



鏈結資料之發展與應用

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Outline

- ▶ Semantic Web Overview
- ▶ Principles of Linked Data
- ▶ Web of Data – Results of Linked Data
- ▶ Start thinking your applications
- ▶ Conclusion
- ▶ Resource Description Framework (RDF)



SEMANTIC WEB OVERVIEW

鏈結(開放)資料

- ▶ 鏈結(開放)資料 = Linked (Open) Data, L(O)D
- ▶ Linked Data乃是一組最佳實務，用以將結構化資料發布在Web上，並加以串聯
- ▶ Linked Data 是實現語意網(Semantic Web)的具體方案
- ▶ [OCLC的一段Linked Open Data短片](#)...呃，希望上完課後你全懂了
- ▶ 從語意網談起...

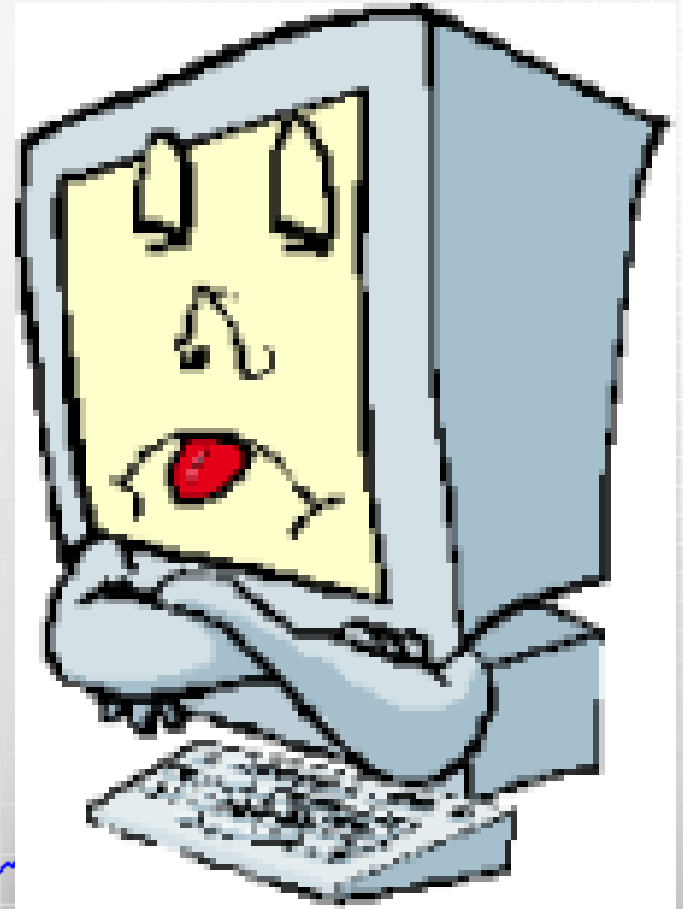
Weaving the Web – Vision of Tim Berners-Lee

- ▶ **Semantic Web (SW)** – a web of data that can be processed directly or indirectly by machines
- ▶ Require that there be a machine-understandable **semantics** for some or all of the information presented in the WWW
- ▶ Data exchange, interoperation, reuse

Berners-Lee, T. (2000). *Weaving the Web: The original design and ultimate destiny of the World Wide Web*. Harper Business, 1st edition.

Web Today

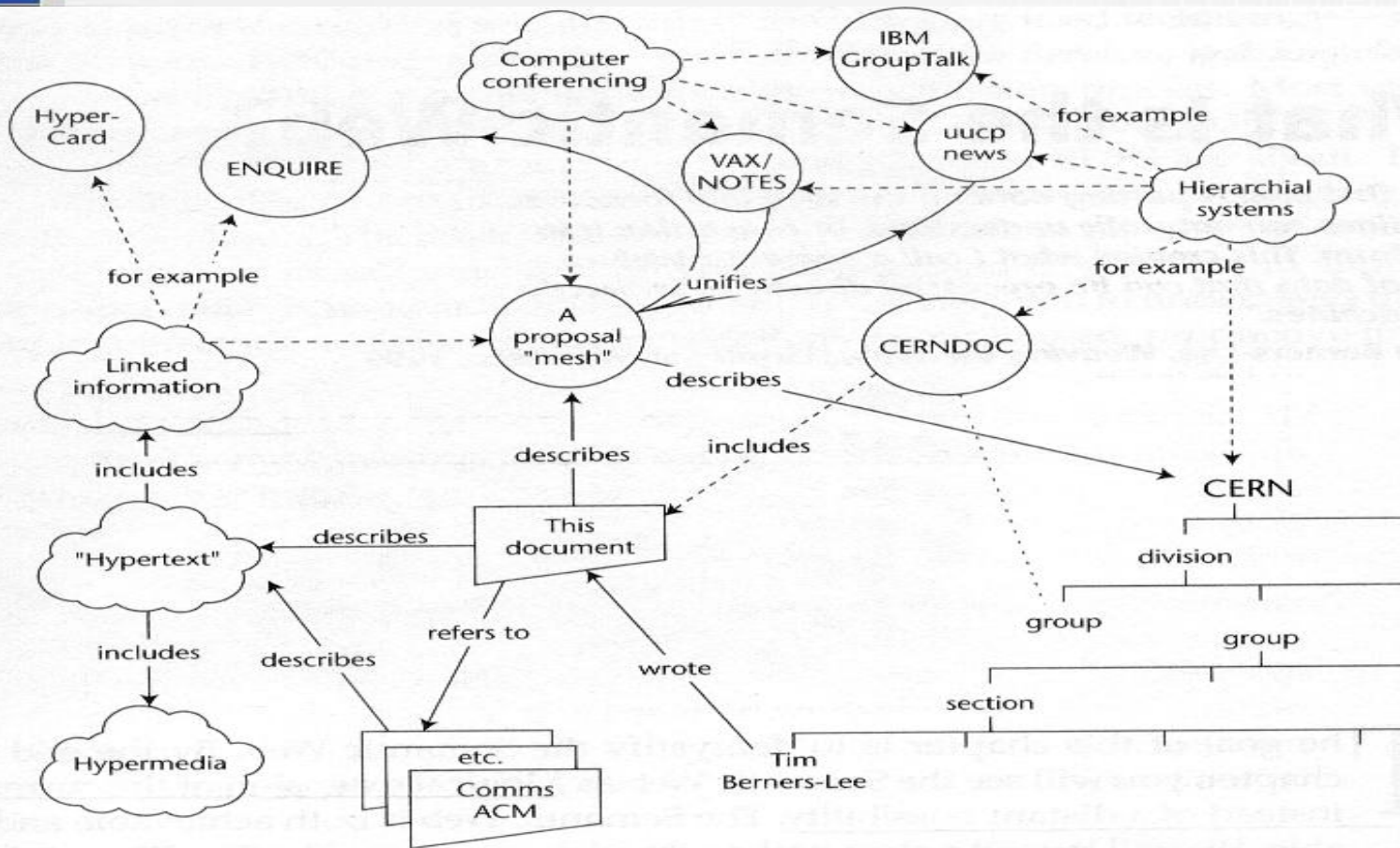
- ▶ Information repository.
- ▶ Simplicity – HTML
- ▶ Primarily for human interpretation and use.



