



Linked Open Data

Ontologies, Datasets, Projects

Vladimir Alexiev, PhD, PMP

1st International Conference Museum Big Data
Doha, Qatar, 30 Apr – 2 May 2019

Outline

- **What is LOD**
- **ONTO Projects & Products**
- **ONTO CH Projects**

END

- **CH Ontologies**
- **Europeana**

[My publications](#)

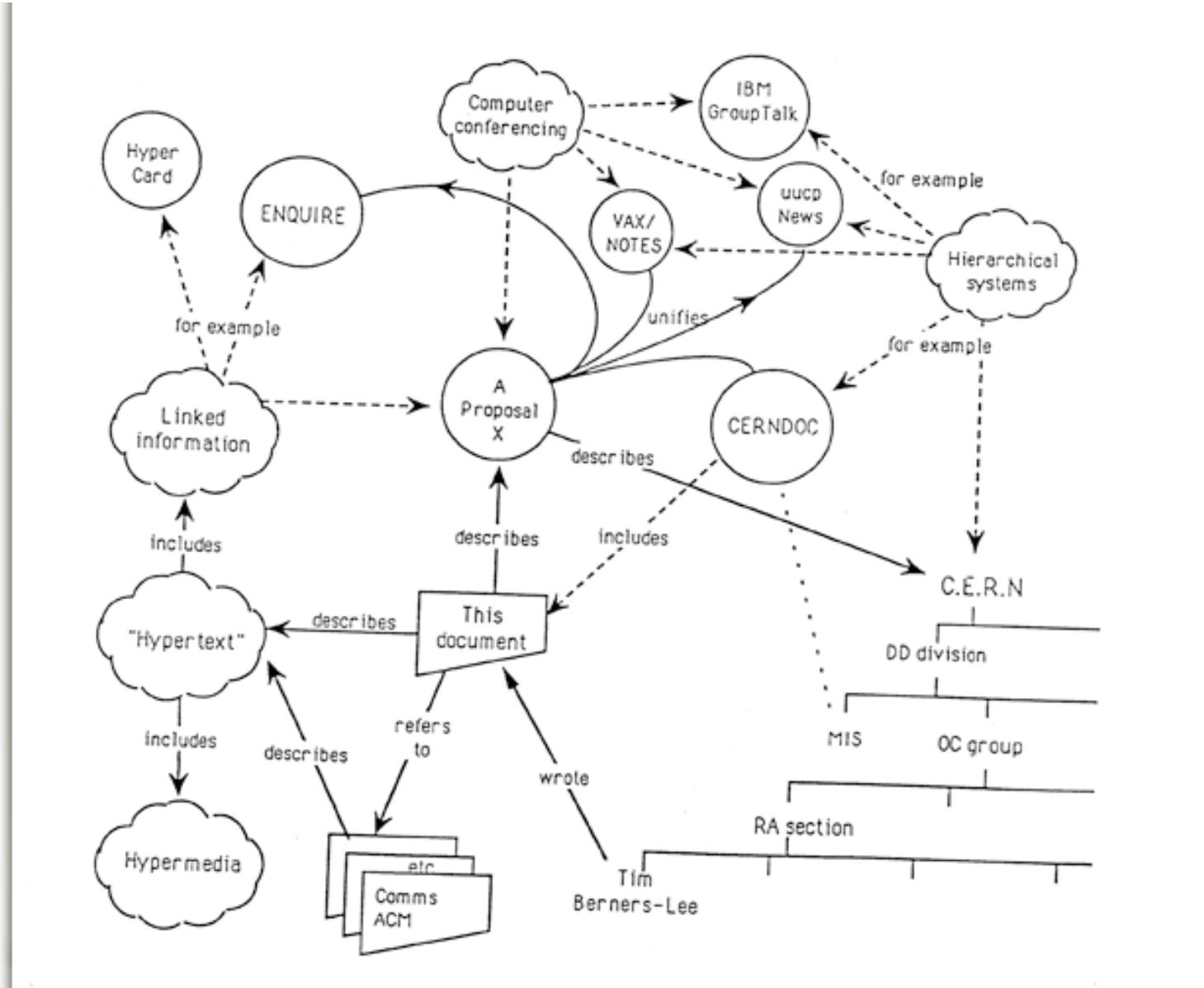
[Museum Linked Open Data: Ontologies, Datasets, Projects](#) (extended version),
Sep 2018: 77 pages, 67 figures

What is LOD

- **Semantic Technologies is a bit of a misnomer**
 - It's about exposing data and datasets to machines, not giving a "higher meaning" to data
- **Ontologies is a bit of a misnomer**
 - It's not philosophy and ontologies are not very complex (or, few large datasets use complex ontologies)
 - Ontologies are the data schemas of the semantic web, but not necessarily the most important schemas (Shapes and Application Profiles are now widely used)
- **Linked Open Data is the essence**
 - Exposing datasets globally, making each entity/data point addressable (URL)
 - "Things not strings"
 - **Linking them**

Where did it come from?

- **TimBL proposal, CERN, 1989: both Web and Semantic Web**
- "Vague but Exciting"



What does WD (LOD) know about TimBL?

Tim Berners-Lee (Q80)

TimBL | Sir Tim Berners-Lee | Timothy John Berners-Lee | TBL | Tim Berners Lee | T. Berners-Lee | T Berners-Lee |
T.J. Berners-Lee | Berners-Lee | Timothy Berners-Lee | آنڈریو ایڈمز | بارنس لی، تیم |
تیم بئرنز لی | Tim Berners-Li | Цім Бернерс-Лі | Тим Бърнърс-Ли | Τιμ Μπέρνερς Λι |
Tim Berners-Li | ティム・バーナーズ=リー | ٹیم برنر-لی | قیم برنس لی | Tim Berners-Lee |
Timotheus Ioannes Berners-Lee | Tims Bérnerss-Li | ٹیم بئرنز لی | Tim Berners-Li | تیم بئرنز لی |

British computer scientist, inventor of the World Wide Web

Tim Berners-Lee is a British computer scientist, physicist, programmer, university teacher, web developer, and engineer.

He was born on June 8, 1955 in London to Conway Berners-Lee and Mary Lee Woods.

He studied at The Queen's College from 1973 until 1976 and Emanuel School from 1969 until 1973. His field of work includes Information Technology and computer science. He is/was a member of Royal Society from 2001, National Academy of Engineering, National Academy of Sciences, and American Academy of Arts and Sciences. He worked for World Wide Web Consortium, for Massachusetts Institute of Technology, for Plessey from 1976 until 1978, for CERN from June 1980 until December 1980, for CERN from 1984 until 1994, for Open Data Institute, and for University of Southampton.

Relatives

Parents

father	♂ Conway Berners-Lee
	♂ Conway Berners-Lee
	♂ Conway Berners-Lee
mother	♀ Mary Lee Woods
	♀ Mary Lee Woods
	♀ Mary Lee Woods

Siblings



[Download unsupported media file](#)

External sites

[official website](#)

External sources

ACM Digital Library author	81100026375
AlloCiné person	686425
Babelio author	5063
BBC Things	2166d5db-3cd1-4d8a-a066-bddb220ef216
BIBSYS	792
BNE	XX1503528
BnF	16588000f
Brockhaus	
Computerbibliographie	berners-lee-timothy

- **TimBL at Wikidata Reasonator**
 - Names in 50 languages
 - Description is auto-generated
 - Parents confirmed 3 times (with different details not shown)

What does LOD know about TimBL?

award received	Prix Ars Electronica one of the most important yearly prizes in the field of electronic and interactive art, computer animation, music point in time : 1995
	W. Wallace McDowell Award the highest technical award made solely by the IEEE Computer Society where selection of the year's best paper is based on the "highest level of technical accomplishment and achievement" point in time : 1996
	Eduard-Rhein Technology Award Technologiepreis der Eduard-Rhein-Stiftung point in time : 1998
	MacArthur Fellows Program a prize awarded annually by the John D. and Catherine T. MacArthur Foundation point in time : 1998
	Japan Prize Japanese science award point in time : 2001
	Millennium Technology Prize the largest technology prize in the world point in time : 2004 prize money : 1000000 (NaN–NaN)
	Quadriga annual German award sponsored by Netzwerk Quadriga gGmbH point in time : 2005
	Charles Stark Draper Prize one of three prizes that constitute the "Nobel Prizes of Engineering point in time : 2007
	Queen Elizabeth Prize for Engineering a global engineering prize point in time : 2013 together with : Robert Kahn together with : Vint Cerf together with : Louis Pouzin together with : Marc Andreessen
	Knight Commander of the Order of the British Empire award, rank of the Order of the British Empire point in time : 2004
	Fellow of the Royal Society Elected Fellow of the Royal Society, including Honorary, Foreign and Royal Fellows point in time : 2001
	UNESCO Niels Bohr Medal

External sources	
BBC Things	21000000-3001-400d-a066-bddb220ef216
BIBSYS	792
BNE	XX1503528
BnF	16588000f
Brockhaus Enzyklopädie	berners-lee-timothy
CANTIC-ID	a11462115
Cinemagia actor	274275
CiNii author ID	DA12374620
CONOR	139656291
DBLP	b/TimBernersLee
Encyclopædia Britannica	biography/Tim-Berners-Lee
FAST	429429
Fellow of the Royal Society	timothy-berners-lee-11074
Freebase	/m/07d5b
GitHub username	timbl
GND	121649091
Goodreads author	428754
Gran Enclopèdia Catalana	0281732
Great Russian Encyclopedia	3918716
IMDb	nm3805083
INSPIRE-HEP author	T.J.Berners-Lee.1
ISFRB author	152322

- Depth of Information on TimBL
 - Links to ~200 authority files
 - Info about ~20 awards
 - Who he got the awards with
 - Life Timeline
 - Family
 - etc, etc



Knowledge Graphs

- Semantically Integrated KB of a domain, e.g.
 - Google KG, e.g. "Jaguar company" vs "Jaguar cat"
 - [Springer Nature Science Graph](#)
 - [Thomson Reuters permid Company Graph](#)
 - [Microsoft Academic Graph](#)
- Dagstuhl Seminar
Knowledge Graphs: New Directions for Knowledge Representation on the Semantic Web

Jaguar Cars
Luxury vehicles company



Jaguar is the luxury vehicle brand of Jaguar Land Rover, a British multinational car manufacturer with its headquarters in Whitley, Coventry, England and owned by the Indian company Tata Motors since 2008.
[Wikipedia](#)

Headquarters: [Coventry, United Kingdom](#)

CEO: [Ralf Speth](#) (Feb 18, 2010–)

Founded: September 4, 1922, [Blackpool, United Kingdom](#)

Parent organizations: [Tata Motors](#), [Jaguar Land Rover](#), [British Leyland](#), [British Motor Holdings](#)

Founders: [William Lyons](#), [William Walmsley](#)

Subsidiaries: [Jaguar Land Rover Canada ULC](#), [MORE](#)

Profiles



Twitter



Facebook



YouTube



Instagram



LinkedIn

People also search for

[View 10+ more](#)



Land Rover



Porsche



BMW



Mercedes...
Mercedes-Benz



Ford
Go Further
Ford Motor Company



Jaguar

Animal

The jaguar is a wild cat species and the only extant member of the genus *Panthera* native to the Americas. The jaguar's present range extends from Southwestern United States and Mexico in North America, across much of Central America, and south to Paraguay and northern Argentina in South America. [Wikipedia](#)

Mass: 56 – 96 kg (Adult)

Height: 63 – 76 cm (Adult, At Shoulder)

Family: Felidae

Class: Mammalia

Order: Carnivora

Did you know: The crest of Argentina's national federation in rugby union features a jaguar; however, because of a journalist error, the country's national team is nicknamed Los Pumas. [wikipedia.org](#)

People also search for

[View 15+ more](#)



Leopard



Cougar



Cheetah



Panthera



Tiger

Wikidata: 98k paintings with image



[commons:Mona Lisa, by Leo...](#)
[Q wd:Q12418](#)



[commons:Gerard David Tryptique de la famille Sedano Brug...](#)
[Q wd:Q23898](#)



[commons:Giotto di Bo...](#)
[Q wd:Q23904](#)



[commons:Guardi, Francesco - The Departure of Bucentaur for the Lido o...](#)
[Q wd:Q23908](#)



[commons:Young tiger playing with its](#)
[Q wd:Q23912](#)



[commons:Domenico Ghirlandai...](#)
[Q wd:Q23915](#)



[commons:Portrait d'une Femme à s...](#)
[Q wd:Q23922](#)



[commons:Domenico ghirlandaio, visitazione, ...](#)
[Q wd:Q23946](#)



[commons:Domenico ghirlandaio, visitazione...](#)
[Q wd:Q23946](#)



[commons:Jean Auguste Dom...](#)
[Q wd:Q24011](#)



[commons:Claude Lorr...](#)
[Q wd:Q24066](#)



Wikidata: Number of Creative Works and Cultural Institutions (SQID)

Classification	
Direct superclasses	item of collection or exhibition 26918936 , intellectual work 26874094
Direct subclasses	With instances 51 With subclasses 44 All 66
	publication 19444206 , list 5785584 , work of art 1425428 , audiovisual work 430668 , literary work 306560 , periodical literature 120411 , software 82435 , fiction 79055 , fictional entity 63514 , narrative 48879 , furnishing 34968 , statute 32090 , computer program 23612 , program 23612 , catalog 22213 , online publication 14572 , advertising 8342 , open content 3939 , collaborative work 3915 , reference work 3091 , visualization 2545 , artificial language 2047 , game franchise 1247 , policy 1043 , unfinished creative work 332 , postcard 317 , folklore 182 , lost work 66 , chromolithography 56 , performance work 44 , logo 39 , apocrypha 26 , screenplay 17 , orphan work 17 , mixed media 16 , sequel 15 , adaptation 15 , debut novel 15 , anime and manga 12 , exploit 6 , written or drawn work 6 , epic 4 , found object 4 , prequel 4 , coming-of-age story 3 , Q18020205 2 , Immram 2 , fandub 2 , straw work 1 , protest art 1 , Fakelore 1
All subclasses	9872
institution 364708	
	With instances 20 With subclasses 7 All 23
	GLAM 63075 , library 18674 , archive 3968 , art institution 857 , public aquarium 329 , planetarium 137 , culture ministry 100 , Q29918292 70 , heritage centre 43 , Q29917259 15 , meeting center in Belgium 14 , Regional Historic Center 14 , heritage society 7 , salon 6 , book café 4 , scientific, technic and industrial culture center 4 , artothèque 2 , book club 2 , Q3854534 2 , Q10650512 1
420	

Outline

- What is LOD
- ONTO Projects & Products
- ONTO CH Projects

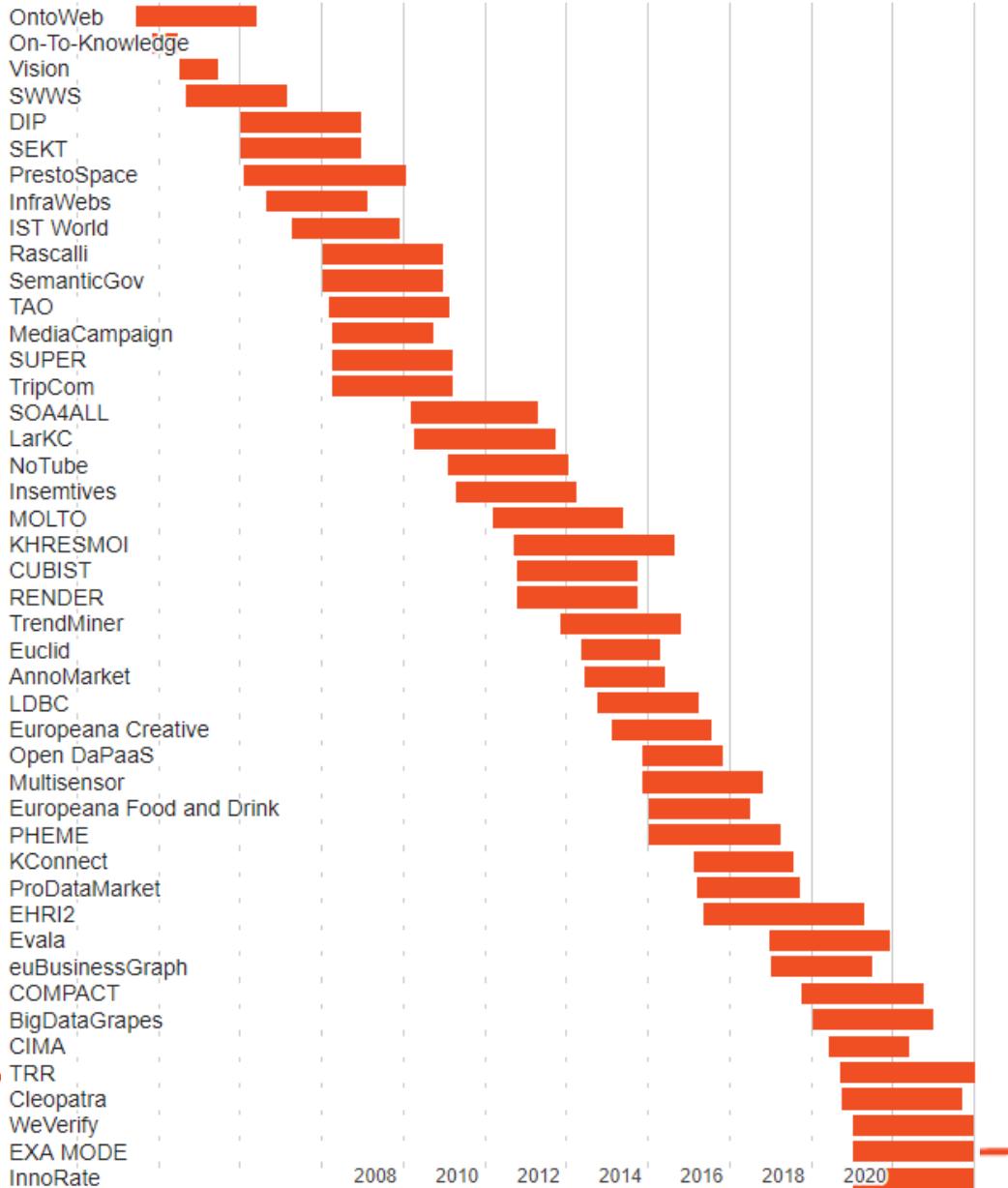
END

- CH Ontologies
- Europeana

ONTO History and Essential Facts

- **Semantic Web pioneer**
 - Started in 2000 as a research lab, spun-off and took VC investment in 2008
 - 65 staff: 7 PhD, 30 MS, 20 BS, 6 university lecturers
 - Over 400 person-years invested in R&D
- **Part of Sirma Group Holding: largest Bulgarian software house**
 - Public company: [BSE:SKK](#), part of SOFIX
 - ONTO is core part of [Sirma Strategy 2022](#) with focus on cognitive computing
- **Member of multiple industry bodies**
 - W3C, EDMC, ODI, LDBC, STI, DBpedia Foundation

