowledge graphs.
- › Raise awareness of the importance of knowledge in a world of predictive madness.
- › That AI is more than ML!

Previous workshops

- > Norwegian Police Force
- > Norwegian Digitalization Agency
- > Compare/Karlstad Municipality, Sweden
- > 6 × Capgemini locations in Scandinavia
- > The Norwegian Maritime Authority
- > Scania
- > Knowledge Graph Oslo Meetup (meetup.com)
- > BaneNOR (Norwegian Railway Service)



Scoping the workshop

	2h	6h	12h
0h		Observations & Motivation	
		Introduction to RDF	
		Hands-on: drawing	
	RDFS+inference	RDFS w/inference	
		Hands-on: drawing	
2h	End	Vocabularies	
3h		Lunch	
		LPG vs. RDF	SPARQL
		More terms	Hands-on: Fuseki
4/6h		OWL	End day 1
		Hands-on + demo	More terms
		Inconsistency explained	OWL
		SHACL	Hands-on + demo
		If time: project demo	Inconsistency explained
6/10h		End	SHACL
			Hands-on + demo
			Project demo
12h			End

Scoping the workshop

- > A classroom set-up, so 3-4 people can work together.
- > Have a whiteboard accessible.
- > Approx. 30 participants is enough if you're alone.
- > For one organization; encourage the audience to use their own domain in the exercises.
- > Mixed audience; let them choose their domain.

Workshop goals

2h How to think in graphs.

6h Understand the Semantic Web technologies and their capabilities.

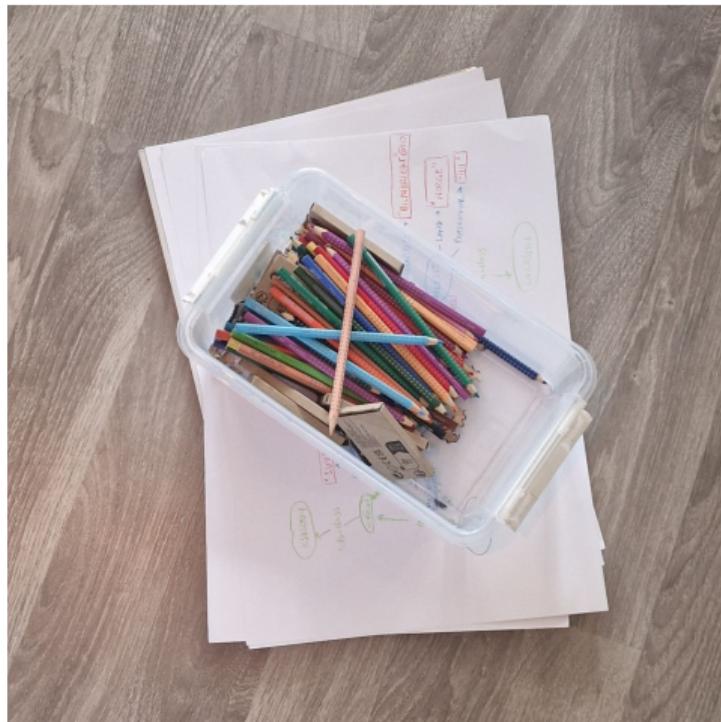
12h Be able to assist ontologists in their work.

Tools of Trade

- A3 paper sheets
- Coloring pencils

- Protégé
- WebProtégé

- Fuseki
- Wikidata SPARQL endpoint
- SHACL playground



- > Brief overview of most used resources.
 - » rdfs:Resource, rdfs:Class, rdf:Property, rdf:type, rdfs:domain, rdfs:range
 - > With inference: explain the transitive relationship through rdf:type. Draw explanation on whiteboard if necessary.
-

```
:Planet rdfs:subClassOf :AstronomicalBody .  
:Jupiter rdf:type :Planet .
```

```
:Jupiter rdf:type :AstronomicalBody .
```

$$\forall a, b, c \in X : (aRb \wedge bRc) \Rightarrow aRc$$

- > Hands-on: classifying the drawing, adding domain and range is optional.

