

STIC Info – Master 2

Info 907: Web Sémantique



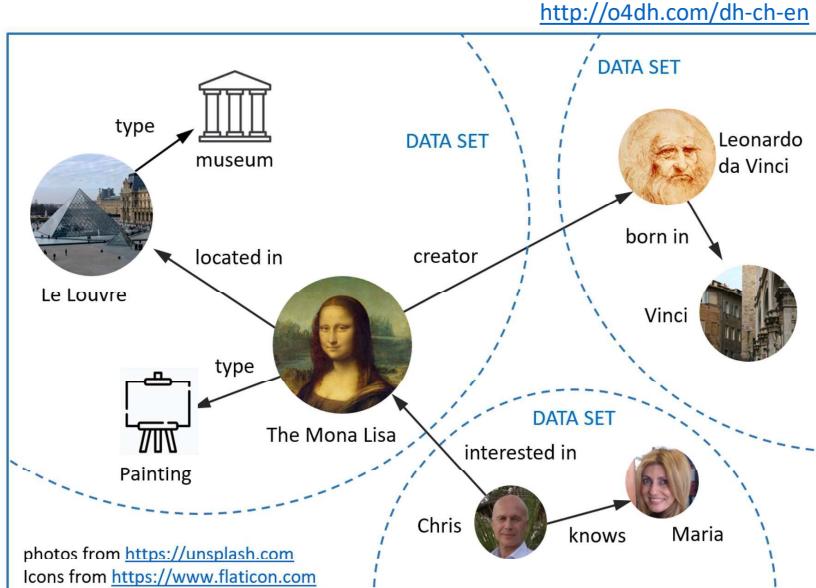
Web des Données (Données Ouvertes et Liées)

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Knowledge Graph



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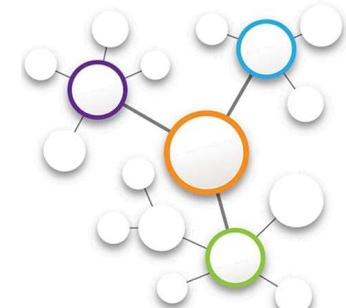
Web des données

https://fr.wikipedia.org/wiki/Web_des_donn%C3%A9es



Le **Web des données** (*linked data*, en anglais) est une initiative du [W3C](#) (Consortium World Wide Web) visant à favoriser la publication de [données structurées](#) sur le Web, non pas sous la forme de silos de données isolés les uns des autres, mais en les reliant entre elles pour constituer un réseau global d'informations.

Il s'appuie sur les standards du [Web](#), tels que [HTTP](#) et [URI](#) - mais plutôt qu'utiliser ces standards uniquement pour faciliter la navigation par les êtres humains, le Web des données les étend pour partager l'information également entre machines. Cela permet d'interroger automatiquement les données, quels que soient leurs lieux de stockage, et sans avoir à les dupliquer¹.



2

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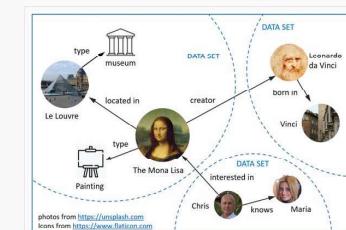
O4DH: Ontologies For Digital Humanities



Digital Humanities & Cultural Heritage (Greek)

The World Wide Web has changed the way people search and discover information that gives them the opportunity to access millions of documents instantly. Electronic repositories, libraries, archives facilitate access to original and rare documents. The new challenge is to overcome traditional data management and information browsing barriers and enable online searches for things, not strings.

In order to achieve this, computers have to 'understand' the world somewhat like humans do. Unlike string-based searches and probability-based methods of information retrieval, Knowledge Graphs (KG) provide computers with structured data across a range of interlinked online resources. In this way, data have added value, as they are no longer stored in silos, but become part of graph databases openly accessible online. For example, a Knowledge graph permits to represent explicitly the information related to Da Vinci as nodes linked by types of relationships. In this way, all the nodes associated to Leonardo Vinci, e.g. his paintings, his birthplace etc., are more easily retrievable.



Ontologies are kinds of Knowledge Graphs that are built in order to describe areas of knowledge promoting interoperability and seamless connectivity across different online sources. Ontologies are Semantic Web (SW) technologies.

« The Semantic Web is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation » Berners-Lee, T., Hendler, J., Lassila, O.: The semantic web. Scientific American Magazine, pp. 29–37, 2001.

The idea behind the Semantic Web is that while information in digital form may be accessible online, its importance remains largely unexplored by search engines. Computers can easily detect search words, but they do not understand the context in which these appear. The vision of the Semantic Web is that the web (as it is now) will be transformed from a collection of documents understood only by humans into a global knowledge base, in which computers will process information based on official semantic data models. Ontologies form the basis of the Semantic Web and will help realize the vision of more effective retrieval of the information sought by users of the World Wide Web, which is constantly becoming larger and more chaotic (at least 5.60 billion indexed web pages as of July 2020).

Thanks to the W3C Consortium (W3C), a number of open standards / languages have been developed, in order to pave the way for the Semantic Web. Among the most important ones are Extensible Markup Language (XML), Resource Description Framework (RDF), Web Ontology Language (OWL), and SPARQL Query Language for RDF (SPARQL).

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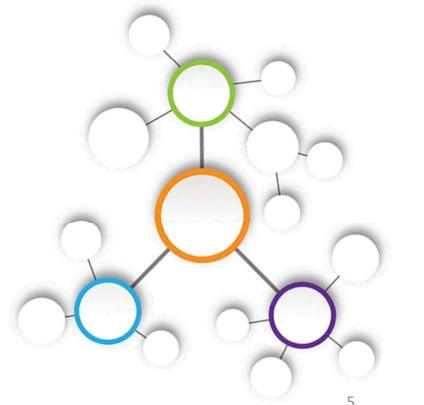
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Knowledge Graphs

■ How to build them?

■ How to structure them?

■ How to query them?



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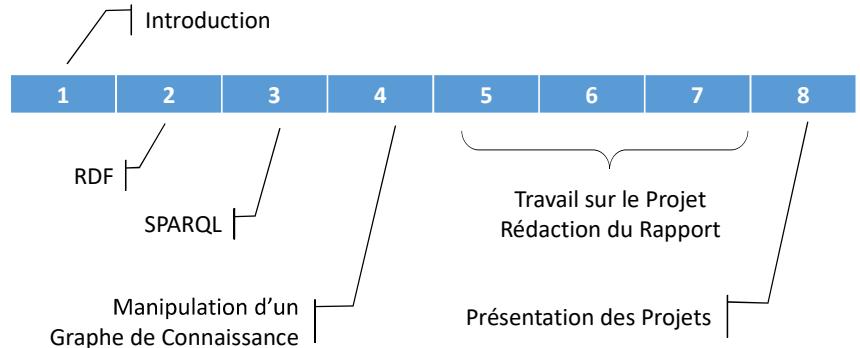
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Structure



Info 907: Web Sémantique

Info 911: Ingénierie des Connaissances



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Contenus



Info 907: Web Sémantique

- Definition du WS et Linked Data
- Knowledge Graph
- Languages RDF
- SPARQL

Info 911: Ingénierie des Connaissances

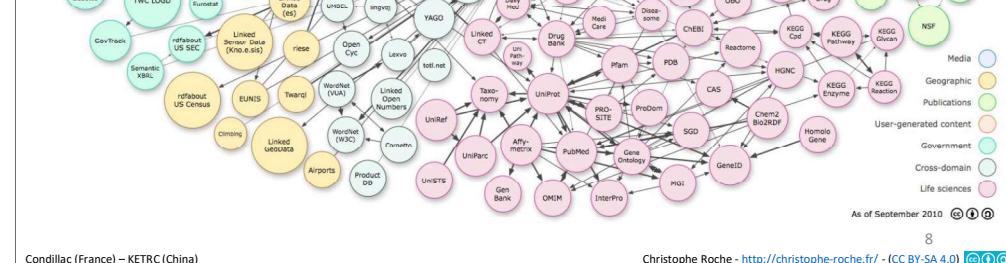
- Ontologies
- Protégé

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Web of Data Semantic Web



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An introduction to the Semantic Web

<https://www.youtube.com/watch?v=OGg8A2zfWKg>

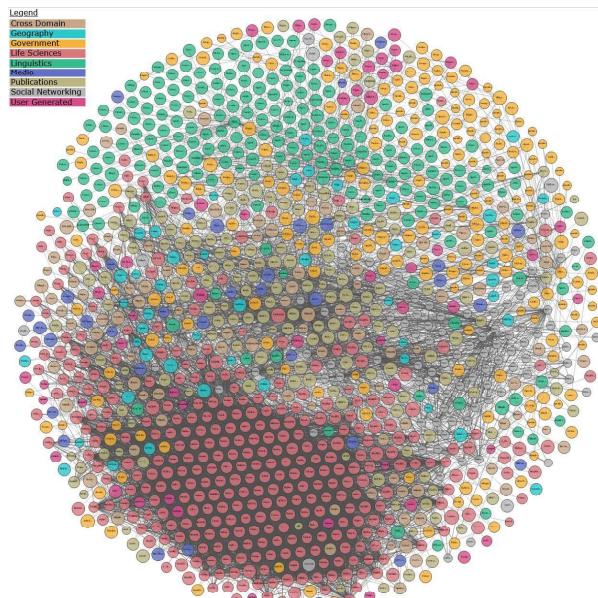
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The Linked Open Data Cloud

<https://lod-cloud.net/>



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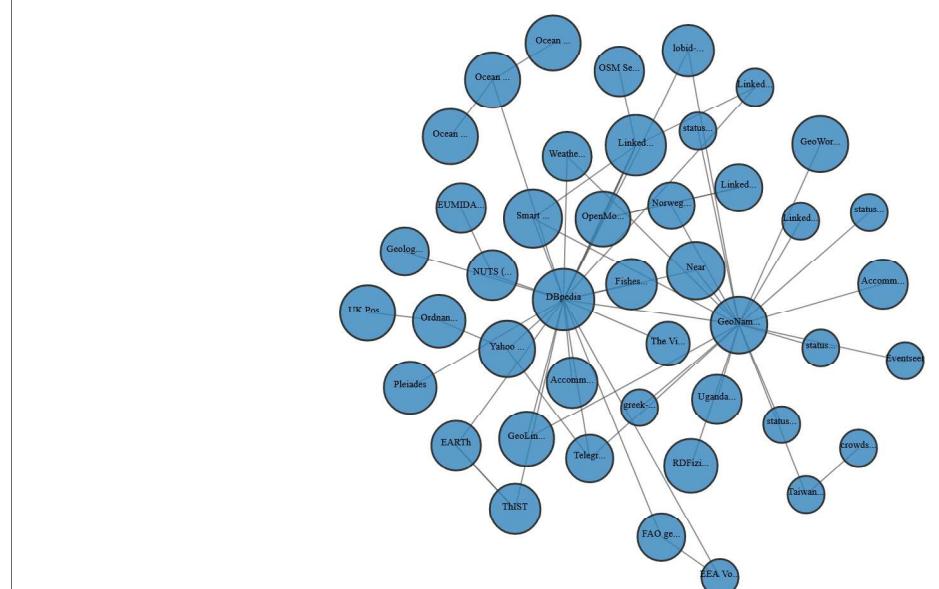
The Linked Open Data Cloud

[Geograph](https://lod-cloud.net/)

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Web Sémantique
ou comment se déplient sur le web les données liées et la sémantique de leurs schémas.

Fabien Gandon

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INTRODUCTION

Histoire

- Tim Berners-Lee, Consultant au CERN

- 1980 : programme de prise de notes avec création de liens (hypertexte) machine multi-utilisateurs
- 1989 : hypertexte pour la gestion de l'information liens étendus aux adresses réseaux des documents données et liens sont décentralisés sur internet => (erreur 404)

- Fin 1990 : 1^{er} serveur et 1^{er} navigateur dénommé **World Wide Web** testés à travers une connexion internet (machine NeXT)

- 1993 : la technologie du web issue du CERN devient gratuite et libre de droits

- 1994 : Crédit du **World Wide Web Consortium (W3C)**

- membres fondateurs : INRIA, MIT, Université de Keio
- publication des standards du web



Cor... tC (China)

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INTRODUCTION



Le **World Wide Web** (WWW), littéralement la « toile (d'araignée) mondiale », communément appelé le Web, et parfois la Toile, est un système hypertexte public fonctionnant sur Internet. Le Web permet de consulter, avec un navigateur, des pages accessibles sur des sites. L'image de la toile d'araignée vient des hyperliens qui lient les pages web entre elles.

Web 1.0 was an early stage of the conceptual evolution of the World Wide Web, centered around a top-down approach to the use of the web and its user interface. [...] users could **only view webpages** but not contribute to the content of the webpages. **Web documentaire (web 1.0)**

Web social
(web 2.0)

A **Web 2.0** site may allow users to **interact and collaborate** with each other in a social media dialogue as creators of user-generated content in a virtual community, in contrast to websites where people are limited to the passive viewing of content. Examples of Web 2.0 include social networking sites, blogs, wikis, folksonomies, video sharing sites, hosted services, web applications, and mashups

Definitions of **Web 3.0** vary greatly. Some believe its most important features are the Semantic Web and personalization. **Web sémantique (web 3.0)**

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Web des données ouvertes et liées

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ARCHITECTURE DU WEB

✓ 3 notions fondamentales (web originel)

1. URI (Universal Resource Identifier)

- identifiant unique permettant de référencer une ressource sur un réseau
- URL** (Universal Resource Locator)
 - chemin d'accès à une représentation de la ressource sur le Web

2. Protocole HTTP (HyperText Transfer Protocol)

- protocole de communication client-serveur développé pour le Web

3. HTML (HyperText Markup Language)

- langage de balisages d'hypertextes dédié à la représentation et à l'échange de pages web.
- HTML est dérivé de SGML (Standard Generalized Markup Language), langage de description à balises normalisé ISO (ISO 8879:1986)

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ARCHITECTURE DU WEB

✓ Format d'échange textuel de données structurées

XML (Extensible Markup Language)

« langage de balisage extensible », langage informatique de balisage générique dérivé de SGML, est un format d'échange de contenus structurés (arborescence) entre systèmes d'informations hétérogènes (interopérabilité).

⇒ **Web des données structurées**



Lier les données ?

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ARCHITECTURE DU WEB

✓ RDFS (RDF Schema)

langage extensible de représentation des connaissances :

- *Classes*
- *Sous-classes*
- *Propriétés (domaine et co-domaine)*

✓ OWL (Ontology Web Language)

- langage de représentation d'ontologies sur la base de RDF et RDFS
- basé sur la logique des descriptions

✓ RIF (Rule Interchange Format)

Format d'échange de règles d'inférences (Si condition Alors action)

⇒ **Web sémantique**

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ARCHITECTURE DU WEB

✓ RDF (Resource Description Framework)

RDF est un format d'échange de données liées pour le Web.

Ces données sont représentées sous la forme de graphes (ensemble de triplets « sujet-prédicat-objet »).

✓ SPARQL (SPARQL Protocol And RDF Query Language)

langage de requête permettant la recherche, l'ajout, la modification et la suppression de données RDF sur Internet.

⇒ **Web des données (ouvertes) liées**



Gérer les données ?

⇒ **Métadonnées (structure, sens...)**

⇒ **Web sémantique**

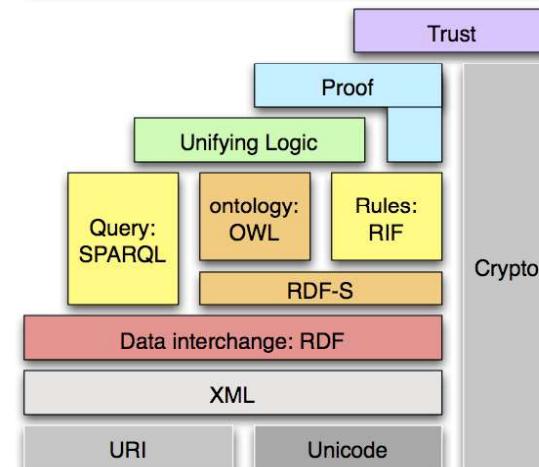
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ARCHITECTURE DU WEB

User Interface & applications



Les standards du web sémantique (Semantic Web Layer)

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Web of Data

The ultimate goal of the Web of data is to enable computers to do more useful work and to develop systems that can support trusted interactions over the network.



Web Architecture

1. **URI*** (Universal Resource Identifier):
Unique identifier permitting to reference a resource on the Web
2. **HTTP Protocol** (HyperText Transfer Protocol)
Protocol of client-server communication developed for the Web
3. **HTML** (HyperText Markup Language)
Markup language of hypertexts dedicated to representation and interchange of web pages.
4. **XML** (Extensible Markup Language)
Textual Interchange format of structured data

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The Internationalized Resource Identifier (IRI)
is an Internet protocol standard which extends the ASCII characters subset of the Uniform Resource Identifier (URI) protocol. While URLs are limited to a subset of the ASCII character set, IRIs may contain characters from the Universal Character Set (Unicode/ISO 10646), including Chinese, Japanese kanji, Korean, and Cyrillic characters.

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Knowledge Graph?

A **knowledge graph** is a **special kind of database** which stores **knowledge in a machine-readable form** and provides a means for information to be collected, organised, shared, searched and utilised.



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Contents

1. What is a Knowledge Graph?
2. An introductory example
3. How to represent a KG?
4. How to query a KG?
5. Practical Works
6. Building/Querying a KG
7. Project



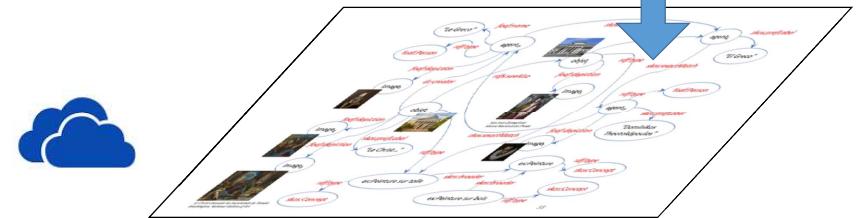
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Knowledge Graph



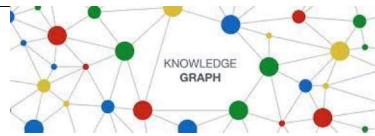
Backend



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Search Engines



The **Knowledge Graph** is a [knowledge base](#) used by [Google](#) and its services to enhance its [search engine](#)'s results with information gathered from a variety of sources.

The information covered by the Knowledge Graph grew significantly after launch, tripling its size within seven months (covering 570 million entities and 18 billion facts^[2]) and answering "roughly one-third" of the 100 billion monthly searches Google processed in May 2016. (Wikipedia)



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WIKIPEDIA
The Free Encyclopedia

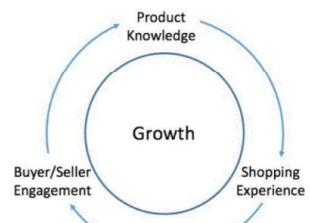
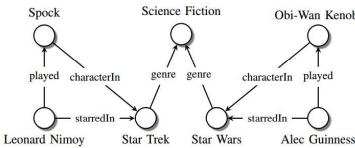
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E-Commerce



Product Graph

❑ Mission: To answer any question about products and related knowledge in the world



http://conferences.cis.umac.mo/icde2019/wp-content/uploads/2019/06/icde-2019-keynote-luna-dong.pdf
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Baidu, Inc. ([Chinese: 百度; pinyin: Bǎidù](#), anglicized /'baidu:/ [BY-doo](#)) is a Chinese multinational [technology company](#) specializing in Internet-related services and products and [artificial intelligence](#) (AI), headquartered in [Beijing's Haidian District](#).^[5] It is one of the largest AI and internet companies in the world.

<https://ai.baidu.com/broad/introduction?dataset=kg>

Introduction

In recent years, there has been rapid developments in **knowledge graph** and it has become a very important resource to support **artificial intelligence applications**. One of the example is **search engine**, based on the structured information from a knowledge base a search engine can perform semantic analysis on a user's query to better understand his/her intention.

Baidu Baike (/'baidu: 'baɪkə; Chinese: 百度百科; pinyin: Bǎidù Bāikē; literally: 'Baidu Encyclopedia') is a Chinese-language collaborative online encyclopedia owned by the Chinese technology company Baidu.

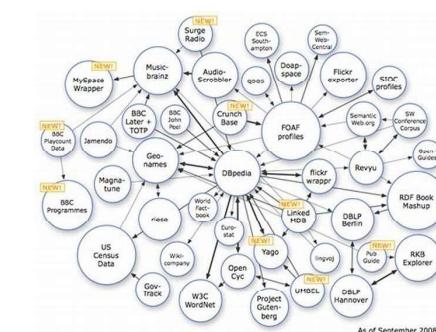
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Encyclopaedias



<https://wiki.dbpedia.org>



Knowledge bases are playing an increasingly important role in enhancing the intelligence of Web and enterprise search and in supporting information integration.

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Encyclopaedias

A Survey of Techniques for Constructing Chinese Knowledge Graphs and Their Applications

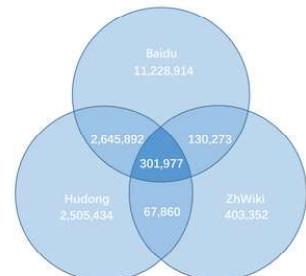
<http://zhishi.me/>

About
Lookup
Cov-Lookup
SPARQL
Publications
Credits
API

Zhishi.me is an effort to build Chinese Linking Open Data. Currently, it covers three largest Chinese encyclopedias: Baidu Baike, Hudong Baike and Chinese Wikipedia.

Dataset overview:

- 14,307,056 entities from Baidu Baike
- 5,521,163 entities from Hudong Baike
- 903,462 entities from Chinese Wikipedia (zhwiki)



Last Modification: 2018-11-12

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Encyclopaedias

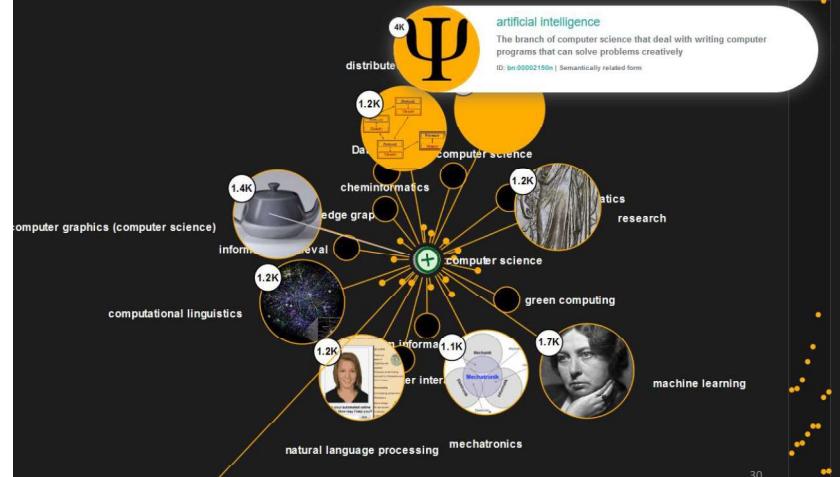
<https://babelnet.org/>



knowledge graph

CHANGE VIEW

QUIT



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Government Data



<https://www.europeandataportal.eu/en>

Category	Name
	Agriculture, fisheries, forestry and food
	Economy and finance
	Education, culture and sport
	Energy
	Environment
	Government and public sector
	Health
	International issues
	Justice, legal system and public safety
	Population and society
	Regions and cities
	Science and technology

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Research Data

The open archive HAL

HAL is an open archive where authors can deposit scholarly documents from all academic fields.

For the attention of the authors

- The deposit of the fulltext should be made in agreement with the co-authors and in the respect for the policy of the publishers.
- The deposit is subject of a control, HAL reserves the right to refuse items that do not meet the criteria of the archive.
- Any deposit is definitive, no withdrawals will be made after the on-line posting of the publication.
- Text files in pdf format or image files are sent to CINES for long-term archiving.

NUMBER OF RESOURCES
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NUMBER OF FULLTEXTS
654 485

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SELECT distinct ?publication

WHERE {

```
?person rdf:type foaf:Person.  
?person foaf:name "Christophe Roche".  
?person foaf:publications ?publication.
```

}

limit 100

<http://sparql.archives-ouvertes.fr/sparql>

Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)

Query Text

```
SELECT distinct ?publication  
WHERE {  
    ?person rdf:type foaf:Person.  
    ?person foaf:name "Christophe Roche".  
    ?person foaf:publications ?publication.  
}  
limit 100
```

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Research Data

<https://www.persee.fr/>



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publication

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<https://data.archives-ouvertes.fr/document/hal-02140064>
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<https://data.archives-ouvertes.fr/document/hal-01354325>

hal-01180279, version 1

Communication dans un congrès

Should Terminology Principles be re-examined?

Christophe Roche 1. * Détails

* Auteur correspondant

1 LISTIC - Laboratoire d'informatique, Systèmes, Traitement de l'information et de la Connaissance

Abstract : Operationalization of terminology for IT applications has revived the Wüsterian approach. The conceptual dimension once more prevails after taking back seat to specialised lexicography. This is demonstrated by the emergence of ontology in terminology. While the Terminology Principles as defined in Fueter's manual and the ISO standards remain at the core of traditional terminology, their computational implementation raises some issues. In this article, while referring their importance, we will be re-examining these Principles from a dual perspective: that of logic in the mathematical sense of the term and that of epistemology as in the theory of knowledge. We will thus be clarifying and describing some of them so as to take into account advances in knowledge engineering (ontology) and formal systems (logic).

Keywords : Terminology | Terminology principles | ISO standards | ISO 704 | ISO 1087-1 | Knowledge theory | Ontology | Logic | Ontoterminalogy | Introduction

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Industry



Ontologies Search Annotator Recommender Mappings Resource Index

Login

Support

<https://bioportal.bioontology.org/>

Welcome to BioPortal, the world's most comprehensive repository of biomedical ontologies

Search for a class

Enter a class, e.g. Melanoma

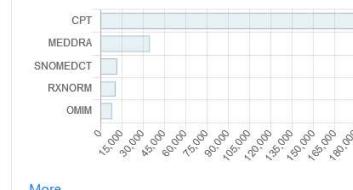
Find an ontology

Start typing ontology name, then choose from !

Advanced Search

Browse Ontologies

Ontology Visits (April 2020)



More

BioPortal Statistics

Ontologies 847

Classes 11,332,659

Resources Indexed 48

Indexed Records 39,537,360

Direct Annotations 95,468,433,792

Direct Plus Expanded Annotations 144,789,582,932

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Condillac (

Microsoft Academic Knowledge Graph (MAKG)

<https://mkg.org/>

We present the Microsoft Academic Knowledge Graph (MAKG), a large RDF data set with over eight billion triples with information about scientific publications and related entities, such as authors, institutions, journals, and fields of study. The data set is based on the Microsoft Academic Graph and licensed under the Open Data Attributions license. Furthermore, we provide entity embeddings for all 210M represented scientific papers. What exactly do we provide?

1. Periodically updated [RDF dump files](#) of the whole Microsoft Academic Knowledge Graph.

2. [URI resolution](#) of the Microsoft Academic Knowledge Graph within the Linked Open Data.

3. A publicly accessible [SPARQL endpoint](#) containing the latest Microsoft Academic Knowledge Graph data.

4. [HTML page descriptions](#) of resources in the Microsoft Academic Knowledge Graph via pubby.

5. [Entity embeddings](#) for all papers in the Microsoft Academic Knowledge Graph.

The Microsoft Academic Knowledge Graph as of 2020-05-29 contains, among others,

238,670,900 publications	16,142 conference instances
151,355,324 authors	4,468 conference series
25,767 affiliation	48,942 journals
1,635,169,990 references	139,227,097 paperabstracts
234,337,833 citations with citation contexts	677,389,638 papertags
740,460 fields of study	75,091 linked datasets and code
34,863 ORCID IDs	

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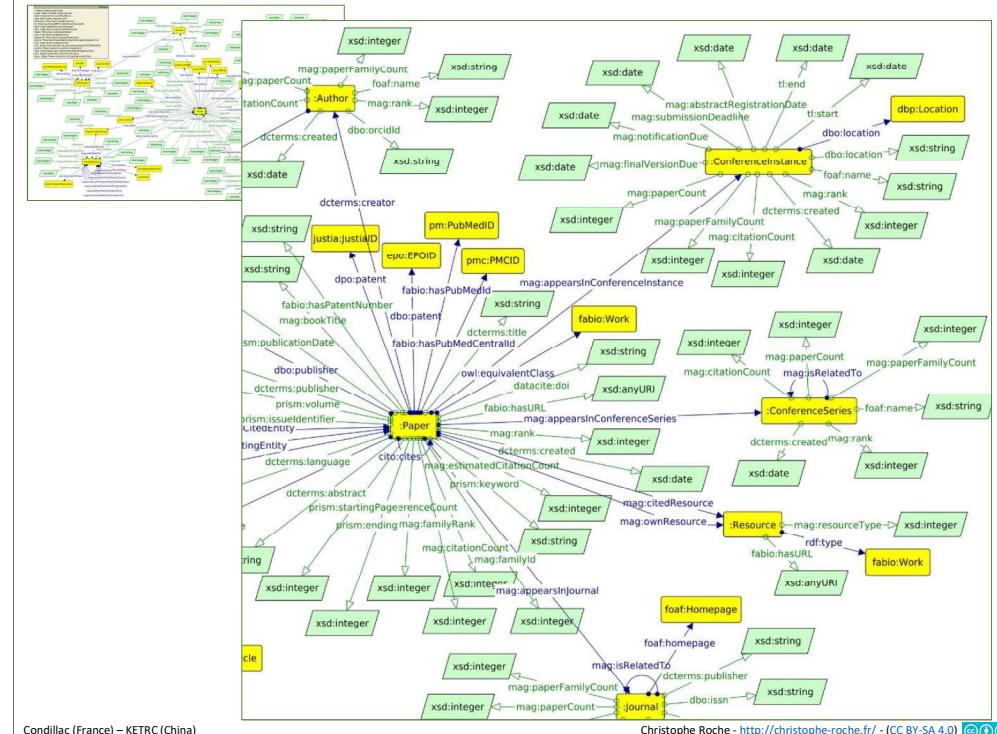
```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX mаго: <https://mkg.org/class/>
PREFIX dcterms: <http://purl.org/dc/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX fabio: <http://purl.org/spar/fabio/>
PREFIX prism: <http://prismstandard.org/namespaces/basic/2.0/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
```

```
SELECT distinct ?paperTitle ?paperPubDate
WHERE {
?paper rdf:type mаго:Paper .
?paper prism:keyword "terminology"^^xsd:string .
?paper prism:keyword "ontology"^^xsd:string .
?paper fabio:hasDiscipline ?field .
?paper dcterms:title ?paperTitle .
?paper prism:publicationDate ?paperPubDate .
}
LIMIT 100
```

paperTitle	paperPubDate
"Domain ontology construction based on semantic relation information of terminology"^^<http://www.w3.org/2001/XMLSchema#string>	2004-11-02
"Should Terminology Principles be re-examined?"^^<http://www.w3.org/2001/XMLSchema#string>	2012-06-19
"Should Terminology Principles be re-examined?"^^<http://www.w3.org/2001/XMLSchema#string>	2016-09-16
"Risk Analysis Examples"^^<http://www.w3.org/2001/XMLSchema#string>	2015-01-01
"Contribution of Ontology to Terminology"^^<http://www.w3.org/2001/XMLSchema#string>	2010-11-12
"Rethinking ISO Principles: the Ontology-oriented Approach"^^<http://www.w3.org/2001/XMLSchema#string>	2013-09-27

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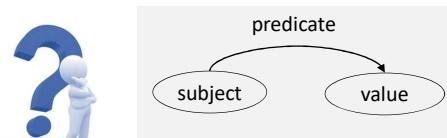
Knowledge Graph?

a graph composed of

nodes and links

which represent
domain knowledge

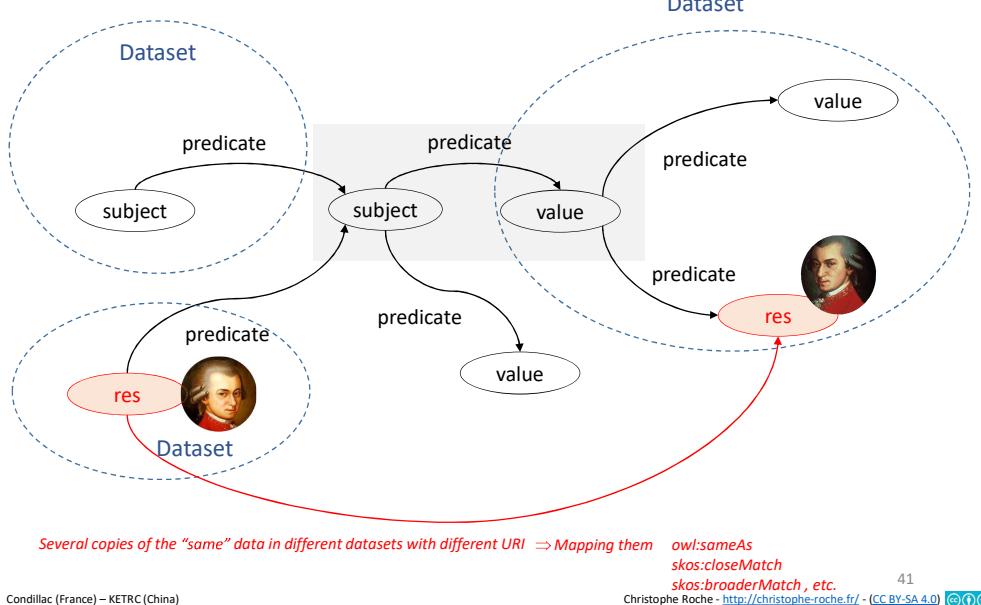
- is a
- has-name
- has-author
- has-image
- ... (Uniform Resource Identifier)



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Knowledge Graph?



Contents

1. What is a Knowledge Graph?
2. An introductory example
3. How to represent a KG?
4. How to query a KG?
5. Practical Works
6. Building/Querying a KG
7. Project



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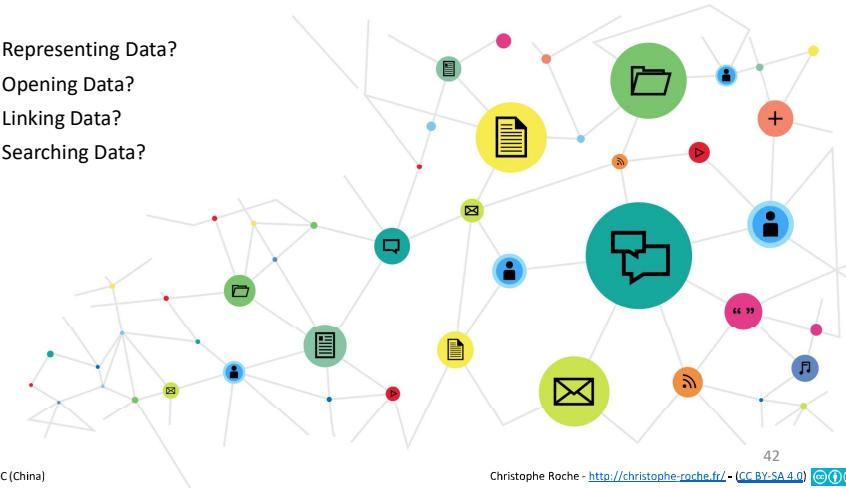
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Knowledge Graph

A **knowledge graph** is a **special kind of database** which stores **knowledge in a machine-readable form** and provides a means for information to be collected, organised, shared, searched and utilised.

Main Issues:

- Representing Data?
- Opening Data?
- Linking Data?
- Searching Data?



