



Linked Open Data Services

Jouni Tuominen

DARIAH Aalto Day 2022, November 30th

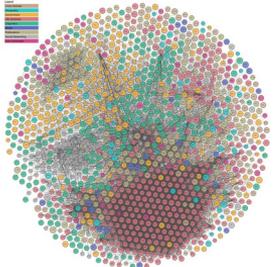
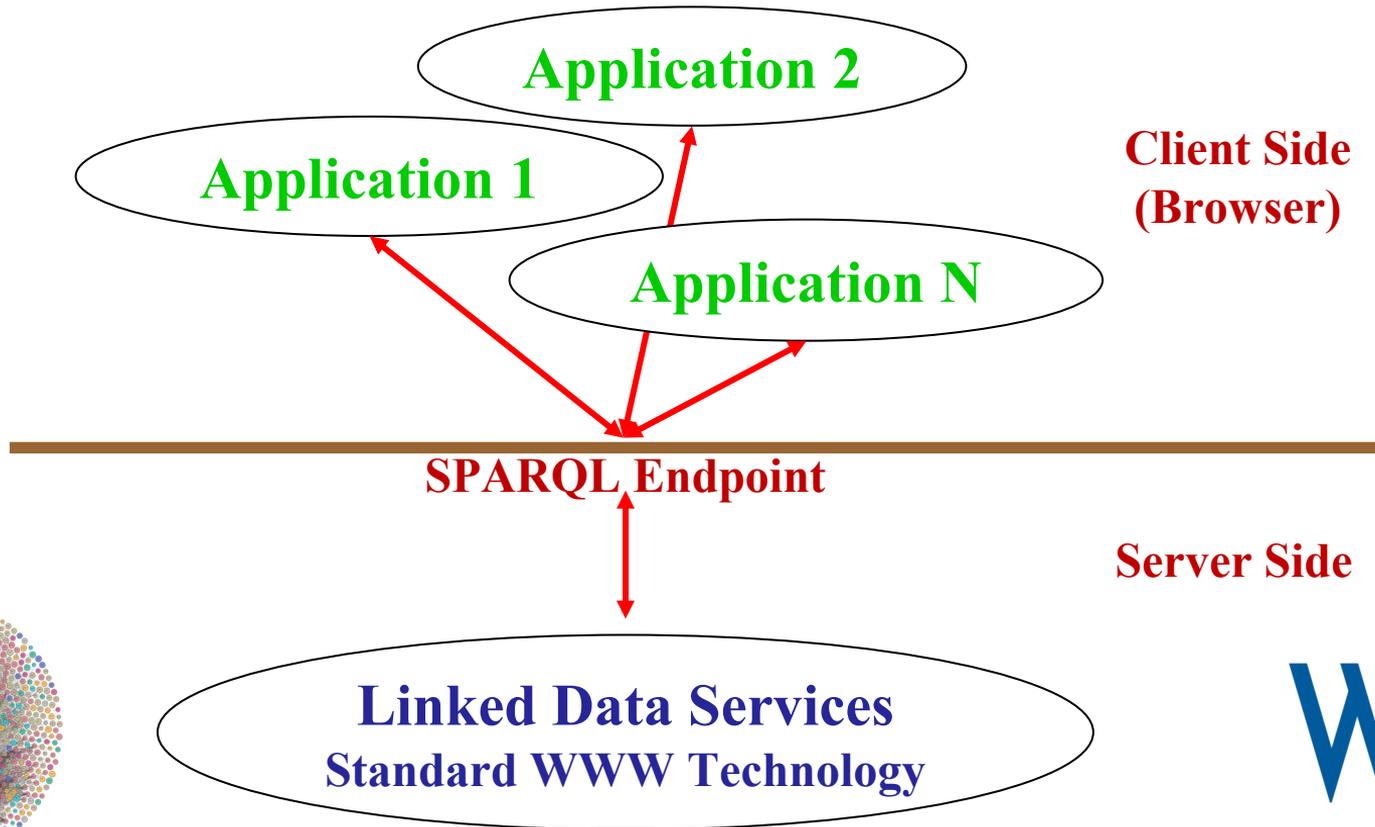
Content

- **7-star model, schemas, datasets**
- **Additional data services**
- **Data quality and validation**



7-star model, schemas, datasets

Linked Data application ecosystem



Linked Data Finland Living Lab <http://ldf.fi>



[Home](#)

[Project](#)

[Datasets](#)

[Schemas](#)

[Services](#)

[Policies](#)

[Documentation](#)

[Validation](#)

[Applications](#)

[Your Data?](#)

Linked Data Finland

Living Laboratory Data Service for the Semantic Web

This site is the Living Laboratory of the [Linked Data Finland](#) research initiative, conducted by the [Semantic Computing Research Group](#) at [Aalto University](#) in collaboration with University of Helsinki and a large consortium of Finnish public organizations and companies.

Our goal is to make life easier for both publishers as well as consumers of structured data on the Web. We base our work on the [Linked Data](#) paradigm and stack of standards, which combines an expressive, semantic data model ([RDF](#)) with standardized access mechanisms ([SPARQL](#) and [live HTTP URIs](#)).

5-star Linked Data

The baseline of our work is the [5-star Linked Data model](#), proposed [originally](#) by Tim Berners-Lee.