Vocabularies

- > Explain the difference between **vocabulary**, **taxonomy**, and **ontology**.
- > List a few well-known external vocabularies, and give short description.
- > Show a visualization with many vocabularies in play for demonstration purposes.
- > Repeat the value of global unique identifiers (URIs).
- > Give references to meta-collections of vocabularies/ontologies.

SPARQL

- > Quick intro to most used keywords; SELECT, ASK, CONSTRUCT, WHERE, FILTER, OPTIONAL. Include a lot of examples.
- > Talk about the most used triple stores on the market, use your own experience. If you don't have any experience with some of the vendors, do some research before the workshop.

Hands-on

Always give a live-demo of the content you're going through. Keep low pace, so others can follow.

- > Type your drawing into RDF Turtle, using your editor of choice.
 - » Provide back-up files, just in case.
- > Download and run Fuseki.
 - » If Fuseki is out of the question; run the demo on Wikidata.
- > Upload and explore the data using SPARQL and Fuseki.

OWL

- › Keep it short. OWL is intimidating, but we try to make it less scary!
-



*Explicit specification of a conceptualization.
The study of existence, categories and relations between what is.
Formal names and definitions of entities, properties and relations.*

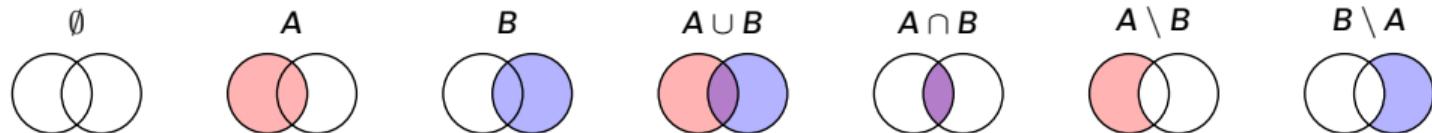
- › My workshops often leads to a follow-up workshop on more hardcore ontology modelling.

Mathematical properties and operations

R is a relation on the set X ($R \text{ SUB } X \times X$), and R are

- > reflexive, if $\langle a, a \rangle \in R$ for all $a \in X$
- > irreflexive, if $\langle a, a \rangle \notin R$ for all $a \in X$
- > symmetric, if $\langle a, b \rangle \in R$ implies $\langle b, a \rangle \in R$
- > asymmetric, if $\langle a, b \rangle \in R$ implies $\langle b, a \rangle \notin R$
- > transitive, if $\langle a, b \rangle, \langle b, c \rangle \in R$ implies $\langle a, c \rangle \in R$
- > functional, if $\langle a, b \rangle, \langle a, c \rangle \in R$ implies $b = c$

Set theory



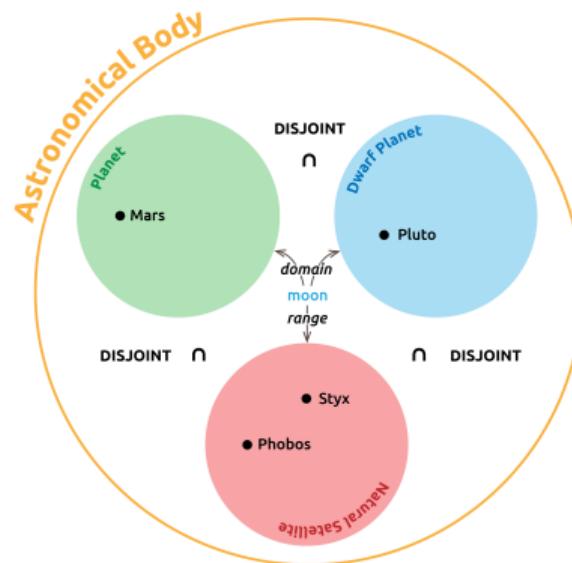
OWL Hands-on

Do this as a follow-along demo.

- › Type the drawing into Protégé (either desktop or web-based).
- › Purpose: get to know open source tools for semantic modelling.

I always leave a contradiction in my demo;

1. ask if the audience catch it,
2. run the reasoner in Protégé,
3. show how Protégé displays and explains contradictions,
4. explain on whiteboard



- › Additional demos on classification by reasoning: hydro power plants by effect and/or stars by kelvin temperature. Purpose: display OWL Axioms.