112000000
100800000
89600000
78400000
67200000
56000000
44800000
33600000
22400000
11200000
0



Original Web Proposal to CERN

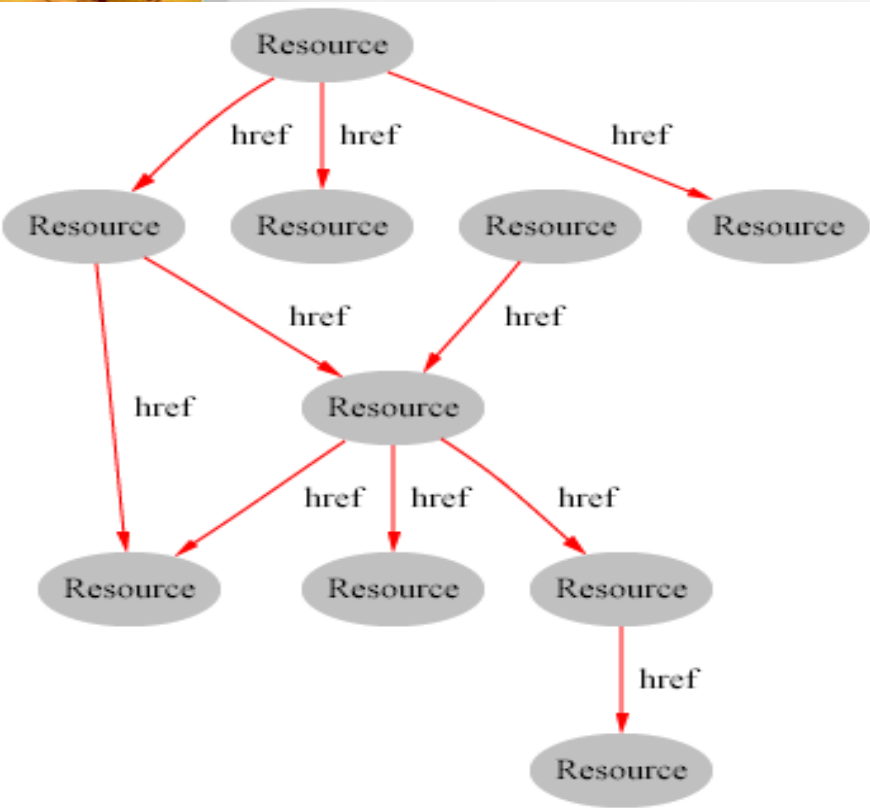


Encompass additional metadata above and beyond what is currently in the Web. This additional metadata is needed for machines to be able to process information on the Web