ONTO Innovation (R&D) Projects



- **Innovation and Consulting Unit**

- More EU research projects than some BG universities combined
- Consulting projects for banks, cultural heritage institutions, government institutions, pharmaceuticals
- Focus: semantic data integration, text extraction

- **Vertical domains**

- Cultural heritage (Europeana Creative, Food and Drink, EHRI2)
- Companies (EBG, CIMA), innovation (TRR, InnoRate), real estate data (ProDataMarket), agriculture (BigDataGrapes)
- Media/Publishing (TrendMiner, Multisensor, Evala)
- Fact & rumour checking (Pheme, WeVerify)
- Life Science (LarKC, KHRESMOI, KConnect), ExaMode



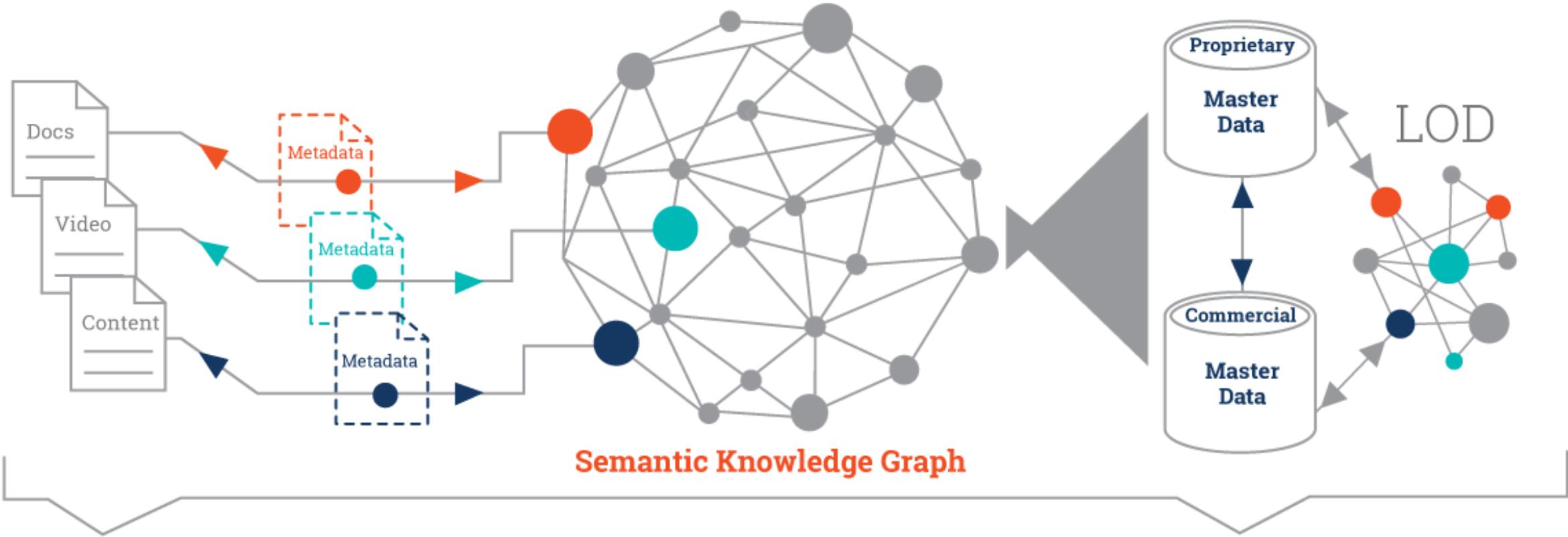
Great Variety of Application Domains

EHRI2	European Holocaust Research Infrastructure: transform archival research on the Holocaust
Evala	Cognitive And Semantic Links Analysis and Media Evaluation Platform
euBusinessGraph	Enabling the European Business Graph for Innovative Data Products and Services
COMPACT	From Research to Policy through Raising Awareness of the State of The Art on Social Media and Convergence
BigDataGrapes	Big Data to Enable Global Disruption of the Grapevine-powered Industries
CIMA	Intelligent Matching and Linking of Company Data (BG Intelligent Specialization)
Cleopatra	Initial Training Network: Cross-lingual Event-centric Open Analytics Research Academy (Maria Skłodowska-Curieia action)
TRR	Tracking of FP7 Research Results (commercial for DG RTD)
WeVerify	Fact-checking against false news. First project that ONTO coordinates
ExaMode	EXtreme-scale Analytics via Multimodal Ontology Discovery & Enhancement
InnoRate	Data-driven tools for supporting and improving the decision-making processes of investors for financing innovative SMEs
CLADA BG	CLARIN (NLP) + DARIA (DH) in BG. Bulgariana aggregator, national authorities

ONTO Cultural Heritage Projects

- **ResearchSpace:**
 - British Museum, Yale Center for British Art.
 - Largest museum collection converted to CIDOC CRM, semantic search...
- **ConservationSpace, Sirma MuseumSpace**
 - Helping Sirma Enterprise
- **Europeana**
 - Creative, Europeana Food and Drink
 - OAI PMH, SPARQL, Europeana members council, 5 work groups, Data Quality Committee
 - Initiator of Bulgariana national aggregator
- **Getty Research Institute**
 - Getty Vocabularies LOD
- **Carnegie Hall LOD**
- **American Art Collaborative**
 - consulted 14 US museums integrating data using CIDOC CRM
- **European Holocaust Research Infrastructure**
 - semantic archive integration
- **Canadian Heritage Information Network**
 - consulting the Canadian national aggregator's transition to LOD
- **Wikidata**
 - frequent contributions, mostly to authority control
- **DBpedia**
 - contributions, association member, data quality/ontology committee
- **CLADA BG**
 - key participant in both CLARIN (NLP) and Dariah (CH/DH)

Content Analytics & Exploration Platform



Automated Tagging
Content Publishing
Personalized Recommendation
Regulatory Compliance

Professional Services
Consultancy

Data Integration
Master Data Management
Information Discovery
Open Data Publishing

ontotext

GraphDB Semantic Database

- GraphDB Workbench

- ↗ User-friendly DB admin and querying

The screenshot shows the GraphDB Workbench interface. On the left, there's a sidebar with various icons for database management. The main area is titled "SPARQL Query & Update". It contains a code editor with a SPARQL query:

```
SELECT ?yr ?name ?document
WHERE {
  ?class rdfs:subClassOf foaf:Document .
  ?document rdf:type ?class .
  ?document dcterms:issued ?yr .
  ?document dc:creator ?author .
  ?author foaf:name ?name
OPTIONAL {
  ?class2 rdfs:subClassOf foaf:Document .
  ?document2 rdf:type ?class2 .
  ?document2 dcterms:issued ?yr2 .
  ?document2 dc:creator ?author2
  FILTER (?author=?author2 && ?yr2<?yr)
} FILTER (!bound(?author2))
```

Below the code editor is a results table. The table has columns for "s" (subject), "p" (predicate), and "o" (object). The first few rows show results related to wine and regions.

s	p	o
1	vin:adjacentRegion	
2	vin:locatedIn	
3		http://www.w3.org/TR/2003/PR-owl-guide-20031209/wine
4		http://www.w3.org/TR/2003/CR-owl-guide-20030818/wine
5	vin:Wine	
6	vin:Winery	
7	vin:Region	
8	vin:Vintage	
9	vin:WineGrape	
10	vin:WhiteWine	

- GraphDB Engine

- ↗ REST API for database access

The screenshot shows the GraphDB REST API documentation. It includes sections for "repositories", "contexts", and "namespaces". Each section lists operations (DELETE, GET, POST, PUT) with their descriptions and URLs.

repositories : Repository management

- DELETE /repositories/{repositoryID}/statements** Deletes statements from the repository.
- GET /repositories/{repositoryID}/statements** Fetches statements from the repository.
- POST /repositories/{repositoryID}/statements** Performs updates on the data in the repository
- PUT /repositories/{repositoryID}/statements** Updates data in the repository, replacing any existing data with the supplied data

contexts : Contexts management

namespaces : Namespaces management

- ↗ Plugin / Connectors



OntoRefine: Uplift Tabular Data to LOD

- **Easily clean and import tabular data**

- View as RDF in real-time with virtual SPARQL endpoint
- Transform using JS & SPIN
- Import newly created RDF directly to GraphDB

- **Usage**

- Financial data
- Agricultural data
- CH data, etc

name: TrumpWorld Data Public Person Org csv

Open... Export ▾ Help

Facet / Filter Undo / Redo 0 Refresh Reset All Remove All

1637 rows SPARQL endpoint Permalink SPARQL

Show as: rows records Show: 5 10 25 50 rows « first < previous 1 - 50 next > last »

All	Organization	Person	Connection	Source(s)
1. 1116 SOUTH MAIN STREET, LLC	WILBUR ROSS	Managing member	https://www.commerce.senate.gov/public--public-questionnaire-redacted.pdf	
2. 1186 BROADWAY, LLC	STEVEN MNUCHIN	Listed as asset/income on Public Financial Disclosure Report	https://extapps2.oge.gov/201/Presiden	
3. 2503(C) MINORITY TRUST FBO MPM	STEVEN MNUCHIN	Trustee	https://extapps2.oge.gov/201/Presiden	
4. 3126 CORPORATION	DONALD J. TRUMP	President	https://www.documentcloud.org/docume	
5. 4 SHADOW TREE LANE LLC	DONALD J. TRUMP	President	https://www.documentcloud.org/docume	
6. 4 SHADOW TREE LANE MEMBER CORP.	DONALD J. TRUMP	President	https://www.documentcloud.org/docume	
7. 40 WALL	DONALD J. TRUMP	President	https://www.documentcloud.org/docume	

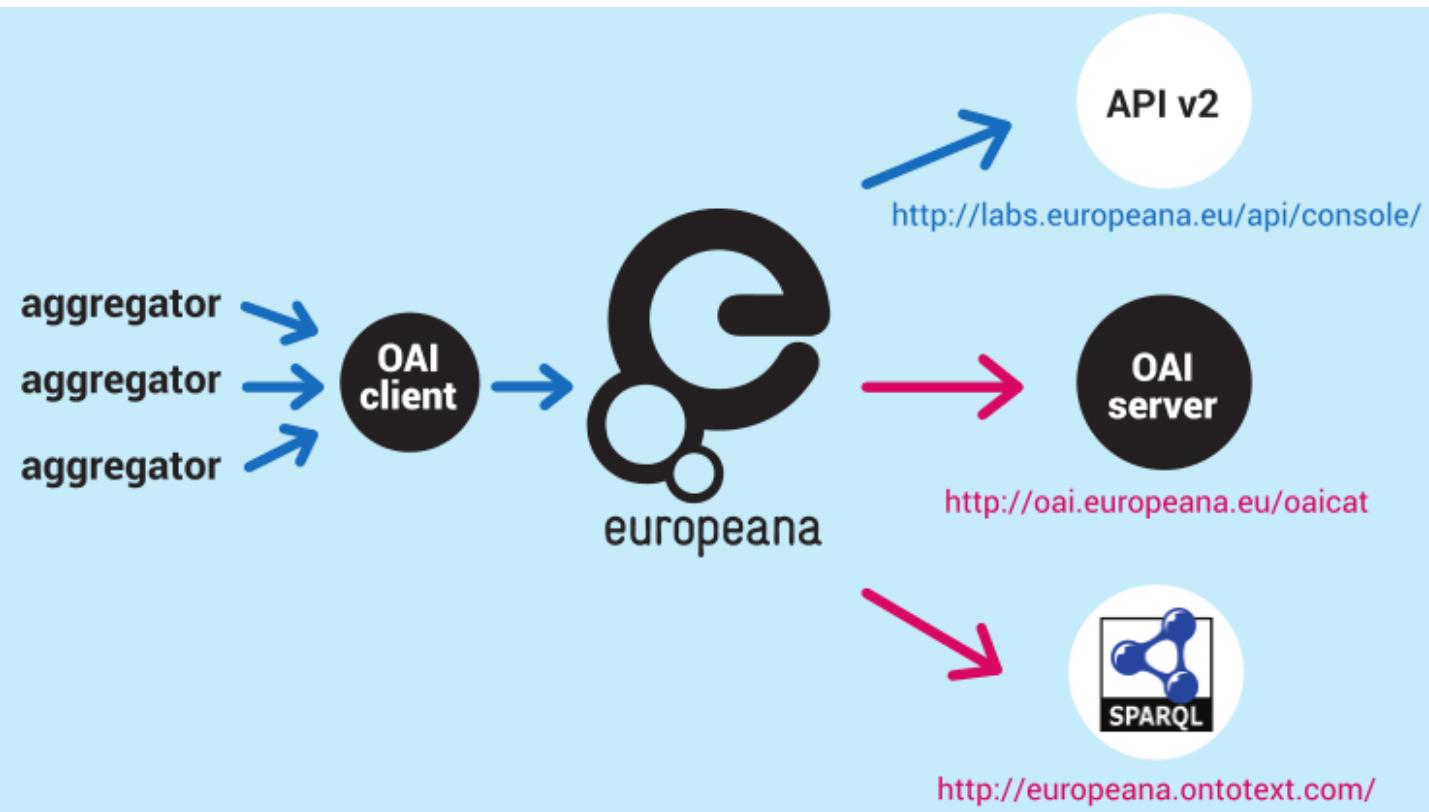
Outline

- What is LOD
- ONTO Projects & Products
- ONTO CH Projects

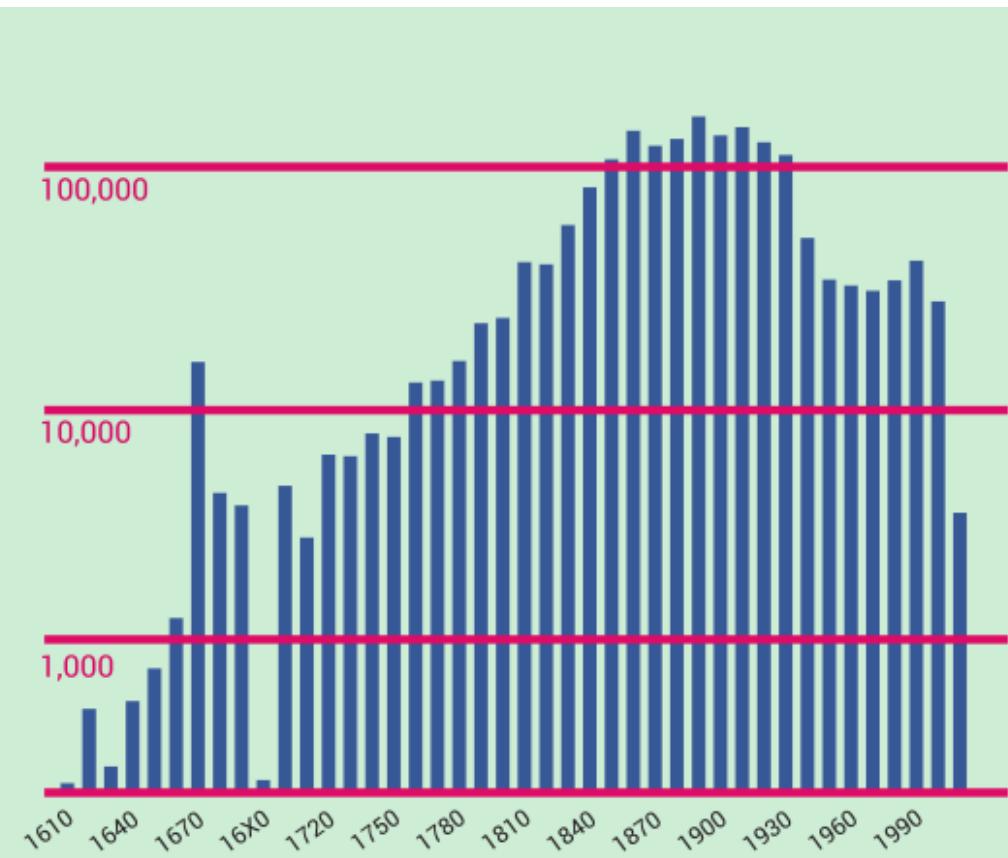
END

- CH Ontologies
- Europeana

Europeana Creative: Data Access: API, OAI PMH, SPARQL

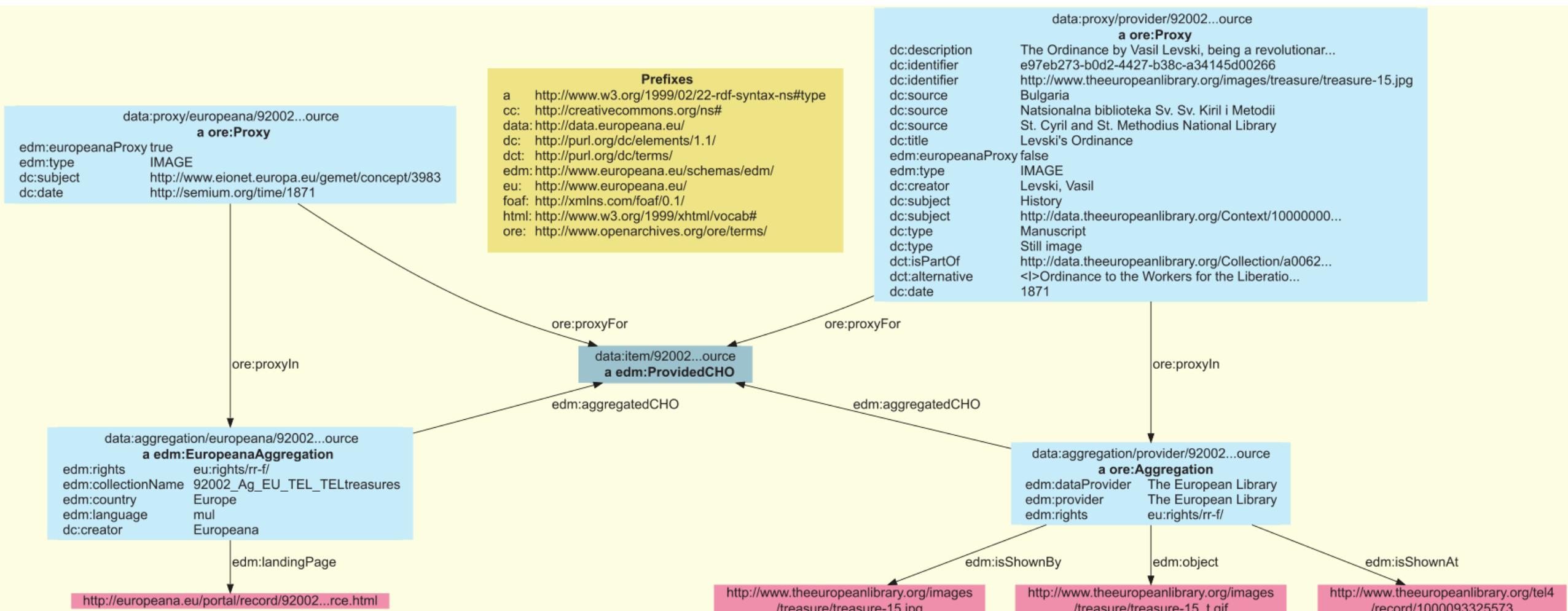


Ontotext added 2 additional channels to Europeana Labs:
OAI & SPARQL, complementing the existing **API**



Using SPARQL for analytics: charting
millions of Europeana Newspapers,
spanning from 1618 to present

EDM: Typical Graph



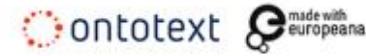
- Other activity on Europeana: Members Council, 5 working groups, data quality committee

Europeana Food and Drink: ONTO sem app



Europeana Food & Drink

The Semantic Demonstrator shows the use of semantic technologies for classification and discovery of Europeana objects related to Food and Drink. Detailed description, data, SPARQL endpoint.