- › Walk through all SHACL Core Constraints, including examples for each "category".
- › Explain how a SHACL Engine works, I always bring in real-world examples and use cases.
- › Show the validation vocabulary.

Hands-on

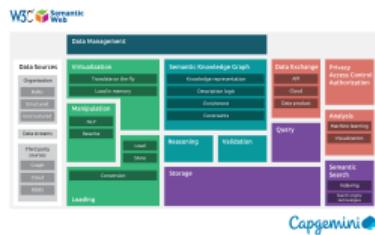
- › I use the web based SHACL Playground.

Closing up the workshop

> Project presentation



> Reference architecture



> After the workshop: send an e-mail to say thank you and add plenty of resources.

> Vendor landscape & tooling



> When selling stuff for Capgemini; brag about our Knights of Knowledge, and our clients and their use cases.

Remember!

> SMILE!

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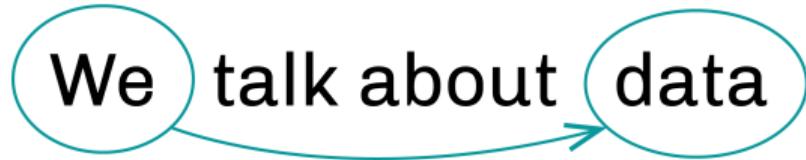
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- > Be enthusiastic! And have a lot of fun!
- > Keep it simple, and inspire curiosity.

