graphthinking

Introduction to Linked Open Data

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SWIB 2015, 23 November 2015
Hamburg, Germany

Your turn!

Fill out your name tag and then transfer it into the Etherpad of your group.

http://etherpad.lobid.org/p/swib15-ws-X

```
@prefix z: <http://etherpad.lobid.org/p/swib15-ws-z#> .

@prefix schema: <http://schema.org/> .

z:fo schema:name “Felix” .
z:fo schema:location “Berlin” .
```

swib15-ws-z | lobid e ×

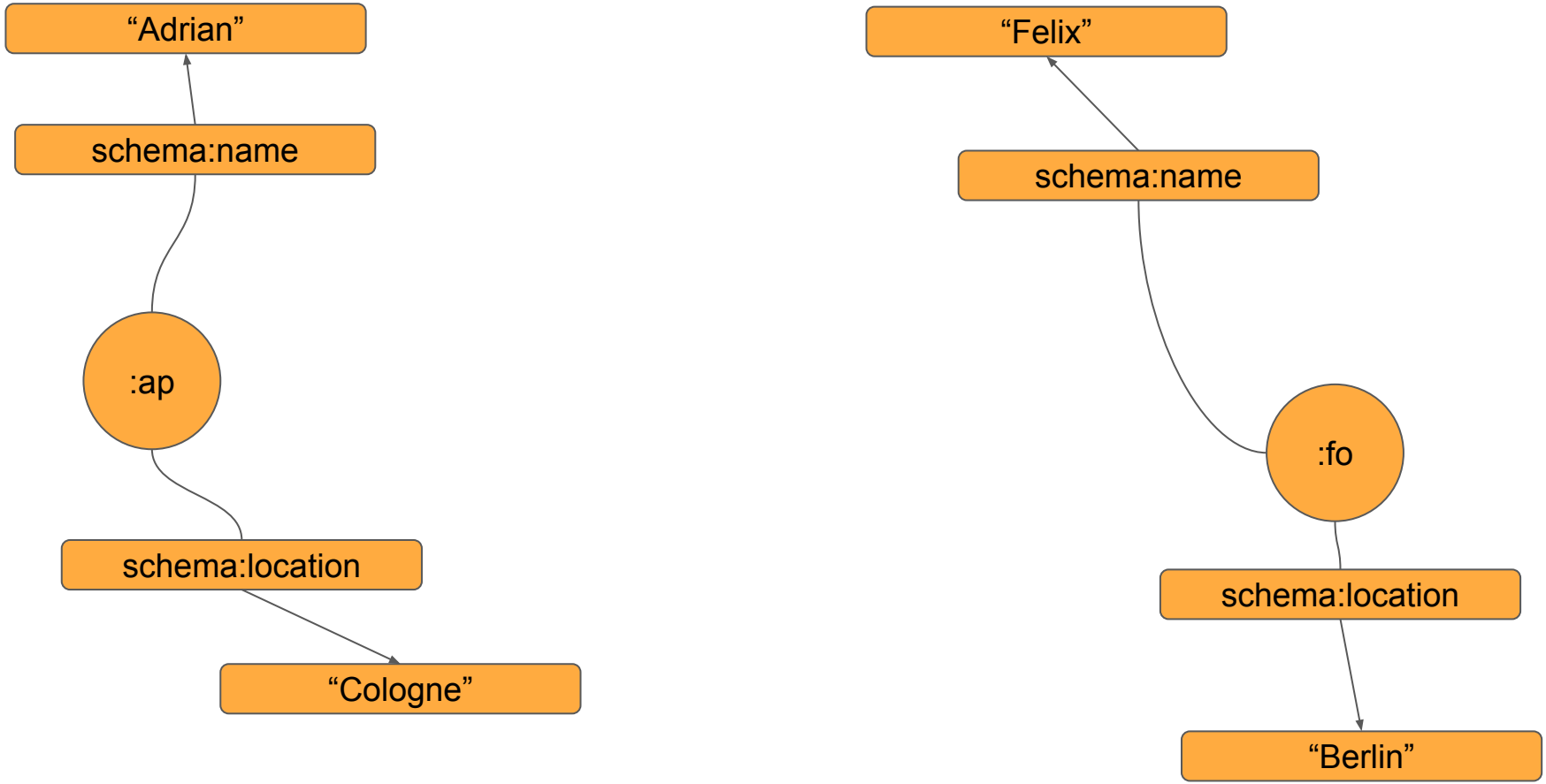
etherpad.lobid.org/p/swib15-ws-z

```
@prefix a: <http://etherpad.lobid.org/p/swib15-ws-a#> .
@prefix b: <http://etherpad.lobid.org/p/swib15-ws-b#> .
@prefix c: <http://etherpad.lobid.org/p/swib15-ws-c#> .
@prefix d: <http://etherpad.lobid.org/p/swib15-ws-d#> .
@prefix e: <http://etherpad.lobid.org/p/swib15-ws-e#> .
@prefix f: <http://etherpad.lobid.org/p/swib15-ws-f#> .
@prefix z: <http://etherpad.lobid.org/p/swib15-ws-z#> .

@prefix  schema: <http://schema.org/> .

z:fo schema:name "Felix" .
z:fo schema:location "Berlin" .

z:ap schema:name "Adrian" .
z:ap schema:location "Cologne" .
```

Chat 0

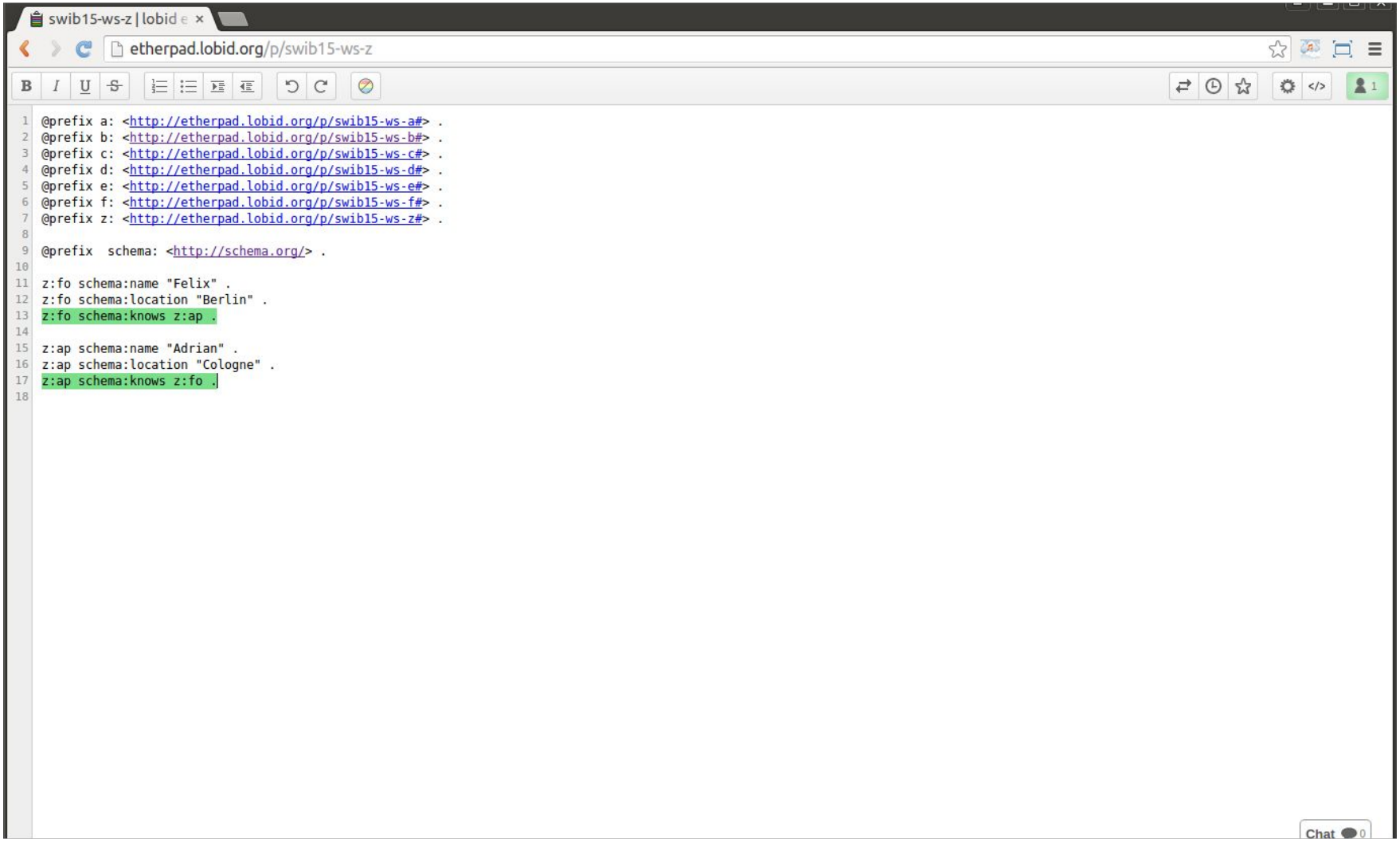
Resource Description Framework (RDF)

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**.