No active filters

[View on map](#)

Food and Drink

- + Agriculture 25266
- + Beverages 14858
- + Cuisine 26796
- + Eating behaviors 27721
- + Food and drink by country 10858
- + Food and drink preparation 28386
- + Food and drink terminology 10581
- + Food and the environment 1027
- + Food culture 27953
- + Food decorations 2166
- + Food festivals 6

Results per page: 24 ▾

Results 1 - 24 of 43685

◀ Page 1 of 1821 ▶



Artists barter pictures for food at Paris exhibition . The ' Barter Selon ' , the art exhibition which comes to the rescue of



Fertility - c.1902 by Munch, Edvard (1863-1944) Location Nasjonalgalleriet, Oslo, Norway In The National Gallery of Oslo Edvard



Helen Wills drinks a toast . Mrs Helen Wills Moody , the American tennis ' Queen ' who is a regular spectator at the Davis Cup matches



Prancūzai pagaminti žirnoliai (receptas)
0,5 litro šviežių arba šaldytų žirnių, 1 žaukštės sviesto, 1 gūžė žalųjų salotų, druskos ir emulkuinu krapu. Žalumvnu

Places

- + 10861432 1568
- + Africa 3776
- + Americas 82
- + Antarctica 4
- + Arabian Peninsula 33
- + Asia 2074
- + Atlantic Ocean 45
- + Australia (continent) 3
- + Bering Sea 1
- + British Empire 12
- + Community of Latin American and Caribbean States 203



Džiovintų vaisių deserto gamyba (receptas)
Pradžiai šiek tiek patikslinti



Grilled aubergine rolls with herbs on wooden skewer credit: Ilva



Freshly rinsed apricots drying on checked tea towel credit: Lara



Traditional style fruit tea loaf sliced and served with butter and

totext

British Museum ResearchSpace

- Project

- Started 2009
- Funded by Mellon Foundation
- Led by the British Museum
- Followed by Yale Center for British Art (YCBA) and Smithsonian American Art Museum (SAAM)
- Initial implementation: ONTO
- Later implementation: Metaphacts
- Additional Involvement: FORTH, Delving

- Virtual Research Environment for Art Research

- CIDOC CRM representation
- Powerful semantic search, saved searches
- Image annotation
- Data basket
- Argumentation
- Intends to be a generic art research system that can be adapted for various needs and projects

ResearchSpace: Map British Museum Data to CIDOC CRM

The Conceptual Reference Model Revealed

Quality contextual data for research and engagement: A British Museum case study

Dominic Oldman, Joshan Mahmud, Vladimir Alexiev

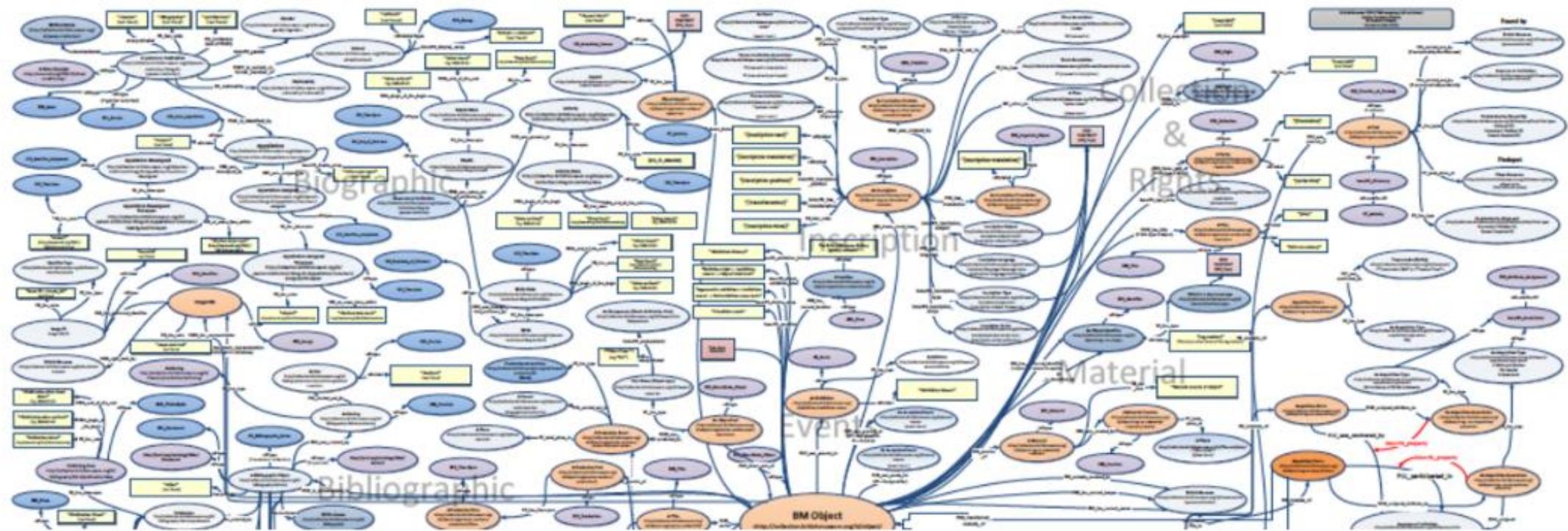
Version: Draft: 0.98, July 2013 (Confidential & Private – Limited Distribution for Discussion)

Contents: 359

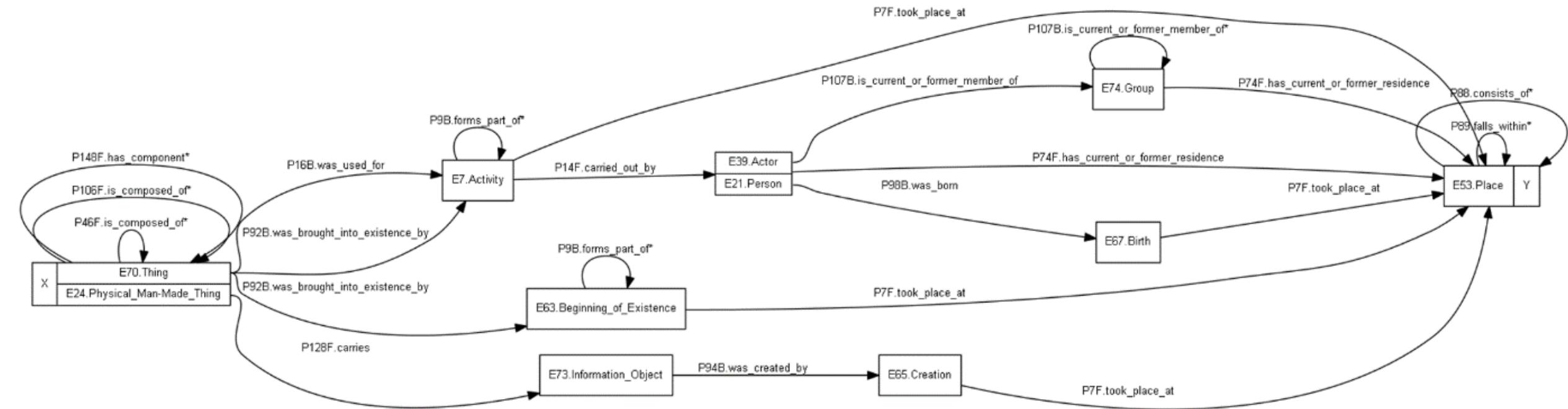
- 169: Main body, including discussion, illustrations and mapping diagrams
- 7p: Association Codes (see details at [BM Association Mapping v2](#))
- 49p: Example Object Graph
- 134p: RDFer configuration files (i.e. mapping implementation)

Overall Picture

[mapping manual-diagram.pdf](#), [mapping manual-diagram.png](#) (Page 9 of 359)



CRM Semantic Search



Fundamental Relation "Thing From Place"

CRM Search: Hierarchical Query Expansion

Find all objects with images created/modified by Rembrandt

and is/has/about drawing and is/has/about mammal +

13 Results

1

Object Type
1 album
13 drawing

Creator
1 Anonymous
13 Dutch
2 Italian
2 Jan Baptist Weenix
1 Jan Lievens
12 Rembrandt

Places
13 (others)



PDO13612 A horse
lying down; with head
to right. ...

by Jan Lievens, Anonymous,
Dutch, and Rembrandt



PDO13924 Study of a
pig, facing left. c.1638-
1639...

by Dutch and Rembrandt



PDO13925 A tethered
pig, facing right.
c.1638-1639...

by Dutch and Rembrandt

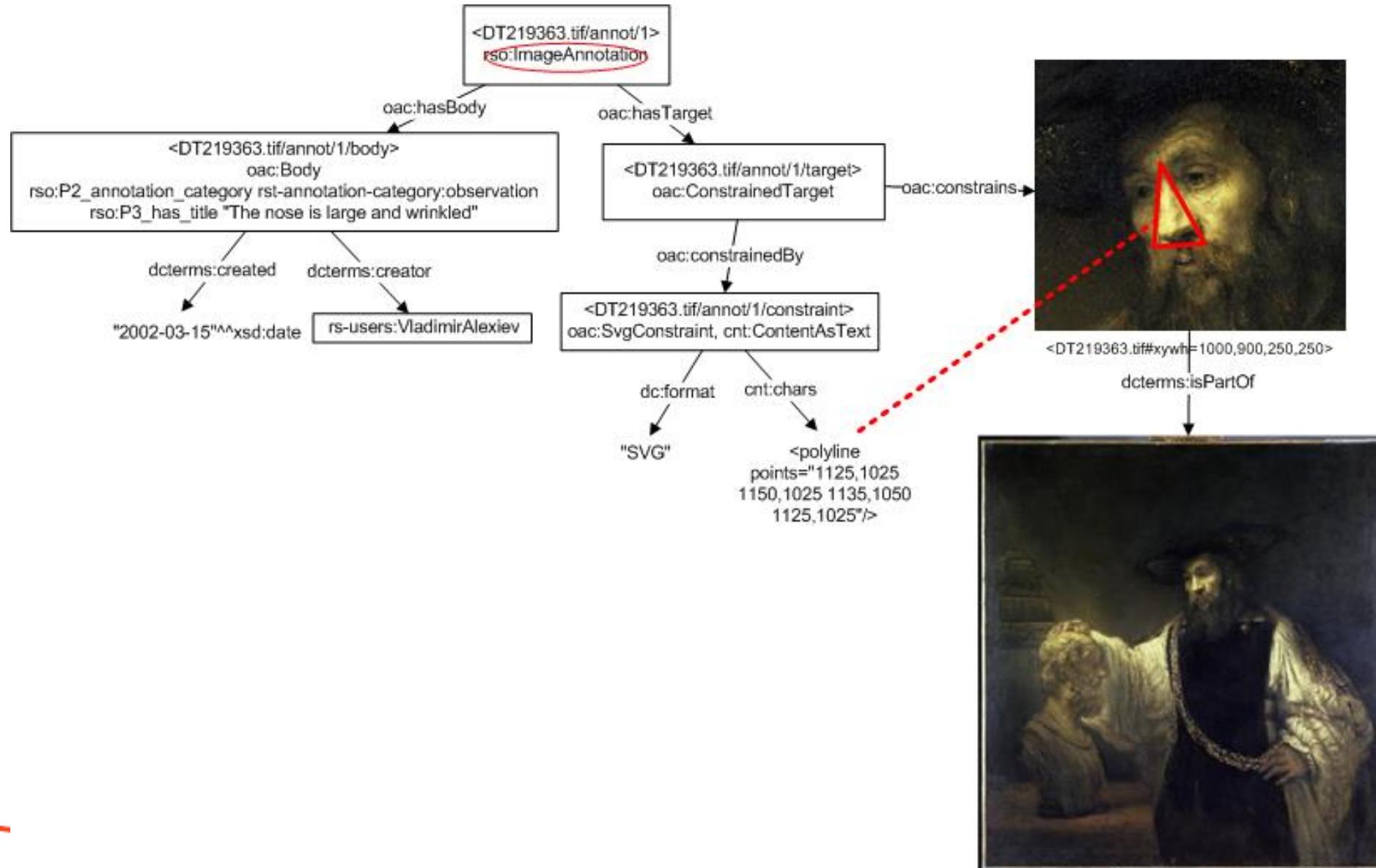


PDO13926 A lion
drinking from a pail;
crouching on...

by Dutch and Rembrandt

ntotext

ResearchSpace: Open Annotation of a SVG Part of Image



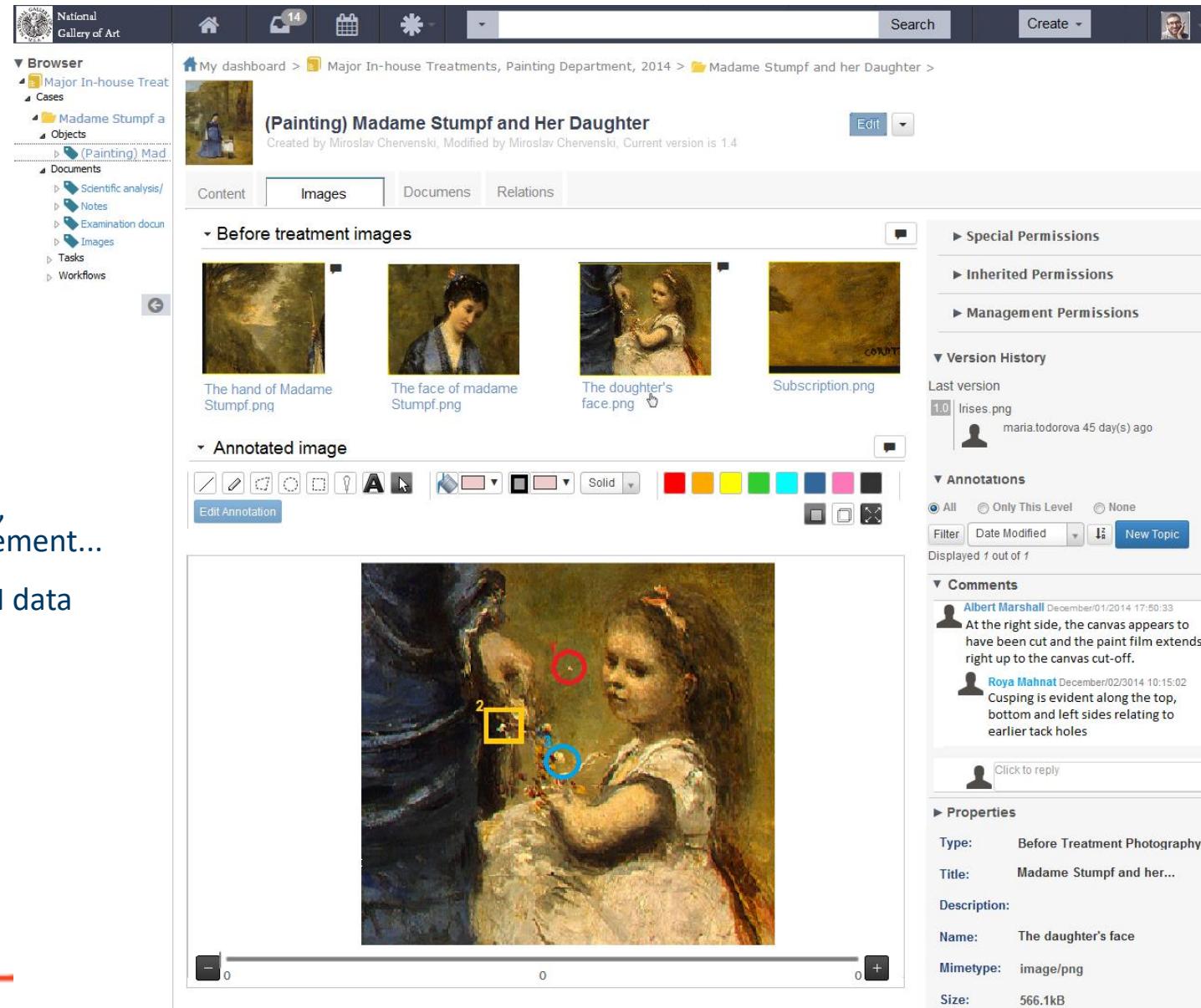
ConservationSpace: Core System for Conservationists