Observations

We think of data

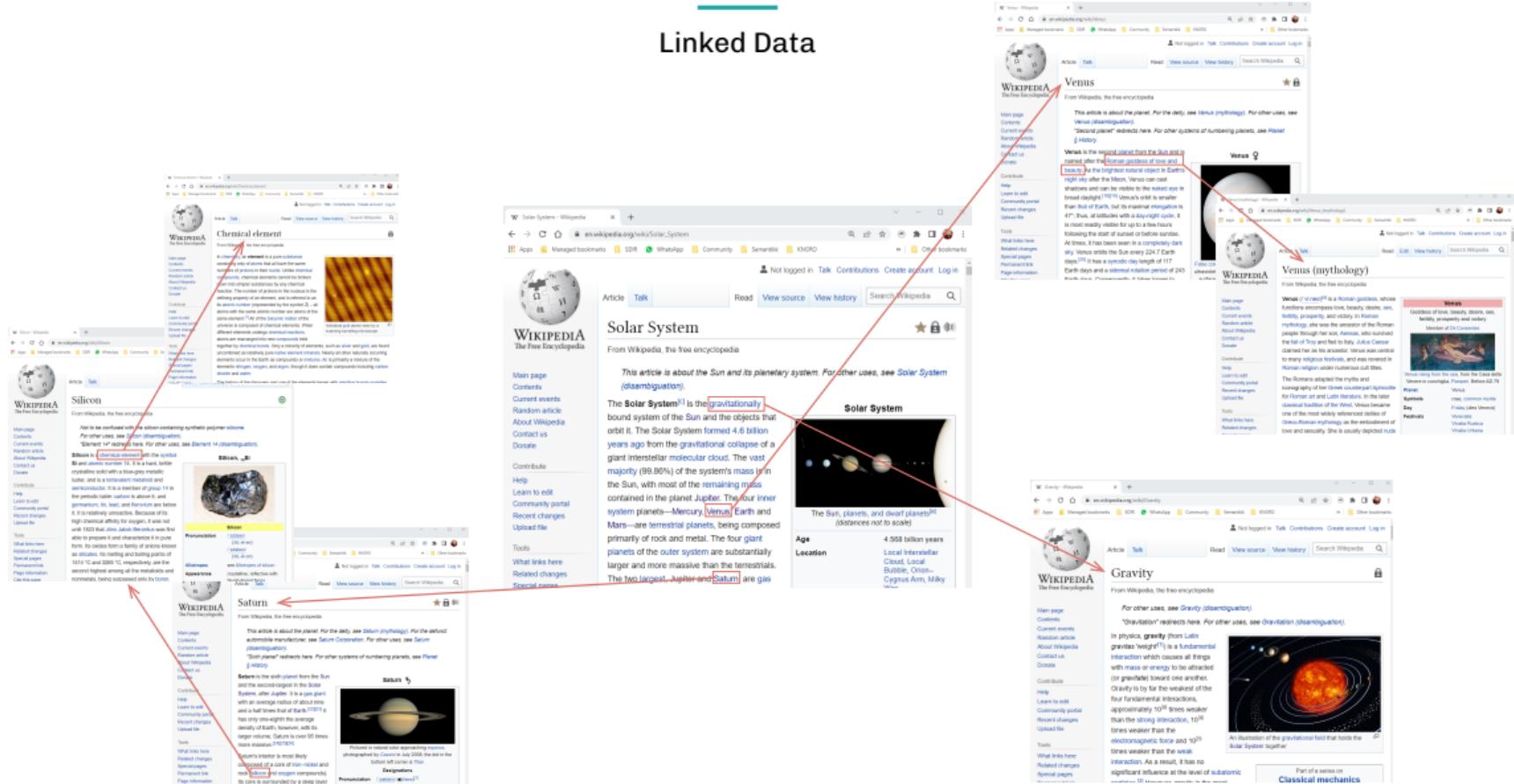
Observations



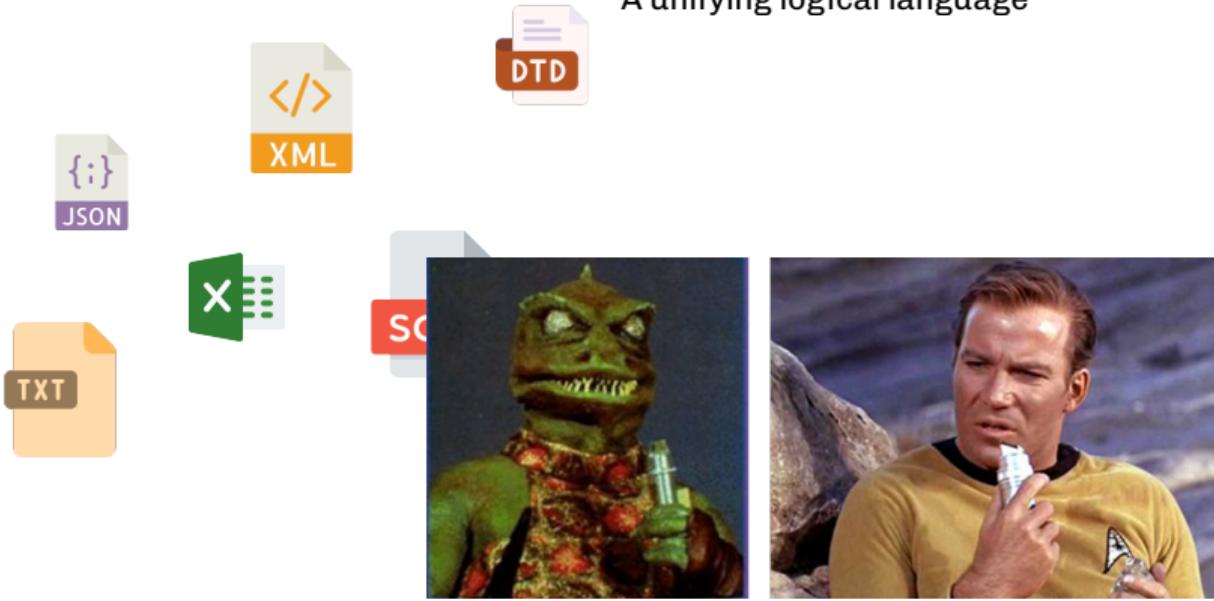
We talk about data

The diagram consists of two teal-outlined circles. The first circle contains the word "We". A curved teal arrow originates from the bottom of this circle and points to the right, ending in an arrowhead that points into the second circle. The second circle contains the word "data".