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Example

I'm looking for visual representations of the composer Wolfgang Amadeus Mozart

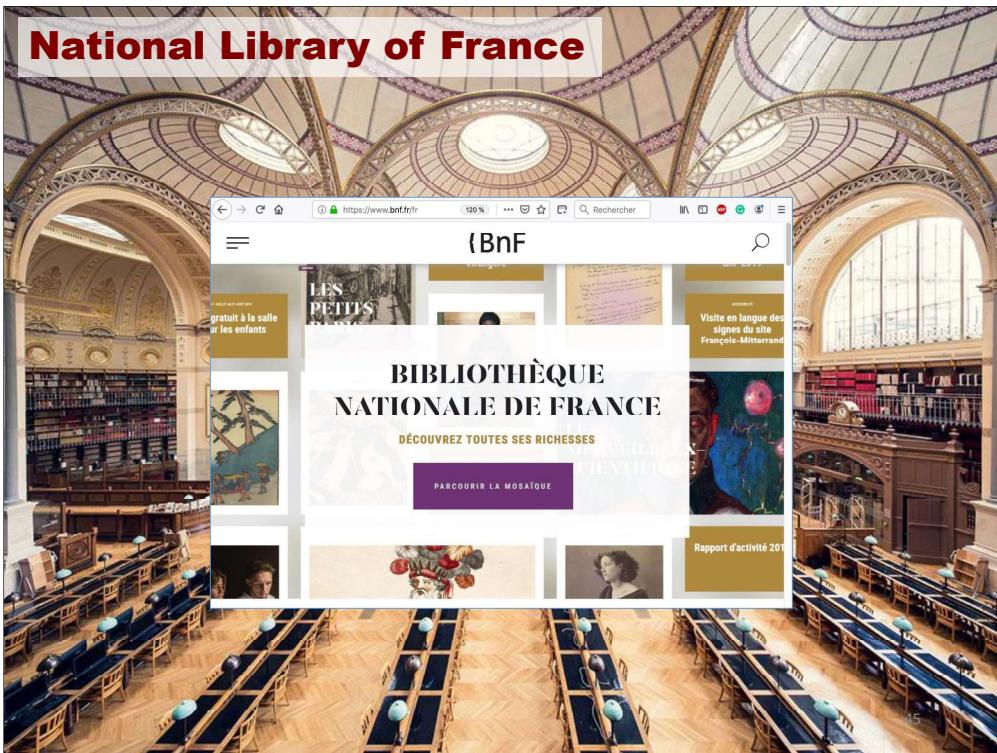


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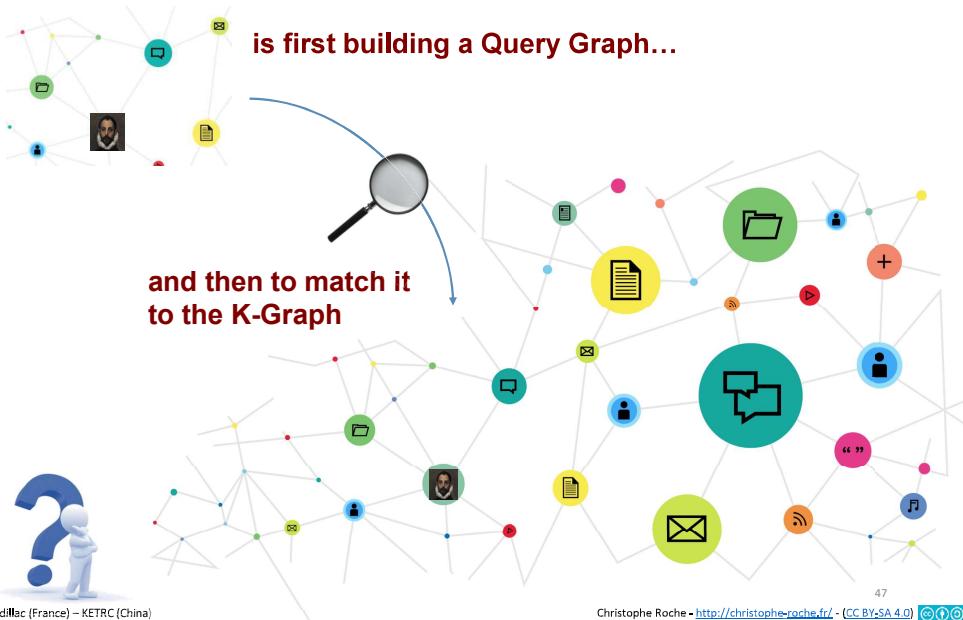
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National Library of France



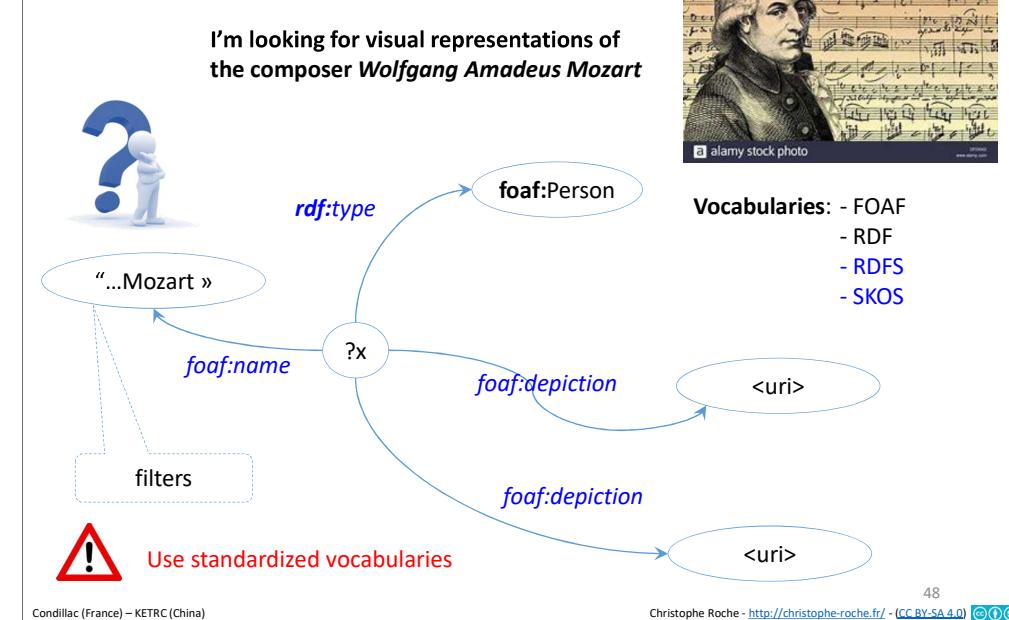
Querying a Knowledge Graph...



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Do it!



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SPARQL Endpoint

<https://data.bnfr.fr/current/sparql.html>



The screenshot shows the SPARQL Endpoint interface at <https://data.bnfr.fr/current/sparql.html>. The interface includes a query editor with the following SPARQL query:

```
1 select distinct ?Concept where {() a ?Concept} LIMIT 100
```

Below the query editor is a results table with one row:

Result
1 select distinct ?Concept where {() a ?Concept} LIMIT 100

Exemple de requêtes

Explorer les données - Dates biographiques d'un auteur - Toutes les éditions de l'œuvre « Les Fleurs du Mal de Baudelaire » (titre, date, éditeur) - Lien à un document numérisé dans Gallica - Expositions virtuelles de la Bnf - Retrouver un nom de personne à partir d'un ISBN - Identifiant ARK d'une œuvre à partir du numéro FRBNF - Retrouver une œuvre à partir d'un ISBN - Tous les auteurs morts avant 1952 - Images dans data.bnfr - Ouvrages adossés pour la jeunesse - Portraits d'auteurs issus de Gallica - Termes sélectifs d'un sujet (ROMEAU) - Soyez RAMEAU de type nom commun - Alignement entre les sujets RAMEAU et Heirax - Liens vers Wikipédia pour les auteurs - Notices modifiées après le 1er janvier 2015

Format du résultat:

HTML

Timeout:

0
milliseconds (values less than 1000 are ignored)

Sponging:

Use only local data (including data retrieved before), but do not retrieve more

Options:

Strict checking of void variables

The result can only be sent back to browser, not saved on the server, see details

Lancer la requête URL de la requête Nouvelle requête

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Copyright © 2015 OpenLink Software
Virtuoso version 07.10.2007 on Linux (x86_64-unknown-linux-gnu), Single Server Edition

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SPARQL Endpoint

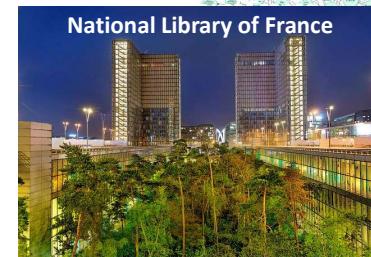


Access to the Knowledge Graph

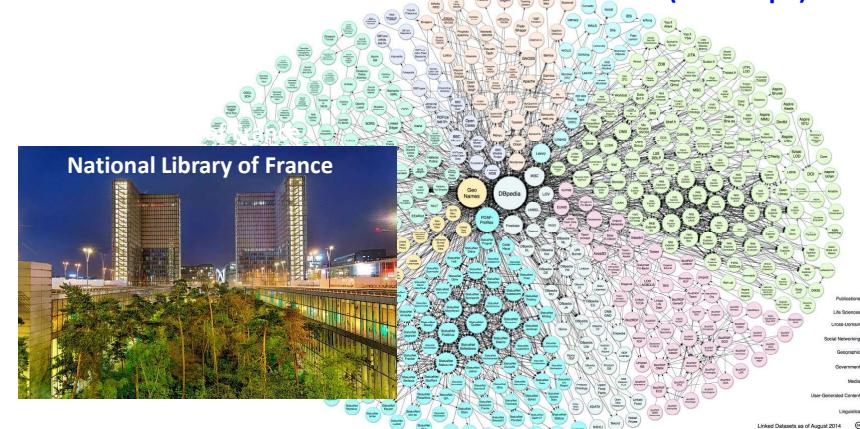
SPARQL
Endpoint

<https://data.bnfr.fr/current/sparql.html>

Knowledge Graph
(RDF Graph)



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SPARQL Endpoint

<https://data.bnfr.fr/current/sparql.html>



SPARQL Endpoint

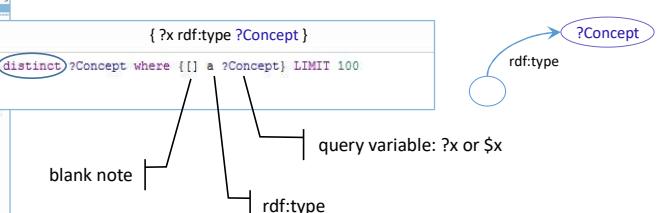
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Result
1 select distinct ?Concept where {() a ?Concept} LIMIT 100

<https://data.bnfr.fr/current/sparql.html>



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SPARQL Endpoint

<https://data.bnf.fr/current/sparql.html>

Requête

```
{ ?x rdf:type ?Concept }
1 select distinct ?Concept where {[] a ?Concept} LIMIT 100
```

Formater résultat:

- Table
- Texte
- Graphique
- CSV
- JSON
- Atom
- N3
- SPARQL

Lancer la requête

Concept

Concept
http://www.openlinksw.com/schemas/virttrdf/QuadMapFormat
http://www.openlinksw.com/schemas/virttrdf/QuadStorage
http://www.openlinksw.com/schemas/virttrdf/Array-of-QuadMapFormat
http://www.openlinksw.com/schemas/virttrdf/QuadMap
http://www.openlinksw.com/schemas/virttrdf/Array-of-QuadMapView
http://www.openlinksw.com/schemas/virttrdf/Array-of-QuadMapColumn
http://www.openlinksw.com/schemas/virttrdf/QuadMapColumn
http://www.openlinksw.com/schemas/virttrdf/QuadMapATable
http://www.openlinksw.com/schemas/virttrdf/QuadMapTable
http://www.openlinksw.com/schemas/virttrdf/QuadMapFText
http://www.openlinksw.com/schemas/virttrdf/Array-of-String
http://www.openlinksw.com/schemas/virttrdf/QuadMap
http://www.w3.org/2002/07/owl#InverseFunctionalProperty
http://www.w3.org/2002/07/owl#SymmetricProperty
http://www.w3.org/2002/07/owl#FunctionalProperty
http://www.w3.org/2002/07/owl#TransitiveProperty
http://www.w3.org/1999/02/22-rdf-syntax-ns#Property
http://www.w3.org/2002/07/owl#Class
http://www.w3.org/2002/07/owl#Ontology
http://www.w3.org/2000/01/rdf-schema#Class
http://www.w3.org/2002/07/owl#AnnotationProperty
http://www.w3.org/1999/02/22-rdf-syntax-ns#List
http://www.w3.org/2002/07/owl#AllDifferent



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Dates biographiques d'un auteur

Espace de nom (namespace)

Query

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX bio: <http://vocab.org/bio/0.1/>
SELECT ?auteur ?jour ?date1 ?date2 ?nom
WHERE {
  ?auteur foaf:birthday ?jour.
  ?auteur bio:birth ?date1.
  ?auteur bio:death ?date2.
  OPTIONAL {?auteur foaf:name ?nom.}
}
ORDER BY (?jour) LIMIT 100
```

Table Response 100 résultats en 0.656 secondes

auteur	jour	date1	date2	nom

Filter query results Page size: 50

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SPARQL Endpoint

<https://data.bnf.fr/current/sparql.html>



(BnF) Data

Requête

```
1 SELECT ?auteur ?jour ?date1 ?date2 ?nom
2 WHERE {
3   ?auteur foaf:birthday ?jour.
4   ?auteur bio:birth ?date1.
5   ?auteur bio:death ?date2.
6   OPTIONAL {
7     ?auteur foaf:name ?nom.
8   }
9 }
10 ORDER BY (?jour)
```

Exemple de requêtes

Explorer les données - Dates biographiques d'un auteur - Toutes les éditions de l'œuvre Les Fleurs du Mal

Lien à un document numérisé dans Gallica - Expositions virtuelles de la BnF - Retrouver un nom de personne à partir d'un ISNI - Identifier ARK d'une notice à partir du numéro FRBNF - Retrouver une œuvre à partir d'un ISBN

Toutes les éditions de l'œuvre "Les Fleurs du Mal" de Baudelaire » (titre, date, éditeur)

Lien à un document numérisé dans Gallica

Expositions virtuelles de la BnF

Retrouver un nom de personne à partir d'un ISNI

Identifier ARK d'une notice à partir du numéro FRBNF

Retrouver une œuvre à partir d'un ISBN

Toutes les éditions de l'œuvre "Les Fleurs du Mal" de Baudelaire » (titre, date, éditeur)

Format du résultat:

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Timeout:

0 milliseconds (values less than 1000 are ignored)

Sponging:

Use only local data (including data retrieved before)

Options:

Strict checking of void variables

The result can only be sent back to browser, not saved on the server, see details

Lancer la requête

URL de la requête Nouvelle requête

```
SELECT ?auteur ?jour ?date1 ?date2 ?nom
WHERE {
  ?auteur foaf:birthday ?jour.
  ?auteur bio:birth ?date1.
  ?auteur bio:death ?date2.
  OPTIONAL {
    ?auteur foaf:name ?nom.
  }
}
ORDER BY (?jour)
```

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(BnF) Data

Télécharger Les Données | Le Modèle De Données | Contact

Dates biographiques d'un auteur

Query

https://data.bnf.fr/sparql

```
1 * PREFIX foaf: <http://xmlns.com/foaf/0.1/>
2 * PREFIX bio: <http://vocab.org/bio/0.1/>
3 * SELECT ?auteur ?jour ?date1 ?date2 ?nom
4 * WHERE {
5   ?auteur foaf:birthday ?jour.
6   ?auteur bio:birth ?date1.
7   ?auteur bio:death ?date2.
8   OPTIONAL {?auteur foaf:name ?nom.}
9 }
10 ORDER BY (?jour) LIMIT 100
```

Table Response 100 résultats en 0.656 secondes

auteur	jour	date1	date2	nom

PREFIX foaf: <http://xmlns.com/foaf/0.1/>

PREFIX bio: <http://vocab.org/bio/0.1/>

SELECT ?auteur ?jour ?date1 ?date2 ?nom

WHERE

?auteur foaf:birthday ?jour.

?auteur bio:birth ?date1.

?auteur bio:death ?date2.

OPTIONAL {?auteur foaf:name ?nom.}

}

ORDER BY (?jour) LIMIT 100

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(BnF) Data

Télécharger Les Données | Le Modèle De Données | Contact

Dates biographiques d'un auteur

```
Query × +
https://data.bnfr.sparql

1 * PREFIX foaf: <http://xmlns.com/foaf/0.1/>
2 PREFIX bio: <http://vocab.org/bio/0.1/>
3 SELECT ?auteur ?jour ?date1 ?date2 ?nom
4 WHERE {
5 ?auteur foaf:birthday ?jour.
6 ?auteur bio:birth ?date1.
7 ?auteur bio:death ?date2.
8 OPTIONAL {?auteur foaf:name ?nom.}
9 }
10 ORDER BY (?jour) LIMIT 100
```

Table Response 100 results in 0.656 seconds

	auteur	jour	date1
1	<http://data.bnfr.ark/12148/cb14656286b#about>	-1-8.	18..-1-8.
2	<http://data.bnfr.ark/12148/cb16956975d#about>	...-.	1882
3	<http://data.bnfr.ark/12148/cb11939653w#about>	...-.	1453
4	<http://data.bnfr.ark/12148/cb11974903s#about>	...-.	1784
5	<http://data.bnfr.ark/12148/cb12310076d#about>	...-.	1570
6	<http://data.bnfr.ark/12148/cb124191432#about>	...-.	1475
7	<http://data.bnfr.ark/12148/cb124036773#about>	...-.	-570
			-554

Espace de nom (namespace)

Michel Pouchet (décorateur, 18..-18..)

Pays : France
Sexe : Masculin
Naissance : 8..-18..
Mort : 18..
Note : Décorateur de théâtre

Michel Pouchet (décorateur, 18..-18..) : œuvres (5 ressources dans data.bnfr.fr)

Spectacles (5)

- Les amours de Psyché (1841) avec Michel Pouchet (décorateur, 18..-18..) comme Réalisateur des décors
- L'argent, la gloire et les femmes (1840) avec Michel Pouchet (décorateur, 18..-18..) comme Réalisateur des décors
- Don Juan de Marana ou La chute d'un ange (1836) avec Michel Pouchet (décorateur, 18..-18..) comme Réalisateur des décors
- La nonne sanglante (1835) avec Michel Pouchet (décorateur, 18..-18..) comme Réalisateur des décors
- Le juif errant (1834) avec Michel Pouchet (décorateur, 18..-18..) comme Réalisateur des décors

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(BnF) Data

Tous les auteurs mort avant 1924

Query × +
https://data.bnfr.sparql

```
1 * PREFIX bio: <http://vocab.org/bio/0.1/>
2 PREFIX dcterms: <http://purl.org/dc/terms/>
3 PREFIX foaf: <http://xmlns.com/foaf/0.1/>
4 PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
5 SELECT distinct ?nom ?auteur ?mort
6 WHERE {
7 ?œuvre dcterms:creator ?auteur.
8 ?auteur bio:death ?mort ;
9 foaf:name ?nom.
10 FILTER (xsd:integer (?mort) < '1924'^^xsd:integer)
11 }
12 ORDER BY DESC (?mort) LIMIT 100
```

Filter regex(?y, "Mozart")

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```
1 * PREFIX bio: <http://vocab.org/bio/0.1/>
2 PREFIX dcterms: <http://purl.org/dc/terms/>
3 PREFIX foaf: <http://xmlns.com/foaf/0.1/>
4 PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
5 SELECT distinct ?nom ?auteur ?mort
6 WHERE {
7 ?œuvre dcterms:creator ?auteur.
8 ?auteur bio:death ?mort ;
9 foaf:name ?nom.
10 FILTER (xsd:integer (?mort) < '1924'^^xsd:integer)
11 }
12 ORDER BY DESC (?mort) LIMIT 100
```

Table Response 100 results in 2.768 seconds

	nom
1	'Abd Allāh ibn 'Abd al-Rahmān ibn Abī Zayd al-Qayrawānī <http://data.bnfr.i...
2	Ismā'il ibn Abīmad al-Šābiib ibn al-'Abbād <http://data.bnfr.i...
3	al Muḥassīn ibn 'Alī al-Tanūhī <http://data.bnfr.i...
4	Muhammad ibn Yūsuf al-'Āmirī <http://data.bnfr.i...

'Abd Allāh ibn 'Abd al-Rahmān ibn Abī Zayd al-Qayrawānī (0922-0996)

Pays : Tunisie
Langue : Arabe
Sexe : Masculin
Naissance : 922
Mort : 996
Note : Jurisconsulte. - Chef de l'école mālikite

Autres formes du nom : عبد الله بن عبد الرحمن ابن أبي زيد القراءاني (0922-0996) (arabe)
Abdallah ibn-Abi-Zaid al-Qairawani (0922-0996)
Abd Allah ibn 'Abd al-Rahman ibn Abi Zayd al-Kayrawani (0922-0996)
Ibn Abi Zayd al-Qayrawani (0922-0996)

ISNI : ISNI 0000 0000 8168 7481

'Abd Allāh ibn 'Abd al-Rahmān ibn Abī Zayd al-Qayrawānī (0922-0996) : œuvres (20 ressources dans data.bnfr.fr)

Oeuvres textuelles (13)

- Al-nawādir wa-al-ziyādāt
- Al-Risālat

Voir plus de documents de ce genre

Manuscrits et archives (7)

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```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX bio: <http://vocab.org/bio/0.1/>
SELECT ?auteur ?jour ?date1 ?date2 ?nom
WHERE {
?auteur foaf:birthday ?jour.
?auteur bio:birth ?date1.
?auteur bio:death ?date2.
OPTIONAL {?auteur foaf:name ?nom.}
}
ORDER BY (?jour) LIMIT 100
```

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX bio: <http://vocab.org/bio/0.1/>
SELECT ?auteur ?jour ?date1 ?date2 ?nom
WHERE {
?auteur foaf:birthday ?jour;
bio:birth ?date1;
bio:death ?date2.
OPTIONAL {?auteur foaf:name ?nom.}
}
ORDER BY (?jour) LIMIT 100
```

```
PREFIX bio: <http://vocab.org/bio/0.1/>
PREFIX dcterms: <http://purl.org/dc/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
SELECT distinct ?nom ?auteur ?mort
WHERE {
?œuvre dcterms:creator ?auteur.
?auteur bio:death ?mort ;
foaf:name ?nom.
}
FILTER (xsd:integer (?mort) < '1924'^^xsd:integer)
}
ORDER BY DESC (?mort) LIMIT 100
```

```
PREFIX bio: <http://vocab.org/bio/0.1/>
PREFIX dcterms: <http://purl.org/dc/terms/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
SELECT distinct ?nom ?auteur ?mort
WHERE {
?œuvre dcterms:creator ?auteur.
?auteur bio:death ?mort ;
foaf:name ?nom.
}
FILTER (xsd:integer (?mort) < '1924'^^xsd:integer)
}
ORDER BY DESC (?mort) LIMIT 100
```

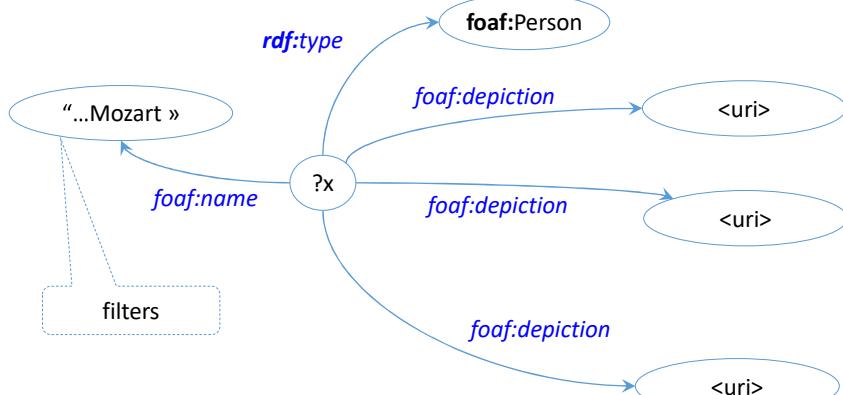
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I'm looking for visual representations of the composer Wolfgang Amadeus Mozart



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National Library of France

<https://data.bnf.fr/current/sparql.html>

Editeur SPARQL de data.bnf.fr

Graphe par défaut (IRI)

Requête

```
1 PREFIX foaf: <http://xmlns.com/foaf/0.1/>
2 select distinct ?z
3 where { ?x rdf:type foaf:Person.
4           ?x foaf:name ?y.
5           Filter regex( ?y, "Mozart").
6           Filter regex( ?y, "Wolfgang").
7           ?x foaf:depiction ?z
8 }
9 LIMIT 100
```

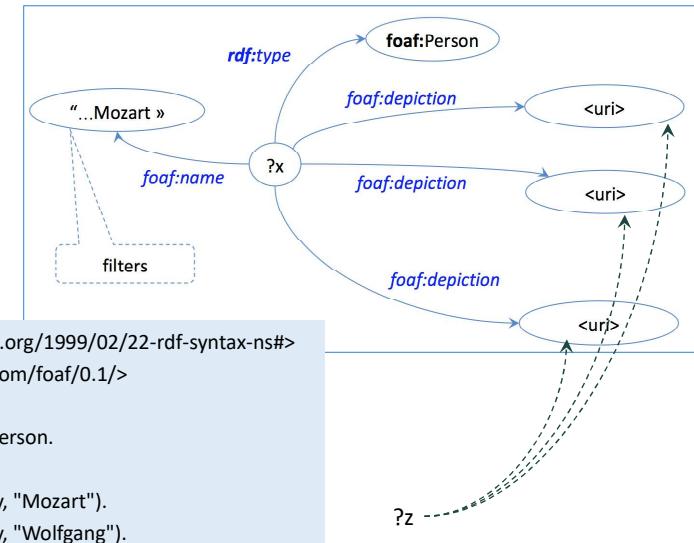
https://gallica.bnf.fr/ark:/12148/btv1b8426563q.thu
https://gallica.bnf.fr/ark:/12148/btv1b84265644.thu
https://gallica.bnf.fr/ark:/12148/btv1b8453820w.thu
https://gallica.bnf.fr/ark:/12148/btv1b86268474.thu

http://commons.wikimedia.org/wiki/Special:FilePath/Wolfgang-amadeus-mozart%201.jpg
http://commons.wikimedia.org/wiki/Special:FilePath/Wolfgang-amadeus-mozart_1.jpg
http://commons.wikimedia.org/wiki/Special:FilePath/Wolfgang-amadeus-mozart_1.jpg?width=300

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National Library of France



PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT DISTINCT ?z
WHERE {
 ?x rdf:type foaf:Person.
 ?x foaf:name ?y.
 FILTER REGEX (?y, "Mozart").
 FILTER REGEX (?y, "Wolfgang").
 ?x foaf:depiction ?z
}
LIMIT 100

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{ BnF }



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Contents

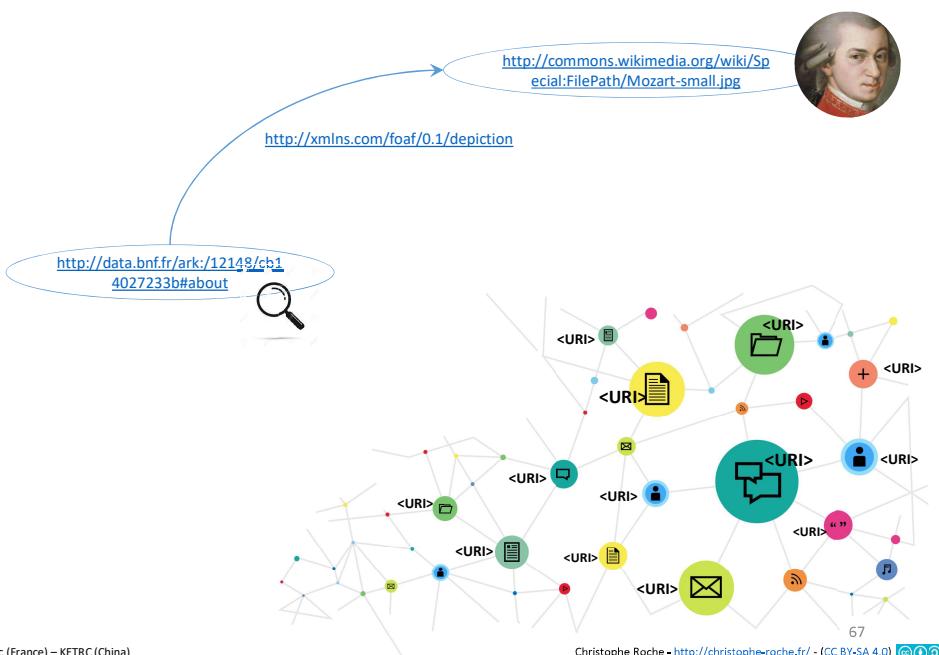
1. What is a Knowledge Graph?
2. An introductory example
3. How to represent a KG?
4. How to query a KG?
5. Practical Works
6. Project

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How to represent Knowledge Graph?

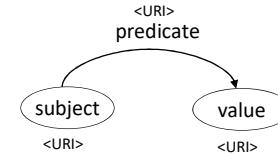


How to represent Knowledge Graph?

Resource Description Framework (RDF) is a model of directed labelled graphs:

- for representing information
- for linking information
- for data interchange on the Web

Triple:

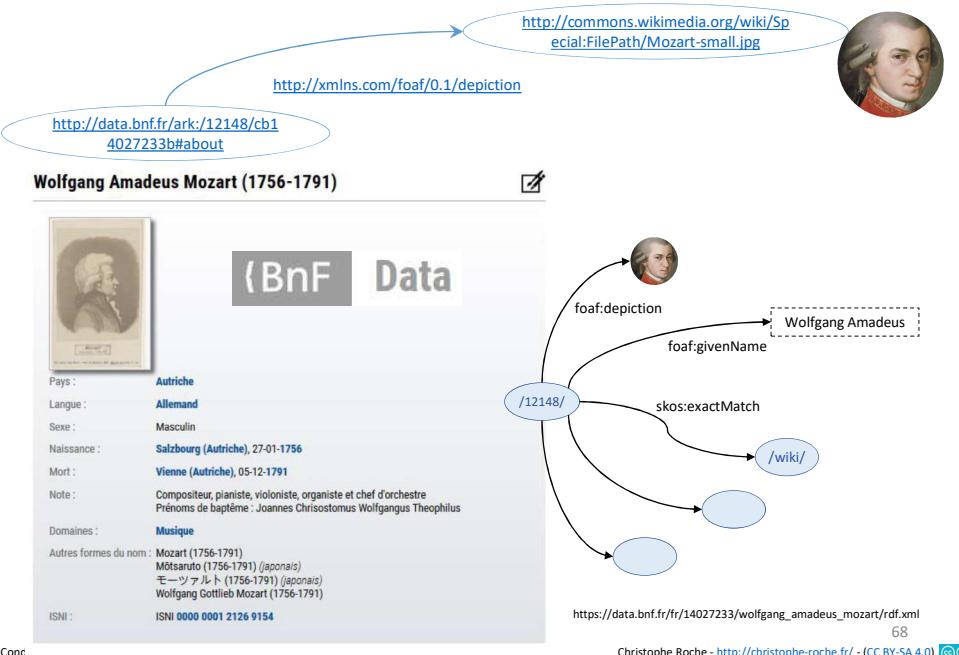


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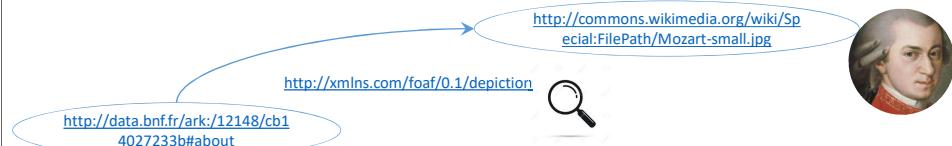
66

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RDF Graph



RDF Graph



FOAF Vocabulary Specification 0.99

Namespace Document 14 January 2014 - Paddington Edition

Property: foaf:depiction

`depiction` - A depiction of some thing.

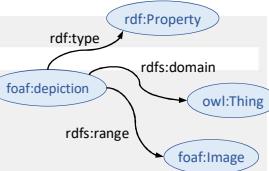
Status: testing

Domain: having this property implies being a [Thing](#)

Range: every value of this property is a [Image](#)

The `depiction` property is a relationship between a thing and an [Image](#) that depicts it. As such it is an inverse of the `depicts` relationship.

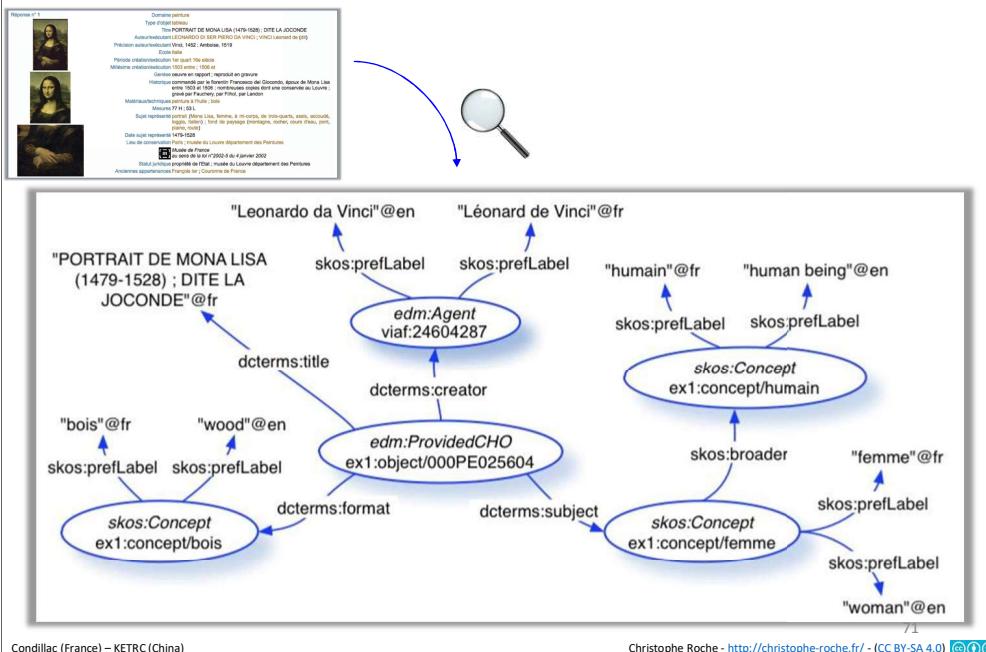
A common use of `depiction` (and `depicts`) is to indicate the contents of a digital image, for example the people or objects represented in an online photo gallery.



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Vocabularies (W3C)



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Representing & Linking: Vocabularies (W3C)



RDF Graph is a directed, labelled graph data format for representing information in the Web, in such a way so as to permit the automatic treatment of such descriptions.

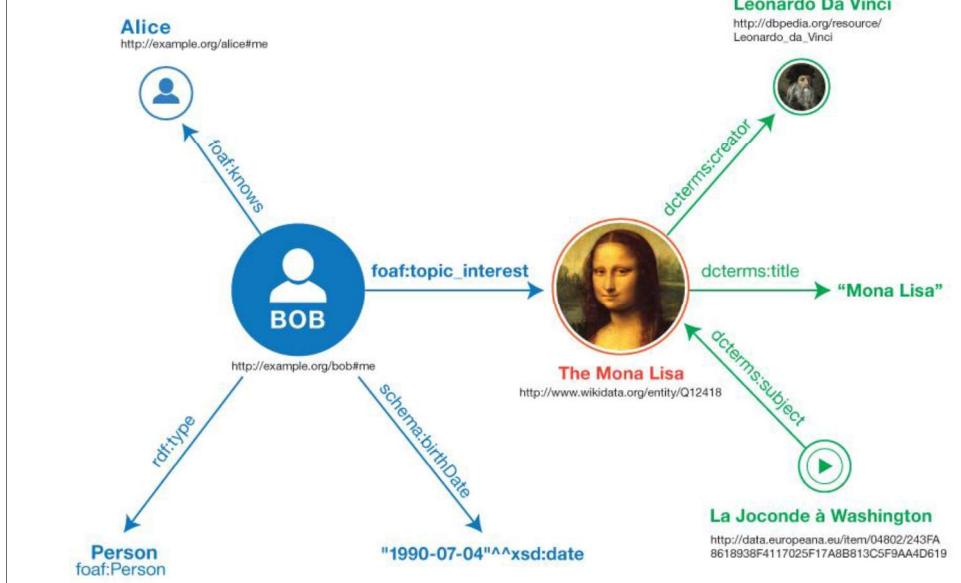
RDF Graph is a **Knowledge Graph** using **RDF as a representation language**.