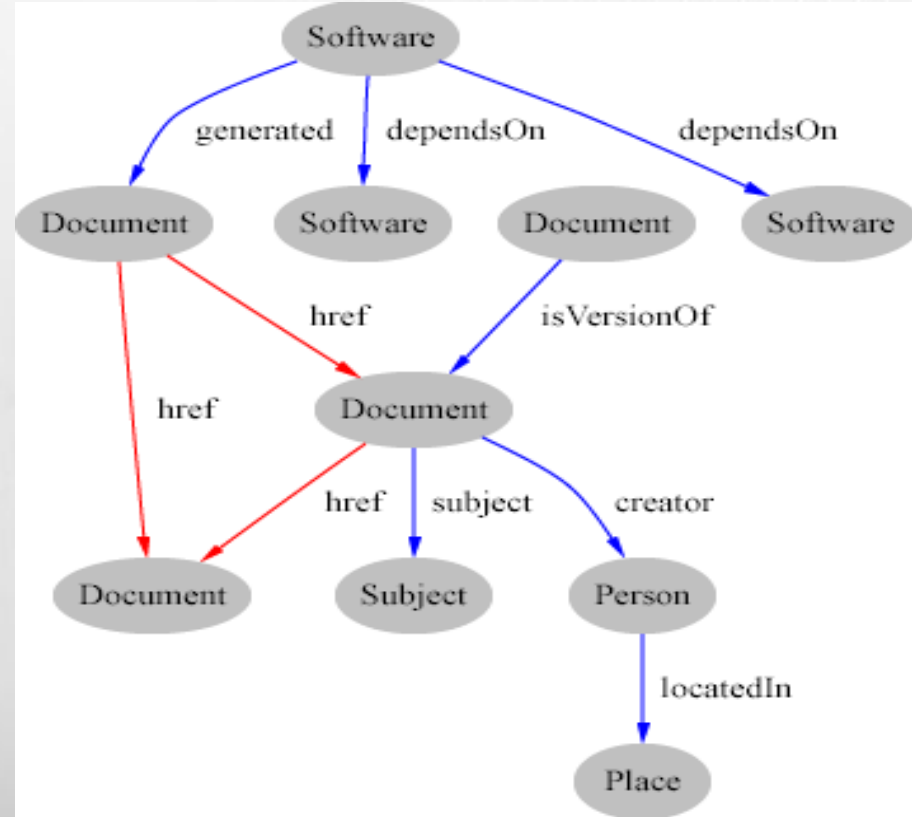


Web vs. Semantic Web

Web



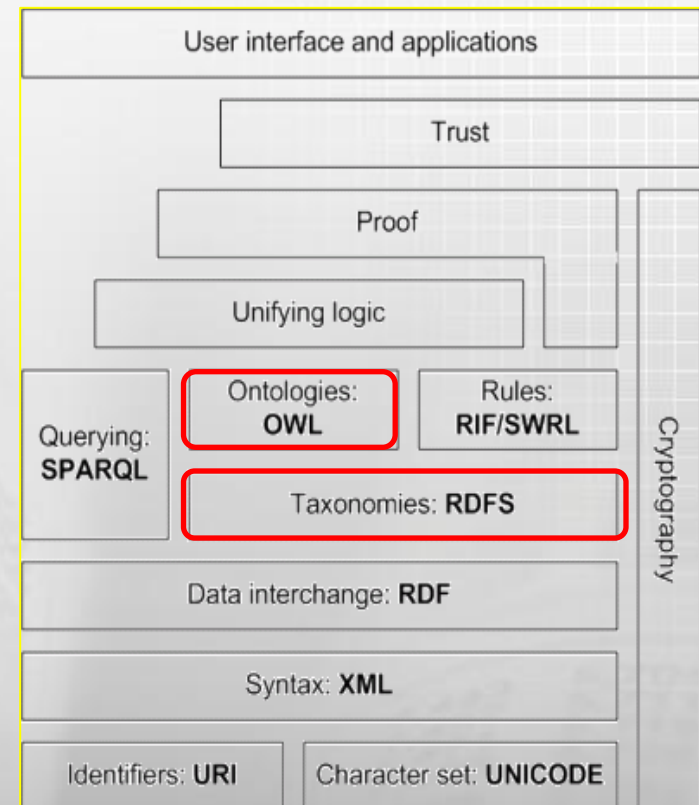
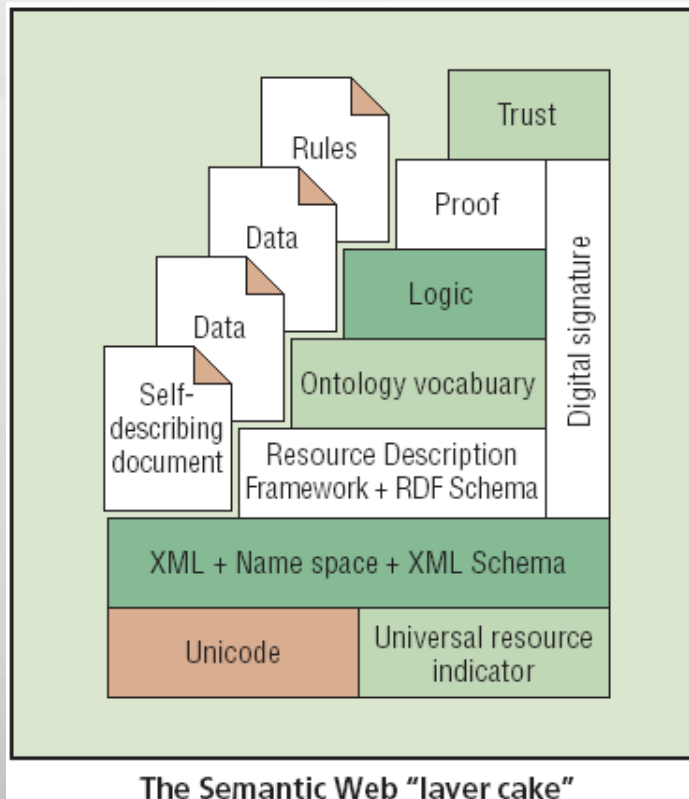
Semantic Web



Definition of Semantic Web

- ▶ The Semantic Web is a Web that is able to describe things in a way that computers can understand
 - ✿ The Beatles was a popular band from Liverpool.
 - ✿ John Lennon was a member of the Beatles.
- ▶ The Semantic Web is not about links between web pages.
- ▶ The Semantic Web describes the **relationships between things** and the **properties of things**
- ▶ An infrastructure enables machines to **COMPREHEND** semantic documents and data

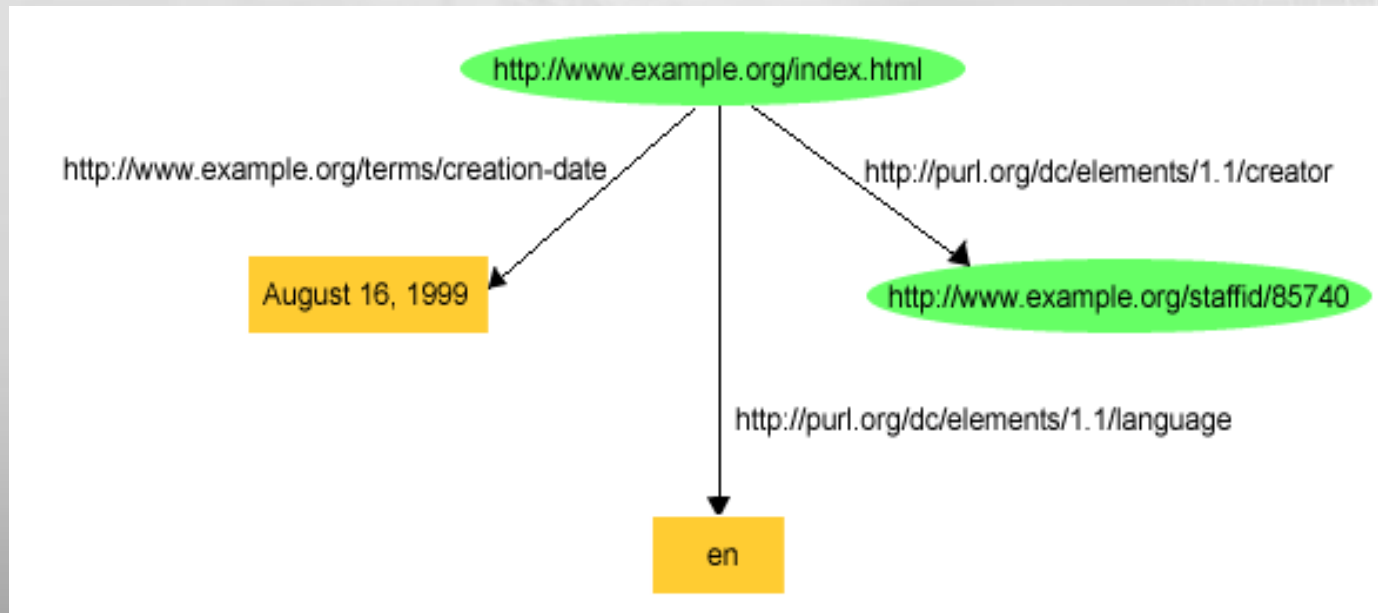
What achieves the Semantic Web?



