Introduction to Querying Linked Data

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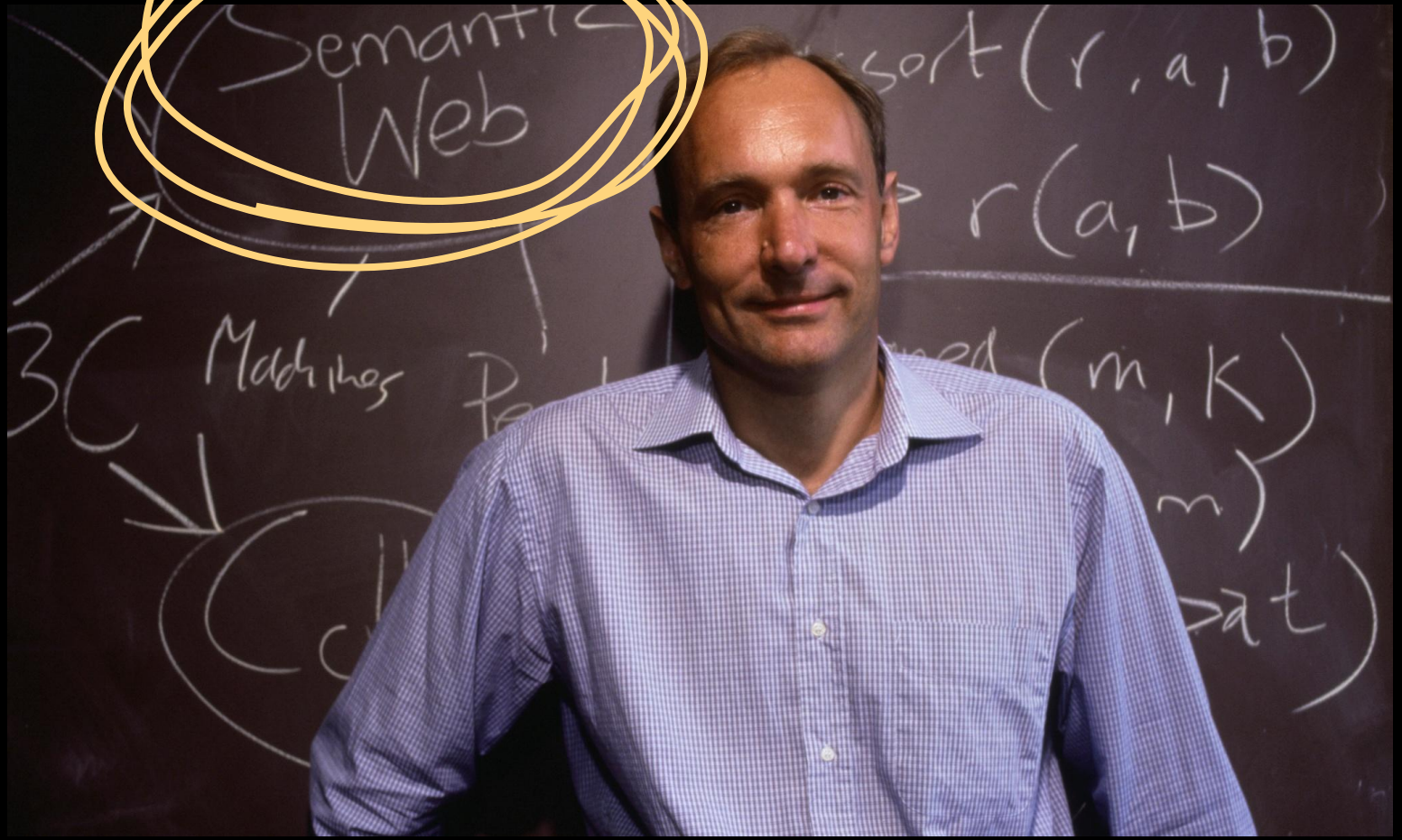
'I said, "Could you put your documents on this web thing?" And you did. Thanks! It's been a blast, hasn't it? ... Now, I want you to put your data on the web. Turns out that there is still huge unlocked potential. There is still a huge frustration that people have because we haven't got data on the web as data.'

Tim Berners-Lee, 2006 TED Talk

What About…

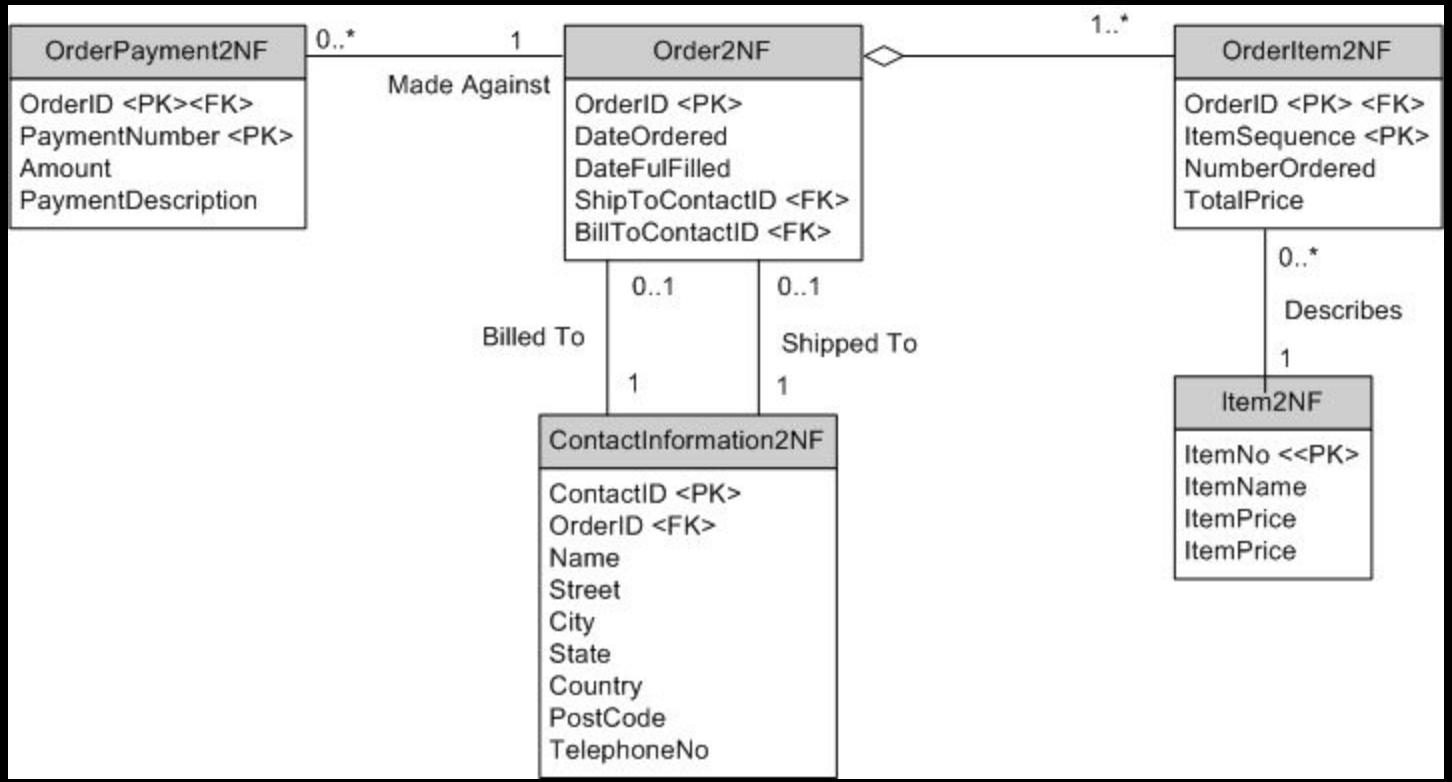
Databases?
APIs?
XML Encoded Documents?


Semantic
Web
sort (r, a, b)
r(a, b)
(m, K)
m)
at)

“The Semantic Web isn’t just about putting data on the web. It is about making links...when you have some of it, you can find other, related, data.”

- https://www.w3.org/DesignIssues/LinkedData.html

Triples


OrderPayment2NF
OrderID <PK><FK>
PaymentNumber <PK>
Amount
PaymentDescription
0..*
1
Made Against
Order2NF
OrderID <PK>
DateOrdered
DateFulFilled
ShipToContactID <FK>
BillToContactID <FK>
1..*
OrderItem2NF
OrderID <PK> <FK>
ItemSequence <PK>
NumberOrdered
TotalPrice
0..*
Describes
1
Item2NF
ItemNo <<PK>
ItemName
ItemPrice
ItemPrice
0..1
Billed To
1
0..1
Shipped To
1
ContactInformation2NF
ContactID <PK>
OrderID <FK>
Name
Street
City
State
Country
PostCode
TelephoneNo