Linked Data



A unifying logical language



Natural language vs. formal semantics

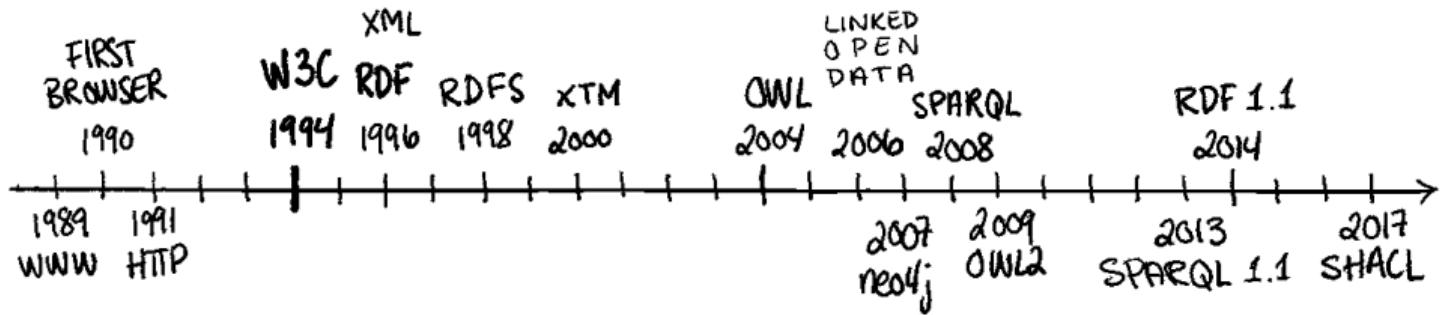
Semantics?

What about JSON?

```
{  
  "planet": "Earth" ,  
  "moon": "Moon" ,  
  "averageOrbitalSpeed": "29.78"  
}
```

```
{  
  "bolygó": "Föld" ,  
  "hold": "Hold" ,  
  "átlagosKeringésiSebesség": "29.78"  
}
```