- ★ Make data available on the Web in whatever format.
- ★★ Make data available as structured data (e.g., Excel instead of an image scan of a table).
- ★★★ Use non-proprietary formats (e.g., CSV instead of Excel format).
- ★★★★ Use URIs to denote things, so that people can point at your data.
- ★★★★★ Link your data to other data to provide context.

7-star Linked Data Service

However, in our opinion, providing 5-star Linked Data is just the beginning. To actually make use of the datasets, consumers need more support in getting to know and access them, as well as a better grasp of their quality and provenance. To this end, we extend the model with two additional stars:

- ★★★★★ Provide your data with a schema and documentation so that people can *understand and re-use* your data easily.
- ★★★★★★ Validate your data and denote its provenance so that people can *trust the quality* of your data.

This added support should come with as little extra work as possible to the data publisher. Our hypothesis is that a lot of this can be done automatically, basing on the Linked Data core. A data publisher needs only to provide

Our "7-star" model and LDF.fi data hotel

Goals: enhance re-usability and data quality

7-star Linked Data Service

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Provide your data with a schema and documentation so that people can *understand and re-use* your data easily.



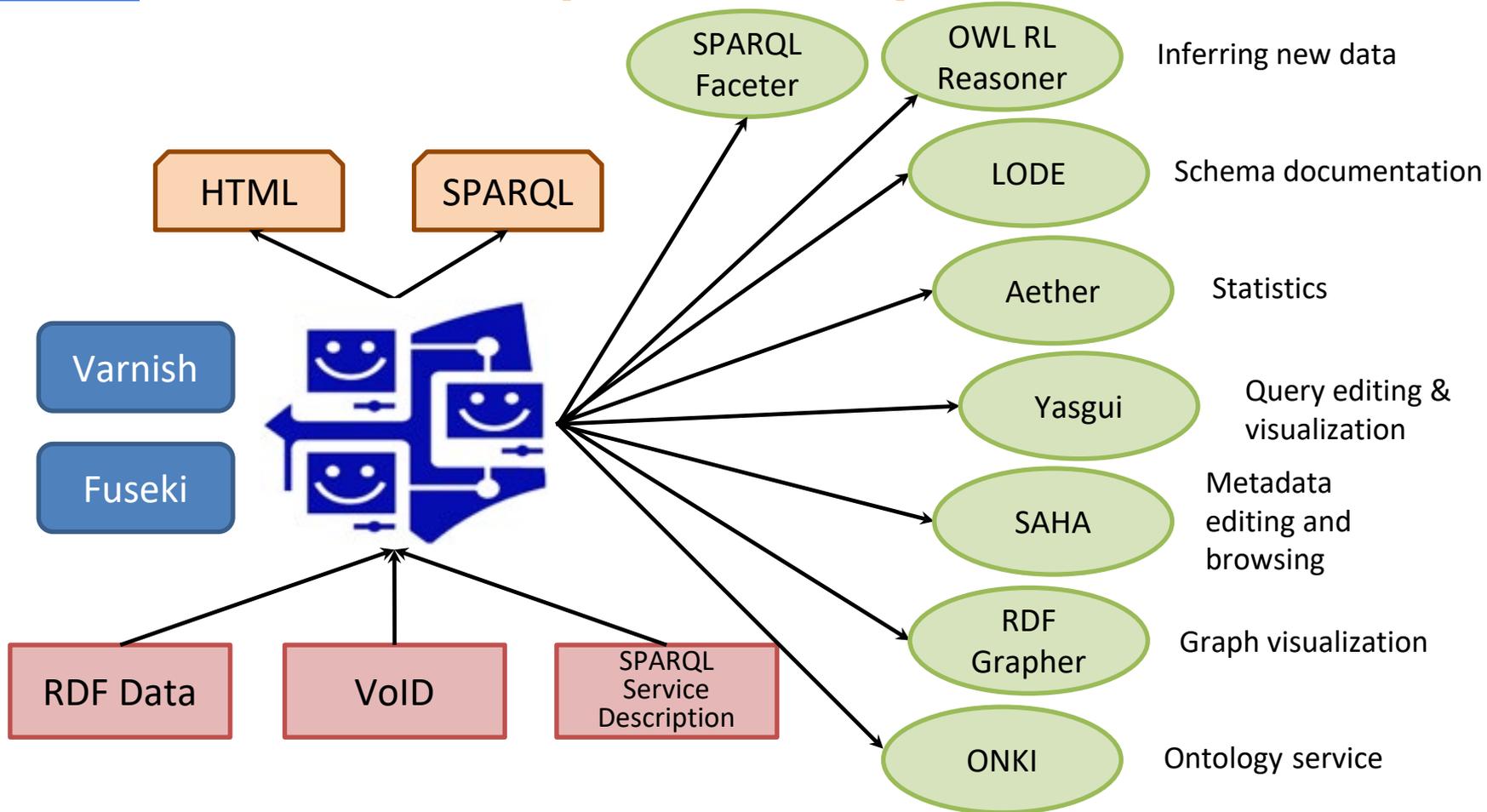
Validate your data and denote its provenance so that people can *trust the quality* of your data.