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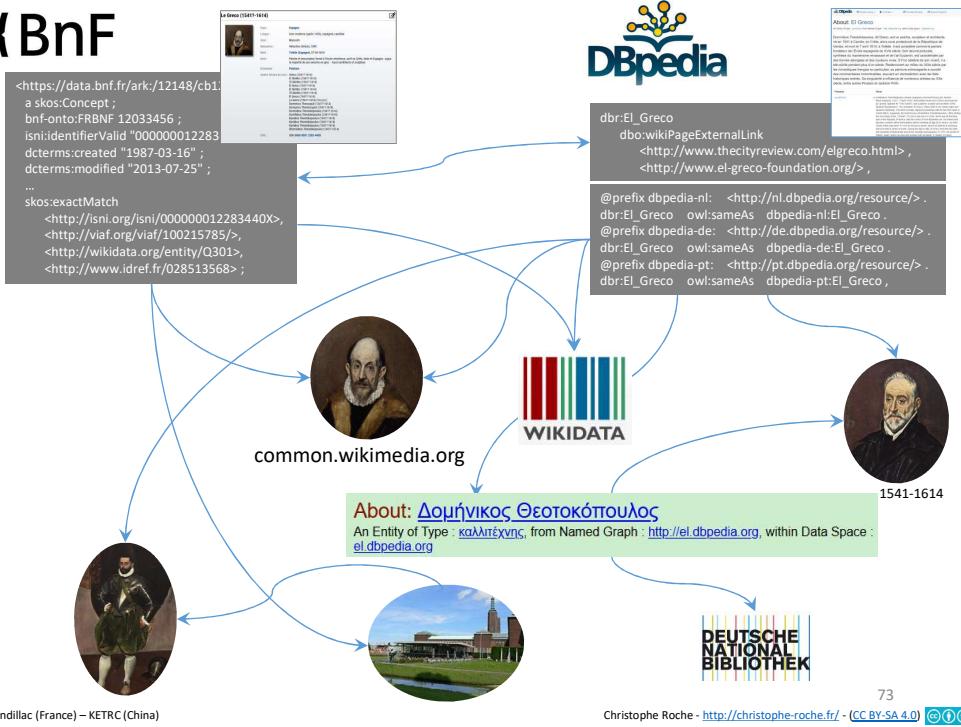
Connecting Knowledge Graphs



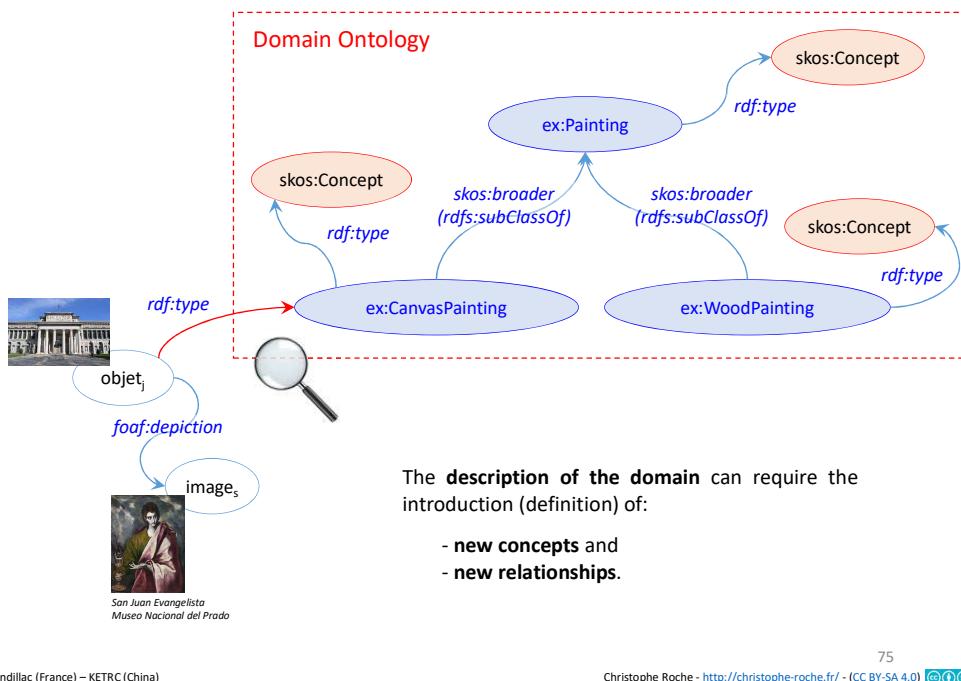
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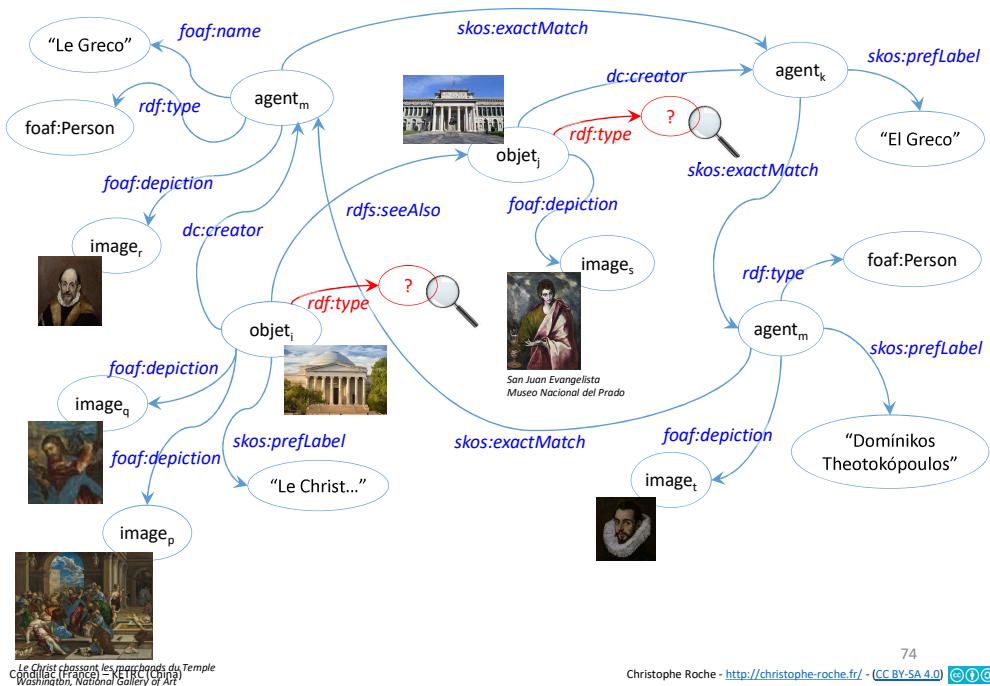
{BnF}



Example



Example

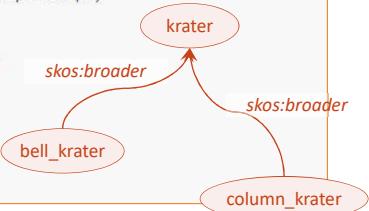


Bell Krater

Definition The bell-krater is an innovation belonging to the red-figure technique. The body rises from a low disk-foot or sometimes a modified disk-foot into the hint of a stem before expanding into the shape of an inverted bell with a mildly flaring mouth with a torus lip. It has sturdy, horizontal, cylindrical handles that are located high up on the body opposite one another and are slightly upturned.
Type **kon:Shape** **skos:Concept**

bell_krater (kon:Shape)

skos:prefLabel Glockenkrater (de), Bell Krater (en), crátera de campana (es), cratère en cloche (fr), cratera a campana (it), звонест кратер (mk), klokkrater (nl)
skos:definition Der Glockenkrater ist eine rot figurige Innovation. Er weist einen niedrigen oder manchmal modifizierten Standfuß mit dem leichten Ansatz eines Stiels auf. Die Gefäßform erinnert an eine umgedrehte Glocke mit einer leicht nach außen gebogenen Mündung mit gerundeten Lippe. Er hat massive, horizontale, zylindrische Henkel, die parallel unter dem Rand angebracht sind. (de)
skos:definition The bell-krater is an innovation belonging to the red-figure technique. The body rises from a low disk-foot or sometimes a modified disk foot into the hint of a stem before expanding into the shape of an inverted bell with a mildly flaring mouth with a torus lip. It has sturdy, horizontal, cylindrical handles that are located high up on the body opposite one another and are slightly upturned. (en)
dcterms:source <https://zenon.dainst.org/Record/000188572>
rdf:type **skos:Concept**
rdfs:seeAlso <https://www.beazley.ox.ac.uk/tools/pottery/shapes/bell.htm>
skos:broader <http://kerameikos.org/id/krater>
skos:changeNote <http://collection.britishmuseum.org/id/thesauri/x5427>
skos:exactMatch <http://vocab.getty.edu/aat/300198857>
skos:exactMatch <http://www.wikidata.org/entity/Q1531905>
skos:inScheme <http://kerameikos.org/id/>



Kerameikos.org: Ontology

kerameikos.org/ontology

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Kerameikos.org Ontology

Vocabulary for defining classes and properties that apply to ceramics, filling in gaps left between existing ontologies, such as CIDOC-CRM

- Classes
 - Production Place
 - Shape
 - Style
 - Technique
 - Ware
- Properties
 - Has Shape
- Alternative Serializations
 - RDF/XML
 - TTL

Classes

Production Place

Stub for the description of Production Place, as a concept. To be differentiated from ecrm:E53_Place and geo:SpatialThing, which are physical locations.

Shape

Stub for the description of Shape

Style

Stub for the description of Style

Technique

Stub for the description of Technique

Ware

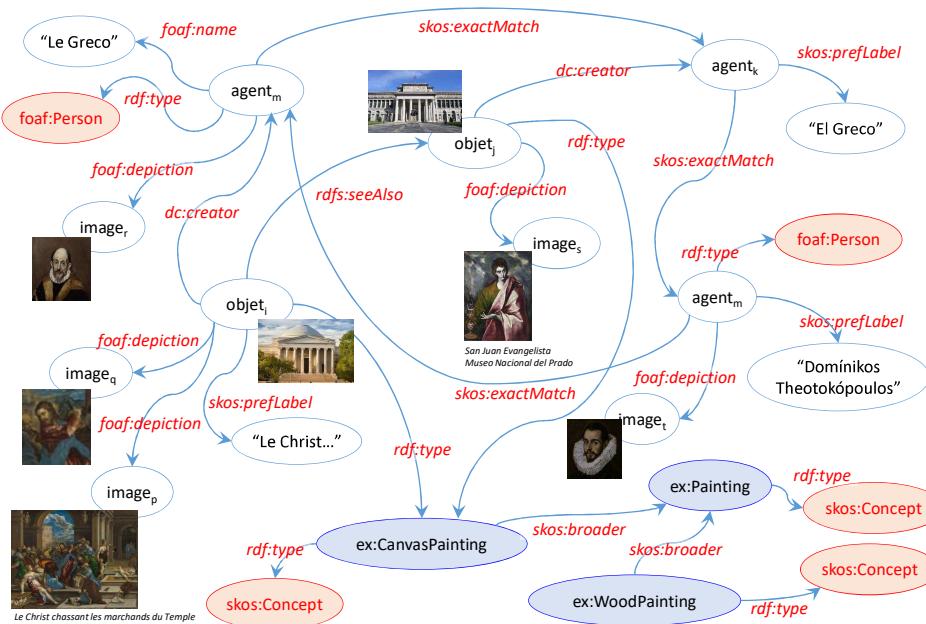
Stub for the description of Ware

Properties

Has Shape

A physical object (vase or other ceramic vessel) has a shape, defined by a resource of kon:Shape class.

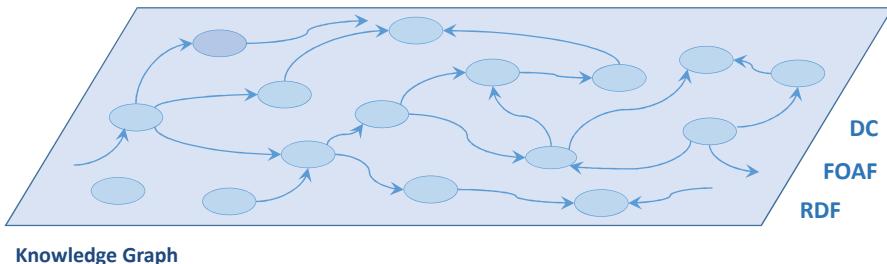
Example



RDF Graph

RDF (family of RDF standards) is a framework for representing information in the web:

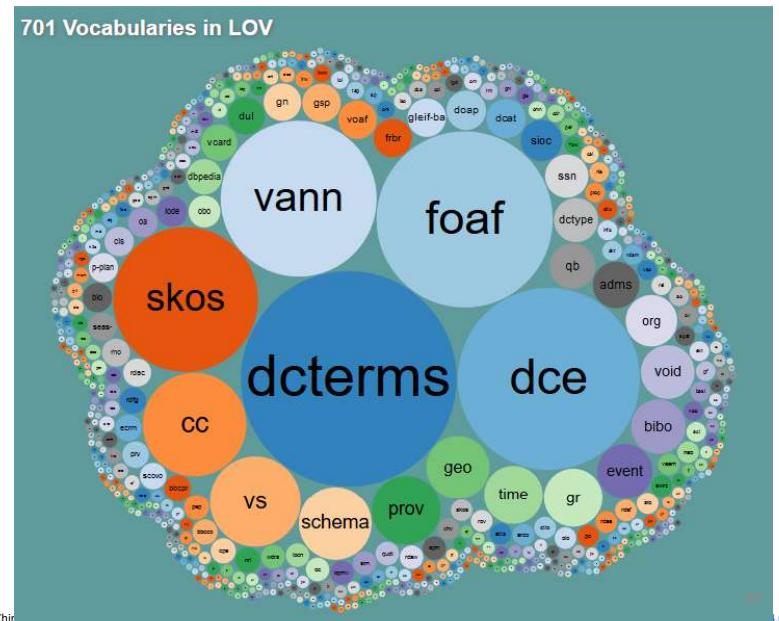
- RDF
 - RDFS
 - FOAF
 - DC
 - SKOS
 - OWL
 - Etc.



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Which Vocabulary?

<https://doi.org/10.5281/zenodo.4302620>



Predefined Namespace Prefixes

<https://www.orpha.net/sparql?nsdecl>

Prefix	URI
HOOM	http://www.semanticweb.org/ontology/HOOM
ORDO	http://www.orpha.net/ORDO/
Orphanet_	http://www.orpha.net/ORDO/Orphanet_#
bif	bif:
dawgt	http://www.w3.org/2001/sw/DataAccess/tests/test-dawg#
dbpedia	http://dbpedia.org/resource/
dbpprop	http://dbpedia.org/property/
dc	http://purl.org/dc/elements/1.1/
ebi	http://www.ebi.ac.uk/efo/
fn	http://www.w3.org/2005/xpath-functions/#
foaf	http://xmlns.com/foaf/0.1/
geo	http://www.w3.org/2003/01/geo/wgs84_pos#
go	http://purl.org/obo/owl/GO#
ldp	http://www.w3.org/ns/ldp#
math	http://www.w3.org/2000/10/sw/math#
mesh	http://purl.org/commons/record/mesh/
mf	http://www.w3.org/2001/sw/DataAccess/tests/test-manifest#
nci	http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#
obo	http://www.geneontology.org/formats/obonOwl#
ogc	http://www.opengis.net/
ogcqml	http://www.opengis.net/ont/gml#
ogcgs	http://www.opengis.net/ont/geosparql#
ogcgsf	http://www.opengis.net/def/function/geosparql/
ogcgsr	http://www.opengis.net/def/rule/geosparql/
ogcs	http://www.opengis.net/ont/s#
owl	http://www.w3.org/2002/07/owl#

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Resource Description Framework (RDF)

<https://www.w3.org/TR/rdf11-primer/> <https://www.w3.org/TR/rdf11-concepts/> <http://www.w3.org/RDF/>

✓ A Graph of Data

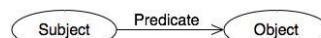
The **Resource Description Framework (RDF)** is a framework for expressing information about [resources](#). Resources can be anything, including documents, people, physical objects, and abstract concepts.

Resource Description Framework (RDF) is a model of graphs dedicated to describing in a formal fashion the Web resources and their metadata, in such a way so as to permit the automatic treatment of such descriptions.

RDF is a standard model for data interchange on the Web. RDF has features that facilitate data merging even if the underlying schemas differ, and it specifically supports the evolution of schemas over time without requiring all the data consumers to be changed.

This linking structure forms a directed, labeled graph, where the edges represent the named link between two resources, represented by the graph nodes. This graph view is the easiest possible mental model for RDF and is often used in easy-to-understand visual explanations

RDF extends the linking structure of the Web to use URIs to name the relationship between things as well as the two ends of the link (this is usually referred to as a “triple”). Using this simple model, it allows structured and semi-structured data to be mixed, exposed, and shared across different applications.



An RDF graph with two nodes (Subject and Object) and a triple connecting them (Predicate)



Vocabularies – Ontologies – Terminologies

✓ RDF

✓ RDFS (RDF Schema)

✓ DC

✓ FOAF

✓ SKOS

✓ OWL



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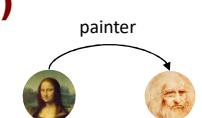
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Resource Description Framework (RDF)



Resources and Statements



Any [IRI](#) or [literal](#) denotes something in the world (the “universe of discourse”). These things are called **resources**. Anything can be a resource, including physical things, documents, abstract concepts, numbers and strings; the term is synonymous with “entity”.

The resource denoted by an IRI is called its [referent](#), and the resource denoted by a literal is called its [literal value](#). Literals have [datatypes](#) that define the range of possible values, such as strings, numbers, and dates. Special kind of literals, [language-tagged strings](#), denote plain-text strings in a natural language.

Asserting an [RDF triple](#) says that *some relationship, indicated by the predicate, holds between the resources denoted by the subject and object*. This statement corresponding to an RDF triple is known as an [RDF statement](#). The predicate itself is an [IRI](#) and denotes a [property](#), that is, a [resource](#) that can be thought of as a binary relation.

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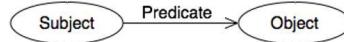
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Resource Description Framework (RDF)

An RDF graph is a set of [RDF triples](#).

An RDF triple consists of three components:

- the subject, which is an [URI](#) or a [blank node](#)
- the predicate, which is an [URI](#)
- the object, which is an [URI](#), a [literal](#) or a [blank node](#)



EXAMPLE 1: Sample triples (informal)

```
<Bob> <is a> <person>.  
<Bob> <is a friend of> <Alice>.  
<Bob> <is born on> <the 4th of July 1990>.  
<Bob> <is interested in> <the Mona Lisa>.  
<the Mona Lisa> <was created by> <Leonardo da Vinci>.  
<the video 'La Joconde à Washington'> <is about> <the Mona Lisa>
```

An **RDF statement** expresses a relationship between two resources. The **subject** and the **object** represent the two resources being related; the **predicate** represents the nature of their relationship. The relationship is phrased in a directional way (from subject to object) and is called in RDF a **property**. Because RDF statements consist of three elements they are called **triples**.

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RDF Vocabulary

Vocabularies and Namespace IRIs

- An **RDF vocabulary** is a collection of [IRIs](#) intended for use in [RDF graphs](#)

- It provides a way to make statements about resources.

```
<rdf:Description rdf:about="https://data.bnf.fr/ark:/12148/cb12439224g#about">  
  <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>  
</rdf:Description>
```



- The IRIs in an RDF vocabulary often begin with a common substring known as a namespace IRI. Some namespace IRIs are associated by convention with a short name known as a namespace prefix.

Some example namespace prefixes and IRIs

Namespace prefix	Namespace IRI	RDF vocabulary
rdf	http://www.w3.org/1999/02/22-rdf-syntax-ns#	The RDF built-in vocabulary [RDF11-SCHEMA]
rdfs	http://www.w3.org/2000/01/rdf-schema#	The RDF Schema vocabulary [RDF11-SCHEMA]
xsd	http://www.w3.org/2001/XMLSchema#	The RDF-compatible XSD types

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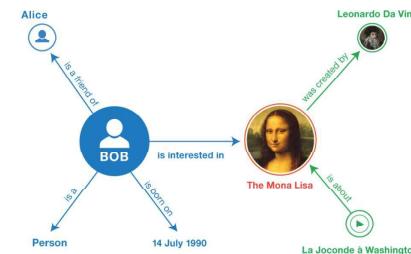
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Resource Description Framework (RDF)

We can visualize triples as a connected **graph**. Graphs consists of nodes and arcs. The subjects and objects of the triples make up the nodes in the graph; the predicates form the arcs.

EXAMPLE 1: Sample triples (informal)

```
<Bob> <is a> <person>.  
<Bob> <is a friend of> <Alice>.  
<Bob> <is born on> <the 4th of July 1990>.  
<Bob> <is interested in> <the Mona Lisa>.  
<the Mona Lisa> <was created by> <Leonardo da Vinci>.  
<the video 'La Joconde à Washington'> <is about> <the Mona Lisa>
```



- The RDF data model is atemporal: [RDF graphs](#) are static snapshots of information.

- Since [RDF graphs](#) are defined as mathematical sets, adding or removing [triples](#) from an RDF graph yields a different RDF graph.

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RDF Vocabulary

Vocabularies and Namespace IRIs

- RDF is typically used in combination with [other vocabularies](#) to enrich semantic information about these resources.

How to define them?

Properties

rdf:type which is used to state that a resource is an instance of a class.

```
<rdf:Description rdf:about="https://data.bnf.fr/ark:/12148/cb12439224g#about">  
  <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>  
</rdf:Description>
```

Classes

rdf:Property is the class of RDF properties.



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RDF-S Vocabulary

<https://www.w3.org/TR/rdf-schema/>

- ✓ To support the definition of new vocabularies RDF provides the RDF Schema language.
- ✓ RDF Schema is an extension of the basic RDF vocabulary.

Classes

- Resources may be divided into groups called classes.
- The members of a class are known as instances of the class.
- Classes are themselves resources.
- They are often identified by IRIs and may be described using RDF properties.
- The `rdf:type` property may be used to state that a resource is an instance of a class.

- ✓ RDF distinguishes between a class and the set of its instances
- ✓ A class may be a member of its own class extension and may be an instance of itself.

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RDF-S Vocabulary

RDF-S allows one to define semantic characteristics of RDF data.

For example, one can state that the IRI <http://www.example.org/friendOf> can be used as a property and that the subjects and objects of <http://www.example.org/friendOf> triples must be resources of class <http://www.example.org/Person>.

```
<rdf>Description rdf:about="https://data.bnf.fr/ark:/12148/cb12439224g#about">
  <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>
</rdf>Description>
```



```
rdf:type a rdf:Property ;
rdfs:isDefinedBy <http://www.w3.org/1999/02/22-rdf-syntax-ns#> ;
rdfs:label "type" ;
rdfs:comment "The subject is an instance of a class." ;
rdfs:domain rdfs:Resource ;
rdfs:range rdfs:Class .
```

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STIC Info – Master 2

Cours 3/8

Info 907: Web Sémantique

1. What is a Knowledge Graph?
2. An introductory example
3. How to represent a KG?
4. How to query a KG?
5. Practical Works
6. Building/Querying a KG
7. Project



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RDF & RDFS VOCABULARIES

Property name	comment	domain	range
<code>rdf:type</code>	The subject is an instance of a class.	<code>rdfs:Resource</code>	<code>rdfs:Class</code>
<code>rdfs:subClassOf</code>	The subject is a subclass of a class.	<code>rdfs:Class</code>	<code>rdfs:Class</code>
<code>rdfs:subPropertyOf</code>	The subject is a subproperty of a property.	<code>rdf:Property</code>	<code>rdf:Property</code>
<code>rdfs:domain</code>	A domain of the subject property.	<code>rdf:Property</code>	<code>rdfs:Class</code>
<code>rdfs:range</code>	A range of the subject property.	<code>rdf:Property</code>	<code>rdfs:Class</code>
<code>rdfs:label</code>	A human-readable name for the subject.	<code>rdfs:Resource</code>	<code>rdfs:Literal</code>
<code>rdfs:comment</code>	A description of the subject resource.	<code>rdfs:Resource</code>	<code>rdfs:Literal</code>
<code>rdfs:member</code>	A member of the subject resource.	<code>rdfs:Resource</code>	<code>rdfs:Resource</code>
<code>rdf:first</code>	The first item in the subject RDF list.	<code>rdf>List</code>	<code>rdfs:Resource</code>
<code>rdf:rest</code>	The rest of the subject RDF list after the first item.	<code>rdf>List</code>	<code>rdf>List</code>
<code>rdfs:seeAlso</code>	Further information about the subject resource.	<code>rdfs:Resource</code>	<code>rdfs:Resource</code>
<code>rdfs:isDefinedBy</code>	The definition of the subject resource.	<code>rdfs:Resource</code>	<code>rdfs:Resource</code>
<code>rdf:value</code>	Idiomatic property used for structured values.	<code>rdfs:Resource</code>	<code>rdfs:Resource</code>
<code>rdf:subject</code>	The subject of the subject RDF statement.	<code>rdf:Statement</code>	<code>rdfs:Resource</code>
<code>rdf:predicate</code>	The predicate of the subject RDF statement.	<code>rdf:Statement</code>	<code>rdfs:Resource</code>
<code>rdf:object</code>	The object of the subject RDF statement.	<code>rdf:Statement</code>	<code>rdfs:Resource</code>

Class name	comment
<code>rdfs:Resource</code>	The class resource, everything.
<code>rdfs:Literal</code>	The class of literal values, e.g. textual strings and integers.
<code>rdf:langString</code>	The class of language-tagged string literal values.
<code>rdf:HTML</code>	The class of HTML literal values.
<code>rdf:XMLLiteral</code>	The class of XML literal values.
<code>rdfs:Class</code>	The class of classes.
<code>rdf:Property</code>	The class of RDF properties.
<code>rdfs:Datatype</code>	The class of RDF datatypes.
<code>rdf:Statement</code>	The class of RDF statements.
<code>rdf:Bag</code>	The class of unordered containers.
<code>rdf:Seq</code>	The class of ordered containers.
<code>rdf:Alt</code>	The class of containers of alternatives.
<code>rdfs:Container</code>	The class of RDF containers.
<code>rdfs:ContainerMembershipProperty</code>	The class of container membership properties, <code>rdf:_1</code> , <code>rdf:_2</code> , ..., all of which are sub-properties of <code>member</code> .
<code>rdf>List</code>	The class of RDF Lists.

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Writing RDF graphs

A number of different serialization formats exist for writing down RDF graphs. However, different ways of writing down the same graph lead to exactly the same triples, and are thus logically equivalent.

1. Turtle family of RDF languages ([N-Triples](#), [Turtle](#), [TriG](#) and [N-Quads](#));
2. [JSON-LD](#) (JSON-based RDF syntax);
3. [RDFa](#) (for HTML and XML embedding);
4. [RDF/XML](#) (XML syntax for RDF).

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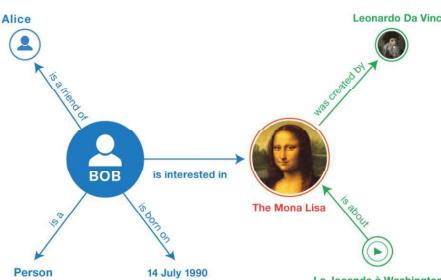
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Writing RDF graphs

Turtle family of RDF languages

■ Turtle

The Turtle syntax is an **extension of N-Triples** with various forms of syntactic sugar to improve readability, such as support for namespace prefixes



```
01 BASE <http://example.org/>
02 PREFIX foaf: <http://xmlns.com/foaf/0.1/>
03 PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
04 PREFIX schema: <http://schema.org/>
05 PREFIX dcterms: <http://purl.org/dc/terms/>
06 PREFIX wd: <http://www.wikidata.org/entity/>
07
08 <bob#me>
09 a foaf:Person;
10 foaf:knows <alice#me>;
11 schema:birthDate "1990-07-04"^^xsd:date ;
12 foaf:topic_interest wd:Q12418 .
13
14 wd:Q12418
15 dcterms:title "Mona Lisa";
16 dcterms:creator <http://dbpedia.org/resource/Leonardo_da_Vinci> .
17
18 <http://data.europeana.eu/item/04802/243FA8618938F4117025F17A8B813C5F9AA4D619>
19 dcterms:subject wd:Q12418 .
```

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Writing RDF graphs

Turtle family of RDF languages

■ N-Triples

N-Triples provides a simple line-based, plain-text way for serializing RDF graphs.

```
01 <http://example.org/bob#me> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://xmlns.com/foaf/0.1/Person> .
02 <http://example.org/bob#me> <http://xmlns.com/foaf/0.1/knows> <http://example.org/alice#me> .
03 <http://example.org/bob#me> <http://schema.org/birthDate> "1990-07-04"^^<http://www.w3.org/2001/XMLSchema#date> .
04 <http://example.org/bob#me> <http://xmlns.com/foaf/0.1/topic_interest> <http://www.wikidata.org/entity/Q12418> .
05 <http://www.wikidata.org/entity/Q12418> <http://purl.org/dc/terms/title> "Mona Lisa" .
06 <http://www.wikidata.org/entity/Q12418> <http://purl.org/dc/terms/creator> <http://dbpedia.org/resource/Leonardo_da_Vinci> .
07 <http://data.europeana.eu/item/04802/243FA8618938F4117025F17A8B813C5F9AA4D619> <http://purl.org/dc/terms/subject> <http://www.wikidata.org/entity/Q12418> .
```

- Each line represents a triple.
- Full IRIs are enclosed in angle brackets (<>).
- The period at the end of the line signals the end of the triple.

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Writing RDF graphs

Turtle family of RDF languages

■ RDF/XML

RDF/XML provides an XML syntax for RDF graphs. When RDF was originally developed in the late 1990s, this was its only syntax, and some people still call this syntax "RDF".

```
01 <?xml version="1.0" encoding="utf-8"?>
02 <rdf:RDF
03   xmlns:dcterms="http://purl.org/dc/terms/"
04   xmlns:foaf="http://xmlns.com/foaf/0.1/"
05   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
06   xmlns:schema="http://schema.org/">
07   <rdf:Description rdf:about="http://example.org/bob#me">
08     <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>
09     <schema:birthDate rdf:datatype="http://www.w3.org/2001/XMLSchema#date">1990-07-04</schema:birthDate>
10    <foaf:knows rdf:resource="http://example.org/alice#me"/>
11    <foaf:topic_interest rdf:resource="http://www.wikidata.org/entity/Q12418"/>
12  </rdf:Description>
13  <rdf:Description rdf:about="http://www.wikidata.org/entity/Q12418">
14    <dcterms:title>Mona Lisa</dcterms:title>
15    <dcterms:creator rdf:resource="http://dbpedia.org/resource/Leonardo_da_Vinci"/>
16  </rdf:Description>
17  <rdf:Description rdf:about="http://data.europeana.eu/item/04802/243FA8618938F4117025F17A8B813C5F9AA4D619">
18    <dcterms:subject rdf:resource="http://www.wikidata.org/entity/Q12418"/>
19  </rdf:Description>
20 </rdf:RDF>
```

triples are specified within an XML element rdf:RDF

The attributes of the rdf:RDF start tag (lines 3-6) provide a shorthand for writing down names of XML elements and attributes

The XML element rdf:Description is used to define sets of triples. The name of the subelement is an IRI representing an RDF property

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Dublin Core Vocabulary (DC)

Vocabulary Dublin Core

The Dublin Core Schema is a small set of vocabulary terms that can be used to describe digital resources (video, images, web pages, etc.), as well as physical resources such as books or CDs, and objects like artworks.

Dublin Core metadata may be used for multiple purposes, from simple resource description to combining metadata vocabularies of different metadata standards, to providing interoperability for metadata vocabularies in the linked data cloud and Semantic Web implementations.

15 meta data

- | | |
|-------------------|-----------------|
| ■ DC.TITLE | ■ DC.FORMAT |
| ■ DC.CREATOR | ■ DC.IDENTIFIER |
| ■ DC.SUBJECT | ■ DC.SOURCE |
| ■ DC.DESCRIPTION | ■ DC.LANGUAGE |
| ■ DC.PUBLISHER | ■ DC.RELATION |
| ■ DC.CONTRIBUTORS | ■ DC.COVERAGE |
| ■ DC.DATE | ■ DC.RIGHTS |
| ■ DC.TYPE | |



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Friend of a friend

Status Published

Year started 2000; 21 years ago

First published June 3, 2005; 15 years ago

Latest version 0.99
January 14, 2014; 6 years ago

Series Namespace Document

Authors Dan Brickley, Libby Miller

Base standards RDF, OWL

Domain Semantic Web

License CC BY 1.0

Abbreviation FOAF

Website xmlns.com/foaf/spec/

FOAF (an acronym of [friend of a friend](#)) is a [machine-readable ontology](#) describing [persons](#), their activities and their relations to other people and objects. Anyone can use FOAF to describe themselves. FOAF allows groups of people to describe [social networks](#) without the need for a centralised database.

```
<rdfs:Class rdf:about="http://xmlns.com/foaf/0.1/Person" rdfs:label="Person" rdfs:comment="A person." vs:term_status="stable">
<rdf:type rdf:resource="http://www.w3.org/2002/07/owl#Class"/>
<owl:equivalentClass rdf:resource="http://schema.org/Person"/>
<owl:equivalentClass rdf:resource="http://www.w3.org/2000/10/swap/pim/contact#Person"/>
+<!-->
-<rdfs:subClassOf>
  <owl:Class rdf:about="http://xmlns.com/foaf/0.1/Agent"/>
</rdfs:subClassOf>
```



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Friend Of A Friend Vocabulary (FOAF)

FOAF is a descriptive vocabulary expressed using the Resource Description Framework (RDF) and the Web Ontology Language (OWL). Computers may use these FOAF profiles to find, for example, all people living in Europe, or to list all people both you and a friend of yours know. This is accomplished by defining relationships between people.

FOAF Basics	Personal Info	Online Accounts / IM
<ul style="list-style-type: none"> Agent Person name nick title homepage mailto mailto_sha1sum img depiction (depicts) surname family_name givenname firstName 	<ul style="list-style-type: none"> weblog knows interest currentProject pastProject plan based_near workplaceHomepage workInfoHomepage schoolHomepage topic_interest publications geekcode myersBriggs dmaChecksum 	<ul style="list-style-type: none"> OnlineAccount OnlineChatAccount OnlineCommerceAccount OnlineGamingAccount holdsAccount accountServiceHomepage accountName icqChatID msnChatID aimChatID jabberID yahooChatID
	Projects and Groups	
	<ul style="list-style-type: none"> Project Organization Group member membershipClass fundedBy theme 	
	Documents and Images	
	<ul style="list-style-type: none"> Document Image PersonalProfileDocument topic (page) primaryTopic tipjar sha1 made (maker) thumbnail logo 	

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Simple Knowledge Organization System (SKOS)

<https://www.w3.org/TR/2009/NOTE-skos-primer-20090818/>

Simple Knowledge Organization System (SKOS) is a [W3C recommendation](#) designed for representation of [thesauri](#), [classification schemes](#), [taxonomies](#), [subject-heading systems](#), or any other type of structured [controlled vocabulary](#). SKOS is part of the [Semantic Web](#) family of standards built upon [RDF](#) and [RDFS](#), and its main objective is to enable easy publication and use of such vocabularies as [linked data](#).

Concept The fundamental element of the SKOS vocabulary is the concept. Concepts are the units of thought —ideas, meanings, or (categories of) objects and events—which underlie many knowledge organization systems. As such, concepts exist in the mind as abstract entities which are independent of the terms used to label them.

skos:Concept SKOS introduces the class `skos:Concept`, which allows implementors to assert that a given resource is a concept.

ex:Animals `rdf:type skos:Concept`



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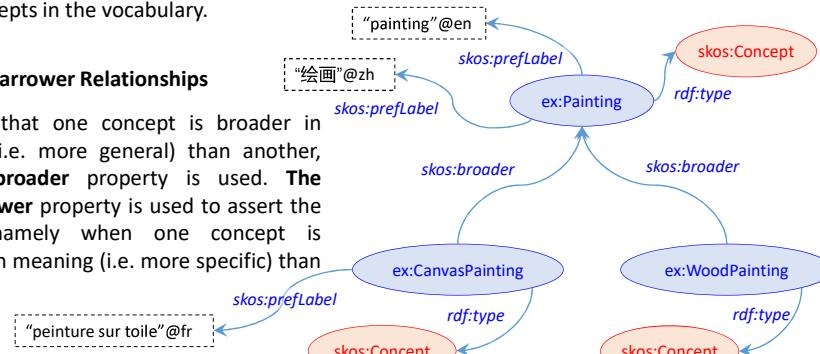
Simple Knowledge Organization System (SKOS)

Semantic Relationships

In KOSs semantic relations play a crucial role for defining concepts. The meaning of a concept is defined not just by the natural-language words in its labels but also by its links to other concepts in the vocabulary.