Benjamin Sisko has rank Captain

Sisko serves on DS9

Sisko knows Jadzia Dax

Dax has rank Lt. Commander

Dax serves on DS9

Dax has position Chief Science Officer

Worf is the son of Mogh

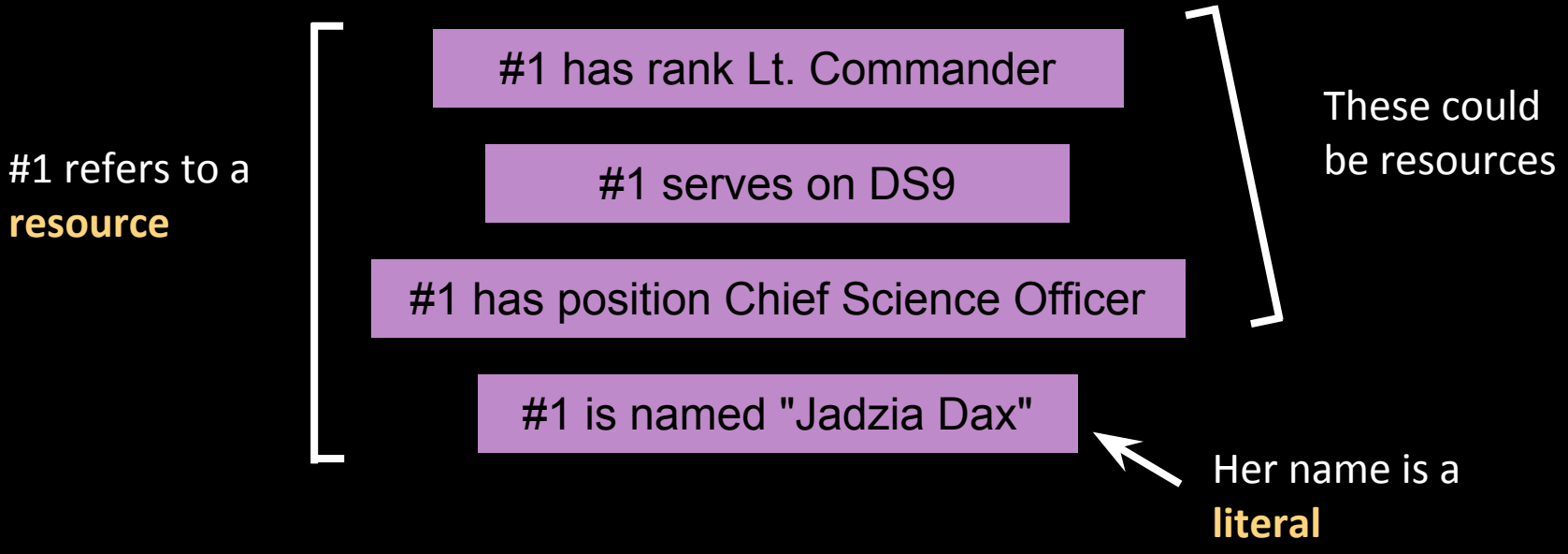
Mogh is a Klingon warrior

"Dax" refers to the same entity each time

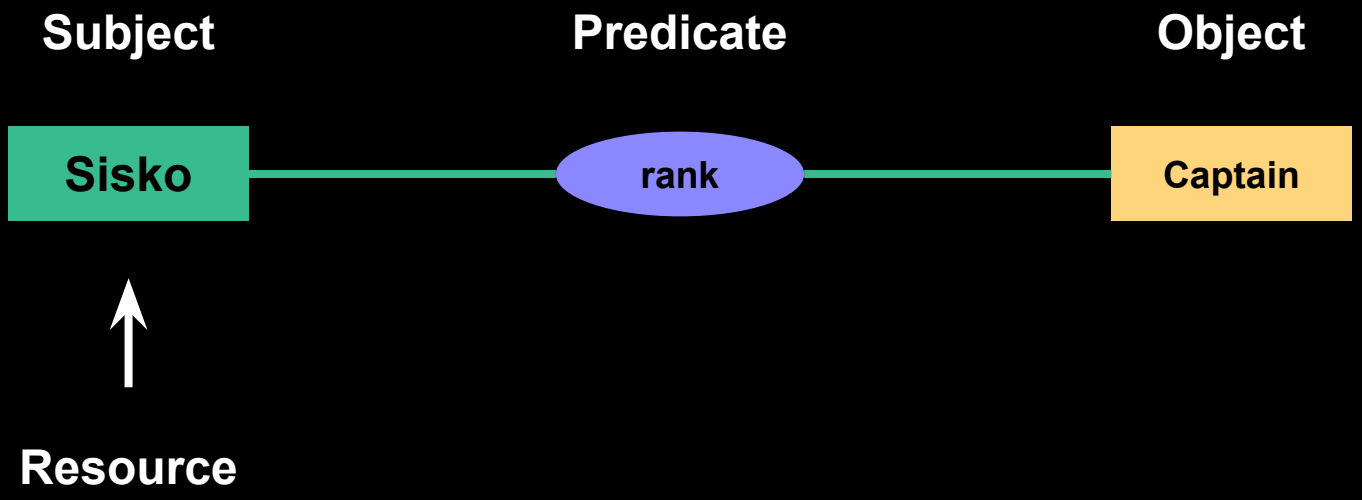
Dax has rank Lt. Commander

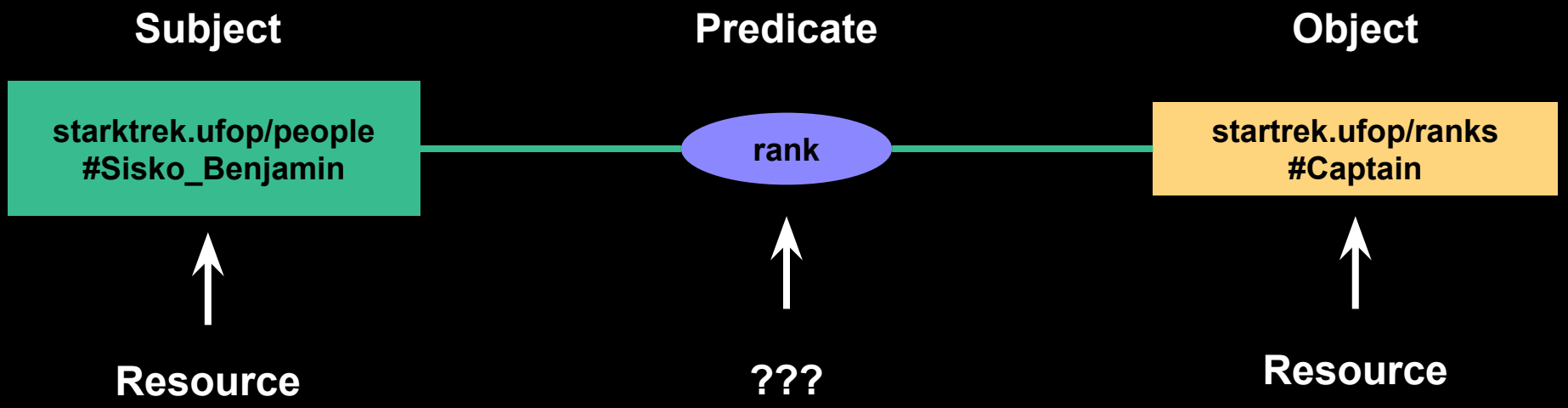
Dax serves on DS9

Dax has position Chief Science Officer


#1 has rank Lt. Commander
#1 serves on DS9
#1 has position Chief Science Officer
#1 is named "Jadzia Dax"
#1 refers to a resource
These could be resources
Her name is a literal

RDF
Resource Description Framework


Subject
Predicate
Object
Sisko
rank
Captain
Resource


Subject
Predicate
Object
starktrek.ufop/people
#Sisko_Benjamin
rank
startrek.ufop/ranks
#Captain
Resource
???
Resource

Web Ontology Language

≈

OWL

Ontology is the philosophical study of the nature of being, becoming, existence, or reality -- wikipedia

http://earlywashingtondc.org/rdf/oscys.objectproperties.owl#childOf

```
<owl:ObjectProperty rdf:about="#childOf">
  <rdfs:domain rdf:resource="#Person"/>
  <rdfs:range rdf:resource="#Person"/>
  <owl:Inverseof rdf:resource="#parentOf"/>
  <rdfs:subPropertyOf rdf:resource="#familyRelationship"/>
</owl:ObjectProperty>
```

xmlns.com/foaf/spec#term_workInfoHomepage

Property: foaf:workInfoHomepage

work info homepage - A work info homepage of some person; a page about their work for some organization.

Status: testing

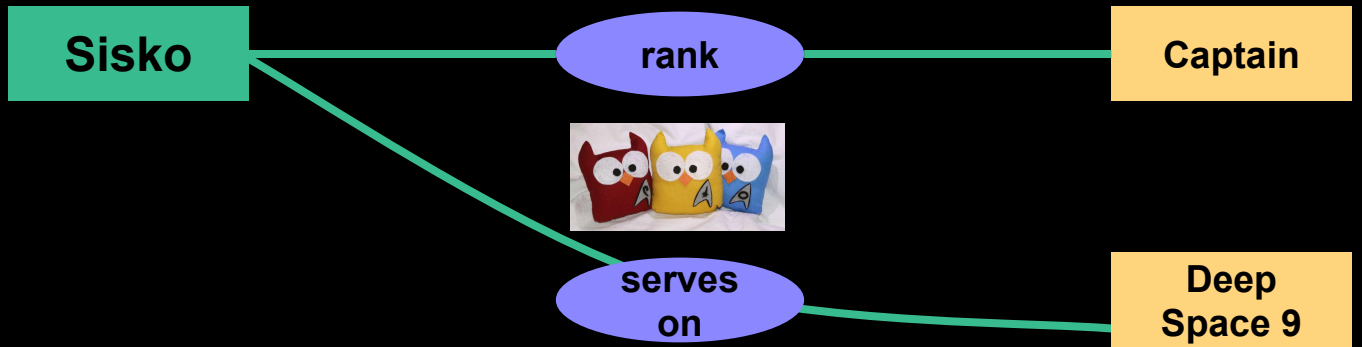
Domain: having this property implies being a Person