“Adrian”
schema:name
:ap
schema:location
“Cologne”
“Felix”
schema:name
:fo
schema:location
“Berlin”

Your turn!

Introduce yourself to the other members of your group. To do so, pass on the yarn and document your new acquaintances in the Etherpad.


swib15-ws-z | lobid e
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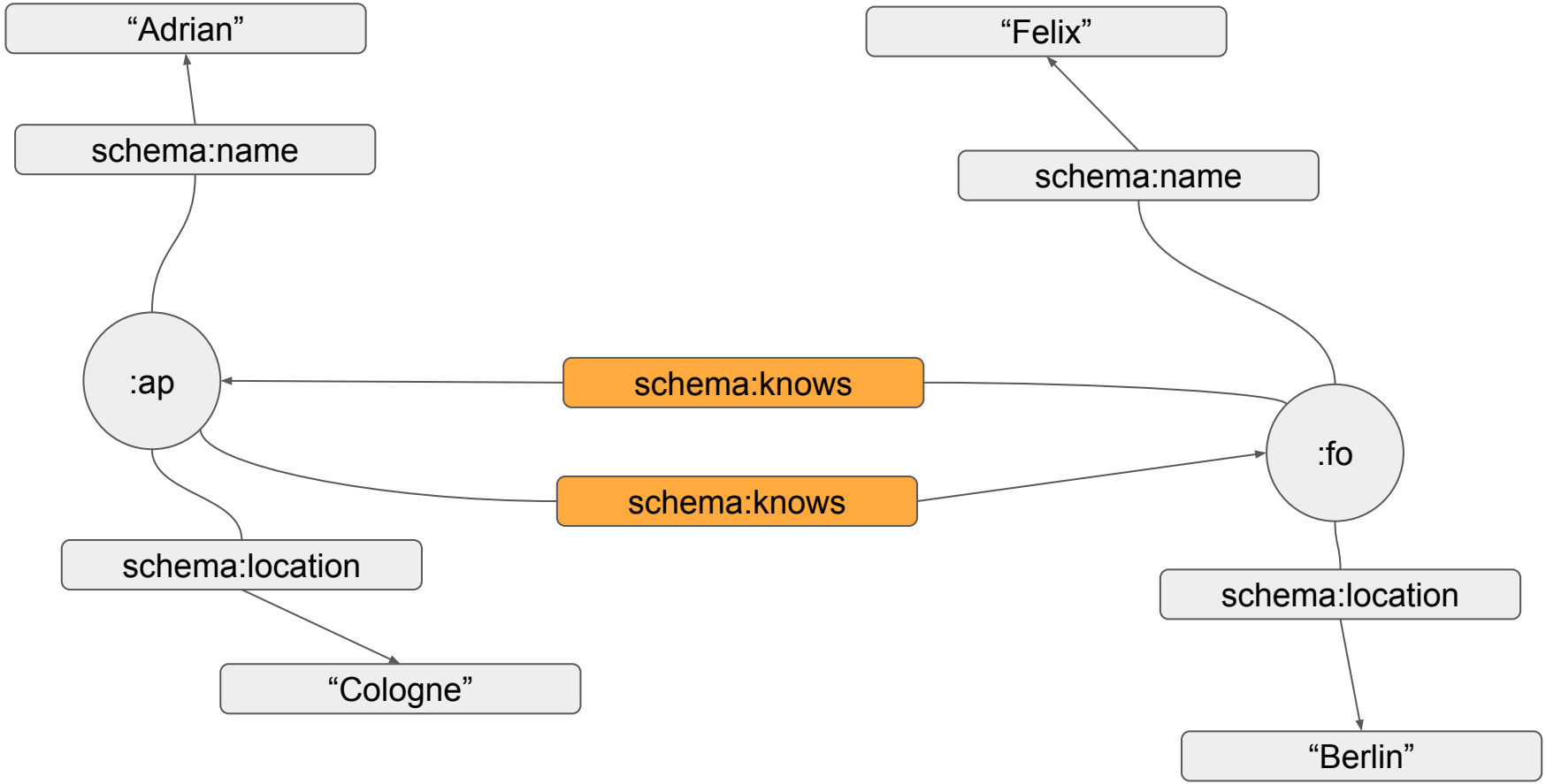
z:fo schema:name "Felix" .
z:fo schema:location "Berlin" .
z:fo schema:knows z:ap .
z:ap schema:name "Adrian" .
z:ap schema:location "Cologne" .
z:ap schema:knows z:fo .
Chat 0

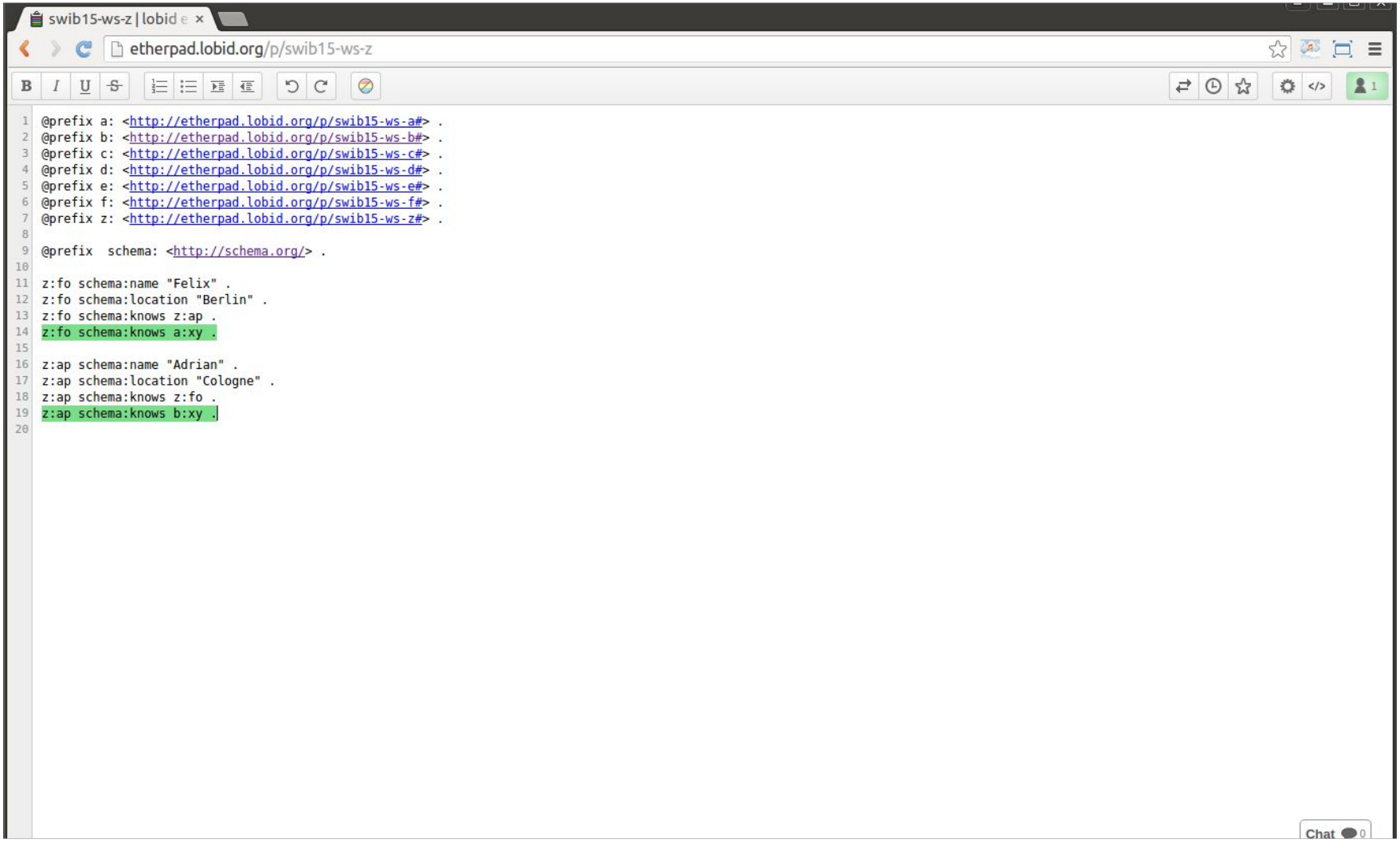
Linked Data

When using RDF, things are **named** by **Uniform Resource Identifiers** (URIs). By linking things, **graphs** emerge. Social **networks** such as Facebook or LinkedIn are well-known examples of this approach.