http://en.wikipedia.org/wiki/Semantic_Web_Stack

Basic RDF Model

- ▶ A model for describing
 - ✿ resources
 - ✿ named properties
 - ✿ property values
- ▶ (resource, property, value)



Meta-online Store – Findbook.tw



御手洗潔的問候

作者：島田莊司

編/譯者：郭清華

出版社：皇冠文化

ISBN：9573322897

出版日：2006.12.18

分級：普級

語言：中文

規格：中文平裝

定價：280元

特價：**82折!**230元

用紅利價：**79折!**220元 (回饋4點)

運費：**0元**(限到店取貨)

參考庫存量：9本

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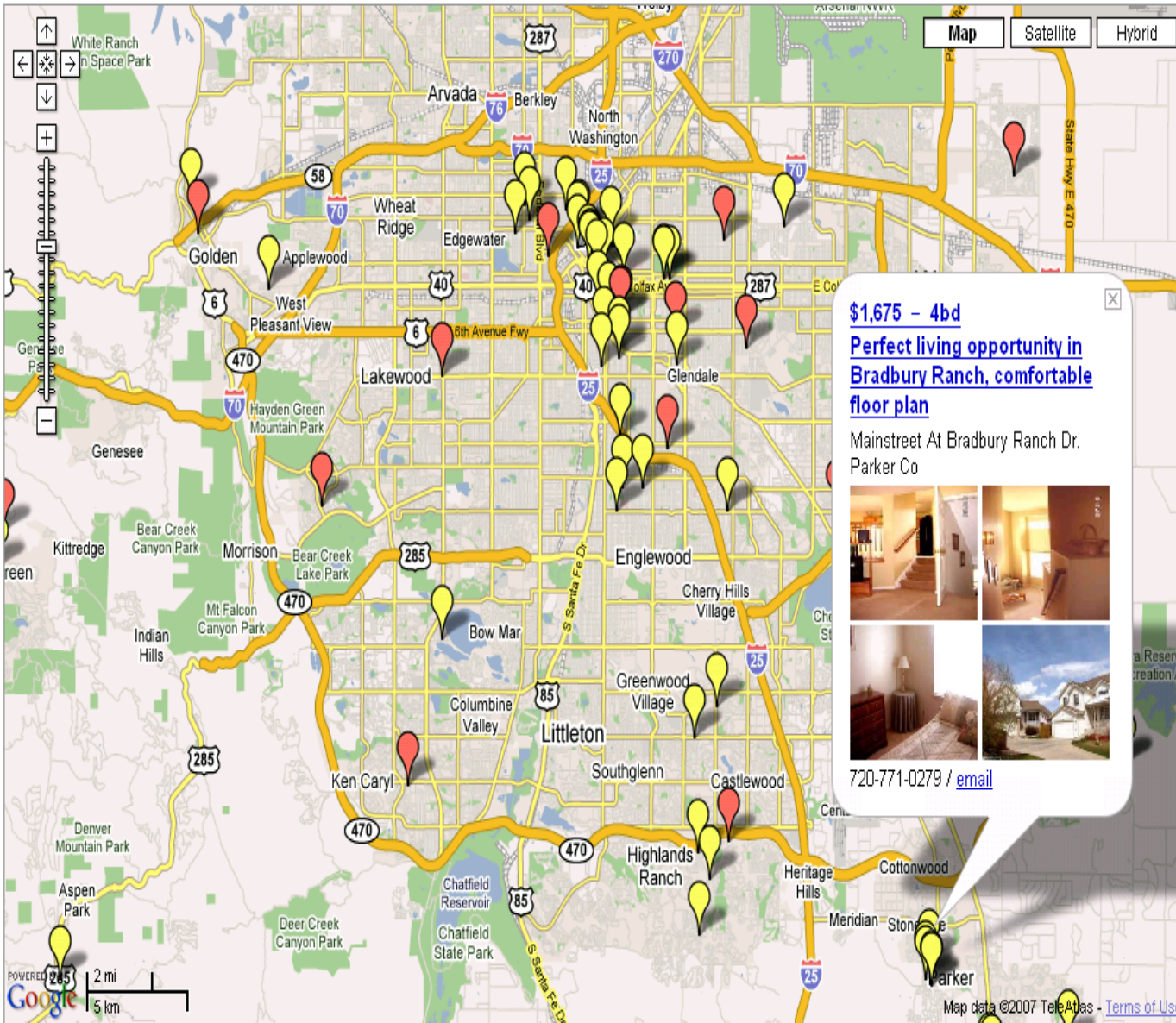
書名 / 期刊名 作者 標題 ISBN ISSN 關鍵字

天龍八部

目前查詢範圍：主要圖書館(三十萬冊以上)

[檢查圖書館列表](#) [更改設定](#)

Housingmaps.com -- Mashup



pics	price	bd	description	city	date
	\$1595	3bd	W/Loff New Appliances 1700+Sq Ft Remodeled Mtn Views	Highlands Rr	5/27
	\$1600	3bd	Near Dtc, Great Home/Neighborhood, 1900 Sft of Living Space	Aurora	5/27
	\$1675	4bd	Perfect living opportunity in Bradbury Ranch, comfortable floor plan	Parker	5/27
	\$1500	3bd	3BR/ 2BA House Avail. 6/16 Must See!	Boulder	5/26
	\$1800	2bd	Denver Dry Lofts - Live in the heart of Downtown!	Denver	5/26
	\$1850	4bd	House for Rent, Great condition, great area; July 1	Denver	5/26
	\$1500	2bd	Total Remodel in Wash Park, 2BR, 2BA, Gorgeous!	Denver	5/26
	\$1750	3bd	North Evergreen Townhome/2 Car attached garage	Evergreen	5/26
	\$1650	3bd	Comfortable Ranch House, Martin Acres, Air Conditioned	Boulder	5/26
	\$1695	4bd	Rock Creek home on Open Space	Superior	5/26
	\$1875		Heart of Cherry Creek	Denver	5/26
	\$1899	5bd	5 BR/ 3 BA mountain home	Evergreen	5/26
	\$1675	3bd	Prestigious private residence in very conv. loc. Bad credit Ok.	Parker	5/26
	\$1600	5bd	5 Bdrm, 4 Bath, 3 Car Garage, House For Rent	Denver	5/26
	\$2000	3bd	Historic home	Denver	5/26
	\$1500	5bd	Rent To Own Large Arvada Home - 2400 sq ft.	Arvada	5/26
	\$1800	4bd	Du / Harvard Park Live On Park Perfect Location	Denver	5/26
	\$1675	1bd	New Listing >Downtown Condos< Brand New w/Fitness Center, Doorman.	Denver	5/26
			4br - Large S Boulder House		