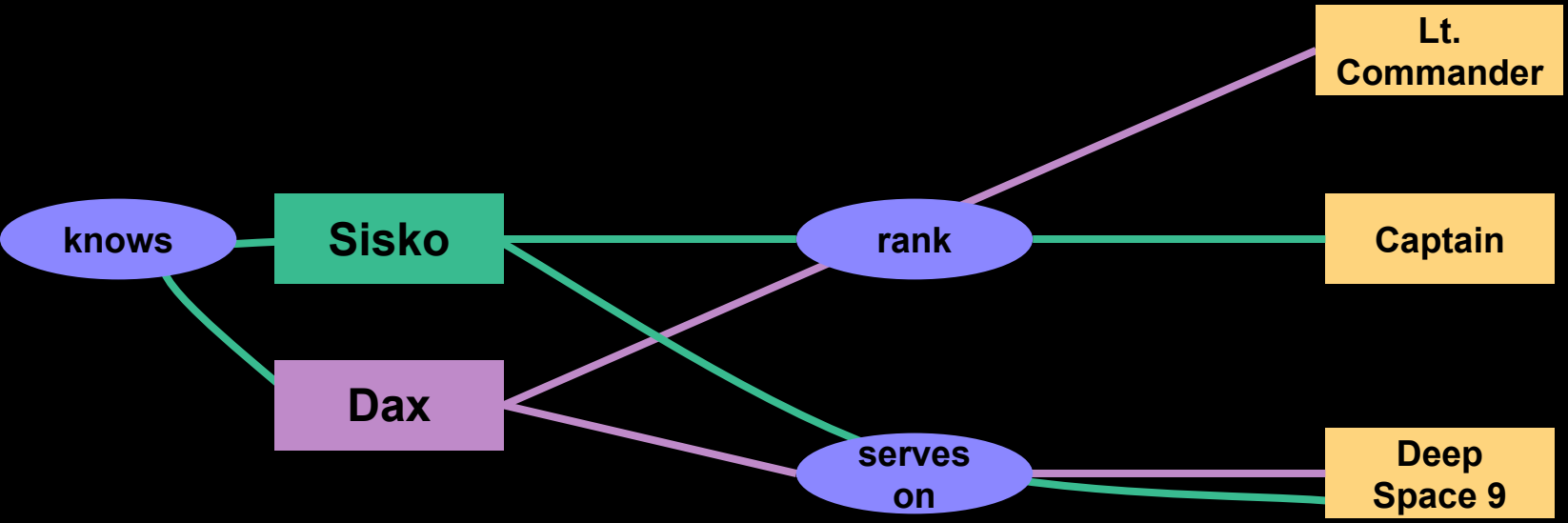
Range: every value of this property is a Document

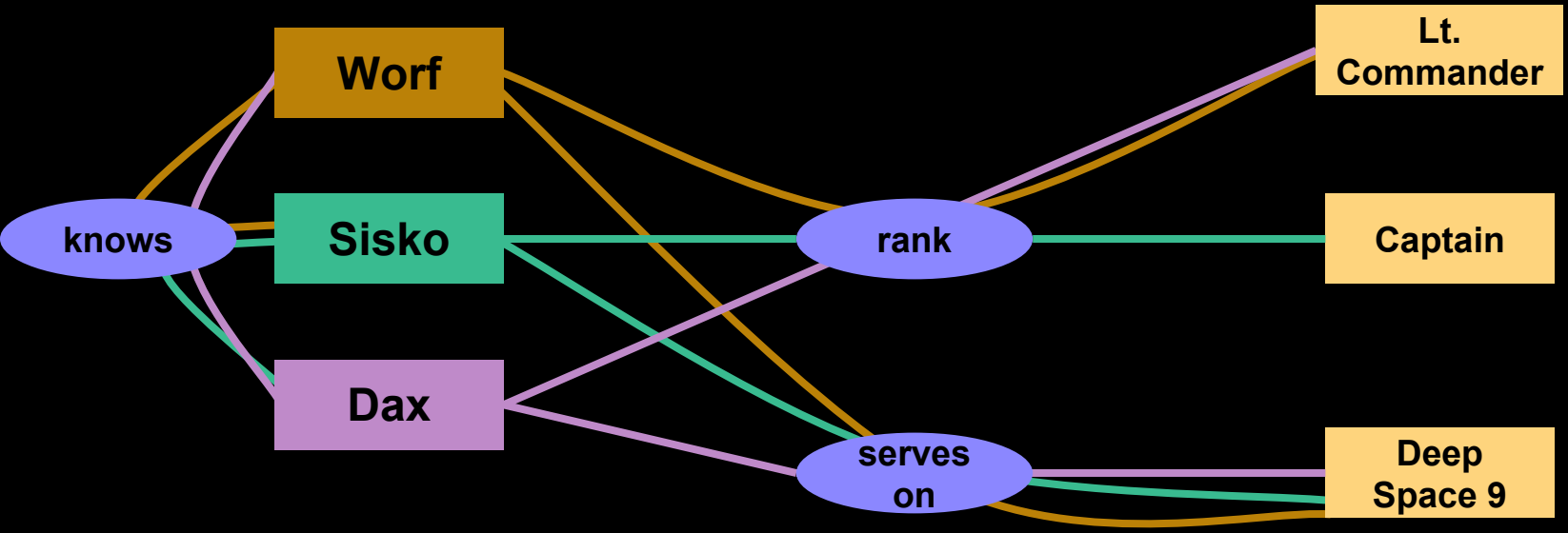
The workInfoHomepage of a Person is a Document that describes their work. It is generally (but not necessarily) a different document from their homepage, and from any workplaceHomepage(s) they may have.

The purpose of this property is to distinguish those pages you often see, which describe someone's professional role within an organisation or project. These aren't really homepages, although they share some characterstics.

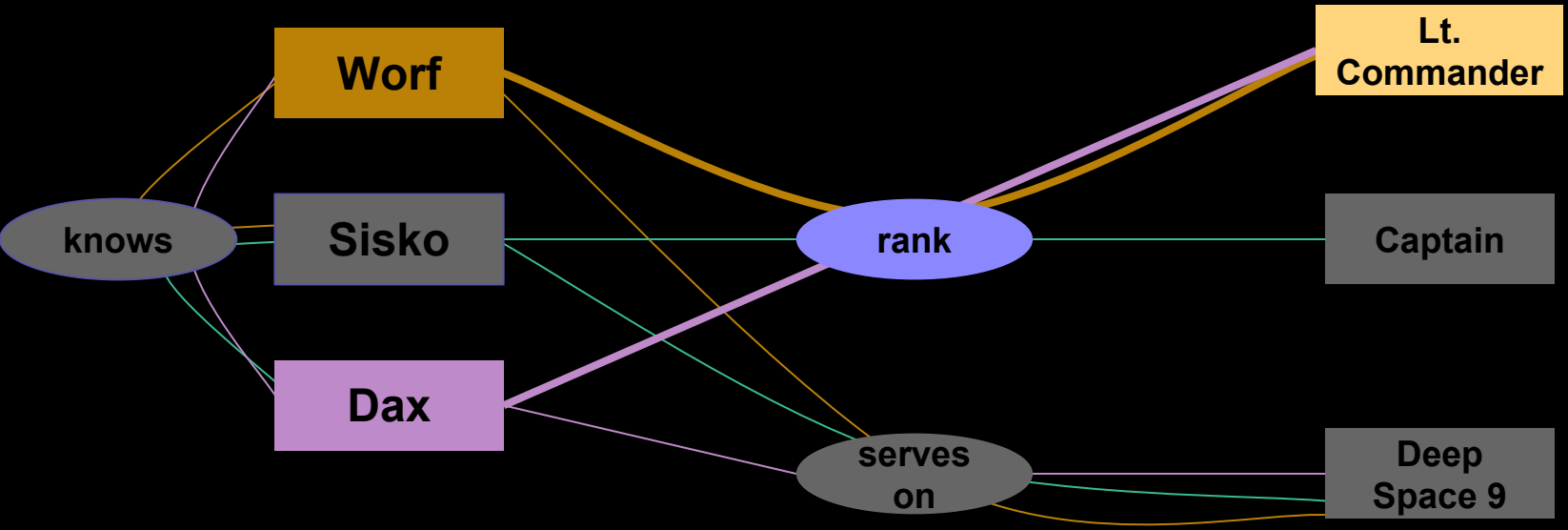
http://www.pr-owl.org/resources/StarTrek/StarTrek.owl


Sisko
rank
Captain
serves on
Deep Space 9

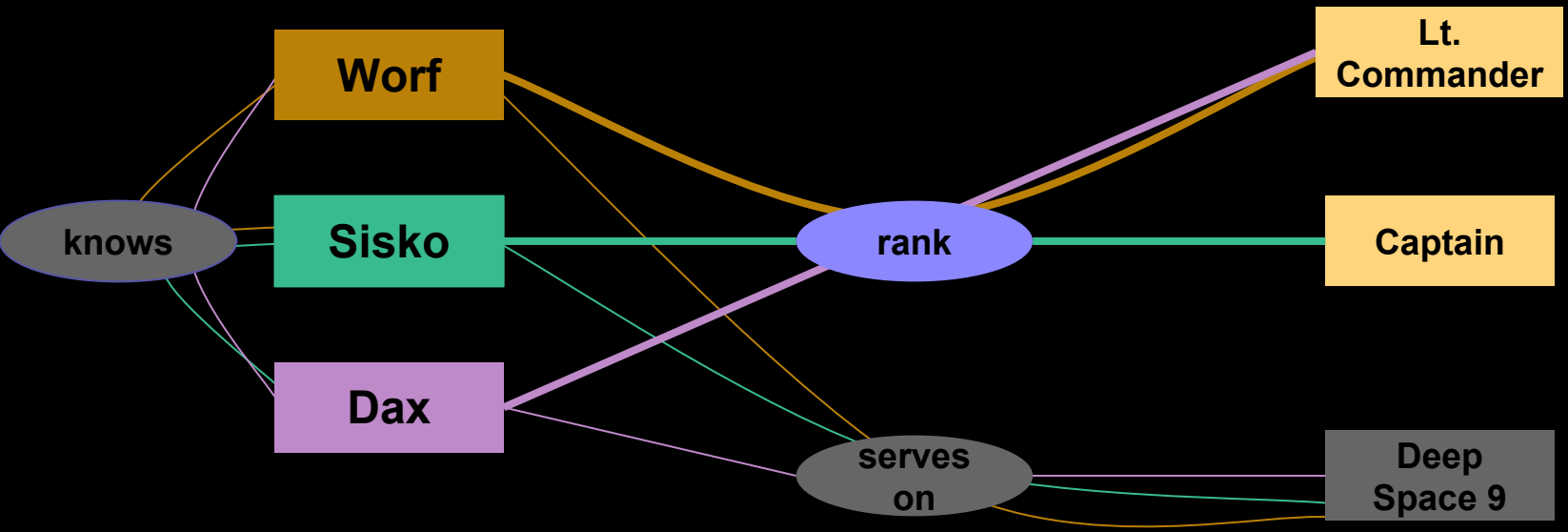

Lt.
Commander
knows
Sisko
rank
Captain
Dax
serves
on
Deep
Space 9


Worf
Sisko
Dax
knows
rank
serves on
Lt. Commander
Captain
Deep Space 9

Who has rank Lt. Commander ?