“Adrian”
“Felix”
schema:name
schema:name
:ap
schema:knows
:fo
schema:knows
schema:location
schema:location
“Cologne”
“Berlin”

Your turn!

Extend your set of acquaintances by passing on the yarn beyond your group. As before, document these new connections in the Etherpad.


swib15-ws-z | lobid e
etherpad.lobid.org/p/swib15-ws-z
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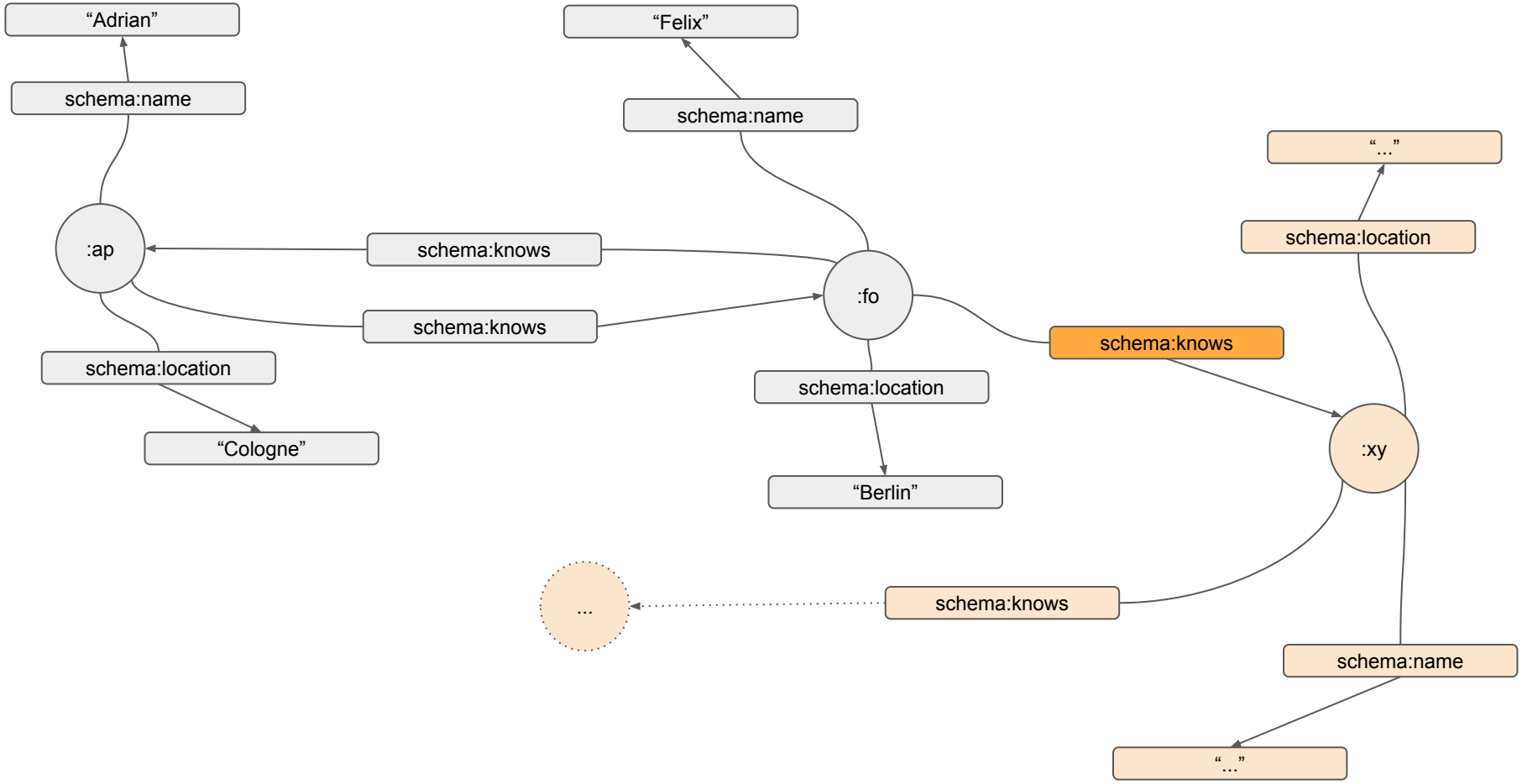
@prefix z: <http://etherpad.lobid.org/p/swib15-ws-z#> .
@prefix schema: <http://schema.org/> .
z:fo schema:name "Felix" .
z:fo schema:location "Berlin" .
z:fo schema:knows z:ap .
z:fo schema:knows a:xy .
z:ap schema:name "Adrian" .
z:ap schema:location "Cologne" .
z:ap schema:knows z:fo .
z:ap schema:knows b:xy .
Chat 0

The simple power of the Link

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


“Adrian”
schema:name
:ap
schema:knows
schema:knows
schema:location
“Cologne”
“Felix”
schema:name
:fo
schema:location
“Berlin”
schema:knows
“...”
schema:location
:xy
...
schema:knows
schema:name
“...”

Your turn!

Replace the name of your location through a reference to DBpedia.

WIKIPEDIA
Die freie Enzyklopädie

Hauptseite
Themenportale
Von A bis Z
Zufälliger Artikel

Mitmachen
Artikel verbessern
Neuen Artikel anlegen
Autorenportal
Hilfe
Letzte Änderungen
Kontakt
Spenden

Drucken/exportieren
Buch erstellen
Als PDF herunterladen
Druckversion

Werkzeuge
Links auf diese Seite
Änderungen an verlinkten Seiten
Spezialseiten
Permanenter Link
Seiteninformationen
Wikidata-Datenobjekt
Artikel zitieren

In anderen Sprachen
Аҧсшәа
Acèh

Koordinaten: 52° 31′ N, 13° 24′ O

Berlin

Der Titel dieses Artikels ist mehrdeutig. Weitere Bedeutungen sind unter Berlin (Begriffsklärung) aufgeführt.

Berlin ([bɛɐ̯ˈliːn]?/i) ist die Bundeshauptstadt der Bundesrepublik Deutschland und zugleich eines ihrer Länder. Die Stadt Berlin ist mit rund 3,5 Millionen Einwohnern die bevölkerungsreichste und mit 892 Quadratkilometern die flächengrößte Gemeinde Deutschlands sowie nach Einwohnern die zweitgrößte der Europäischen Union. Sie bildet das Zentrum der Metropolregion Berlin/Brandenburg (6 Millionen Einw.) und der Agglomeration Berlin (4,4 Millionen Einw.). Der Stadtstaat unterteilt sich in zwölf Bezirke. Neben den Flüssen Spree und Havel befinden sich im Stadtgebiet kleinere Fließgewässer sowie zahlreiche Seen und Wälder.

Urkundlich erstmals im 13. Jahrhundert erwähnt, war Berlin im Verlauf der Geschichte und in verschiedenen Staatsformen Residenz- und Hauptstadt Brandenburgs, Preußens und des Deutschen Reichs. Ab 1949 war der Ostteil der Stadt faktisch Hauptstadt der Deutschen Demokratischen Republik. Mit der deutschen Wiedervereinigung im Jahr 1990 war Berlin wieder gesamtdeutsche Hauptstadt und wurde in der Folge Sitz der Bundesregierung, des Bundespräsidenten, des Deutschen Bundestags, des Bundesrats sowie zahlreicher Bundesministerien und Botschaften.

