Introduction to Linked Open Data

bit.ly/SWIBLODintro

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SWIB 2017, 4 December 2017
Hamburg, Germany

Workshop Resources:
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Workshop Etiquette
(influenced by the Hacker School Rules)

- Feel free to ask questions
- Help others where you can
- Be open to different domain expertise & experiences
- Be kind

More info on the “Hacker School Rules”:

https://www.recurse.com/blog/38-subtle-isms-at-hacker-school

https://www.recurse.com/manual#sub-sec-social-rules

Schedule

13:00 - 13:15	General Workshop Introduction
13:15 - 14:00	RDF Introduction: Create Your Graph
14:00 - 14:30	Linked Data Intro.: Link Your Graph to Your Group
14:30 - 15:30	Linked Data & Semantic Web: Expanding Your Graph
15:30 - 16:00	*30 minute break, cake served in the foyer*
16:00 - 16:15	Linked Open Data & Licensing: License Your Graph
16:15 - 17:15	Linked Data Experimentation: SPARQL & Vis.
17:15 - 17:30	*15 minute break*
17:30 - 18:00	Linked Data Examples, Resources & Datasets
18:00 - 19:00*	Wrap-up & Help Moving Forward *(optional)*

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Our Goals for this Workshop

- Introduce & Leverage the RDF data model
- Create & Refine RDF Documents
- Explain Fundamentals of Linked Data Technologies
- Introduce & Discuss Basic Issues of Linked **Open** Data
- Apply Open Data Principles to RDF data
- Understand Advantages of Modeling in RDF
- Understand Advantages of Publishing Linked Data
- Share LOD Tools, Projects, Resources, Examples

Your goals for this Workshop?

- Why are you attending this workshop?
- What are your goals - immediate or long-term?
- What's your level of comfort & experience with Linked Data?

RDF Introduction: Create Your Graph

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Facilitator's Example

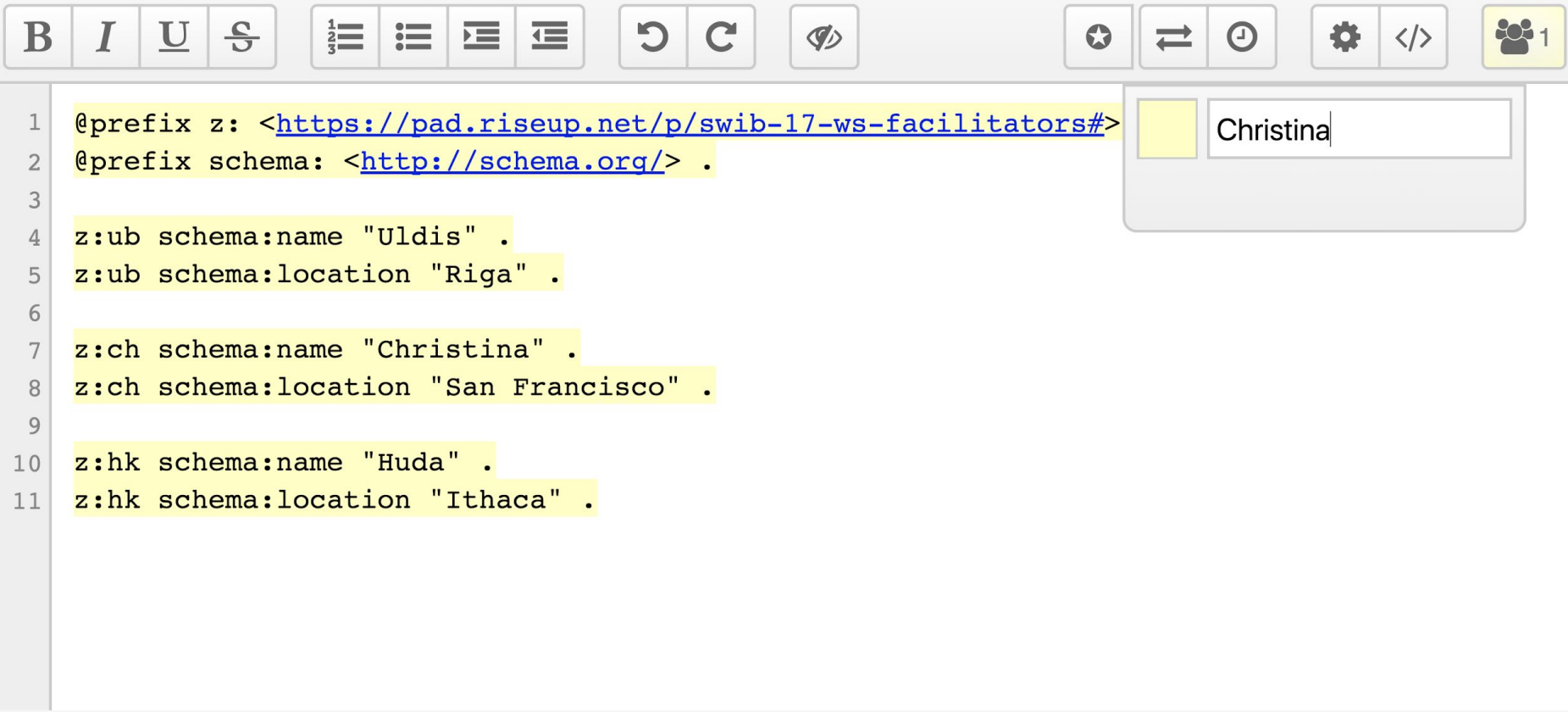
```
@prefix z: <https://pad.riseup.net/p/swib-17-ws-facilitators#> .
@prefix schema: <http://schema.org/> .

z:ub schema:name "Uldis" .
z:ub schema:location "Riga" .

z:ch schema:name "Christina" .
z:ch schema:location "San Francisco" .

z:hk schema:name "Huda" .
z:hk schema:location "Ithaca" .
```

Facilitator's Example



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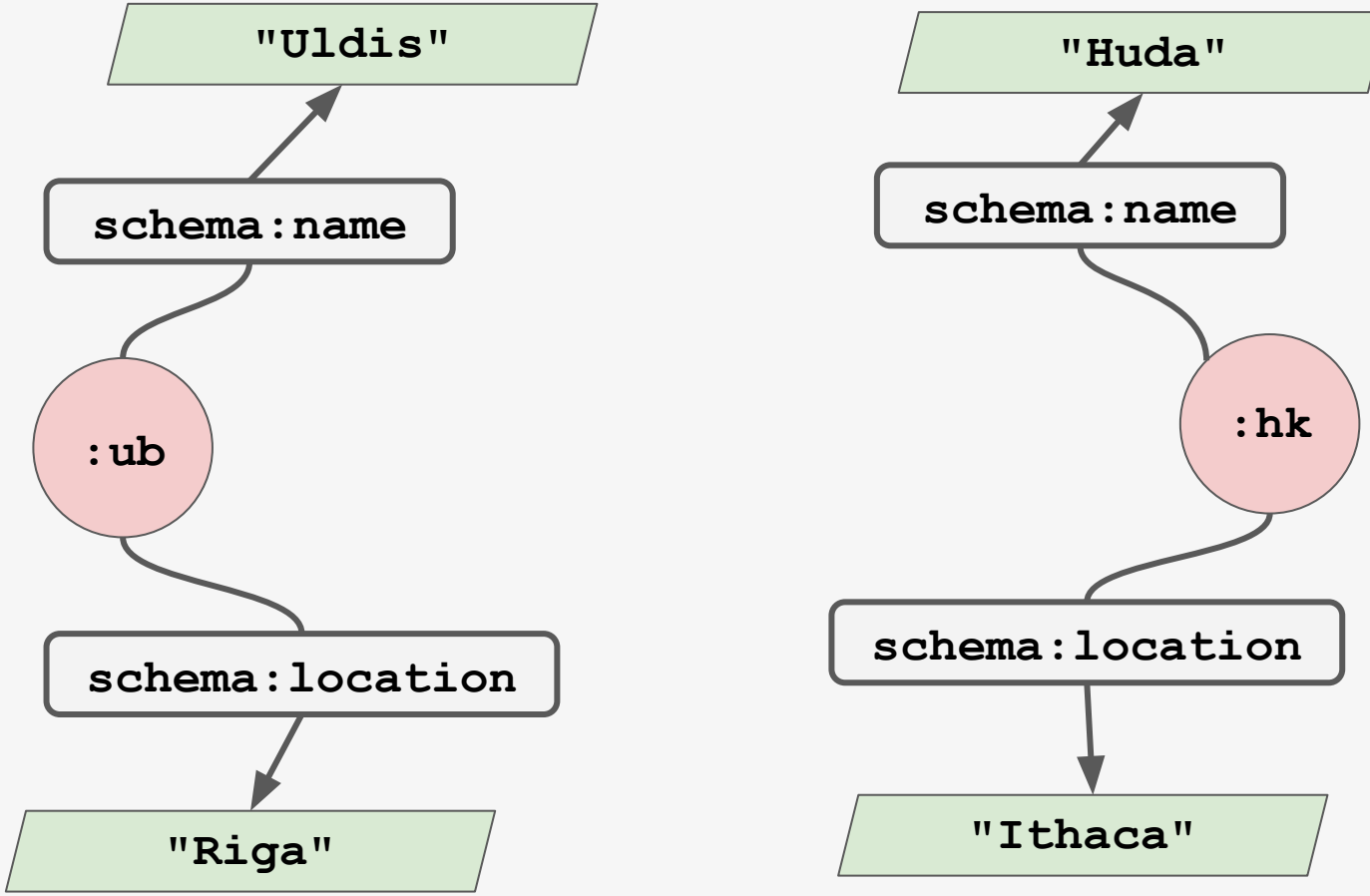
Resource Description Framework (RDF)

The **Resource Description Framework** (RDF) is used to **describe arbitrary things**.

RDF is based on the concept of **triples**, which consist of **subject**, **predicate** and **object**. It is an abstract model for which several notations exist. Today we will be using **Turtle** for our RDF serialization.



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Your turn!

1. Fill out your name tag.
2. Then transfer your nametag data into the Etherpad of your group.

https://pad.riseup.net/p/swib-17-ws

Linked Data Introduction: Link Your Graph to Your Group Member's

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Facilitator's Example

```
@prefix z: <https://pad.riseup.net/p/swib-17-ws-z#> .
@prefix schema: <http://schema.org/> .

z:ub schema:name "Uldis" .
z:ub schema:location "Riga" .
z:ub schema:knows z:ch .
z:ub schema:knows z:hk .

z:ch schema:name "Christina" .
z:ch schema:location "San Francisco" .

z:hk schema:name "Huda" .
z:hk schema:location "Ithaca" .
```

Facilitator's Example

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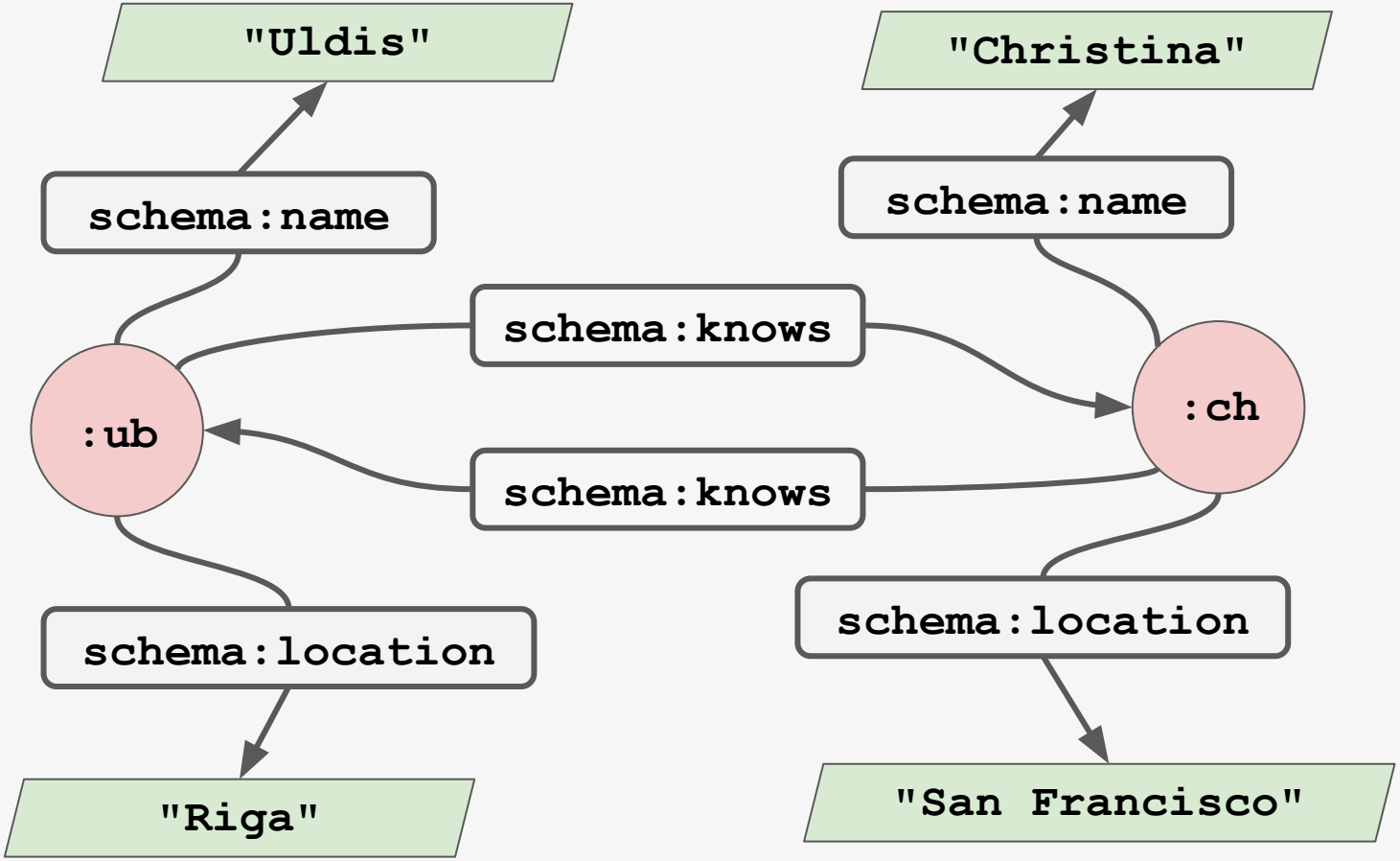
Linked Data

When using RDF, things are **named** by **Uniform Resource Identifiers** (URIs). By describing and linking things, **graphs** emerge.

Social **networks** such as Facebook or LinkedIn are well-known examples of this approach.



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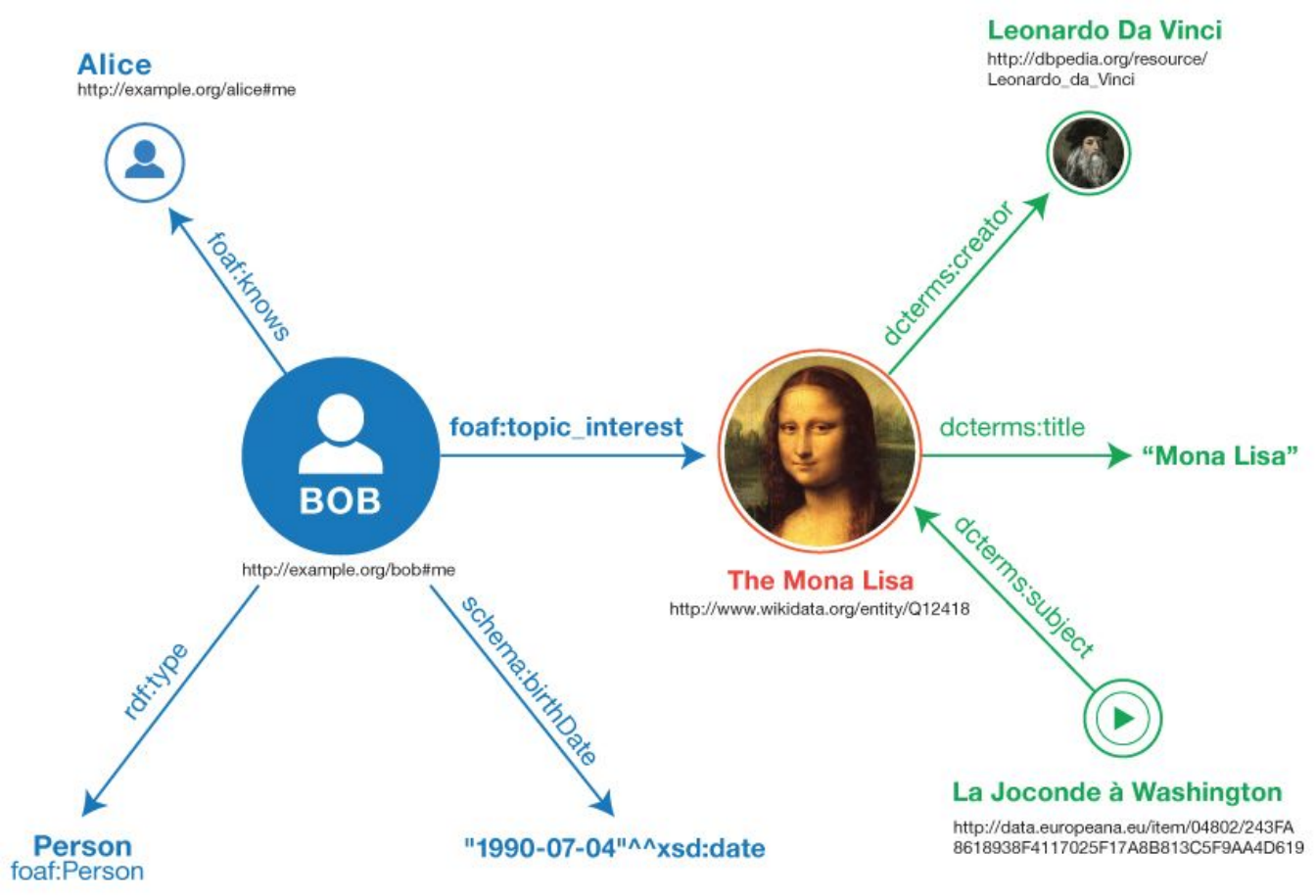