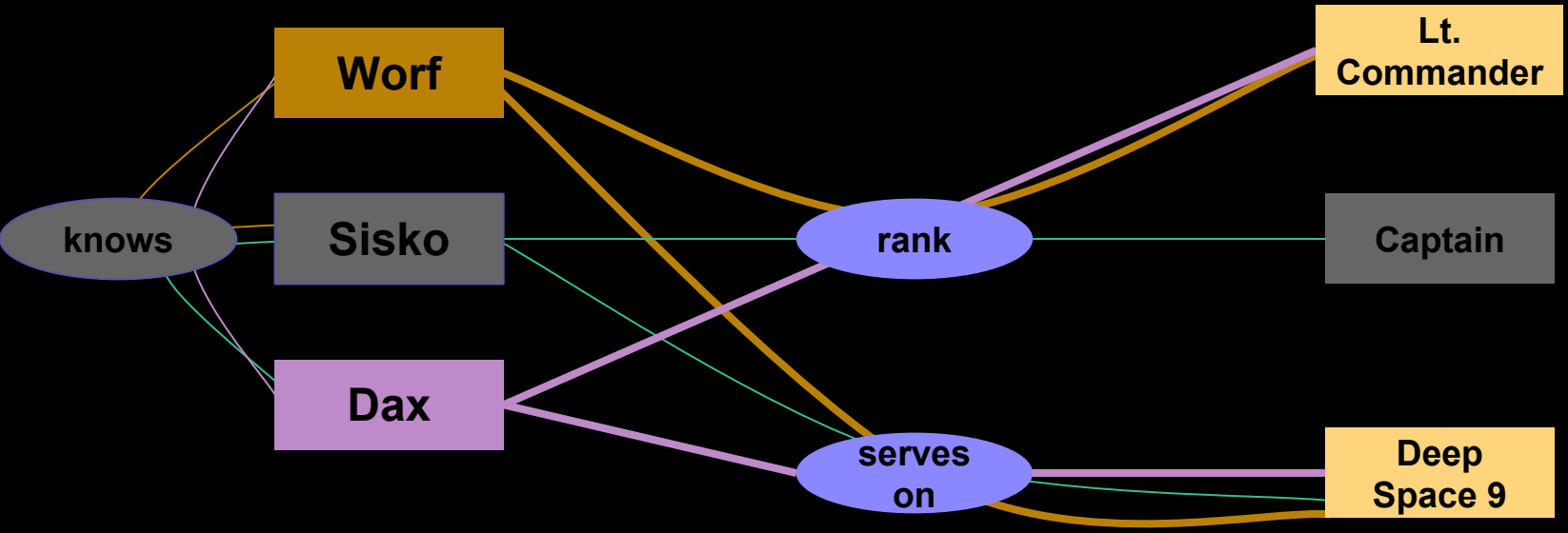


Who has rank anything?



Who has rank Lt. Commander ?

Those people serve on what vessel / station?



Turtle
N-Triples
N-Quads
JSON-LD
Notation3
RDF/XML
RDFa
microdata
Microformats (older)

JSON-LD

Marking Up Sites With Linked Data

```
<div>
   <h1>Human Dental Office</h1>
   <p>
       Dr. Samantha Web welcomes you to the
       Human Dental Office, where we are totally normal humans.
   </p>
   <ul>
      <li>Weekdays: 7am - 4pm</li>
      <li>Saturday: 11am - 3pm</li>
   </ul>
   <p>402-431-2817</p>
</div>
```


Company name

<h1>Human Dental Office</h1>

Dr. Samantha Web welcomes you to the
Human Dental Office, where we are totally normal humans.

Weekdays: 7am - 4pm
Saturday: 11am - 3pm

402-431-2817

Probably a normal human
Something of a red flag
Hours of Operation
Phone #

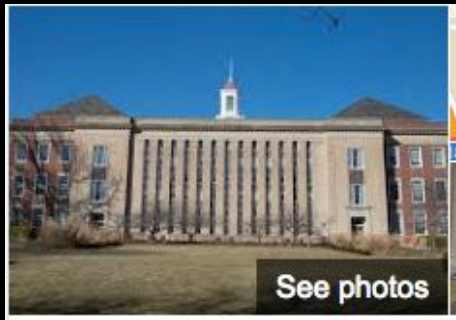
```
<div>
  <h1>Human Dental Office</h1>
  <p>
    Dr. Samantha Web welcomes you to the
    Human Dental Office, where we are totally normal humans.
  </p>
  <ul>
    <li>Weekdays: 7am - 4pm</li>
    <li>Saturday: 11am - 3pm</li>
  </ul>
  <p>402-431-2817</p>
</div>
```

Header tag

Bunch o' text in a paragraph

List with some text

It's a paragraph filled with characters resembling a phone number



Love Library

Website Directions

Library

Located in: University of Nebraska-Lincoln

Address: Love Library North and Link, 318 R St, Lincoln, NE 68508

Phone: (402) 472-9568

Hours: Thursday	**7:30AM–11PM**
Friday	7:30AM–8PM
Saturday	9AM–5PM
Sunday	12–11PM
Monday	7:30AM–11PM
Tuesday	7:30AM–11PM
Wednesday	7:30AM–11PM

Love Library

Regular Hours

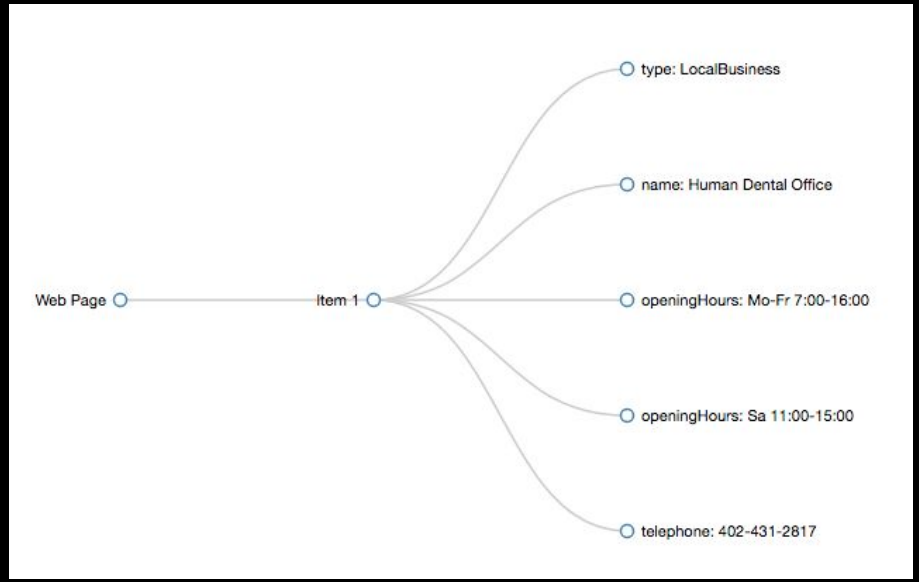
LOVE SOUTH MAIN ENTRANCE

Monday-Thursday: 7:30 am - 1 am
Friday: 7:30 am - 8 pm
Saturday: 9 am - 5 pm (Open Football Saturdays)
Sunday: 12 noon - 1 am

```
▼<h3>
   "Regular Hours"
   <span class="wdn-subhead">Love South Main Entrance</span>
  </h3>
▼<p>
   "Monday-Thursday: 7:30 am - 1 am"
   <br>
   "
                                Friday: 7:30 am - 8 pm"
   <br>
   "
                                Saturday: 9 am - 5 pm (Open Football Saturdays)"
   <br>
   "
                                Sunday: 12 noon - 1 am"
  </p>
```

```
<div vocab="http://schema.org/" typeof="LocalBusiness">
  <h1 property="name">Human Dental Office</h1>
  <p>
    Dr. Samantha Web welcomes you to the
     <span property="name">Human Dental Office</span>, where we are totally
normal humans.
  </p>
  <ul>
    <li property="openingHours" content="Mo-Fr 7:00-16:00">Weekdays: 7am -
4pm</li>
    <li property="openingHours" content="Sa 11:00-15:00">Saturday: 11am - 3pm</li>
  </ul>
  <p property="telephone">402-431-2817</p>
</div>
```