Berlin gilt als Weltstadt der Kultur, Politik, Medien und Wissenschaften.[10][11][12][13] Die Metropole ist ein europäischer Verkehrsknotenpunkt und eines der meistbesuchten Zentren des Kontinents.[14] Die Sportereignisse, Universitäten, Forschungseinrichtungen und Museen Berlins genießen internationalen Ruf.[15] Seit der Jahrhundertwende hat sich die Stadt zu einem Anziehungspunkt für Unternehmensgründer, Kreative und Einwanderer entwickelt.[16] Berlins Architektur, Festivals, Nachtleben und vielfältige Lebensbedingungen sind weltweit bekannt.[17]

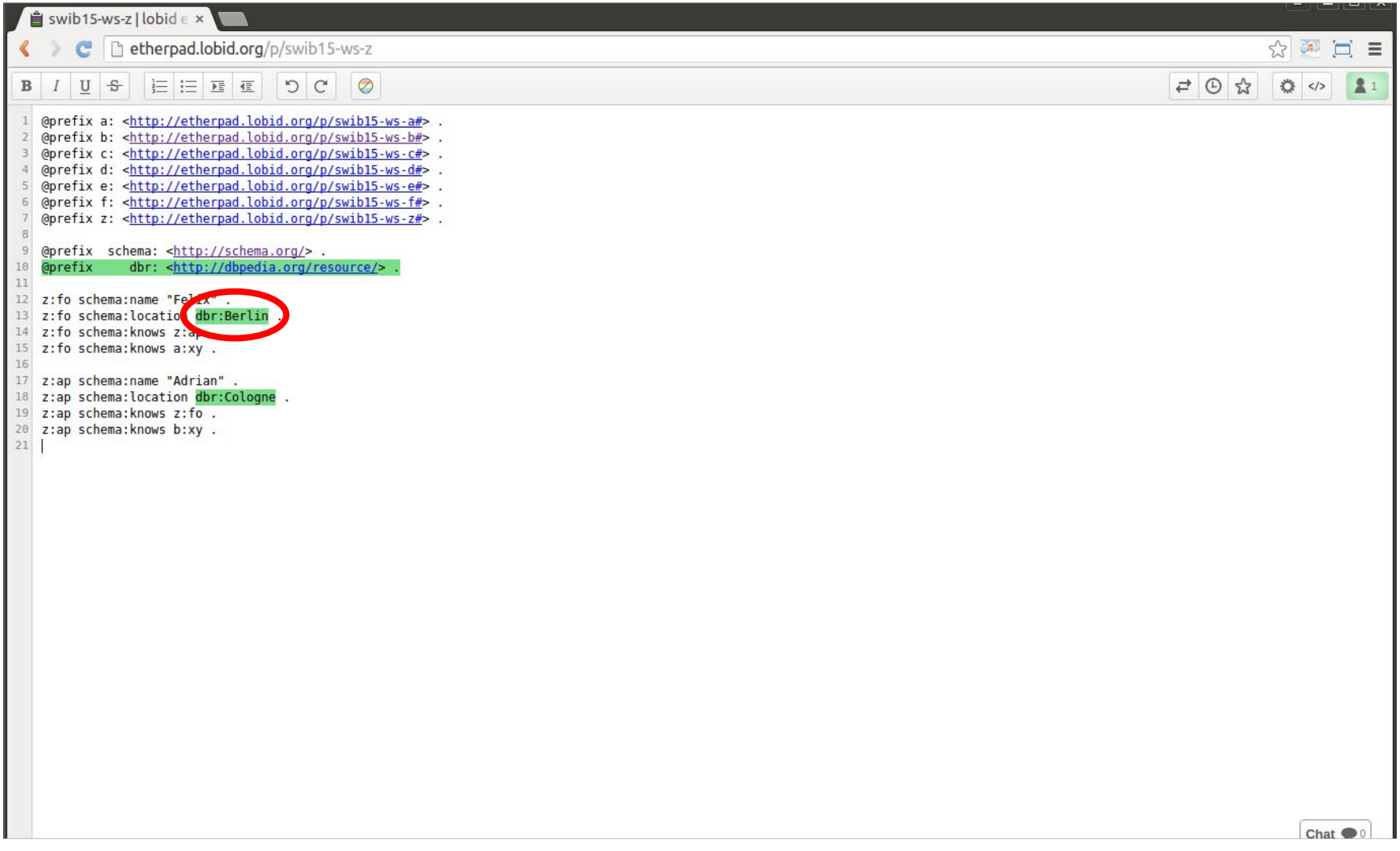
Inhaltsverzeichnis [Verbergen]

Land Berlin

Landesflagge

Landeswappen

Basisdaten	
Staatsform:	parlamentarische Republik, teilsouveräner Gliedstaat der Bundesrepublik Deutschland
Sprache:	Deutsch
Postleitzahlen:	10115–14199
Vorwahl:	030
Kfz-Kennzeichen:	B
Kaufkraftindex:	91,6 % (2015; Deutschland = 100 %) [1]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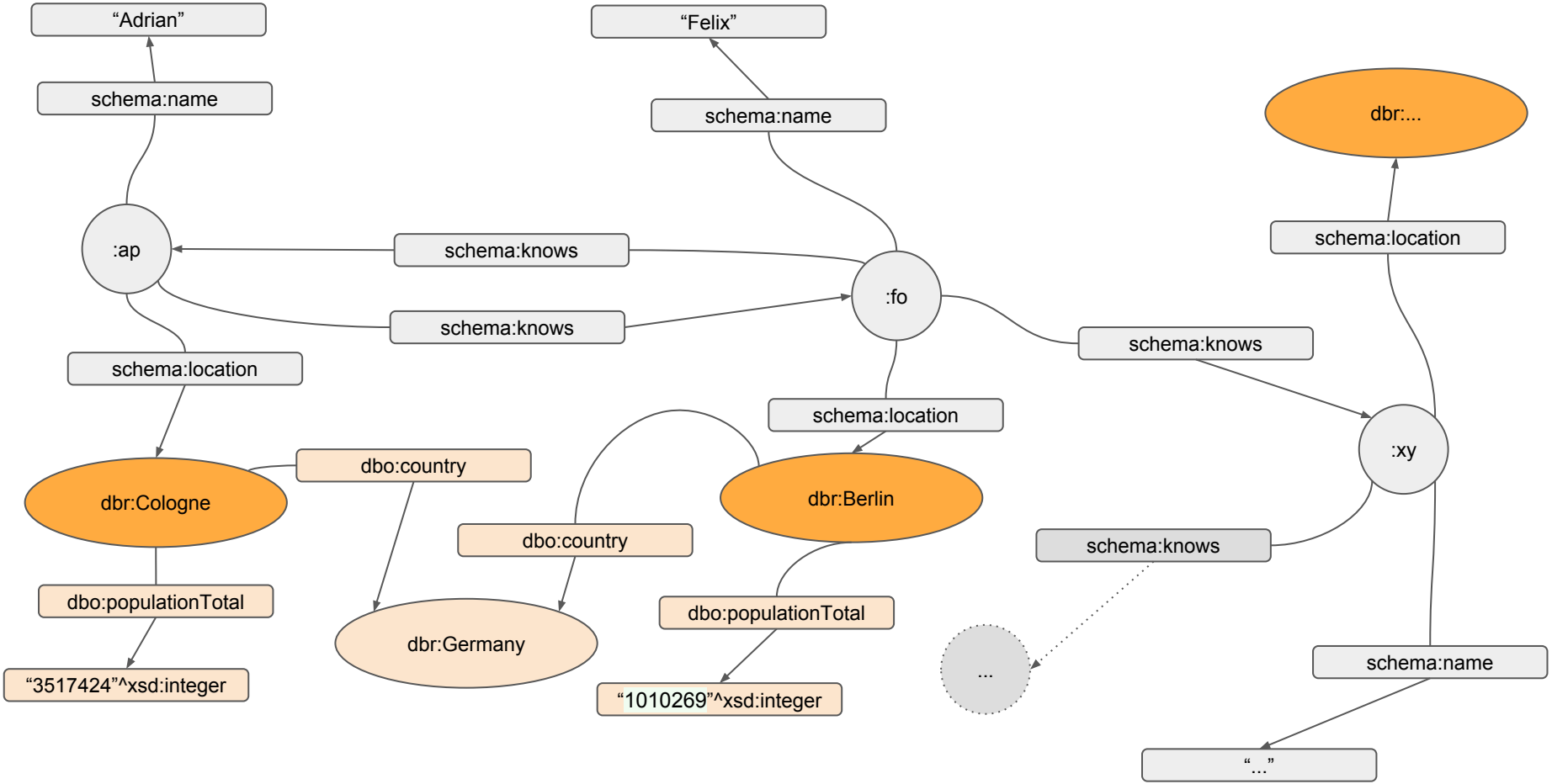
@prefix e: <http://etherpad.lobid.org/p/swib15-ws-e#> .
@prefix f: <http://etherpad.lobid.org/p/swib15-ws-f#> .
@prefix z: <http://etherpad.lobid.org/p/swib15-ws-z#> .
@prefix schema: <http://schema.org/> .
@prefix dbr: <http://dbpedia.org/resource/> .
z:fo schema:name "Felix" .
z:fo schema:location dbr:Berlin .
z:fo schema:knows z:ap
z:fo schema:knows a:xy .
z:ap schema:name "Adrian" .
z:ap schema:location dbr:Cologne .
z:ap schema:knows z:fo .
z:ap schema:knows b:xy .
Chat 0

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 to 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.