RDF 1.1 Primer - Copyright © 2003-2014 W3C

http://www.w3.org/TR/rdf11-primer/

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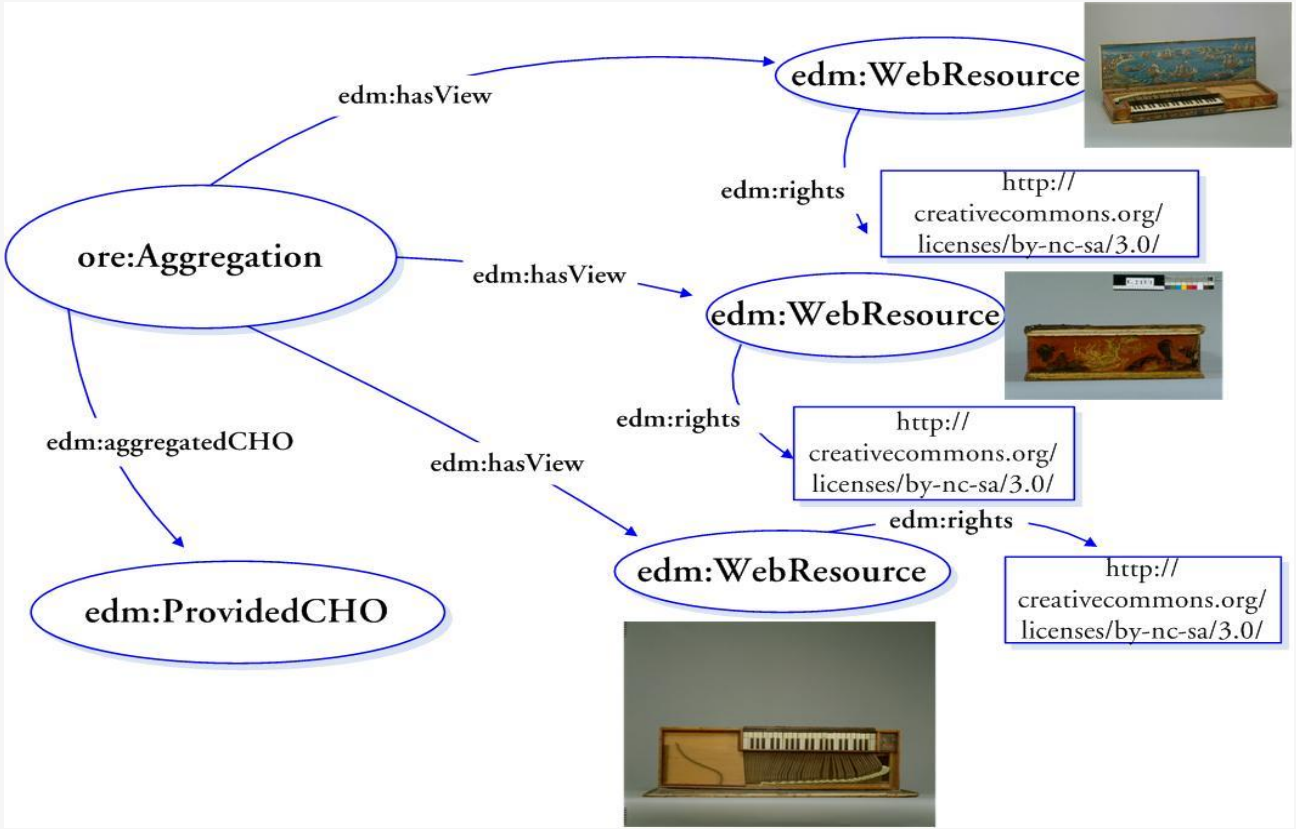
Graphs Let Europeana Grow…



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http://pro.europeana.eu/page/mimo-edm

Your turn!

Introduce yourself to the other members of your group. After doing so, document your new acquaintances in the Etherpad data using `schema:knows`.

Linked Data Introduction: Link Your Graph to Members of other Groups

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Facilitator's Example

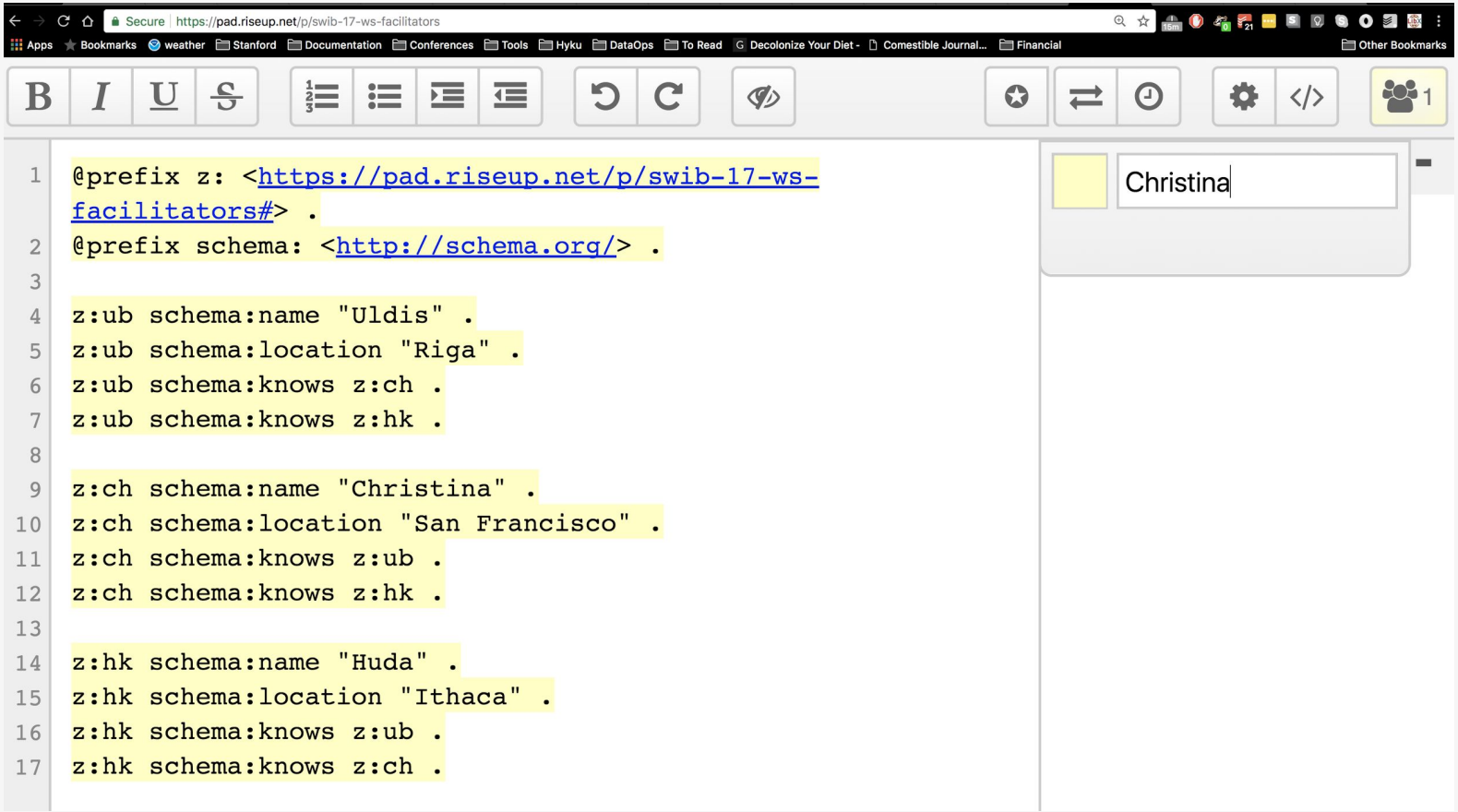
```
@prefix z: <https://pad.riseup.net/p/swib-17-ws-facilitators#> .
@prefix a: <https://pad.riseup.net/p/swib-17-ws-a#> .
@prefix schema: <http://schema.org/> .

...[truncated example data]

z:ch schema:name "Christina" .
z:ch schema:location "San Francisco" .
z:ch schema:knows z:ub .
z:ch schema:knows z:hk .

z:hk schema:name "Huda" .
z:hk schema:location "Ithaca" .
z:hk schema:knows z:ub .
z:hk schema:knows z:ch .
```

Facilitator's Example



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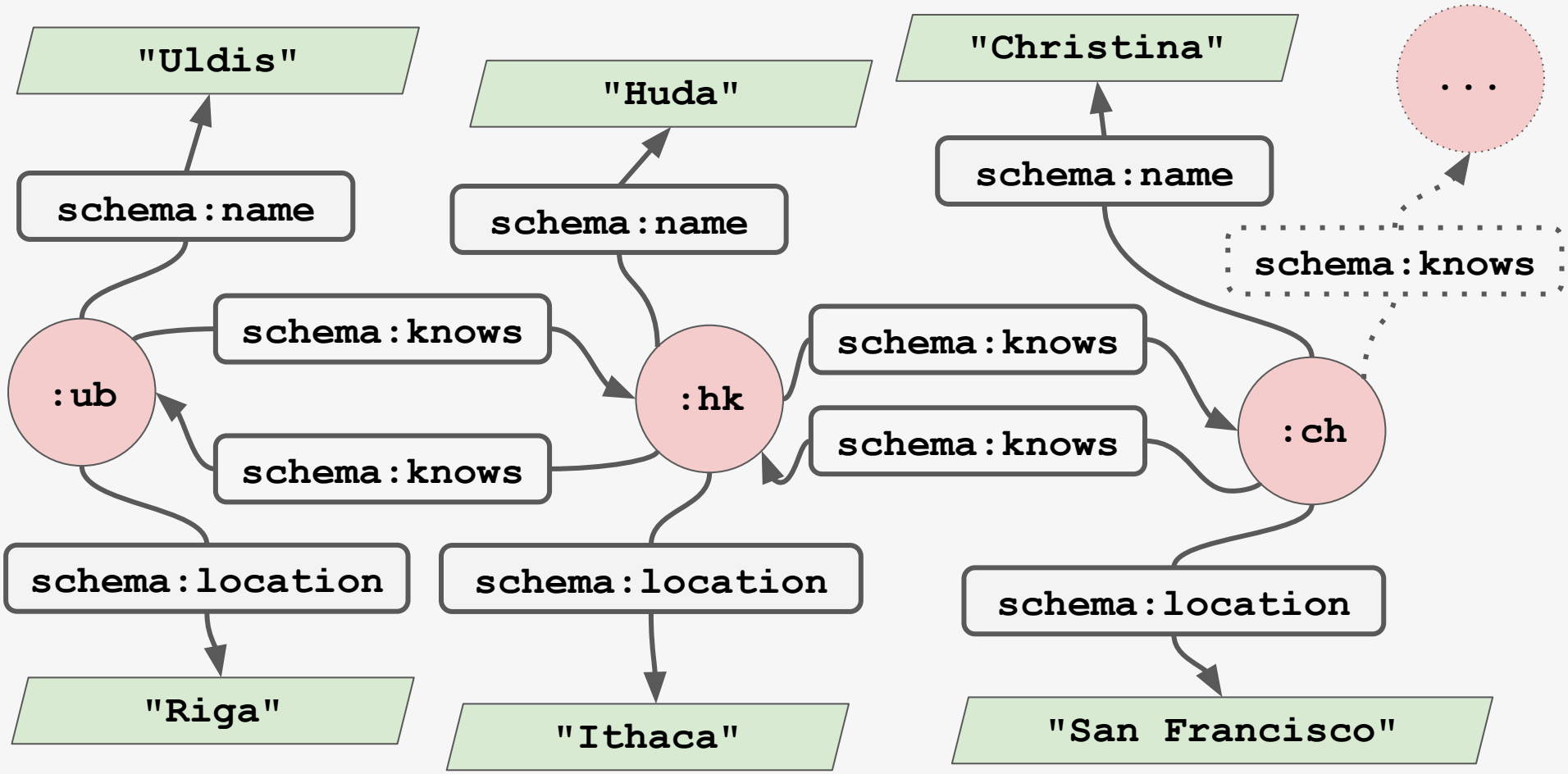
The simple power of the Link

Even a **single link** can greatly **expand** a **graph**, because many new connections can join the network.



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Your turn!

Extend your set of acquaintances linking out to people beyond your group. As before, document these new connections in the Etherpad.

Turtle RDF Serialization & Syntax

- **Turtle (Terse RDF Triple Language)**: format for expressing data in RDF.
- Each RDF triple starts on new line & ends with a full stop (.).
- **URIs:** Enclosed in angle brackets, i.e. *<http://www.ex.com/ex>*
- **Literals** are written *usually* using double-quotes (“”).
- Blank spaces / white spaces (outside of Literal quotes) are only to separate components of RDF statement.
- **Comments**: Preceded by ‘# ’ & continue to end of line.
- **Prefixes**: Letters preceding colon that are an abbreviation for an ontology namespace URI defined above in the Turtle document.
- **Online Turtle Validator:** http://ttl.summerofcode.be/

Linked Data & Semantic Web: Expanding Your Graph

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Facilitator's Example

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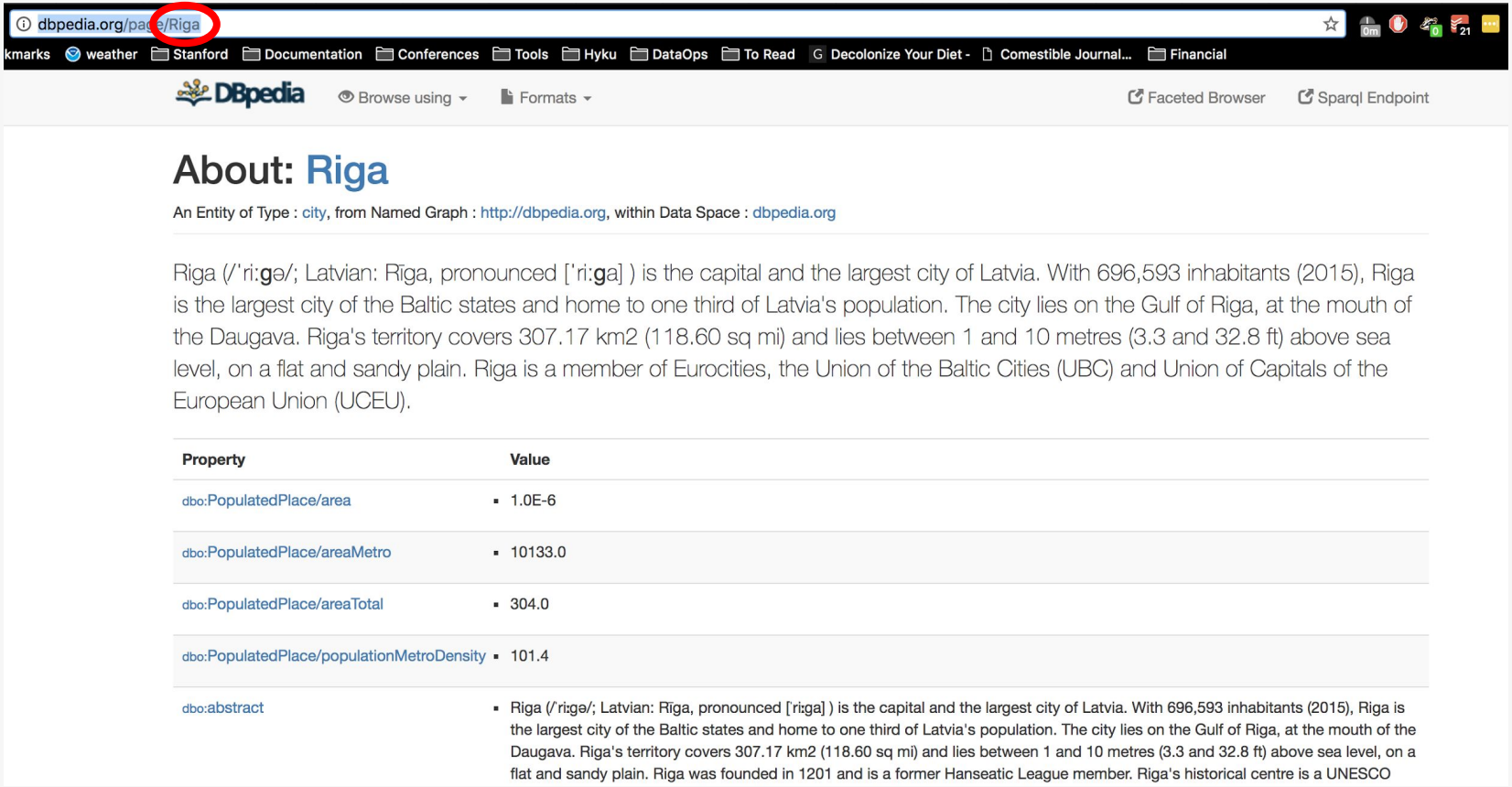
Facilitator's Example