Toward Semantic Web



Information repository → Information-service provider



PRINCIPLES OF LINKED DATA

<http://linkeddatabook.com/editions/1.0/#>

Five Stars



Linked Data Principles

- ▶ A set of best practices for publishing and interlinking structured data on the Web
 - ✿ Sharing structured data on global scale
 - ✿ Access, Discovery, Integration
- ▶ Linked Data principles
 - ✿ Use URIs as names for things.
 - ✿ Use HTTP URIs, so that a client (machine or human reader) can look up those names.
 - ✿ When someone looks up a URI, provide useful information, using the standards (RDF, SPARQL).
 - ✿ Include links to other URIs, so that they can discover more things.

Items, Things, Resources

- ▶ To publish data on the Web, the **items in a domain of interest** must first be identified
 - ✿ **Things** whose properties and relationships will be described in the data
 - ✓ Web documents, real-world entities, abstract concepts
 - ✿ **Resource** is used to refer to these *things of interest*, which are, in turn, identified by HTTP URIs

Naming Things with URIs

<http://biglynx.co.uk/people/matt-briggs> ————— <http://biglynx.co.uk/people/scott-miller>

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

<http://biglynx.co.uk/people/linda-meyer>



Description of <http://biglynx.co.uk/people/matt-briggs>

<http://biglynx.co.uk/people/matt-briggs>

http://xmlns.com/foaf/0.1/topic_interest

http://dbpedia.org/resource/Wildlife_photography

<http://biglynx.co.uk/people/matt-briggs>

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

Matt Briggs

RDF in human-readable format

<http://biglynx.co.uk/people/matt-briggs>

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

<http://biglynx.co.uk/people/matt-briggs.rdf>

<http://biglynx.co.uk/people/matt-briggs>

http://xmlns.com/foaf/0.1/based_near

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

<http://biglynx.co.uk/people/matt-briggs>

http://xmlns.com/foaf/0.1/based_near

<http://sws.geonames.org/3333125/>

<http://biglynx.co.uk/people/matt-briggs>

<http://www.w3.org/1999/02/22-rdf-syntax-ns#type>

<http://biglynx.co.uk/vocab/productions#Director>

<http://biglynx.co.uk/people/matt-briggs>

<http://www.w3.org/1999/02/22-rdf-syntax-ns#type>

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

<http://biglynx.co.uk/people/matt-briggs>

<http://purl.org/vocab/relationship/employedBy>

<http://biglynx.co.uk/people/dave-smith>

<http://biglynx.co.uk/people/matt-briggs>

<http://biglynx.co.uk/vocab/productions#directed>

<http://biglynx.co.uk/productions/pacific-sharks>

<http://biglynx.co.uk/people/matt-briggs.rdf>

<http://purl.org/dc/terms/creator>

<http://biglynx.co.uk/people/nelly-jones>

<http://biglynx.co.uk/people/matt-briggs.rdf>

<http://www.w3.org/1999/02/22-rdf-syntax-ns#type>

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

foaf, dc, skos, productions...: vocabulary
topic_interest, title, directed: vocabulary term

```
<rdf:Description rdf:about="http://biglynx.co.uk/people/matt-briggs">  
  <foaf:topic_interest rdf:resource="http://dbpedia.org/resource/Wildlife_photography"/>  
  <foaf:name> Matt Briggs </foaf:name>  
  <foaf:isPrimaryTopicOf rdf:resource="http://biglynx.co.uk/people/matt-briggs.rdf"/>  
  <foaf:based_near rdf:resource="http://sws.geonames.org/3333125"/>  
  <foaf:based_near rdf:resource="http://dbpedia.org/resource/Birmingham"/>  
  <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>  
  <rdf:type rdf:resource="http://biglynx.co.uk/vocab/productions#Director"/>  
  <rel:employedBy rdf:resource="http://biglynx.co.uk/people/dave-smith"/>  
  <productions:directed rdf:resource="http://biglynx.co.uk/productions/pacific-sharks"/>  
</rdf:Description>
```

```
...  
</rdf:RDF>
```

RDF in XML format

Making URIs De-referenceable

▶ De-referenceable

- ✿ HTTP clients can look up the URI using the HTTP protocol and retrieve a description of the resource that is identified by the URI
 - ✓ Resources can be classic HTML documents, real-world objects and abstract concepts

▶ Descriptions of resources are embodied in...

- ✿ HTML: read by humans
- ✿ RDF data: read by machines

▶ HTTP content negotiation

- ✿ Clients send HTTP headers with each request to indicate what kinds of documents they prefer

Providing Useful RDF Information

▶ RDF Data Model

- ✿ Triple: Subject, predicate, object
 - ✓ Two principal types of RDF triples
 - Literal triples
 - RDF links

✿ RDF Graph

▶ RDF Serialization Formats

- ✿ RDF/XML
- ✿ RDFa: embed RDF triples in HTML documents
- ✿ Turtle
- ✿ N-Triples
- ✿ RDF/JSON

Including Links to Other Things

- ▶ Set RDF links pointing into other data sources on the Web
 - ✿ Glue that connects data islands into a global, interconnected data space
 - ✿ Enable applications to discover additional data sources
- ▶ Three types of RDF links
 - ✿ Relationship Links
 - ✿ Identity Links
 - ✿ Vocabulary Links

Relationship Links

- ▶ Point at related things in other data sources
 - ✱ People, places or genes
- ▶ Relationship links enable people to point to background information about the place they live, or to bibliographic data about the publications they have written