This added support should come with as little extra work as possible to the data publisher. Our hypothesis is that a lot of this can be done automatically, basing on the Linked Data core. A data publisher needs only to provide their data in the RDF format, and the LDF.fi portal will do the rest automatically. See the [overview paper](#) (in ESWC 2014 Proceedings, Springer-Verlag) for some more details about the underlying ideas.



Burj Al Arab

LDF.fi – Linked Data publication platform



Datasets

Linked Data Finland

Below you find examples of datasets (services) published by LDF.fi, arranged according to their application domain.

Encyclopedic

1. [Finnish Wikipedia as Linked Data \(DBpedia\)](#). First publication of the Finnish DBpedia linked open data via a SPARQL endpoint.

Lexical

1. [WordNet](#). Large lexical database of English with translations collected by the Open Multilingual WordNet Project.

Cultural Heritage

1. [MuseumFinland](#). The data behind the classic [online application](#) from 2004 that was rewarded e.g. the international Semantic Web Challenge Award.
2. [Semantic Kalevala and Folklore](#). Arguably the first publication of folklore as Linked Open Data in the world.
3. Data from CultureSampo (Kulttuurisampo) (work in progress). Data from the [CultureSampo](#) application that got the [Outstanding Paper Award 2011-2012](#) of the Semantic Web Journal.
4. [BookSampo \(Kirjasampo\)](#). Data behind the famous collaborative [Kirjasampo](#) application of the Finnish Public Libraries that contains rich semantic descriptions of virtually all Finnish fiction literature.
5. [Mapping Manuscript Migrations \(MMM\)](#). Disparate datasets from Europe and North America about pre-modern manuscripts as a unified knowledge graph. [MMM Portal](#) is built on this knowledge graph.
6. [FindSampo](#). Data on Finnish archaeological finds made by the public, based on the finds database by the Finnish Heritage Agency (2015–). [FindSampo Portal](#) is built on this knowledge graph.

History

1. [World War I Linked Open Data](#). Result on an international collaboration regarding sharing data about war history.
2. Finnish war victim databases published by the National Archives of Finland:
 - [War Victims in Finland 1914–1922](#)
 - [Prisoner-of-war deaths and people handed over in Finland 1939–1955](#)
 - [Casualties during the Finnish wars 1939–1945](#)
3. [WarSampo](#). Large heterogeneous sets of data about the World War II in Finland as linked open data. [WarSampo \(Sotasampo\)](#) portal is built on this data, providing different perspectives to war history.
4. [WarVictimSampo 1914–1922](#). The dataset combines information about the war victims of the Finnish Civil War (1918) and prison camps, the First World War, and Kinship Wars that took place around the same time, and also includes information on the civil war battles. [WarVictimSampo \(Sotasurmasampo\) 1914–1922](#) portal is built on this data.
5. [BiographySampo](#). Data on approximately 13 600 people who are significant to the history of Finland from the 3rd century to the contemporary times. [BiographySampo \(Biografiasampo\)](#) portal is built on this data.
6. [AcademySampo](#). Data on approximately 28 000 university students from the Student registers 1640–1852 and 1853–1899 in the University of Helsinki Central Archives. [AcademySampo \(Akatemiasampo\)](#) portal is built on this data.

Epistolary data

1. [CKCC corpus](#). 20,000 letters that were written by and sent to 17th century scholars who lived in the Dutch Republic.
2. [correspSearch corpus](#). Approx. 130 000 letters provided by print or digital scholarly editions of letters in the correspSearch system.

Law

Schemas

Linked Data Finland

LDF.fi publishes both datasets and metadata schemas used in them. Links to schema documentations can be found at the home pages of the datasets in which the schema have been used.

In below, only some examples of schema documents are given.

Health

- [HealthFinland Metadata Schema](#)

Law

- [Finlex Legislation Metadata Schema](#)
- [Finlex Case-law Metadata Schema](#)

Ontologies

- [FinnONTO SKOS Extensions Schema](#)
- [Taxon Meta-Ontology TaxMeOn Schema](#)

+ dataset-specific schemas!



This dataset includes harmonized data of different kinds concerning the Second World War in Finland, separated in different graphs representing events, actors, places, photographs, and other aspects and documentation of the war. To test and demonstrate its usefulness, this data service is in use in the semantic portal [WarSampo](#) explained in more detail in this [project page](#).

Example SPARQL queries for the data:

- [Events, photographs and articles that are situated in Vyborg](#)
- [Casualties of the 1st Division and its subunits in the time interval 13.2.-13.3.1940 by place and date](#)

License

[CC BY 4.0](#)



See possible graph-specific licenses below.