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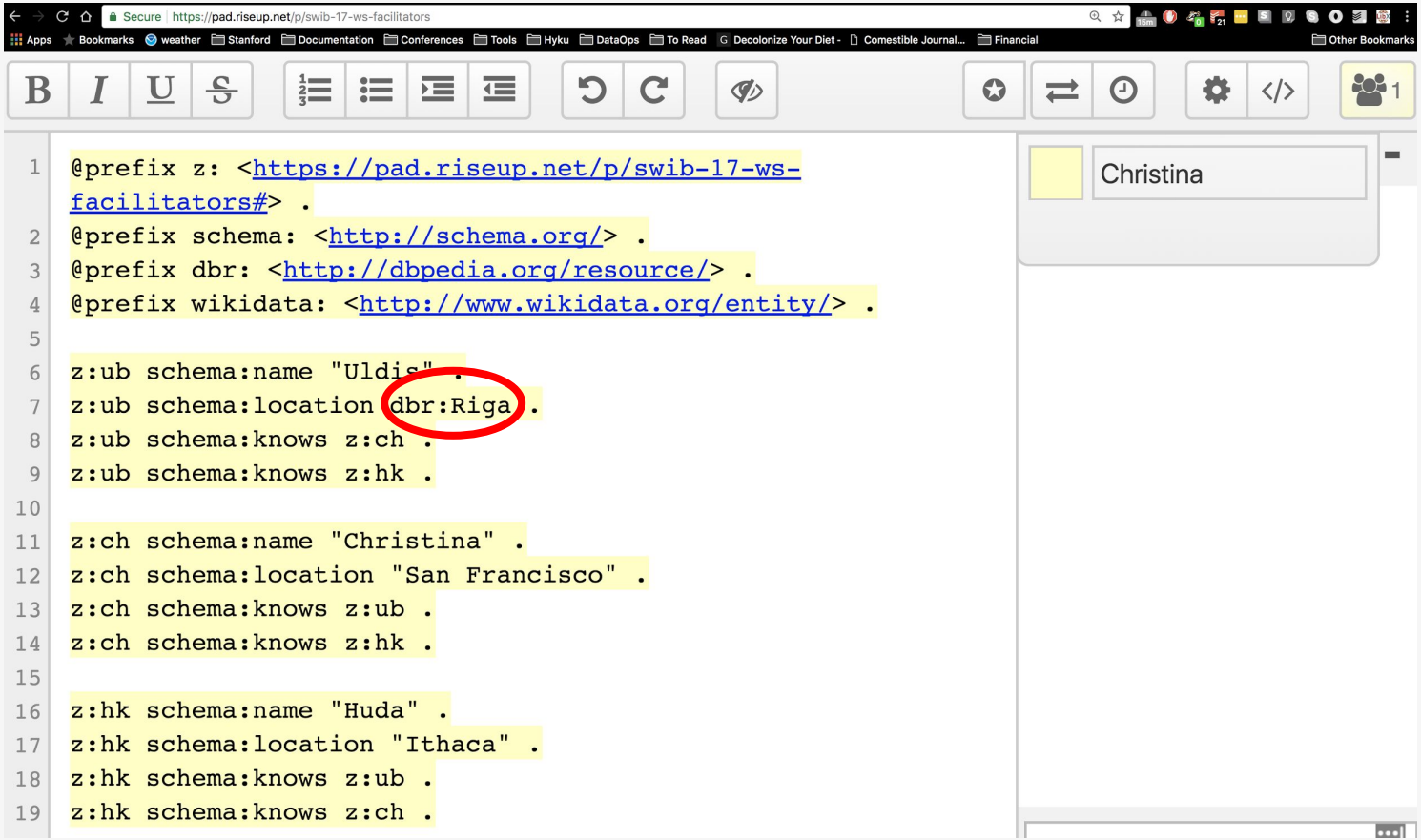
Facilitator's Example

```
@prefix z: <https://pad.riseup.net/p/swib-17-ws-facilitators#> .
@prefix schema: <http://schema.org/> .
@prefix dbr: <http://dbpedia.org/resource/> .
@prefix wikidata: <http://www.wikidata.org/entity/> .

z:ub schema:name "Uldis" .
z:ub schema:location dbr:Riga .
z:ub schema:knows z:ch .
z:ub schema:knows z:hk .

...[truncated example data]
```

Facilitator's Example



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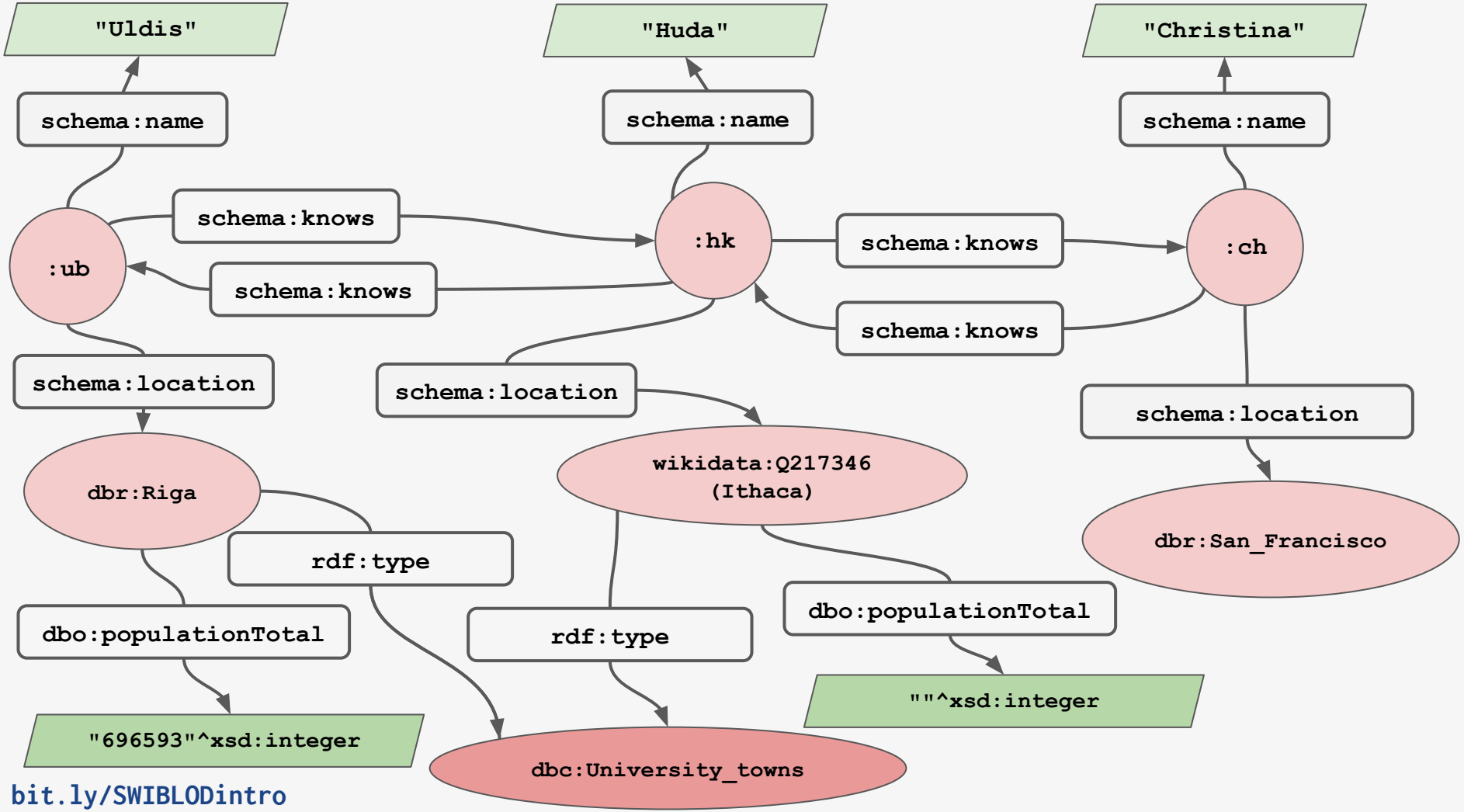

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The Giant Global Graph

By using **HTTP-URIs**, Linked Data builds upon a technology that is proven to **scale** globally. With reference to the World Wide Web, the term **Giant Global Graph** is sometimes used. What is true for the WWW is also true for the GGG:

Anyone can say anything about anything.

Linked Data Principles

Tim Berners-Lee

1. Use URIs as names for things
2. Use HTTP URIs so that things can be looked up
3. When someone looks up a URI, provide useful information, using the standards (RDF*, SPARQL)
4. Include links to other things so that they can discover more things.

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

Your turn!

First, find your location in Wikipedia.

Then, Replace the name of your location in your RDF with a reference to DBpedia (or other vocabulary) using the Wikipedia URL key.

Facilitator's Example

https://en.wikipedia.org/wiki/Music

Apps Bookmarks weather Cornell Documentation Conferences Tools To Read Financial Other Bookmarks

Not logged in Talk Contributions Create account Log in

Article Talk Read View source View history Search Wikipedia

WIKIPEDIA
The Free Encyclopedia

Main page
Contents
Featured content
Current events
Random article
Donate to Wikipedia
Wikipedia store

Interaction
Help
About Wikipedia
Community portal
Recent changes
Contact page

Tools
What links here

Music

From Wikipedia, the free encyclopedia

For other uses, see Music (disambiguation).

Music is an art form and cultural activity whose medium is sound and silence, which exist in time. The common elements of music are pitch (which governs melody and harmony), rhythm (and its associated concepts tempo, meter, and articulation), dynamics (loudness and softness), and the sonic qualities of timbre and texture (which are sometimes termed the "color" of a musical sound). Different styles or types of music may emphasize, de-emphasize or omit some of these elements. Music is performed with a vast range of instruments and vocal techniques ranging from singing to rapping; there are solely instrumental pieces, solely vocal pieces (such as songs without instrumental accompaniment) and pieces that combine singing and instruments. The word derives from Greek μουσική (*mousike*; "art of the Muses").[1] In its most general form, the activities describing music as an art form include the production of works of music (songs, tunes, symphonies, and so on), the criticism of music, the study of the history of music, and the aesthetic examination of music. Ancient Greek and Indian philosophers defined music as tones ordered horizontally as melodies and vertically as harmonies. Common sayings such as "the harmony of the spheres" and "it is music to my ears" point to the notion that music is often ordered and pleasant to listen to. However, 20th-century composer John Cage thought that any sound can be music, saying, for example, "There is no noise, only sound."[2]

Music

A painting on an ancient Greek vase depicts a music lesson (c. 510 BCE).

Medium	Sound, silence, time
Originating culture	Various
Originating era	Paleolithic era

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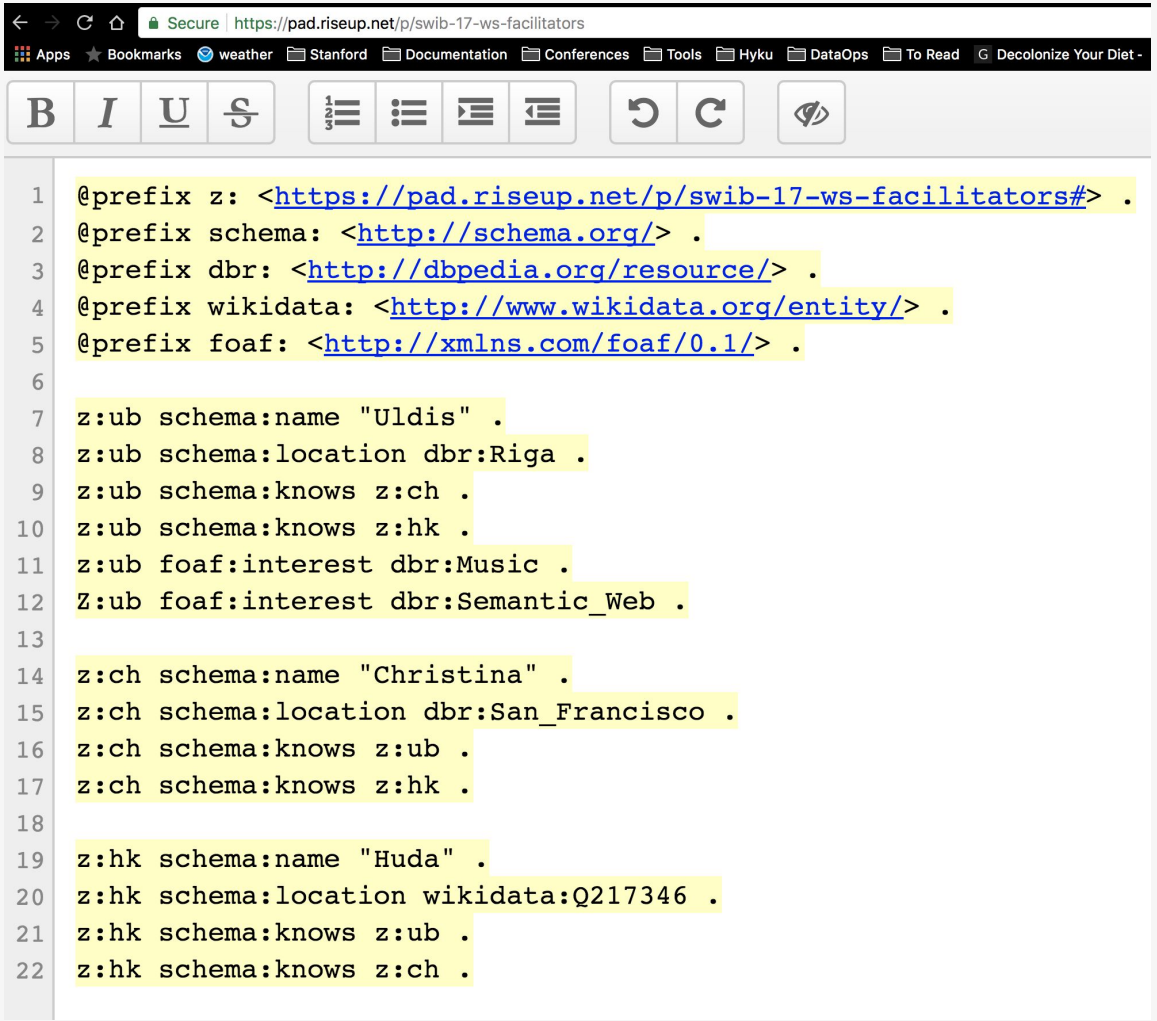
Facilitator's Example

```
@prefix z: <https://pad.riseup.net/p/swib-17-ws-facilitators#> .
@prefix schema: <http://schema.org/> .
@prefix dbr: <http://dbpedia.org/resource/> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .

z:ub schema:name "Uldis" .
z:ub schema:location dbr:Riga .
z:ub schema:knows z:ch .
z:ub schema:knows z:hk .
z:ub foaf:interest dbr:Music .
Z:ub foaf:interest dbr:Semantic_Web .

...[truncated example data]
```

Facilitator's Example



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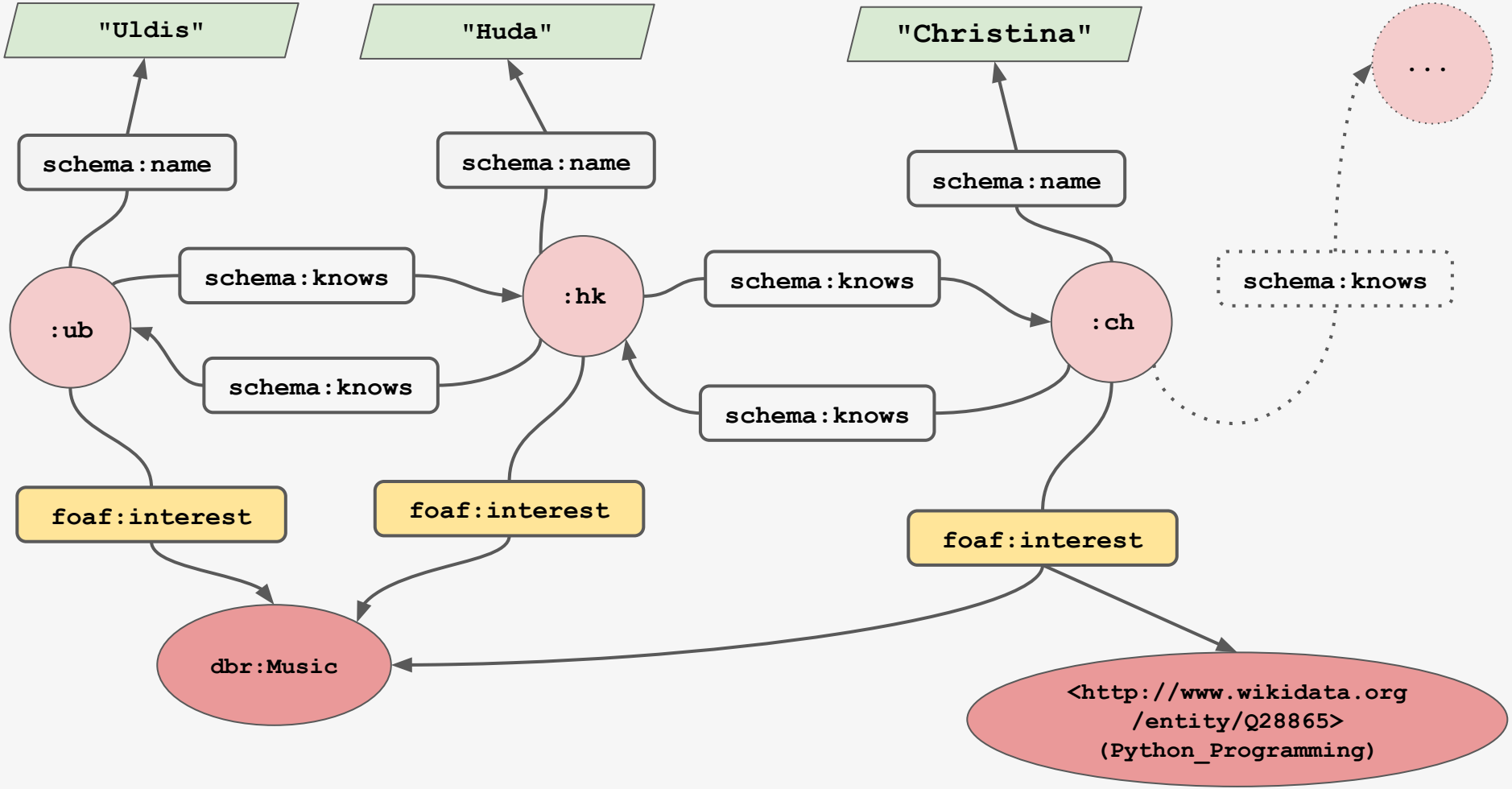

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Your turn!