“Adrian”
“Felix”
schema:name
schema:name
dbr:...
:ap
schema:knows
:fo
schema:location
schema:knows
schema:knows
schema:location
schema:location
dbr:Cologne
dbo:country
dbr:Berlin
:xy
dbo:country
schema:knows
dbo:populationTotal
dbr:Germany
dbo:populationTotal
...
schema:name
“3517424”^xsd:integer
“1010269”^xsd:integer
“...”

Break

Your turn!

Enhance your profile with interest you have. Again, refer to DBpedia entries to do so.

swib15-ws-z | lobid e ×

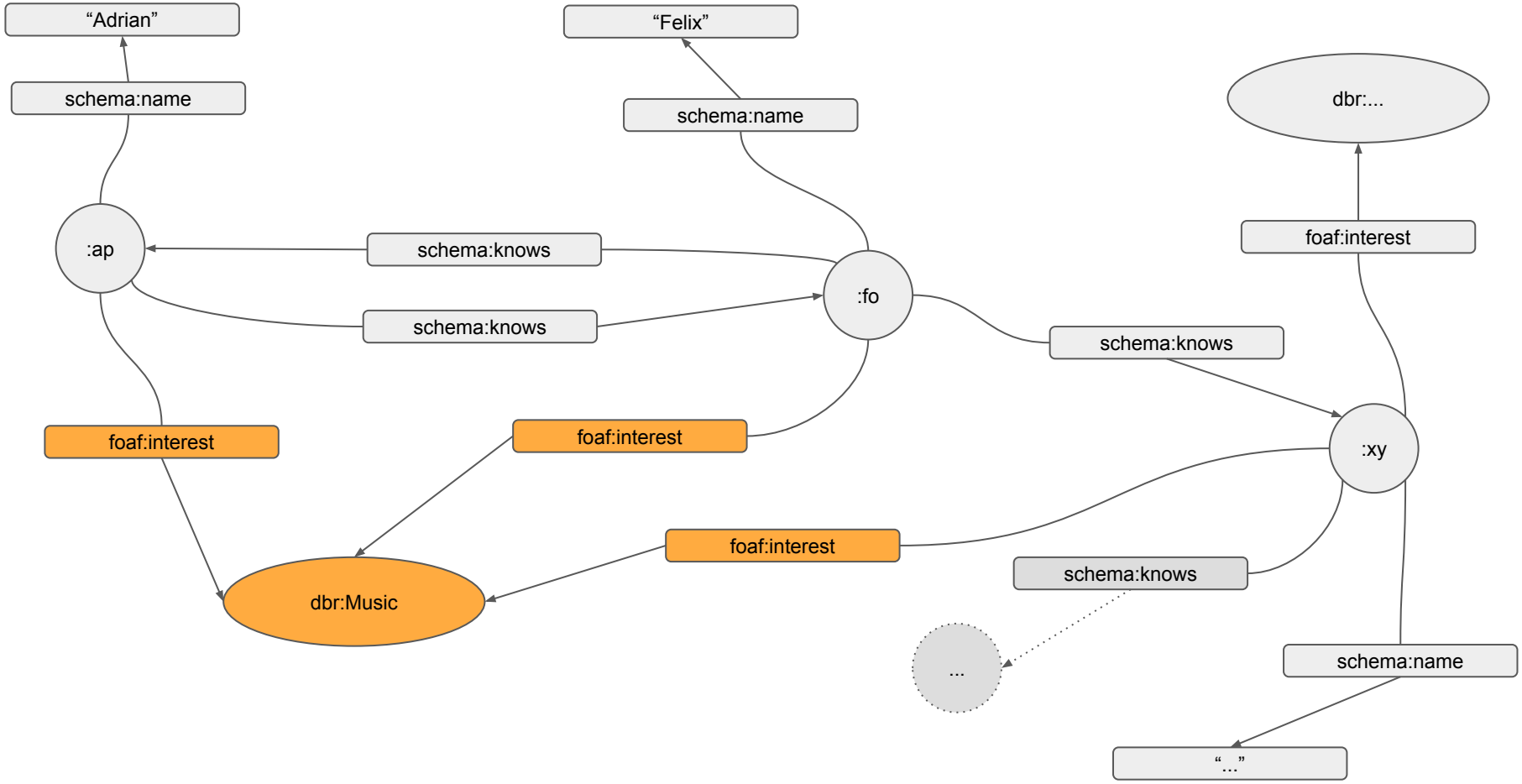
etherpad.lobid.org/p/swib15-ws-z

```
@prefix a: <http://etherpad.lobid.org/p/swib15-ws-a#> .
@prefix b: <http://etherpad.lobid.org/p/swib15-ws-b#> .
@prefix c: <http://etherpad.lobid.org/p/swib15-ws-c#> .
@prefix d: <http://etherpad.lobid.org/p/swib15-ws-d#> .
@prefix e: <http://etherpad.lobid.org/p/swib15-ws-e#> .
@prefix f: <http://etherpad.lobid.org/p/swib15-ws-f#> .
@prefix z: <http://etherpad.lobid.org/p/swib15-ws-z#> .

@prefix  schema: <http://schema.org/> .
@prefix     dbr: <http://dbpedia.org/resource/> .
@prefix    foaf: <http://xmlns.com/foaf/0.1/> .

z:fo schema:name "Felix" .
z:fo schema:location dbr:Berlin .
z:fo schema:knows z:ap .
z:fo schema:knows a:xy .
z:fo foaf:interest dbr:Music .
z:fo foaf:interest <http://dbpedia.org/resource/Python_(programming_language)> .

z:ap schema:name "Adrian" .
z:ap schema:location dbr:Cologne .
z:ap schema:knows z:fo .
z:ap schema:knows b:xy .
z:ap foaf:interest dbr:Music .
a:ap foaf:interest dbr:Resource_Description_Framework .
```

Chat 0

Additional Vocabularies

- FOAF
- DBpedia-Ontology
- … and many more (see Linked Open Vocabularies (LOV))
- prefix.cc can be used to look up namespaces


“Adrian”
“Felix”
schema:name
schema:name
dbr:...
:ap
schema:knows
:fo
foaf:interest
schema:knows
schema:knows
foaf:interest
foaf:interest
:xy
foaf:interest
dbr:Music
schema:knows
...
schema:name
“...”

Library-related vocabularies

- Dublin Core Metadata Terms
- Simple Knowledge Organisation System (SKOS)
  - Examples: 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
- Learning Resource Metadata Initiative
- RDA Elements sets
- Bibframe
- ...

Your turn!

Allow the reuse of your data. In order to do so, document your authorship and apply the CC0 license.

swib15-ws-z | lobid e ×

etherpad.lobid.org/p/swib15-ws-z

```
@prefix a: <http://etherpad.lobid.org/p/swib15-ws-a#> .
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@prefix f: <http://etherpad.lobid.org/p/swib15-ws-f#> .
@prefix z: <http://etherpad.lobid.org/p/swib15-ws-z#> .

@prefix  schema: <http://schema.org/> .
@prefix     dbr: <http://dbpedia.org/resource/> .
@prefix    foaf: <http://xmlns.com/foaf/0.1/> .
@prefix dcterms: <http://purl.org/dc/terms/> .

<> dcterms:creator z:fo .
<> dcterms:creator z:ap .
<> schema:license <https://creativecommons.org/publicdomain/zero/1.0/> .

z:fo schema:name "Felix" .
z:fo schema:location dbr:Berlin .
z:fo schema:knows z:ap .
z:fo schema:knows a:xy .
z:fo foaf:interest dbr:Music .
z:fo foaf:interest <http://dbpedia.org/resource/Python_(programming_language)> .

z:ap schema:name "Adrian" .
z:ap schema:location dbr:Cologne .
z:ap schema:knows z:fo .
z:ap schema:knows b:xy .
z:ap foaf:interest dbr:Music .
a:ap foaf:interest dbr:Resource_Description_Framework .
```

Chat 0

“open” / ”offen”?

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

The Open Definition

Openness is a question of...

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

Licensing data

STW Thesaurus for Economics (v 9.0, 2015-06-15) • Suggestions and comments to the thesaurus team •
Mailing lists: stw-announce, stw-user
ZBW - Leibniz Information Centre for Economics - Imprint

The STW Thesaurus for Economics is licensed under an Open Database License (ODbL) 1.0. Permissions beyond the scope of this license are available at ZBW.