○ Project

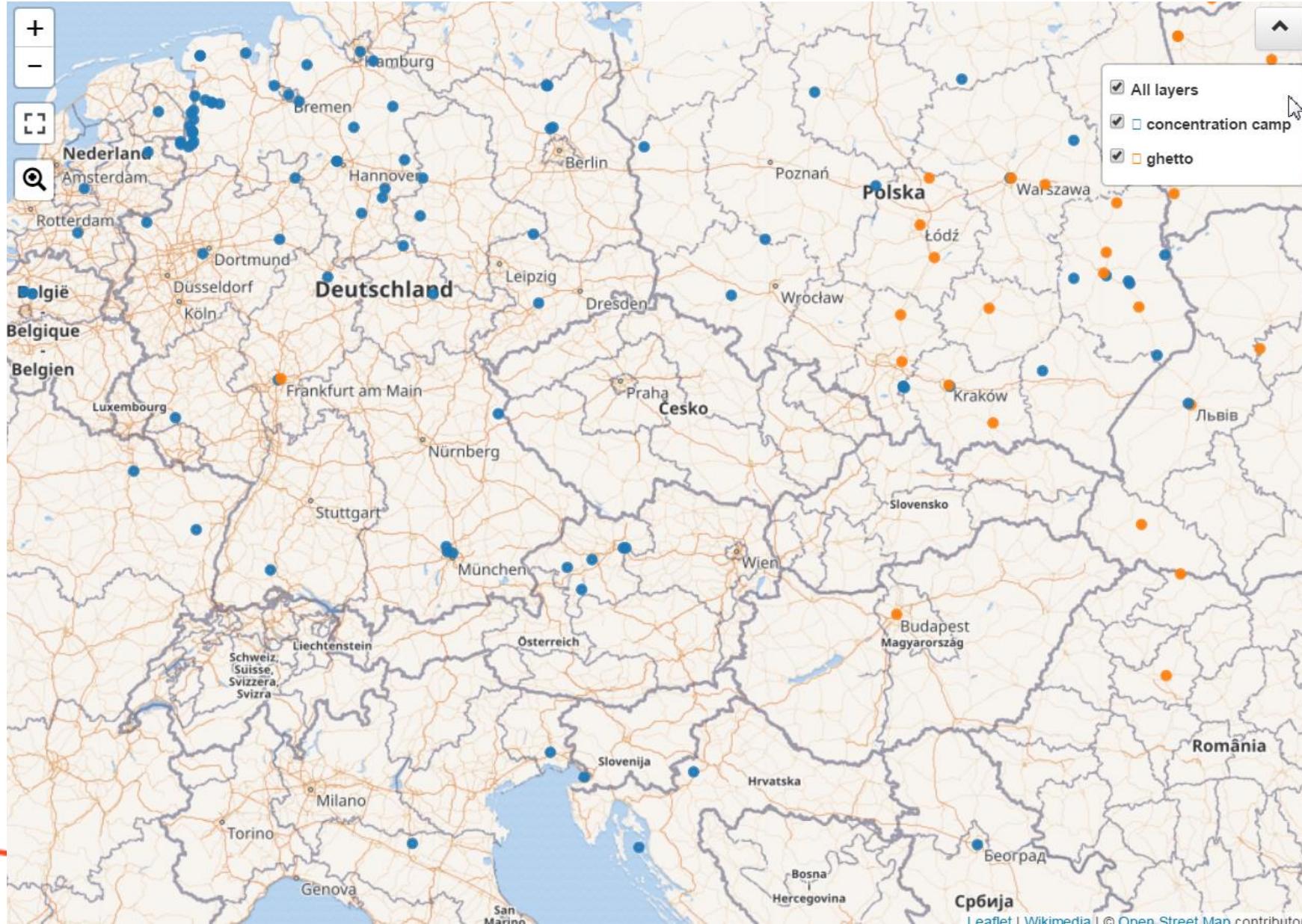
- Mellon Funding
- Led by US National Gallery of Art
- Implemented by Sirma Enterprise
- Supported by ONTO
- Uses GraphDB

○ Based on Sirma Enterprise Platform

- Sirma MuseumSpace: curation/collection management, exhibition and loan management, conservation management...
- Semantic integration, enrichment and publication of CH data
- Digital Asset Management
- Thesaurus Management
- Paper-less office (Sirma GO Digital)
- Contract management
- ISO 9001 QMS document management



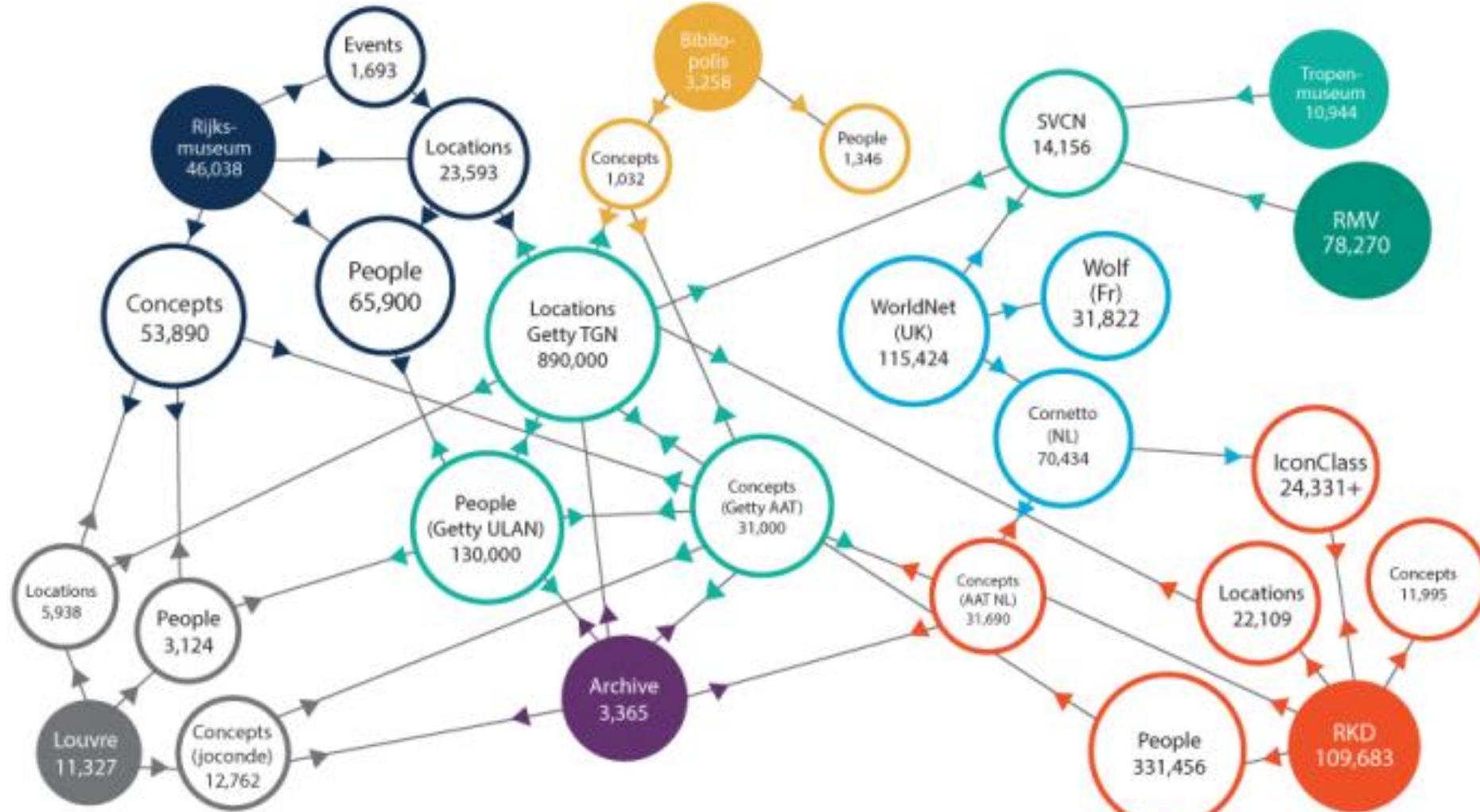
European Holocaust Research Infrastructure



- Camps and Ghettos integrated through Wikidata
- [Blog post \(USHMM\)](#)
- [Camps query](#)

ontotext

Getty Vocabulary Program LOD



Getty Vocabularies Program LOD Project

- **Timeline**
 - Art and Architecture Thesaurus (AAT): [2014-02](#)
 - Thesaurus of Geographic Names (TGN): [2014-08](#)
 - Union List of Artist Names (ULAN): [2015-03](#)
 - Support: 2014-2018
- **ONTO Services**
 - [Semantic/ontology](#) development
 - Contributed to the [ISO 25964 ontology](#) (latest standard on thesauri), provided implementation experience, suggestions and fixes.
 - Published on varieties of Broader relations (BTG, BTP, BTI)
 - Complete mapping specification, [comprehensive documentation](#)
 - Helped implement R2RML scripts working off Getty's Oracle database, contribution to Perl implementation (RDB2RDF), R2RML extension (rrx:languageColumn)
 - GraphDB semantic repository, clustered for high-availability
 - Semantic application development (customized user interface), technical consulting
 - [SPARQL 1.1 compliant endpoint](#), [sample queries](#)
 - Per-entity export files, explicit/total data dumps
 - Semantic dataset description (VOID)
 - Help desk / support on twitter and google group (continuing)
- **GVP LOD is widely regarded as a good example to be followed by GLAMs**

GVP LOD Ontology

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❖ Ontologies (1):

[Getty Vocabulary Program ontology](#)

⌚ Classes (10):

[AdminPlaceConcept](#) , [Concept](#) , [Facet](#) , [GuideTerm](#) , [Hierarchy](#) , [ObsoleteSubject](#) , [PhysAdminPlaceConcept](#) , [PhysPlaceConcept](#) , [Scope Note](#) , [Subject](#)

PropertyParams (177):

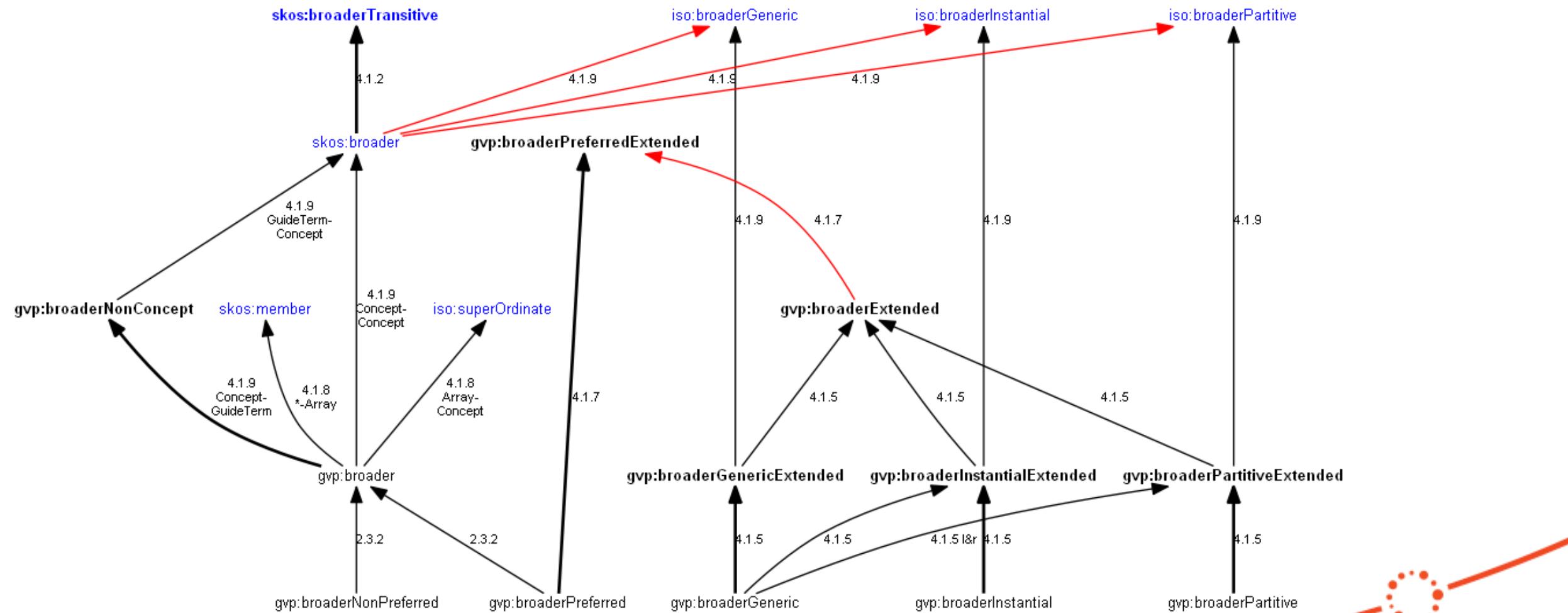
[aat2000_related_to](#) , [aat2001_formerly_referred_to](#) , [aat2100_distinguished_from](#) , [aat2110_meaning-usage_overlaps_with](#) , [aat2203_associated_with](#) , [aat2205_causes-is_required](#) , [aat2206_caused_by-requires](#) , [aat2208_locus-setting_for](#) , [aat2209_used-located_in](#) , [aat2211_produce](#) , [aat2212_produced_by](#) , [aat2215_required_for](#) , [aat2216_require](#) , [aat2218_used-function_as](#) , [aat2219_have_form](#) , [aat2222_act_upon](#) , [aat2223_are_acted_upon](#) , [aat2281_have_counterpart](#) , [aat2285_practiced-studied_by](#) , [aat2286_practice-study](#) , [aat2291_locus-setting_for](#) , [aat2292_work-live_in](#) , [aat2294_locus-setting_for](#) , [aat2295_located_in](#) , [aat2311_performed_by](#) , [aat2312_perform](#) , [aat2315_used_by](#) , [aat2316_use](#) , [aat2318_involved_in](#) , [aat2319_involves](#) , [aat2321_used_by](#) , [aat2322_use](#) , [aat2325_created_by](#) , [aat2326_create](#) , [aat2328_involved_with](#) , [aat2329_involves](#) , [aat2332_affiliated_with](#) , [aat2333_have_affiliates](#) , [aat2335_associated_with](#) , [aat2336_has_associates](#) , [aat2397_focus_of](#) , [aat2398_focuses_on](#) , [aat2408_locus-setting_for](#) , [aat2409_takes_place_in](#) , [aat2411_involved_in](#) , [aat2412_involves](#) , [aat2415_required_for](#) , [aat2416_requires](#) , [aat2418_uses](#) , [aat2419_used_for](#) , [aat2421_locus-setting_for](#) , [aat2422_takes_place_in](#) , [aat2424_produced_by](#) , [aat2425_produces](#) , [aat2427_produced_by](#) , [aat2428_produces](#) , [aat2431_required_for](#) , [aat2432_requires](#) , [aat2434_contextualized_in](#) , [aat2435_context_for](#) , [aat2501_made_of-require](#) , [aat2502_material_for](#) , [aat2504_used-located_in](#) , [aat2505_locus-setting_for](#) , [aat2507_produce-process](#) , [aat2508_produced-processed_by](#) , [aat2551_reflect-produced_by](#) , [aat2552_reflected_in-produces](#) , [aat2554_reflects](#) , [aat2555_reflected_in](#) , [aat2557_reflects](#) , [aat2558_reflected_in](#) , [aat2562_locus-setting_for](#) , [aat2563_located_in](#) , [aat2601_possessed_by-existing_in](#) , [aat2602_possess-exist_in](#) , [aat2604_possessed_by-existing_in](#) , [aat2605_possess-exist_in](#) , [aat2607_caused_by-requires](#) , [aat2608_causes-required_for](#) , [aat2612_possessed_by-existing_in](#) , [aat2613_possess-exist_in](#) , [aat2801_conjuncted_with](#) , [aat2802_exemplified_by](#) , [aat2803_example_of](#) , [aat2805_contextualized_in](#) , [aat2806_provide_context](#) , [aat2807_derived_from_common_source](#) , [aat2809_coexisted_with](#) , [aat2811_preceded](#) , [aat2812_followed](#) , [aat2814_constituent_of](#) , [aat2815_composed_of](#) , [aat2817_derived-made_from](#) , [aat2818_source_for](#) , [aat2821_based_on](#) , [aat2822_basis_of](#) , [aat2824_hasparallels_with](#) , [aat2826_used_with](#) , [aat2828_use-require](#) , [aat2829_used-required_for](#) , [aat2831_associated_with](#) , [aat2833_ancestor_of](#) , [aat2834_descendant_of](#) , [aat2836_derived-made_from](#) , [aat2837_source_for](#) , [aat2841_derived-made_from](#) , [aat2842_source_for](#) , [aat2845_used-located_in](#) , [aat2846_locus-setting_for](#) , [aat2848_involved_in](#) , [aat2849_involves](#) , [aat2852_involved_with](#) , [aat2853_involve](#) , [aat2875_characteristic_of](#) , [aat2876_characterized_by](#) , [aat2878_preceded-source_for](#) , [aat2879_followed-developed_from](#) , [aat2881_reflected_in](#) , [aat2882_reflect](#) , [aat2884_involved_with](#) , [aat2885_involves](#) , [aat2891_exemplified_by](#) , [aat2892_example_of](#) , [aat2894_exemplified_by](#) , [aat2895_example_of](#) , [aat2900_miscellaneous_relationship](#) , [broader](#) , [broaderExtended](#) , [broaderGeneric](#) , [broaderGenericExtended](#) , [broaderInstantial](#) , [broaderInstantialExtended](#) , [broaderNonPreferred](#) , [broaderPartitive](#) , [broaderPartitiveExtended](#) , [broaderPreferred](#) , [broaderPreferredExtended](#) , [contributorAlternatePreferred](#) , [contributorNonPreferred](#) , [contributorPreferred](#) , [displayOrder](#) , [historicFlag](#) , [narrower](#) , [narrowerExtended](#) , [parentString](#) , [parentStringAbbrev](#) , [placeTypeNonPreferred](#) , [placeTypePreferred](#) , [prefLabelGVP](#) , [prefLabelLoC](#) , [qualifier](#) , [sourceAlternatePreferred](#) , [sourceNonPreferred](#) , [sourcePreferred](#) , [term](#) , [termDisplay](#) , [termFlag](#) , [termKind](#) , [termPOS](#) , [termType](#) , [tgn3000_related_to](#) , [tgn3001_distinguished_from](#) , [tgn3005 PossiblyIdentifiedAs](#) , [tgn3101_adjacent_to](#) , [tgn3102_coextensive_with](#) , [tgn3110_meaning-usage_overlaps_with](#) , [tgn3201_capital_of](#) , [tgn3202_capital_is](#) , [tgn3301_ally_of](#) , [tgn3317_member_of](#) , [tgn3318_member_is](#) , [tgn3401_moved_from](#) , [tgn3402_moved_to](#) , [tgn3411_successor_of](#) , [tgn3412_predecessor_of](#) , [tgn3510_historical_connection](#)