Enhance your profile with interest you have. Again, refer to DBpedia (or other) entries to do so, remembering to use URIs, not URLs.

http://ttl.summerofcode.be

Other Element (Predicate, Field) Sets

- FOAF (Friend of a Friend)
- vcard (people and organisations)
- schema.org
- geo (to express geo-coordinates)
- Void (to describe datasets)
- Prov (provenance information)
- … and many more.
- See:
  - Linked Open Vocabularies (LOV) to look up ontologies & vocabularies
  - prefix.cc to look up namespaces

Library-Related Element Sets

- Dublin Core Metadata Terms
- Simple Knowledge Organisation System (SKOS)
  - Examples of Vocabularies using SKOS: Agrovoc, STW Thesaurus for Economics, many small controlled vocabularies (for example, RDA value vocabularies)
  - SKOS schemas in BARTOC: http://bartoc.org/en/search/advanced?f[0]=field_format%3A24
- GND Ontology, Getty Authorities Ontology
- RDA Elements sets
- EDM (Europeana Data Model)
- BIBFRAME (Version 2.0)
- And a growing number more…

(Instance) Datasets

- DBpedia, Wikidata
- BNF, BL, BNE, DNB, LoC, …
- GeoNames
- VIAF

See datahub.io for many more ...

30 minutes Break
(Return at 15:50)

Linked Open Data & Data Licensing

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“Open”?

*“Open data and content can be **freely used, modified, and shared** by **anyone** for **any purpose**”*

The Open Definition

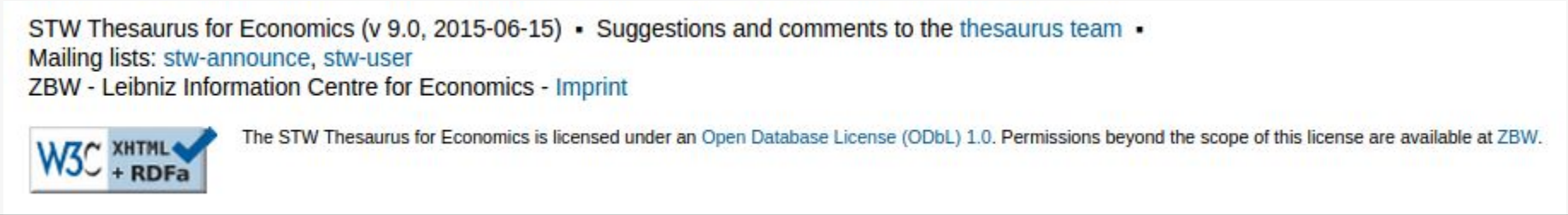
Openness involves...

- **Access**: no passwords, quantity restrictions, etc.
- **License**: only allowed restrictions are *attribution* and *share-alike*, i.e.:
  - CC0, CC-BY, CC-BY-SA
  - *no* non-commercial (NC) licenses
- **Formats**: no proprietary formats without freely accessible specification. Supports reuse of data

Some Data License Options

- Public Domain Dedication and License (PDDL): “Public Domain for data/databases”, opendatacommons.org/licenses/pddl/
- Open Data Commons Attribution (ODC-By): “Attribution for data/databases”,opendatacommons.org/licenses/by/
- Open Database License (ODC-ODbL): “Attribution Share-Alike for data/databases”,opendatacommons.org/licenses/odbl/
- CC0 1.0 Universal: “Creative Commons public domain waiver”, creativecommons.org/publicdomain/zero/1.0/

Licensing data




```
@prefix cc: <http://creativecommons.org/ns#> .

<http://zbw.eu/stw>
  cc:attributionName "ZBW - Leibniz Information Centre for
    Economics"@en, "ZBW - Leibniz-Informationszentrum Wirtschaft"@de ;
  cc:attributionURL "http://zbw.eu" ;
  dcterms:rights "see cc:license"@en, "siehe cc:license"@de ;
  cc:license <http://opendatacommons.org/licenses/odbl/1-0/> ;
  ...
```

Facilitator's Example

```
@prefix z: <https://pad.riseup.net/p/swib-17-ws-facilitators#> .
@prefix schema: <http://schema.org/> .
@prefix dbr: <http://dbpedia.org/resource/> .
@prefix wikidata: <http://www.wikidata.org/entity/> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix dcterms: <http://purl.org/dc/terms/> .

<> dcterms:creator z:ub .
<> dcterms:creator z:ch .
<> dcterms:creator z:hk .
<> schema:license <https://creativecommons.org/publicdomain/zero/1.0/>.

z:ch schema:name "Christina" .
z:ch schema:location "Ithaca" .
… [truncated example data]
```

Facilitator's Example

```
@prefix z: <https://pad.riseup.net/p/swib-17-ws-facilitators#> .
@prefix schema: <http://schema.org/> .
@prefix dbr: <http://dbpedia.org/resource/> .
@prefix wikidata: <http://www.wikidata.org/entity/> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix dcterms: <http://purl.org/dc/terms/> .

<> dcterms:creator z:ub .
<> dcterms:creator z:ch .
<> dcterms:creator z:hk .
<> schema:license <https://creativecommons.org/publicdomain/zero/1.0/>.

z:ub schema:name "Uldis" .
z:ub schema:location dbr:Riga .
z:ub schema:knows z:ch .
z:ub schema:knows z:hk .
z:ub foaf:interest dbr:Music .
Z:ub foaf:interest dbr:Semantic_Web .

z:ch schema:name "Christina" .
z:ch schema:location dbr:San_Francisco .
z:ch schema:knows z:ub .
z:ch schema:knows z:hk .
z:ch foaf:interest dbr:Music .
z:ch foaf:interest wikidata:Q28865 .

z:hk schema:name "Huda" .
z:hk schema:location wikidata:Q217346 .
z:hk schema:knows z:ub .
z:hk schema:knows z:ch .
z:hk foaf:interest dbr:Music .
```

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Other GLAM-focused Open Data/Licenses

- RightsStatement.org (for Digital Objects)
- Europeana Dataset
- DPLA (Digital Public Library of America) Dataset
- Getty Vocabularies & Ontology
- Data on the Web Best Practices W3C Recommendation Section on Licensing
- Share-PSI (Public Sector Information) Localised Guide Pages for Open Data

Moving towards 5 Star Linked Data

★ make your stuff available on the Web (whatever format) under an open license

★★ make it available as structured data (e.g., Excel instead of image scan of a table)

★★★ make it available in a non-proprietary open format (e.g., CSV as well as of Excel)

★★★★ use URIs to denote things, so that people can point at your stuff

★★★★★ link your data to other data to provide context

Your turn!

Allow the reuse of your data. In order to do so, document your authorship (add `dcterms:creator`) and apply a CC0 or another license as you see fit (add `schema:license`).

Linked Data Experimentation: SPARQL & Visualization(s)

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About LODLive

- Uses Linked Data standards (RDF, SPARQL) to browse RDF data.
- Spread Linked Data Ideas through Easy & Reusable Interface.
- Browse by Querying Endpoint for Specific Resource or Start from a Given Example URI.
- LODLive built with:
  - jQuery plug-in (lodlive-core.js)
  - JSON configuration map (lodlive-profile.js)
  - HTML page with a few images (sprites)
  - Few other jQuery public plug-ins
- http://en.lodlive.it/ & https://github.com/dvcama/LodLive

LODLive Viz

Browse, collect and view the group graphs we have created

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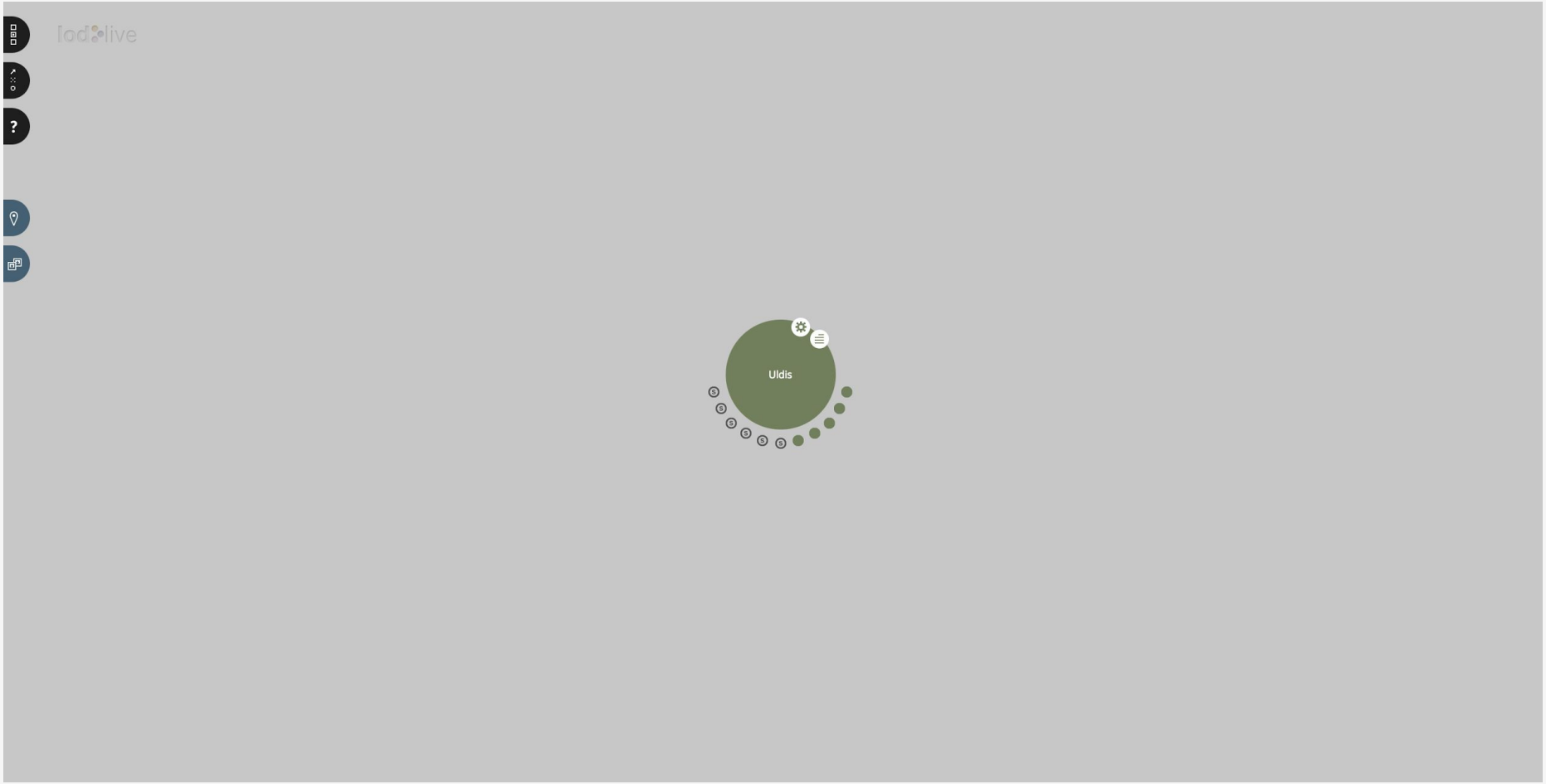

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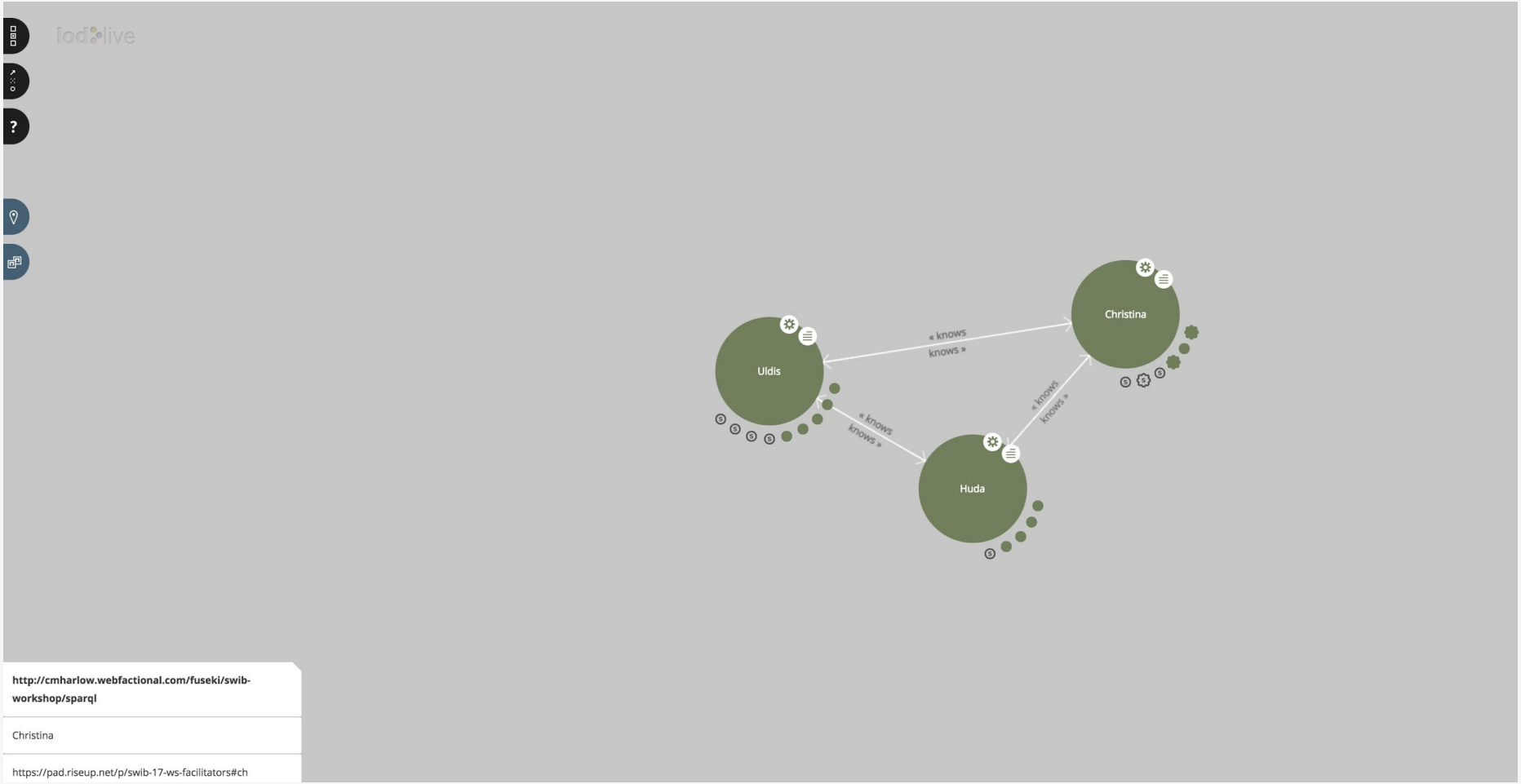