Detailed Dataset Contents

Wartime Events (URI: <http://ldf.fi/warsa/events>)



([Browse data](#) / [View in Sotasampo.fi](#) / [Download](#))

Information on the events of the Winter War and Continuation War were derived from the books Talvisodan pikkujättiläinen, Jatkosodan pikkujättiläinen, and the organization records of the Finnish Defence Force.

saari: Ukko

[\[edit\]](#)

68.936487, 27.282297

Collection	1-kokoelma
Collection parish (in ca 1938)	Inari
Collector	Portti, Reija
http://ldf.fi/schema/kotus-names-archive/positioning_accuracy	Paikka sijaitsee keruukartalla tämän karttaruudun alueella.
Latitude	68.936487
Longitude	27.282297
Name	Ukko
Name type	paikannimi
Same as	https://nimiarkisto.fi/wiki/Q5601617
Stamp date	1990
Type	<u>saari</u>

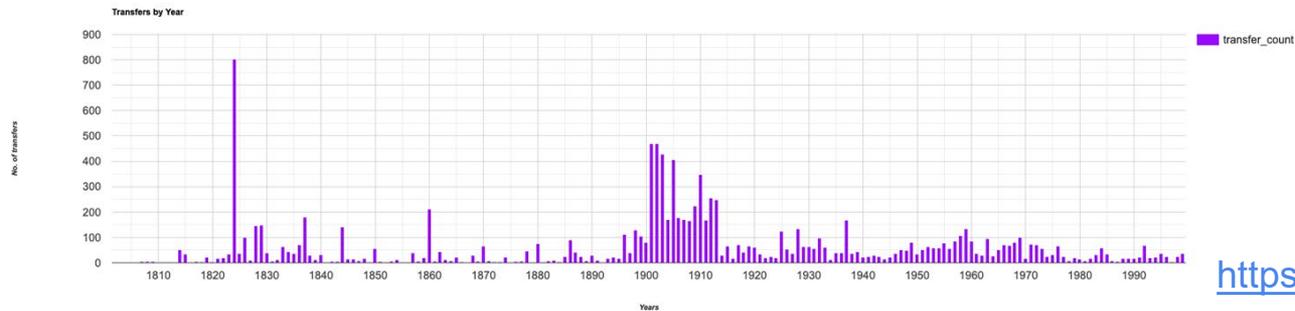
Linked Data browsing for humans (SAHA) and machines

SPARQL endpoints for querying data for analysis, visualization, mash-up apps

```
Query +  
http://rdf4immm.vspart  
1 - PREFIX skos: <http://www.w3.org/2004/02/skos/core#>  
2 PREFIX ecrm: <http://eizlangen-crm.org/current/>  
3 PREFIX efrbroos: <http://eizlangen-crm.org/efrbroo/>  
4  
5 # transfers of custody in 1800-2000  
6  
7 - SELECT ?transfer_year (COUNT (*) AS ?transfer_count) WHERE {  
8   ?transfer ecrm:P8a_time-span ?transfer_timespan ;  
9     ecrm:P701_is_documented_in ?source .  
10  ?transfer_timespan skos:prefLabel ?timespan_label ;  
11    ecrm:P82a_begin_of_the_begin ?timespan_datetime .  
12  BIND(YEAR(?timespan_datetime) AS ?transfer_year)  
13  FILTER(?transfer_year < 2000 && ?transfer_year > 1800)  
14  
15  ?source skos:prefLabel ?source_title .  
16  
17  ?transfer ecrm:P30_transferred_custody_of ?manuscript .  
18  ?manuscript a efrbroos:P1_Manifestation_Singleton ;  
19    skos:prefLabel ?manuscript_name .  
20  
21 } GROUP BY ?transfer_year  
22 ORDER BY ?transfer_year
```

Table Response Gallery Chart Geo Geo-3D Geo events Pivot Timeline 193 results in 9.526 seconds

Configure



Download data dumps

```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix schema: <http://schema.org/> .
@prefix skos: <http://www.w3.org/2004/02/skos/core#> .
@prefix xml: <http://www.w3.org/XML/1998/namespace> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W0003542600> schema:author <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:contributor <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Mikael Agricolan teokset : 1, ABC kiria ; Rucoufkiria",
"Mikael Agricolan teokset : 1, Abckiria, rucouskiria",
"Mikael Agricolan teokset : 2, Se Wfi Teftamenti",
"Mikael Agricolan teokset : 2, Se wsi testamentti",
"Mikael Agricolan teokset : 3, Käsikiria, Messu eli Herran echtolinen, Se meiden Herran Iesusen Christusen pina, Davidin
psaltari, Weisut ia ennustoxet, Ne prophetat, Haggaj, Sacharia, Maleachi",
"Mikael Agricolan teokset : 3, Käsikirja",
"Mikael Agricolan teokset : Tekstien selvennys" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00023266800> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Suomalaisia suurmiehiä" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00025575600> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Mikael Agricolan edelläkävijä : Pyhän Stefanin, Perman ensimmäisen piispan, elämäntyö" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00028705000> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Nuori Mikael Agricola" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00029465400> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Mikael Agricolasta E. W. Pakkalaan : Suomen kirkon paimenien elämäkerrasto" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00031602000> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "En väg till en av världslitteraturens stora namnlösa skålder : vem var Michael Agricola?" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00041137700> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Fiskaresonen : Finlands oförgätlige wälgörare" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00041920500> schema:contributor <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Mikael Agricola ja Erasmus Rotterdamlainen" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00046892800> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Mikael Agricola : bibliografinen opas" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00047053600> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Vanhan kirjasuomen lukemisto" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00047350200> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Michael Agricola : der Reformator Finnlands : sein Leben und sein Werk" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00047843300> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Mikael Agricola, der erste finnische Bibelübersetzer" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00048912200> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:contributor <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Oma kieli : Mikael Agricolan tekstejä nykysuomeksi" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00049272700> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Agricolan aika" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00060415000> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Suomalaisen eksegetiikan ja orientalistiikan juuria : Roots of exegetics and oriental studies in Finland" .
```

```
<http://urn.fi/URN:NBN:fi:bib:me:W00060662600> schema:about <http://urn.fi/URN:NBN:fi:au:pn:000103346> ;
schema:name "Mikael Agricola",
"Mikael Agricola : elämä ja teokset" .
```