Broader/Narrower Relationships

To assert that one concept is broader in meaning (i.e. more general) than another, the **skos:broader** property is used. The **skos:narrower** property is used to assert the inverse, namely when one concept is narrower in meaning (i.e. more specific) than another.



Associative Relationships

To assert an associative relationship between two concepts, **skos:related** can be used

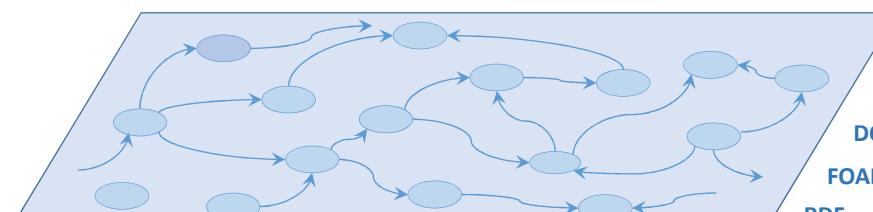
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RDF Graph

RDF (family of RDF standards) is a framework for representing information in the web:

- RDF
- RDFS
- FOAF
- DC
- SKOS
- OWL
- Etc.



Knowledge Graph

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Ontology Web Language Vocabulary (OWL)

Vocabulary OWL (<https://www.w3.org/TR/owl-ref/>)

The Web Ontology Language OWL is a semantic markup language for publishing and sharing ontologies on the World Wide Web. OWL is developed as a vocabulary extension of RDF (the Resource Description Framework) and is derived from the DAML+OIL Web Ontology Language. This document contains a structured informal description of the full set of OWL language constructs and is meant to serve as a reference for OWL users who want to construct OWL ontologies.

5.2.1 owl:sameAs

The built-in OWL property **owl:sameAs** links an individual to an individual. Such an **owl:sameAs** statement indicates that two URI references actually refer to the same thing: the individuals have the same "identity".

For individuals such as "people" this notion is relatively easy to understand. For example, we could state that the following two URI references actually refer to the same person:

```
<rdf:Description rdf:about="#William_Jefferson_Clinton">
  <owl:sameAs rdf:resource="#BillClinton"/>
</rdf:Description>
```

The **owl:sameAs** statements are often used in defining mappings between ontologies. It is unrealistic to assume everybody will use the same name to refer to individuals. That would require some grand design, which is contrary to the spirit of the web.

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RDF Graph

<https://data.bnfr.fr/current/sparql.html>

Wolfgang Amadeus Mozart (1756-1791)

Franz Xaver Wolfgang Mozart (1791-1844)

Euvres musicales (8 486)

Wolfgang Amadeus Mozart (1756-1791) : œuvres (9 534 ressources dans data.bnfr.fr)

Franz Xaver Wolfgang Mozart (1791-1844) : œuvres (27 ressources dans data.bnfr.fr)

Pays : Autriche
Langue : Allemand
Sexe : Masculin
Naissance : Salzbourg (Autriche), 27-01-1756
Mort : Vienne (Autriche), 05-12-1791
Note : Compositeur, pianiste, violoniste et chef d'orchestre.
Père : Compositeur : Joannes Christostophus Wolfgangus Theophilus

Autres formes du nom : Mozart (1756-1791)
Mozart (1756-1791) (japonais)
モーツアルト (1756-1791) (japonais)
Wolfgang Gottlieb Mozart (1756-1791)

ISNI : ISNI 0000 0001 2126 9154

Wolfgang Amadeus Mozart (1756-1791) : œuvres (9 534 ressources dans data.bnfr.fr)

Franz Xaver Wolfgang Mozart (1791-1844) : œuvres (27 ressources dans data.bnfr.fr)

Pays : Autriche
Langue : Allemand
Sexe : Masculin
Naissance : 26-07-1791
Mort : 29-07-1844
Note : Pianiste, musicien et compositeur - Fils de Wolfgang Amadeus Mozart
Domaine : Musique

ISNI : ISNI 0000 0000 8369 3877

Pays : Autriche
Langue : Allemand
Sexe : Masculin
Naissance : Variations, Piano, Do majeur, Valse, Diabelli, Anton (1824)
Mort : Concertos, Piano, orchestre, Mi bémol majeur, No 2, Op. 25 (1818)
Concertos, Piano, orchestre, Do majeur, No 1, Op. 14 (1805)

ISNI : ISNI 0000 0000 8369 3877

Allegretto, Piano, Sol majeur (1841)
Variations, Piano, Do majeur, Valse, Diabelli, Anton (1824)
Concertos, Piano, orchestre, Mi bémol majeur, No 2, Op. 25 (1818)
Concertos, Piano, orchestre, Do majeur, No 1, Op. 14 (1805)

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Christophe Roche /12439224/Franz_xaver_wolfgang_mozart_(1791-1844)

Web sémantique et modèle de données

Franz Xaver Wolfgang Mozart (1791-1844)

Pays :	Autriche
Langue :	Allemand
Sexe :	Masculin
Néissance :	26-07-1791
Mort :	29-07-1844
Note :	Pianiste, musicien et compositeur. - Fils de Wolfgang Amadeus Mozart
Domaines :	Musique
ISNI :	ISNI 0000 0000 8369 3877

Pour en savoir plus sur le web sémantique et le web de données à la Bnf

Il s'agit de structurer les ressources pour que les machines puissent mieux les exploiter. Le projet data.bnf.fr utilise des données produites dans des formats divers, notamment Intermarc pour les catalogues de livres, EAD pour les inventaires d'archives et les manuscrits, et Dublin Core pour la bibliothèque numérique.

Ces données sont restructurées, regroupées, enrichies par des traitements automatiques et publiées selon le modèle descriptif du web sémantique, RDF. Le résultat est disponible sur ce site, selon plusieurs syntaxes de RDF : RDF-XML, RDF-N3, et RDF-NT.

Une partie des données sont alignées sur d'autres référentiels : `!loc:gov` pour les langues et nationalités, DCMI type pour les types de documents. Elles sont aussi alignées vers des jeux de données recensés dans CKAN, en particulier DBpedia et VIAF. Enfin, les données des pages thématiques RAMEAU sont alignées vers d'autres thésaurus, de bibliothèques étrangères (LCSH, DnB, BNE) ou plus spécialisés (Agricore, Geonames, Thesaurus W).

Comprendre le modèle de données de data.bnf.fr

Que la Bibliothèque nationale de France fournit

- Des URI pour les ressources : toutes les ressources disposent d'identifiants pérennes, attribués selon le mécanisme ARK qui permet d'accéder à toutes les ressources de la bibliothèque.
- Pour chaque ressource, un ensemble de métadonnées associées à l'URI de la ressource sous forme de triplets RDF, selon les technologies du *linked open data*. Ces métadonnées sont récupérables sur chaque page (export) et pour toute la base (dump).

Comment récupérer les données de data.bnf.fr ?

- En cliquant sur l'icône RDF  bas des pages
- En ajoutant un des suffixes suivants à l'URL d'une page : NT, N3, RDF-XML selon le format souhaité, par exemple :
 - `http://data.bnf.fr/ark:/192801/jules_verne/rdf.xml`
 - `http://data.bnf.fr/ark:/192801/jules_verne/rdf.nt`
 - `http://data.bnf.fr/ark:/192801/jules_verne/rdf.n3`
- Par négociation de contenu en utilisant un navigateur RDF à partir des URL
- En utilisant le langage de requête SPARQL : `http://data.bnf.fr/sparql`
- En téléchargeant via FTP le dump de l'intégralité des données RDF :
 - hôte : `pel.bnf.fr`
 - port : 21
 - login : `databnfr`
 - mot de passe : `databnfr`

Voir plus de documents de ce genre

Télécharger les données

- Télécharger en RDF (xml | nt | n3)
- Télécharger en JSON-LD
- Télécharger en JSON
- Le Web sémantique dans data.bnf.fr

Franz Xaver Wolfgang Mozart (1791-1844)

Pays :	Autriche
Langue :	Allemand
Sexe :	Masculin
Néissance :	26-07-1791
Mort :	29-07-1844
Note :	Pianiste, musicien et compositeur. - Fils de Wolfgang Amadeus Mozart
Domaines :	Musique
ISNI :	ISNI 0000 0000 8369 3877

Franz Xaver Wolfgang Mozart (1791-1844) : œuvres (27 ressources dans data.bnf.fr)

Allergretto. Piano. Sol majeur (1841)
Variations. Piano. Do majeur. Valse. Diabelli, Anton (1824)
Concertos. Piano, orchestre. Mi bémol majeur. No 2. Op. 25 (1818)
Concertos. Piano, orchestre. Do majeur. No 1. Op. 14 (1805)
Lieder
Musique pour piano

Voir plus de documents de ce genre

Télécharger les données

- Télécharger en RDF (xml | nt | n3)
- Télécharger en JSON-LD
- Télécharger en JSON
- Le Web sémantique dans data.bnf.fr

https://data.bnf.fr/12439224/franz_xaver_wolfgang_mozart/rdf.xml

Franz Xaver Wolfgang Mozart (1791-1844) : œuvres (27 ressources dans data.bnf.fr)

Allergretto. Piano. Sol majeur (1841)
Variations. Piano. Do majeur. Valse. Diabelli, Anton (1824)
Concertos. Piano, orchestre. Mi bémol majeur. No 2. Op. 25 (1818)
Concertos. Piano, orchestre. Do majeur. No 1. Op. 14 (1805)
Lieder
Musique pour piano

Voir plus de documents de ce genre

Télécharger les données

- Télécharger en RDF (xml | nt | n3)
- Télécharger en JSON-LD
- Télécharger en JSON
- Le Web sémantique dans data.bnf.fr

https://data.bnf.fr/12439224/franz_xaver_wolfgang_mozart/rdf.xml

RDF Graph

<https://data.bnf.fr/current/sparql.html>

{BnF} Data

Exemple de requêtes

Query X +

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT DISTINCT ?x
WHERE { ?x rdf:type foaf:Person .
?x foaf:name ?y .
FILTER REGEX (?y, "Mozart") .
FILTER REGEX (?y, "Wolfgang") .
}
LIMIT 10
```

Table Response 2 results in 18.55 seconds

1 <[http://data.bnf.fr/ark:/12148/cb14027233b#about](https://data.bnf.fr/ark:/12148/cb14027233b#about)>

2 <[http://data.bnf.fr/ark:/12148/cb12439224g#about](https://data.bnf.fr/ark:/12148/cb12439224g#about)>

https://data.bnf.fr/12439224/franz_xaver_wolfgang_mozart/rdf.xml

Franz Xaver Wolfgang Mozart (1791-1844)

Pays :	Autriche
Langue :	Allemand
Sexe :	Masculin
Néissance :	26-07-1791
Mort :	29-07-1844
Note :	Pianiste, musicien et compositeur. - Fils de Wolfgang Amadeus Mozart
Domaines :	Musique
ISNI :	ISNI 0000 0000 8369 3877

Franz Xaver Wolfgang Mozart (1791-1844) : œuvres (27 ressources dans data.bnf.fr)

Allergretto. Piano. Sol majeur (1841)
Variations. Piano. Do majeur. Valse. Diabelli, Anton (1824)
Concertos. Piano, orchestre. Mi bémol majeur. No 2. Op. 25 (1818)
Concertos. Piano, orchestre. Do majeur. No 1. Op. 14 (1805)

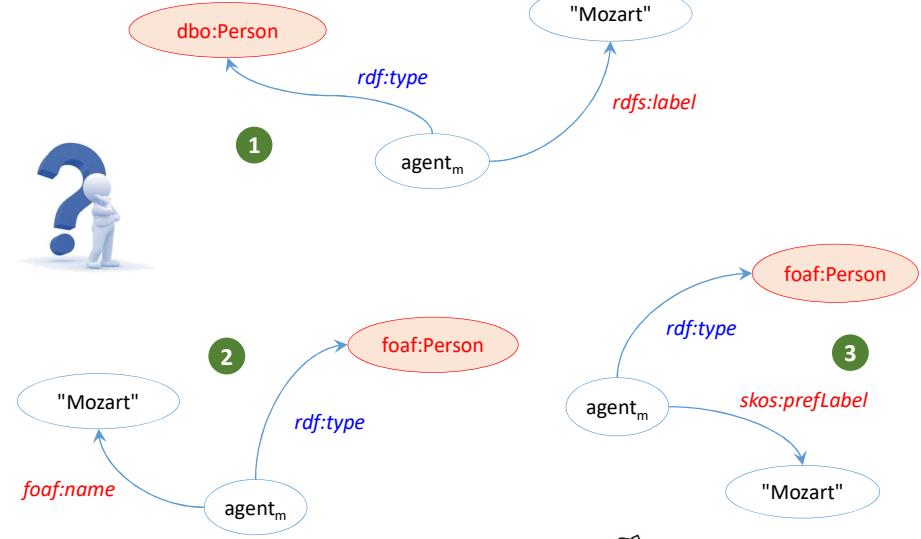
Voir plus de documents de ce genre

Télécharger les données

- Télécharger en RDF (xml | nt | n3)
- Télécharger en JSON-LD
- Télécharger en JSON
- Le Web sémantique dans data.bnf.fr

https://data.bnf.fr/12439224/franz_xaver_wolfgang_mozart/rdf.xml

Question: How to label a node?

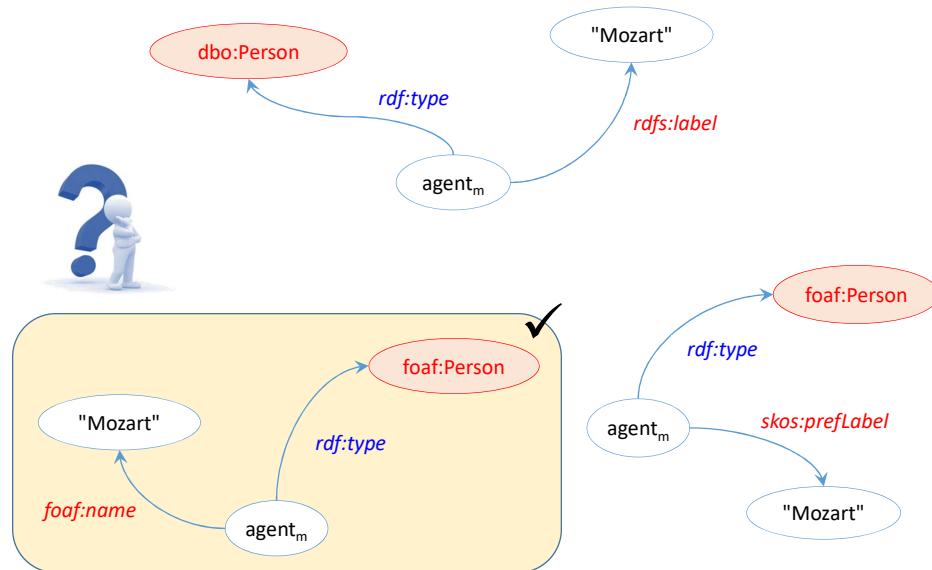


Which is it the best?
1, 2 or 3

https://data.bnf.fr/12439224/franz_xaver_wolfgang_mozart/rdf.xml

https://data.bnf.fr/12439224/franz_xaver_wolfgang_mozart/rdf.xml

Question: How to label a node?



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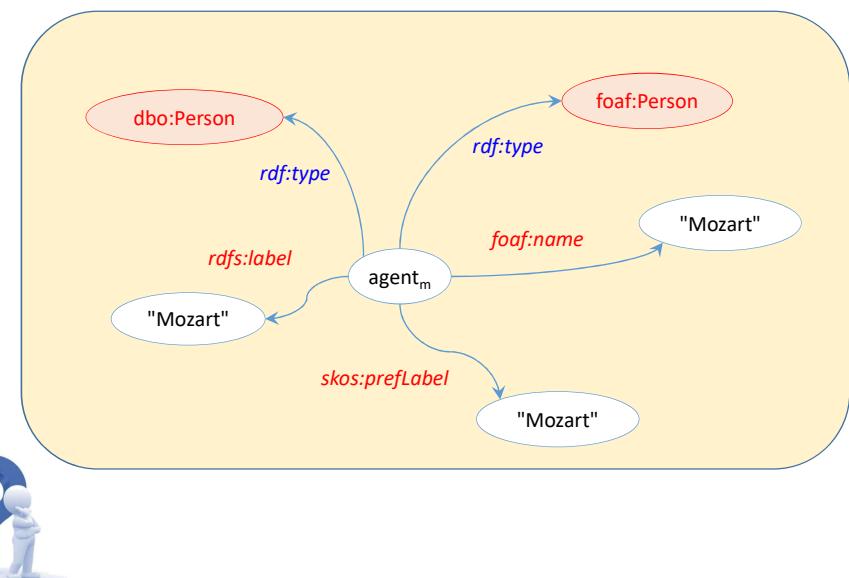
DBpedia Query

	person
	http://dbpedia.org/resource/Confucius

- [wikidata:Confucius](#)
- [dbpedia-es:Confucius](#)
- [dbpedia-de:Confucius](#)
- [dbpedia-el:Confucius](#)
- [dbpedia-es:Confucius](#)
- [dbpedia-eu:Confucius](#)
- [dbpedia-fr:Confucius](#)
- [dbpedia-id:Confucius](#)
- [dbpedia-it:Confucius](#)
- [dbpedia-ja:Confucius](#)
- [dbpedia-ko:Confucius](#)
- [dbpedia-nl:Confucius](#)
- [dbpedia-pl:Confucius](#)
- [dbpedia-pt:Confucius](#)
- [dbpedia-wikidata:Confucius](#)
- <http://viaf.org/viaf/89664672>
- http://www4.wiwiss.fu-berlin.de/gutendata/resource/people/Confucius_551_BC-479_BC
- http://sw.cyc.com/concept/Mx4r_k-Y9SNjQYOm5JvVjX8_ug
- [freebase:Confucius](#)
- [yago-res:Confucius](#)
- <https://dph.info/fnd/118565026>

Condillac (France) – KFTBC (China)

Question: How to label a node?



Condillac (France) – KETRC (Chin

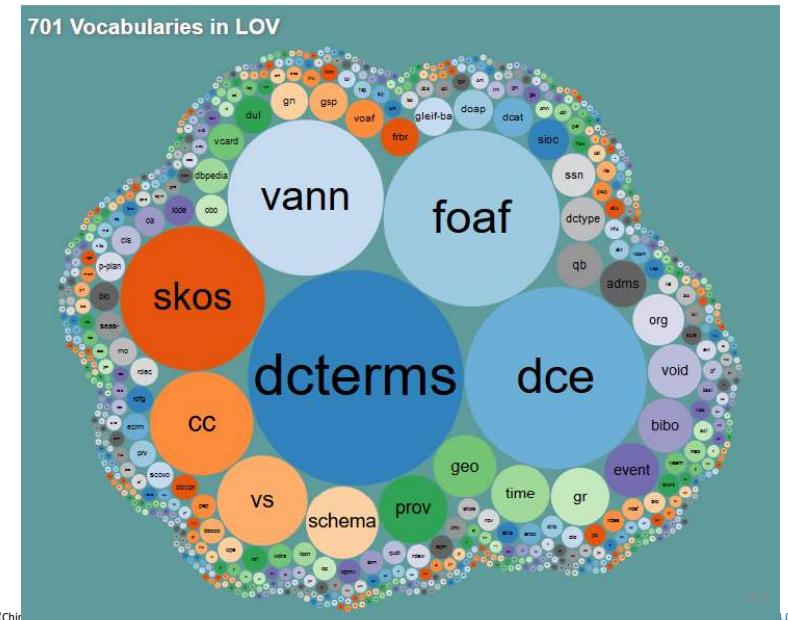
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DBpedia Query

Which Vocabulary?

Linked Open Vocabularies (LOV)

<https://lov.linkeddata.es/dataset/lov>

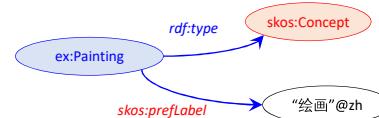


Condillac (France) – KFTBC (China)

To sum up...

The choice of relationships from standardized vocabularies (`rdf:type`, `dc:creator`, `foaf:name`, `foaf:depiction`, `skos:prefLabel`, `skos:broader`, etc.) depends on:

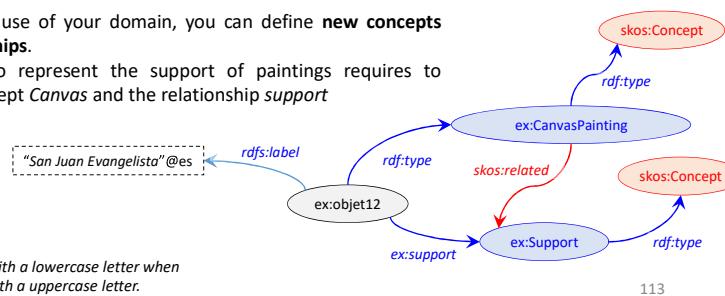
- 1) the **domain of application**;
- 2) the **type of nodes** to be linked. For example, `skos:prefLabel` should be only used to label nodes of type `skos:Concept`, i.e. nodes linked by the relation `rdf:type` to the node `skos:Concept`



The same is true for the **choice of concepts** from standardized vocabularies (`foaf:Person`, `skos:Concept`, etc.) used for typing nodes.

Nevertheless, because of your domain, you can define **new concepts** and **new relationships**.

For example, to represent the support of paintings requires to introduce the concept `Canvas` and the relationship `support`



Relation names start with a lowercase letter when concept names start with an uppercase letter.

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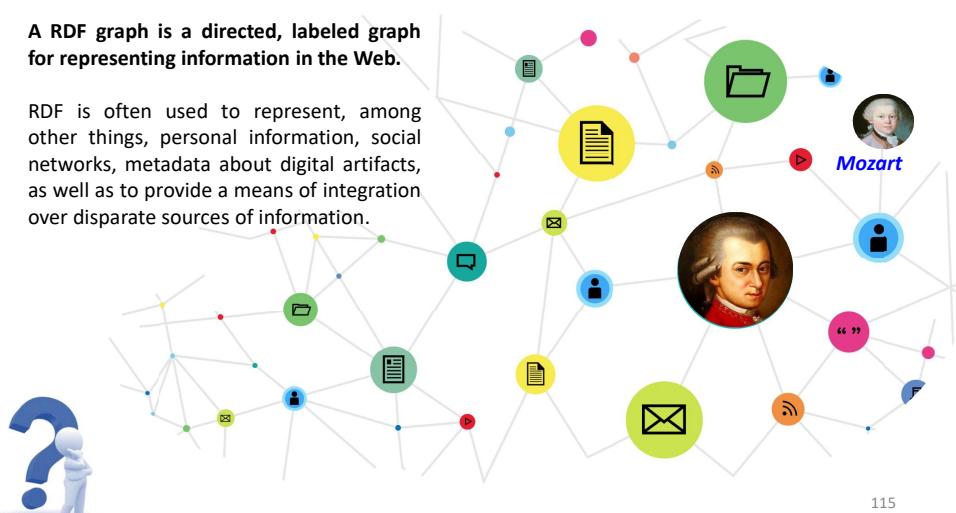
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Knowledge Graph

A **knowledge graph** is a **special kind of database** which stores **knowledge in a machine-readable form** and provides a means for information to be collected, organised, shared, searched and utilised.

A **RDF graph** is a **directed, labeled graph** for representing information in the Web.

RDF is often used to represent, among other things, personal information, social networks, metadata about digital artifacts, as well as to provide a means of integration over disparate sources of information.



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Contents

1. What is a Knowledge Graph?
2. An introductory example
3. How to represent a KG?
4. How to query a KG?
5. Practical Works
6. Building/Querying a KG
7. Project

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SPARQL

✓ SPARQL Protocol And RDF Query Language



<https://www.w3.org/TR/sparql11-query/>

<http://www.w3.org/TR/rdf-sparql-query/>

SPARQL is an **RDF query language** — that is, a semantic query language for databases — able to retrieve and manipulate data stored in Resource Description Framework (RDF) format.



SPARQL is to RDF data as SQL is to Relational Database

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT distinct ?name
FROM <http://dbpedia.org>
WHERE
{ ?person rdf:type foaf:Person .
?person foaf:name ?name
}
LIMIT 10
```

The full-stop expresses the "conjunction"

name
"A. C. Bhaktivedanta Swami Prabhupada"@en
"His Divine Grace A. C. Bhaktivedanta Prabhupada"
"Aaron Burr"@en
"Aaron Burr Jr."@en
"Abbie Hoffman"@en
"Abraham Robinson"@en
"Abraham de Moivre"@en
"Adalbert of Magdeburg"@en
"Adalbert"@en
"Adam Oehlenschläger"@en

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SPARQL



✓ A Query Language for RDF Graph

→ a SPARQL query consists of writing a query graph

Most forms of SPARQL query contain a set of triple patterns called a **basic graph pattern**.

Triple patterns are like RDF triples except that each of the subject, predicate and object may be a **variable**.

→ Retrieval:

- graph matching
- graphs which match with the **query graph**

A basic graph pattern matches a subgraph of the RDF data when RDF terms from that subgraph may be substituted for the variables and the result is RDF graph equivalent to the subgraph.

→ The results of SPARQL queries can be results **sets** or **RDF graphs**.

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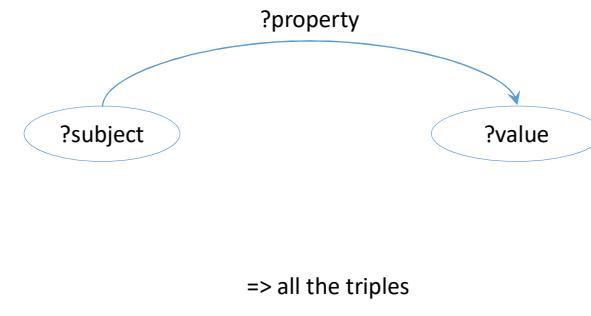
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SPARQL



Graph Pattern



=> all the triples

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SPARQL



<https://dbpedia.org/sparql>

```
SELECT distinct ?r
WHERE {
    ?x ?r ?y
}
LIMIT 15
```

A 'binding' is a pair (variable, RDF term)

r
http://www.w3.org/1999/02/22-rdf-syntax-ns#type
http://www.w3.org/2000/01/rdf-schema#subPropertyOf
http://www.w3.org/2002/07/owl#equivalentClass
http://www.w3.org/2002/07/owl#equivalentProperty
http://purl.org/dc/terms/modified
http://www.w3.org/2000/01/rdf-schema#label
http://www.w3.org/2000/01/rdf-schema#domain
http://www.w3.org/2000/01/rdf-schema#range
http://www.w3.org/2000/01/rdf-schema#comment
http://www.w3.org/2002/07/owl#versionInfo
http://www.w3.org/2002/07/owl#disjointWith
http://www.w3.org/2002/07/owl#differentFrom
http://www.w3.org/2000/01/rdf-schema#seeAlso
http://www.w3.org/2002/07/owl#sameAs
http://www.w3.org/2000/01/rdf-schema#subClassOf

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SPARQL



<https://dbpedia.org/sparql>

```
SELECT DISTINCT ?x
WHERE {
    ?x rdf:type owl:Class
}
LIMIT 15
```

A 'binding' is a pair (variable, RDF term)

x
http://dbpedia.org/ontology/Company
http://dbpedia.org/ontology/Activity
http://dbpedia.org/ontology/Name
http://dbpedia.org/ontology/Person
http://dbpedia.org/ontology/Actor
http://dbpedia.org/ontology/Place
http://dbpedia.org/ontology/Publisher
http://dbpedia.org/ontology/Genre
http://dbpedia.org/ontology/Language
http://dbpedia.org/ontology/Department
http://dbpedia.org/ontology/Software
http://dbpedia.org/ontology/School
http://dbpedia.org/ontology/Type
http://dbpedia.org/ontology/Abbey
http://dbpedia.org/ontology/AcademicConference

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SPARQL

About: logiciel

An Entity of Type : Class, from Named Graph : <http://dbpedia.org/resource/classes#>, within Data Space : dbpedia.org

Property	Value
rdf:type	owl:Class
rdfs.isDefinedBy	http://dbpedia.org/ontology/
rdfs:label	logiciel (fr) software (en)
rdfs:subClassOf	dbo:Work
owl:equivalentClass	wikidata:Q7397
wdrs:describedby	dbo:Data/Definitions.ttl
prov:wasDerivedFrom	http://mappings.dbpedia.org/index.php/OntologyClass:Software
is http://open.vocab.org/terms/defines of	http://dbpedia.org/ontology/
is http://open.vocab.org/terms/describes of	dbo:Data/Definitions.ttl
is rdfs:domain of	dbo:Software/fileSize dbo:aspectRatio dbo:computingInput dbo:computingMedia dbo:computingPlatform

A 'binding' is a pair ([variable](#), [RDF term](#))

x
http://dbpedia.org/ontology/Company
http://dbpedia.org/ontology/Activity
http://dbpedia.org/ontology/Name
http://dbpedia.org/ontology/Person
http://dbpedia.org/ontology/Actor
http://dbpedia.org/ontology/Place
http://dbpedia.org/ontology/Publisher
http://dbpedia.org/ontology/Genre
http://dbpedia.org/ontology/Language
http://dbpedia.org/ontology/Department
http://dbpedia.org/ontology/Software
http://dbpedia.org/ontology/School
http://dbpedia.org/ontology>Type
http://dbpedia.org/ontology/Abbey
http://dbpedia.org/ontology/AcademicConference



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SPARQL

About: LispWorks

An Entity of Type : logiciel, from Named Graph : <http://dbpedia.org/>, within Data Space : dbpedia.org

LispWorks is a commercial implementation and Integrated Development Environment for the Common Lisp programming language. The software runs on Microsoft Windows, Mac OS X (Intel), Linux (ARM and Intel), FreeBSD, Solaris (x86/x64, SPARC) and AIX. A runtime version for Android and iOS is available. Some of LispWorks's features are The Enterprise edition also includes KnowledgeWorks, which supports rule-based programming (including support for Prolog); the CommonSQL database interface; and a CORBA binding.

Property

Value

dbo:abstract	
	LispWorks is a commercial implementation and Integrated Development Environment for the Common Lisp programming language. The software runs on Microsoft Windows, Mac OS X (Intel), Linux (ARM and Intel), FreeBSD, Solaris (x86/x64, SPARC) and AIX. A runtime version for Android and iOS is available. LispWorks was developed by the UK software company Harlequin Ltd., and first published in 1989. Harlequin ultimately spun off its Lisp arm as Xanalys, which took over management and rights to LispWorks. In January 2005, the Xanalys Lisp team formed LispWorks Ltd. to market, develop and support the LispWorks software. Some of LispWorks's features are: * a native-code compiler and an interpreter for an extended ANSI Common Lisp * an implementation of the Common Lisp Object System with support for the Metabject protocol * support for 32bit and 64bit versions * native threads and symmetric multiprocessing * Unicode support: it can read and write Unicode files and supports strings encoded in Unicode * Foreign Language Interface (FFI) for interfacing with routines written in C, Java interface * the Common Application Programmer's Interface (C API) GUI toolkit, which provides native look-and-feel on Windows, Cocoa, GTK+ and Motif * an Emacs-like editor (source code is included in the Professional edition) * a Lisp Listener, which provides a Common Lisp Read Eval Print Loop * a graphical debugger, inspector, stepper, profiler, class browser; etc. * a facility to generate standalone executables and shared libraries. To reduce memory size, a free shaker can be used to remove unused code and data * on Mac OS X it provides a bridge to Objective-C for using Apple's Cocoa library * many of the libraries are written using the Common Lisp Object System and can be extended by the user (by writing subclasses and new methods) The Enterprise edition also includes KnowledgeWorks, which supports rule-based programming (including support for Prolog), the CommonSQL database interface, and a CORBA binding. In September 2009, it had been announced that LispWorks 6 would support concurrent threads and the C API graphics toolkit has been extended to support GTK+. LispWorks 6.1, released in January 2012, includes many further enhancements to CAPI, such as support for anti-aliased drawing. LispWorks ran on the space craft Deep Space 1. The application called RAX won the NASA Software of the Year award in 1999. (en)

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SPARQL



<https://dbpedia.org/sparql>

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

```
SELECT DISTINCT ?x
WHERE {
  ?x rdf:type dbo:Software.
  ?x rdfs:label ?name.
  FILTER REGEX (?name,"Lisp")
}
LIMIT 15
```



A 'binding' is a pair ([variable](#), [RDF term](#))

x
http://dbpedia.org/resource/LispWorks
http://dbpedia.org/resource/S-1 Lisp
http://dbpedia.org/resource/Kyoto Common Lisp
http://dbpedia.org/resource/Coman Common Lisp
http://dbpedia.org/resource/Macintosh Common Lisp
http://dbpedia.org/resource/IronLisp
http://dbpedia.org/resource/OpenLisp
http://dbpedia.org/resource/CLX (Common Lisp)
http://dbpedia.org/resource/Embeddable Common Lisp
http://dbpedia.org/resource/Common Lisp Interface Manager
http://dbpedia.org/resource/Vax Common Lisp
http://dbpedia.org/resource/Allegro Common Lisp
http://dbpedia.org/resource/Le Lisp
http://dbpedia.org/resource/CMU Common Lisp
http://dbpedia.org/resource/LispMe

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SPARQL

I'm looking for names of people....

Draw the query graph



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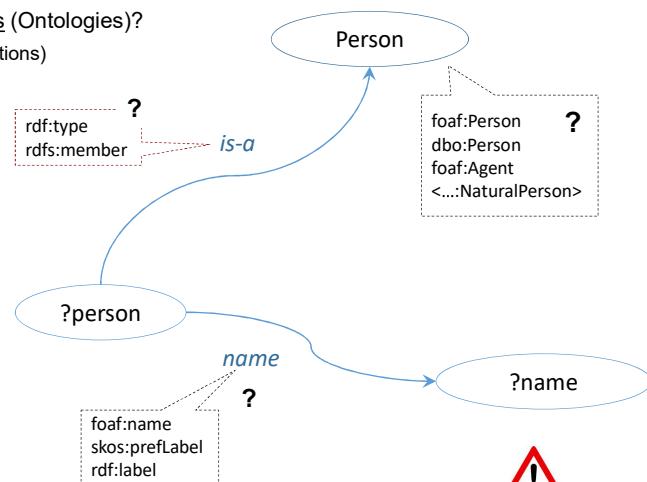
SPARQL

I'm looking for names of people....



Which Vocabularies (Ontologies)?

- properties (relations)
- concepts



Use standardized vocabularies

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SPARQL



```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT distinct ?name
WHERE {
    { ?person rdf:type foaf:Person .
      ?person foaf:name ?name
    }
}
LIMIT 15
```

This query joins together all of the triples with a matching subject, where the type predicate, "rdf:type", is a person (foaf:Person), and the person has one or more names (foaf:name).

The result of the join is a set of rows – ?person, ?name.

This query returns the ?name because ?person is often a complex URI rather than a human-friendly string.

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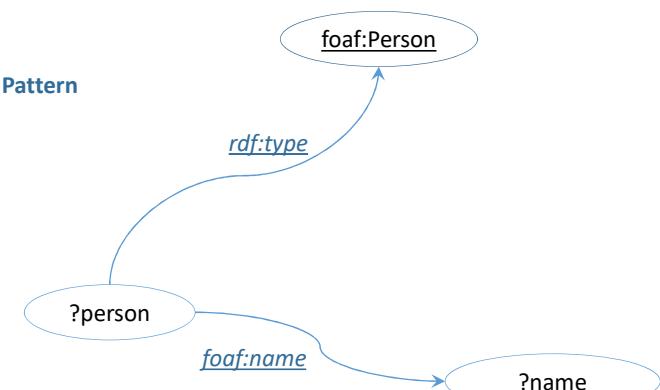
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SPARQL



I'm looking for names of people....