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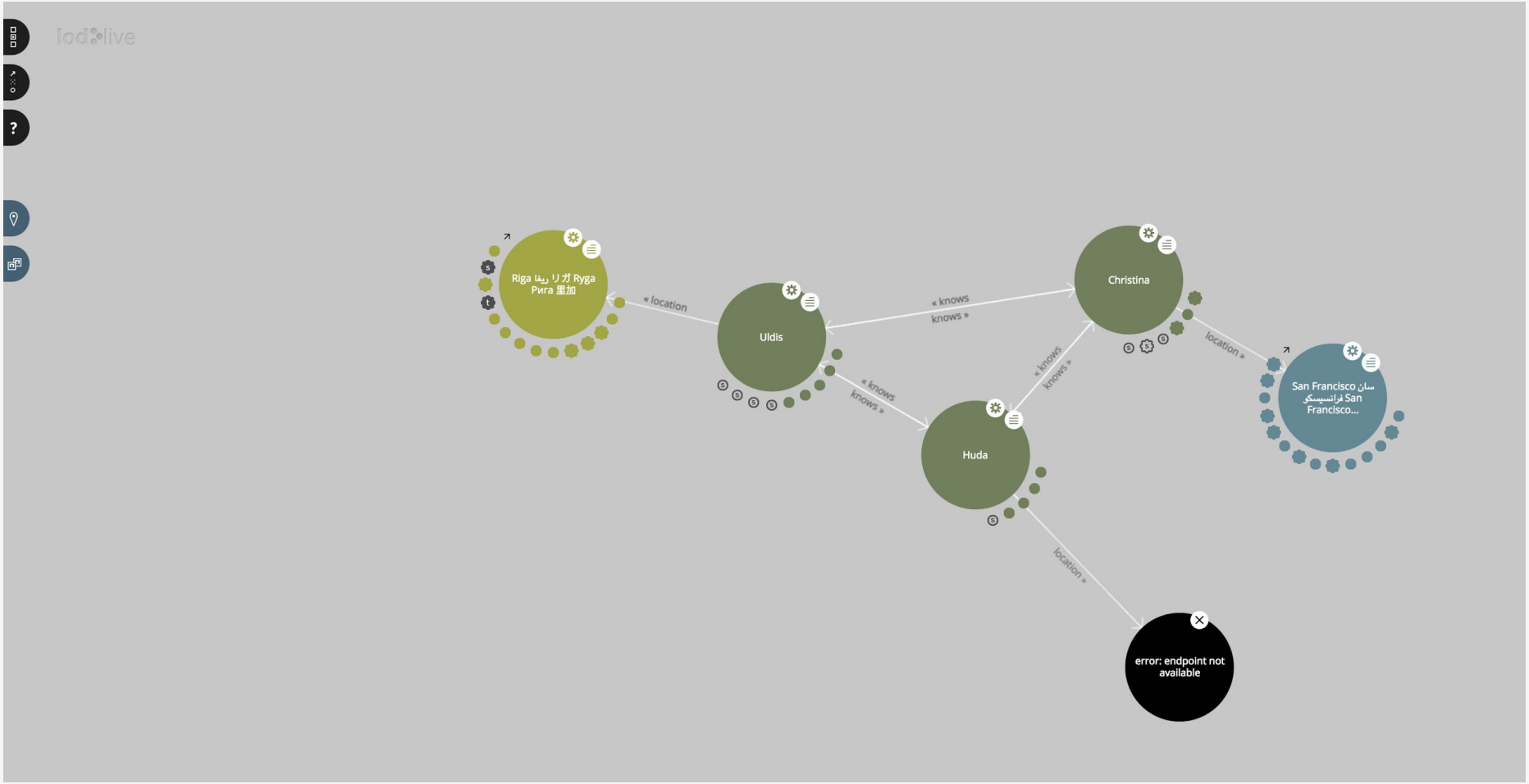

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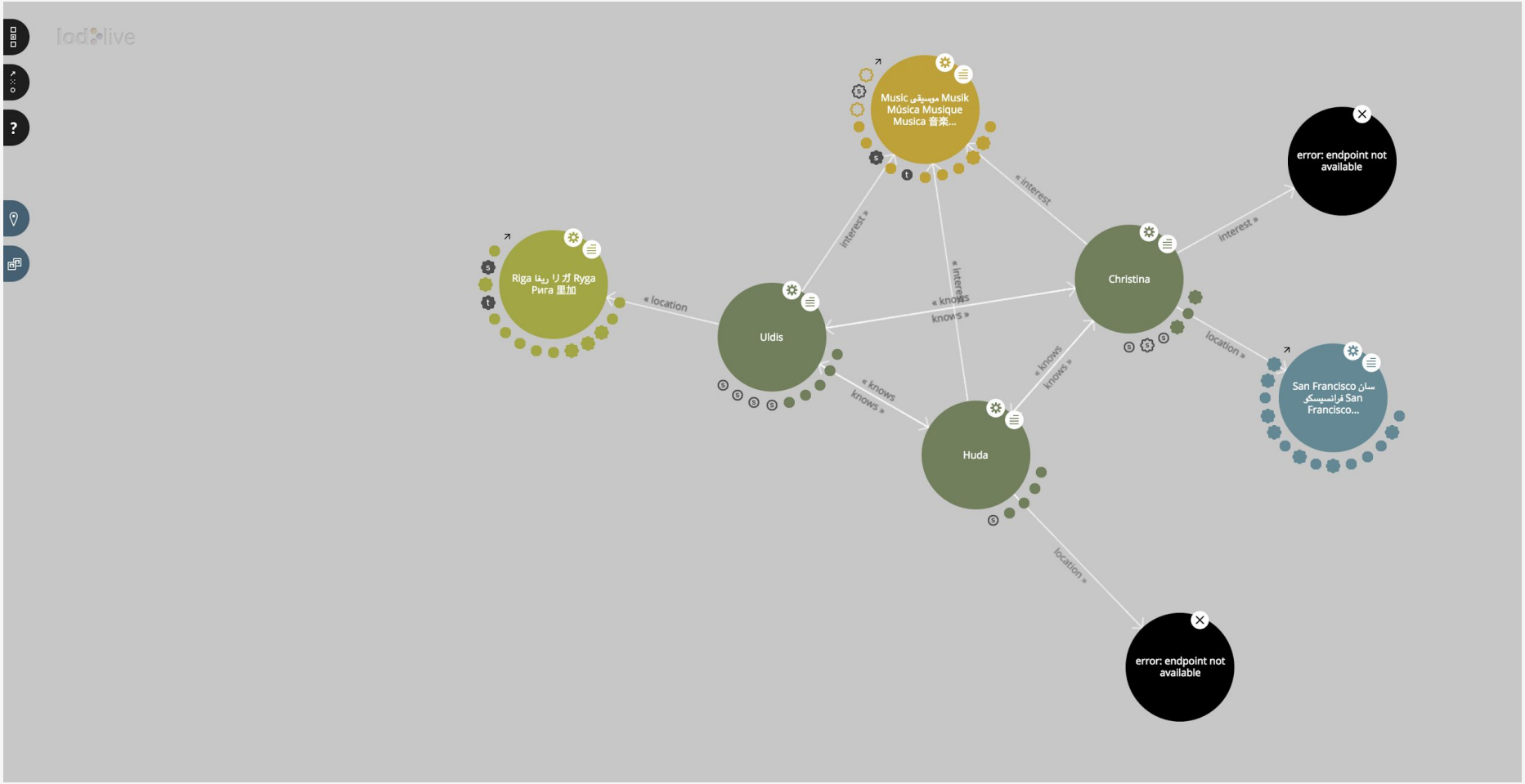

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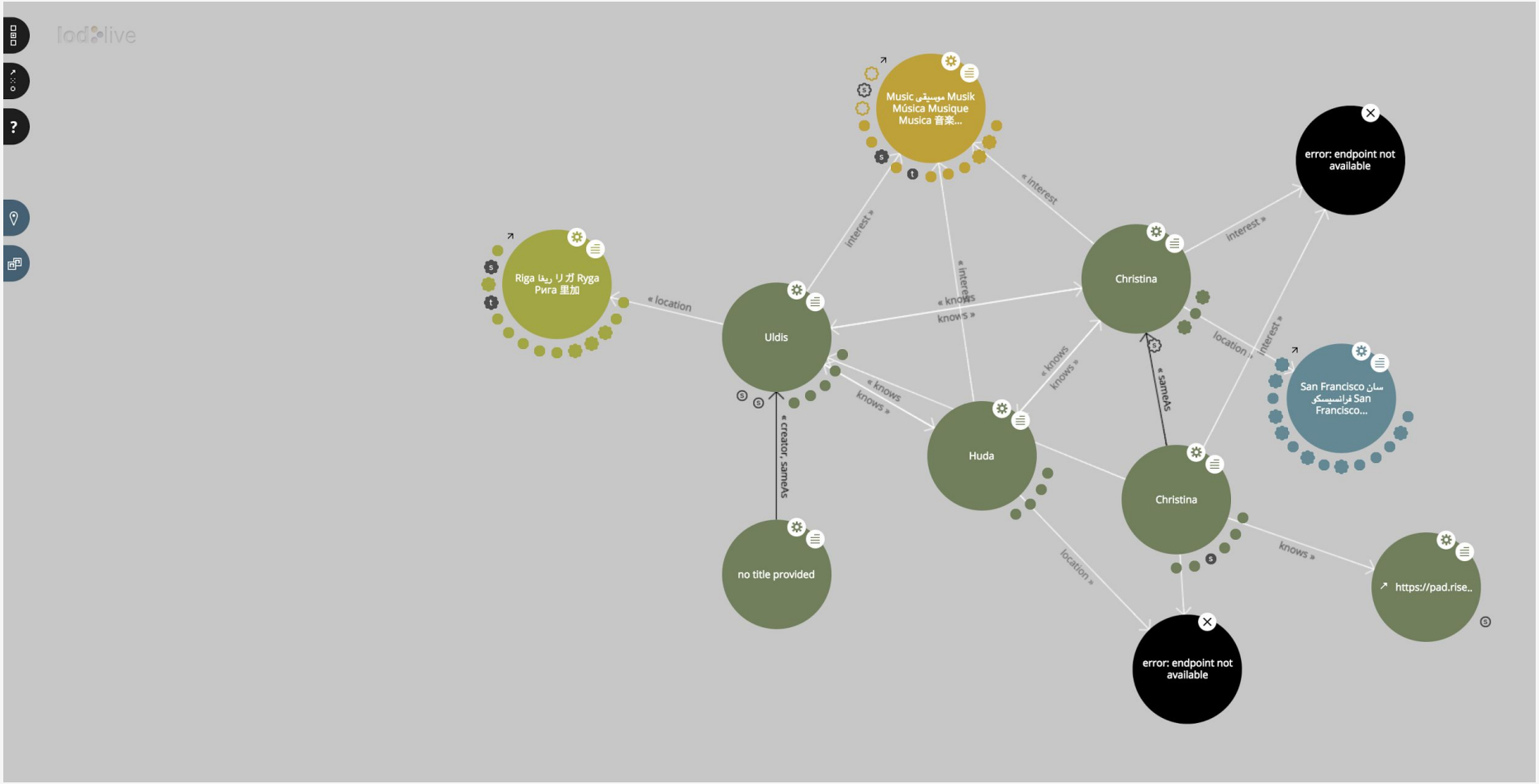

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LODLive live demo

Try this first:

http://cmharlow.webfactional.com/lodlive/app_en.html

Back-up (try second):

http://en.lodlive.it/?http://dbpedia.org/resource/Riga

SPARQL / Fuseki

Browse, collect and query the group graphs we have created:

http://cmharlow.webfactional.com/fuseki/

Select /swib-workshop and query

Triplestores & SPARQL

Scattered machine readable descriptions are useful, but we can do better! RDF is a **distributed data** model which makes it easy to **combine descriptions**. Special databases called **triplestores** exist that allow to query the aggregated data using the query language **SPARQL**.

SPARQL Query General Form

```
PREFIX test: <http://testNamespace.edu>

SELECT ?variable FROM <http://testNamespace.edu/dataset.rdf>
WHERE {

  ?variable ?predicate ?obj .

}

ORDER by ?variable
```


https://www.w3.org/TR/rdf-sparql-query/

SPARQL: Names of the participants

SPARQL ENDPOINT: swib-workshop | CONTENT TYPE (SELECT): JSON | CONTENT TYPE (GRAPH): Turtle

```
# Names of Workshop Participants
PREFIX schema: <http://schema.org/>
SELECT * WHERE {
  ?person schema:name ?name .
}
```

QUERY RESULTS

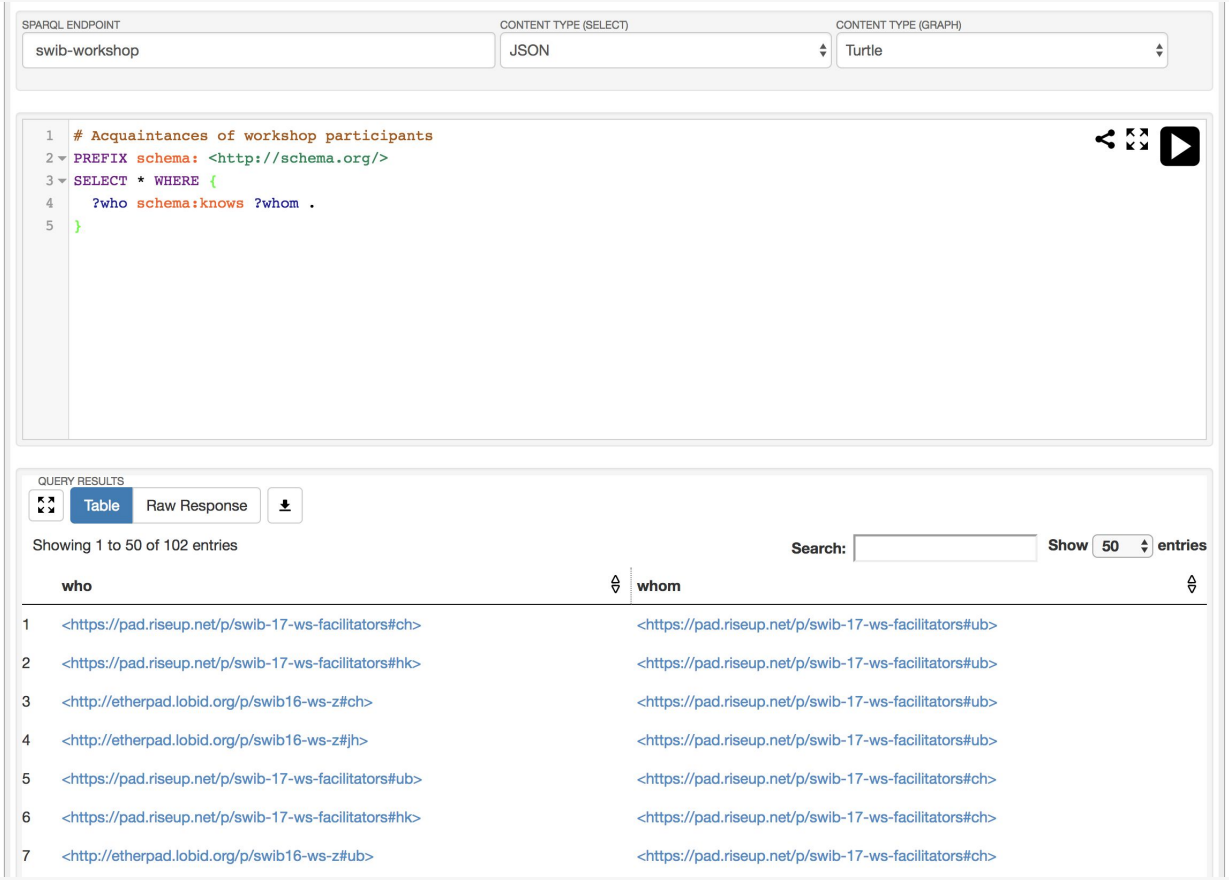
Table | Raw Response

Showing 1 to 25 of 25 entries

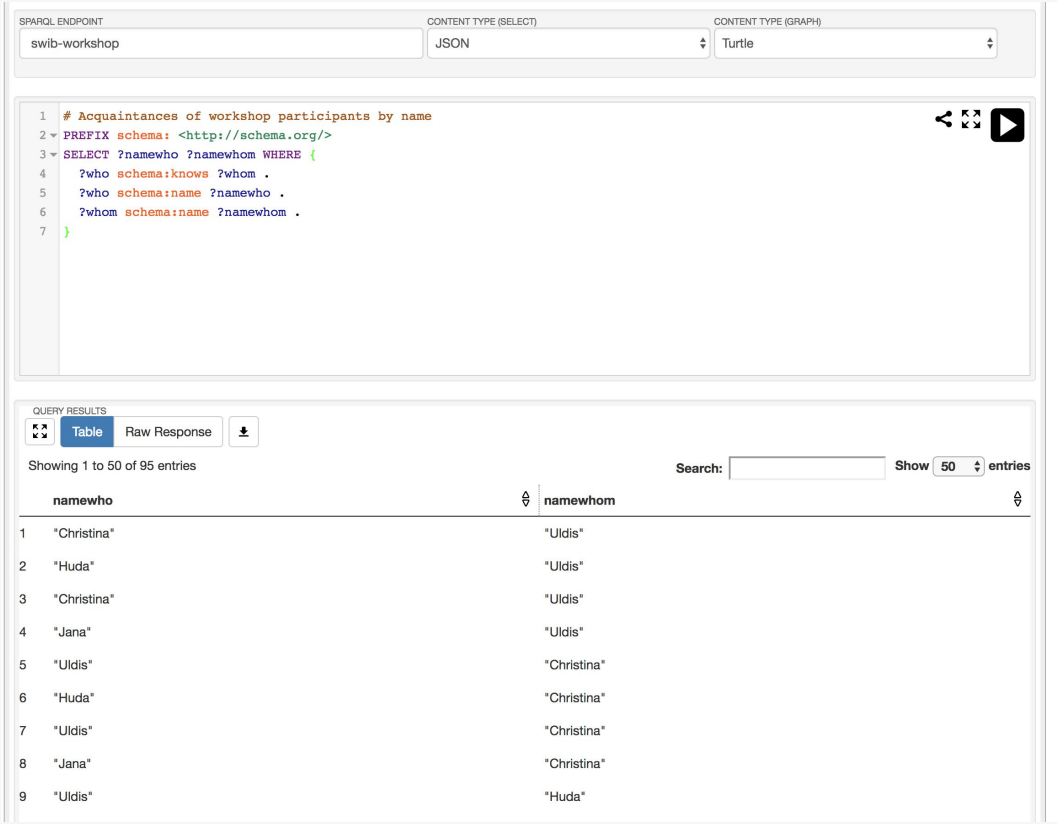
Search: | Show 50 entries

	person	name
1	<https://pad.riseup.net/p/swib-17-ws-facilitators#ub>	"Uldis"
2	<http://etherpad.lobid.org/p/swib16-ws-z#ub>	"Uldis"
3	<https://pad.riseup.net/p/swib-17-ws-facilitators#ch>	"Christina"
4	<http://etherpad.lobid.org/p/swib16-ws-z#ch>	"Christina"
5	<https://pad.riseup.net/p/swib-17-ws-facilitators#hk>	"Huda"
6	<http://etherpad.lobid.org/p/swib16-ws-z#jh>	"Jana"
7	<http://etherpad.lobid.org/p/swib16-ws-b#oj>	"Olaf"
8	<http://etherpad.lobid.org/p/swib16-ws-b#ag>	"Astrid"