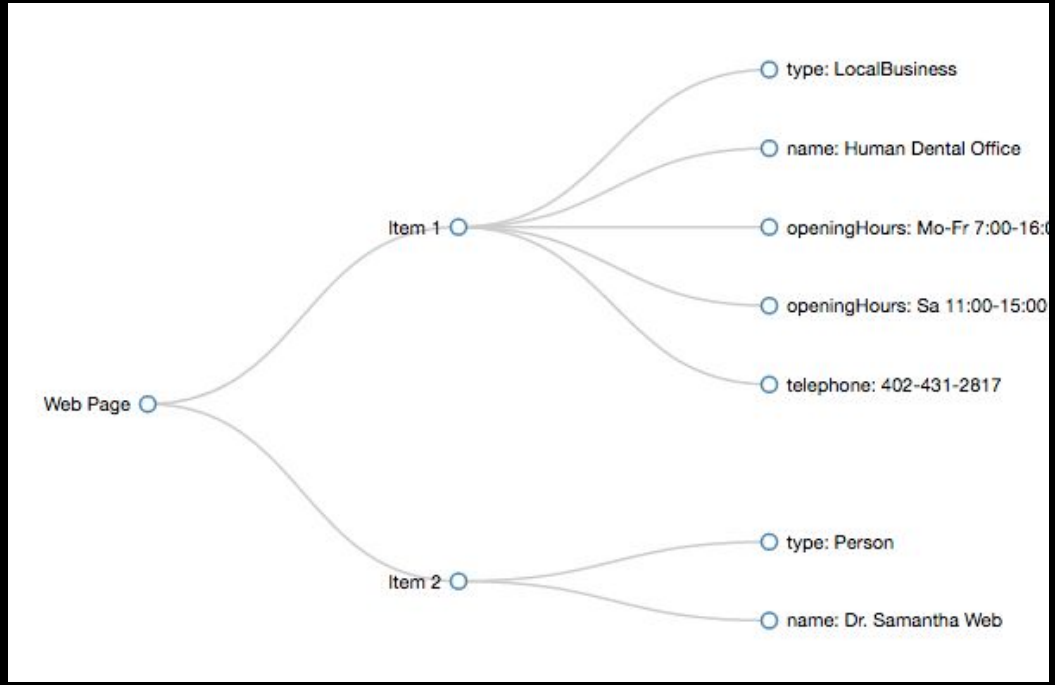
```
@prefix rdfa: <http://www.w3.org/ns/rdfa#> .
@prefix schema: <http://schema.org/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .

<https://rdfa.info/play/>
  rdfa:usesVocabulary schema: .
_:1
  rdf:type schema:LocalBusiness;
  schema:name "Human Dental Office";
  schema:openingHours "Mo-Fr 7:00-16:00";
  schema:openingHours "Sa 11:00-15:00";
  schema:telephone "402-431-2817" .
```



```
<div vocab="http://schema.org/" typeof="LocalBusiness">
  <h1 property="name">Human Dental Office</h1>
  <p>
    <span vocab="http://xmlns.com/foaf/0.1/" typeof="Person">
      <span property="name">Dr. Samantha Web</span></span> welcomes you to the
     <span property="name">Human Dental Office</span>, where we are totally
normal humans.
  </p>
  <ul>
    <li property="openingHours" content="Mo-Fr 7:00-16:00">Weekdays: 7am -
4pm</li>
    <li property="openingHours" content="Sa 11:00-15:00">Saturday: 11am - 3pm</li>
  </ul>
  <p property="telephone">402-431-2817</p>
</div>
```

```
@prefix rdfa: <http://www.w3.org/ns/rdfa#> .
@prefix schema: <http://schema.org/> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
```

```
<https://rdfa.info/play/>
  rdfa:usesVocabulary schema:;
  rdfa:usesVocabulary foaf: .
_:1
  rdf:type schema:LocalBusiness;
  schema:name "Human Dental Office";
  schema:openingHours "Mo-Fr 7:00-16:00";
  schema:openingHours "Sa 11:00-15:00";
  schema:telephone "402-431-2817" .
_:2
  rdf:type foaf:Person;
  foaf:name "Dr. Samantha Web" .
```



```
<div prefix="schema: http://schema.org/ foaf: http://xmlns.com/foaf/0.1/" typeof="
schema:LocalBusiness foaf:Person">
   <h1 property="schema:name">Human Dental Office</h1>
   <p>
      <span property="foaf:name">Dr. Samantha Web</span> welcomes you to the
      <span property="schema:name">Human Dental Office</span>, where we are
totally normal humans.
   </p>
   <ul>
      <li property="schema:openingHours" content="Mo-Fr 7:00-16:00">Weekdays: 7am
- 4pm</li>
      <li property="schema:openingHours" content="Sa 11:00-15:00">Saturday: 11am -
3pm</li>
   </ul>
   <p property="schema:telephone">402-431-2817</p>
</div>
```

LocalBusiness

Thing > Organization > LocalBusiness
Thing > Place > LocalBusiness

A particular physical business or branch of an organization. Examples of LocalBusiness include a restaurant, a particular branch of a restaurant chain, a branch of a bank, a medical practice, a club, a bowling alley, etc.

Usage: Between 500,000 and 1,000,000 domains

Dentist

Thing > Organization > LocalBusiness > ProfessionalService > Dentist
Thing > Organization > LocalBusiness > MedicalBusiness > Dentist
Thing > Organization > MedicalOrganization > Dentist
Thing > Place > LocalBusiness > ProfessionalService > Dentist
Thing > Place > LocalBusiness > MedicalBusiness > Dentist

A dentist.

Usage: Between 1000 and 10,000 domains

```
<script type="application/ld+json">
{
 "@graph": [
  {
   "@id": "_:a",
   "@type": "https://health-lifesci.schema.org/Dentist",
   "https://health-lifesci.schema.org/name": "Human Dental Office",
   "https://health-lifesci.schema.org/openingHours": [
    "Sa 11:00-15:00",
    "Mo-Fr 7:00-16:00"
   ],
   "https://health-lifesci.schema.org/telephone": "402-431-2817"
  },
  {
   "@id": "_:b",
   "@type": "http://xmlns.com/foaf/0.1/Person",
   "http://xmlns.com/foaf/0.1/name": "Dr. Samantha Web"
  }
 ]
}
</script>
```

http://www.unl.edu/ FETCH & VALIDATE CANCEL Shortlink

Results - Filter by use case

```
4.1.css?v=2016-05-09" />
<script src="sharedcode/js/picturefill.min.js" async></script>
<meta name="google-site-verification"
content="IBnMrc35WF2Fjglqjd_q3QmhmY9qnHUu4gKLsOll1Fw" />
<script type="application/ld+json">
{
  "@context" : "http://schema.org",
  "@type" : "CollegeOrUniversity",
  "name" : "University of Nebraska–Lincoln",
  "url" : "http://www.unl.edu",
  "sameAs" : [
    "http://www.facebook.com/UNLincoln",
    "https://twitter.com/UNLincoln",
    "https://www.instagram.com/unlincoln/",
    "https://www.linkedin.com/edu/school?id=18836",
    "https://plus.google.com/+UNLincoln",
    "https://www.pinterest.com/unlincoln/",

"https://en.wikipedia.org/wiki/University_of_Nebraska%E2%80%93Lincoln
"
  ]
}
</script><!-- InstanceEndEditable -->
```

▾ CollegeOrUniversity (1) All good

CollegeOrUniversity	
name:	University of Nebraska–Lincoln
url:	http://www.unl.edu
sameAs:	http://www.facebook.com/UNLincoln
sameAs:	https://twitter.com/UNLincoln
sameAs:	https://www.instagram.com/unlincoln/
sameAs:	https://www.linkedin.com/edu/school?id=18836
sameAs:	https://plus.google.com/+UNLincoln
sameAs:	https://www.pinterest.com/unlincoln/
sameAs:	https://en.wikipedia.org/wiki/University_of_Nebraska%E2%80%93Lincoln

▸ Custom Search Result Filters

http://allrecipes.com/recipe/236991/chef-johns-rhut

FETCH & VALIDATE | CANCEL | Shortlink

```
</div>
                <div itemprop="reviewRating" itemscope
itemtype="http://schema.org/Rating">
                    <meta itemprop="ratingValue" content="5">
                </div>
                <div class="review-date">6/10/2014</div>
                <meta itemprop="dateCreated" content="2014-06-10">
            </div>
        </article>
        <p itemprop="reviewBody">
Love this!  Easy to make!  I put a few more strawberries and less
rhubarb than it called for.        </p>
        <div class="review-detail">
                <a class="review-detail__link"
href="reviews/4734788/" ng-
click="$event.preventDefault();reviewModalDialog(0, sortBy)">
                    <span class="icon--expand-icon"></span>
                    <span>Read more</span>
                </a>
        </div>
```

Results - Filter by use case

ingredients:	1 tablespoon lemon juice
ingredients:	1 teaspoon lemon zest
ingredients:	Topping:
ingredients:	1/2 cup brown sugar
ingredients:	1/2 cup whole wheat flour
ingredients:	1/2 cup rolled oats
ingredients:	1/4 teaspoon salt
ingredients:	1 pinch ground cinnamon
ingredients:	4 tablespoons cold butter, cut into cubes
prepTime:	PT15M
cookTime:	PT35M
totalTime:	PT50M
recipeInstructions:	Preheat oven to 375 degrees F (190 degrees C). Grease a 2-qua baking dish. Combine rhubarb, strawberries, white sugar, lemon j ice, and lemon zest together in a bowl. Stir brown sugar, whole w eat flour, oats, salt, and cinnamon together in a bowl. Cut cold bu er into oat mixture with a pastry blender until the mixture resembl s coarse crumbs and butter pieces are pea-sized. Pour rhubarb m xture into prepared baking dish. Spread oatmeal mixture evenly o er the top. Bake in the preheated oven until golden and bubbling,

JSON-LD

http://json-ld.org/

Schema.org

http://schema.org/

RDFa

https://rdfa.info/

Google Structured Data Markup Helper

https://www.google.com/webmasters/markup-helper/

"Bing! That's data. Data, data, data."
- Tim Berners-Lee

Google: Knowledge Graph

Bing: Marking Up Your Site

Facebook: Open Graph Protocol

'Google has done a tremendous service in exposing some Linked Data to the end user. They could do a much greater service if they exposed it as a SPARQL endpoint. Somehow I don't expect it to show up in the Google API anytime soon.

I've expressed concern over the privatization of the semantic web before. I don't think this is quite the same thing. Maybe this is more of a "don't show us how the sausage is made" dynamic. It's hard to blame Google for letting people assume the Knowledge Graph is more of their magic. But if IT leaders and practitioners continue to think they can't do this stuff because they aren't Google, opportunities are going to be missed. In fact, they already are. I find it ironic that one of the objections raised to the Semantic Web is that it all sounds too much like science fiction. In his blog post Singhal hails the Knowledge Graph as Google's first baby step towards the Star Trek computer. If we don't start to step up, when that computer eventually materializes it will be ad-driven. We need to get more comfortable with semantic technologies and bringing them into the enterprise. The more Linked Open Data available, the more powerful the graph becomes for all of us. It's time to get more involved or as Jean-Luc Picard might say, "Engage!" '

- Darin Stewart, 2012 "Google's Knowledge Graph: Yeah, that's the Semantic Web (sort of)"

Let's Think Big!

...wikipedia is pretty big...