Data model documentation (LODE)



Powered by
IRI: <http://ldf.fi/schema/bioc/>
Current version :
Created with TopBraid Composer
Other visualisation :
[Ontology source](#) - [WebVowl](#)

Table of Content

1. [Classes](#)
2. [Object Properties](#)
3. [Data Properties](#)
4. [Namespace Declarations](#)

Classes

[Acquisition](#) [Activity](#) [Actor](#) [Actor Appellation](#) [Actor Role](#) [Alternative Name](#) [Appellation](#) [Attribute Assignment](#) [Authority Document](#) [Beginning of Existence](#) [Binary Relationship Role](#) [Biological Object](#) [Birth](#) [Conceptual Object](#) [Condition Assessment](#) [Condition State](#) [Creation](#) [CRM Entity](#) [Curated Holding](#) [Curation Activity](#) [Currency](#) [Death](#) [Design or Procedure](#) [Destruction](#) [Dimension](#) [Dissolution](#) [Document](#) [Document](#) [End of Existence](#) [Entity](#) [Entity Role](#) [Event](#) [Event](#) [Event Role](#) [Family Relationship Role](#) [Formation](#) [Gender](#) [Group](#) [Group](#) [Group](#) [Group Relationship Role](#) [Human-Made Feature](#) [Human-Made Object](#) [Human-Made Thing](#) [Identifier](#) [Identifier Assignment](#) [Information Object](#) [Inscription](#) [Inter-Group Relationship Role](#) [Joining](#) [Language](#) [Leaving](#) [Legal Object](#) [Linguistic Appellation](#) [Linguistic Object](#) [Mark](#) [Material](#) [Measurement](#) [Measurement Unit](#) [Modification](#) [Monetary Amount](#) [Move](#) [Nationality](#) [Occupation](#) [Official Name](#) [Part Addition](#) [Part Removal](#) [Period](#) [Persistent Item](#) [Person](#) [Person](#) [Person Relationship Role](#) [Physical Feature](#) [Physical Human-Made Thing](#) [Physical Object](#) [Physical Thing](#) [Place](#) [Place](#) [Presence](#) [Product Type](#) [Production](#) [Propositional Object](#) [Purchase](#) [Right](#) [Site](#) [Social Relationship Role](#) [Spacetime Volume](#) [Symbolic Object](#) [Temporal Entity](#) [Thing](#) [Thing](#) [Thing Role](#) [Time-Span](#) [Time-Span](#) [Title](#) [Transfer of Custody](#) [Transformation](#) [Type](#) [Type Assignment](#) [Type Creation](#) [Unary Role](#) [Visual Item](#)

Acquisition^{OP}

[back to ToC](#) or [Class ToC](#)

IRI: http://www.cidoc-crm.org/cidoc-crm/E8_Acquisition

This class comprises transfers of legal ownership from one or more instances of E39 Actor to one or more other instances of E39 Actor. The class also applies to the establishment or loss of ownership of instances of E18 Physical Thing. It does not, however, imply changes of any other kinds of right. The recording of the donor and/or recipient is optional. It is possible that in an instance of E8 Acquisition there is either no donor or no recipient. Depending on the circumstances, it may describe: 1. the beginning of ownership 2. the end of ownership 3. the transfer of ownership 4. the acquisition from an unknown source 5. the loss of title due to destruction of the item It may also describe events where a collector appropriates legal title, for example by annexation or field collection. The interpretation of the museum notion of "accession" differs between institutions. The CIDOC CRM therefore models legal ownership (E8 Acquisition) and physical custody (E10 Transfer of Custody) separately. Institutions will then model their specific notions of accession and deaccession as combinations of these.

has super-classes

[Activity](#)^{OP}

has sub-classes

[Purchase](#)^{OP}

is in domain of

[transferred title from](#)^{OP}, [transferred title of](#)^{OP}, [transferred title to](#)^{OP}