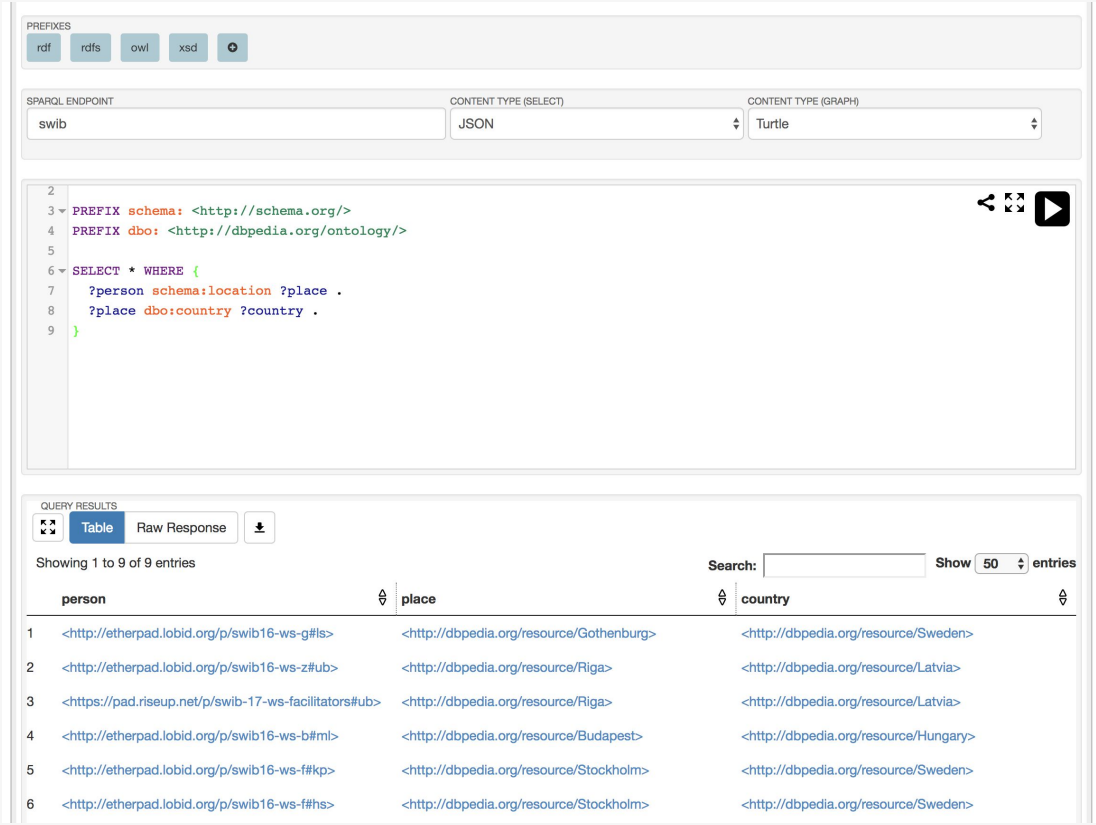
Acquaintances



Acquaintances by name



Localities and Countries



Shared Interests

```
# Shared Interests of workshop participants
PREFIX schema: <http://schema.org/>
PREFIX dbo: <http://dbpedia.org/ontology/>
PREFIX z: <https://pad.riseup.net/p/swib-17-ws-facilitators#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT * WHERE {
  z:ub foaf:interest ?interest .
  ?person foaf:interest ?interest .
  FILTER (?person != z:ub)
}
```

QUERY RESULTS

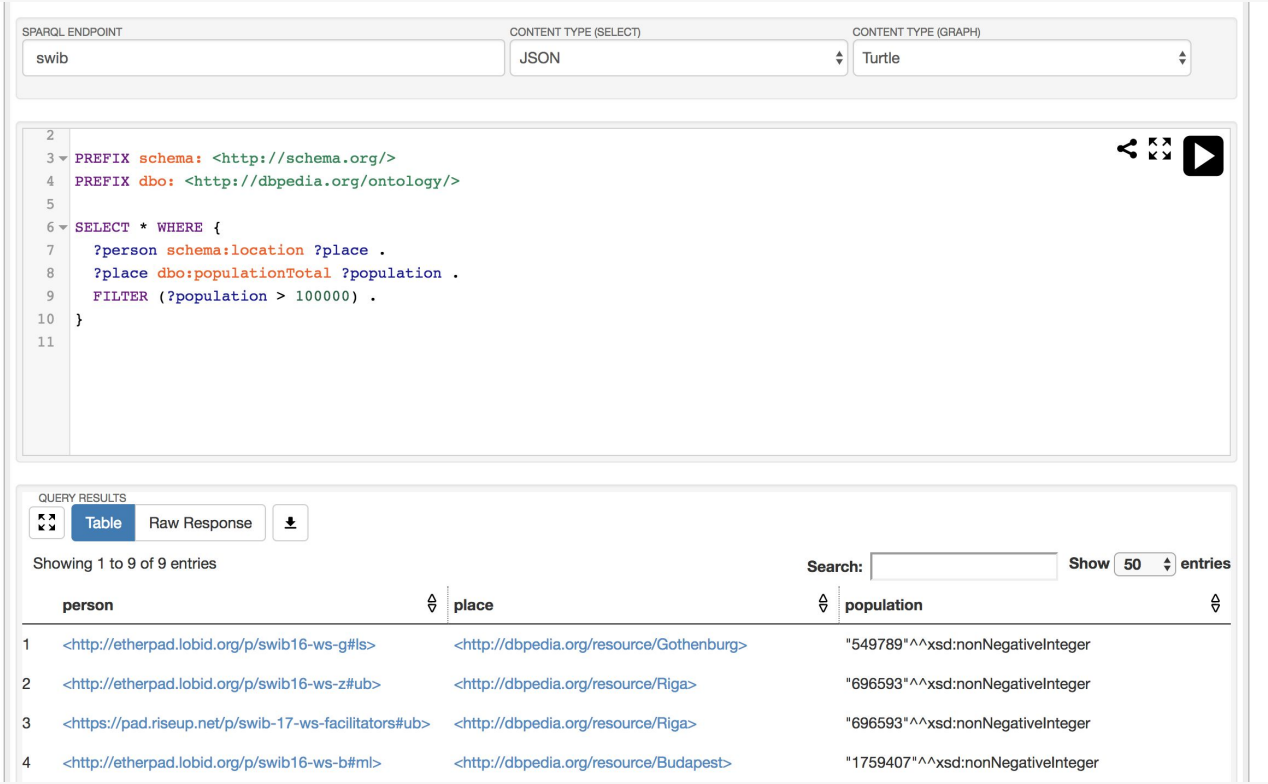
Table | Raw Response

Showing 1 to 10 of 10 entries

Search: Show 50 entries

	interest	person
1	<http://dbpedia.org/resource/Music>	<http://etherpad.lobid.org/p/swib16-ws-c#rr>
2	<http://dbpedia.org/resource/Music>	z:hk
3	<http://dbpedia.org/resource/Music>	<http://etherpad.lobid.org/p/swib16-ws-z#jh>
4	<http://dbpedia.org/resource/Music>	z:ch
5	<http://dbpedia.org/resource/Music>	<http://etherpad.lobid.org/p/swib16-ws-e#ml>
6	<http://dbpedia.org/resource/Music>	<http://etherpad.lobid.org/p/swib16-ws-z#ub>
7	<http://dbpedia.org/resource/Music>	<http://etherpad.lobid.org/p/swib16-ws-b#ag>

Metropolitans (Cities of certain size)



SPARQL ENDPOINT: swib
CONTENT TYPE (SELECT): JSON
CONTENT TYPE (GRAPH): Turtle

```
PREFIX schema: <http://schema.org/>
PREFIX dbo: <http://dbpedia.org/ontology/>

SELECT * WHERE {
  ?person schema:location ?place .
  ?place dbo:populationTotal ?population .
  FILTER (?population > 100000) .
}
```

QUERY RESULTS

Table | Raw Response

Showing 1 to 9 of 9 entries

Search: Show 50 entries

	person	place	population
1	<http://etherpad.lobid.org/p/swib16-ws-g#ls>	<http://dbpedia.org/resource/Gothenburg>	"549789"^^xsd:nonNegativeInteger
2	<http://etherpad.lobid.org/p/swib16-ws-z#ub>	<http://dbpedia.org/resource/Riga>	"696593"^^xsd:nonNegativeInteger
3	<https://pad.riseup.net/p/swib-17-ws-facilitators#ub>	<http://dbpedia.org/resource/Riga>	"696593"^^xsd:nonNegativeInteger
4	<http://etherpad.lobid.org/p/swib16-ws-b#ml>	<http://dbpedia.org/resource/Budapest>	"1759407"^^xsd:nonNegativeInteger

SPARQL live demo

http://cmharlow.webfactional.com/fuseki/dataset.html?tab=query&ds=/swib-workshop

Your turn!

Explore your social network using the SPARQL-Endpoint and the interactive LodLive visualization. Details & links: https://pad.riseup.net/p/swib-17-ws

Overview of Some (More) Linked Data Technologies

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SPARQL & Triplestores

- Triplestores are like SQL databases, but Optimised to manage Triples or RDF statements
- SPARQL isn’t just for Querying - e.g. SPARQL update
- Triplestores versus Graph Stores
- Some Triplestores:
  - Apache Jena Fuseki
  - Apache Jena TDB
  - Blazegraph
  - Virtuoso, Stardog, Marmotta, …

Subset of Random Other RDF Tech

- W3C RDF Validator (expects RDF/XML)
- Turtle Validator
- SHACL (Shapes Constraint Language), ShEx (Shapes Expr.)
- Structured Data (RDFa) Linter (See what structured data machines can pick up from your website)
- Python RDFLib (Library for working with RDF in Python)
- Ruby RDF.rb (Library for working with RDF in Ruby)
- Raptor (RDF Parsers written in C that are used in many other programming libraries with RDF)

15 minutes Break
(Return at TBD)

Linked Data Examples, Resources & Projects

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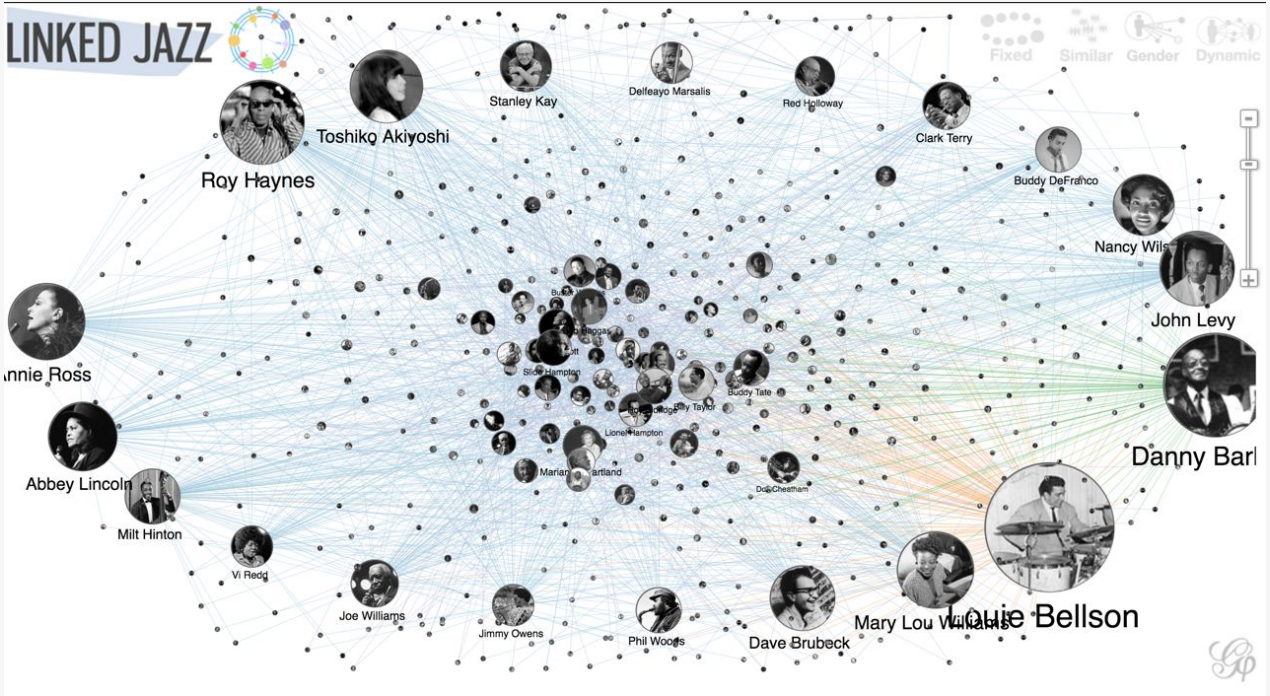
Linked Jazz: Network Viz



linkedjazz.org/network/

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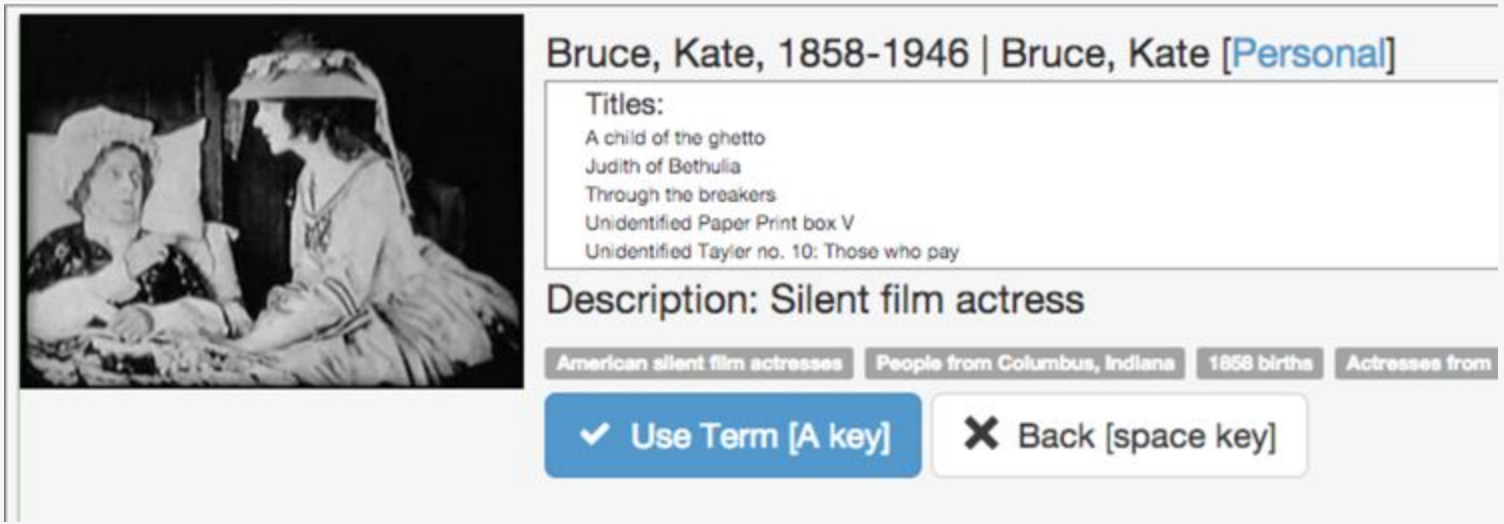
Linked Jazz: Ecco!



linkedjazz.org/tools/ecco/

NYPL Labs B.I.L.L.I.