❖ Individuals (44):

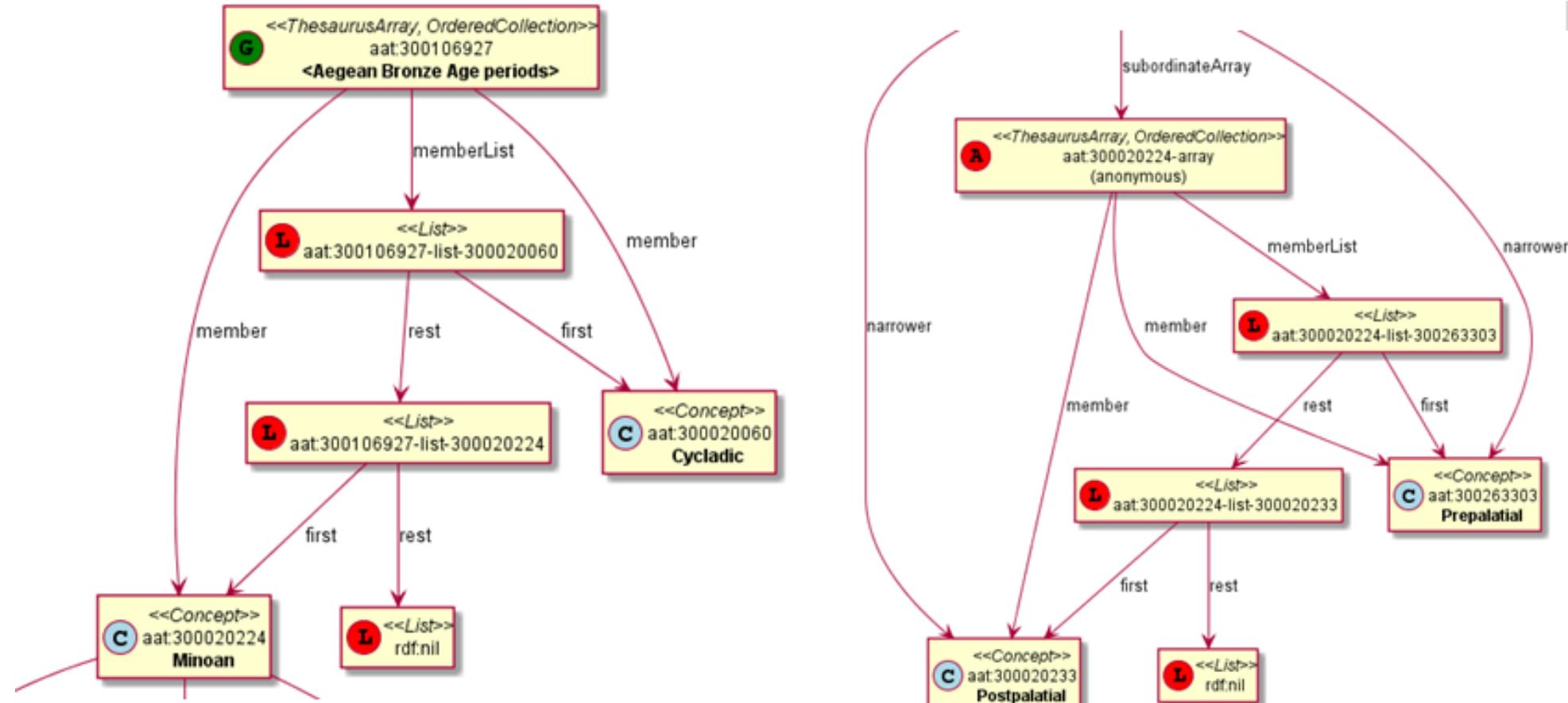
[Abbreviation](#) , [Adjectival](#) , [Alternate Descriptor](#) , [Art and Architecture Thesaurus](#) , [Both](#) , [Both Singular and Plural](#) , [Chemical Name](#) , [Common term](#) , [Current](#) , [Descriptor](#) , [FIPS Code](#) , [Full term](#) , [Getty Research Institute](#) , [Historic](#) , [Historic Flag concept scheme](#) , [ISO alpha-2 code](#) , [ISO alpha-3 code](#) , [ISO numeric-2 code](#) , [ISO numeric-3 code](#) , [Jargon or Slang](#) , [Loan Term](#) , [Neologism](#) , [Noun](#) , [Official Name](#) , [Ontotext Corp](#) , [Part of Speech concept scheme](#) , [Past Participle](#) , [Plural Noun](#) , [Provisional Name](#) , [Pseudonym](#) , [Scientific or Technical term](#) , [Singular Noun](#) , [Site Name](#) , [Term Display concept scheme](#) , [Term Flag concept scheme](#) , [Term Kind concept scheme](#) , [Term Type concept scheme](#) , [Thesaurus of Geographic Names](#) , [US Postal Service Code](#) , [Use for Display](#) , [Use in Indexes/lists](#) , [Used for Term](#) , [Verbal Noun/Gerund](#) , [Vernacular](#)



GVP Specialized Hierarchical Relation Inference



GVP Ordered Guide Term, represented as iso:ThesaurusArray



GVP Documentation: Contents

Getty Vocabularies: Linked Open Data

Semantic Representation

Version: 2.0
Last updated: 19 Aug 2014
HTML version: <http://vocab.getty.edu/doc/> (for link
PDF version: <http://vocab.getty.edu/doc/gvp-lod.pdf>
Formerly at: <http://www.getty.edu/research/tools/>
Initial version: Vladimir Alexiev, Joan Cobb, Greg
Updates: Vladimir Alexiev, Joan Cobb

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Very detailed: 100 pages! Linkable anchors:

 vocab.getty.edu/doc/#Full_Text_Search

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GVP Sample Queries UI

Getty Vocabularies: LOD SPARQL Queries Any ▾ Search... (3) Search Brief ▾ BETA

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(2) Query:

```
1 select ?x ?name ?bio ?start ?end {  
2   ?x gvp:agentTypePreferred [rdfs:label "popes"@en];  
3     gvp:prefLabelGVP [xl:literalForm ?name];  
4     foaf:focus [  
5       bio:event [dct:type [rdfs:label "reign"@en]; gvp:estStart ?start; gvp:estEnd ?end];  
6         gvp:biographyPreferred [schema:description ?bio]]  
7 } order by ?start
```

Include inferred (6)
 Expand results over equivalent URIs

(7) 5.17 Popes and Their Reigns (5)

```
select ?x ?name ?bio ?start ?end {  
  ?x gvp:agentTypePreferred [rdfs:label "popes"@en];  
    gvp:prefLabelGVP [xl:literalForm ?name];  
    foaf:focus [  
      bio:event [dct:type [rdfs:label "reign"@en]; gvp:estStart ?start; gvp:estEnd ?end];  
        gvp:biographyPreferred [schema:description ?bio]]  
  } order by ?start
```

Returns 127 popes. There is one ([ulan:500324155](#) Pius VI) for which the reign is not recorded.

5.18 Pope Reign Durations

Let's chart the durations of Popes' reigns.

```
select ?dur (count(*) as ?c) {  
  ?x gvp:agentTypePreferred [rdfs:label "popes"@en];  
    foaf:focus [bio:event [dct:type [rdfs:label "reign"@en]; gvp:estStart ?start; gvp:estEnd ?end]].  
  bind(xsd:integer(str(?end))-xsd:integer(str(?start)) as ?dur)
```

American Art Collaborative

- **Project**
 - 2-year project (Oct 2015-Nov 2017)
 - Mellon funded
 - [14 US museums and galleries](#)
 - Publish their data to RDF
 - ONTO consulted on semantic mapping and data publishing
 - Worked alongside two Getty staff (semantic architect and data architect)
- **Publications**
 - [Lessons Learned in Building Linked Data for the American Art Collaborative](#), C.Knoblock et al, ISWC 2017: project challenges, volumetrics and semantic conversion experience
 - [American Art Collaborative \(AAC\) Linked Open Data \(LOD\) Initiative: Overview and Recommendations for Good Practices](#). E. Fink, 2018
- **Achievements**
 - Aggregated artwork data from 14 institutions: 233,666 Objects, 28,882 Artists and 20,446 other agents (Related Parties)
 - Made about 15M triples. (For comparison, the British Museum semantic data comprises 2.5M objects and 960M triples.)
 - Used a harmonized data model so the data can be shown together.
 - Harmonized not only data models but also value sets to AAT
 - Linked per-institution artists to ULAN
 - Raised LOD awareness with the target institutions and a wider audience and mobilized inter-institutional collaboration.
 - Some of the institutions took charge of their transformations to establish a sustainable LOD publication process.
 - Created excellent use cases and UI mockups for browsing and exploration, e.g. comparing artists by style, material and genres; artwork timelines, etc.

AAC Target Mapping: eg Actor Gender

Secondary IDs
Secondary IDs for the party

LOD Identifiers
Authority records for the party

Qualities

Gender
The gender of a party

Nationality
The nationality of a party

Birth
Birth of a party

Death
Death of a party

Resources

Biography
A bio about the party

Other Biographies
Alt. biog. of the party

Image
Digital image of the party

Primary Website
Website about the party

Alternate Websites
Other related websites

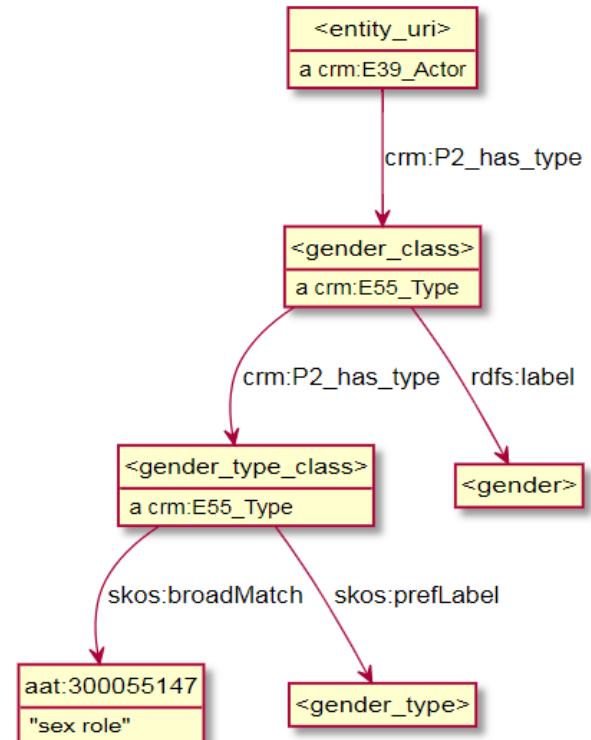
(*) indicates a mandatory field

Query-Specific URLs:

Gender Type Url:

<http://vocab.getty.edu/aat/300055147>

AAC Target Mapping For Gender



AAC Artwork View

National Portrait Gallery

SELF-PORTRAIT WITH RITA



Thomas Hart Benton

CREATION DATE

c.1924

TYPE

Painting

MEDIUM

Oil on canvas

SUBJECTS

Rita Piacenza Benton
Thomas Hart Benton

12 Other works by
this artist in this
institution

DIMENSIONS

146.1 x 121 x 7cm (57 1/2 x 47 5/8 x 2 3/4")
124.5 x 100 x 2.5cm (49 x 39 3/8 x 1")

76 Works by this
artist in other
institutions

ACCESSION #

NPG.75.30

OBJECT #

19570

CREDIT LINES

National Portrait Gallery, Smithsonian
Institution; gift of Mr. and Mrs. Jack H.
Mooney
The artist; stolen from his garage
sometime in 1939. Mr. and Mrs. Jack H.
Mooney, Montgomery, Alabama; gift 1975
to NPG

PARTNER URL

http://npg.si.edu/object/npg_NPG.75.30

LINKED DATA URI

[npg:object/19570](#)

VIEW LOD

[as JSON-LD](#) [as Turtle](#)

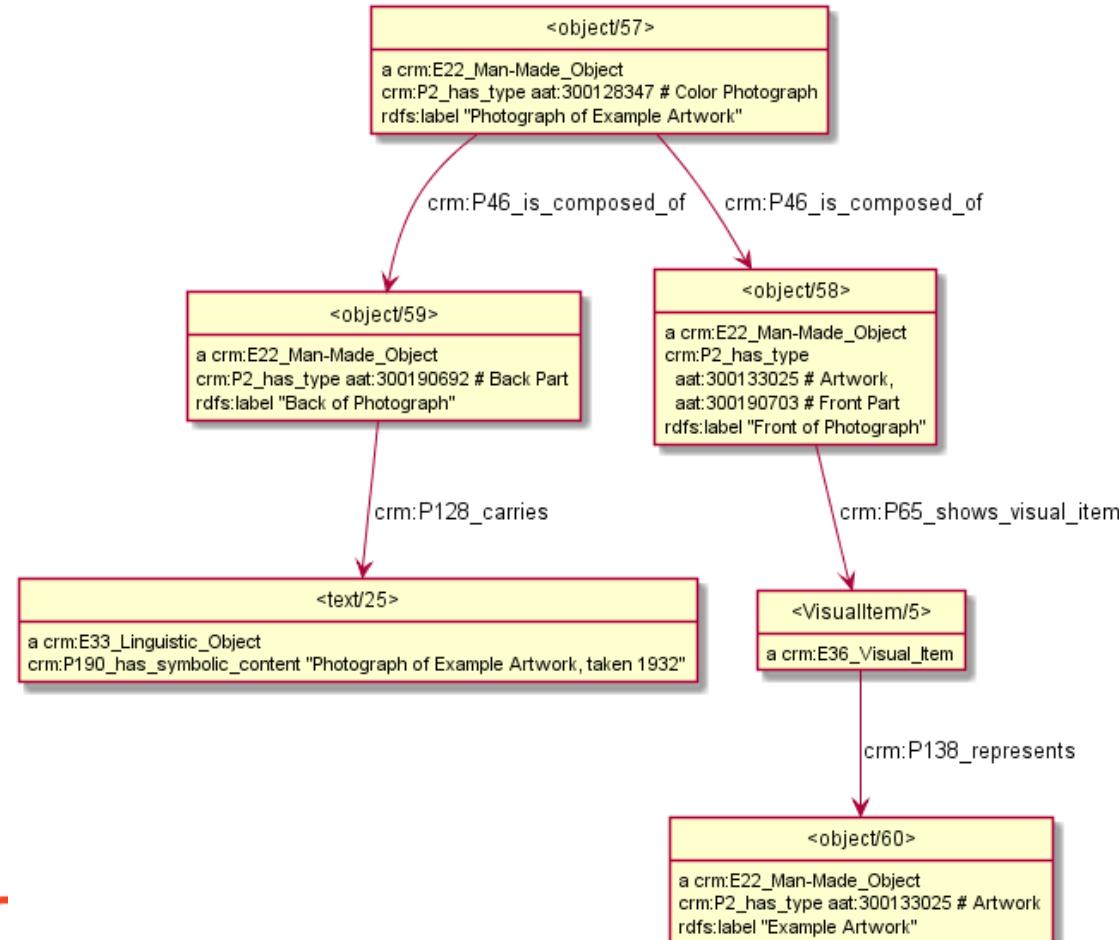
linked.art

- **Created as a post-product of AAC**
 - Application profile for CRM i.e. a particular way of using CRM.
 - Created out of frustration with the complications of applying CRM, promoted under the moniker Linked Open Usable Data (LOUD).
 - Uses CIDOC-CRM as the core ontology, giving an event-based paradigm
 - Uses the Getty Vocabularies as core sources of identity, i.e. specific object types (e.g. painting), activity types (e.g. book binding, gilding, etching), title types (e.g. artists vs repository title), etc
 - JSON-LD as primary RDF serialization. Being JSON, it is more developer-friendly than other serializations.