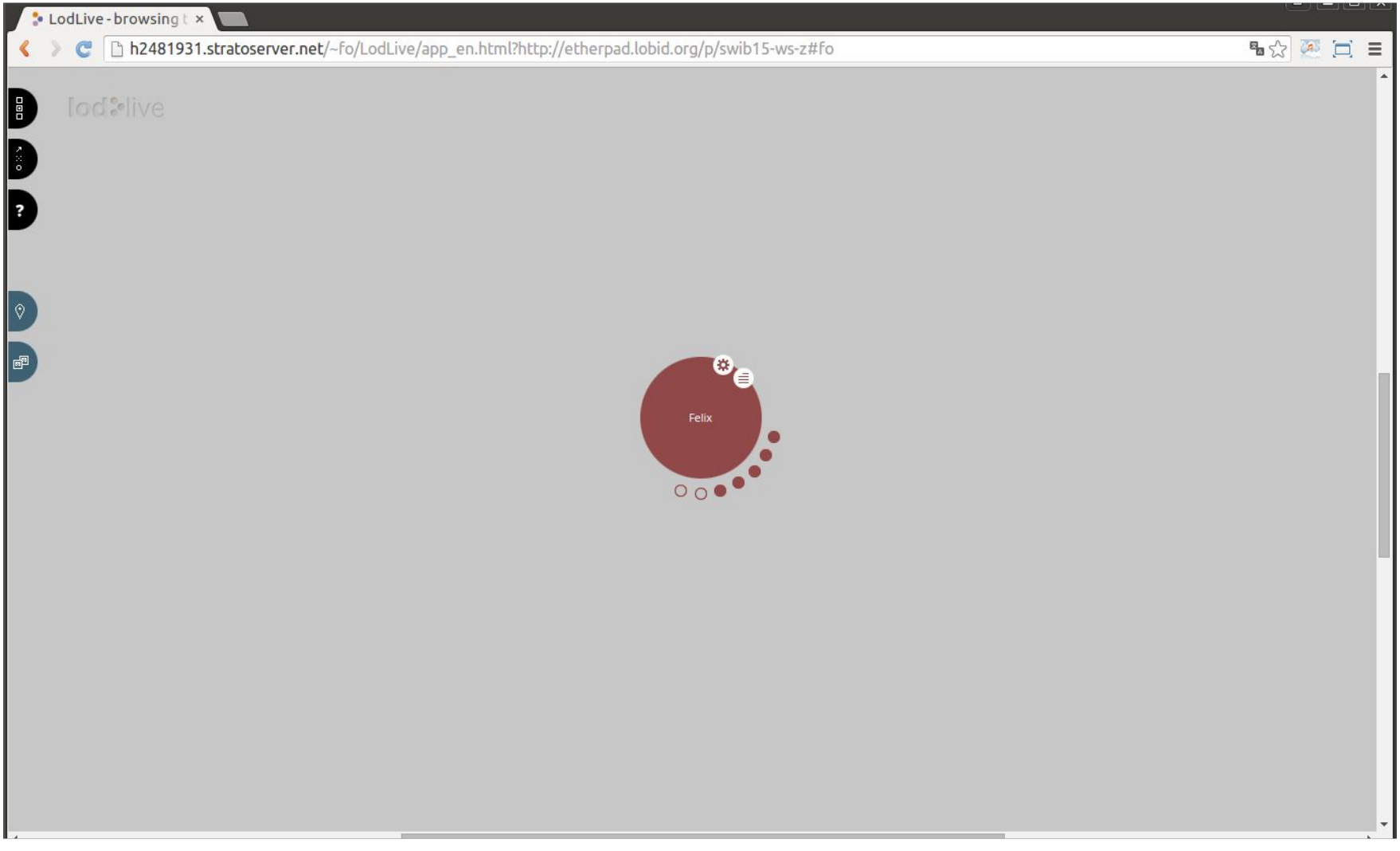
```
@prefix cc: <http://creativecommons.org/ns#> .

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

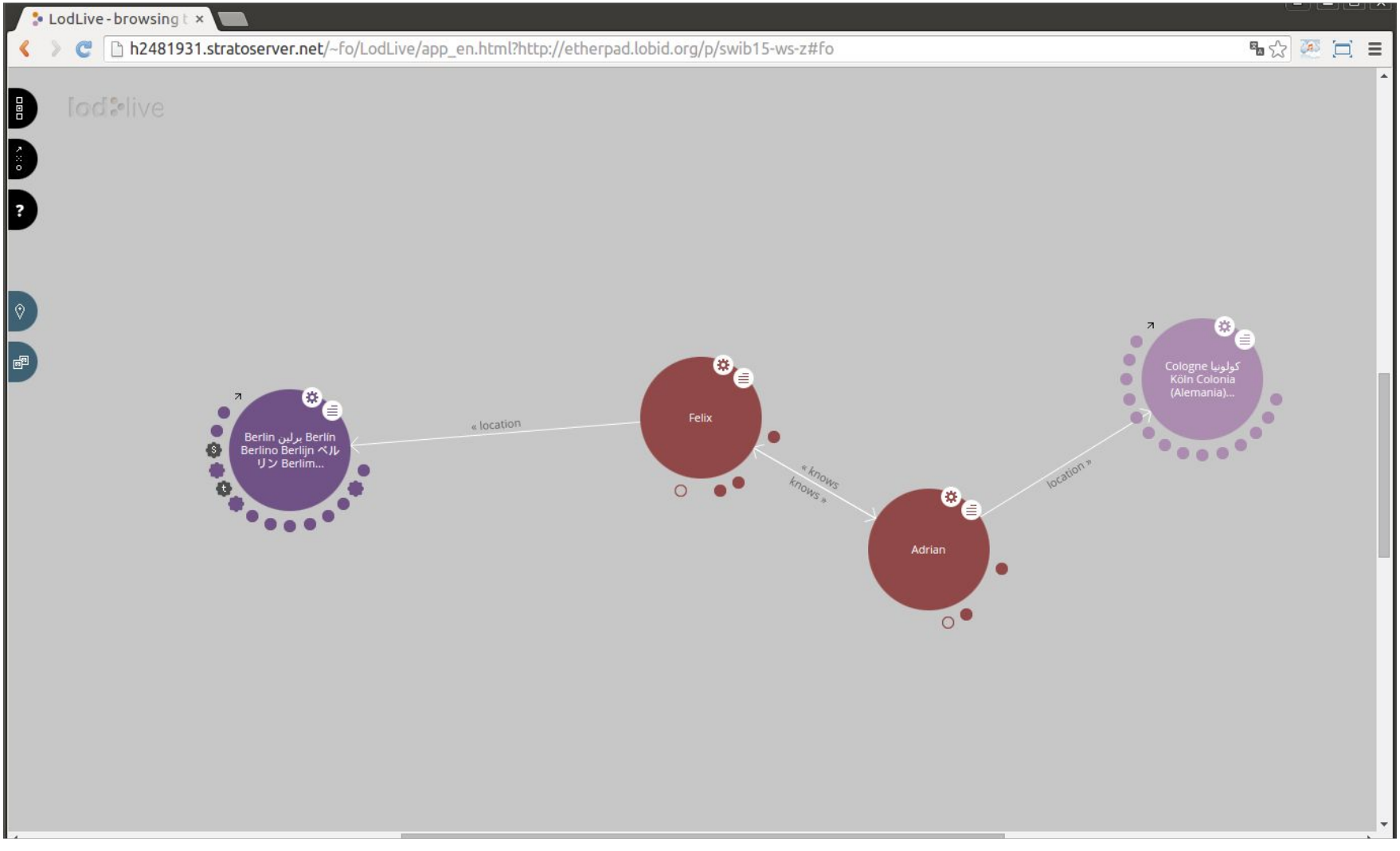
Break

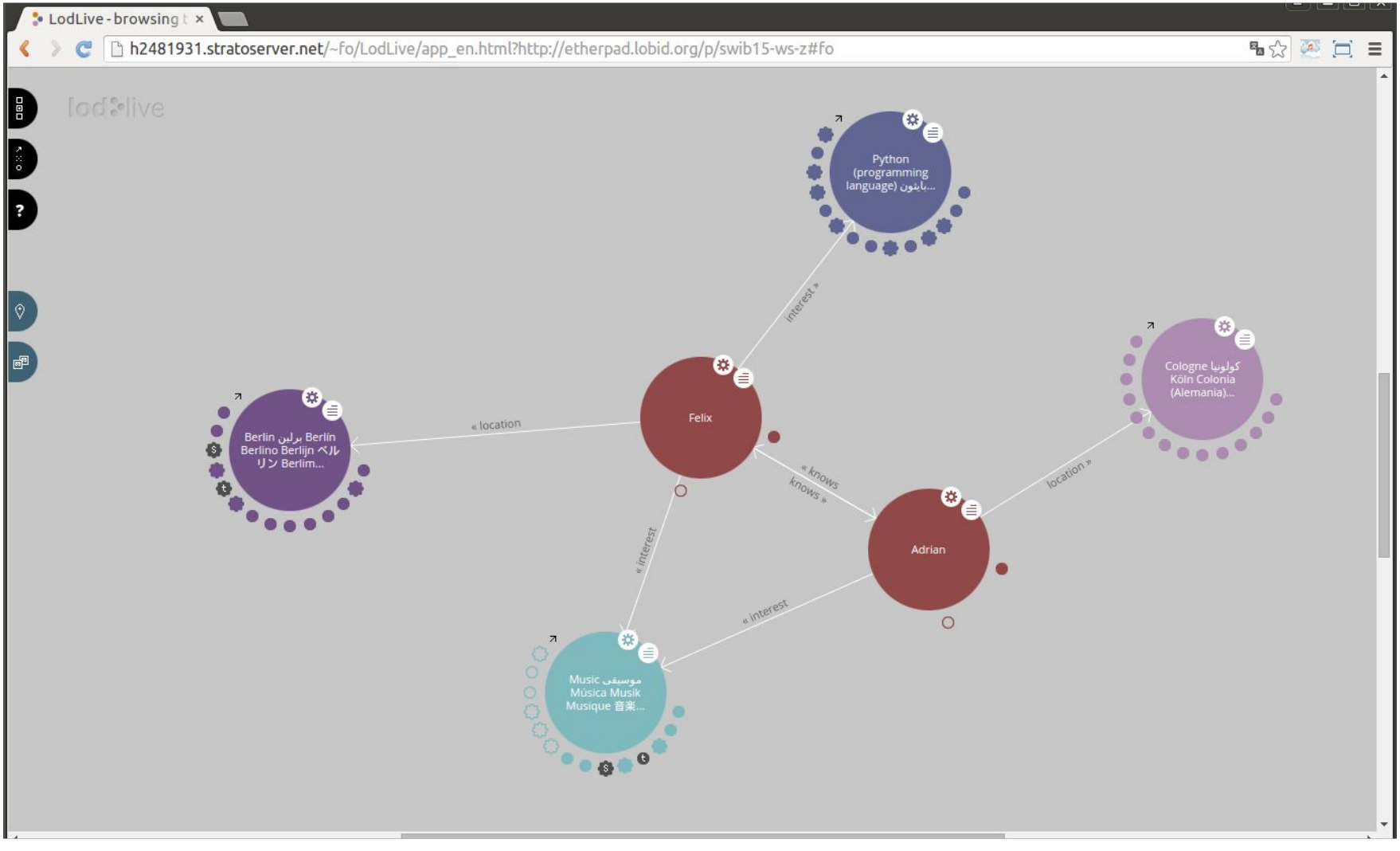
Demo

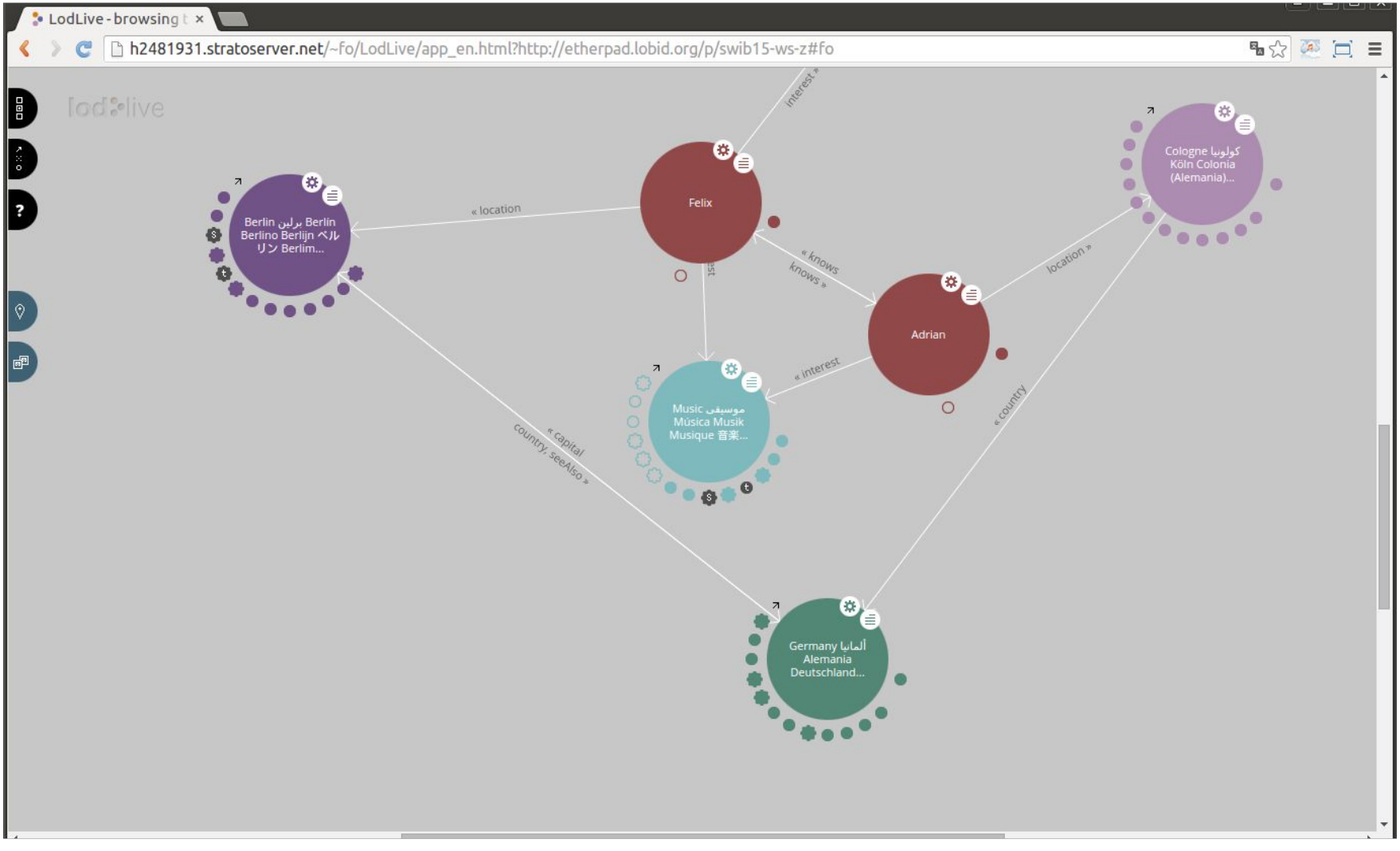
Browse, collect and query


LodLive - browsing t
h2481931.stratoserver.net/~fo/LodLive/app_en.html?http://etherpad.lobid.org/p/swib15-ws-z#fo
lod live
Felix


LodLive - browsing t
h2481931.stratoserver.net/~fo/LodLive/app_en.html?http://etherpad.lobid.org/p/swib15-ws-z#fo
lod live
Felix
« knows
knows »
Adrian


LodLive - browsing t
h2481931.stratoserver.net/~fo/LodLive/app_en.html?http://etherpad.lobid.org/p/swib15-ws-z#fo
lodlive
Berlin برلين Berlín Berlino Berlijn ベルリン Berlim...
« location
Felix
« knows
knows »
Adrian
location »
Cologne كولونيا Köln Colonia (Alemania)...


LodLive - browsing t
h2481931.stratoserver.net/~fo/LodLive/app_en.html?http://etherpad.lobid.org/p/swib15-ws-z#fo
lodlive
Python (programming language) بايثون...
interest »
Cologne كولونيا Köln Colonia (Alemania)...
Berlin برلين Berlín Berlino Berlijn ベルリン Berlim...
« location
Felix
« knows
knows »
location »
Adrian
« interest
« interest
Music موسيقى Música Musik Musique 音楽...


LodLive - browsing t
h2481931.stratoserver.net/~fo/LodLive/app_en.html?http://etherpad.lobid.org/p/swib15-ws-z#fo
lodlive
Berlin برلين Berlin
Berlino Berlijn ベル
リン Berlim...
« location
Felix
« interest »
« knows
knows »
Cologne كولونيا
Köln Colonia
(Alemania)...
Adrian
location »
« interest
Music موسيقى
Música Musik
Musique 音楽...
« capital
country, seeAlso »
« country
Germany ألمانيا
Alemania
Deutschland...

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 **SPARQL**.

Names of the participants