(Bibliographic Identifiers for Library Location Information)

billi.nypl.org

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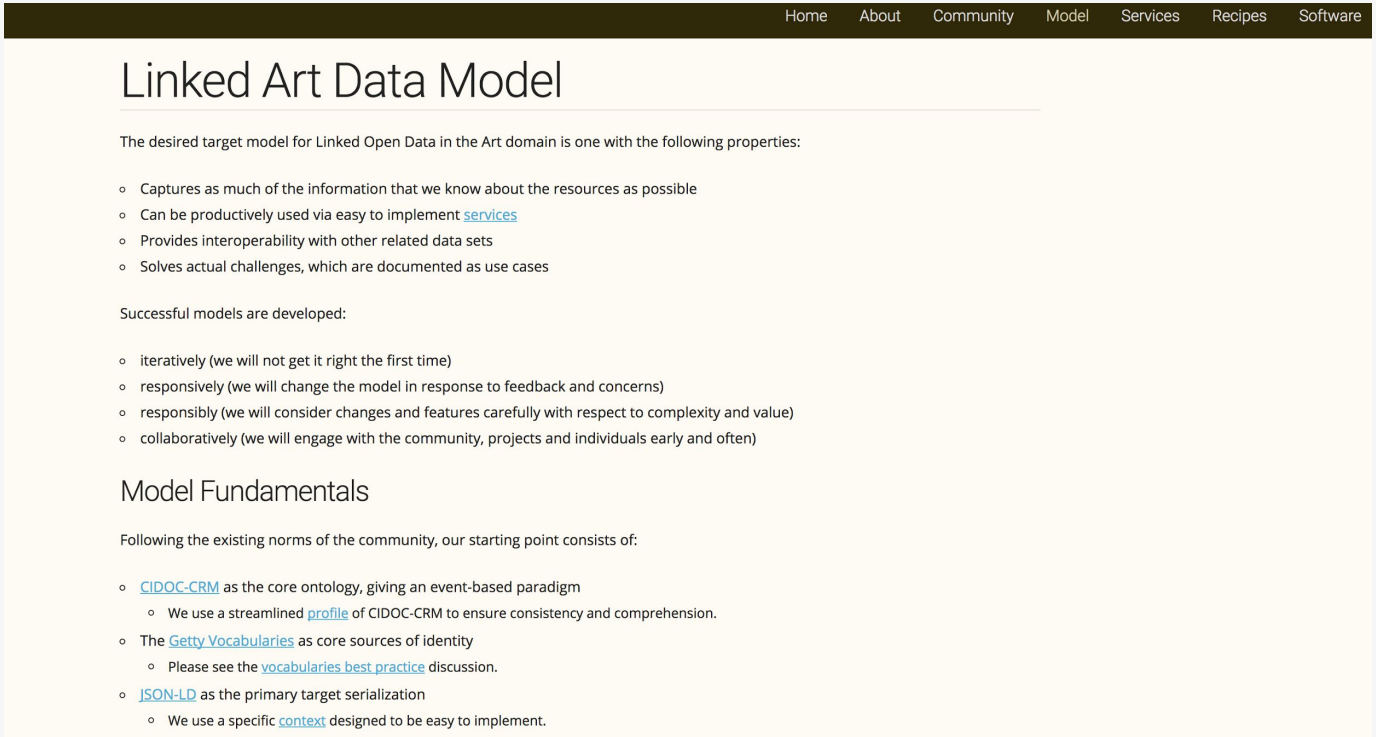
ls.ext RDF Cataloging Client

vimeo.com/192831354 / github.com/digibib/ls.ext

Linked.Art



http://linked.art/

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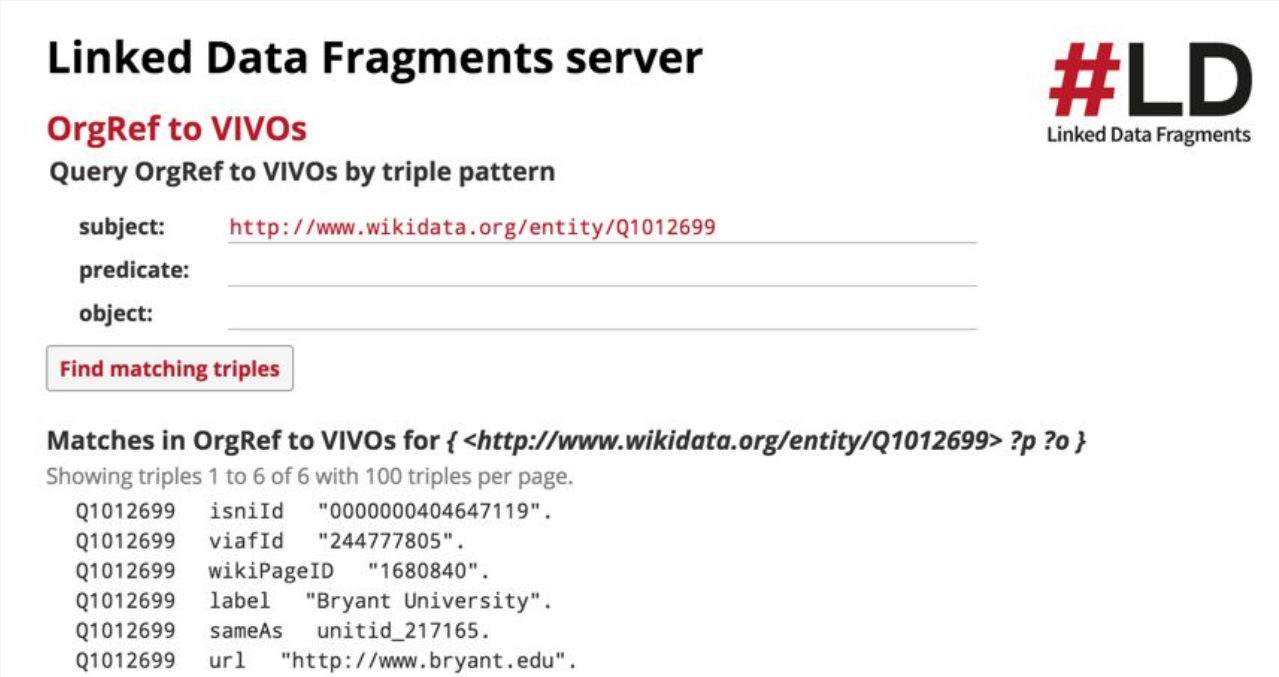
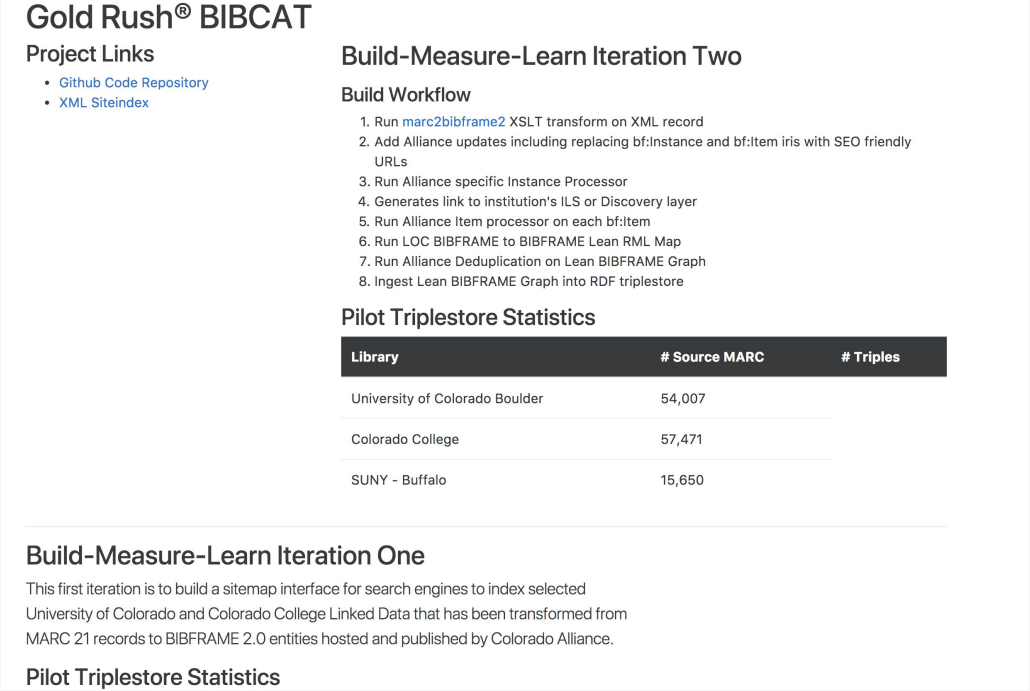
LDF Server: OrgRef to VIVOs



ldf-vivo.herokuapp.com/orgref

BibCat



Gold Rush® BIBCAT

Project Links

- Github Code Repository
- XML Siteindex

Build-Measure-Learn Iteration Two

Build Workflow

1. Run marc2bibframe2 XSLT transform on XML record
2. Add Alliance updates including replacing bf:Instance and bf:Item iris with SEO friendly URLs
3. Run Alliance specific Instance Processor
4. Generates link to institution's ILS or Discovery layer
5. Run Alliance Item processor on each bf:Item
6. Run LOC BIBFRAME to BIBFRAME Lean RML Map
7. Run Alliance Deduplication on Lean BIBFRAME Graph
8. Ingest Lean BIBFRAME Graph into RDF triplestore

Pilot Triplestore Statistics

Library	# Source MARC	# Triples
University of Colorado Boulder	54,007	
Colorado College	57,471	
SUNY - Buffalo	15,650	

Build-Measure-Learn Iteration One

This first iteration is to build a sitemap interface for search engines to index selected University of Colorado and Colorado College Linked Data that has been transformed from MARC 21 records to BIBFRAME 2.0 entities hosted and published by Colorado Alliance.

Pilot Triplestore Statistics

http://bibcat.org/

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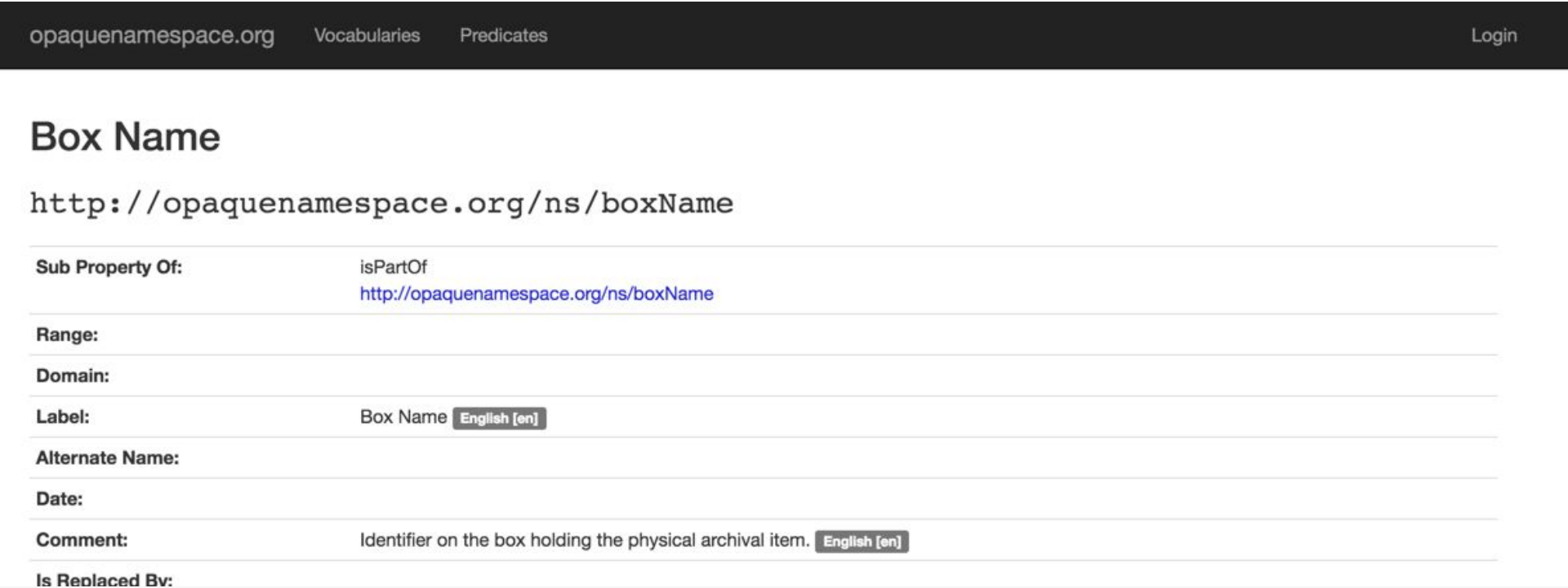
Opaque Namespace



opaquenamespace.org

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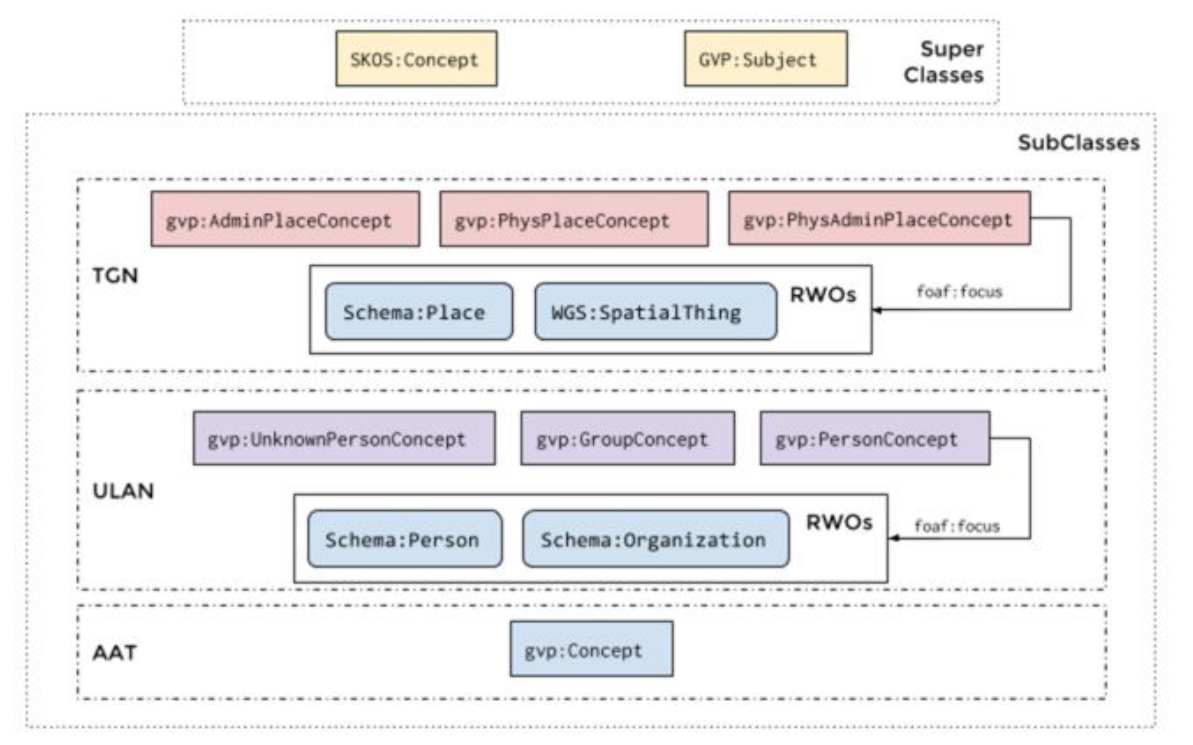
Getty Vocabs Model



vocab.getty.edu

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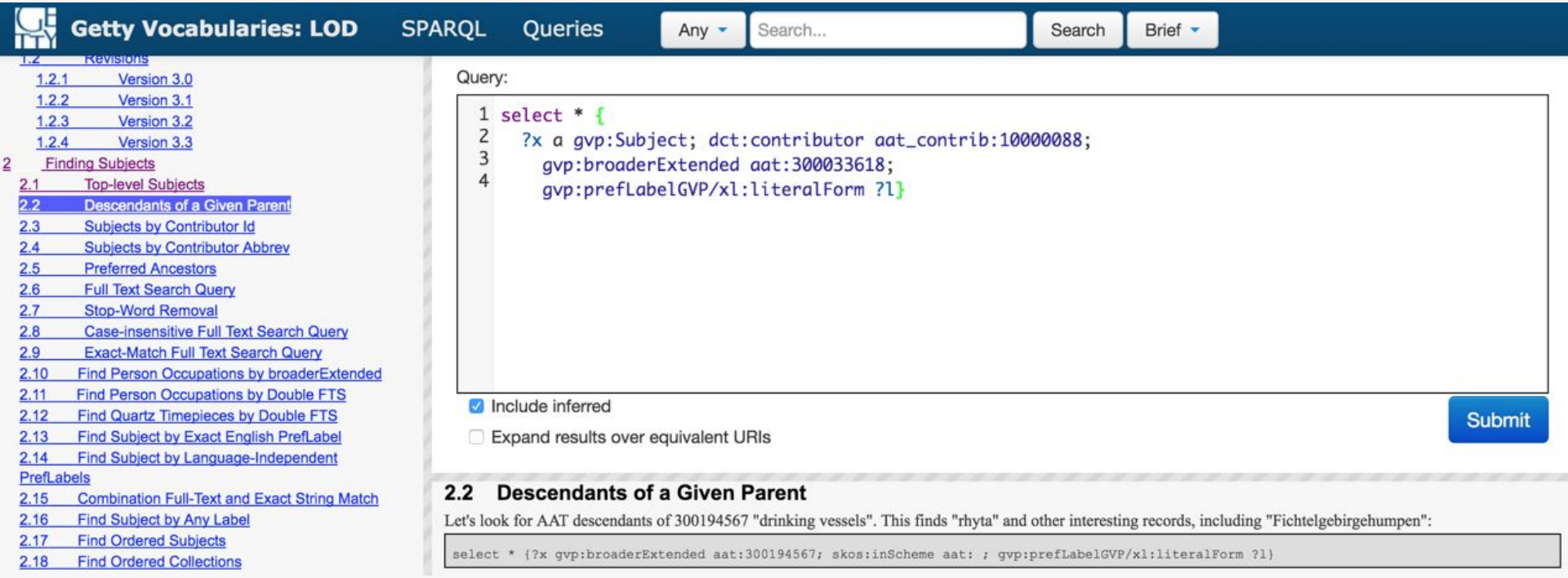
Getty Vocabs SPARQL Endpoint