Graph Pattern



=> all the possible couples of values of ?person and ?name

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```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name
WHERE {
    ?person rdf:type foaf:Person .
    ?person foaf:name ?name
}
LIMIT 15
```

name
"A. C. Bhaktivedanta Swami Prabhupada"@en
"His Divine Grace A. C. Bhaktivedanta Prabhupada"
"Aaron Burr"@en
"Aaron Burr Jr."@en
"Abbie Hoffman"@en
"Abraham Robinson"@en
"Abraham de Moivre"@en
"Adalbert of Magdeburg"@en
"Adalbert"@en
"Adam Oehlenschläger"@en
"Adam Gottlob Oehlenschläger"@en
"Adam Wiśniewski-Snerg"@en
"Adi Shamir"@en
"Adlai Stevenson II"@en
"Adolf Loos"@en

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Querying a RDF Graph

O4DH: Ontologies For Digital Humanities

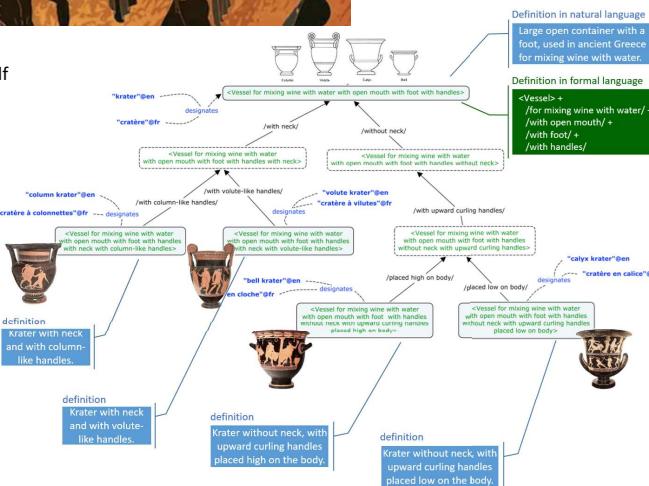


<http://ontologia.fr/OTB/krater.rdf>

Which Vocabularies?



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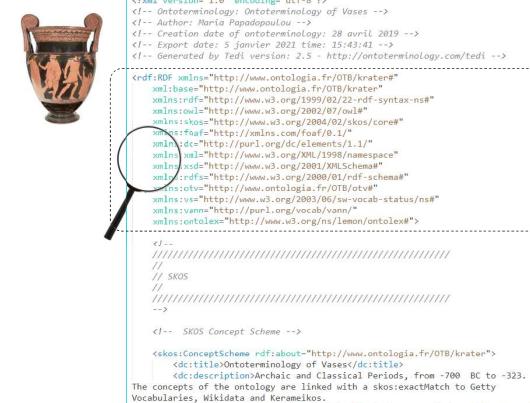


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Querying a RDF Graph

The Ontology of Kraters



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The Ontotermontology Process

RDF Export

<http://ontologia.fr/OTB/krater.rdf>

```

<?xml version="1.0" encoding="utf-8"?>
<!-- Ontotermontology: Ontotermontology of Vases -->
<!-- Author: Maria Papadopoulou -->
<!-- Creation date of ontotermontology: 28 avril 2019 -->
<!-- Export date: 28 d閏embre 2020 time: 00:07:22 -->
<!-- Generated by Tedi version: 2.5 - http://ontotermontology.com/tedi -->
```

```

<rdf:RDF xmlns="http://www.ontologia.fr/OTB/krater#"
  xmlns:rdf="http://www.ontologia.fr/1999/02/22-rdf-syntax-ns#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:skos="http://www.w3.org/2004/02/skos/core#"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:vann="http://purl.org/vocab/vann#"
  xmlns:ontolex="http://www.w3.org/ns/lemon/ontolex#"
  xmlns:swv="http://www.w3.org/2003/06/sw-vocab-status/ns#"
  xmlns:svann="http://purl.org/vocab/vann#"
  xmlns:ontolex="http://www.w3.org/ns/lemon/ontolex#"

  // SKOS
  // SKOS Concept Scheme -->
  <skos:ConceptScheme rdf:about="http://www.ontologia.fr/OTB/krater#"
    <dc:title>Ontotermontology of Vases</dc:title>
    <dc:description>Archaic and Classical Periods, from -700 BC to -323. The concepts of the ontology are linked with a skos:exactMatch to Getty Vocabularies, Wikidata and Kerameikos.</dc:description>
    <dc:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2019-4-28</dc:issued>
    <dc:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2020-12-27</dc:modified>
    <dc:creator>Maria Papadopoulou</dc:creator>
    <dc:publisher>Condillac</dc:publisher>
  </skos:ConceptScheme>
```

Cor



SPARQL

The Ontology of Kraters

```

SELECT distinct ?predicate
FROM <http://ontologia.fr/OTB/krater.rdf>
WHERE {
  ?subject ?predicate ?value
}
ORDER BY ?predicate
  
```

```

<?xml version="1.0" encoding="utf-8"?>
<!-- Ontotermontology: Ontotermontology of Vases -->
<!-- Author: Maria Papadopoulou -->
<!-- Creation date of ontotermontology: 28 avril 2019 -->
<!-- Export date: 5 janvier 2021 time: 15:43:41 -->
<!-- Generated by Tedi version: 2.5 - http://ontotermontology.com/tedi -->

<rdf:RDF xmlns="http://www.ontologia.fr/OTB/krater#"
  xmlns:rdf="http://www.ontologia.fr/1999/02/22-rdf-syntax-ns#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:skos="http://www.w3.org/2004/02/skos/core#"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:vann="http://purl.org/vocab/vann#"
  xmlns:ontolex="http://www.w3.org/ns/lemon/ontolex#"
  xmlns:swv="http://www.w3.org/2003/06/sw-vocab-status/ns#"
  xmlns:svann="http://purl.org/vocab/vann#"
  xmlns:ontolex="http://www.w3.org/ns/lemon/ontolex#"

  // SKOS
  // SKOS Concept Scheme -->
  <skos:ConceptScheme rdf:about="http://www.ontologia.fr/OTB/krater#"
    <dc:title>Ontotermontology of Vases</dc:title>
    <dc:description>Archaic and Classical Periods, from -700 BC to -323. The concepts of the ontology are linked with a skos:exactMatch to Getty Vocabularies, Wikidata and Kerameikos.</dc:description>
    <dc:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2019-4-28</dc:issued>
    <dc:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2020-12-27</dc:modified>
    <dc:creator>Maria Papadopoulou</dc:creator>
    <dc:publisher>Condillac</dc:publisher>
  </skos:ConceptScheme>
```



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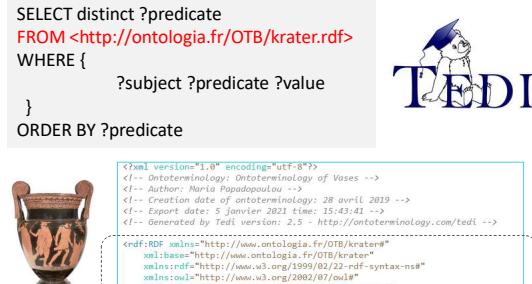
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Querying a RDF Graph

The Ontology of Kraters

```
SELECT distinct ?predicate
FROM <http://ontologia.fr/OTB/krater.rdf>
WHERE {
    ?subject ?predicate ?value
}
ORDER BY ?predicate
```



TEDI

XML code snippet showing the schema and some triples from the ontology.

```
<?xml version="1.0" encoding="utf-8"?>
<!-- Ontotermatology: Ontotermatology of Vases -->
<!-- Author: Christophe Pautrizel -->
<!-- Creation date: 10/01/2019 -->
<!-- Export date: 5 janvier 2021 time: 15:43:41 -->
<!-- Generated by Tedi version: 2.5 - http://ontotermatology.com/tedi -->

<krater>
  <@id>http://www.ontologia.fr/OTB/krater#</@id>
  <@base>http://www.ontologia.fr/OTB/krater#</@base>
  <@version>2021-01-05</@version>
  <@label>Ontotermatology of Vases</@label>
  <@type>owl:Ontology</@type>
  <@comment>This ontology is a vocabulary for archaic and classical periods, from -700 BC to -323. The concepts of the ontology are linked with a skos:exactMatch to Getty VocabularySources, Wikidata and Kerameikos.</@comment>
  <@skos:conceptScheme rdf:about="http://www.ontologia.fr/OTB/krater">
    <dc:title>Ontotermatology of Vases</dc:title>
    <dc:description>Archaic and Classical Periods, from -700 BC to -323. The concepts of the ontology are linked with a skos:exactMatch to Getty VocabularySources, Wikidata and Kerameikos.</dc:description>
  </skos:ConceptScheme>
  <@prefix>
    owl: "http://www.w3.org/2002/07/owl#"
    xsd: "http://www.w3.org/2001/XMLSchema#"
    rdfs: "http://www.w3.org/2000/01/rdf-schema#"
    skos: "http://www.w3.org/2004/02/skos/core#"
    dc: "http://purl.org/dc/terms/"
    foaf: "http://xmlns.com/foaf/0.1/"
    rdf: "http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    void: "http://rdfs.org/ns/void#"
    pargl: "http://www.ontologia.fr/OTB/krater#"
    fabric: "http://www.ontologia.fr/OTB/krater#fabric"
    height: "http://www.ontologia.fr/OTB/krater#height"
    latitude: "http://www.ontologia.fr/OTB/krater#latitude"
    longitude: "http://www.ontologia.fr/OTB/krater#longitude"
    poleiaedes_coordinates: "http://www.ontologia.fr/OTB/krater#poleiaedes_coordinates"
    provenance: "http://www.ontologia.fr/OTB/krater#provenance"
    technique: "http://www.ontologia.fr/OTB/krater#technique"
    vase_number_in_Beazley: "http://www.ontologia.fr/OTB/krater#vase_number_in_Beazley"
    belongsToAxis: "http://www.ontologia.fr/OTB/krater#belongsToAxis"
    containsDifference: "http://www.ontologia.fr/OTB/krater#containsDifference"
    denotedByTerm: "http://www.ontologia.fr/OTB/krater#denotedByTerm"
    denotedByProperName: "http://www.ontologia.fr/OTB/krater#denotedByProperName"
    denotedConcept: "http://www.ontologia.fr/OTB/krater#denotedConcept"
    denotedObject: "http://www.ontologia.fr/OTB/krater#denotedObject"
    instanceOf: "http://www.ontologia.fr/OTB/krater#instanceOf"
    isA: "http://www.ontologia.fr/OTB/krater#isA"
    language: "http://www.ontologia.fr/OTB/krater#language"
    ownDifferenceConcept: "http://www.ontologia.fr/OTB/krater#ownDifferenceConcept"
    propertyName: "http://www.ontologia.fr/OTB/krater#propertyName"
    term: "http://www.ontologia.fr/OTB/krater#term"
    termStatus: "http://www.ontologia.fr/OTB/krater#termStatus"
    type: "http://www.ontologia.fr/OTB/krater#type"
  </@prefix>
  // SKOS
  // ...
</krater>
```

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SPARQL

<https://www.w3.org/TR/rdf-sparql-query/#QueryForms>

SPARQL has four query forms.

These query forms use the solutions from pattern matching to form result sets or RDF graphs.

SELECT

Returns all, or a subset of, the variables bound in a query pattern match.

CONSTRUCT

Returns an RDF graph constructed by substituting variables in a set of triple templates.

ASK

Returns a boolean indicating whether a query pattern matches or not.

DESCRIBE

Returns an RDF graph that describes the resources found.



SPARQL

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

SPARQL can be used to express queries across diverse data sources, whether the data is stored natively as RDF or viewed as RDF via middleware.

Name spaces (prefixes):

prefix p1: <...>

prefix p2: <...>

...

Query Form:

select, construct, describe, ask...

RDF Datasets:

from <IRI>
from <IRI>...

Query graph pattern:

where {

... filters

}



Modifiers:

limit...
order by ...

Query patterns generate an unordered collection of **solutions**. These solutions are then treated as a sequence on which **sequence modifiers** are applied to create another sequence. Finally, this latter sequence is used to generate one of the results of a SPARQL query form.

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SPARQL: SELECT

The **SELECT** form of results returns variables and their bindings directly.

The syntax **SELECT *** is an abbreviation that selects all of the variables in a query.

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?nameX ?nameY ?nickY
WHERE
{ ?x foaf:knows ?y ;
  foaf:name ?nameX .
  ?y foaf:name ?nameY .
  OPTIONAL { ?y foaf:nick ?nickY } }
```

nameX	nameY	nickY
"Alice"	"Bob"	
"Alice"	"Clare"	"CT"

SPARQL: SELECT

Tedi Onto-Dictionary on "Ontoterminalogy of Vases" (en)

Date: 28 août 2020 - Time: 18:06:07 - Version: 2.1 - www.ontoterminalogy.com/tedi

search: vase

vase
Definition: Ceramic vessel.
Status: preferred

Equivalent(s)
- fr: vase (preferred)
- gr: ουρανός (preferred)

Concept: <vessel>
essential characteristic(s): vessel.
linked to: <Place>

Real depiction: https://upload.wikimedia.org/wikipedia/commons/8/8c/Volute_kraters_en.jpg
RDF description: https://upload.wikimedia.org/wikipedia/commons/3/36/Shapes_of_ancient_greek_pottery.jpg
RDF seeAlso: https://en.wikipedia.org/wiki/Typyology_of_Greek_vase_shapes
RDFs seeAlso: <https://www.wikidata.org/wikidatawiki?191851>
Skos broader: https://derungen-cm.org/40917#E24_Physical_Man-Made_Thing

Illustration: https://en.wikipedia.org/wiki/Typyology_of_Greek_vase_shapes

- Terms denoting vases?
- Terms are not resources (not URI)

SPARQLer

<http://sparql.org/sparql.html>

SPARQLer - General purpose processor

General SPARQL query : input query, set any options and press "Get Results"

```

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>

SELECT ?name ?definition
FROM <http://ontologia.fr/OTB/krater.rdf>
WHERE {
    ?name rdfs:label ?name.
    ?concept skos:prefLabel ?name.
    ?concept skos:definition ?definition.
    FILTER (lang(?name) = 'en')
    FILTER (lang(?definition) = 'en')
}
ORDER BY ?name
LIMIT 100

```

Target graph URI (or use FROM in the query)
If no dataset is provided, the query will execute on the current graph.
The query can contain use VALUES to set some variables.

Output: XML
XSLT style sheet (blank for none): /xml-to-html
 Force the accept header to text/plain reponse

SPARQLer Query Results

name	definition
"amphora" @en	"Vase with neck and two handles for storing and transport liquids and solids." @en
"bell krater" @en	"Krater without neck, with upward curling handles placed high on the body." @en
"calyx krater" @en	"Krater without neck, with upward curling handles placed low on the body." @en
"column krater" @en	"Krater with neck and with column-like handles." @en
"hydria" @en	"Vase with neck and three handles, two for carrying and one for pouring, for storing and transport water." @en
"krater" @en	"Large open container with a foot and handles, used in ancient Greece for mixing wine with water." @en
"lekythos" @en	"Vase with neck for perfume." @en
"vase" @en	"Ceramic vessel." @en
"volute krater" @en	"Krater with neck and with volute-like handles." @en

SPARQLer

<http://sparql.org/>

Validators

- SPARQL query validator
- SPARQL update validator
- RDF data validator
- IRI validator

Query forms

- General purpose SPARQL processor

SPARQL Services

The general SPARQL query service is accessed directly using the SPARQL protocol at </sparql>

Links to SPARQL 1.1 Specifications

The full set of SPARQL specification is:

- SPARQL Query language
- SPARQL Update
- SPARQL Protocol
- SPARQL Graph Store Protocol
- SPARQL Result formats
 - SPARQL Query Results JSON Format
 - SPARQL Query Results CSV and TSV Formats
 - SPARQL Query Results XML Format
- SPARQL Service Description
- SPARQL Federated Query
- SPARQL Entailment Regimes

OpenLink SPARQL Editor

<http://demo.openlinksw.com/sparql>

OPENLINK SOFTWARE Making Technology Work for You! OPENLINK VIRTUOSO SPARQL Query Editor

Not logged in. [Login](#) [About](#) [Namespace Prefixes](#) [Inference Rules](#) | [Macros](#) | [RDF Views](#) | [Permalink](#) | [ISP](#)

Default Graph URI:

Run Query

Query Text

```

PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
SELECT ?term
FROM <http://www.ontologia.fr/OTB/krater.rdf>
WHERE { ?concept rdfs:type skos:Concept.
        ?concept skos:prefLabel "vase"@en.
        ?subConcept skos:broader ?concept.
        ?subConcept skos:prefLabel ?term.
        FILTER (lang(?term) = 'en')
      } ORDER BY ?term

```

Sponging:

Results Format: (The CXML output is disabled, see [details](#))

Execution timeout: milliseconds (values less than 1000 are ignored)

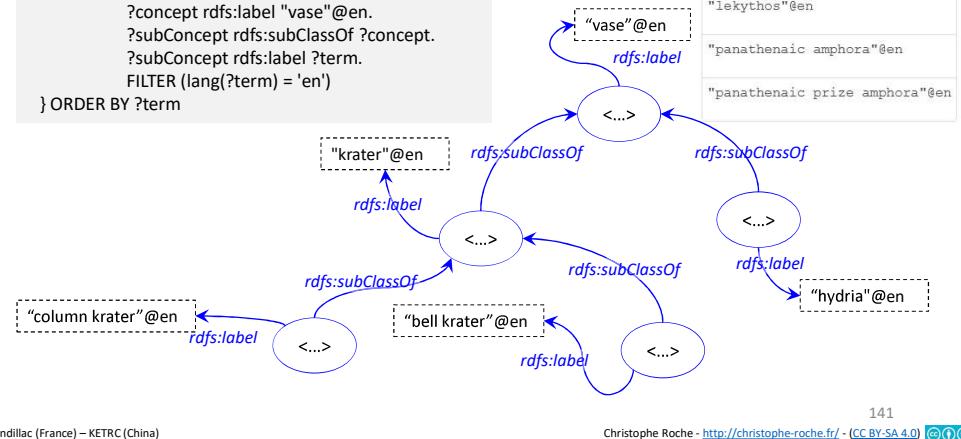
Options: Strict checking of void variables

SPARQL: SELECT

The **SELECT** form of results returns variables and their bindings directly.

<http://demo.openlinksw.com/sparql>

```
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
SELECT ?term
FROM <http://www.ontologia.fr/OTB/krater.rdf>
WHERE { ?concept rdf:type owl:Class.
         ?concept rdfs:label "vase"@en.
         ?subConcept rdfs:subClassOf ?concept.
         ?subConcept rdfs:label ?term.
         FILTER (lang(?term) = 'en')
} ORDER BY ?term
```



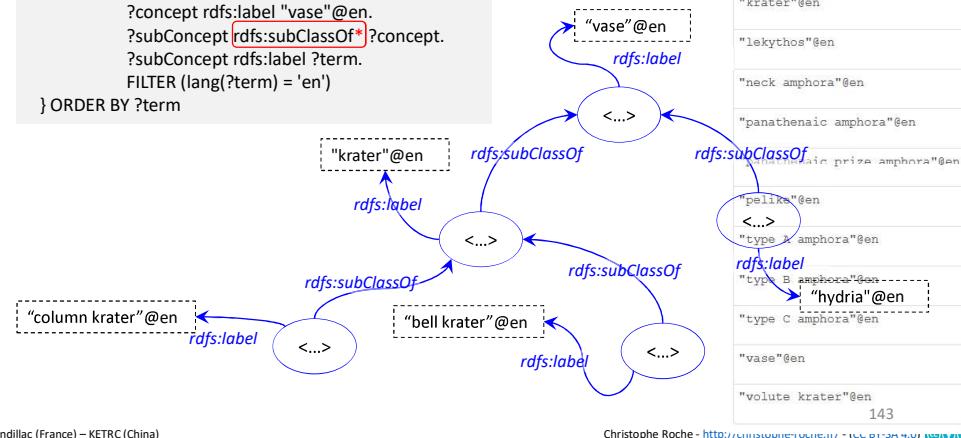
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SPARQL: SELECT

The **SELECT** form of results returns variables and their bindings directly.

<http://demo.openlinksw.com/sparql>

```
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
SELECT ?term
FROM <http://www.ontologia.fr/OTB/krater.rdf>
WHERE { ?concept rdf:type owl:Class.
         ?concept rdfs:label "vase"@en.
         ?subConcept rdfs:subClassOf ?concept.
         ?subConcept rdfs:label ?term.
         FILTER (lang(?term) = 'en')
} ORDER BY ?term
```



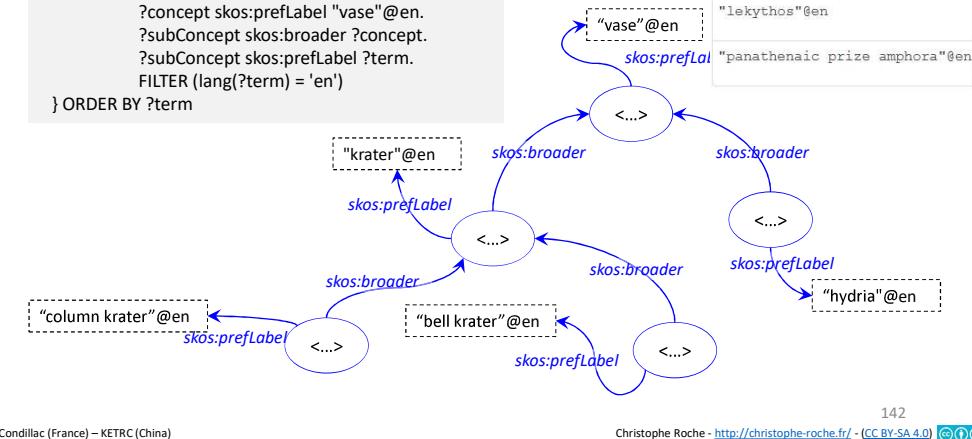
Condillac (France) – KETRC (China)

SPARQL: SELECT

The **SELECT** form of results returns variables and their bindings directly.

<http://demo.openlinksw.com/sparql>

```
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
SELECT ?term
FROM <http://www.ontologia.fr/OTB/krater.rdf>
WHERE { ?concept rdf:type skos:Concept.
         ?concept skos:prefLabel "vase"@en.
         ?subConcept skos:broader ?concept.
         ?subConcept skos:prefLabel ?term.
         FILTER (lang(?term) = 'en')
} ORDER BY ?term
```



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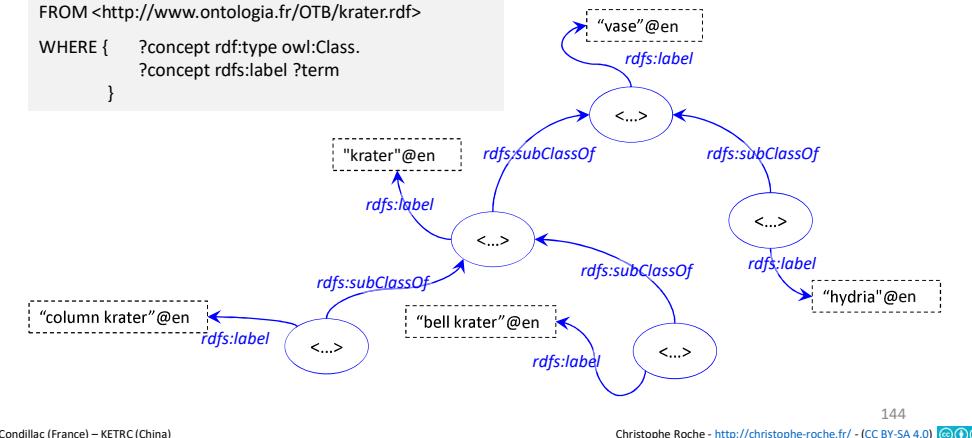
SPARQL: CONSTRUCT

The **CONSTRUCT** query form returns a single RDF graph specified by a graph template.

The result is an RDF graph formed by taking each query solution in the solution sequence, substituting for the variables in the graph template, and combining the triples into a single RDF graph by set union.

<http://demo.openlinksw.com/sparql>

```
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
CONSTRUCT { ?concept skos:prefLabel ?term }
FROM <http://www.ontologia.fr/OTB/krater.rdf>
WHERE { ?concept rdf:type owl:Class.
         ?concept rdfs:label ?term }
```



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SPARQL: ASK

The **ASK** query form tests whether or not a query pattern has a solution..

No information is returned about the possible query solutions, just whether or not a solution exists.

<http://demo.openlinksw.com/sparql>

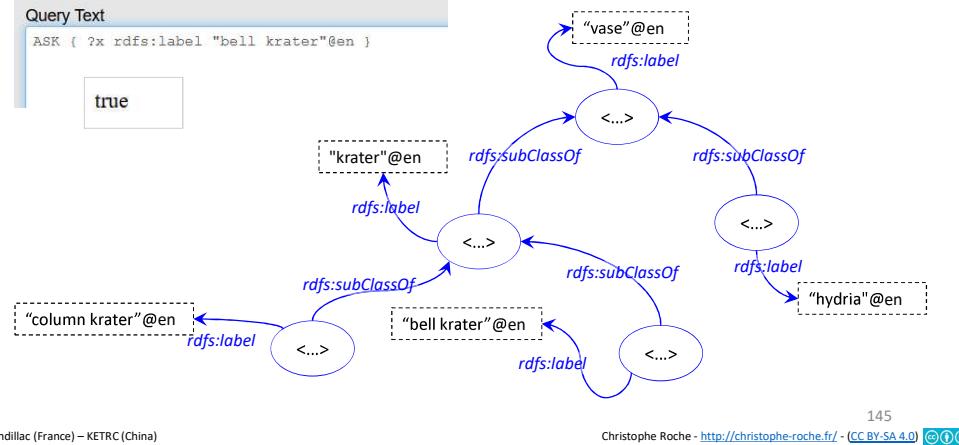
Default Graph URI

<http://www.ontologia.fr/OTB/krater.rdf>

Query Text

```
ASK { ?x rdfs:label "bell krater"@en }
```

true



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SPARQL: DESCRIBE

The **DESCRIBE** form returns a single result RDF graph containing RDF data about resources.

Query <https://data.bnfr.org/sparql>

```
1 * PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax#>
2 * PREFIX foaf: <http://xmlns.com/foaf/0.1/>
3 * DESCRIBE ?x
4 * WHERE { ?x rdf:type foaf:Person .
5 *         ?x foaf:name "Wolfgang Amadeus Mozart"
6 * }
```

Table Response 55810 results in 20.388 seconds

subject	predicate	object
< http://data.bnfr.org/ark:/12148/cb4133110 39#about>	< http://purl.org/dc/terms/subject >	< http://data.bnfr.org/ark:/12148/cb14027233b#about >
< http://data.bnfr.org/ark:/12148/cb4130304 34#about>	< http://purl.org/dc/terms/subject >	< http://data.bnfr.org/ark:/12148/cb14027233b#about >
< http://data.bnfr.org/ark:/12148/cb4298623 6z#about>	< http://purl.org/dc/terms/subject >	< http://data.bnfr.org/ark:/12148/cb14027233b#about >

The RDF returned is determined by the information publisher. It is the useful information the service has about a resource. It may include information about other resources: for example, the RDF data for a book may also include details about the author.describe

SPARQL

FILTERS

A constraint, expressed by the keyword **FILTER**, is a **restriction** on solutions over the whole group in which the filter appears.

SPARQL FILTERs restrict the solutions of a graph pattern match according to a given expression.

```
{ ?x foaf:name ?name .
?x foaf:mbox ?mbox .
FILTER regex(?name, "Smith")
}
```

```
select ?name ?url
where {
?person foaf:name ?name .
OPTIONAL { ?person rdfs:seeAlso ?url } .
FILTER regex (?name, "Mozart").
FILTER (lang(?name)="en")
}
```

11.2 Filter Evaluation

<https://www.w3.org/TR/rdf-sparql-query/#evaluation>

```
SELECT ?title ?price
WHERE { ?x book:price ?price .
?x dc:title ?title .
FILTER (?price < 25.5) }
```

```
{ ?concept skos:prefLabel "vase"@en.
?x skos:broader* ?concept.
?x skos:prefLabel ?name
FILTER (lang(?name)="en") }
```

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SPARQL

FILTERS

SPARQL FILTERs restrict the solutions of a graph pattern match according to a given expression.

```
select ?name ?url
where {
?person foaf:name ?name .
optional { ?person rdfs:seeAlso ?url } .
FILTER regex (?name, "Mozart").
FILTER (lang(?name)="en")
}
```



<https://dbpedia.org/sparql>

name	url
"Wolfgang Amadeus Mozart"@en	http://dbpedia.org/resource/List_of_operas_by_Mozart
"Wolfgang Amadeus Mozart"@en	http://dbpedia.org/resource/Haydn
"Wolfgang Amadeus Mozart"@en	http://dbpedia.org/resource/List_of_compositions_by_Wolfgang_Amadeus_Mozart
"Wolfgang Amadeus Mozart"@en	http://dbpedia.org/resource/Mozart's_Berlin_journey
"Wolfgang Amadeus Mozart"@en	http://dbpedia.org/resource/Mozart's_name
"Wolfgang Amadeus Mozart"@en	http://dbpedia.org/resource/Mozart
"Mozarteum University of Salzburg"@en	
"Leopold Mozart"@en	
"Franz Xaver Wolfgang Mozart"@en	
"Mozart and the Whale"@en	
"Go-Kart Mozart"@en	
"Mozartkugel"@en	

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SPARQL

NEGATION

The SPARQL query language incorporates two styles of negation, one based on filtering results depending on whether a graph pattern does or does not match in the context of the query solution being filtered, and one based on removing solutions related to another pattern.

Filtering Using Graph Patterns

Filtering of query solutions is done within a FILTER expression using NOT EXISTS and EXISTS.

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

```
SELECT ?person
WHERE
{
  ?person rdf:type foaf:Person .
  FILTER NOT EXISTS { ?person foaf:name ?name }
}
```

```
SELECT ?person
WHERE
{
  ?person rdf:type foaf:Person .
  FILTER EXISTS { ?person foaf:name ?name }
}
```

The NOT EXISTS filter expression tests whether a graph pattern does not match the dataset

The filter expression EXISTS is also provided. It tests whether the pattern can be found in the data

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SPARQL

NEGATION

The SPARQL query language incorporates two styles of negation, one based on filtering results depending on whether a graph pattern does or does not match in the context of the query solution being filtered, and one based on removing solutions related to another pattern.

Removing Possible Solutions

The other style of negation provided in SPARQL is MINUS which evaluates both its arguments, then calculates solutions in the left-hand side that are not compatible with the solutions on the right-hand side.

```
PREFIX : <http://example/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
```

```
SELECT DISTINCT ?s
WHERE
{
  ?s ?p ?o .
  MINUS { ?s foaf:givenName "Bob" }
}
```

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SPARQL

UNION

SPARQL provides a means of combining graph patterns so that one of several alternative graph patterns may match. If more than one of the alternatives matches, all the possible pattern solutions are found.

```
PREFIX dc10: <http://purl.org/dc/elements/1.0/>
PREFIX dc11: <http://purl.org/dc/elements/1.1/>

SELECT ?title ?author
WHERE
  { { ?book dc10:title ?title . ?book dc10:creator
?author }
    UNION
    { ?book dc11:title ?title . ?book dc11:creator ?author }
  }
```

The UNION pattern combines graph patterns; each alternative possibility can contain more than one triple pattern:

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SPARQL

<https://www.w3.org/TR/sparql11-query/>

RDF is a directed, labeled graph data format for representing information in the Web. This specification defines the syntax and semantics of the SPARQL query language for RDF. SPARQL can be used to express queries across diverse data sources, whether the data is stored natively as RDF or viewed as RDF via middleware. SPARQL contains capabilities for querying required and optional graph patterns along with their conjunctions and disjunctions. SPARQL also supports aggregation, subqueries, negation, creating values by expressions, extensible value testing, and constraining queries by source RDF graph. The results of SPARQL queries can be result sets or RDF graphs.

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Querying Knowledge Graphs: SPARQL Endpoint



Access to a RDF Graph

SPARQL
Endpoint



RDF Graph
Knowledge Graph

ZHISHI.me

<http://zhishi.me/sparql>

EUROPEAN
DATA PORTAL

<https://data.europa.eu/euodp/en/data/>

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{ BnF Data

<https://data.bnf.fr/current/sparql.html>

DBpedia

<https://dbpedia.org/sparql>

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SPARQLer

<http://sparql.org/sparql.html>

SPARQLer - General purpose processor

General SPARQL query : input query, set any options and press "Get Results"

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX obo: <http://www.ontologia.fr/OTB#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
```

SELECT ?name ?definition
FROM <<http://ontologia.fr/OTB/krater.rdf>>

WHERE {
?concept rdf:type owl:Class.
?concept rdfs:label ?name.
?concept skos:definition ?definition.
FILTER (lang(?name) = 'en')
FILTER (lang(?definition) = 'en')
}
ORDER BY ?name
LIMIT 100

Target graph URI (or use FROM in the query)

If no dataset is provided, the query will execute against an empty one.

The query can contain use VALUES to set some variables.

Output:

XSLT style sheet (blank for none):

Force the accept header to text/plain regardless

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SPARQLer

<http://sparql.org/>

Validators

- SPARQL query validator
- SPARQL update validator
- RDF data validator
- IRI validator

Query forms

- General purpose SPARQL processor

SPARQL Services

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- SPARQL Update
- SPARQL Protocol
- SPARQL Graph Store Protocol
- SPARQL Result formats
 - SPARQL Query Results JSON Format
 - SPARQL Query Results CSV and TSV Formats
 - SPARQL Query Results XML Format
- SPARQL Service Description
- SPARQL Federated Query
- SPARQL Entailment Regimes

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SPARQLer

<http://sparql.org/sparql.html>

SPARQLer - General purpose processor

General SPARQL query : input query, set any options and press "Get Results"

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX obo: <http://www.ontologia.fr/OTB#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
```

SELECT ?name ?definition
FROM <<http://ontologia.fr/OTB/krater.rdf>>

WHERE {
?concept rdf:type owl:Class.
?concept rdfs:label ?name.
?concept skos:definition ?definition.
FILTER (lang(?name) = 'en')
FILTER (lang(?definition) = 'en')
}
ORDER BY ?name
LIMIT 100

SPARQLer Query Results

name	definition
"amphora" @en	"Vase with neck and two handles for storing and transport liquids and solids." @en
"bell krater" @en	"Krater without neck, with upward curling handles placed high on the body." @en
"calyx krater" @en	"Krater without neck, with upward curling handles placed low on the body." @en
"column krater" @en	"Krater with neck and with column-like handles." @en
"hydria" @en	"Vase with neck and three handles, two for carrying and one for pouring, for storing and transport water." @en
"krater" @en	"Large open container with a foot and handles, used in ancient Greece for mixing wine with water." @en
"lekythos" @en	"Vase with neck for perfume." @en
"vase" @en	"Ceramic vessel." @en
"volute krater" @en	"Krater with neck and with volute-like handles." @en

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OpenLink SPARQL Editor

<http://demo.openlinksw.com/sparql>

The screenshot shows the OpenLink Virtuoso SPARQL Query Editor. It features a top navigation bar with the OpenLink Software logo and a "Query Editor" section. Below the navigation is a "Default Graph URI" input field and a "Run Query" button. The main area contains a "Query Text" section with a query about concepts and their labels, and a "Sponging:" section for retrieving remote RDF data. At the bottom, there are "Results Format" (HTML), "Execution timeout" (3000000 milliseconds), and "Options" checkboxes.

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Visualization

<http://vowl.visualdataweb.org/>

<http://vowl.visualdataweb.org/webvowl.html>

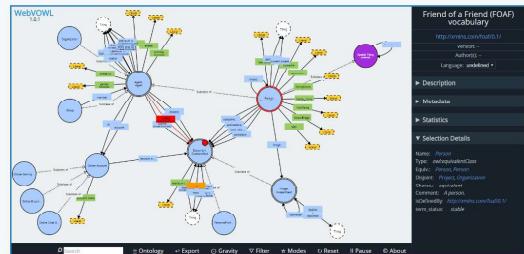
WebVOWL : Web-based Visualization of Ontologies

WebVOWL is a web application for the interactive visualization of ontologies. It implements the Visual Notation for OWL Ontologies (VOWL) by providing graphical depictions for elements of the Web Ontology Language (OWL) that are combined to a force-directed graph layout representing the ontology. Interaction techniques allow to explore the ontology and to customize the visualization. The VOWL visualizations are automatically generated from ISON files into which the ontologies need to be converted. A Java-based OWL2VOWL converter is provided along with WebVOWL.