TIMELINE OF GRAPH ON THE WEB



QUERYING
SPARQL

ONTOLOGIES
OWL

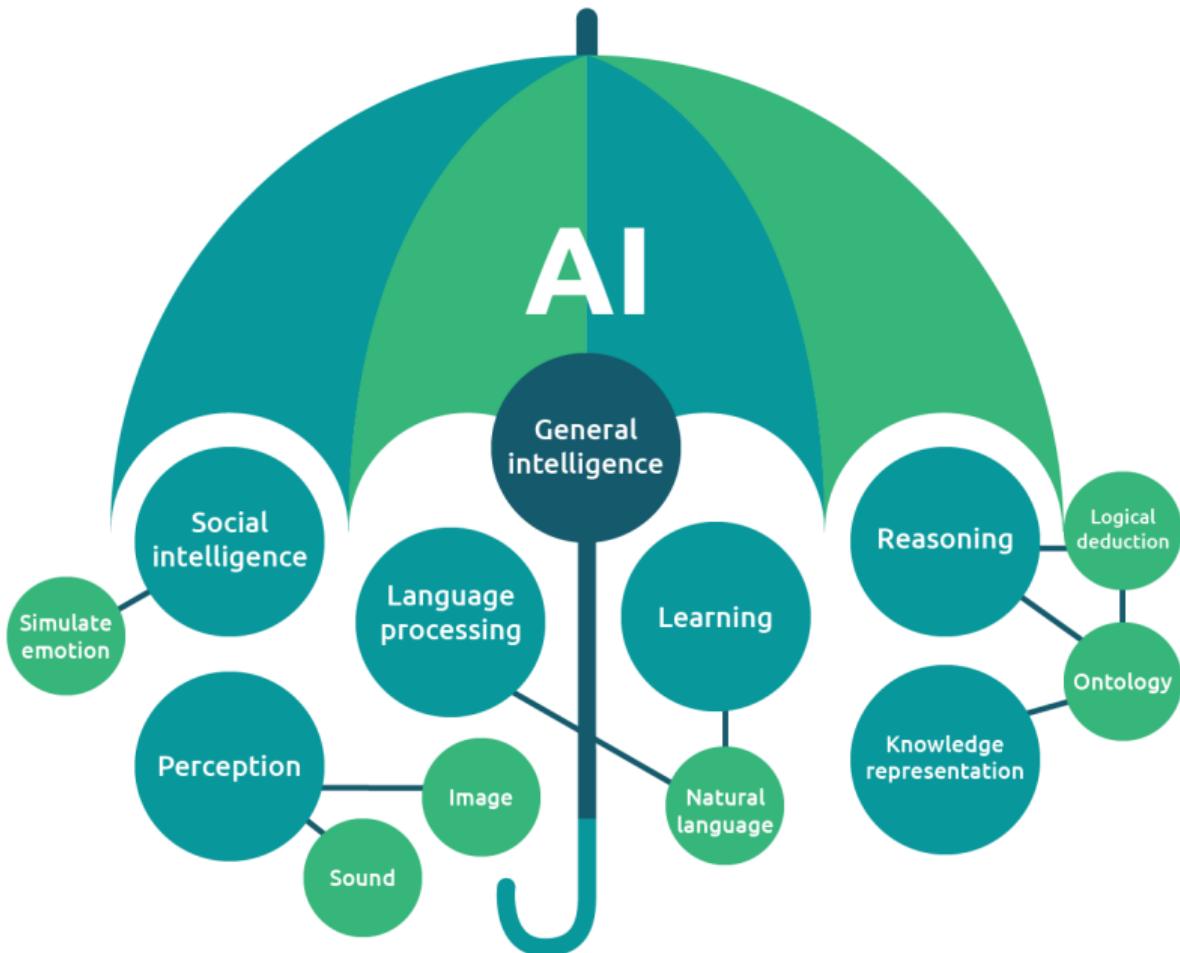
CONSTRAINTS
SHACL

TAXONOMIES
RDFS

DATA INTERCHANGE
RDF

SYNTAX
RDF/XML, TURTLE, JSON-LD, N-TRIPLES ++

IDENTIFIERS
URI



Resource Description Framework

Think about data as a *directed graph*, and that all *things* has a relation to other things.

Terminology

Think about data as a *directed graph*, and that all *things* has a relation to other things.

- › A model for describing data as directed graphs.



- › Data described as *triples*.
- › A triple is also called a *fact* or a *statement*.
- › The elements of a triple are also called *resources*.

subject predicate object

- › Use of *Uniform Resource Identifiers* (URI) to tell resources from another.

URI

- › Is **only** a *name*. Does not need to link to anything.

```
scheme://[user:password@]host[:port]][/]path[?query][#fragment]
```

Example

<http://capgemini.data.com/planets/Jupiter>

RDF syntax

There are several ways of writing RDF.

- › Turtle, N-triples, RDF/XML, JSON-LD ...

easyrdf.org/converter

RDF Turtle

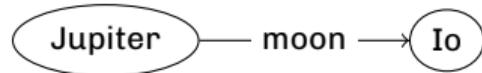
```
<http://capgemini.data.com/planets/Jupiter>
<http://capgemini.data.com/planets/moon>
<http://capgemini.data.com/planets/Io> .
```

RDF Turtle, prefix

```
@prefix planets: <http://capgemini.data.com/planets/> .  
planets:Jupiter  
    planets:moon planets:Io .
```

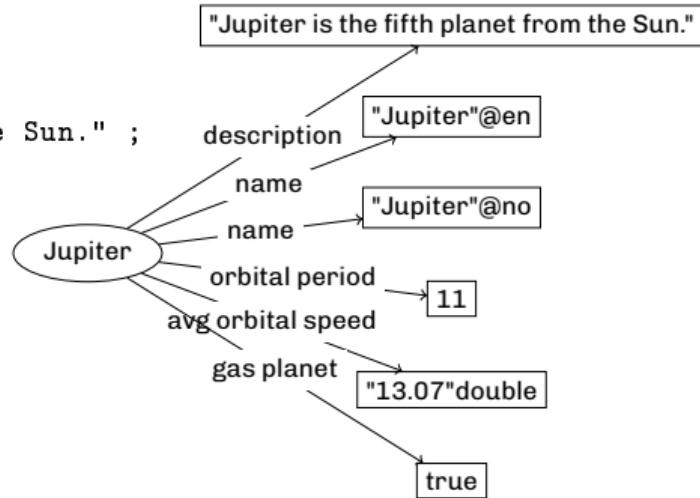
RDF Turtle, prefix

```
@prefix : <http://capgemini.data.com/planets/> .  
  
:Jupiter  
  :moon :Io .
```