vocab.getty.edu

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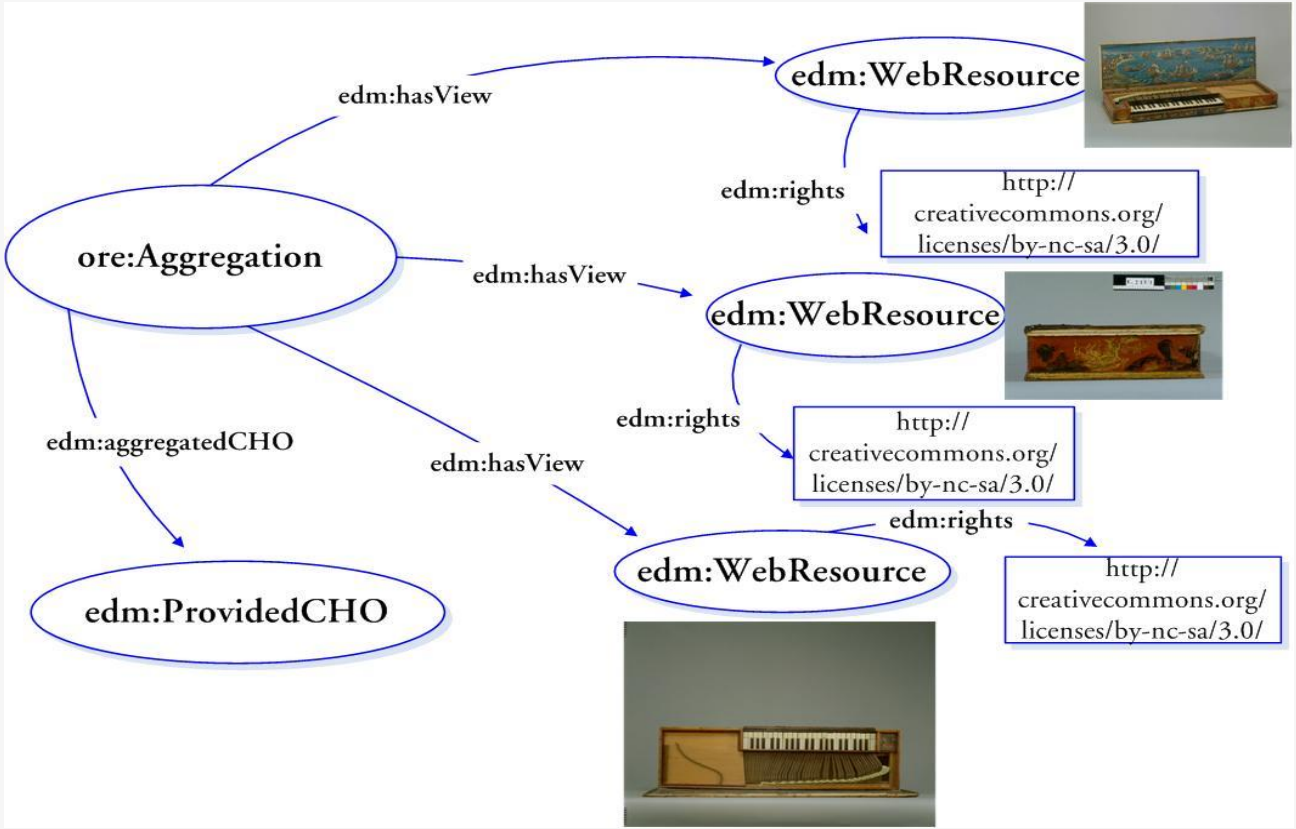
Europeana Data Model



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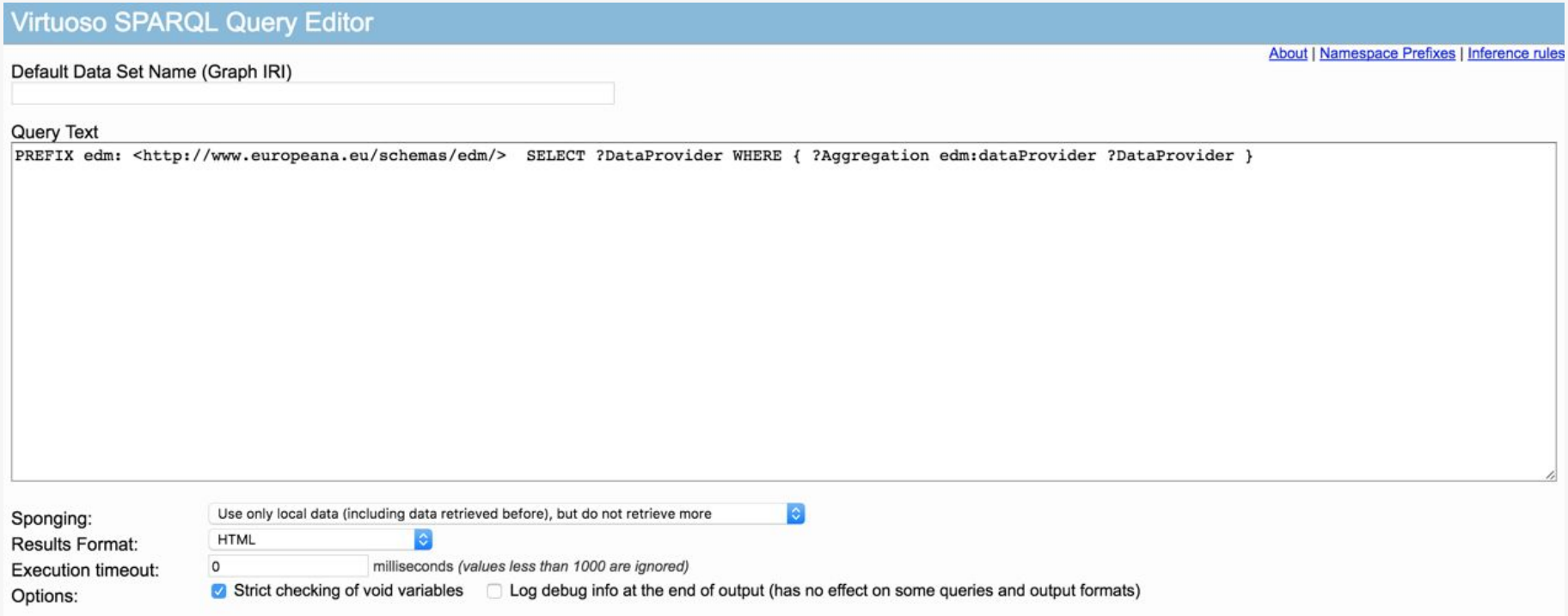
http://pro.europeana.eu/page/mimo-edm

Europeana SPARQL Endpoint



europeana.ontotext.com

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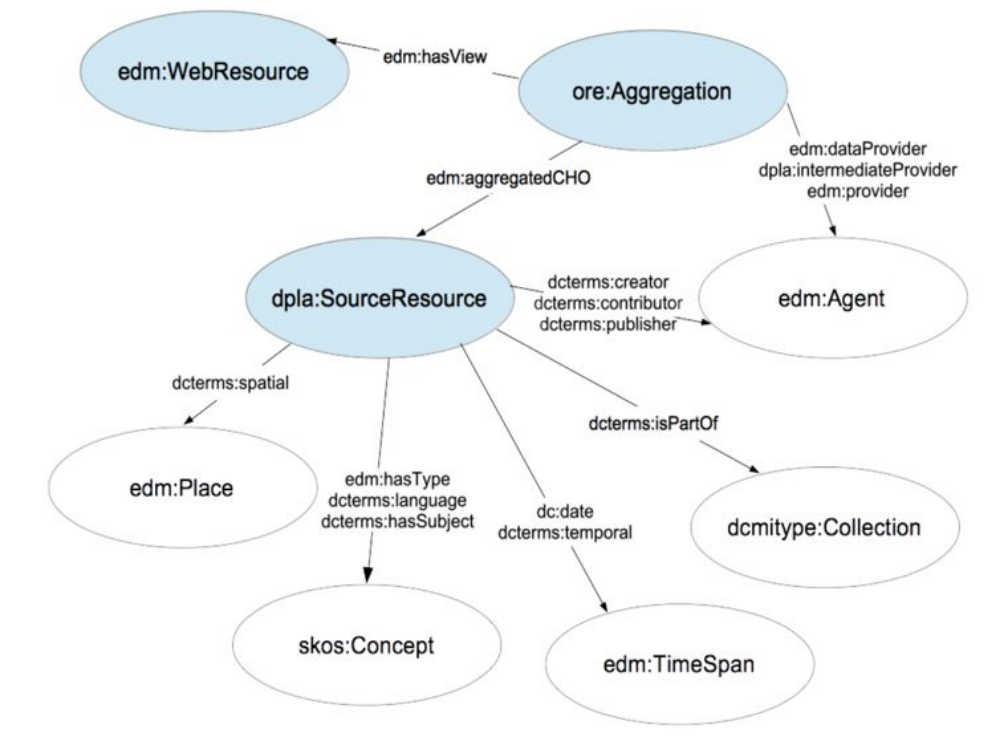
DPLA Model

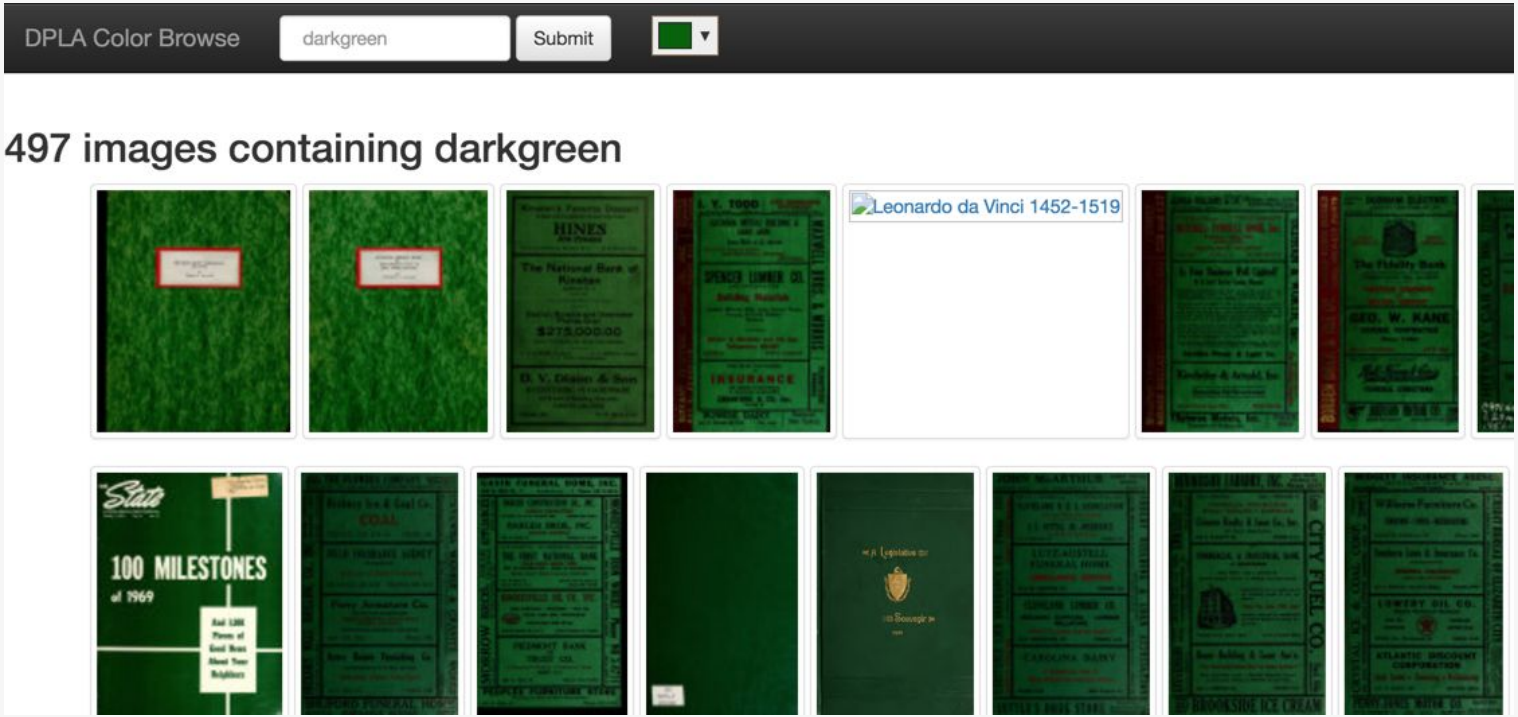


dp.la/info/wp-content/uploads/2015/03/MAPv4.pdf

DPLA Ingestion3

github.com/dpla/ingestion3

DPLA Color Browse



colorbrowse.club

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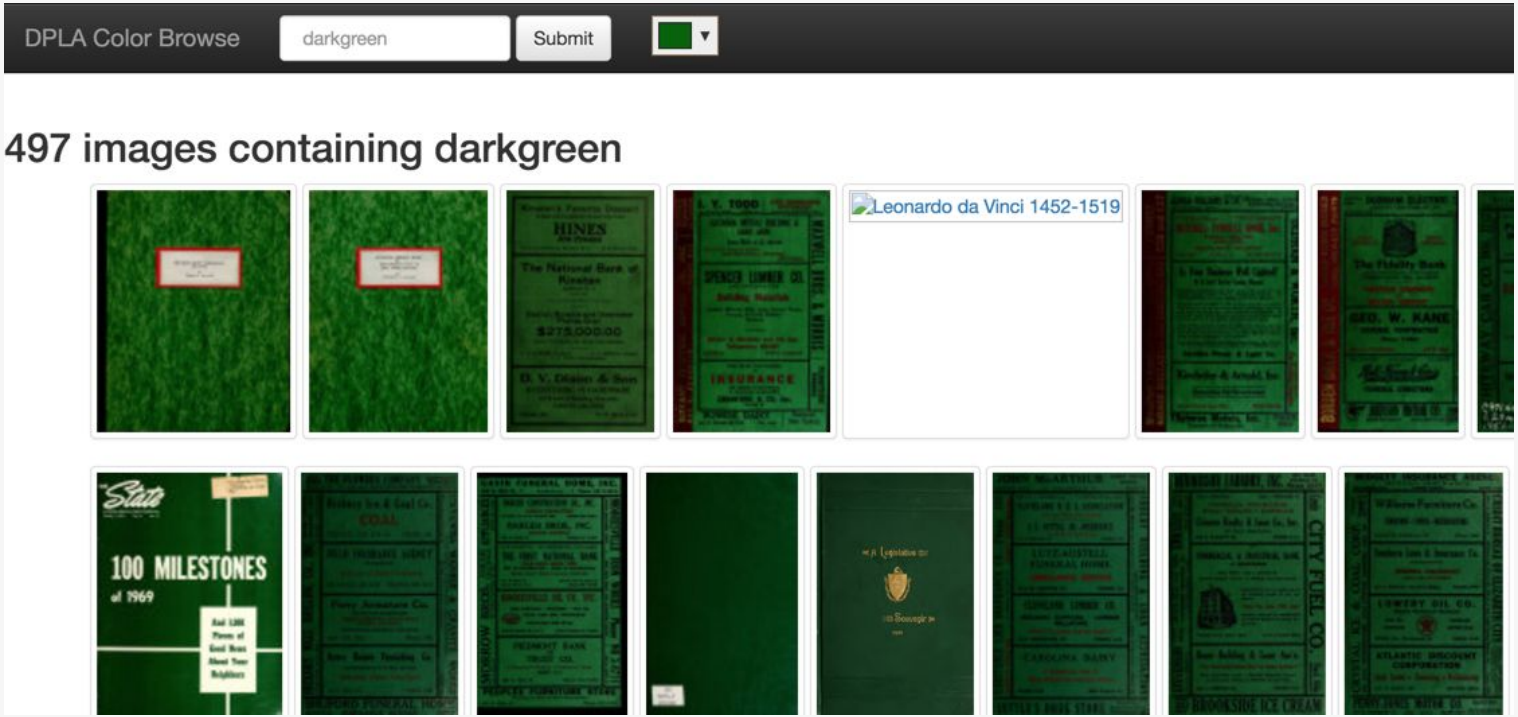
DPLA Color Browse



colorbrowse.club

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Moving Forward with Linked Open Data

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Your turn!

Explore any of the previous projects & examples given.

Then, in your groups, discuss your own potential uses of LOD. What projects could you see for using this? What support would you need to make it happen?

Checking Back In…

Returning to the Goals from the Introduction…

Do you feel like you learned what you expected? Needed? Any remaining questions?

Thank you! Question?

Questions? Now and here or anytime to:

uldis.bojars@gmail.com
cmharlow@stanford.edu
hjk54@cornell.edu