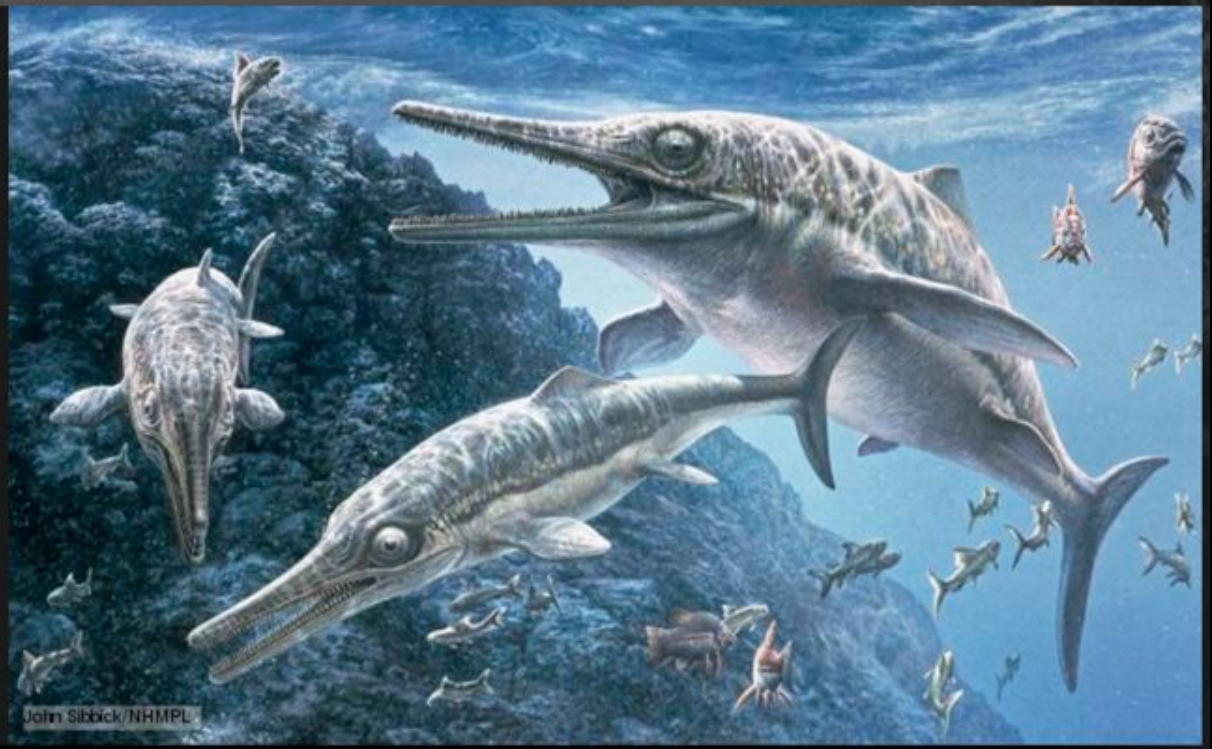
Search Engines
BBC Things
Dbpedia
OpenStreetMap

BBC 2012 Olympics

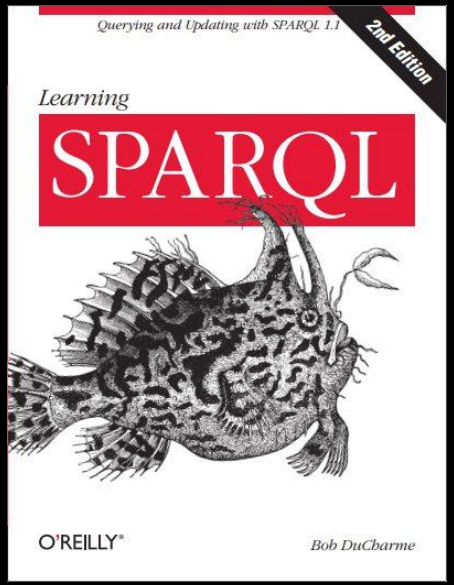
Ichthyosaurs

Ichthyosaurs were predatory marine reptiles that swam the world's oceans while dinosaurs walked the land. They appeared in the Triassic period, dying out around 25 million years before the extinction event that wiped out the dinosaurs. Ichthyosaurs (literally 'fish-lizards') evolved from an as yet unidentified land reptile that moved back into the water. These huge animals rapidly diversified from being lizards with fins to developing a much more streamlined, fish-like form built for speed. One species has been calculated to have a cruising speed of 36 km/h. These enormous predators remained at the top of the food chain until they were replaced by the plesiosaurs.

Scientific name: Ichthyosauria
Rank: **Order**
Common names: fish lizard



Querying Large Datasets



```
SELECT *
FROM <graph_uri>
WHERE {

}
LIMIT 100
```

?s ?p ?o

```
SELECT *
FROM <graph_uri>
WHERE {
  ?s  ?p  ?o
}
LIMIT 100
```

```
SELECT *
FROM <graph_uri>
WHERE {
  <resource>  ?p  ?o
}
LIMIT 100
```

Default Data Set Name (Graph IRI)

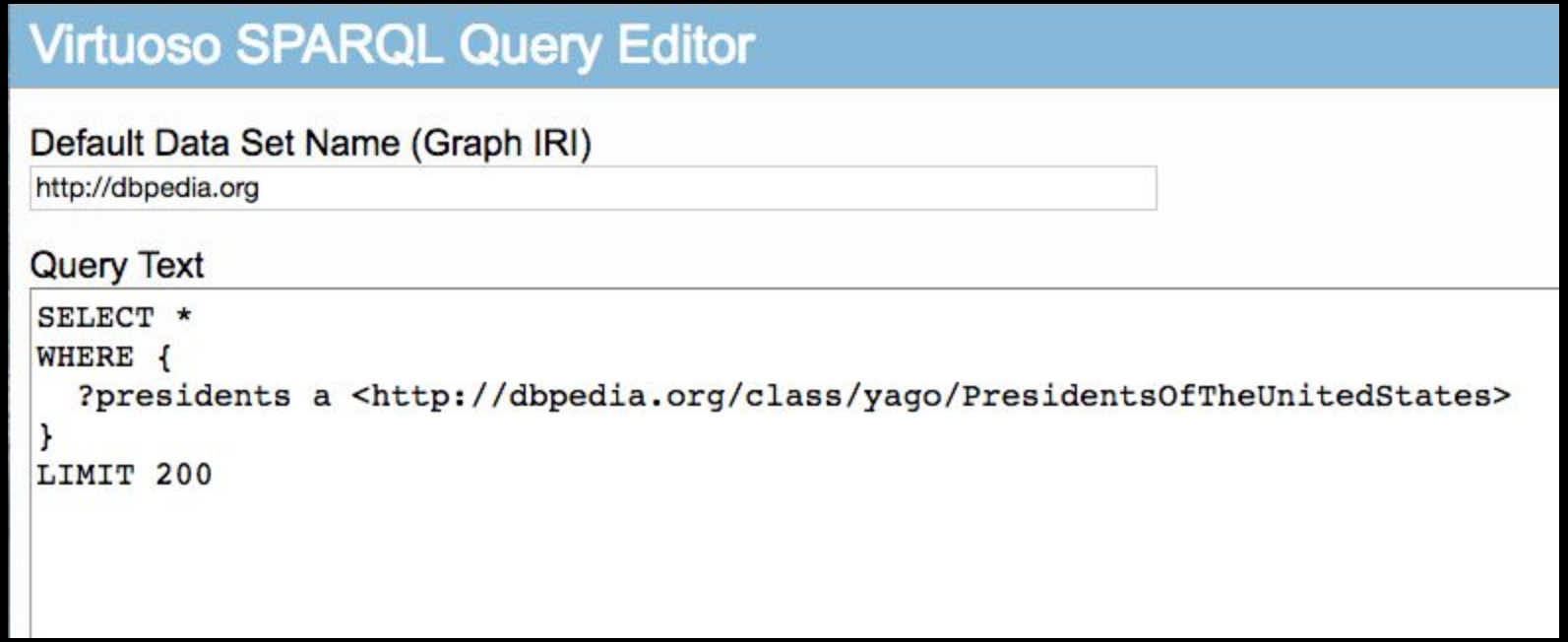
http://dbpedia.org

Query Text

```
SELECT *
WHERE {
  <http://dbpedia.org/resource/George_Washington> ?p ?o
}
LIMIT 200
```

http://dbpedia.org/sparql

http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/Officeholder110371450
http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/Owner110389398
http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/PhysicalEntity100001930
http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/UnitedStatesArmyGenerals
http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/WashingtonCollegePeople
http://dbpedia.org/ontology/deathPlace	http://dbpedia.org/resource/Virginia
http://dbpedia.org/ontology/deathPlace	http://dbpedia.org/resource/United_States
http://dbpedia.org/ontology/deathPlace	http://dbpedia.org/resource/Mount_Vernon
http://dbpedia.org/property/deathPlace	http://dbpedia.org/resource/Virginia
http://dbpedia.org/property/deathPlace	http://dbpedia.org/resource/United_States
http://dbpedia.org/property/deathPlace	http://dbpedia.org/resource/Mount_Vernon
http://dbpedia.org/ontology/deathDate	1799-12-14
http://dbpedia.org/ontology/birthPlace	http://dbpedia.org/resource/British_America
http://dbpedia.org/ontology/birthPlace	http://dbpedia.org/resource/Westmoreland_County,_Virginia
http://dbpedia.org/ontology/birthPlace	http://dbpedia.org/resource/Colony_of_Virginia
http://dbpedia.org/property/birthPlace	http://dbpedia.org/resource/British_America
http://dbpedia.org/property/birthPlace	http://dbpedia.org/resource/Westmoreland_County,_Virginia
http://dbpedia.org/property/birthPlace	http://dbpedia.org/resource/Colony_of_Virginia
http://dbpedia.org/ontology/birthDate	1732-02-22
http://purl.org/dc/terms/subject	http://dbpedia.org/resource/Category:1732_births
http://purl.org/dc/terms/subject	http://dbpedia.org/resource/Category:1799_deaths
http://purl.org/dc/terms/subject	http://dbpedia.org/resource/Category:18th-century_American_Episcopalians
http://purl.org/dc/terms/subject	http://dbpedia.org/resource/Category:18th-century_American_politicians
http://purl.org/dc/terms/subject	http://dbpedia.org/resource/Category:American_cartographers
http://purl.org/dc/terms/subject	http://dbpedia.org/resource/Category:American_deists