王建民 (1980年3月31日—), 大聯盟登錄名字 Chien-Ming Wang, 是台灣旅美職業棒球選手。2005年王建民成為美國職棒大聯盟紐約洋基隊的固定先發投手後, 在2006年和2007年成為洋基隊最多勝投手, 曾被「體育畫報」評選為美國最受矚目的20位運動員之一, 並在2007及2008年入選「時代 (雜誌)」全球最具影響力的百大人物之一, 成為華人圈中的焦點人物, 台灣報導常暱稱「建仔」、譽為「台灣之光」。目前為華盛頓國民隊的先發投手。

Property	Value
dbpedia-owl:abstract	<ul style="list-style-type: none"> Chien-Ming Wang ist ein taiwanischer Baseballspieler. Der Pitcher Wang spielte von 2005-2009 in der nordamerikanischen Major League Baseball für die New York Yankees, seit 2010 für die Washington Nationals. Außerdem ist er Nationalspieler der taiwanischen Baseball-Nationalmannschaft. Wang ist gegenwärtig einer von vier taiwanischen Baseballspielern in der MLB – neben den Los Angeles Dodgers-Spielern Hong-Chih Kuo, Chin-hui Tsao und Chin-Feng Chen. Im Jahr 2007 wurde Wang vom US-Wochenmagazin Time zu einer der 100 einflussreichsten Personen der Welt gekürt. Chien-Ming Wang (born March 31, 1980) is a Taiwanese Major League Baseball pitcher for the Washington Nationals. He was initially signed as an amateur free agent by the New York Yankees for the 2000 season, and played for the Staten Island Yankees. He was considered the Yankees ace pitcher for the 2006 and 2007 seasons, after winning 19 games in both years, to finish among the Major League leaders in victories. Chien-Ming Wang, né le 31 mars 1980 à Tainan, Taiwan, est un lanceur des Lagues majeures de baseball depuis 2005. Il fait partie des Nationals de Washington. 王建民 (ワン・チェンミン、Chien-Ming Wang, 1980年3月31日 -) は、台湾台南市出身のプロ野球選手 (投手)。現在は、MLBワシントン・ナショナルズに所属している。NHKの野球放送では、日本語の音読みを当てて「おうけんみん」と呼ばれ、新聞や他局の野球放送では、「ワン・チェンミン」と呼ばれている。 왕치엔밍은 미국 메이저리그 프로 야구 내셔널리그 동부지구 팀인 워싱턴 내셔널스의 투수이다. 2000년 스테이튼 아일랜드 양키스와 아마추어 자유계약선수로 계약을 맺었다. 2006년과 2007년 양키스 선발투수로 활약하면서 이름을 알리게 되었다. 2009년 시즌 끝으로 방출되어 2010년 2월 워싱턴 내셔널스로 입단하였다. 王建民 (1980年3月31日—), 大聯盟登錄名字 Chien-Ming Wang, 是台灣旅美職業棒球選手。2005年王建民成為美國職棒大聯盟紐約洋基隊的固定先發投手後, 在2006年和2007年成為洋基隊最多勝投手, 曾被「體育畫報」評選為美國最受矚目的20位運動員之一, 並在2007及2008年入選「時代 (雜誌)」全球最具影響力的百大人物之一, 成為華人圈中的焦點人物, 台灣報導常暱稱「建仔」、譽為「台灣之光」。目前為華盛頓國民隊的先發投手。
dbpedia-owl:award	<ul style="list-style-type: none"> dbpedia:World_Series dbpedia:Win-loss_record_(pitching) dbpedia:American_League
dbpedia-owl:battingSide	<ul style="list-style-type: none"> Right
dbpedia-owl:birthDate	<ul style="list-style-type: none"> 1980-03-31 (xsd:date)
dbpedia-owl:birthPlace	<ul style="list-style-type: none"> dbpedia:Taiwan dbpedia:Tainan
dbpedia-owl:formerTeam	<ul style="list-style-type: none"> dbpedia:New_York_Yankees
dbpedia-owl:number	<ul style="list-style-type: none"> 40 (xsd:integer)
dbpedia-owl:position	<ul style="list-style-type: none"> Starting pitcher
dbpedia-owl:statisticLabel	<ul style="list-style-type: none"> dbpedia:Win-loss_record_(pitching)
dbpedia-owl:statisticValue	<ul style="list-style-type: none"> 59.000000 (xsd:float)
dbpedia-owl:team	<ul style="list-style-type: none"> dbpedia:Washington_Nationals dbpedia:New_York_Yankees
dbpedia-owl:throwingSide	<ul style="list-style-type: none"> Right
dbpedia-owl:thumbnail	<ul style="list-style-type: none"> http://upload.wikimedia.org/wikipedia/commons/thumb/e/ed/MG_3905_Chien-Ming_Wang.jpg/200px-MG_3905_Chien-Ming_Wang.jpg
dbpedia-owl:wikiPageExternalLink	<ul style="list-style-type: none"> http://www.youtube.com/watch?v=A7WoaQxyVc http://www.franksfieldofdreams.com/feheroes/wangcm.htm
dbpprop:after	<ul style="list-style-type: none"> dbpedia:Josh_Beckett
dbpprop:awards	<ul style="list-style-type: none"> * Led AL in wins * 2006 Starting Pitcher of the Year Award * World Series champion
dbpprop:bats	<ul style="list-style-type: none"> Right

http://dbpedia.org/page/Chien-Ming_Wang

Identity Links

- ▶ Point at URI **aliases** used by other data sources to identify the same real-world object or abstract concept
- ▶ Enable clients to retrieve further descriptions about an entity from other data sources
- ▶ Identity links have an important social function as they enable different views of the world to be expressed on the Web of Data
- ▶ Multiple URIs identifying the same entity
 - ✱ <http://www.w3.org/2002/07/owl#sameAs>
- ▶ Quality Control