RDF Turtle, literals

```
@prefix : <http://capgemini.data.com/planets/> .  
  
:Jupiter  
  :description "Jupiter is the fifth planet from the Sun." ;  
  :name "Jupiter"@no ,  
        "Jupiter"@de ;  
  :orbitalPeriod 11 ;  
  :avgOrbitalSpeed "13.07"^^xsd:double ;  
  :gasPlanet true .
```





CLASSES
CONCEPTS
TBOX

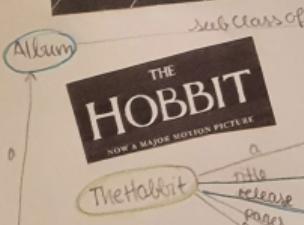
INSTANCES
ABOX



NightfallInMiddleEarth

itemType "Nightfall in Middle-Earth" Pen!
mostViewedDate "1998-04-28"^^date
minViewingTime "65"^^MIN

BlindGuardian



The Hobbit

THE HOBBIT
NOW A MAJOR MOTION PICTURE

subClassOf

Work

subClassOf

Book

subClassOf

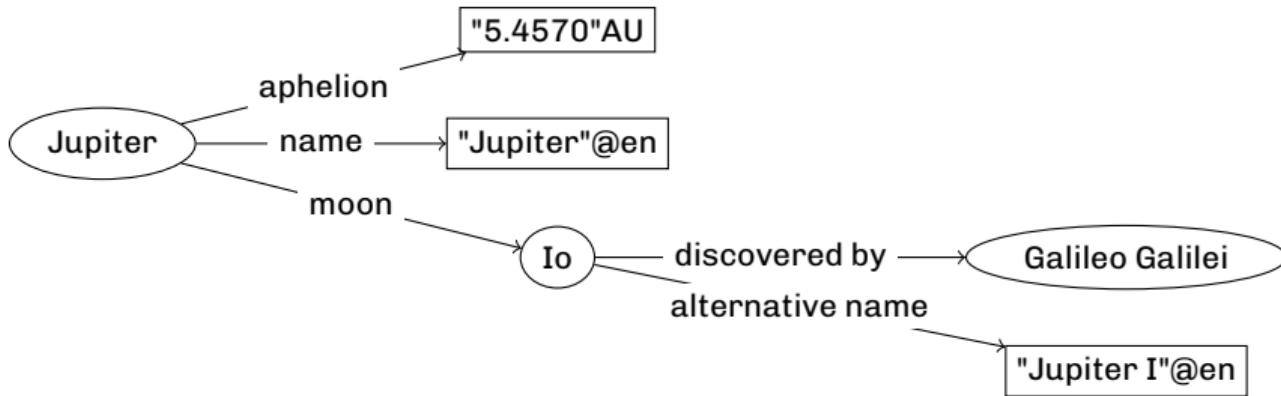
Movie

subClassOf

Exercises

40 min

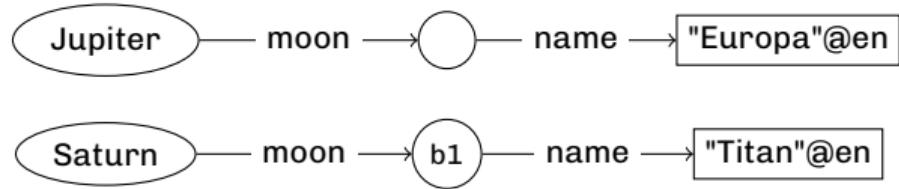
- › Draw a knowledge graph in your domain of choice!



- › **Remember** draw objects (defined by URIs) as circles, and data values (literals) as rectangles.
- › Remember to type your data values.

RDF Turtle, blank nodes

```
@prefix : <http://capgemini.data.com/planets/> .  
  
#1  
:Jupiter  
:moon [  
:name "Europa"@en .  
] .  
  
#2  
:Saturn  
:moon _:b1 .  
  
_:b1 :name "Titan"@en .
```



RDF Turtle, collections

```
@prefix : <http://capgemini.data.com/planets/> .  
  
#1  
:Jupiter :moon ( :Europa :Io :Callisto ) .  
  
# 2  
:Saturn :moon _:b1 .  
  
_:b1 rdf:first :Titan .  
_:b1 rdf:rest _:b2 .  
  
_:b2 rdf:first :Mimas .  
_:b2 rdf:rest rdf:nil .
```