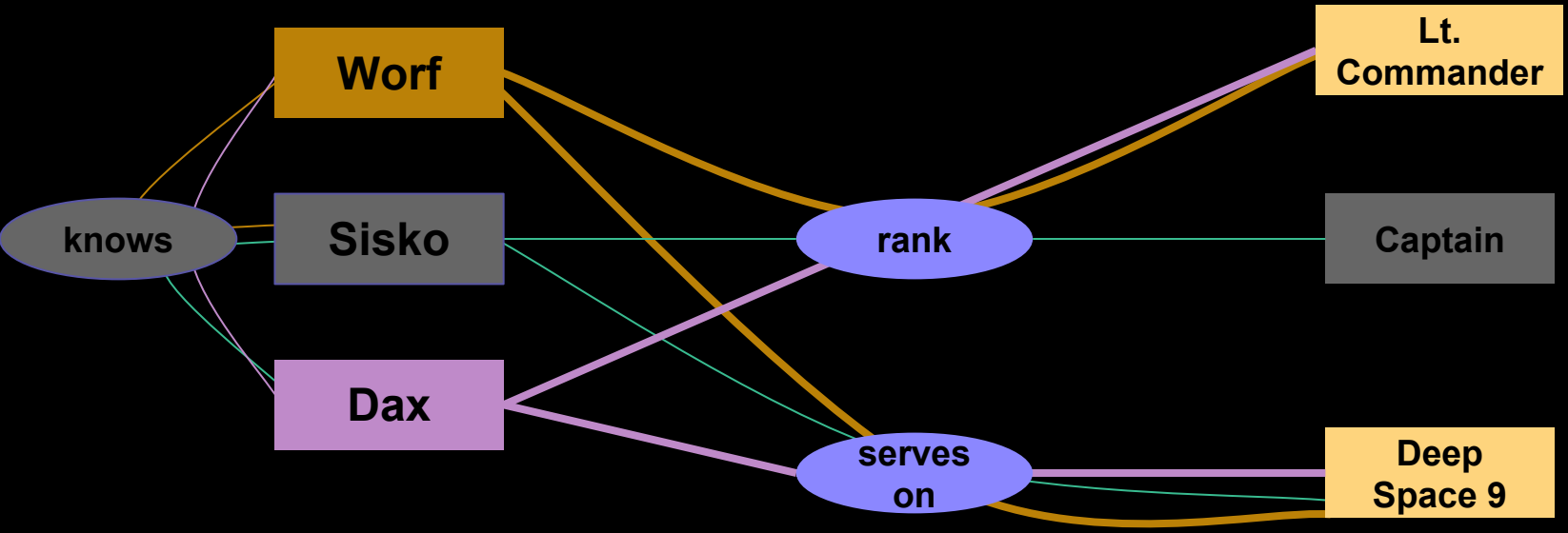

Virtuoso SPARQL Query Editor
Default Data Set Name (Graph IRI)
http://dbpedia.org
Query Text
SELECT *
WHERE {
?presidents a <http://dbpedia.org/class/yago/PresidentsOfTheUnitedStates>
}
LIMIT 200

presidents
http://dbpedia.org/resource/Zachary_Taylor
http://dbpedia.org/resource/Benjamin_Harrison
http://dbpedia.org/resource/Chester_A._Arthur
http://dbpedia.org/resource/Harry_S._Truman
http://dbpedia.org/resource/James_Buchanan
http://dbpedia.org/resource/John_Adams
http://dbpedia.org/resource/Millard_Fillmore
http://dbpedia.org/resource/Presidential_Issue
http://dbpedia.org/resource/Franklin_Pierce
http://dbpedia.org/resource/John_Tyler
http://dbpedia.org/resource/Gerald_Ford
http://dbpedia.org/resource/Abraham_Lincoln
http://dbpedia.org/resource/Andrew_Jackson
http://dbpedia.org/resource/Andrew_Johnson
http://dbpedia.org/resource/Bill_Clinton
http://dbpedia.org/resource/Calvin_Coolidge
http://dbpedia.org/resource/Dwight_D._Eisenhower
http://dbpedia.org/resource/Franklin_D._Roosevelt
http://dbpedia.org/resource/George_H._W._Bush
http://dbpedia.org/resource/George_Washington

```
SELECT *
WHERE {
  ?thing1  ?p  ?thing2 .
  ?thing2  ?p2 ?thing3
}
```

?person rank Lt. Commander .

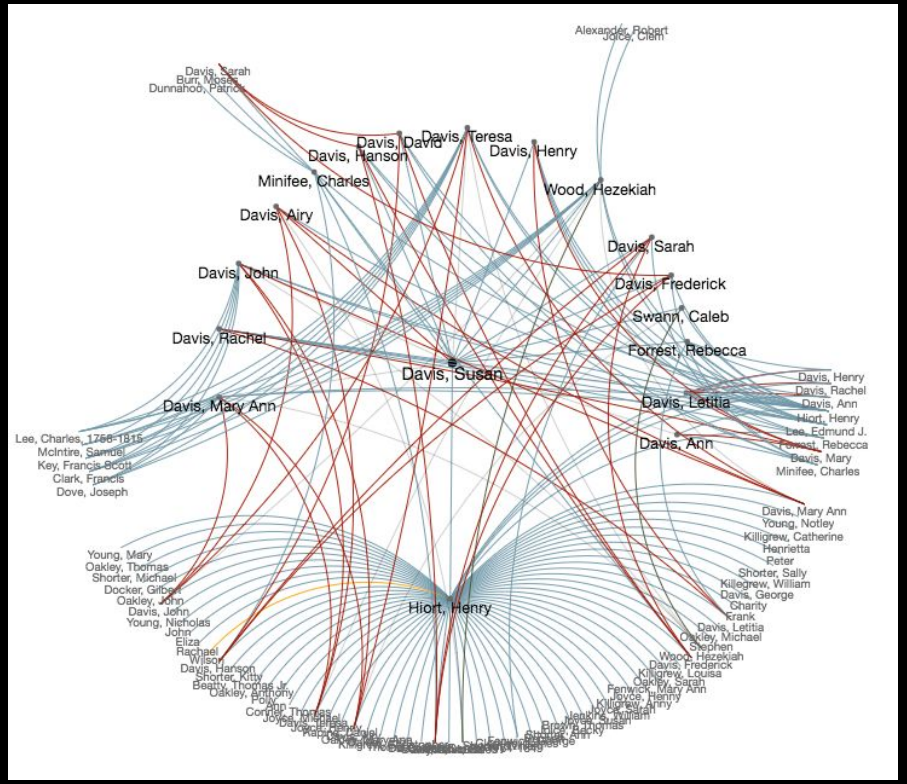
?person serve on ?vessel

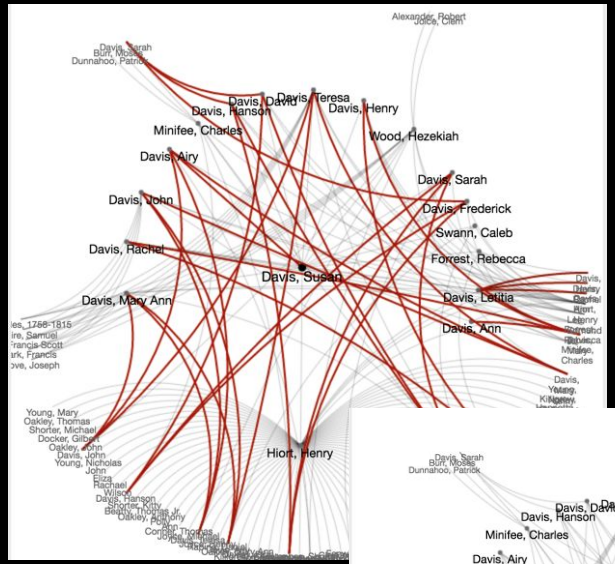


O SAY CAN YOU SEE

EARLY WASHINGTON, D.C., LAW & FAMILY

```
osrdf:per.000160 a "person";
   oscys:clientOf osrdf:per.000011;
   oscys:fullName "Davis, Susan";
   oscys:fullname "Davis, Susan";
   oscys:judgedBy osrdf:per.000004;
   oscys:parentOf osrdf:per.001601,
     osrdf:per.001602,
     osrdf:per.001603,
     osrdf:per.001608;
   oscys:petitionerAgainst osrdf:per.000168;
   oscys:sex "female";
   oscys:siblingOf osrdf:per.000150,
     osrdf:per.000161;
   oscys:witnessAgainst osrdf:per.000153,
     osrdf:per.000166,
     osrdf:per.001604;
   oscys:witnessFor osrdf:per.000150,
     osrdf:per.000151,
     osrdf:per.000152,
     osrdf:per.000161,
     osrdf:per.000162,
     osrdf:per.000163,
     osrdf:per.000164,
```


Alexander, Robert
Davis, Sarah
Davis, David
Davis, Teresa
Davis, Hanson
Davis, Henry
Minifee, Charles
Wood, Hezekiah
Davis, Airy
Davis, Sarah
Davis, John
Davis, Frederick
Swann, Caleb
Davis, Rachel
Forrest, Rebecca
Davis, Susan
Davis, Mary Ann
Davis, Letitia
Davis, Ann
Hiort, Henry


Alexander, Robert
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Davis, John
Davis, Frederick
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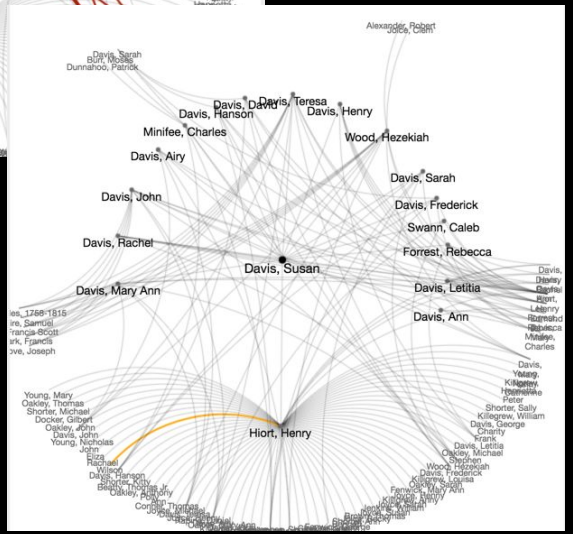
Davis, Rachel
Forrest, Rebecca
Davis, Susan
Davis, Mary Ann
Davis, Letitia
Davis, Ann
Hiort, Henry


Alexander, Robert
Davis, Teresa
Davis, David
Davis, Henry
Davis, Hanson
Minifee, Charles
Wood, Hezekiah
Davis, Airy
Davis, Sarah
Davis, John
Davis, Frederick
Swann, Caleb
Davis, Rachel
Forrest, Rebecca
Davis, Susan
Davis, Mary Ann
Davis, Letitia
Davis, Ann
Hiort, Henry

Search By Relationship Type

Find people related by a specific type of connection in the OSCYS data.