rdfs:label	<ul style="list-style-type: none"> ▪ Wang Chien-ming ▪ Chien-Ming Wang ▪ Chien-Ming Wang ▪ 王建民 ▪ 왕치엔밍 ▪ 王建民
owl:sameAs	<ul style="list-style-type: none"> ▪ http://ja.dbpedia.org/resource/王建民 ▪ http://fr.dbpedia.org/resource/Chien-Ming_Wang ▪ http://de.dbpedia.org/resource/Wang_Chien-ming ▪ http://ko.dbpedia.org/resource/왕치엔밍 ▪ freebase:王建民
wdrs:describedby	<ul style="list-style-type: none"> ▪ http://dbpedia.org/page/Chien-Ming_Wang ▪ http://dbpedia.org/data/Chien-Ming_Wang.n3 ▪ http://dbpedia.org/data/Chien-Ming_Wang.nt ▪ http://dbpedia.org/data/Chien-Ming_Wang.xml ▪ http://dbpedia.org/data/Chien-Ming_Wang.json ▪ http://dbpedia.org/data/Chien-Ming_Wang.ttl ▪ http://dbpedia.org/data/Chien-Ming_Wang.rdf ▪ http://dbpedia.org/data/Chien-Ming_Wang.jsod ▪ http://dbpedia.org/data/Chien-Ming_Wang.atom
http://www.w3.org/ns/prov#wasDerivedFrom	<ul style="list-style-type: none"> ▪ http://en.wikipedia.org/wiki/Chien-Ming_Wang?oldid=495288273
foaf:depiction	<ul style="list-style-type: none"> ▪ http://upload.wikimedia.org/wikipedia/commons/e/ed/MG_3905_Chien-Ming_Wang.jpg
foaf:givenName	<ul style="list-style-type: none"> ▪ Chien-Ming
foaf:isPrimaryTopicOf	<ul style="list-style-type: none"> ▪ http://en.wikipedia.org/wiki/Chien-Ming_Wang
foaf:name	<ul style="list-style-type: none"> ▪ Chien-Ming Wang
foaf:surname	<ul style="list-style-type: none"> ▪ Wang
is dbpedia-owl:wikiPageDisambiguates of	<ul style="list-style-type: none"> ▪ dbpedia:CMW
is dbpedia-owl:wikiPageRedirects of	<ul style="list-style-type: none"> ▪ dbpedia:Chien_Ming_Wang ▪ dbpedia:建民網 ▪ dbpedia:王建民 ▪ dbpedia:Wang_40 ▪ dbpedia:Wang_Chien-Ming ▪ dbpedia:Chin-Ming_Wang ▪ dbpedia:Chin_Ming_Wong ▪ dbpedia:Chin-Ming_Wong

Vocabulary Links

- ▶ Point from data to the definitions of the **vocabulary terms** that are used to represent the data, as well as from these definitions to the definitions of **related terms in other vocabularies**
- ▶ Vocabulary links make data self-descriptive and enable Linked Data applications to understand and integrate data across vocabularies
- ▶ Mixture of distinct terms from different RDF vocabularies that are used by a data source to publish data on the Web



Property

dbpedia-owl:abstract

dbpedia-owl:award

dbpedia-owl:battingSide

dbpedia-owl:birthDate

dbpedia-owl:birthPlace

dbpedia-owl:formerTeam

dbpedia-owl:number

dbpedia-owl:position

dbpedia-owl:statisticLabel

dbpedia-owl:statisticValue

dbpedia-owl:team

dbpedia-owl:throwingSide

dbpedia-owl:thumbnail

dbpedia-owl:wikiPageExternalLink

dbpprop:after

dbpprop:awards

dbpprop:bats

dbpprop:before

dbpprop:birthDate

dbpprop:birthPlace

dbpprop:br

dbpprop:brm

Sindice.com

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web01 Version: 2.1.17

Sindice - Data Web Services

Millions of websites mark up their content using RDF, Microformats, Microdata, Schema.org, RDFa, Opengraph and more. Sindice helps you find, understand and integrate with their content.

[Start here →](#)[Search](#)[Sparql](#)[Submit](#)[Inspector Tool](#)[Analytics](#)Search: term property advanced **SIG₂MA**[SEARCH](#)Examples: [tim berners lee](#) (by [URI](#)), [michele, deri](#)

Searching on about 708.26 million documents.

LATEST DATA

2013/Nov/22 11:30:15 [23 triples](#) <http://www.playapk.org...download/20129>
2013/Nov/22 11:26:46 [4 triples](#) <http://www.poleonplastering.com>
2013/Nov/22 11:23:03 [4 triples](#) <http://www.info@nanaimopcrepairs.com>
2013/Nov/22 11:19:27 [8 triples](#) <http://tradisionall.obat-acemaxss.com...>

SINDICE IS HIRING

Excited by the Web of Data? Sindice is [hiring](#) ! [Apply with LinkedIn](#)

HIGHLIGHTS

Anything to Triples

[Anything to Triples](#)

Introduction

any23Anything to Triples. New version - **Now available**

Anything To Triples (any23) is a library and web service that allows you to query and retrieve data in RDF format from a variety of Web document following input formats:

DEVELOPERS: START CONSUMING THE WEB OF DATA

SINDICE TWEET

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02-07-2010 at 10:15am RT@mhausenblas:
<http://code.google.com/p/sindice4j/> #Java #library providing a simple interface for querying the Semantic Web index #sindice

SINDICE BLOG

[Feed](#)

[How we ingested 100M semantic documents in a day \(And where do they come from\)](#) JUL 18, 2012

How to get some unexpected big data satisfactionFirst: build an infrastructure to process millions of document documents. ([More →](#))

[Updates on the Sindice SPARQL Endpoint](#) MAY 18, 2012

SPARQL is really hard to beat as a tool to experiment with data integration across datasets. ([More →](#))

[Sig.ma Enterprise Edition \(EE\) available](#) AUG 24, 2011

The original Sig.ma The <http://sig.ma> service was created as a demonstration of live, on the fly Web of Data mashup. ([More →](#))

[Sindice, its startup company and 12 billion+ live triples SPARQL endpoint](#) JUN 14, 2011


Today we're happy to share two big news: 1) We're launching today our startup company set to drive commercialization of Sindice... ([More →](#))



[Sindice reindexed: find your datasets \(much\)](#) MAY 31, 2011

Sameas.org

<sameAs> interlinking the Web of Data

The Web of Data has many equivalent URIs.
This service helps you to find co-references
between different data sets.
Enter a known URI, or use Sindice to search first.

<sameAs> 

Why not try searching for the string "[Edinburgh](#)", (which we will look up for you on [Sindice](#) first)
or finding other equivalent identifiers for <http://dbpedia.org/resource/Edinburgh>?

If you want to query only for data that has come from [Freebase](#), then consult the [Freebase sameAs store](#).