[Run WebVOWL](#)

[Old WebVOWL version \(beta 0.5.2\) as fallback](#)

Note that WebVOWL is able to visualize most language constructs of OWL 2 but not all of them (and also not all combinations). For instance, complex datatypes and some instance level constructs are not supported by WebVOWL at the moment.



A custom ontology can be visualized by opening the [Ontology](#) menu and either entering the IRI of the ontology or uploading the ontology file. The size of the ontology files that can be visualized is limited to 5 MB in the public WebVOWL installation.

The screenshot shows the "Ontology Visualization Benchmark" interface. It has a search bar labeled "Search" and several buttons: "Ontology", "Export", "Visualize", "Select ontology file", and "Upload".

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STIC Info – Master 2 Info 907: Web Sémantique

1. What is a Knowledge Graph?

2. An introductory example

3. How to represent a KG?

4. How to query a KG?

5. Practical Works

6. Project



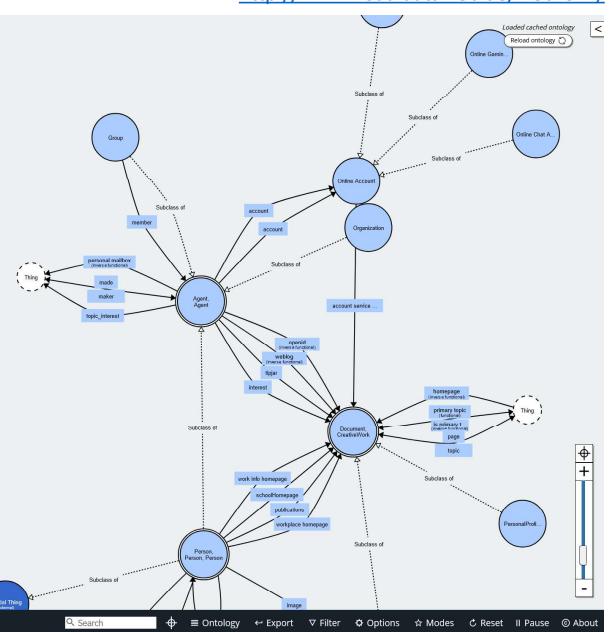
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Visualization

<http://www.visualdataweb.de/webvowl/>

WebVOWL

WebVOWL 1.1.7
Default Element
▼ Class: owl:Class
owl:Thing
owl:Class
owl:DeprecatedClass
▼ Property: owl:objectProperty
rdfs:subClassOf
owl:disjointWith
owl:allValuesFrom
owl:someValuesFrom
▼ Datatype: rdfs:Literal
xsd:boolean
xsd:double
xsd:integer
xsd:string
undefined



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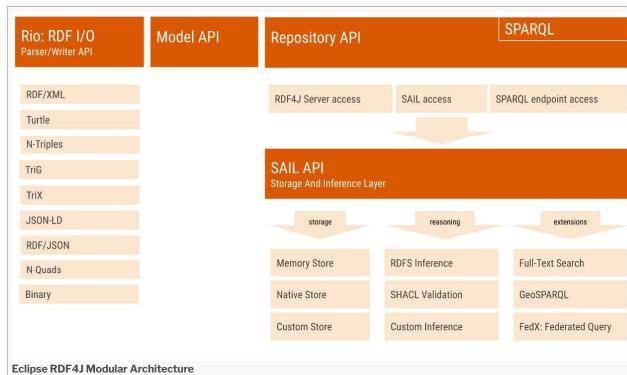
Editor

<https://rdf4j.org/>



The Eclipse RDF4J Framework

Eclipse RDF4J is an open source modular Java framework for working with [RDF](#) data. This includes parsing, storing, inferencing and querying of/over such data. It offers an easy-to-use API that can be connected to all leading RDF storage solutions. It allows you to connect with [SPARQL](#) endpoints and create applications that leverage the power of [Linked Data](#) and [Semantic Web](#).



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<https://prefix.cc/>

The prefix.cc interface shows a search bar with "foaf" and a "look up" button. Below it, examples of queries like "foaf foaf.knows dc,foaf rdfs,dc,foaf,geo.sparql http://xmlns.com/foaf/0.1/name" are listed. A "popular latest about" dropdown menu is visible. A modal window for "foaf" provides links to "http://xmlns.com/foaf/0.1/" (with a blue arrow icon), "http://xmlns.com/foaf/spec/#" (with a blue arrow icon), and "https://www.tikag.com/" (with a blue arrow icon).

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Editor

OpenLink Structured Data Editor (OSDE)

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Making Technology Work For You®

OSDE, the OpenLink Structured Data Editor, is a tool for creating and editing structured data using [RDF](#) Language statements/triples, through many web browsers.

OSDE enables creation and editing of data using abstract **subject → predicate → object** or **entity → attribute → value** notation.

OSDE currently ingests RDF from documents serialized as [RDF-Turtle](#), [JSON-LD](#), and [RDF/XML](#).

Once constructed or edited, data can be saved to local or remote storage, or directly copied, as [RDF-Turtle](#) documents.

A screenshot of the OSDE extension from the Chrome Store. It shows a table of RDF triples with columns for Entity, Attribute, and Value. The table contains several rows of data, each with a delete icon (x). The interface includes tabs for Statements, Entities, Attributes, and Values, and a search bar at the top. The URL in the address bar is "http://xmlns.com/foaf/0.1/".

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Contents

1. What is a Knowledge Graph?
2. An introductory example
3. How to represent a KG?
4. How to query a KG?
5. Practical Works
6. Building/Querying a KG
7. Project

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Practical Works



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Practical Works

1. The DBpedia Knowledge Graph:

- Return the first 100 persons in DBpedia
- Find a picture of Confucius
- Find a picture of Beijing
- Find an article about Chiton
- **Propose examples of queries**

2. The Wikidata Knowledge Graph:

- Return the first 100 persons
- Find a picture of Confucius
- Find a picture of Beijing
- **Propose examples of queries**

3. The Knowledge Graph of the National Library of France

- Find a document
- **Propose examples of queries**

4. The KETRC Knowledge Graph

- What are the different types of Chinese vases and their names in Chinese?
- **Propose examples of queries**

5. The Condillac Knowledge Graph

- Display the list of terms of Ancient Greek Potteries in English with their definition
- Display the list of concepts (URI) of Ancient Greek Dresses and their names
- **Propose examples of queries**

Practical Works

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- **Propose examples of queries**

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Practical Works

Access to a RDF Graph



SPARQL
Endpoint

2

National
Library
of France



3

KETRC
Knowledge Engineering & Terminology Research Centre
University of Liaocheng



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RDF Graph
Knowledge Graph

<https://data.bnfr.fr/current/sparql.html>
<http://sparql.org/sparql.html>
<http://demo.openlinksw.com/sparql>

CONDILLAC RESEARCH GROUP
TERMINOLOGY & ONTOLOGY



<https://dbpedia.org/sparql>

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Practical Works

1. The DBpedia Knowledge Graph:

- Return the first 100 persons in DBpedia
- Find a picture of Confucius
- Find a picture of Beijing
- Find an article about Chiton
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- Find a document
- Propose examples of queries

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DBpedia SPARQL Endpoint

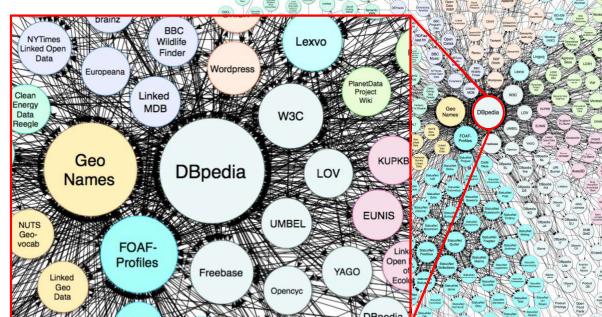
Access to a RDF Graph

SPARQL
Endpoint

<https://dbpedia.org/sparql>

<http://fr.dbpedia.org/sparql>

RDF Knowledge Graph



DBpedia
<https://dbpedia.org/sparql>

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DBpedia



WIKIPEDIA
The Free Encyclopedia

DBpedia (from "DB" for "database") is a project aiming to extract structured content from the information created in the Wikipedia project. This structured information is made available on the World Wide Web. DBpedia allows users to semantically query relationships and properties of Wikipedia resources, including links to other related datasets. In 2008, Tim Berners-Lee described DBpedia as one of the most famous parts of the decentralized Linked Data effort.

DBpedia	
Developer(s)	Leipzig University University of Mannheim
Initial release	10 January 2007 (13 years ago)
Stable release	DBpedia 2016-10 / 4 July 2017
Repository	github.com/dbpedia/
Written in	Scala · Java · VSP
Operating system	Virtuoso Universal Server
Type	Semantic Web · Linked Data
License	GNU General Public License
Website	dbpedia.org/

<https://dbpedia.org/>

DBpedia is a crowd-sourced community effort to extract structured content from the information created in various Wikimedia projects. This structured information resembles an open knowledge graph (OKG) which is available for everyone on the Web.

In addition, we provide localized versions of DBpedia in 125 languages. All these versions together describe 38.3 million things, out of which 23.8 million are localized descriptions of things that also exist in the English version of DBpedia. The full DBpedia data set features 38 million labels and abstracts in 125 different languages, 25.2 million links to images and 29.8 million links to external web pages; 80.9 million links to Wikipedia categories, and 41.2 million links to YAGO categories. DBpedia is connected with other Linked Datasets by around 50 million RDF links. Altogether the DBpedia 2014 release consists of 3 billion pieces of information (RDF triples) out of which 580 million were extracted from the English edition of Wikipedia, 2.46 billion were extracted from other language editions. Detailed statistics about the DBpedia datasets in 24 popular languages are provided at Dataset Statistics.

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DBpedia Query

Return the first 100 persons in DBpedia?



DBpedia

<https://dbpedia.org/sparql>

Do it



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DBpedia Query

Return the first 100 persons in DBpedia?



Draw the query graph



Do it



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SPARQL

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



RDF Query Structure

Name spaces (prefixes):

prefix p1: <...>
prefix p2:<...>

...

prefix foaf: <http://xmlns.com/foaf/0.1/>

Query Form:

select, construct, describe, ask...

select distinct ?x

RDF Datasets:

from <IRI>
from <IRI>...

Query graph pattern:

where { set of triples with variables
... filters
}

?x rdf:type foaf:Person

Modifiers:

limit...
order by ...

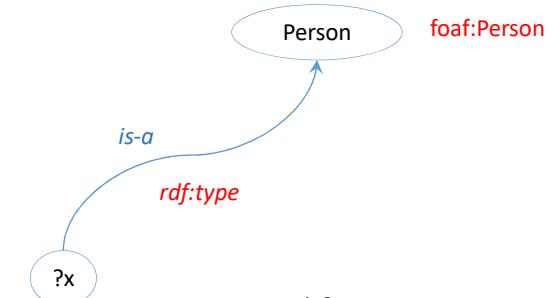
limit 100

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DBpedia Query

Return the first 100 persons in DBpedia?



Triple?

?x rdf:type foaf:Person



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SPARQL

✓ An example

```
prefix foaf: <http://xmlns.com/foaf/0.1/>
select distinct ?x
where {
  ?x rdf:type foaf:Person
}
order by ?x limit 100
```

Returns the first 100 distinct persons



<https://dbpedia.org/sparql>

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DBpedia SPARQL Endpoint

<https://dbpedia.org/sparql>



Do it



Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)
<http://dbpedia.org>

Query Text
select distinct ?Concept where {() a ?Concept} LIMIT 100

(Security restrictions of this server do not allow you to retrieve remote RDF data, see [details](#))

Results Format: HTML XML JSON TSV CSV N3 Turtle SPARQL Update

Execution timeout: 30000 milliseconds (values less than 1000 are ignored)

Options:
 Strict checking of void variables
 Log debug info at the end of output (has no effect on some queries and output formats)
 Generate SPARQL compilation report (instead of executing the query)

(The result can only be sent back to browser, not saved on the server, see [details](#))

[Run Query](#) [Reset](#)

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DBpedia SPARQL Endpoint

<https://dbpedia.org/sparql>



Default Data Set Name (Graph IRI)

<http://dbpedia.org>

Query Text

```
select distinct ?x
where {?x rdf:type foaf:Person}
LIMIT 100
```

Do it



Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)
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select distinct ?x
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Virtuoso SPARQL Query Editor

<https://dbpedia.org/sparql>

Default Data Set Name (Graph IRI)

<http://dbpedia.org>

Query Text

```
select distinct ?x
where {
  ?x rdf:type foaf:Person
}
limit 100
```

x
http://dbpedia.org/resource/A._C._Bhaktivedanta_Swami_Prabhupada
http://dbpedia.org/resource/Aaron_Burr
http://dbpedia.org/resource/Abbie_Hoffman
http://dbpedia.org/resource/Abraham_Robinson
http://dbpedia.org/resource/Abraham_de_Moivre
http://dbpedia.org/resource/Adalbert_of_Magdeburg
http://dbpedia.org/resource/Adam_Oehlenschläger
http://dbpedia.org/resource/Adam_Wisniewski-Snerg
http://dbpedia.org/resource/Adi_Shamir
http://dbpedia.org/resource/Adlai_Stevenson_II
http://dbpedia.org/resource/Adolf_Loops
http://dbpedia.org/resource/Adrian_and_Natalia_of_Nicomedia
http://dbpedia.org/resource/Adrien-Marie_Legendre
http://dbpedia.org/resource/Adrienne_Rich
http://dbpedia.org/resource/Akiyo_Yano
http://dbpedia.org/resource/Al_Pacino
http://dbpedia.org/resource/Alain_Prost
http://dbpedia.org/resource/Alan_Rickman
http://dbpedia.org/resource/Alan_Shearer
http://dbpedia.org/resource/Albert_Abrams
http://dbpedia.org/resource/Albert_Brudzewski
http://dbpedia.org/resource/Albert_Finney
http://dbpedia.org/resource/Albrecht_III_Achilles,_Elector_of_Brandenburg
http://dbpedia.org/resource/Albus_Dumbledore
http://dbpedia.org/resource/Aldo_Rossi
http://dbpedia.org/resource/Alec_Jeffreys

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About: Abraham Robinson

An Entity of Type : [scientifique](#), from Named Graph : <http://dbpedia.org>, within Data Space : dbpedia.org

Abraham Robinson (6 octobre 1918 en Allemagne - 11 avril 1974 aux États-Unis) est un mathématicien, logicien et un ingénieur en aérodynamique célèbre pour sa création de l'analyse non standard (1961), une théorie mathématique du calcul infinitésimal, qui rend rigoureux l'usage des infiniment petits et des infiniment grands introduit par Leibniz (vers 1690) et largement utilisé par Euler. La formalisation la plus usuelle du calcul infinitésimal, celle mise au point par les analystes du XIXe siècle, évacue ces deux notions. Il reçoit la Médaille Brouwer en 1973.

Property

[dbo:abstract](#)

Value

▪ Abraham Robinson (born Robinson; October 6, 1918 – April 11, 1974) was a mathematician who is most widely known for development of non-standard analysis, a mathematically rigorous system whereby infinitesimal and infinite numbers were reincorporated into modern mathematics. Nearly half of Robinson's papers were in applied mathematics rather than in pure mathematics. (en)

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About: has abstract

An Entity of Type : DatatypeProperty, from Named Graph : <http://dbpedia.org/resource/classes#>, within Data Space : dbpedia.org

Reserved for DBpedia.

Property	Value
rdf:type	▪ rdf:Property ▪ owl:DatatypeProperty
rdfs:comment	▪ Reserved for DBpedia. (en)
rdfs.isDefinedBy	▪ http://dbpedia.org/ontology/
rdfs:label	▪ has abstract (en)
rdfs:range	▪ rdf:langString
wdo:describedby	▪ dbo:data/definitions.ttl
prov:wasDerivedFrom	▪ http://mappings.dbpedia.org/index.php/OntologyProperty:abstract
is http://open.vocab.org/terms/defines of	▪ http://dbpedia.org/ontology/
is http://open.vocab.org/terms/describes of	▪ dbo:data/definitions.ttl

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DBpedia Query

Find a picture of Confucius



Draw the query graph



Do it

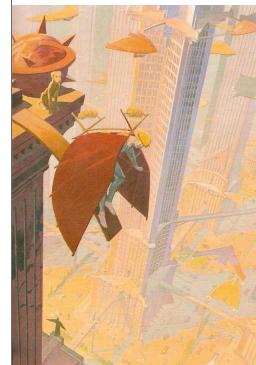


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DBpedia Query



Find a picture of Confucius



<https://dbpedia.org/sparql>

Do it

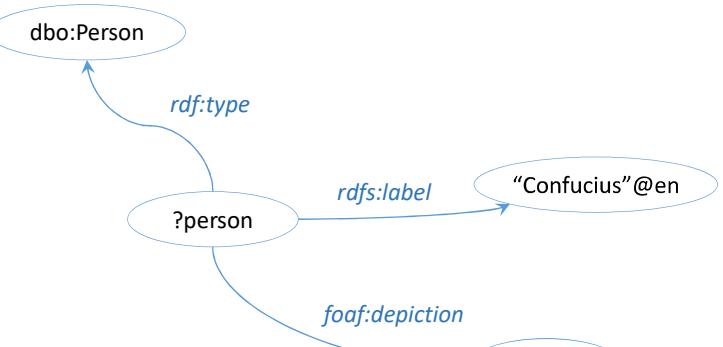


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DBpedia Query

Find a picture of Confucius



Triples?

```
?person rdf:type dbo:Person.  
?person rdfs:label "Confucius"@en.  
?person foaf:depiction ?img.
```



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SPARQL

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



RDF Query Structure

Name spaces (prefixes):

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prefix p2:<...>
...

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select, construct, describe, ask...

RDF Datasets:

from <IRI>
from <IRI>...

Query graph pattern:

where { set of triples with variables
... filters
}

Modifiers:

limit...
order by ...

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DBpedia Query



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DBpedia Query

<https://dbpedia.org/sparql>

```
SELECT distinct ?img
WHERE {
    ?person rdf:type dbo:Person.
    ?person rdfs:label "Confucius"@en.
    ?person foaf:depiction ?img.
}
limit 100
```

Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)
<http://dbpedia.org>

Query Text

```
SELECT distinct ?img
WHERE {
    ?person rdf:type dbo:Person.
    ?person rdfs:label "Confucius"@en.
    ?person foaf:depiction ?img.
}
limit 100
```

img

http://commons.wikimedia.org/wiki/Special:FilePath/Confucius_Tang_Dynasty.jpg

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DBpedia Query

person

<http://dbpedia.org/resource/Confucius>

<http://dbpedia.org/page/Confucius>

- [wikidata:Confucius](#)
- [dbpedia-cs:Confucius](#)
- [dbpedia-de:Confucius](#)
- [dbpedia-el:Confucius](#)
- [dbpedia-es:Confucius](#)
- [dbpedia-eu:Confucius](#)
- [dbpedia-fr:Confucius](#)
- [dbpedia-id:Confucius](#)
- [dbpedia-it:Confucius](#)
- [dbpedia-ja:Confucius](#)
- [dbpedia-ko:Confucius](#)
- [dbpedia-nl:Confucius](#)
- [dbpedia-pl:Confucius](#)
- [dbpedia-pt:Confucius](#)
- [dbpedia-wikidata:Confucius](#)
- <http://viaf.org/viaf/89664672>
- http://www4.wiwiss.fu-berlin.de/gutendata/resource/people/Confucius_551_BC-479_BC
- http://sw.cyc.com/concept/Mx4r_k-Y9SNjQYOm5JvVjX8_ug
- [freebase:Confucius](#)
- [yago:res:Confucius](#)
- <http://d-nb.info/gnd/118565036>

- [owl:Thing](#)
- [foaf:Person](#)
- [dbo:Person](#)
- [dul:Agent](#)
- [dul:NaturalPerson](#)
- [wikidata:Q215627](#)
- [wikidata:Q24229398](#)
- [wikidata:Q4964182](#)
- [wikidata:Q5](#)
- [dbo:Agent](#)
- [dbo:Philosopher](#)
- [schema:Person](#)
- [umbel-rc:PersonWithOccupation](#)
- [umbel-rc:Philosopher](#)
- [yago:WikicatGuqinPlayers](#)
- [yago:CausalAgent100007347](#)
- [yago:Communicator109610660](#)
- [yago:Contestant109613191](#)
- [yago:Historian110177150](#)
- [yago:Humanist110191192](#)
- [yago:Intellectual109621545](#)
- [yago:LivingThing100004258](#)
- [yago:Object100002684](#)
- [yago:Organism100004475](#)
- [yago:Person100007846](#)
- [yago:Philosopher110423589](#)
- [yago:PhysicalEntity100001930](#)
- [yago:Player110439851](#)
- [yago:Scholar10557854](#)
- [yago:Whole100003553](#)
- [yago:Writer110794014](#)
- [yago:YagoLegalActor](#)
- [yago:YagoLegalActorGeo](#)
- [yago:WikicatChinesePhilosophers](#)
- [yago:WikicatChineseWriters](#)
- [yago:WikicatClassicalHumanists](#)
- [yago:Wikicat5th-centuryBCHistorians](#)
- [yago:Wikicat5th-centuryBCPhilosophers](#)
- [yago:Wikicat5th-centuryPhilosophers](#)
- [yago:Wikicat6th-centuryBCPhilosophers](#)
- [yago:WikicatAncientChinesePeople](#)
- [yago:WikicatAncientChinesePhilosophers](#)
- [yago:WikicatWritersFromShandong](#)
- [yago:Wikicat7thDynastyHistorians](#)
- [yago:WikicatMoralPhilosophers](#)
- [yago:WikicatPeopleFromQufu](#)
- [yago:WikicatPoliticalPhilosophers](#)

Condillac (France) – KETRC (China)

192

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DBpedia Query

<http://fr.dbpedia.org/sparql>



```
SELECT distinct ?img
WHERE {
    ?person rdf:type foaf:Person.
    ?person rdfs:label "Confucius"@en.
    ?person foaf:depiction ?img.
}
limit 100
```

Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)

Query Text

```
SELECT distinct ?img
WHERE {
    ?person rdf:type foaf:Person.
    ?person rdfs:label "Confucius"@en.
    ?person foaf:depiction ?img.
}
limit 100
```

img

<http://commons.wikimedia.org/wiki/Special:FilePath/Konfuzius-1770.jpg>

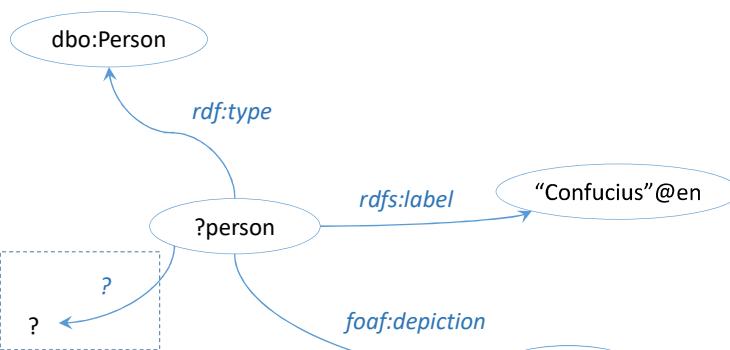
Condillac (France) – KETRC (China)

193

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DBpedia Query

Find a picture and an abstract (in Chinese) of Confucius



Do it



195

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DBpedia Query



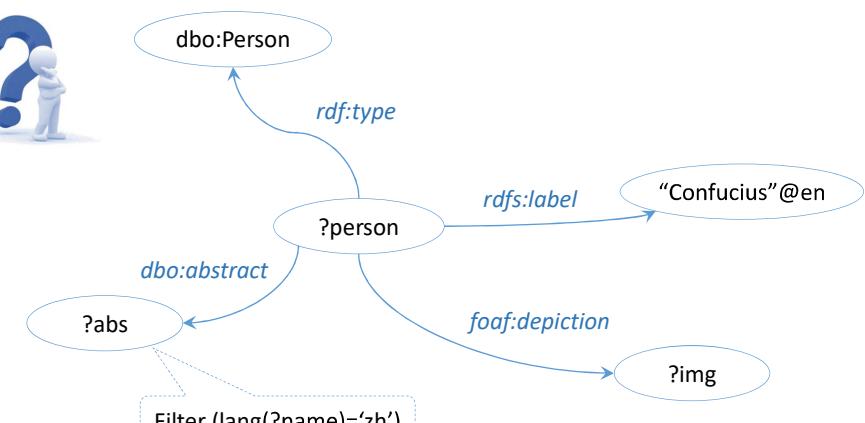
Condillac (France) – KETRC (China)

194

Christophe Roche - <http://christophe-roche.fr/> - (CC BY-SA 4.0)

DBpedia Query

Find a picture and an abstract (in Chinese) of Confucius



Do it



196

Christophe Roche - <http://christophe-roche.fr/> - (CC BY-SA 4.0)

DBpedia Query

<https://dbpedia.org/sparql>

```
SELECT distinct ?img ?abs
WHERE {
?person rdf:type dbo:Person.
?person rdfs:label "Confucius"@en.
?person foaf:depiction ?img.
?person dbo:abstract ?abs.
FILTER (lang(?abs)='zh')
}
limit 100
```

Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)

<http://dbpedia.org>

Query Text

```
SELECT distinct ?img ?abs
WHERE {
?person rdf:type dbo:Person.
?person rdfs:label "Confucius"@en.
?person foaf:depiction ?img.
?person dbo:abstract ?abs.
FILTER (lang(?abs)='zh')
}
limit 100
```

img	
http://commons.wikimedia.org/wiki/Special:FilePath/Confucius_Tang_Dynasty.jpg	"孔丘（約前551年－約前479年），子姓，孔氏，名丘，字仲尼，後代敬稱孔子或孔夫子。生於春秋時期的魯國陬邑（今中國山東曲阜）。

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197

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DBpedia Query

Find a picture of Beijing



Draw the query graph



Do it



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DBpedia Query



Find a picture of Beijing



Do it



<https://dbpedia.org/sparql>

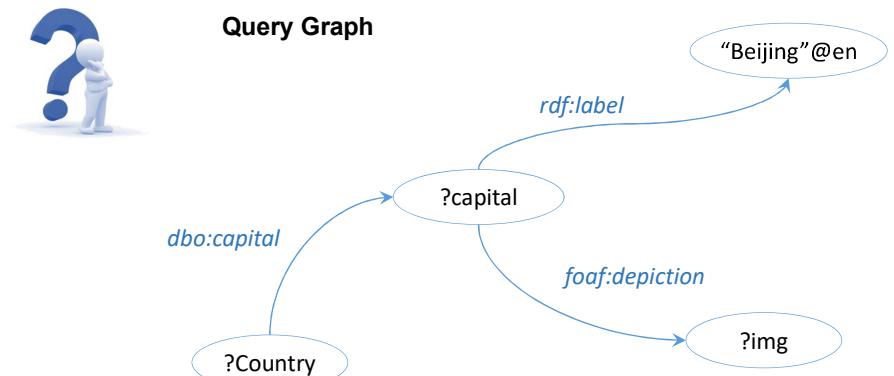
198

Christophe Roche - <http://christophe-roche.fr/> - (CC BY-SA 4.0)

DBpedia Query

Find a picture of Beijing

Query Graph



Do it



Triples?

```
?country dbo:capital ?capital.
?capital rdfs:label "Beijing"@en.
?capital foaf:depiction ?img
```

200

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199

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```

PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX dbo: <http://dbpedia.org/ontology/>
PREFIX dbr: <http://dbpedia.org/resource/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>

```

```

SELECT distinct ?img
WHERE {
    ?country dbo:capital ?capital.
    ?capital rdfs:label "Beijing"@en.
    ?capital foaf:depiction ?img
}
limit 10

```

```

SELECT distinct ?img
WHERE {
    ?city rdf:type dbo:Settlement.
    ?city rdfs:label "Beijing"@en.
    ?city foaf:depiction ?img
}

```

Virtuoso SPARQL Query Editor [About | Names](#)

Default Data Set Name (Graph IRI)
<http://dbpedia.org>

Query Text

```

PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX dbo: <http://dbpedia.org/ontology/>
PREFIX dbr: <http://dbpedia.org/resource/>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>

SELECT distinct ?img
WHERE {
    ?country dbo:capital ?capital.
    ?capital rdfs:label "Beijing"@en.
    ?capital foaf:depiction ?img
}
limit 10

```

img

http://commons.wikimedia.org/wiki/Special:FilePath/Beijing_montage_1.png

201

Condillac (France) – KETRC (China)

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SPARQL

Give a resource about chiton



<https://dbpedia.org/sparql>

Do it



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DBpedia Query



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DBpedia Query

Give a resource about chiton



Draw the query graph



Do it



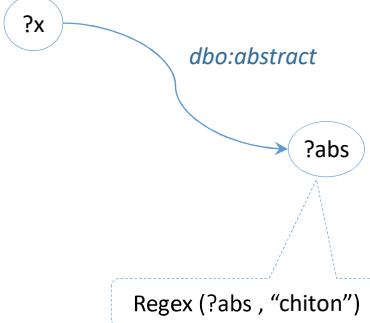
204

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SPARQL



Give a resource about chiton



Do it



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About: Himation

An Entity of Type : <http://dbpedia.org>, within Data Space : dbpedia.org

L'himation (en grec ancien ιμάνιον / himátion ; génitif singulier : ιμάριου / himatiou) est un vêtement de la Grèce antique. Il est ample et enveloppant comme une sorte de châle. Il se porte à même le corps ou sur un chiton. Il se drape ou s'ensroule sur une épaule pour faire la différence de la chlamyde. L'himation était à la fin de la République romaine et des empereurs romains, car il était plus pratique que la lourde et encombrante pallium.

Property	Value
dbo:abstract	<ul style="list-style-type: none"> L'himation (en grec ancien ιμάνιον / himátion ; génitif singulier : ιμάριου / himatiou) est un vêtement de la Grèce antique. Il est ample et enveloppant comme une sorte de châle. Il se porte à même le corps ou sur un chiton. Il se drape ou s'ensroule sur une épaule pour faire la différence de la chlamyde. L'himation était à la fin de la République romaine et des empereurs romains, car il était plus pratique que la lourde et encombrante pallium.

About: Chiton (vêtement)

An Entity of Type : Dress103236735, from Named Graph : <http://dbpedia.org>, within Data Space : dbpedia.org

Le chiton (en grec ancien χτίνος / khitón ; génitif singulier : χτιώνος / khítónos) est un vêtement de la Grèce antique. C'est une tunique de lin au plissé fin, cousue sur les côtés ou tissée sans coutures, cintre à la taille, portée par les hommes comme par les femmes : elle est courte et sans manches pour les hommes, longue et avec manches pour les femmes. D'abord confectionné en laine dans les périodes les plus anciennes, le chiton est ensuite fabriqué en lin et paglé alors en amont pour se porter à la taille. La partie basse est complétée par une écharpe, teinte ou non de pourpre.

Property	Value
dbo:abstract	<ul style="list-style-type: none"> Le chiton (en grec ancien χτίνος / khitón ; génitif singulier : χτιώνος / khítónos) est un vêtement de la Grèce antique. C'est une tunique de lin au plissé fin, cousue sur les côtés ou tissée sans coutures, cintre à la taille, portée par les hommes comme par les femmes : elle est courte et sans manches pour les hommes, longue et avec manches pour les femmes. D'abord confectionné en laine dans les périodes les plus anciennes, le chiton est ensuite fabriqué en lin et paglé alors en amont pour se porter à la taille. La partie basse est complétée par une écharpe, teinte ou non de pourpre. Chez les hommes, il peut couvrir la jambe jusqu'à mi-cuisse ou descendre jusqu'au pied, on parle alors de chitonitique, comme pour l'usage de Dilphée. Il peut être orné de dessins géométriques pour les jeunes de tête. Il peut se porter avec un pallium, sorte de manteau drapé. Dans l'armée, le chiton est porté sous la cuirasse (thorax) et est d'une couleur vive généralement bleu ou rouge. Chez les femmes, il se porte long. Ainsi l'apportion du lin, il remplace progressivement le péplos qui n'est pas un vêtement cousu mais drapé, dont il se différencie car il ne retombe pas en plis sur la poitrine et se porte bouffant à la taille grâce à une ceinture.

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```

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX dbo: <http://dbpedia.org/ontology/>
PREFIX dbc: <http://dbpedia.org/resource/Category>
PREFIX dct: <http://purl.org/dc/terms/>
  
```

```

select distinct ?x
where { ?x dbo:abstract ?z.
         ?x dct:subject dbc:Greek_clothing.
         Filter regex (?z, "chiton")
LIMIT 100
  
```

x
http://dbpedia.org/resource/Peplos
http://dbpedia.org/resource/Clothing_in_ancient_Greece
http://dbpedia.org/resource/Chiton_(costume)
http://dbpedia.org/resource/Exomis
http://dbpedia.org/resource/Himation
http://dbpedia.org/resource/Zoster_(costume)
http://dbpedia.org/resource/Tunic
http://dbpedia.org/resource/Pileus_(hat)
http://dbpedia.org/resource/Kolpos
http://dbpedia.org/resource/Use_of_costume_in_Athenian_tragedy

Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)
<http://dbpedia.org>

```

Query Text
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX dbo: <http://dbpedia.org/ontology/>
PREFIX dbc: <http://dbpedia.org/resource/Category>
PREFIX dct: <http://purl.org/dc/terms/>

select distinct ?x
where { ?x dbo:abstract ?z.
         ?x dct:subject dbc:Greek_clothing.
         Filter regex (?z, "chiton")
LIMIT 100
  
```

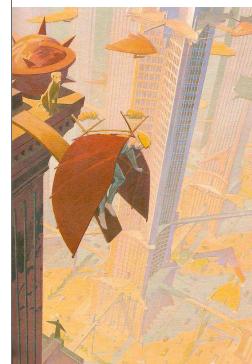
Condillac (France) – KETRC (China)

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 Christophe Roche - <http://christophe-roche.fr/> - (CC BY-SA 4.0)

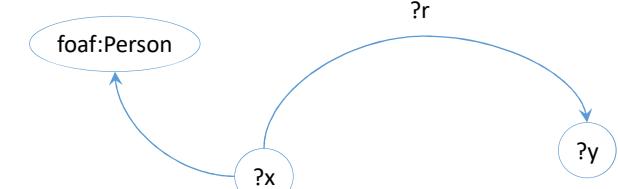
SPARQL



<https://dbpedia.org/sparql>



Enter the query graph below (limited to 50).
 What can you remark?