Enslaved By

Go!

Individual	enslaved by
Lyles, Sylvester	Hyatt, Christopher C.
James	Thompson, Elizabeth
Gordon, Ann	Harrison, Mildred
Compton, Henry	Dorsey, William
Lewis, Jane	Conrad, Nelson
Johnson, Ellen	Tyler, Trueman
Morris, Peter	Davis, Jonathan

Direct Relationships

Starting Person	Relationship	Final Person
Key, Francis Scott	attorney with	Caldwell, Elias Boudinot
Key, Francis Scott	attorney against	Caldwell, Elias Boudinot

Relationships Two Apart

Starting Person	Relationship	Person	Relationship	Final Person
Key, Francis Scott	attorney for	Lingan, Janet	client of	Caldwell, Elias Boudinot
Key, Francis Scott	attorney against	Bennett	oppositions attorney	Caldwell, Elias Boudinot
Key, Francis Scott	opposing attorneys	Taney, Augustus	opposing attorneys	Caldwell, Elias Boudinot
Key, Francis Scott	opposing attorneys	Law, John	attorney with	Caldwell, Elias Boudinot
Key, Francis Scott	attorney with	Taney, Augustus	opposing attorneys	Caldwell, Elias Boudinot
Key, Francis Scott	deposed	Middleton, Walter H.	deponent of	Caldwell, Elias Boudinot

http://cdrh.github.io/

I get how to write queries,
but WHERE do I write queries?

Available Online Processors

http://www.sparql.org/sparql.html

http://dbpedia.org/sparql

Setting Up Your Own Processor

Jena Fuseki

Virtuoso

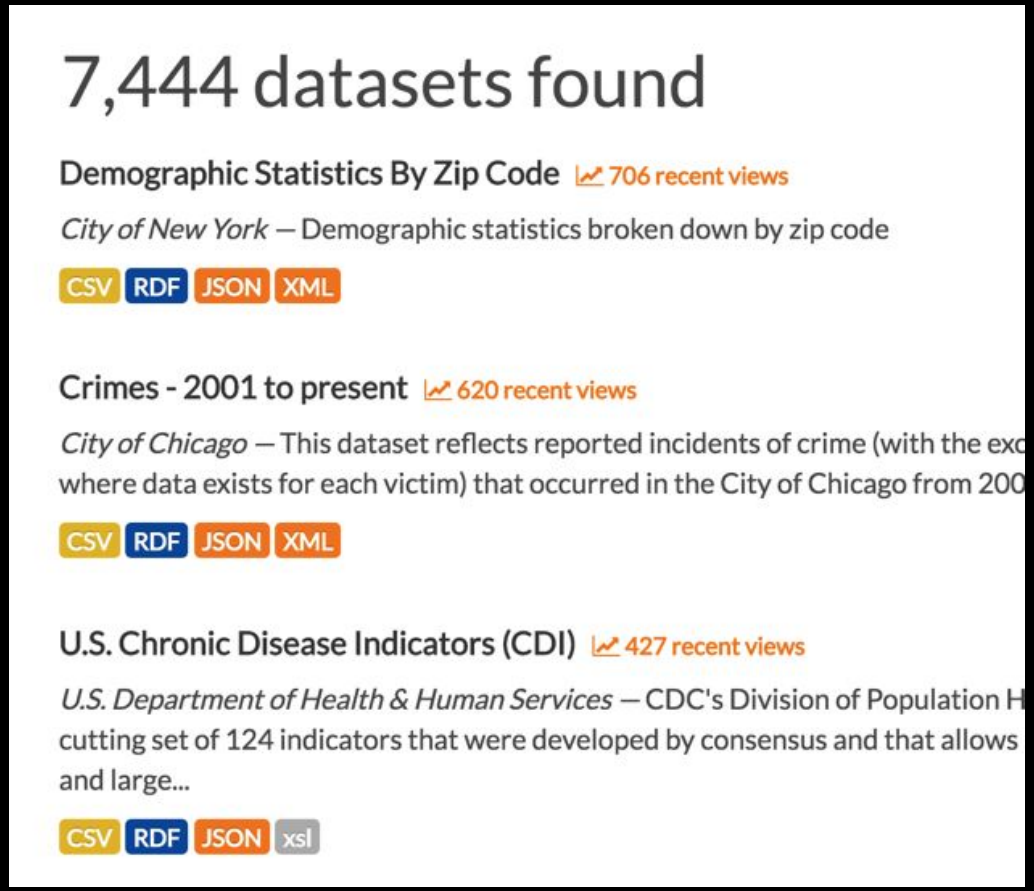
w3 List of Implementations

Command Line Utilities

Jena ARQ

	npm	rubygems	php packagist	rdocumentation	pypi
rdf	211	105	45	14	485
json-ld	94	2	20	1	n/a*
sparql	70	11	18	20	81
microdata	33	9	16	48	29

* Too fuzzy to return reasonable results


7,444 datasets found
Demographic Statistics By Zip Code 706 recent views
City of New York — Demographic statistics broken down by zip code
CSV RDF JSON XML
Crimes - 2001 to present 620 recent views
City of Chicago — This dataset reflects reported incidents of crime (with the exc
where data exists for each victim) that occurred in the City of Chicago from 200
CSV RDF JSON XML
U.S. Chronic Disease Indicators (CDI) 427 recent views
U.S. Department of Health & Human Services — CDC's Division of Population H
cutting set of 124 indicators that were developed by consensus and that allows
and large...
CSV RDF JSON xsl

data.gov

Search Engine Optimization
Website Creation
Data Discovery
Interconnectivity
Collaboration

"OK, so it's called linked data.
I want you to make it.
I want you to demand it.
And I think it's an idea worth spreading."

- Tim Berners-Lee

Resources - Tim Berners-Lee & RDF

- Berners-Lee, 1998: Semantic Web Roadmap
- Berners-Lee, 1998: Web Architecture from 50,000 Feet
- Berners-Lee, Hendler, Lassila, 2001: The Semantic Web (Scientific American)
- Berners-Lee, 2006: Linked Data
- Berners-Lee, 2009: The Next Web (TED Talk)
- W3C Resource Description Framework (RDF)
- Dussault, 2015, "Figuring out RDF and SPARQL: Part I Triples"

Resources - RDFa, JSON-LD, Schema.org

- https://rdfa.info/ - intro specs, resources, playground, plugins, libraries
- http://json-ld.org/ - specs, playground, resources
- Sporny, 2008, RDFa Basics - video

- http://schema.org/
- Google Developer Schema Guides
- Google Structured Data Testing Tool
- Google Structured Data
- Bing Linked Data Markup Overview

Resources - Ontologies / OWL

- https://prefix.cc/ - namespace lookup
- https://www.w3.org/TR/owl-features/ - w3 documentation
- http://xmlns.com/foaf/spec/ - friend of a friend ontology
- Ontologies Website Introduction - BBC Ontologies
- Schema.org - collection of schemas
- Early Washington DC Ontology (in progress)

Resources - Semantic Search Tools

- The Knowledge Graph
- http://ogp.me/ - Open Graph Protocol (Facebook)
- Stewart, 2012: "Google's Knowledge Graph: Yeah, That's the Semantic Web, Sort Of"
- http://swoogle.umbc.edu/ - swoogle

Resources - BBC Semantic Web

- W3C, "Case Study: Use of Semantic Web Technologies on the BBC Web Sites"
- Bartlett, 2013, "Linked Data: Connecting Together the BBC's Online Content"
- Linked Data and the Semantic Web
- Murphy, 2014, "Opening Up the BBC's Linked Data with /things"
- Linked Data - BBC landing page for semantic web rationale and technology
- Ontologies Website Introduction

Resources - SPARQL

- Hausenblas, 2009, "The Web, One Huge Database" - video introduction
- StackOverflow - Blank Nodes - This is the most helpful answer ever
- W3C SPARQL Specifications
- Dussault, 2015, "Figuring out RDF and SPARQL: Part II Getting Set Up"
- Dussault, 2015, "Figuring out RDF and SPARQL: Part III Some Queries"

Resources - Datasets

- Project Gutenberg - downloadable RDF file
- datahub - Open Knowledge Foundation sponsored dataset search
- British National Bibliography
- BBC Things - no SPARQL endpoint
- data.gov - dataset finding aid
- LinkedGeoData - OpenStreetMap data
- OpenStreetMap Semantic Network
- dbpedia sparql editor
- dbpedia data downloads
- YAGO
- Early Washington DC Relationships TTL (in progress)

Image Citations

- https://static.guim.co.uk/sys-images/Guardian/Pix/pictures/2015/5/29/1432905359571/dffff0c3-c2de-4a28-9e42-6c113b9ed1d9-2060x1236.jpeg
- http://www.diranieh.com/Database/Figures/Schema2NF.gif
- http://www.ctvnews.ca/polopoly_fs/1.2024833.1460442480!/httpImage/image.jpg_gen/derivatives/landscape_620/image.jpg
- http://json-ld.org/images/json-ld-logo.png
- http://wiki.dbpedia.org/sites/default/files/DBpediaLogoFull.png
- https://upload.wikimedia.org/wikipedia/commons/thumb/b/b0/Openstreetmap_logo.svg/2000px-Openstreetmap_logo.svg.png
- http://www.learningsparql.com/img/cover.jpg
- https://c1.staticflickr.com/7/6005/5927758528_a2060423e7_b.jpg
- https://s-media-cache-ak0.pinimg.com/736x/b0/6f/d0/b06fd0c88c0a04391923558dafa0ba0d.jpg
- http://petattack.com/wp-content/uploads/2014/07/cute-owl-wallpaper-15774-16256-hd-wallpapers.jpg
- https://upload.wikimedia.org/wikipedia/en/thumb/d/de/2012_Summer_Olympics_logo.svg/922px-2012_Summer_Olympics_logo.svg.png