```
1  PREFIX schema: <http://schema.org/>
2
3  SELECT * WHERE {
4    ?person schema:name ?name .
5  }
```

QUERY RESULTS

Raw Response | Table

Search:

Show 50 entries

	person	name
1	<http://etherpad.lobid.org/p/swib15-ws-z#fo>	"Felix"
2	<http://etherpad.lobid.org/p/swib15-ws-z#ap>	"Adrian"

Showing 1 to 2 of 2 entries

Acquaintances

```
1  PREFIX schema: <http://schema.org/>
2
3  SELECT * WHERE {
4    ?who schema:knows ?whom .
5  }
```

QUERY RESULTS

Raw Response | Table

Search:

Show 50 entries

	who	whom
1	<http://etherpad.lobid.org/p/swib15-ws-z#ap>	<http://etherpad.lobid.org/p/swib15-ws-b#xy>
2	<http://etherpad.lobid.org/p/swib15-ws-z#fo>	<http://etherpad.lobid.org/p/swib15-ws-z#ap>
3	<http://etherpad.lobid.org/p/swib15-ws-z#ap>	<http://etherpad.lobid.org/p/swib15-ws-z#fo>
4	<http://etherpad.lobid.org/p/swib15-ws-z#fo>	<http://etherpad.lobid.org/p/swib15-ws-a#xy>

Showing 1 to 4 of 4 entries

Acquaintances by name

```
1  PREFIX schema: <http://schema.org/>
2
3  SELECT ?namewho ?namewhom WHERE {
4    ?who schema:knows ?whom .
5    ?who schema:name ?namewho .
6    ?whom schema:name ?namewhom .
7  }
```

QUERY RESULTS

Raw Response | Table

Search:

Show 50 entries

	namewho	namewhom
1	"Felix"	"Adrian"
2	"Adrian"	"Felix"

Showing 1 to 2 of 2 entries

Localities and Countries

```
1  PREFIX schema: <http://schema.org/>
2  PREFIX    dbo: <http://dbpedia.org/ontology/>
3
4  SELECT * WHERE {
5    ?person schema:location ?locality .
6    ?locality dbo:country ?country .
7  }
```

QUERY RESULTS

Raw Response | Table

Search:

Show 50 entries

	person	locality	country
1	<http://etherpad.lobid.org/p/swib15-ws-z#fo>	<http://dbpedia.org/resource/Berlin>	<http://dbpedia.org/resource/Germany>
2	<http://etherpad.lobid.org/p/swib15-ws-z#ap>	<http://dbpedia.org/resource/Cologne>	<http://dbpedia.org/resource/Germany>

Showing 1 to 2 of 2 entries

Same interests

```
1  PREFIX schema: <http://schema.org/>
2  PREFIX    dbo: <http://dbpedia.org/ontology/>
3  PREFIX      z: <http://etherpad.lobid.org/p/swib15-ws-z#>
4  PREFIX   foaf: <http://xmlns.com/foaf/0.1/>
5
6  SELECT * WHERE {
7    z:fo foaf:interest ?interest .
8    ?person foaf:interest ?interest .
9    FILTER (?person != z:fo)
10 }
```

QUERY RESULTS

Raw Response | Table

Search:

Show 50 entries

	interest	person
1	<http://dbpedia.org/resource/Music>	z:ap

Showing 1 to 1 of 1 entries

Metropolitans

```
PREFIX schema: <http://schema.org/>
PREFIX    dbo: <http://dbpedia.org/ontology/>
PREFIX sc: <http://purl.org/science/owl/sciencecommons/>

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

QUERY RESULTS

Raw Response | Table

Search:

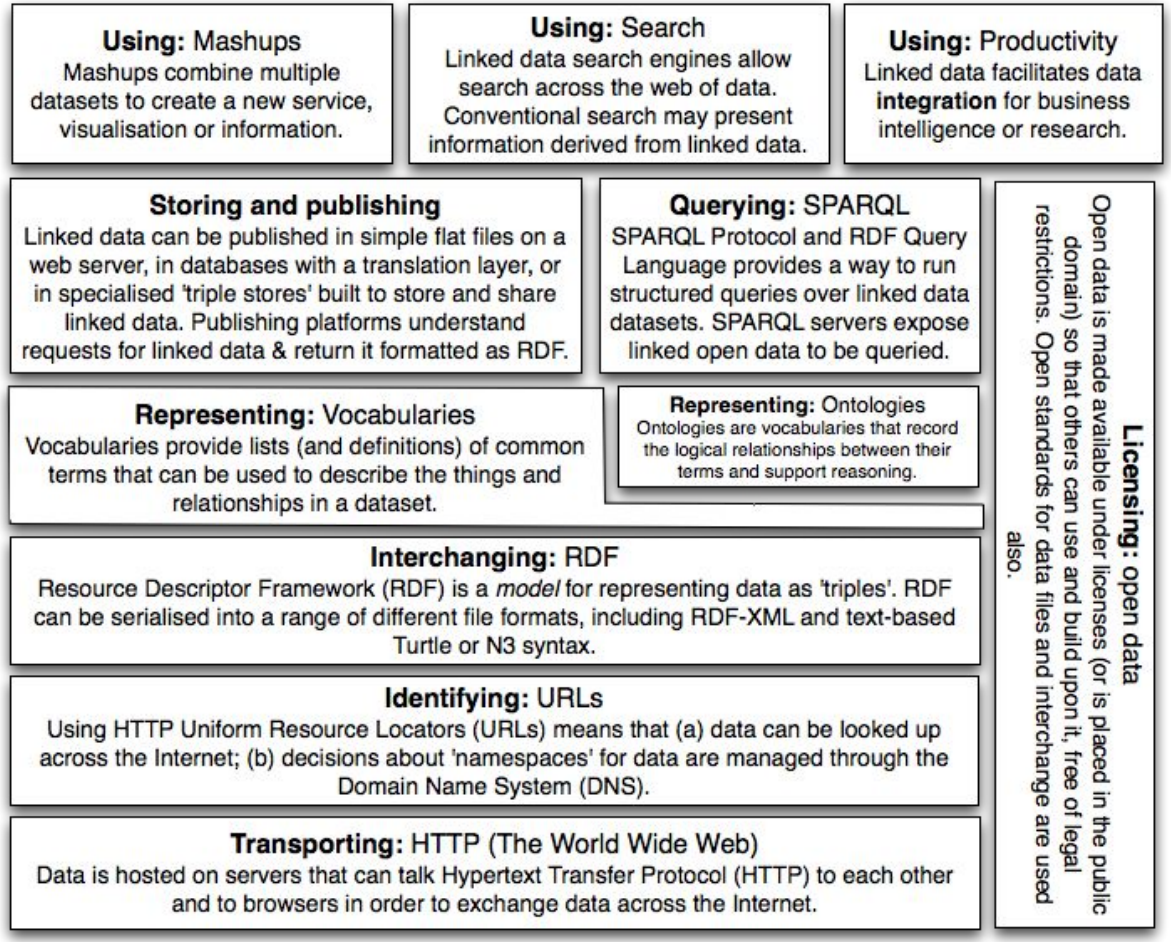
Show 50 entries

	person	place	population
1	<http://etherpad.lobid.org/p/swib15-ws-z#fo>	<http://dbpedia.org/resource/Berlin>	3517424
2	<http://etherpad.lobid.org/p/swib15-ws-z#ap>	<http://dbpedia.org/resource/Cologne>	1010269

Showing 1 to 2 of 2 entries

Your turn!

Explore your social network using the SPARQL-Endpoint and the interactive LodLive visualization.
http://etherpad.lobid.org/p/swib15-ws-sparql



Elements of the Linked Open Data Stack (revision 3) - 5th May 2011. CC BY-SA-NC
Draft sketch by Tim Davies (@timdavies / tim@practicalparticipation.co.uk) for IKM Working Paper on Linked Open Data for Development. Comments welcome. Search 'linked open data stack' on http://www.opendataimpacts.net for latest version.

Idea based on Semantic Web Stack at http://en.wikipedia.org/wiki/Semantic_Web_Stack

The End

Questions? Now and here or anytime to:

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