- **A large number of examples (model components). Count per area:**

- 42 activity,
- 1 concept,
- 2 group,
- 2 identifier,
- 2 legal,
- 1 name,
- 46 object,
- 12 person,
- 6 place,
- 7 set,
- 11 text,
- 2 value

- **Example: back & front of photograph**



linked.art Traveling Exhibition: JSON-LD (left) vs Turtle (right)

```
"@context": "https://linked.art/ns/v1/linked-art.json",
"id": "https://linked.art/example/activity/15",
"type": "Activity",
"label": "Example Travelling Exhibition at Two Museums",
"classified_as": ["aat:300054773"],
"timespan": {
  "id": "https://linked.art/example/time/9",
  "type": "TimeSpan",
  "begin_of_the_begin": "1980-10-01",
  "end_of_the_end": "1981-08-14"
},
"part": [
  {
    "id": "https://linked.art/example/activity/16",
    "type": "Activity",
    "label": "Exhibition at Museum 1",
    "classified_as": ["aat:300054766"],
    "timespan": {
      "id": "https://linked.art/example/time/10",
      "type": "TimeSpan",
      "begin_of_the_begin": "1980-10-01",
      "end_of_the_end": "1981-03-01"
    }
  },
  {
    "id": "https://linked.art/example/activity/17",
    "type": "Activity",
    "label": "Exhibition at Museum 2",
    "classified_as": ["aat:300054766"],
    "timespan": {
      "id": "https://linked.art/example/time/11",
      "type": "TimeSpan",
      "begin_of_the_begin": "1981-03-14",
      "end_of_the_end": "1981-08-14"
    }
  }
]
```

```
@base      <https://linked.art/example/>.
@prefix aat: <http://vocab.getty.edu/aat/> .
@prefix aat: <http://vocab.getty.edu/aat/>.
@prefix crm: <http://www.cidoc-crm.org/cidoc-crm/> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix dcterms: <http://purl.org/dc/terms/> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix la: <https://linked.art/ns/terms/> .
@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#> .

<activity/15> a crm:E7_Activity ;
  rdfs:label "Example Travelling Exhibition at Two Museums" ;
  crm:P2_has_type aat:300054773 ;
  crm:P4_has_time-span <time/9> ;
  crm:P9_consists_of <activity/16>, <activity/17> .

<activity/16> a crm:E7_Activity ;
  rdfs:label "Exhibition at Museum 1" ;
  crm:P2_has_type aat:300054766 ;
  crm:P4_has_time-span <time/10> .

<activity/17> a crm:E7_Activity ;
  rdfs:label "Exhibition at Museum 2" ;
  crm:P2_has_type aat:300054766 ;
  crm:P4_has_time-span <time/11> .

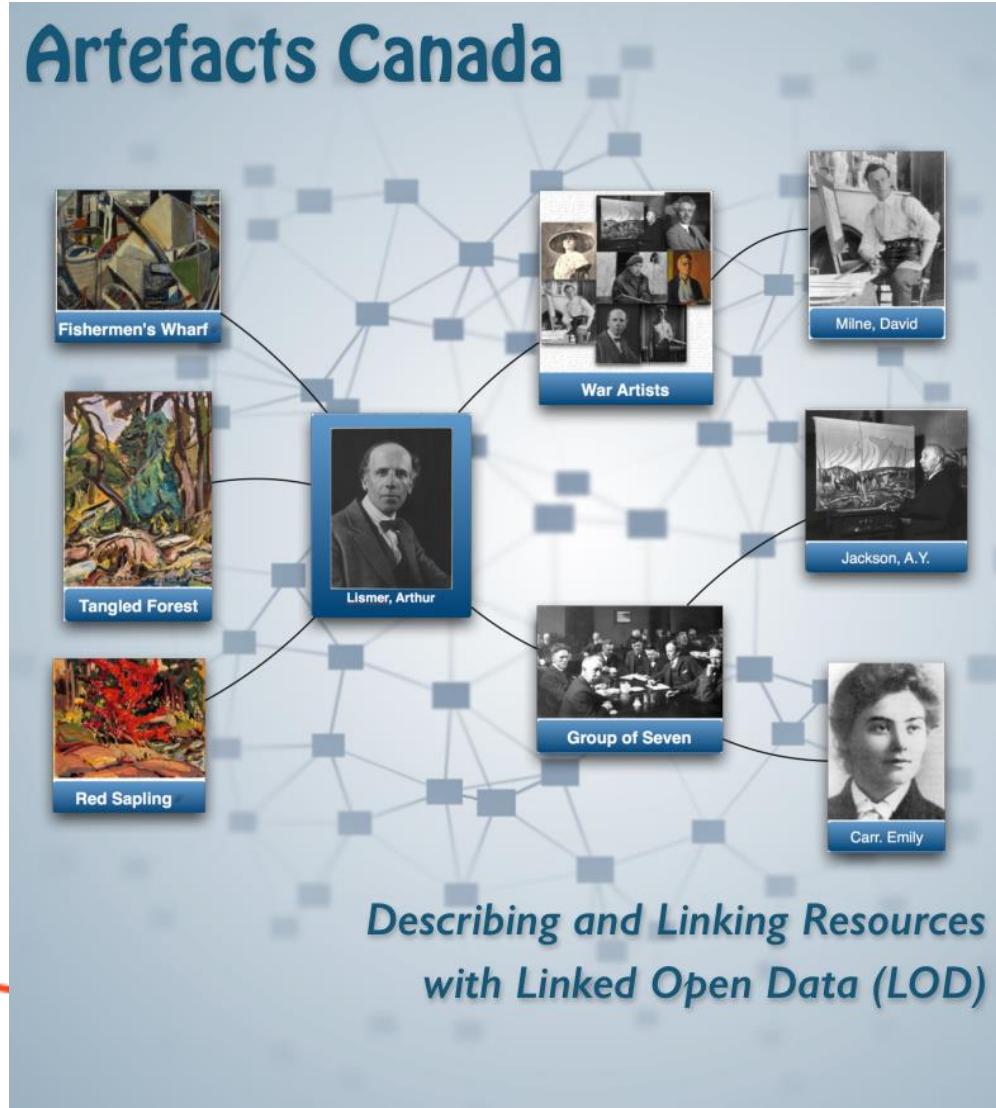
<time/10> a crm:E52_Time-Span ;
  crm:P82a_begin_of_the_begin "1980-10-01" ;
  crm:P82b_end_of_the_end "1981-03-01" .

<time/11> a crm:E52_Time-Span ;
  crm:P82a_begin_of_the_begin "1981-03-14" ;
  crm:P82b_end_of_the_end "1981-08-14" .

<time/9> a crm:E52_Time-Span ;
  crm:P82a_begin_of_the_begin "1980-10-01" ;
  crm:P82b_end_of_the_end "1981-08-14" .
```

Canadian Heritage Information Network

LOD Strategy and Plan



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Canadian Heritage Information Network

LOD Environment Scan: 115p

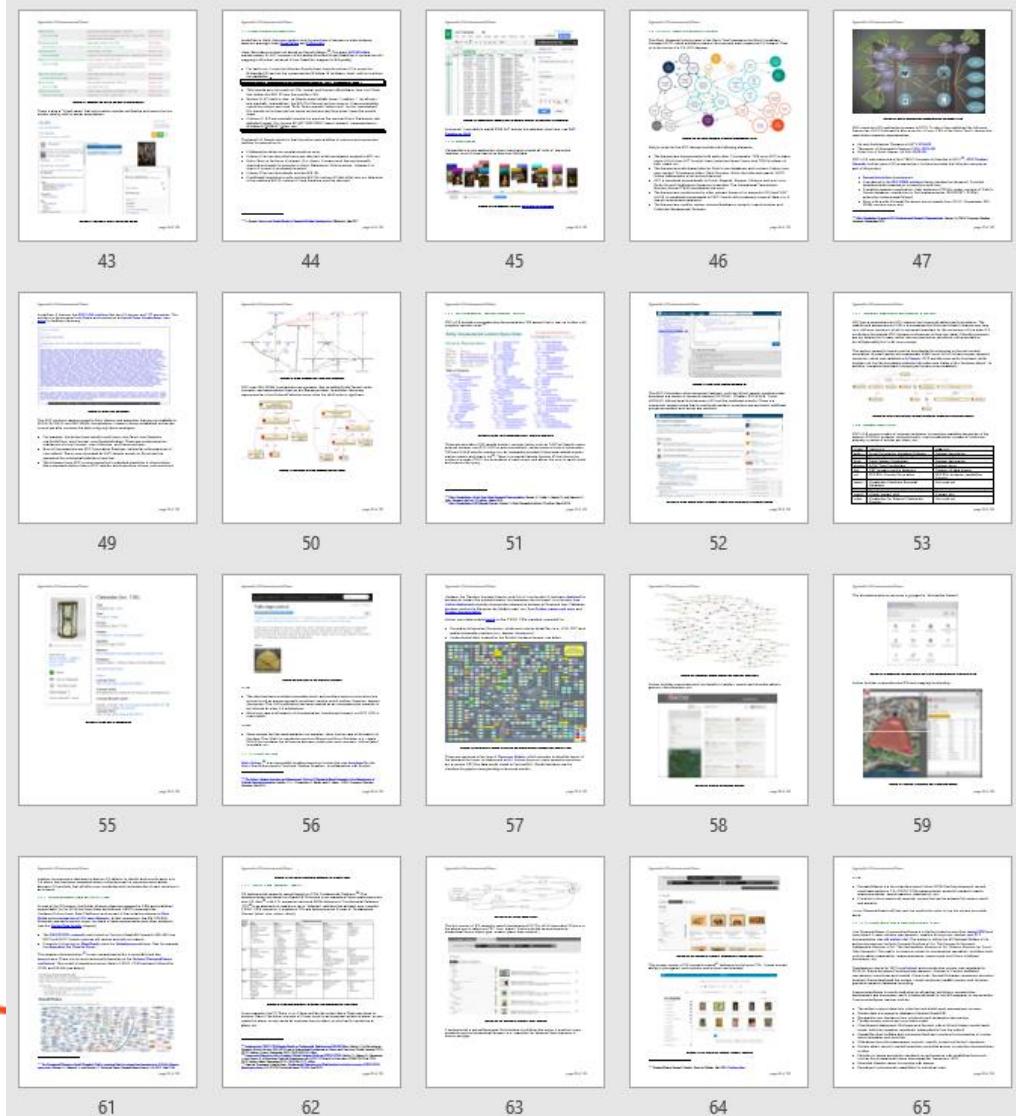


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Artefacts Canada Data Analysis (97p)

Outline X

Artefacts Canada Data Analysis

1 Contents

2 Introduction

 2.1 Executive Summary

 2.1.1 How Much to Clean-Up

 2.1.2 Another LOD Pilot?

 2.1.3 Future Efforts

 2.2 Glossary and Links

 2.3 Revisions

 2.4 Deliverables

 2.4.1 Exports

 2.4.2 Thesauri

 2.4.3 Reconciliation

 2.4.4 Data-analysis

 2.5 Analysis Report

 2.6 Access and Commenting

 2.7 Authors and Effort

 2.8 Author Profiles

 2.9 ONTO Links

3 Tools and Techniques

Note that AAT has only 136 French labels in this facet. Complementing with WD FR as we did for the Object facet will certainly improve the matching.

7 Statistical Analysis

This section explains the statistics and graphics by museum, displayed at Shiny Apps:
<https://lauratolosi.shinyapps.io/museums/>

1. **The drop-down menu** allows the viewer to select a museum. The name of the museum is in English, French or both. Different institution names were matched (see [Institution Data Problems](#)): when several names for the same institution were found, all objects pertaining to these names are reported together.
2. **Number of objects overview plot** shows the number of objects by museum, decreasing sort. The Vertical line shows the currently selected museum, its name and exact number of objects. Please note the vertical axis is in **log10** scale, and all institutions with less than 10 objects should be considered suspect (maybe some data was lost in transmission).

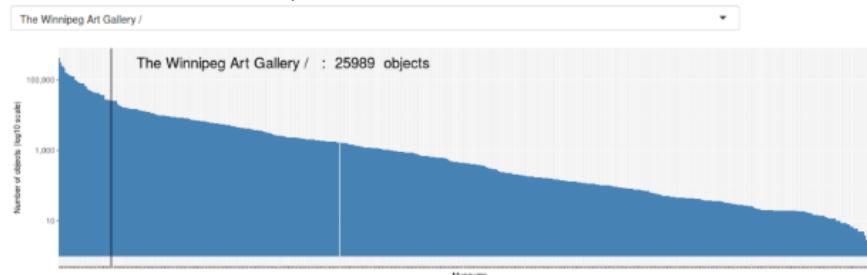
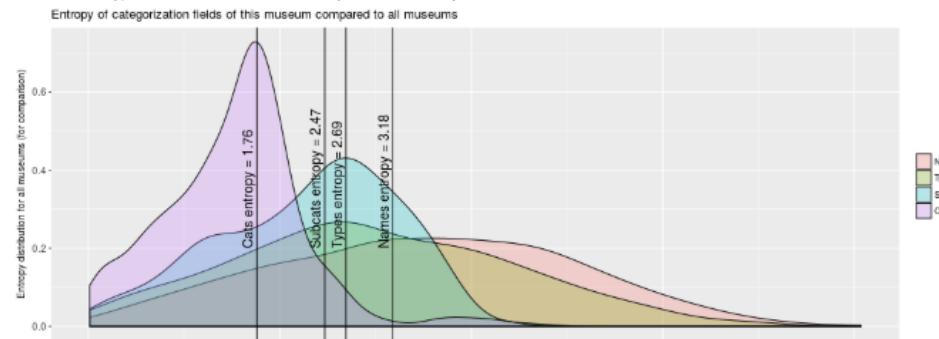


Figure 36 Number of objects per institution (log10 plot)

3. **Entropy plot** shows the entropy of categorial fields for the selected institution (vertical lines), and for all institutions (distributions)



drive) commented. Quite impressive.
That's where the RVM could be used to
match a lot of terms..



Heather Dunn
Mar 20, 2018

[Resolve](#)

I am so amazed by these stats/graphics
- thank you so much for this!!

[Reply...](#)

Nomenclature: LOD is Upcoming in 2020

The screenshot shows the header of the Nomenclature for Museum Cataloging website. At the top right, there are language links for "Français" and "English". Below the header, a dark navigation bar contains links for "Home", "About", "Browse hierarchy", "Search terms", "Bibliography", "User guide", and "Updates".

Browse hierarchy

This screenshot shows the "Browse hierarchy" page. It includes settings for "Term order" (radio buttons for "Inverted" and "Natural", with "Inverted" selected) and "Linguistic variant" (radio buttons for "International" and "Canadian", with "International" selected). A "Change preferences" button is located at the bottom right of the settings area.

The sidebar on the left lists categories under "All categories". It includes "Category 01: Built Environment Objects" which branches into "Building Components" (with "Architectural Spaces" expanded to show "Balcony", "Carport", "Catwalk"), "Cellar", "Deck", "Gangway", "Loggia", "Platform", "Porch", "Porte-Cochère", "Portico", "Stage", and "Stall, Shower".

Sub-class	Architectural Spaces
Definition	Structures and other objects originally created to serve as space-defining internal or external architectural building components.
Definition Source	Nomenclature
Preferred French Term	Espaces architecturaux
Date created	1978-2010
Date updated	2018-07-25
Nomenclature ID Number	4



CHIN Semantic Training

1. What are the most recent developments in the application of Semantic web theories and principles in the heritage and museums domains?
2. Discussion of ONTO's work at CHIN
3. Specific NOM questions
4. Overview of ontologies needed in cultural heritage institutions
5. Semantic data integration. What capabilities/interfaces are needed to manage the entire process surrounding linked data? (LD Life Cycle)
6. Overview of semantic Integration Tools
7. RDF editing tools for persons, events, etc.

E.g. topic 5:

Overview of typical data flows:

- modeling,
- conversion,
- validation,
- matching,
- data fusion,
- text and data enrichment,
- aggregation,
- update;
- model documentation,
- sample queries,
- visualizations and apps

Thank you
for your attention!

Overflow slides follow

For discussion please email Vladimir.Alexiev@Ontotext.com



Outline

- What is LOD
- ONTO Intro
- ONTO Projects & Products
- ONTO CH Projects

END

➤ CH Ontologies

- Europeana

Web Annotation

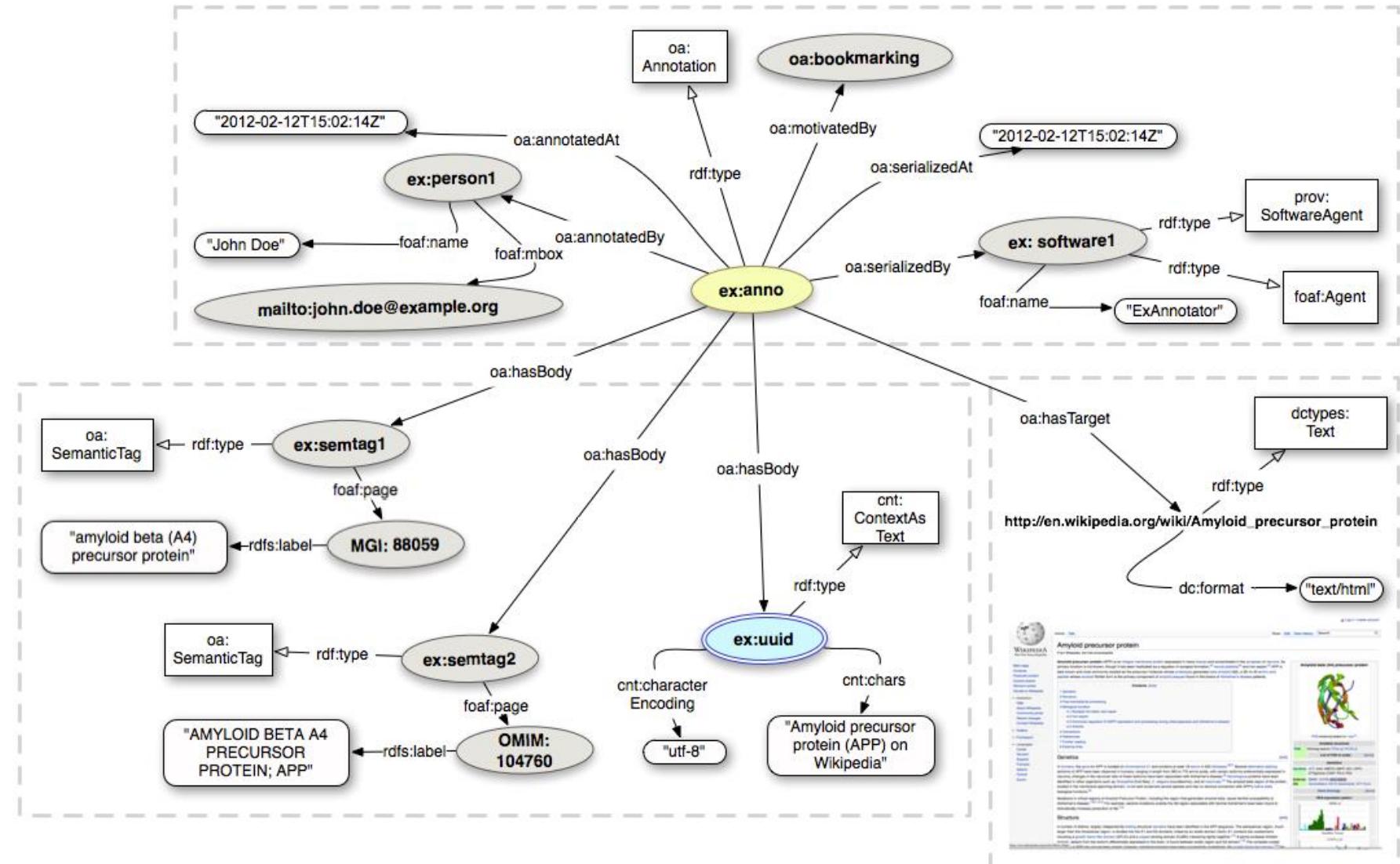
- **W3C OA Specifications**

- [Web Annotation Data Model](#): description of ontology, use cases and combinations
- [Web Annotation Protocol](#): defines the interaction between annotation servers and annotation clients
- [Selectors and States](#): how to select part of a resource (e.g. section of HTML document, rectangle from a PNG image, structural part of a SVG image, page of a PDF) or specify a particular version of a resource as it existed at a certain time.
- [Embedding Web Annotations in HTML](#).