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SPARQL

```
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/>
select *
where { ?x rdf:type foaf:Person.
         x ?r ?y}
LIMIT 100
```



Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)

<http://dbpedia.org>

Query Text

```
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/>
select *
where {?x rdf:type foaf:Person.
         x ?r ?y}
LIMIT 100
```

Condillac (France) – KETRC (China)

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1.4 Practical Works

1. The DBpedia Knowledge Graph:

- Return the first 100 persons in DBpedia
- Find a picture of Confucius
- Find a picture of Beijing
- Find an article about Chiton

- Propose examples of queries

2. The Knowledge Graph of the National Library of France

- Find a document
- Propose examples of queries**

3. The KETRC Knowledge Graph

- What are the different types of Chinese vases and their names in Chinese?
- Propose examples of queries**

4. The Condillac Knowledge Graph

- Display the list of terms of Ancient Greek Potteries in English with their definition
- Display the list of concepts (URI) of Ancient Greek Dresses and their names
- Propose examples of queries**

Condillac (France) – KETRC (China)

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x	r	y
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/2002/07/owl#Thing
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://xmlns.com/foaf/0.1/Person
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/ontology/Person
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.ontologydesignpatterns.org/ont/dul/DUL.owl#Agent
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.ontologydesignpatterns.org/ont/dul/DUL.owl#NaturalPerson
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.wikidata.org/entity/Q215627
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.wikidata.org/entity/Q24229398
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.wikidata.org/entity/Q2566598
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.wikidata.org/entity/Q5
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/ontology/Agent
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/ontology/Religious
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://schema.org/Person
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/WikicatPeopleFromKolkata
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/WikicatHinduMonks
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/WikicatHinduPhilosophers
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/WikicatHinduSaints
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/WikicatIndianPeople
http://dbpedia.org/resource/A_C_Bhaktivedanta_Swami_Prabhupada	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://dbpedia.org/class/yago/WikicatIndianPhilosophers

Practical Works

1. The DBpedia Knowledge Graph:

- Return the first 100 persons in DBpedia
- Find a picture of Confucius
- Find a picture of Beijing
- Find an article about Chiton
- Propose examples of queries**

2. The Wikidata Knowledge Graph:

- Return the first 100 persons
- Find a picture of Confucius
- Find a picture of Beijing
- Propose examples of queries**

3. The Knowledge Graph of the National Library of France

- Find a document
- Propose examples of queries**

4. The KETRC Knowledge Graph

- What are the different types of Chinese vases and their names in Chinese?
- Propose examples of queries**

5. The Condillac Knowledge Graph

- Display the list of terms of Ancient Greek Potteries in English with their definition
- Display the list of concepts (URI) of Ancient Greek Dresses and their names
- Propose examples of queries**

Condillac (France) – KETRC (China)

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Practical Works

1. The DBpedia Knowledge Graph:

- Return the first 100 persons in DBpedia
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- Display the list of concepts (URI) of Ancient Greek Dresses and their names
- Propose examples of queries

Condillac (France) – KETRC (China)

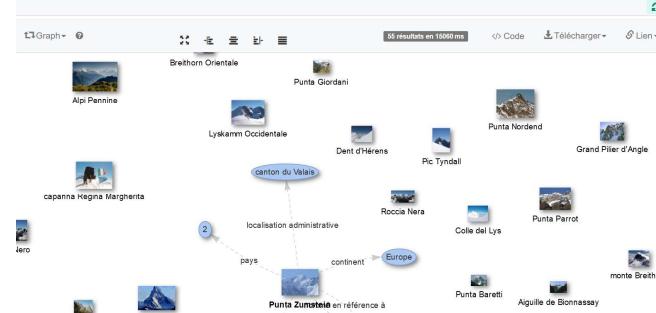
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<https://query.wikidata.org/>

Wikidata Query Service Exemples Aide Davantage d'outils français

```
1 #Somets italiens de plus de 4000 mètres
2 #defaultView:mapgrid
3 SELECT ?item ?itemLabel ?coord ?elev ?picture
4 {
5   ?item p:P204/pv:P204/wikibaseql:amount ?elev ; # normalized height
6   wdt:P625 ?coord ;
7   wdt:P17 wdt:Q38 ;
8   wdt:P18 ?picture
9   FILTER (?elev > 4000)
10
11 SERVICE wikibase:label { bd:serviceParam wikibase:language "it" }
12 }
```



Condillac (France) – KETRC (China)

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<https://www.wikidata.org/>

Wikidata is a free and open knowledge base that can be read and edited by both humans and machines.

Wikidata acts as central storage for the **structured data** of its Wikimedia sister projects including Wikipedia, Wikivoyage, Wiktionary, Wikisource, and others.

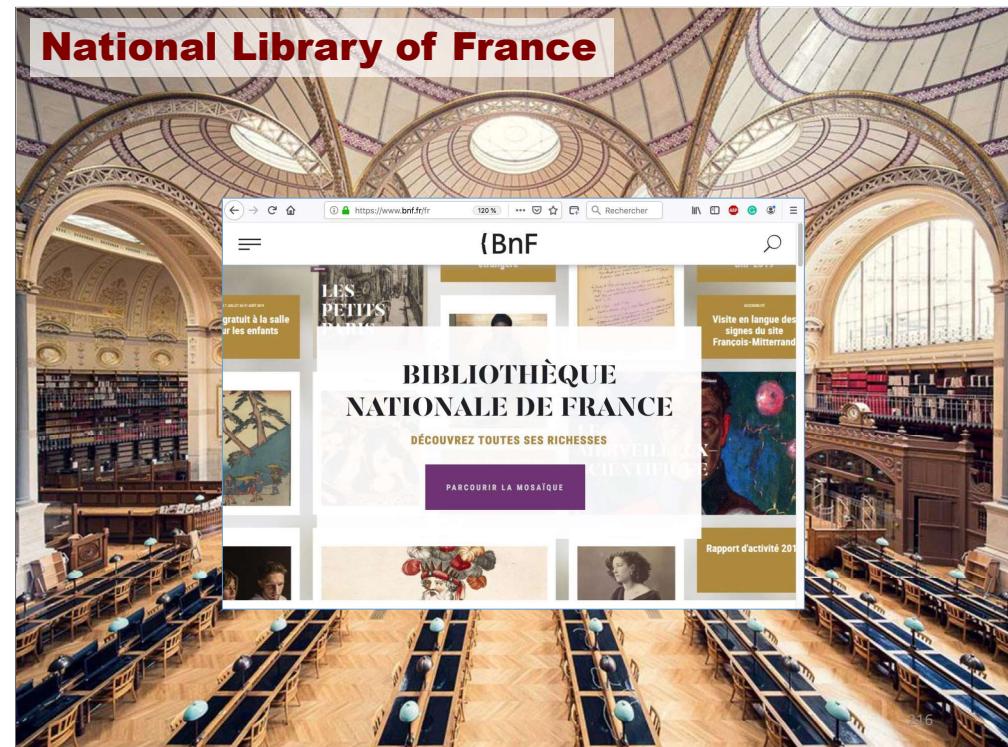
Wikidata also provides support to many other sites and services beyond just Wikimedia projects! The content of Wikidata is [available under a free license](#), [exported using standard formats](#), and [can be interlinked to other open data sets](#) on the linked data web.

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National Library of France



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SPARQL Endpoint



SPARQL Endpoint

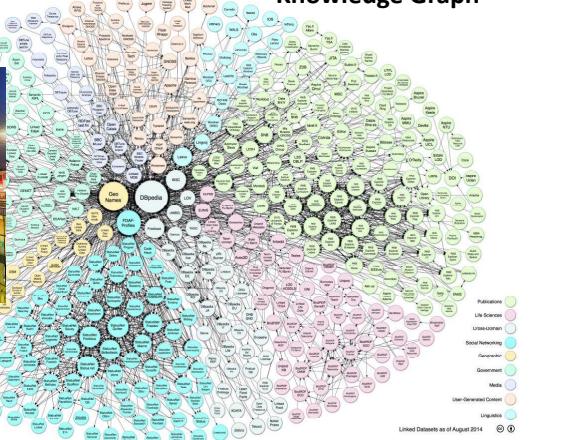
Access to a RDF Graph

SPARQL
Endpoint

RDF Graph
Knowledge Graph

<https://data.bnffr/current/sparql.html>

National Library of France



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Condillac (France) – KETRC (China)



Give an example of document of the National Library of France



<https://data.bnffr/current/sparql.html>

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National Library of France

Give an example of document of the National Library of France



Draw the query graph



Do it



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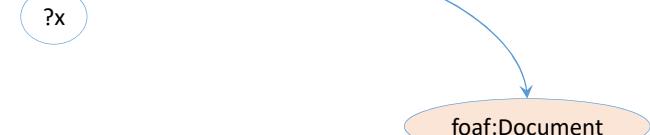
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National Library of France

Give an example of document of the National Library of France



rdf:type



Do it



Triple

? ?x rdf:type foaf:Document

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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/>

select distinct ?x

where { ?x rdf:type foaf:Document }

LIMIT 10

Editeur SPARQL de data.bnf.fr

Graphe par défaut (IRI)

Le Web sémantique dans data.bn

Requête

```
1 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
3 PREFIX foaf: <http://xmlns.com/foaf/0.1/>
4 select distinct ?x
5 where {?x rdf:type foaf:Document}
6 LIMIT 10
7
```

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x
http://ark.bnf.fr/ark:/12148/mm132201414h
http://ark.bnf.fr/ark:/12148/mm132201415w
http://ark.bnf.fr/ark:/12148/mm108200226b
http://ark.bnf.fr/ark:/12148/mm1312001882
http://ark.bnf.fr/ark:/12148/mm131200189f
http://ark.bnf.fr/ark:/12148/mm131200193h
http://ark.bnf.fr/ark:/12148/mm215200006r
http://ark.bnf.fr/ark:/12148/mm2152000116
http://ark.bnf.fr/ark:/12148/mm215200245c
http://ark.bnf.fr/ark:/12148/mm2152002474



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Practical Works

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- Find a picture of Confucius
- Find an article about Chiton
- Propose examples of queries

2. The Knowledge Graph of the National Library of France

- Find a document

Propose examples of queries

3. The KETRC Knowledge Graph

- What are the different types of Chinese vases and their names in Chinese?
- Propose examples of queries

4. The Condillac Knowledge Graph

- Display the list of terms of Ancient Greek Potteries in English with their definition
- Display the list of concepts (URI) of Ancient Greek Dresses and their names
- Propose examples of queries

Condillac (France) – KETRC (China)

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Practical Works

1. The DBpedia Knowledge Graph:

- Return the first 100 persons in DBpedia
- Find a picture of Confucius
- Find an article about Chiton
- Propose examples of queries

2. The Knowledge Graph of the National Library of France

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Digital Humanities

Digital Humanities (DH) is a newly emerging interdisciplinary area at the intersection of Computer Science and the Humanities (including but not limited to art, geography, history, language, literature, music). Its main aim is to develop and implement digital tools to Humanities research.

The fundamental question in DH is how datasets from the Humanities can be represented digitally in such a way that both humans and machines can process and exchange them on the Web. Ontology and Terminology have a central role to play to this end.

This approach is implemented in the "Naming the Things" project.

[Download the OCAM flyer](#)



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KETRC Ontologies

<http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl>

```
<owl:Class rdf:about="http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl#ArrowVase_I">
<rdfs:subClassOf rdf:resource="http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl#Vase"/>
<rdfs:subClassOf>
  <owl:Restriction>
    <owl:onProperty rdf:resource="http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl#has"/>
    <owl:someValuesFrom rdf:resource="http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl#SlantingShoulder"/>
  </owl:Restriction>
</rdfs:subClassOf>
+<rdfs:subClassOf><rdfs:subClassOf>
+<rdfs:subClassOf><rdfs:subClassOf>
+<rdfs:subClassOf><rdfs:subClassOf>
+<rdfs:subClassOf><rdfs:subClassOf>
+<rdfs:subClassOf><rdfs:subClassOf>
+<conceptName xml:lang="en"></conceptName>
<rdfs:comment>
  The vase has a square mouth, long neck, slanting shoulder, pierced handles, bulge belly and square foot.
</rdfs:comment>
<skos:definition xml:lang="en">
  Vase is with a square mouth, long neck, slanting shoulder, pierced handles, bulge belly and square foot.
</skos:definition>
<skos:prefLabel xml:lang="en">arrow vase</skos:prefLabel>
<skos:definition xml:lang="zh">花瓶, 带有一个方形口, 长颈, 斜肩, 带有贯耳, 垂腹和方足。</skos:definition>
<skos:prefLabel xml:lang="zh">贯耳瓶</skos:prefLabel>
</owl:Class>
```

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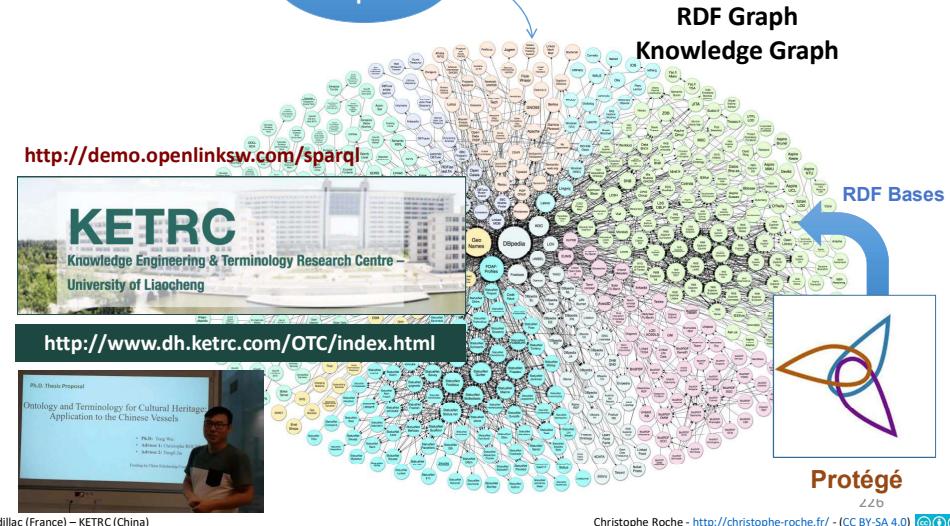
Condillac (France) – KETRC (China)

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KETRC Ontologies

Access to a RDF Graph

SPARQL
Endpoint



RDF Graph
Knowledge Graph

RDF Bases

Protégé

<http://www.dh.ketrc.com/>



TAO CI Project

The TAO CI Project is a collaborative project dedicated to defining the concept denoted by Chinese ceramics vessel terms. The purpose of TAO CI project is to provide a model of publishing open data for museums and link data of the Chinese ceramics and build a multi-linguistics e-dictionary of Chinese ceramics to communicate with archeologists in the world.

The TAO CI project is based on the ISO 704 and ISO 1087 to develop this model. It is an interdisciplinary project, which is related to Archeology (Cultural Heritage), Linguistic (Terminology), Artificial Intelligence (Knowledge Representation), Semantic Web (Linked Data). The methodology of the TAO CI project is the ontoterminology that is a terminology whose conceptual system is a formal ontology.

Support



The TAO CI project was funded by China Scholarship Council from November 2017 to November 2020.

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OTContainer

O: Ontology T: Terminology
C: China and Container

Home Ontology E-dictionary Dataset Contact

Arrow Vase
Arrow Vase I
Arrow Vase II
Arrow Vase III
Aw-handle-shaped Vase
Circle Rouleau Vase
Cong-shaped Vase
Cylindrical Vase
Double-tube Vase
Double Gourd Shaped Vase
Double Gourd Shaped Vase I
Double Gourd Shaped Vase II
Double Gourd Shaped Vase III
Gall-bladder Vase
Gall-bladder Vase I
Gall-bladder Vase II
Garlic-head Vase
Garlic-head Vase I
Garlic-head Vase II
Lantern-shaped Vase
Moon-shaped Vase
Oil-hammer Vase
Olive-shaped Vase
Olive-shaped Vase I
Olive-shaped Vase II
Pear-shaped Vase
Plum Vase
Plum Vase I
Plum Vase II
Reward Vase
Square Rouleau Vase
Twin Vase

Garlic-head Vase I

- * Terms(prefLabel):

garlic-head vase I [EN]

蒜头瓶 [ZH]

- * Terms(alternative):

garlic vase I @cn | garlic-mouth vase II @en |

- * Definition:

Vase with a garlic shaped mouth, short neck, circle shoulder, globular belly, ring foot, and Ru-Yi shaped handle [EN]

花瓶，带有一个蒜头形口，短颈，带如意耳，球形腹和圈足。[ZH]

- * Concept:

<vase one and garlic bulb shape mouth short neck with Ru-Yi shaped handle globular belly with ring foot>

- * Essential Characteristic

- has component:/Short Neck/
- has component:/Garlic Bulb Shape Mouth/
- has component:/Ring Foot/
- has component:/Ru-Yi Shaped Handle/
- has component:/Globular Belly/
- is fired at:/High Temperature/
- has function:/Function For Decoration/
- is made of:/Clay/



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Condillac (France) – KETRC (China)

KETRC Ontologies

What are the different types of Vases?
(Chinese names)



Draw the query graph

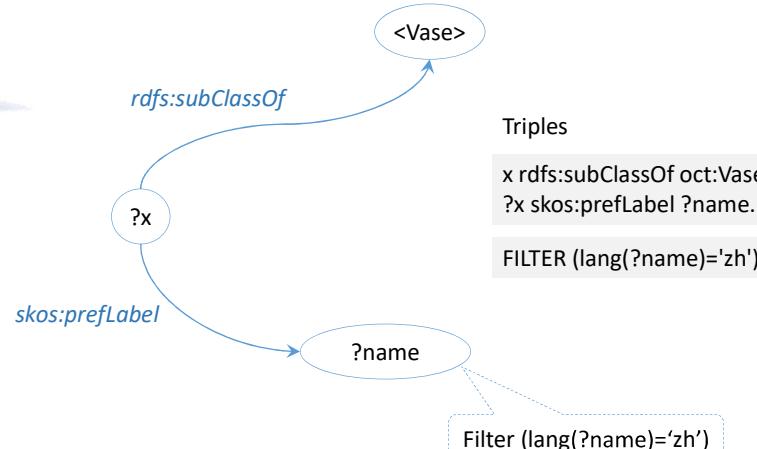


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KETRC Ontologies

What are the different types of Vases?
(Chinese names)



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Condillac (France) – KETRC (China)

<http://demo.openlinksw.com/sparql>

OpenLink Virtuoso SPARQL Query Editor

Not logged in. [Login](#) | [About](#) | [Namespace Prefixes](#) | [Inference Rules](#) | [Macros](#) | [RDF Views](#) | [Permalink](#) | [iSPARQL](#)

Default Graph URI: Run Query

Query Text:

```
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
SELECT ?term
FROM <http://www.ontologia.fr/OTB/krater.rdt>
WHERE { ?concept rdf:type skos:Concept.
?concept skos:prefLabel "vase"@en.
?subConcept skos:broader ?concept.
?subConcept skos:prefLabel ?term.
FILTER (lang(?term) = 'en')
} ORDER BY ?term
```

Sponging:

Results Format: (The CXML output is disabled, see [details](#))

Execution timeout: milliseconds (values less than 1000 are ignored)

Options: Strict checking of void variables

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Condillac (France) – KETRC (China)

KETRC Ontologies

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
PREFIX oct: <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl#>
SELECT ?nameZh ?nameEn
FROM <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl>
WHERE {
    ?x rdfs:subClassOf* oct:Vase.
    ?x skos:prefLabel ?nameZh.
    ?x skos:prefLabel ?nameEn.
    FILTER (lang(?nameZh)='zh')
    FILTER (lang(?nameEn)='en')
}
```

SPARQLer Query Results

nameZh	nameEn
"花瓶" @zh	"vase" @en
"多管瓶" @zh	"double-tube vase" @en
"双联瓶" @zh	"twin vase" @en
"梅瓶" @zh	"plum vase" @en
"梅瓶 I" @zh	"plum vase I" @en
"梅瓶 II" @zh	"plum vase II" @en
"花口瓶" @zh	"flower mouth vase" @en
"花口瓶 I" @zh	"flower mouth vase I" @en
"花口瓶 II" @zh	"flower-mouth vase II" @en
"柳叶瓶" @zh	"willow leaf-shaped vase" @en
"蒜头瓶" @zh	"garlic-head vase" @en
"蒜头瓶 I" @zh	"garlic-head vase I" @en
"蒜头瓶 II" @zh	"garlic-head vase II" @en
"荸荠瓶" @zh	"water-chestnut vase" @en
"活环瓶" @zh	"loosing ring vase" @en
"方棱瓶" @zh	"square rouleau vase" @en
"XJ龙瓶" @zh	"lantern-shaped vase" @en
"橄榄瓶" @zh	"olive shaped vase" @en
"橄榄瓶 II" @zh	"olive-shaped vase II" @en
"橄榄瓶 I" @zh	"olive-shaped vase I" @en

Condillac (France) – KETRC (China)

<http://sparql.org/sparql.html>

SPARQLer - General purpose processor

General SPARQL query : input query, set any options and press "Get Results"

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
PREFIX oct: <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl#>
SELECT ?nameZh ?nameEn
FROM <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl>
WHERE {
    ?x rdfs:subClassOf* oct:Vase.
    ?x skos:prefLabel ?nameZh.
    ?x skos:prefLabel ?nameEn.
    FILTER (lang(?nameZh)='zh')
    FILTER (lang(?nameEn)='en')
}
```



Target graph URI (or use FROM in the query)

If no dataset is provided, the query will execute against an empty one.
The query can contain use VALUES to set some variables.

Output:

XSLT style sheet (blank for none):

Force the accept header to text/plain regardless

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```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
PREFIX oct: <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
```

SELECT ?nameZh ?nameEn ?img

FROM <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl>

```
WHERE {
    ?x rdf:type owl:NamedIndividual.
    ?x skos:prefLabel ?nameEn.
    ?x skos:prefLabel ?nameZh.
    FILTER (lang(?nameEn)='en').
    FILTER (lang(?nameZh)='zh').
    ?x foaf:depiction ?img
}
```

<http://sparql.org/sparql.html>

SPARQLer Query Results

nameZh	nameEn	img
"明万历青花寿字葫芦瓶" @zh	"blue-and-white double gourd shaped vase painted with short word, Wanli mark" @en	http://www.sdmuseum.com/resource/sdbwg/image/201707/7e8ed9c9404-4849-be4-846e2f7c15fb6.jpg
"清康熙青花夜宴桃李园图棒槌瓶" @zh	"blue-and-white color medusa pattern painted with peacock garden, Kangxi mark of Qing dynasty" @en	http://old.chmuseum.cn/Portals/AntiqueImages/20120220203515_4.jpg
"清雍正斗彩团花纹天球瓶" @zh	"Doucai vault of Heaven vase painted with medallion, Yongzheng mark of Qing dynasty" @en	http://www.chmuseum.cn/zp/2pm1/201812/18722757505211.jpg
"明万历青花鱼藻纹蒜头瓷瓶" @zh	"Blue-and-white garlic-head porcelain vase with fish and water-weed design, Wanli mark of Ming dynasty" @en	http://s13.sinming.cn/middle/a5d4644fc20109eeace&690
"清乾隆粉彩花蝶纹瓶" @zh	"famille rose lantern-shaped vase, Qianlong mark of Qing dynasty" @en	http://newback.njmuseum.com/ware/images/big/porselain/34_20021115.jpg
"清乾隆青釉八卦顶项式瓶" @zh	"celadon glaze Gong-shaped vase designed with eight divinatory trigrams, Qianlong mark of Qing dynasty" @en	http://newback.njmuseum.com/ware/images/big/porcelain/28_20021115.jpg

Condillac (France) – KETRC (China)



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KETRC Ontologies

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
PREFIX oct: <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl#>
SELECT ?nameZh ?nameEn
FROM <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl>
```

```
WHERE {
    ?x rdfs:subClassOf* oct:Vase.
    ?x skos:prefLabel ?nameZh.
    ?x skos:prefLabel ?nameEn.
    FILTER (lang(?nameZh)='zh')
    FILTER (lang(?nameEn)='en')
}
```

nameZh	nameEn
"花瓶" @zh	"vase" @en
"箭耳瓶" @zh	"arrow vase" @en
"箭耳瓶 I" @zh	"arrow vase I" @en
"箭耳瓶 II" @zh	"arrow vase II" @en
"箭耳瓶 III" @zh	"arrow vase III" @en
"把手瓶" @zh	"awl-handle vase" @en
"葵瓣瓶" @zh	"cong-snaped vase" @en
"葫芦瓶" @zh	"double-gourd vase" @en
"葫芦瓶 I" @zh	"double-gourd vase I" @en
"葫芦瓶 II" @zh	"double-gourd vase II" @en
"葫芦瓶 III" @zh	"double-gourd vase III" @en
"多管瓶" @zh	"double-tube vase" @en

Condillac (France) – KETRC (China)

<http://demo.openlinksw.com/sparql>

OpenLink Virtuoso SPARQL Query Editor

Not logged in. [Logout](#) About | Namespace Prefixes | Inference Rules | Macros | RDF Views | Permalink | SPARQL

Run Query

Query Text

```
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
PREFIX oct: <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl#>
SELECT ?nameZh ?nameEn
FROM <http://www.dh.ketrc.com/otcontainer/data/OTContainer.owl>
```

Results:

nameZh	nameEn
"花瓶" @zh	"vase" @en
"箭耳瓶" @zh	"arrow vase" @en
"箭耳瓶 I" @zh	"arrow vase I" @en
"箭耳瓶 II" @zh	"arrow vase II" @en
"箭耳瓶 III" @zh	"arrow vase III" @en
"把手瓶" @zh	"awl-handle vase" @en
"葵瓣瓶" @zh	"cong-snaped vase" @en
"葫芦瓶" @zh	"double-gourd vase" @en
"葫芦瓶 I" @zh	"double-gourd vase I" @en
"葫芦瓶 II" @zh	"double-gourd vase II" @en
"葫芦瓶 III" @zh	"double-gourd vase III" @en
"多管瓶" @zh	"double-tube vase" @en

Sponging: Retrieve all missing remote RDF data that might be useful, including seeAlso references [\(details\)](#)

Results Format: HTML XML [\(The XML output is disabled, see details\)](#)

Execution timeout: 30000000 milliseconds (values less than 1000 are ignored)

Options: Strict checking of void variables

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1.4 Practical Works

1. The DBpedia Knowledge Graph:

- Return the first 100 persons in DBpedia
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Practical Works

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SPARQL Endpoint

Access to a RDF Graph

SPARQL
Endpoint

RDF Graph
Knowledge Graph



<http://ontologia.fr/OTB/>



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UD Terminology Cloud

Created from the Condillac Research Group in Knowledge Engineering at the University of Savoie (Equipe de Recherche Technologique Condillac No. 20032288, French Ministry of Research), Condillac is today an international research group whose interests concern Terminology and Ontology, and, in a more general way, the links between Language and Knowledge. Condillac is in charge of the organization of the [TOTH International Conference](#) on Terminology and Ontology.

Condillac brings together researchers coming from different disciplines (terminology, artificial intelligence, linguistics, computer science, philology, digital humanities) and different institutions (Universities of Savoie Mont-Blanc, NOVA de Lisboa, LiaoCheng, Paris Dauphine).

Contact: Prof Christophe Roche
Condillac Research Group – LISTIC Lab.
Campus Scientifique – Université Savoie Mont-Blanc
73 376 – Le Bourget du Lac cedex – France
tel: +33 (0) 479 758 779 – mob: +33 (0) 686 250 705
roche@univ-savoie.fr



Condillac (F)

Etienne Bonnot de Condillac (1714-1780). French philosopher, disciple of John Locke, he wrote several books on human knowledge, logic, grammar and language.

« Because words are the signs of our ideas, the system inherent in natural language must be based on the system inherent in our knowledge » (Grammar, 1775)

« Languages as analytic methods » (Grammar, 1775)

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Condillac (France) – KETRC (China)

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Ontoterminology of Ancient Greek Pottery

<http://ontoterminology.com/>

An ontoterminology is a terminology
whose conceptual system is a formal ontology



Computer readable form

Individual



RDF Export

```
<owl:NamedIndividual rdf:about="#Beazley-214878">
  <skos:prefLabel>Beazley-214878</skos:prefLabel>
  <rdf:type>
    <rdf:resource="#Vessel_with_handle(s)_for_mixing_wine_with_water_without_neck_with_upward_curling_handles_upward_curling_handles_placed_high_on_the_body"/>
    <technique>RED-FIGURE</technique>
    <vase_number_in_Beazley>214878</vase_number_in_Beazley>
    <current_collection>Athens,_National_Museum:_N1144</current_collection>
    <fabric>Athenian</fabric>
    <foaf:depiction rdf:resource="http://ontologia.fr/Images/GreekVase/Beazley-214878.png"/>
    <foaf:depiction rdf:resource="http://ontologia.fr/Images/GreekVase/Beazley-214878.png"/>
    <skos:exactMatch rdf:resource="http://www.beazley.ox.ac.uk/record/686041A0-D3BA-4EFB-8F56-08F2AA04C96F"/>
</owl:NamedIndividual>
```

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Ontoterminality of Ancient Greek Pottery

Display the list of the **terms** (**names**) in English with their **definition**

<http://ontologia.fr/OTB/Krater.owl>



Draw the query graph



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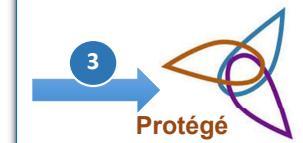
The Ontoterminality Process

OWL Export

```
<?xml version="1.0" encoding="utf-8"?>
<!-- Ontoterminality: Ontoterminality of kraters -->
<!-- Author: Maria -->
<!-- Creation date of ontoterminality: April 28, 2019 -->
<!-- Export date: August 23, 2019 time: 4:21:56 PM -->
<!-- Generated by Tedi version: 2.0 - http://christophe-roche.fr/tedi -->

<rdf:RDF xmlns="http://www.ontologia.fr/OTB/Ontoterminalityofkraters#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:skos="http://www.w3.org/2004/02/skos/core#"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:dce="http://www.w3.org/2001/XMLSchema#"
  xmlns:xsd="http://www.w3.org/1998/04/08-xml-schema#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:vocab="http://www.w3.org/2003/06/sw-vocab-status/ns#"
  xmlns:vanilla="http://purl.org/vocab/vann#"
  <owl:ontology rdf:about="http://ontologia.fr/OTB/Ontoterminalityofkraters">
    <dc:title></dc:title>
    <dc:description></dc:description>
    <dc:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2019-4-28</dc:issued>
    <dc:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2019-7-10</dc:modified>
    <dc:creator>Maria Papadopoulou</dc:creator>
    <dc:publisher>Condillac</dc:publisher>
  </owl:Ontology>
  <!-- Object Properties: -->
  <owl:ObjectProperty rdf:about="#hasPart#>
    <owl:inverse rdf:resource="#partOf#"/>
    <owl:domain rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
    <owl:range rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
  </owl:ObjectProperty>
  <owl:ObjectProperty rdf:about="#partOf#>
    <rdfs:domain rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
    <rdfs:range rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
  </owl:ObjectProperty>
  <owl:ObjectProperty rdf:about="#relatedTo#>
    <rdfs:domain rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
    <rdfs:range rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
  </owl:ObjectProperty>
</owl:Ontology>
```

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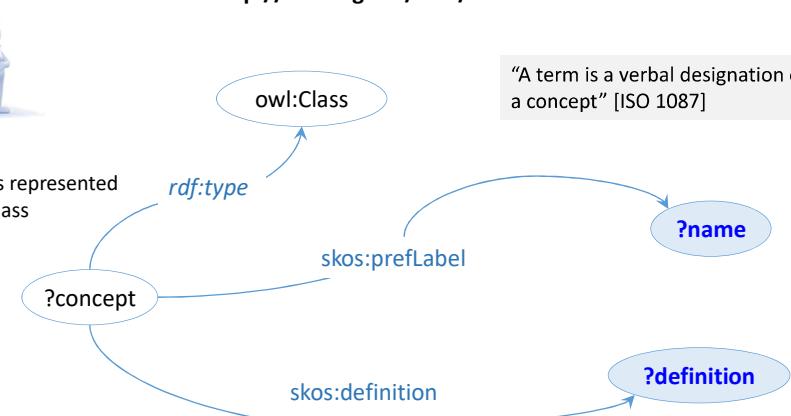
Ontoterminality of Ancient Greek Pottery

Display the list of the **terms** (**names**) in English with their **definition**

<http://ontologia.fr/OTB/Krater.owl>



A concept is represented as a OWL Class



"A term is a verbal designation of a concept" [ISO 1087]

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SPARQLer

<http://sparql.org/>

The screenshot shows the main page of the SPARQLer website. It includes sections for Validators (SPARQL query validator, SPARQL update validator, RDF data validator, IRI validator), Query forms (General purpose SPARQL processor), SPARQL Services (The general SPARQL query service is accessed directly using the SPARQL protocol at /sparql), and Links to SPARQL 1.1 Specifications (SPARQL Query language, SPARQL Update, SPARQL Protocol, SPARQL Graph Store Protocol, SPARQL Result formats (SPARQL Query Results JSON Format, SPARQL Query Results CSV and TSV Formats, SPARQL Query Results XML Format), SPARQL Service Description, SPARQL Federated Query, SPARQL Entailment Regimes).

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SPARQLer

<http://sparql.org/sparql.html>

The screenshot shows the query editor interface of the SPARQLer website. It features a "General SPARQL query" input field containing a query about ancient Greek kraters, followed by a "SPARQLer Query Results" table.

SPARQLer Query Results

name	definition
"amphora" @en	"Vase with neck and two handles for storing and transport liquids and solids." @en
"bell krater" @en	"Krater without neck, with upward curling handles placed high on the body." @en
"calyx krater" @en	"Krater without neck, with upward curling handles placed low on the body." @en
"column krater" @en	"Krater with neck and with column-like handles." @en
"hydria" @en	"Vase with neck and three handles, two for carrying and one for pouring, for storing and transport water." @en
"krater" @en	"Large open container with a foot and handles, used in ancient Greece for mixing wine with water." @en
"lekythos" @en	"Vase with neck for perfume." @en
"vase" @en	"Ceramic vessel." @en
"volute krater" @en	"Krater with neck and with volute-like handles." @en

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SPARQLer

<http://sparql.org/sparql.html>

The screenshot shows the query editor interface of the SPARQLer website. It features a "General SPARQL query" input field containing a more complex query involving multiple prefixes and filters, followed by output options for XML or XSLT, and a "Get Results" button.

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OpenLink Virtuoso SPARQL Query Editor

<http://demo.openlinksw.com/sparql>

The screenshot shows the OpenLink Virtuoso SPARQL Query Editor interface. It includes a "Query Text" input field with a query about skos:Concepts, a "Sponging:" dropdown (set to "Retrieve remote RDF data for all missing source graphs"), and various configuration options for Results Format (HTML), Execution timeout (3000000 milliseconds), and Options (Strict checking of void variables). The interface also features the OpenLink Software logo and navigation links for Login, About, Namespace Prefixes, Inference Rules, Macros, RDF Views, Permalink, and SPARQL.