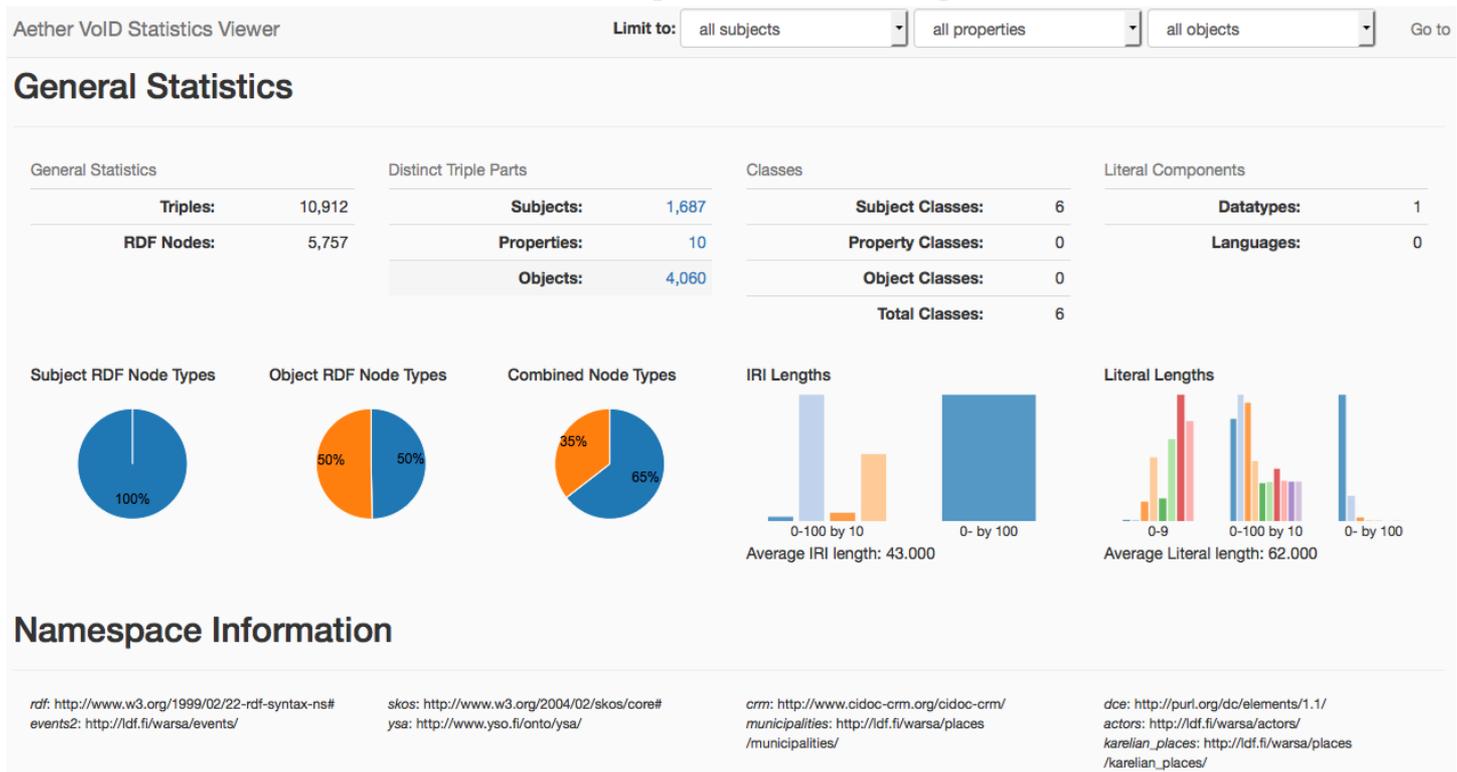
is in range of

[acquired title through](#)^{OP}, [changed ownership through](#)^{OP}, [surrendered title through](#)^{OP}



Additional data services

Dataset statistics (Aether)



<http://goo.gl/LgQhmQ>

Dataset search (SPARQL Faceter)

Remove all selections

Free Text Search

Keywords

-- No Selection -- (22)

Age of Enlightenment (1)
Business (1)
Continuation War (1)
England (2)
English language (1)
English people (1)
France (3)
Hanko (1)
Hanko(1977-) (1)

Rights Holder

-- No Selection -- (22)

Edita Publishing Ltd (2)
Helsingin seudun lintutieteellinen yhdistys (1)
Helsinki City Library (1)
Ilmatieteen laitos (1)
National Archives Service of Finland (1)
National Archives of Finland (3)
National Board of Antiquities (1)
National Land Survey of Finland (1)
OCLC Online Computer Library Center, Inc. (1)

Creator

-- No Selection -- (22)

Edita Publishing Ltd (2)
Helsingin seudun lintutieteellinen yhdistys (1)
Ilmatieteen laitos (2)
Mikko Koho (2)
National Archives Service of Finland (1)
National Land Survey of Finland (1)
OCLC Online Computer Library Center, Inc. (1)
Princeton University (1)
Semantic Computing Research Group (1)

Publisher

LODSCI Dataset Search

Register of LDF.fi datasets. You can filter the results with the provided facets.