- **Implementations**

- [Annotorious](#) image and text annotator by [Austrian Institute of Technology](#), developed as part of [EuropeanaConnect](#)
- [Lorestore server](#) and [Annotator OA client](#) by [University of Queensland](#), Australia
- [OACVideoAnnotator](#) by [UMD MITH](#) and [Alexander Street Press](#)
- [LombardPress annotator of ancient manuscripts](#) that works over canonic text representations in the [Scholastic Commentaries and Texts Archive](#)
- [Annotopia](#) by MIND Informatics group, Massachusetts General Hospital
- [Hypothes.is](#), largest OA project and development community. Implements the core [AnnotatorJS](#) project. A number of [tools, plug-ins and integrations](#) are available, including Drupal, WordPress and Omeka integrations. [Omeka](#) is a popular light-weight CMS and virtual exhibition system
- [MangoServer](#)
- [Wellcome Quilt](#), funded by the Wellcome Trust
- [Europeana Annotation Server](#)
- [Mirador client](#), a well-known IIIF viewer
- etc etc

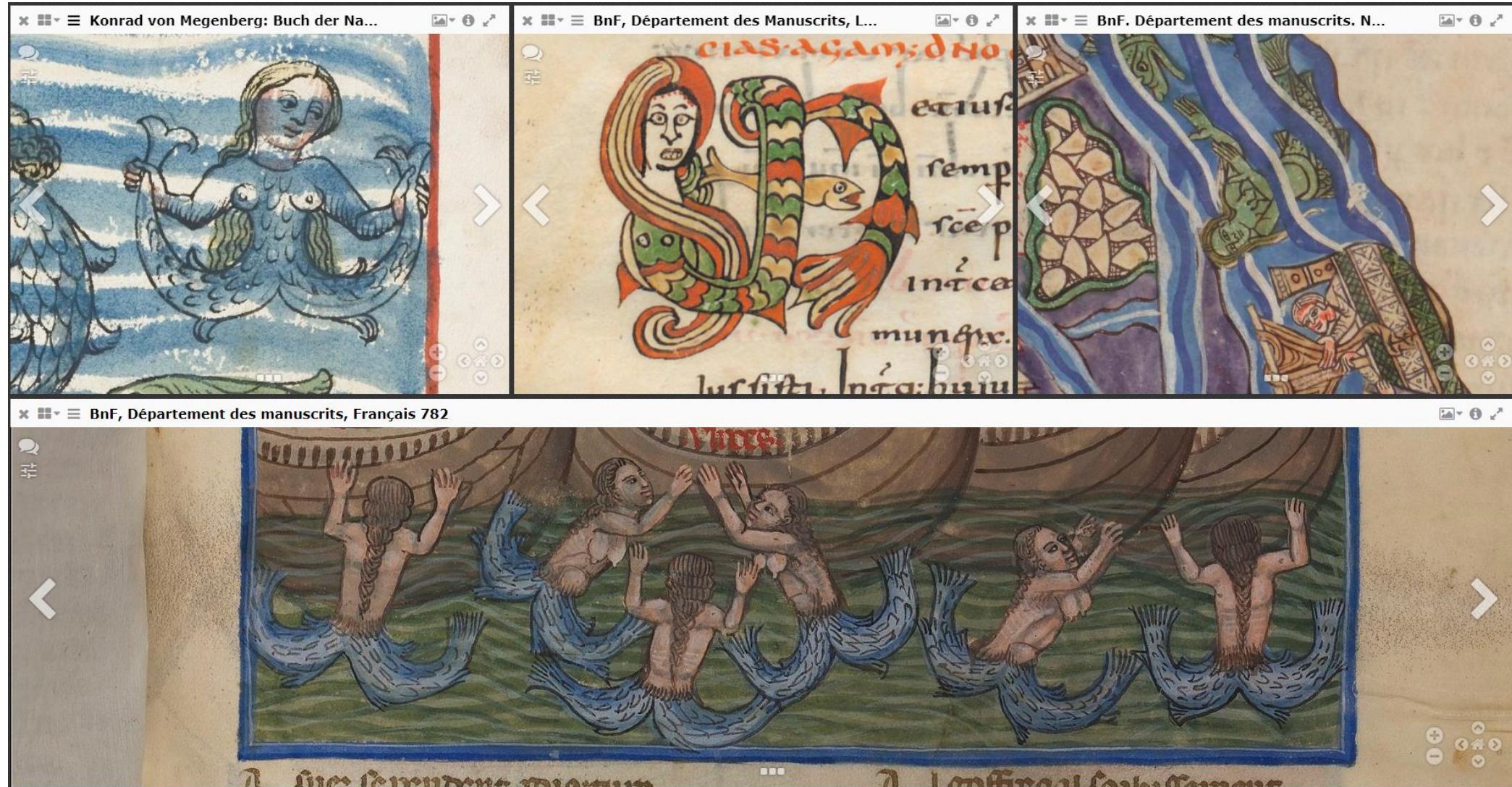
OA Example: Bookmarking and Semantic Tagging (Life Science)



International Image Interoperability Framework (IIIF)

- **iiif.io Specifications**
 - **Image**: semantic description of images (available resolutions, features, credit line, conformance level, etc) and serving features (zooming, gray-scaling, cropping, rotation, etc)
 - **Presentation (Shared Canvas)**: laying images side by side, assembling folios and books (using so-called IIIF Manifests), image annotation. Very popular for virtual reconstruction of manuscripts, book viewers, etc
 - **Authentication**: modes or interaction patterns for getting access to protected resources (e.g. Login, Click-through, Kiosk, External authentication)
 - **Search**: search of full-text embedded or related to image resources (e.g. OCRed or manually annotated text of some old book)
- **IIIF Client Implementations**
 - Diva.js, especially suited for use in archival book digitization initiatives
 - IIIMooViewer, for image streaming and zooming
 - Mirador, implementing a workspace that enables comparison of multiple images from multiple repositories, widely used for manuscripts
 - OpenSeadragon, enabling smooth deep zoom and pan
 - Leaflet-IIIF, a plugin for the Leaflet framework that also includes display of geographic maps
 - Universal Viewer, widely used by CH institutions
- **IIIF Server Implementations**
 - Cantaloupe, enabling on-demand generation of image derivatives
 - IIIPImage Server, fast C++ server also used for scientific imagery such as multispectral or hyperspectral images
 - Loris, a server written in Python
 - ContentDM, a full-featured digital collection management (DAM) system
 - Djatoka, a Java-based image server
 - Digilib, another Java-based image server

IIIF Example: Mirador at Biblissima (French manuscript library)



ontotext

Most Relevant Museum Ontologies

- **CIDOC CRM**
 - Pros: strong foundational ontology, used by numerous projects especially in Europe.
 - Cons: many consider it complicated, some shortcomings for describing relations between people and between objects, not friendly for integrating with other ontologies, the community (SIG) is slow to adopt practically important issues, few application profiles for specific kinds of objects (e.g. coins vs paintings).
- **linked.art**
 - Pros: a simplified CRM profile created under the moniker "Linked Open Usable Data (LOUD)", more developer friendly through an emphasis on JSONLD, used by some projects especially in the US.
 - Cons: various simplifications that are not vetted by the CRM SIG, rift with European CRM developments.
- **Schema.org**
 - Pros: supported by the major search engines thus ensures semantic SEO and findability, used by the largest amount of LOD (on billions of websites), pragmatic and collaborative process for data modeling with a lot of examples, possible extensions as exemplified by bibliographic (SchemaBibEx) and archival extension.
 - Cons: not yet proven it is sufficient to represent rich museum data
- **Wikidata**
 - Pros: universal platform for data integration, richer model than RDF (but also exposed as RDF), pragmatic and versatile collaborative process for data modeling (property creation) with a lot of examples and justifications, used by some GLAMs and crowd-sourced projects (e.g. Authority Control, Sum of All Paintings, Wiki Loves Monuments).
 - Cons: institutional endorsement is not yet strong enough, concerns of institutions how they can be masters of "their own" data.

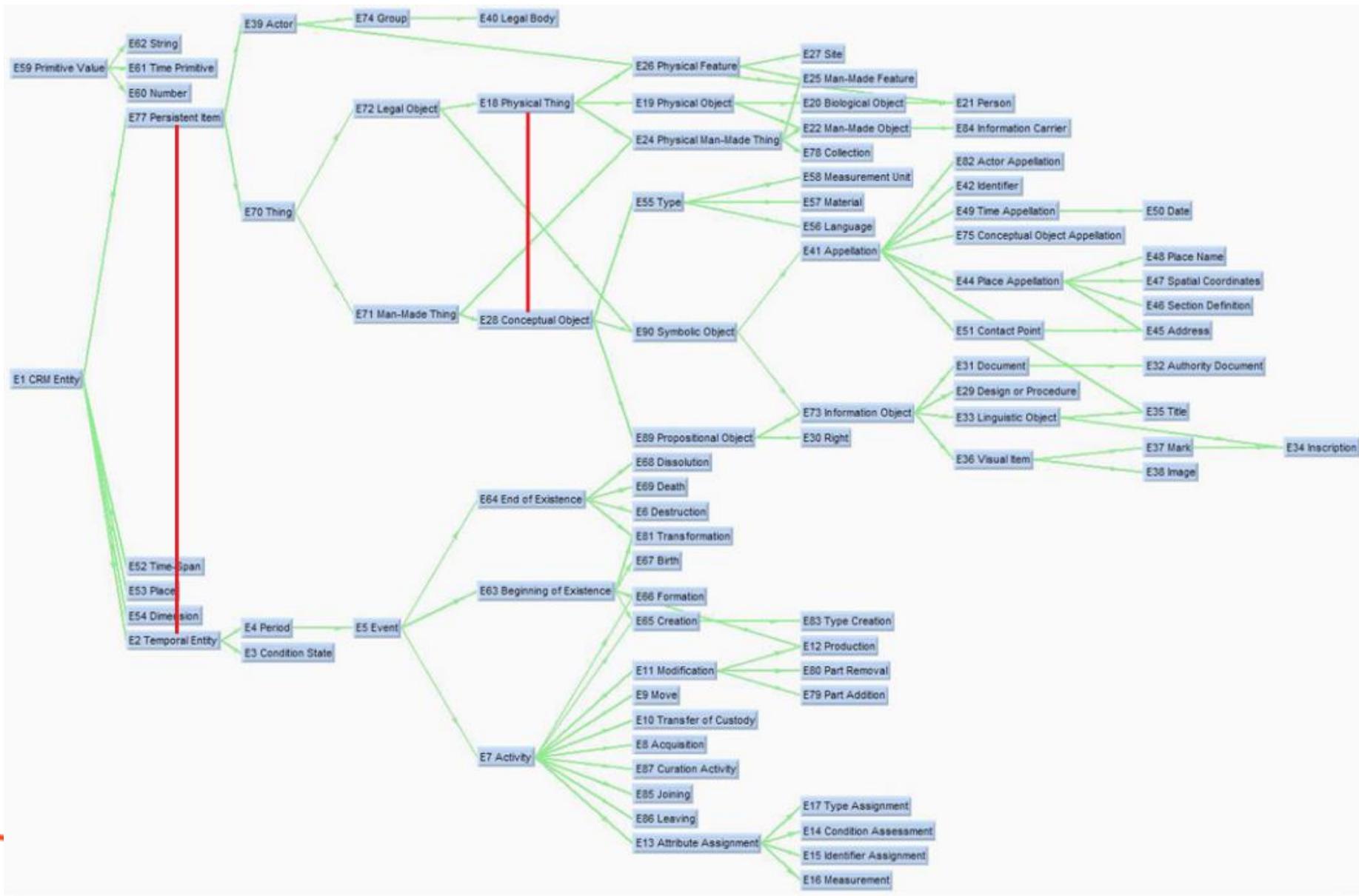
CIDOC CRM

- **Conceptual Reference Model (CRM)**
 - By ICOM, International Committee for Documentation (CIDOC), CRM SIG
 - In development for 17 years (since 1999)
 - Standardized as ISO 21127:2006 in 2006, continues to evolve
 - Current version: CRM 6.2.1 (Oct 2015), version in progress CRM 6.2.3 (May 2018).
- **Foundational ontology for history, archeology and art.**
 - About 85 classes
 - About 285 properties (140 object properties and their inverses, and a few that don't have inverses)