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Ontoterminology of Ancient Greek Pottery

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
 PREFIX owl: <http://www.w3.org/2002/07/owl#>
 PREFIX otb: <http://www.ontologia.fr/OTB#>
 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
 PREFIX skos: <http://www.w3.org/2004/02/skos/core#>

SELECT ?concept ?name

① FROM <http://ontologia.fr/OTB/krater.rdf>

<http://sparql.org/sparql.html>

<http://demo.openlinksw.com/sparql>

WHERE {
 ?concept rdf:type owl:Class ;
 skos:prefLabel ?name.
 }

LIMIT 20

② <http://ontologia.fr/OTB/krater.rdf>

Requête

```

1 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 PREFIX owl: <http://www.w3.org/2002/07/owl#>
3 PREFIX otb: <http://www.ontologia.fr/OTB#>
4 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
5 PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
6
7 SELECT ?concept ?name
8 FROM <http://ontologia.fr/OTB/krater.rdf>
9
10 WHERE {
11     ?concept rdf:type owl:Class ;
12     skos:prefLabel ?name.
13 }
14
15 LIMIT 20

```

① or ②

② Sponging:

Retrieve remote RDF data for all missing source graphs

Condillac (France) – KETRC (China)

Ontoterminology of Ancient Greek Pottery

PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
 PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
 PREFIX owl: <http://www.w3.org/2002/07/owl#>

SELECT ?name ?definition

FROM <http://ontologia.fr/OTB/krater.rdf>

WHERE {

?concept rdf:type owl:Class.
 ?concept skos:prefLabel ?name.
 ?concept skos:definition ?definition.
 FILTER (lang(?name) = 'en')
 FILTER (lang(?definition) = 'en')

ORDER BY ?name

LIMIT 100

<http://sparql.org/sparql.html>

<http://demo.openlinksw.com/sparql>

Graphe par défaut (IRI) <https://data.bnfr/current/sparql.html>

Requête

```

1 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
3
4 SELECT ?name ?definition
5 FROM <http://ontologia.fr/OTB/krater.rdf>
6
7 WHERE {
8     ?concept rdf:type owl:Class.
9     ?concept skos:prefLabel ?name.
10    ?concept skos:definition ?definition.
11    FILTER (lang(?name) = 'en')
12    FILTER (lang(?definition) = 'en')
13 }
14
15 ORDER BY ?name
16 LIMIT 100

```

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Ontoterminology of Ancient Greek Pottery

concept	name
http://www.ontologia.fr/OTB/krater#Person	"personne"@fr
http://www.ontologia.fr/OTB/krater#Place	"lieu"@fr
http://www.ontologia.fr/OTB/krater#Vessel	"vase"@fr
http://www.ontologia.fr/OTB/krater#Vessel	"vase"@en
http://www.ontologia.fr/OTB/krater#Vessel	"αγγείο"@gr
http://www.ontologia.fr/OTB/krater#Vessel_for_mixing_wine_with_water_with_handle(s)	"cratère"@fr
http://www.ontologia.fr/OTB/krater#Vessel_for_mixing_wine_with_water_with_handle(s)	"krater"@en
http://www.ontologia.fr/OTB/krater#Vessel_for_mixing_wine_with_water_with_handle(s)	"κρατήρας"@gr
http://www.ontologia.fr/OTB/krater#Vessel_for_perfume_with_neck	"lekythos"@en
http://www.ontologia.fr/OTB/krater#Vessel_for_perfume_with_neck	"λέκυθος"@fr
http://www.ontologia.fr/OTB/krater#Vessel_for_perfume_with_neck	"λήκυθος"@gr
http://www.ontologia.fr/OTB/krater#Vessel_for_storing_and_transport_liquid_water_with_neck_with_handle(s)_with_three_handles	"hydria"@en
http://www.ontologia.fr/OTB/krater#Vessel_for_storing_and_transport_liquid_water_with_neck_with_handle(s)_with_three_handles	"ὑδρία"@gr
http://www.ontologia.fr/OTB/krater#Vessel_for_storing_and_transport_with_neck_with_handle(s)_with_two_handles	"amphora"@en
http://www.ontologia.fr/OTB/krater#Vessel_for_storing_and_transport_with_neck_with_handle(s)_with_two_handles	"ἀμφορά"@gr
http://www.ontologia.fr/OTB/krater#Vessel_for_storing_and_transport_with_neck_with_handle(s)_with_two_handles	"αμφόρας"@gr
http://www.ontologia.fr/OTB/krater#Vessel_with_handle(s)_for_mixing_wine_with_water_with_neck_with_column-like_handles	"column krater"@en
http://www.ontologia.fr/OTB/krater#Vessel_with_handle(s)_for_mixing_wine_with_water_with_neck_with_column-like_handles	"cratère à colonnettes"@fr
http://www.ontologia.fr/OTB/krater#Vessel_with_handle(s)_for_mixing_wine_with_water_with_neck_with_column-like_handles	"κρατήρας κιονωτός"@gr
http://www.ontologia.fr/OTB/krater#Vessel_with_handle(s)_for_mixing_wine_with_water_with_neck_with_volute-like_handles	"cratère à volutes"@fr

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Ontoterminology of Ancient Greek Pottery



name	definition
"amphora"@en	"Vase with neck and two handles for storing and transport liquids and solids."@en
"bell krater"@en	"Krater without neck, with upward curling handles placed high on the body."@en
"calyx krater"@en	"Krater without neck, with upward curling handles placed low on the body."@en
"column krater"@en	"Krater with neck and with column-like handles."@en
"hydria"@en	"Vase with neck and three handles, two for carrying and one for pouring, for storing and transport water."@en
"krater"@en	"Large open container with a foot, used in ancient Greece for mixing wine with water."@en
"lekythos"@en	"Vase with neck for perfume."@en
"vase"@en	"Ceramic vessel."@en
"volute krater"@en	"Krater with neck and with volute-like handles."@en

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1.4 Practical Works

1. The DBpedia Knowledge Graph:

- Return the first 100 persons in DBpedia
- Find a picture of Confucius
- Find an article about Chiton
- Propose examples of queries

2. The Knowledge Graph of the National Library of France

- Find a document
- Propose examples of queries

3. The KETRC Knowledge Graph

- What are the different types of Chinese vases and their names in Chinese?
- Propose examples of queries

4. The Condillac Knowledge Graph

- Display the list of terms of Ancient Greek Potteries in English with their definition
- Display the list of concepts (URI) of Ancient Greek Dresses and their names
- Propose examples of queries

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bell_krater (kon:Shape)

skos:prefLabel
Glockenkrater (de), Bell Krater (en), crátera de campana (es), cratère en cloche (fr), cratera a campana (it), sъвонест кратер (mk), klokkrater (nl)
skos:definition
Der Glockenkrater ist eine rot-figurige Innovation. Er weist einen niedrigen oder manchmal modifizierten Standfuß mit dem leichten Ansatz eines Stiels auf. Die Gefäßform erinnert an eine umgedrehte Glocke mit einer leicht nach außen gebogenen Mundung mit gerundeten Lippe. Er hat massive, horizontale, zylindrische Henkel, die parallel unter dem Rand angebracht sind. (de)
skos:definition
The bell krater is an innovation belonging to the red figure technique. The body rises from a low disk foot or sometimes a modified disk-foot into the hint of a stem before expanding into the shape of an inverted bell with a mildly flaring mouth with a torus lip. It has sturdy, horizontal, cylindrical handles that are located high up on the body opposite one another and are slightly upturned. (en)
dcterms:source
rdf:type
skos:Concept
rdfs:seeAlso
<https://www.beazley.ox.ac.uk/tools/pottery/shapes/bell.htm>
skos:broadner
<http://kerameikos.org/id/krater>
skos:changeNote
http://kerameikos.org/id/bell_krater#provenance
ekos:exactMatch
<http://collection.britishmuseum.org/id/thesauri/x5427>
skos:exactMatch
<http://vocab.getty.edu/aat/300198857>
skos:exactMatch
<http://www.wikidata.org/entity/Q1531905>
skos:inScheme
<http://kerameikos.org/id/>

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Kerameikos.org

Support

NATIONAL ENDOWMENT FOR THE Humanities

In August 2018, the National Endowment for the Humanities awarded Kerameikos \$85,382 as part of the Digital Humanities Advancement program. An 18-month long Level II project, this will fund the creation of all necessary Archaic and Classical Greek pottery concepts the building of various aggregation or harvesting tools.

Scientific Committee

The scientific committee includes both pottery and cultural heritage informatics experts.



<rdf:RDF>
<kon:Shape rdf:about="http://kerameikos.org/id/bell_krater">
<rdf:type rdf:resource="<http://www.w3.org/2004/02/skos/core#Concept>">
<skos:inScheme rdf:resource="<http://kerameikos.org/id/>">/>
<skos:prefLabel xml:lang="en">Bell Krater</skos:prefLabel>
<skos:definition xml:lang="en">
The bell-krater is an innovation belonging to the red-figure technique. The body rises from a low disk-foot or sometimes a modified disk-foot into the hint of a stem before expanding into the shape of an inverted bell with a mildly flaring mouth with a torus lip. It has sturdy, horizontal, cylindrical handles that are located high up on the body opposite one another and are slightly upturned.
</skos:definition>
<skos:exactMatch rdf:resource="<http://collection.britishmuseum.org/id/thesauri/x5427>">
<skos:exactMatch rdf:resource="<http://vocab.getty.edu/aat/300198857>">
<rdfs:seeAlso rdf:resource="<https://www.beazley.ox.ac.uk/tools/pottery/shapes/bell.htm>">
<skos:broadner rdf:resource="<http://kerameikos.org/id/krater>">
<skos:changeNote rdf:resource="http://kerameikos.org/id/bell_krater#provenance">
<dcterms:source rdf:resource="<https://zenon.dainst.org/Record/000188572>">
<skos:prefLabel xml:lang="de">Glockenkrater</skos:prefLabel>
<skos:prefLabel xml:lang="fr">cratère en cloche</skos:prefLabel>
<skos:prefLabel xml:lang="it">cratere a campana</skos:prefLabel>
<skos:prefLabel xml:lang="nl">klokkrater</skos:prefLabel>
<skos:prefLabel xml:lang="es">crátera de campana</skos:prefLabel>
<skos:prefLabel xml:lang="mk">съвонест кратер</skos:prefLabel>
<skos:exactMatch rdf:resource="<http://www.wikidata.org/entity/Q1531905>">
<skos:definition xml:lang="de">
Der Glockenkrater ist eine rot-figurige Innovation. Er weist einen niedrigen oder manchmal modifizierten Standfuß mit dem leichten Ansatz eines Stiels auf. Die Gefäßform erinnert an eine umgedrehte Glocke mit einer leicht nach außen gebogenen

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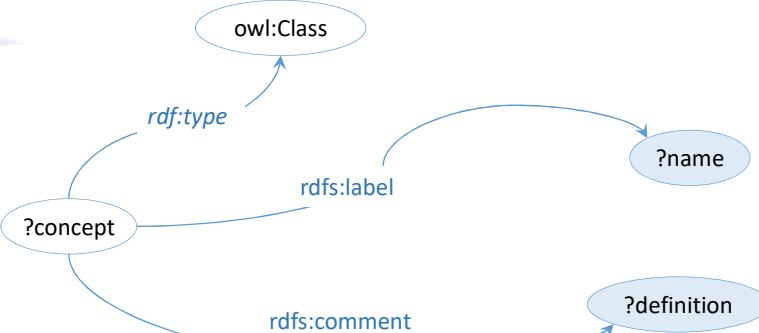
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Kerameikos Ontology

Display the list of the terms (names) in English with their definition



<http://ontologia.fr/OTB/Kerameikos.rdf>



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Kerameikos Ontology

name	definition
"Production Place"@en	"Stub for the description of Production Place, as a concept. To be differentiated from ecrm:E53_Place and geo:SpatialThing, which are physical locations."@en
"Shape"@en	"Stub for the description of Shape"@en
"Style"@en	"Stub for the description of Style"@en
"Technique"@en	"Stub for the description of Technique"@en
"Ware"@en	"Stub for the description of Ware"@en

Krater Ontoterminology

name	definition
"bell krater"@en	"Krater without neck, with upward curling handles placed high on the body."@en
"calyx krater"@en	"Krater without neck, with upward curling handles placed low on the body."@en
"column krater"@en	"Krater with neck and with column-like handles."@en
"krater"@en	"Large open container with a foot, used in ancient Greece for mixing wine with water."@en
"volute krater"@en	"Krater with neck and with volute-like handles."@en

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<http://ontologia.fr/OTB/Kerameikos.rdf>

```

SELECT ?name ?definition
WHERE {
  ?concept rdf:type owl:Class.
  ?concept rdfs:label ?name.
  ?concept rdfs:comment ?definition.
  filter (lang(?name) = 'en')
}
LIMIT 100
  
```

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Graphe par défaut (IRI)

<http://ontologia.fr/OTB/Kerameikos.rdf>

Requête

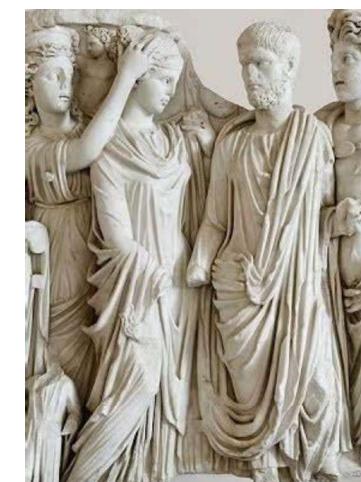
```

1 SELECT ?name ?definition
2 WHERE {
3   ?concept rdf:type owl:Class.
4   ?concept rdfs:label ?name.
5   ?concept rdfs:comment ?definition.
6   filter (lang(?name) = 'en')
7 }
8 LIMIT 100
9
  
```

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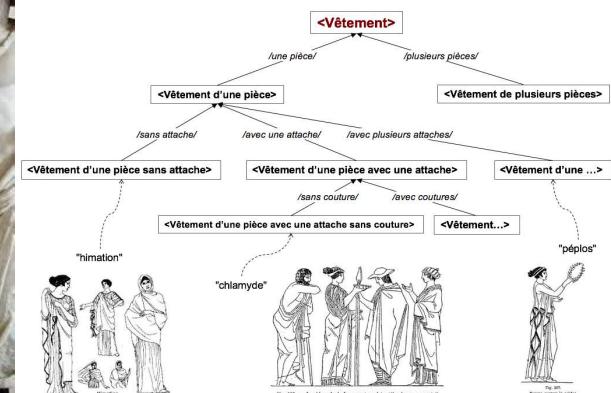
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Ancient Greek Dress Onto-Terminology



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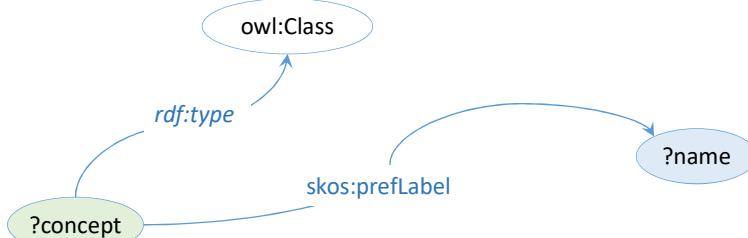
268

Ontoterminology of Ancient Greek Dress

Display the list of the concepts (URI) with their names



<http://ontologia.fr/OTB/Greek-Dress-Ontology.rdf>



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concept	name
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment	"garment"@en
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_around_body_male_one_part_without_sewing_without_sleeves_attached_one_attachment_knee-length_over_unpleated	"chlamys"@en
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_around_body_male_one_part_without_sewing_without_sleeves_attached_one_attachment_knee-length_over_unpleated	"χλαμύς"@gr
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_leg_encasing_with_sewing_more_than_one_part	"anaxyrides"@en
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_leg_encasing_with_sewing_more_than_one_part	"anaxyrides"@fr
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_leg_encasing_with_sewing_more_than_one_part	"ἀναξυρίδες"@gr
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_male_around_body_more_than_one_part_with_sewing_without_sleeves_attached_one_attachment_knee-length_unpleated_under	"exomis"@en
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_more_than_one_part_with_sewing_attached_multiple_attachments_around_body_ankle-length	"chiton orthostadios"@fr
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_more_than_one_part_with_sewing_attached_multiple_attachments_around_body_ankle-length	"chiton podrcrs"@en
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_more_than_one_part_with_sewing_attached_multiple_attachments_around_body_ankle-length	"χιτών οφθοστάδιος"@gr
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_over_with_sleeves_more_than_one_part_with_sewing_attached_multiple_attachments_around_body_unpleated	"ependytes"@en
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_over_with_sleeves_more_than_one_part_with_sewing_attached_multiple_attachments_around_body_unpleated	"ἐπενδύτης"@gr
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_with_sleeves_more_than_one_part_attached_multiple_attachments_around_body_under	"chiton cheiridotos"@en
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_with_sleeves_more_than_one_part_attached_multiple_attachments_around_body_under	"chiton cheiridotos"@fr
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_with_sleeves_more_than_one_part_with_sewing	"kandys"@en
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_with_sleeves_more_than_one_part_with_sewing	"kandys"@fr
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_with_sleeves_more_than_one_part_with_sewing	"κάνδης"@gr
http://www.ontologia.fr/OTB/Greek-Dress-Ontology#Garment_with_sleeves_with_sewing_around_body_ankle-length_more_than_one_part_under	"chiton chortaios"@en

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<http://ontologia.fr/OTB/Greek-Dress.rdf>

PREFIX rdf: <<http://www.w3.org/1999/02/22-rdf-syntax-ns#>>
PREFIX owl: <<http://www.w3.org/2002/07/owl#>>
PREFIX otb: <<http://www.ontologia.fr/OTB#>>
PREFIX rdfs: <<http://www.w3.org/2000/01/rdf-schema#>>
PREFIX skos: <<http://www.w3.org/2004/02/skos/core#>>

```

SELECT ?concept ?name
WHERE {
  ?concept rdf:type owl:Class.
  ?concept skos:prefLabel ?name
}
LIMIT 100
  
```

Editeur SPARQL de data.bnfr

Graphe par défaut (IRI)

<http://ontologia.fr/OTB/Greek-Dress.rdf>

Requête

```

1 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 PREFIX owl: <http://www.w3.org/2002/07/owl#>
3 PREFIX otb: <http://www.ontologia.fr/OTB#>
4 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
5 PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
6 SELECT ?concept ?name
7 WHERE {
8   ?concept rdf:type owl:Class.
9   ?concept skos:prefLabel ?name
10 }
11 LIMIT 100
12
  
```

Sponging:

Retrieve all missing remote RDF data that might be useful

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The Krater Knowledge Graph



Column-krater: Named for its column-like handles, the column-krater is first known from Corinthian examples dated to the late seventh century. It is regularly produced by Athenian potters from the first half of the sixth-century until the third quarter of the fifth. It seems from graffiti on Athenian red-figure examples that the vessel was referred to as *Korinthios* or *Korinthiourges*.



Volute-krater: The volute-krater is named after its handles. The François Vase is a famous and early example, but the typical Athenian form occurs only later in the sixth century, with the handles tightly curled so that they look like the volutes on Ionic columns. The shape is also found in metal. Over the course of the fifth and fourth centuries, examples become slimmer, and Apulian volute-kraters from South Italy are particularly elaborate.



Calyx-krater: The handles of the calyx-krater are placed low down on the body, at what is termed the cul. Their upward curling form lends the shape an appearance reminiscent of the calyx of a flower, hence the name. The [earliest known example](#) was possibly made by Exekias in the third quarter of the sixth century. It continues to be produced, mainly in red-figure, becoming more elongated over the course of the fifth and fourth centuries.



Bell-krater: The latest of the four krater-types, it first occurs in the early fifth century, and is not found decorated in black-figure. It is named for its bell-like shape, perhaps originating in wood. It has small horizontal upturned handles just over halfway up the body. Some do not have a foot, and earlier examples may have lugs for handles. Over the course of the fifth and fourth centuries, the shape becomes slimmer.

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The Krater Knowledge Graph

2. Existing Resources?

CLASSICAL ART RESEARCH CENTRE



Home | Beazley Archive | Pottery database | Gem research | Terracottas | Other databases | Events | Resources | Publications | People

Beazley Archive

History

Acquisition policy

Funding

Visiting us

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Accessibility

Copyright

The Beazley Archive

Housed on the top floor of the Beazley Centre, behind the Ashmolean Museum and next to Oxford's main classical library, the Beazley Archive is a world centre for the study of ancient Greek painted pottery.

The Archive contains the world's largest collection of photographs of ancient Greek painted pottery, as well as relevant books and offprints, extensive material on the history of gem-collecting, and thousands of other items. Many photographs relating to Greek archaeology and Sir John Beazley. Most of the Archive's images are available online, but the Archive's library remains a resource of central importance for research on classical art.

Search

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PERSEUS DIGITAL LIBRARY

GREGORY R. CRANE, EDITOR-IN-CHIEF
TUFTS UNIVERSITY

<http://www.perseus.tufts.edu/hopper/text?doc=Perseus:text:1999.04.0004:entry=samphora&highlight=krater>



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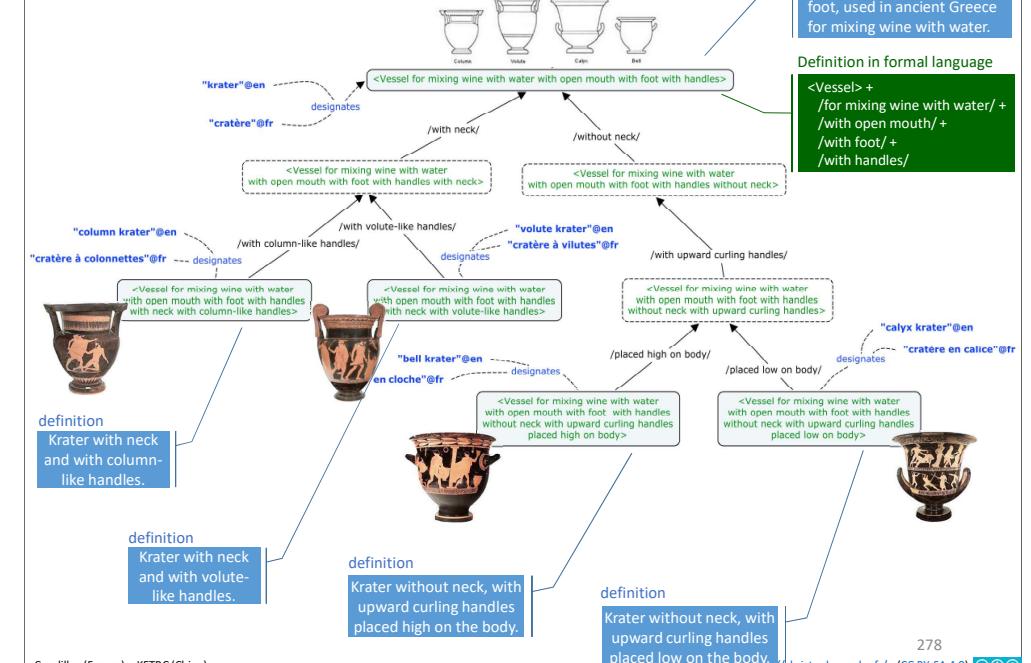
The Krater Knowledge Graph

Definition in natural language

Large open container with a foot, used in ancient Greece for mixing wine with water.

Definition in formal language

<Vessel> +
/for mixing wine with water/ +
/with open mouth/ +
/with foot/ +
/with handles/



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The Krater Knowledge Graph

3. Which Languages?

<http://ontologia.fr/OTB/krater.rdf>

```
<?xml version="1.0" encoding="utf-8"?>
<!-- Ontoterminalogy: Ontoterminalogy of Vases -->
<!-- Author: Maria Papadopoulou -->
<!-- Creation date of ontoterminalogy: 28 avril 2019 -->
<!-- Export date: 28 décembre 2020 time: 00:07:22 -->
<!-- Generated by Tedi version: 2.5 - http://ontoterminalogy.com/tedi -->

<rdf:RDF xmlns="http://www.ontologia.fr/OTB/krater#"
    xml:base="http://www.ontologia.fr/OTB/krater"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:owl="http://www.w3.org/2002/07/owl#"
    xmlns:skos="http://www.w3.org/2004/02/skos/core#"
    xmlns:foaf="http://xmlns.com/foaf/0.1/"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:xml="http://www.w3.org/XML/1998/namespace"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    xmlns:otv="http://www.ontologia.fr/OTB/otv#"
    xmlns:vs="http://www.w3.org/2003/06/sw-vocab-status/ns#"
    xmlns:vann="http://purl.org/vocab/vann/"
    xmlns:ontolex="http://www.w3.org/ns/lemon/ontolex#">
```

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3. Which Languages?

<http://www.ontologia.fr/OTB/otv.rdf>

```

<!-- Ontotermiology vocabulary (otv) -->
<!-- Concept Theory of Terminology (C.T.T.) -->
<!-- http://ontotermiology.com/ -->
<!-- 24th December 2020 -->
</!-->

***** OTV VOCABULARY *****

The OTV Vocabulary is defined as an OWL Ontology including
OWL Classes, OWL Object Properties, and OWL Annotation Properties

-- OWL Classes --

otv:Concept
    comment: an ontotermiology concept is an instance of the otv:Concept
    extension = { ontotermiology concepts }

otv:AxisOfAnalysis
    extension = { ontotermiology axes of analysis }

otv:Difference
    extension = { ontotermiology differences }

otv:Relation
    extension = { ontotermiology relations }

otv:Attribute
    extension = { ontotermiology attributes }

otv:Object
    extension = { ontotermiology objects }

otv:Term
    extension = { ontotermiology terms }

otv:ProperName
    extension = { ontotermiology proper names }

-->
<owl:Class rdf:about="http://www.ontologia.fr/OTB/otv#Concept">
<rdfs:label>Concept</rdfs:label>
<rdfs:subClassOf rdf:resource="http://www.ontologia.fr/Ontology">
<rdfs:comment>The class of OTV Concept</rdfs:comment>
<rdfs:comment>
    Les concepts sont des instances de la classe Concept
</rdfs:comment>
<rdfs:comment></rdfs:comment>
<rdfs:isDefinedBy>http://www.ontologia.fr/OTB/otv.rdf</rdfs:isDefinedBy>
<owl:disjointWith rdf:resource="http://www.ontologia.fr/Ontology">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#AxisOfAnalysis">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Difference">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Relation">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Attribute">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Object">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Term">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#ProperName">
</owl:Class>
<owl:Class rdf:about="http://www.ontologia.fr/OTB/otv#AxisOfAnalysis">
<rdfs:label>AxisOfAnalysis</rdfs:label>
<rdfs:subClassOf rdf:resource="http://www.ontologia.fr/Ontology">
<rdfs:comment>The class of OTV AxesOfAnalysis</rdfs:comment>
<rdfs:comment>
    Les axes d analyse sont des instances de la classe AxesOfAnalysis
</rdfs:comment>
<rdfs:isDefinedBy>http://www.ontologia.fr/OTB/otv.rdf</rdfs:isDefinedBy>
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Concept">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Difference">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Relation">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Attribute">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Object">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#Term">
<owl:disjointWith rdf:resource="http://www.ontologia.fr/OTB/otv#ProperName">
</owl:Class>

```

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4. Implementation?



<http://ontologia.fr/OTB/krater.rdf>

```

<owl:version_info "1.0" encoding="utf-8">
<!-- Onterminology: Onterminology of kraters -->
<!-- Author: Maria Papadopoulou -->
<!-- Creation date of ontterminology: April 28, 2010 -->
<!-- Export date: August 23, 2019 time: 4:21:56 PM -->
<!-- Generated by Tedi version: 2.0 -->
<!-- URL: http://christophe-roche.fr/tedi -->

<rdf:RDF xmlns="http://www.ontologia.fr/OTB/OntterminologyOfKraters#"
    xmlns:xbase="http://www.ontologia.fr/OTB/OntterminologyOfKraters"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:owl="http://www.w3.org/2002/07/owl#"
    xmlns:skos="http://www.w3.org/2004/02/skos/core#"
    xmlns:foaf="http://xmlns.com/foaf/0.1/"
    xmlns:dc="http://purl.org/dc/elements/1.1/"
    xmlns:w3c="http://www.w3.org/XML/1998/namespace"
    xmlns:xsdl="http://www.w3.org/2001/XMLSchema#"
    xmlns:modif="http://www.w3.org/2003/06/modification#"
    xmlns:usage="http://www.w3.org/2003/06/usage#">
<owl:ontology rdf:about="http://www.ontologia.fr/OTB/OntterminologyOfKraters#"
    <dc:title>Onterminology of kraters</dc:title>
    <dc:description></dc:description>
    <dc:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2019-4-28</dc:issued>
    <dc:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2019-7-10</dc:modified>
    <dc:editor>Maria Papadopoulou</dc:editor>
    <dc:publisher>Condillac</dc:publisher>
</owl:Ontology>

<!-- Object Properties: -->

<owl:ObjectProperty rdf:about="#hasPart">
    <rdfs:domain rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
    <rdfs:range rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
</owl:ObjectProperty>

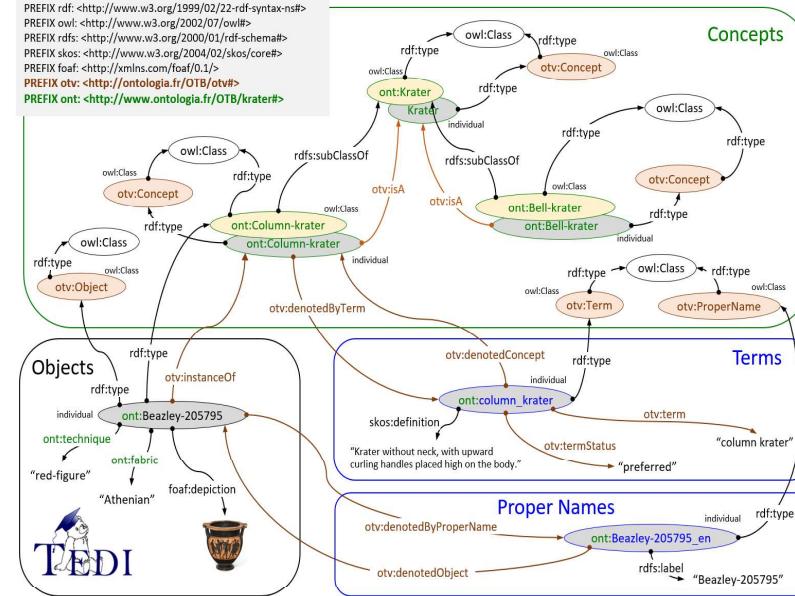
<owl:ObjectProperty rdf:about="#partOf">
    <rdfs:domain rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
    <rdfs:range rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
</owl:ObjectProperty>

<owl:ObjectProperty rdf:about="#relatedTo">
    <rdfs:domain rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
    <rdfs:range rdf:resource="http://www.w3.org/2002/07/owl#Thing"/>
</owl:ObjectProperty>
```

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RDF Graph of an Ontoterminology

http://www.ontologia.fr/OTB/SPARQL_Queries.pdf



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5. Validation?

Competency Questions into SPARL queries



CQ1: English terms with their definition?

```
SELECT ?name ?definition
```

```

    WHERE {
      ?concept rdf:type owl:Class.
      ?concept skos:prefLabel ?name.
      ?concept skos:definition ?definition
      FILTER (lang(?name) = 'en')
      FILTER (lang(?definition) = 'en')
    }
  
```

```
ORDER BY ?name  
LIMIT 100
```

<http://demo.openlinksw.com/sparql>
<http://sparql.org/sparql.html>

Graphe par défaut (IR)

Beaujolais

```

1 PREFIX rdf: <http://www.w3.org/1999/02/22-
2 PREFIX skos: <http://www.w3.org/2004/02/skos#
3
4 SELECT ?name ?definition
5 FROM <http://ontologie.fr/OTB/krater.rdf>
6
7 WHERE {
8     ?concept rdf:type owl:Class.
9     ?concept skos:prefLabel ?name.
10    ?concept skos:definition ?definition.
11    FILTER (lang(?name) = 'en')
12    FILTER (lang(?definition) = 'en')
13 }
14
15 ORDER BY ?name

```

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5. Validation?

Competency Questions into SPARL queries



name	definition
"amphora"@en	"Vase with neck and two handles for storing and transport liquids and solids."@en
"bell krater"@en	"Krater without neck, with upward curling handles placed high on the body."@en
"calyx krater"@en	"Krater without neck, with upward curling handles placed low on the body."@en
"column krater"@en	"Krater with neck and with column-like handles."@en
"hydria"@en	"Vase with neck and three handles, two for carrying and one for pouring, for storing and transport water."@en
"krater"@en	"Large open container with a foot, used in ancient Greece for mixing wine with water."@en
"lekythos"@en	"Vase with neck for perfume."@en
"vase"@en	"Ceramic vessel."@en
"volute krater"@en	"Krater with neck and with volute-like handles."@en

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5. Validation?

Competency Questions http://www.ontologia.fr/OTB/SPARQL_Queries.pdf

CQ10: What are all the differences between a 'bell krater' and a 'type B amphora'?

PREFIX rdf: <<http://www.w3.org/1999/02/22-rdf-syntax-ns#>>
PREFIX skos: <<http://www.w3.org/2004/02/skos/core#>>
PREFIX rdfs: <<http://www.w3.org/2000/01/rdf-schema#>>
PREFIX otv: <<http://www.ontologia.fr/OTB/otv#>>

```

SELECT distinct ?diffName
FROM <http://www.ontologia.fr/OTB/krater.rdf>
WHERE {
  ?cpt1 rdfs:label "column krater"@en.
  ?cpt1 otv:difference ?diff1.
  ?diff1 rdfs:label ?diff1Name.
  ?cpt2 rdfs:label "type B amphora"@en.
  ?cpt2 otv:difference ?diff2.
  ?diff2 rdfs:label ?diff2Name.
  FILTER NOT EXISTS {?cpt2 otv:difference ?diff1}
  BIND (?diff1Name AS ?diffName)
  UNION
  { ?cpt1 rdfs:label "column krater"@en.
  ?cpt1 otv:difference ?diff1.
  ?diff1 rdfs:label ?diff1Name.
  ?cpt2 rdfs:label "type B amphora"@en.
  ?cpt2 otv:difference ?diff2.
  ?diff2 rdfs:label ?diff2Name.
  FILTER NOT EXISTS {?cpt1 otv:difference ?diff2}.
  BIND (?diff2Name AS ?diffName)}
}
ORDER BY ?diffName

```

"for mixing wine with water"
"for storing and transport"
"liquid or solid"
"with a clearly defined neck"
"with column-like handles"
"with open mouth"
"with round handles"
"with standard belly"
"with straight lip"
"with two handles"
"without a clearly defined neck"

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5. Validation?

Competency Questions http://www.ontologia.fr/OTB/SPARQL_Queries.pdf

CQ12: List of the first 10 black-figure vases with their images?

#List of the first 10 black-figure vases and their images whose reference is greater than 6000

PREFIX rdf: <<http://www.w3.org/1999/02/22-rdf-syntax-ns#>>
PREFIX skos: <<http://www.w3.org/2004/02/skos/core#>>
PREFIX rdfs: <<http://www.w3.org/2000/01/rdf-schema#>>
PREFIX foaf: <<http://xmlns.com/foaf/0.1/>>
PREFIX otv: <<http://www.ontologia.fr/OTB/otv#>>
PREFIX krat: <<http://www.ontologia.fr/OTB/krater#>>

```

SELECT ?label ?img
FROM <http://www.ontologia.fr/OTB/krater.rdf>
WHERE {
  ?object rdf:type otv:Object.
  ?object krat:technique "RED-FIGURE"^^<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
  ?object skos:prefLabel ?label.
  ?object foaf:depiction ?img.
  ?object krat:vase_number_in_Beazley ?num.
  FILTER (?num > 6000)
}
ORDER BY ?label LIMIT 10

```

label	img
"Beazley-214878"	http://ontologia.fr/Images/GreekVase/Beazley-214878.png
"Beazley 215332"	http://ontologia.fr/Images/GreekVase/Beazleyr-215332.png
"Beazley-215332"	http://ontologia.fr/Images/GreekVase/Beazley-215332.png
"Beazley-215424"	http://ontologia.fr/Images/GreekVase/Beazley-215424.png
"Beazley-217564"	http://ontologia.fr/Images/GreekVase/Beazleyr-217564.png
"Beazley-217564"	http://ontologia.fr/Images/GreekVase/Beazley-217564.png
"Beazley-218065"	http://ontologia.fr/Images/GreekVase/Beazleyr-218065.png
"Beazley-218065"	http://ontologia.fr/Images/GreekVase/Beazley-218065.png

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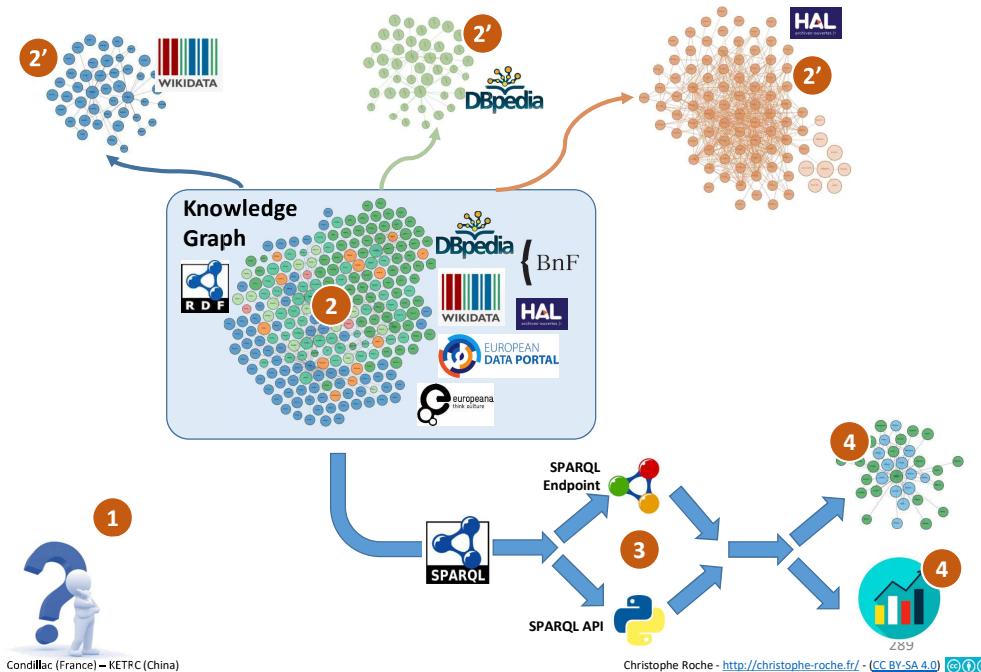
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Study and Querying a Knowledge Graph



Study and Querying a Knowledge Graph

1 Définition des objectifs du projet et des questions de compétences

2 Identification du ou des graphes de connaissances

- Pour chaque graphe de connaissances:
 - Domaine couvert
 - Décrire les vocabulaires utilisés
 - Présenter les ressources externes
- Pour chaque ressource externe de type K-Graph :
 - Domaine couvert
 - Décrire les vocabulaires utilisés (si différents des précédents)

3 Extraction d'informations à partir du ou des graphes de connaissances

- SPARQL Endpoint ou SPARQL API
 - Décrire les requêtes SPARQL
 - Décrire les données retournées (graphe(s) et visualisation(s), JSON)

4 Traitement(s) des résultats retournés par les requêtes SPARQL

5) Rédaction d'un rapport décrivant chacune de ces étapes à remettre le 15 janvier

6) Présentation Power Point de 20 minutes + 5 minutes de Questions le 15 janvier

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