Sort: Title

Dataset	Description	Organization	License
Semantic Finlex	This dataset contains Linked Data regarding Finnish legislation and case law. The RDF data has been converted from legacy XML formats used within the Finlex online service. RDF data models used in the converted data conform to European URI and metadata standards, namely ELI (European Legislation Identifier) and ECLI (European Case Law Identifier). The datasets are updated regularly. More information and documentation can be found from the project website (http://data.finlex.fi). Special thanks to the Ministry of Justice and Edita Publishing Ltd. Subject: linked open data , legislation , case law , statutes , legal cases	Rights Holder: Semantic Computing Research Group (SeCo), Edita Publishing Ltd Creator: Semantic Computing Research Group (SeCo), Edita Publishing Ltd Publisher: Semantic Computing Research Group (SeCo)	http://creativecommons.org/licenses/by/4.0/ , http://creativecommons.org/licenses/by-nc/4.0/
Asiakastieto's business data	This dataset includes business, person, news and field of business data from Asiakastieto. Subject: http://dbpedia.org/resource/Business		http://ldf.fi/license/restricted
Ontology of finnish bird species	Ontology of bird species observed in Finland. Species are annotated with characteristics descriptions, conservation statuses and rarity classes. Ontology is based on work by Birdlife Finland and Finnish Museum of Natural History. The characteristics ontology and annotations are based on NatureGate's characteristics system. Subject: linked open data , birds , identification marks , uhanaalaisuus (AFO) , endangered animals , ontologies (information management)	Rights Holder: Semantic Computing Research Group (SeCo) Creator: Semantic Computing Research Group (SeCo) Publisher: Semantic Computing Research Group (SeCo)	http://creativecommons.org/licenses/by/4.0/
CEEC Sampler	Published in 1998, the Corpus of Early English Correspondence Sampler (CEECS) represents the non-copyrighted materials included in the original CEEC. This means that the editors of the collections included in it have died over 70 years ago. We have also included some material (re-)edited by us (see Henslowe and Marshall collections). The CEECS is a fairly accurate small-scale copy of the full CEEC, giving similar results for many linguistic phenomena. The time covered is nearly the same (1418–1680) and here too the bulk of the material is at the latter end of the time span. 23 letter collections have been included with altogether 194 informants. The size of the CEECS is c. 450,000 words. It has been divided into two parts for technical reasons. CEECS1 covers the 15th and 16th centuries, with the exception of the Hutton collection, which goes on to the 17th century. CEECS2 consists of 17th century material, only 3 letters in Original 3 are from the late 16th century. Subject: linked open data , corpus linguistics , English language	Rights Holder: Semantic Computing Research Group (SeCo), The Research Unit for Variation, Contacts and Change in English Creator: Semantic Computing Research Group (SeCo), The Research Unit for Variation, Contacts and Change in English Publisher: Semantic Computing Research Group (SeCo)	http://creativecommons.org/publicdomain/zero/1.0/
FBTEE: The French Book Trade in Enlightenment Europe	The French Book Trade in Enlightenment Europe (FBTEE) project is a digital humanities project of international significance mapping the production, marketing, dissemination, policing, and reception of books (and hence ideas) in the late eighteenth century. It aims to bring together and make interoperable and publicly available in a single digital resource multiple historical bibliometric databases. Subject: linked open data , book history , commerce , Age of Enlightenment , France	Rights Holder: Semantic Computing Research Group (SeCo), The FBTEE Project Creator: Semantic Computing Research Group (SeCo), The FBTEE Project Publisher: Semantic Computing Research Group (SeCo)	http://fbtee.uws.edu.au/main/eula/

Graph visualization (RDF Grapher)

Try the service:

RDF data or URI:

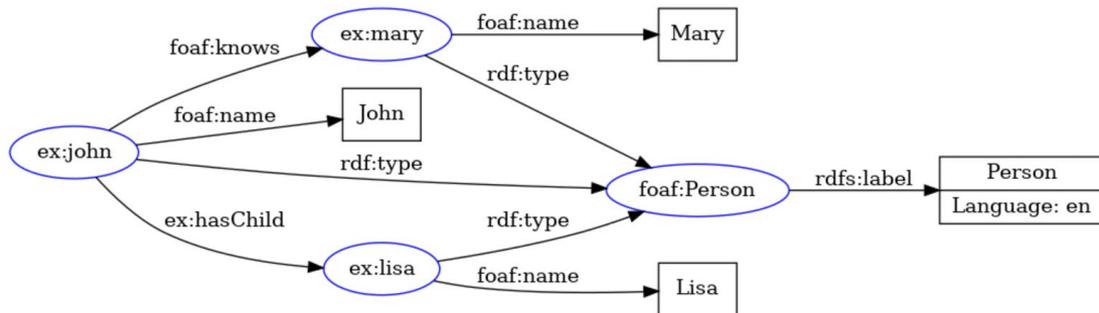
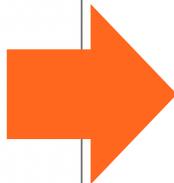
```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix ex: <http://example.org/> .

ex:john a foaf:Person ;
  foaf:name "John" ;
  foaf:knows ex:mary ;
  ex:hasChild ex:lisa .

ex:mary a foaf:Person ;
  foaf:name "Mary" .

ex:lisa a foaf:Person ;
  foaf:name "Lisa" .

foaf:Person rdfs:label "Person"@en .
```



From format:

To format:

Send form as HTTP POST (needed for large RDF data):

Namespaces:
rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
rdfs: <http://www.w3.org/2000/01/rdf-schema#>
foaf: <http://xmlns.com/foaf/0.1/>
ex: <http://example.org/>

Data format conversions (RDF Serializer & OWL Syntax Converter)

Try the service:

RDF data or URI:

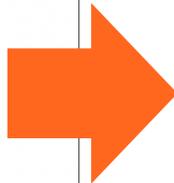
```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix ex: <http://example.org/> .

ex:john a foaf:Person ;
  foaf:name "John" ;
  foaf:knows ex:mary ;
  ex:hasChild ex:lisa .

ex:mary a foaf:Person ;
  foaf:name "Mary" .

ex:lisa a foaf:Person ;
  foaf:name "Lisa" .

foaf:Person rdfs:label "Person"@en .
```



```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:ex="http://example.org/"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xml:base="http://www.ietf.org/rfc/rfc2119.txt">
  <rdf:Description rdf:about="http://example.org/john">
    <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://example.org/john">
    <foaf:name>John</foaf:name>
  </rdf:Description>
  <rdf:Description rdf:about="http://example.org/john">
    <foaf:knows rdf:resource="http://example.org/mary"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://example.org/john">
    <ex:hasChild rdf:resource="http://example.org/lisa"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://example.org/mary">
    <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://example.org/mary">
    <foaf:name>Mary</foaf:name>
  </rdf:Description>
  <rdf:Description rdf:about="http://example.org/lisa">
    <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>
  </rdf:Description>
  <rdf:Description rdf:about="http://example.org/lisa">
    <foaf:name>Lisa</foaf:name>
  </rdf:Description>
  <rdf:Description rdf:about="http://xmlns.com/foaf/0.1/Person">
    <rdfs:label xml:lang="en">Person</rdfs:label>
  </rdf:Description>
</rdf:RDF>
```

From format: ▾

To format: ▾

View result in browser (accept header = text/plain):

Send form as HTTP POST (needed for large RDF data):

Serialize

Inferring new data (OWL RL Reasoner & N3 Logic Rule Reasoner)

Try the service:

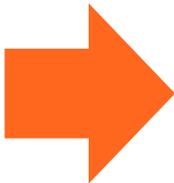
RDF data in Turtle syntax:

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix ex: <http://example.org/> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .

ex:john a foaf:Person ;
  foaf:name "John" ;
  foaf:knows ex:mary .

ex:mary a foaf:Person ;
  foaf:name "Mary" .

foaf:knows a owl:SymmetricProperty .
```



and/or URI:

From format (input URI):

To format:

OWL 2 RL + RDFS Processing: yes no – if set to "no", the following additional parameters can be used:

OWL 2 RL Processing: yes no

RDFS Processing: yes no

Extra OWL Processing: yes no

Add Axiomatic triples: yes no

Add Datatype Axiomatic triples: yes no

Send form as HTTP POST (needed for large RDF data):

Reason

```
owl:sameAs owl:incompatibleWith .

owl:priorVersion a rdfs:Resource,
  owl:AnnotationProperty,
  owl:Thing ;
  owl:sameAs owl:priorVersion .

owl:versionInfo a rdfs:Resource,
  owl:AnnotationProperty,
  owl:Thing ;
  owl:sameAs owl:versionInfo .

ex:john a rdfs:Resource,
  owl:Thing,
  foaf:Person ;
  owl:sameAs ex:john ;
  foaf:knows ex:mary ;
  foaf:name "John" .

ex:mary a rdfs:Resource,
  owl:Thing,
  foaf:Person ;
  owl:sameAs ex:mary ;
  foaf:knows ex:john ;
  foaf:name "Mary" .

owl:SymmetricProperty a rdfs:Resource,
  owl:Thing ;
  owl:sameAs owl:SymmetricProperty .

"John" a rdfs:Resource,
  owl:Thing ;
  owl:sameAs "John" .

"Mary" a rdfs:Resource,
  owl:Thing ;
  owl:sameAs "Mary" .
```



Data quality and validation

Shape/schema-based validation

- **Shapes Constraint Language (SHACL),
W3C Recommendation 20 July 2017**
- **Shape Expressions Language (ShEx),
Final Community Group Report 8 October 2019**
- **Jose E. Labra Gayo, Eric Prud'hommeaux, Iovka Boneva, Dimitris Kontokostas (2018) Validating RDF Data, Synthesis Lectures on the Semantic Web: Theory and Technology, Vol. 7, No. 1, 1-328, DOI: 10.2200/S00786ED1V01Y201707WBE016, Morgan & Claypool. Open access: <https://book.validatingrdf.com>**

SHACL

- Experiments on creating a web user interface for SHACL shape creation and validation, master's thesis and prototype in SeCo: <https://roteva.demo.seco.cs.aalto.fi>

Roteva – Linked Data Validator

Validate & Repair

[Documentation](#)

[About](#)

With Roteva Validate & Repair it is possible to iteratively validate and repair a dataset against some set of rules.

Start by entering data followed by rules by which to validate it.

ShEx

- Experiments in SeCo for parliamentary data (SEMPARL project), upcoming: letter metadata (CoCo project)
- Future work: integration of ShEx validation into linked data production workflows

Shape Expressions is a structural schema language for RDF graphs. It allows one to describe profiles of data like this:

```
# our EmployeeShape reuses the FOAF ontology
<EmployeeShape> {
  foaf:givenName xsd:string+, # at least one givenName.
  foaf:familyName xsd:string, # one familyName.
  foaf:phone IRI*, # any number of phone numbers.
  foaf:mbox IRI # one FOAF mbox.
}
```

```
# Employee7 matches EmployeeShape
<http://a.example/Employee7>
  foaf:givenName "Robert", "Taylor" ;
  foaf:familyName "Johnson" ;
  # no phone number needed
  foaf:mbox <mailto:rtj@example.com>
  .
```

Thank you!