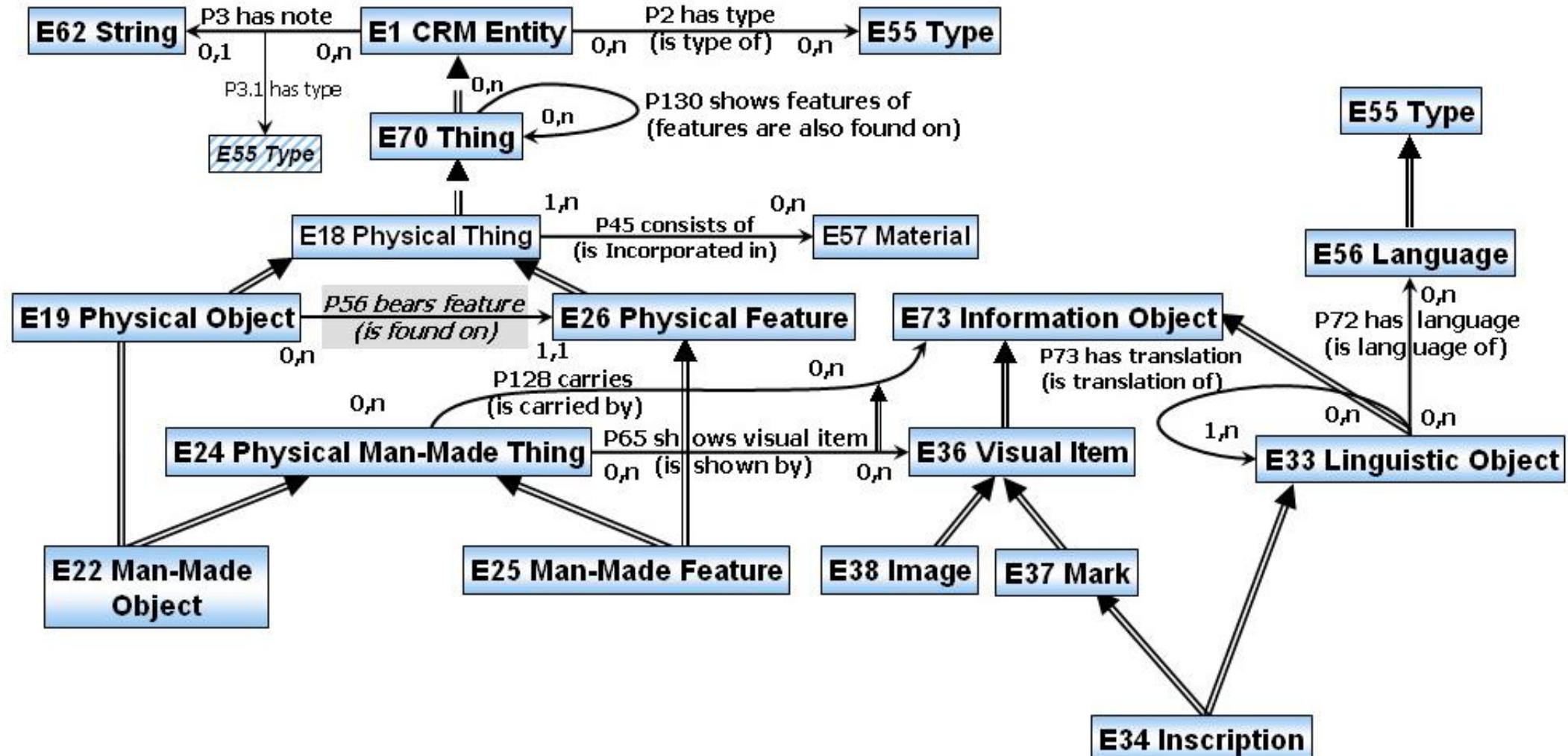
CRM Graphical Representation : Index

1. [CIDOC CRM Class Hierarchy](#)
 2. [Acquisition Information](#) E1 E2 E5 E7 E8 E18 E39 E52 E55 E62 E78 E87; P2 P3 P3.1 P4 P14 P14.1 P22 P23 P24 P51 P52 P147
 3. [Appellation Information](#) E1 E15 E35 E39 E41 E42 E44 E49 E51 E52 E53 E71 E75 E82 E90; P1 P37 P38 P48 P78 P87 P102 P131 P139
 4. [Attribute Assignment](#) E1 E5 E7 E13 E55 E62; P2 P3 P3.1 P140 P141
 5. [Changing Thing](#) E11 E12 E18 E24 E63 E64 E77 E79 E80 E81; P31 P92 P93 P108 P110 P111 P112 P113 P123 P124
 6. [Collection Information](#) E7 E18 E24 E39 E53 E78 E79 E80 E87; P14 P14.1 P46 P49 P50 P53 P109 P110 P111 P112 P113 P147
 7. [Condition Information](#) E1 E2 E3 E5 E7 E14 E18 E29 E39 E52 E55 E62; P2 P3 P3.1 P4 P5 P14 P14.1 P20 P32 P33 P34 P35 P44
 8. [Deaccession and Disposal Information](#) E1 E2 E5 E6 E7 E8 E10 E18 E39 E52 E55 E62; P2 P3 P3.1 P4 P13 P14 P14.1 P22 P23 P24 P28
 9. [Description Information](#) E1 E62 P3 P3.1
 10. [Documentation and References](#) E1 E29 E31 E32 E33 E36 E55 E73 E89 E90; P67 P67.1 P70 P71 P106 P129 P138 P138.1 P148
 11. [Existence Information](#) E6 E12 E18 E21 E24 E28 E63 E64 E65 E66 E67 E68 E69 E74 E77 E81; P13 P92 P93 P94 P95 P96 P97 P98 P99
 12. [Group Dynamics](#) E5 E7 E39 E74 E77 E85 E86; P11 P12 P143 P144 P145 P146
 13. [Image Information Objects and Carriers](#) E1 E24 E36 E38 E41 E73 E84 E89 E90; P1 P62 P62.1 P65 P67 P67.1 P106 P128 P129 P138
 14. [Institution Information](#) E20 E21 E39 E40 E41 E44 E45 E51 E53 E74 E77 E82 E90; P74 P76 P87 P107 P131
 15. [Location Information](#) E4 E5 E7 E9 E12 E18 E19 E24 E44 E45 E46 E47 E48 E53 E55 P7 P8; P20 P21 P25 P26 P27 P53 P54 P55 P58 P:
 16. [Mark and Inscription Information](#) E1 E7 E11 E18 E19 E22 E24 E25 E26 E33 E34 E36 E37 E38 E53 E55 E56 E57 E62 E70 E73; P2 P:
 17. [Material and Technique Information](#) E7 E11 E12 E18 E24 E29 E39 E55 E57; P14 P14.1 P31 P32 P33 P45 P68 P69 P69.1 P108 P129
 18. [Measurement Information](#) E1 E7 E13 E16 E29 E54 E55 E58 E60 E70; P16 P16.1 P32 P33 P39 P40 P43 P90 P91 P125 P140 P141
 19. [Object Association Information](#) E2 E4 E5 E7 E39 E52 E53 E55 E70 E71 E77; P4 P7 P11 P12 P16 P16.1 P19 P19.1 P101 P103
 20. [Object Collection Information](#) E1 E2 E4 E7 E10 E18 E39 E41 E52 E53 E55 E62; P1 P2 P3 P3.1 P4 P7 P14 P14.1 P21 P28 P29 P30 P45
 21. [Object Entry Information](#) E1 E2 E5 E7 E10 E18 E39 E41 E52 E55 E62; P1 P3 P3.1 P4 P14 P14.1 P20 P21 P28 P29 P30 P49 P50
 22. [Object Name and Classification Information](#) E1 E7 E13 E15 E17 E32 E41 E42 E55; P2 P37 P41 P42 P71 P140 P141
 23. [Object Number Information](#) E1 E2 E5 E7 E13 E15 E39 E41 E42 E52; P4 P14 P14.1 P20 P37 P38 P48 P140 P141 P142
 24. [Object Production Information](#) E2 E4 E5 E7 E11 E12 E24 E39 E52 E53 E55 E57 E70 E77; P4 P7 P11 P12 P14 P14.1 P16 P16.1 P21 P:
 25. [Object Title Information](#) E28 E33 E35 E41 E55 E56 E70 E71 E73; P72 P73 P102 P130 P130.1
 26. [Part and Component Information](#) E11 E18 E19 E26 E57 E59 E60 E79 E80; P45 P46 P56 P57 P111 P113
 27. [Person Nationality Information](#) E4 E21 E44 E45 E46 E47 E48 E53 E55 E67 E74; P2 P7 P10 P87 P98 P107
 28. [Planned Activities \(design, purpose, use\)](#) E1 E5 E7 E11 E29 E55 E57 E70 E71 E83; P2 P15 P16 P17 P19 P20 P21 P32 P33 P68 P101 P1
 29. [Recorder Information \(Attribute Assignment\)](#) E1 E2 E7 E13 E28 E31 E39 E52 E65 E89 P4 P14 P14.1; P67 P70 P94 P140 P141
 30. [Reference Information](#) E1 E24 E28 E31 E89; P62 P62.1 P67 P67.1 P70 P129
 31. [Reproduction Rights Information](#) E1 E30 E39 E55 E62 E70 E72 E89; P2 P3 P3.1 P75 P104 P105 P129
 32. [Spatial - Temporal Relationship](#) E2 E4 E5 E52 E53 E54; P1 P4 P7 P83 P84 P88 P89 P114 P115 P116 P117 P118 P119 P120 P121 P122
 33. [Subject Depicted Information](#) E1 E18 E21 E24 E27 E53 E55 E89; P53 P62 P62.1 P67 P67.1 P148
 34. [Taxonomic Discourse](#) E1 E7 E17 E28 E55 E65 E83; P2 P41 P42 P94 P127 P135 P136 P137 P137.1
 35. [Time-Span Information](#) E1 E2 E3 E4 E5 E41 E49 E50 E52 E53 E59 E61 E62 E77; P1 P4 P5 P7 P9 P10 P78 P79 P80 P81 P82 P83 P84

CRM Classes



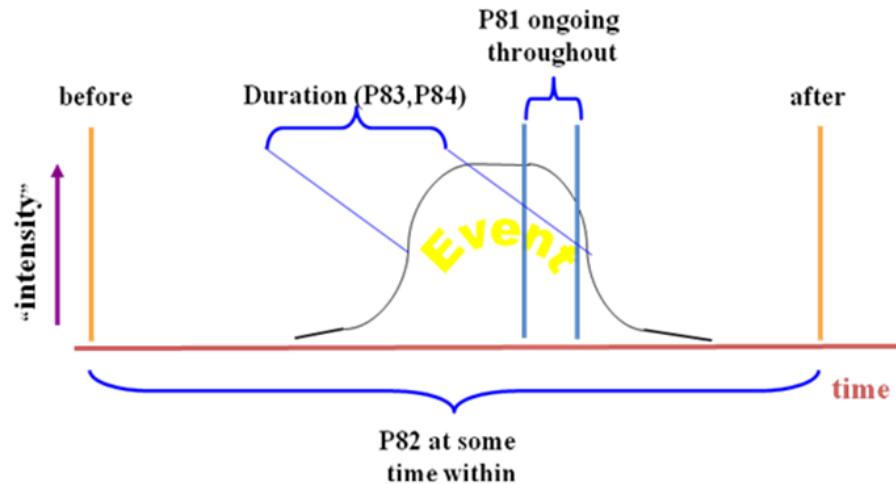
CRM Graphical: Mark and Inscription Information (part 1)



Apply CRM: Model Coins

- **E22_Man-Made_Object**
 - standardized P2_has_type (e.g. Coin from AAT or more specific from Nomisma)
 - P56_bears_feature E25_Man-Made_Feature
 - P43_has_dimension E54_Dimension with P2_has_type (e.g. die axis), P91_has_unit (e.g. "o'clock"), P90_has_value
- **E25_Man-Made_Feature**
 - standardized P2_has_type: Obverse or Reverse
 - P65_carries_visual_item E38_Image (e.g. of a ruler) and/or E34_Inscription (text)
- **E38_Image**
 - P138_represents (e.g. some ruler from ULAN, or e.g. "laurel wreath" from AAT)
- **E34_Inscription**
 - P3_has_note "the text"
 - and P72_has_language (e.g. Latin from AAT)
 - optionally P73_has_translation to another Linguistic Object

CRM Time Spans



CRM property	Meaning	Latin phrase	Meaning
P82a_begin_of_the_begin	started after this moment	terminus post quem	limit after which
P81a_end_of_the_begin	started before this moment	terminus a quo	limit from which
P81b_begin_of_the_end	finished after this moment	terminus ad quem	limit to which
P82b_end_of_the_end	finished before this moment	terminus ante quem	limit before which

CRM Extensions

- FRBRoo: bibliographic information following FRBR principles (Work-Expression-Manifestation-Item), artistic performances and their recordings
- PRESoo: periodic publications
- DoReMus: music and performances
- CRMdig: digitization processes and provenance metadata
- CRMinf: statements, argumentation, beliefs
- CRMsci: scientific observations
- CRMgeo: spatiotemporal modeling by integrating CRM to GeoSPARQL
- Parthenos Entities: research objects, software, datasets
- CRMeh (English Heritage): archeology
- CRMarchaeo: archeology, excavation, stratigraphy
- CRMba: buildings
- CRMx: proposed extension for museum objects, including simple properties such as main depiction of an object, preferred title, extent, etc

Outline

- What is LOD
- ONTO Intro
- ONTO Projects & Products
- ONTO CH Projects

END

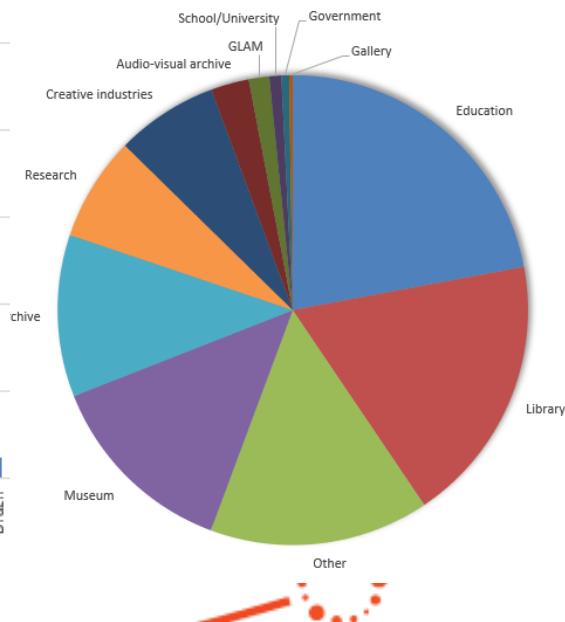
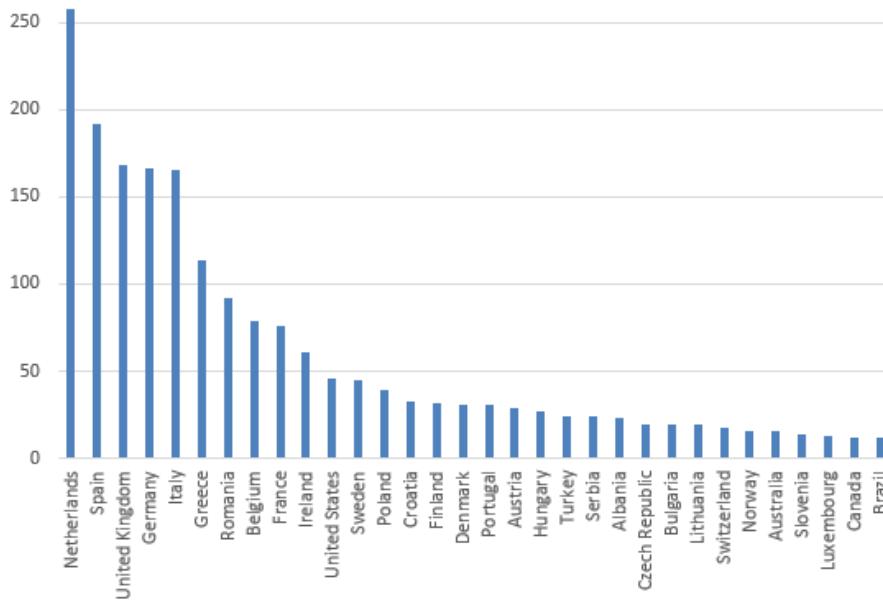
- CH Ontologies
- Europeana

Europeana

- Started in 2008
 - Has aggregated 53M objects at present
 - Perhaps 50-70 Europeana-related projects
 - Currently supported by Connecting Europe Facility as a Digital Service Infrastructure
- Uses Europeana Data Model (EDM), an RDF ontology
- General search and display mechanism
 - The search is not semantic (e.g. won't catch different multilingual names, unless they are included in enriched object data)
 - A set of fixed facets (including image characteristics).

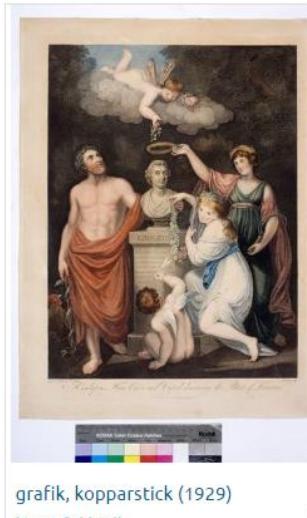
- Europe (and beyond) GLAM Networking

- Foundation: does the work, ~50 staff
- Association: elections, 2066 members, 75 countries, 19 from BG
- Members Council (36, growing to 50): sets strategy
- Task Forces: tech guidelines, temporary
- Work Groups: tech guidelines, more permanent
- Data Quality Council: reflects new strategy



Europeana: Search Paintings of Cupid

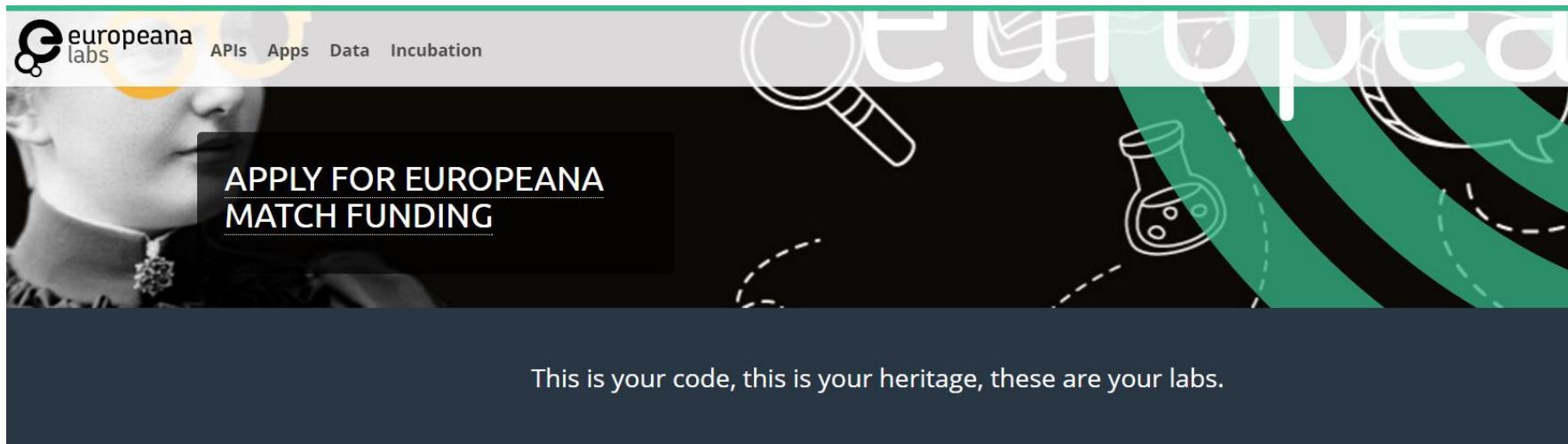
The screenshot shows the Europeana search interface with the following details:

- Search Terms:** paintings (highlighted), Cupid (highlighted), Add a search term.
- MEDIA:** Image | FILE FORMAT: JPEG
- Results:** 1 - 12 of 22 results
- Per page:** 12 | GRID (selected) | LIST
- Refine Your Search (Left Sidebar):**
 - COLLECTIONS:** All items (selected), Art, Fashion, Music.
 - MEDIA:** Image (22) (selected).
 - PALETTE:** Colour (20), Black And White (2).
 - COLOUR:** A color palette grid.
 - ORIENTATION:** Portrait (14), Landscape (8).
 - SIZE:** Extra Large (4MP+) (13).
- Paintings displayed:**
 -  **Emblemata Amatoria. Embleme...** by Unknown
 -  **grafik, kopparstick (1929)** by James Caldwall
 -  **The Hunter's Present** by Metsu, Gabriël
 -  **The Rape of Europa** by Verkolje, Nicolaas

Europeana Collections: a "Personal Face"

The screenshot shows the Europeana Collections website. At the top, there's a navigation bar with 'BETA' and the 'Europeana collections' logo, followed by 'Collections', 'Explore', 'Exhibitions', 'Blog', 'OUR SITES', and 'LANGUAGE'. A large, stylized illustration of two women's faces, one with dark hair and one with light hair, serves as the background for the header. Overlaid on this is a black banner with the text 'EUROPEANA FASHION' and a search bar with the placeholder 'Add a search term'. To the right of the search bar are a magnifying glass icon and a 'Browse' button. Below this, a dark blue bar contains the text 'Discover 815,943 historical dresses, accessories and catwalk photographs from across Europe.' In the bottom right corner of the main image, there's a small caption: 'Penelope: Nyaste journal för damer 1859, Stiftelsen Nordiska Museet' and 'Public Domain'. At the bottom of the page, there are several categories with small thumbnail images: 'Paul Poiret' (a woman in a patterned dress), 'Balenciaga' (a dark dress), 'Madeleine Vionnet' (a yellow dress), 'Fashion illustrations' (a woman in a dark dress), 'Pumps' (a gold-colored pump shoe), 'Skirts' (a red pleated skirt), and a 'More people...' link. On the far right, there's a red curved line graphic and the word 'ontotext'.

Europeana Labs: Galleries of Apps and Datasets



LATEST UPDATES

SHOWCASE

Europanorama

Discover a big data book that investigates European culture and identity. This research project used over 240,000 images of cultural objects available on Europeana.

DATA

Art Nouveau drawings of plants and ornaments

A collection of drawings illustrating plants and their ornamental applications during the famous Art Nouveau movement. Discover a pattern book that gathers colorful floral prints.

BLOG

Meet Storypix

An interview with #EuropeanaChallenge winner, Storypix, about democratising art, museum innovation and other stories.

IIIF Example: Search IIIF Images on Europeana

sv_dcterms_conformsTo: *iiif* X Add a search term

1 - 12 of 2,505,663 results

Per page: 12 GRID LIST

REFINE YOUR SEARCH

COLLECTIONS

- All Items
- 1914-1918
- Art
- Fashion
- Manuscripts

More ▾

MEDIA

- Text (1,836,970)
- Image (668,686)
- 3D (7)

Only items with links to media

CAN I USE IT? ?

Three manuscript pages are displayed:

- Varii textus theologici, sermones**
Hugo (musician); Master Hugo; Jan Hus
- Lectionarium bipartitum, pars h...**
Jan Hus
- Varii textus philosophici**
Jan Hus