The [British Library](#) has provided data for their [British Library store](#), and there is a world library store at the [World Library store](#).

Or you can look at one of the [sub-stores](#).

Now over 150 Million URIs!

Currently serving over 150 406 368 URIs which relate to over 53 054 359 apparently distinct entities

The URI colouring is the official colour of the canonical URI, as provided by CoLD - Color the Linked Data Web!

Linked Data SE – Falcons

Falcons

Object [Concept](#) [Ontology](#) [Document](#)

Roger Federer

Search Objects

Type

Any type

agent
animate thing
athlete
being
cause
champion
concept
contestant
entity100001740
jock
living people
person
physical entity
physical object
player
rival
social entity
spatial thing
tennis player
unit

Objects 1 - 5 of 100 for your search **Roger Federer**

罗杰·费德勒 - [TennisPlayersAtThe2000SummerOlympics](#), [PeopleFromBasel\(city\)](#), [champion](#), [champion](#), [TennisPlayersAtThe2004Sum](#)

[SwissTennisPlayers](#), [TennisPlayer](#), [tennis player](#)

- type: [champion](#)
- label: **Roger Federer**
- page: [Roger_Federer](#)
- comment:
- depiction: [Roger_Federer_\(26_June_2009,_Wimbledon\)_2_new.jpg](#)
- subject: [Category:Australian_Open_\(tennis\)_champions](#)
- thumbnail: [200px-Roger_Federer_\(26_June_2009,_Wimbledon\)_2_new.jpg](#)
- name: **Roger Federer**
- birthDate: 1981-08-08
- birthPlace: [瑞士](#)

http://dbpedia.org/resource/Roger_Federer

Roger Federer - Agent

- type: [Agent](#)
- knows: [twitter](#)
- name: **Roger Federer**
- page: [FedererNews](#)
- homepage: <http://www.rogerfederer.com/>
- depiction: [12_normal.jpg](#)
- isDefinedBy: [FedererNews](#)
- knows: [centre_court](#)
- knows: [CNN](#)
- knows: [kingfederex](#)

<http://twitter2foaf.appspot.com/id/FedererNews>

FedererNews

- define: **Roger Federer**

<http://twitter2foaf.appspot.com/data/FedererNews>

Photos for DBpedia.org resource [Roger_Federer](#) - Document

- type: [Document](#)
- label: [Photos for DBpedia.org resource **Roger_Federer**](#)
- primary topic: [罗杰·费德勒](#)
- maker: <http://www4.wiwiss.fu-berlin.de/flickrwrapp/>
- License: [terms.gne](#)

http://www4.wiwiss.fu-berlin.de/flickrwrapp/photos/Roger_Federer

Federer, Roger - Concept

- type: [Concept](#)
- is primary topic of: [73418278779906874903.rdf](#)
- sameAs: [罗杰·费德勒](#)
- is attributionURL of: [73418278779906874903.rdf](#)

Linked Data Browser -- Sig.Ma



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Version: 2.0.8

Spiderman

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[Use it](#)

spiderman

picture:



[18]



[18]



[18]



[18]



[18]

given name: spiderman [1]

family name: spiderman [1]

comment: Spiderman 3 [2,4]

Spiderman [3,5,9]

Sosyal Medya ve Kişisel Pazarlama Üzerine [13]

Spider-Man is a fictional Marvel Comics superhero. The character was created by writer-editor Stan Lee and writer-artist Steve Ditko. He first appeared in *Amazing Fantasy* #15 (Aug. 1962). Lee and Ditko conceived of the character as an orphan being raised by his Aunt May and Uncle Ben, and as a teenager, having to deal with the normal struggles of adolescence in addition to those of a costumed crime fighter. Spider-Man's creators gave him super strength and agility, the ability to cling to most surfaces, shoot spider-webs using devices of his own invention which he called web-shooters, and react to danger quickly with his spider-sense, enabling him to combat his foes. When Spider-Man first appeared in the early 1960s, teenagers in superhero comic books were usually relegated to the role of sidekick to the protagonist. The Spider-Man series broke ground by featuring Peter Parker, a teenage high school student to whose self-obsessions with rejection, inadequacy, and loneliness young readers could relate. Unlike previous teen heroes such as Bucky and Robin, Spider-Man did not benefit from being the protégé of any adult mentors like Captain America and Batman, and thus had to learn for himself that with great power there must also come great responsibility. A line included in a text box in the final panel of the first Spider-Man story, but later retroactively attributed to his guardian, the late Uncle Ben. Marvel has featured Spider-Man in several comic book series, the first and longest-lasting of which is titled *The Amazing Spider-Man*. Over the years, the Peter Parker character has developed from shy, high school student to troubled but outgoing college student, to married high school teacher to, in

Sources (20)

Approved (0)

Rejected (0)

1 [SPIDERMAN](#) 6 facts | 2010-12-03

[indice](#) <http://spidermanquat.blogspot.com/2008/12...>

2 [Spiderman 3](#) 11 facts | 2010-07-15

[indice](#) <http://it.bestshopping.com/prezzi/Spiderm...>

3 [Spiderman](#) 11 facts | 2010-07-15

[indice](#) <http://it.bestshopping.com/prezzi/Spiderm...>

4 [Spiderman 3](#) 11 facts | 2010-07-15

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5 [Spiderman](#) 11 facts | 2010-07-14

[indice](#) <http://it.bestshopping.com/prezzi/Spiderm...>

6 [Untitled document](#) 2 facts | 2013-03-20

[OPENLINK](#) <http://sw.opencyc.org/2008/06/10/concept/...>

7 [Spiderman](#) 5 facts | 2013-03-20

[OPENLINK](#) <http://rdf.basekb.com/ns/m.0vkbxi>

8 [Spiderman](#) 6 facts | 2013-03-20

[OPENLINK](#) <http://rdf.basekb.com/ns/m.0zv9f5>

9 [Spiderman](#) 11 facts | 2010-07-15

[indice](#) <http://it.bestshopping.com/prezzi/Spiderm...>

10 [Spiderman](#) 32 facts | 2009-09-13

[indice](#) <http://www.mloknitting.com/?tag=spiderman>

11 [spiderman](#) 7 facts | 2012-10-10

[indice](#) <http://www.hisboycanswim.com/tag/spiderm...>

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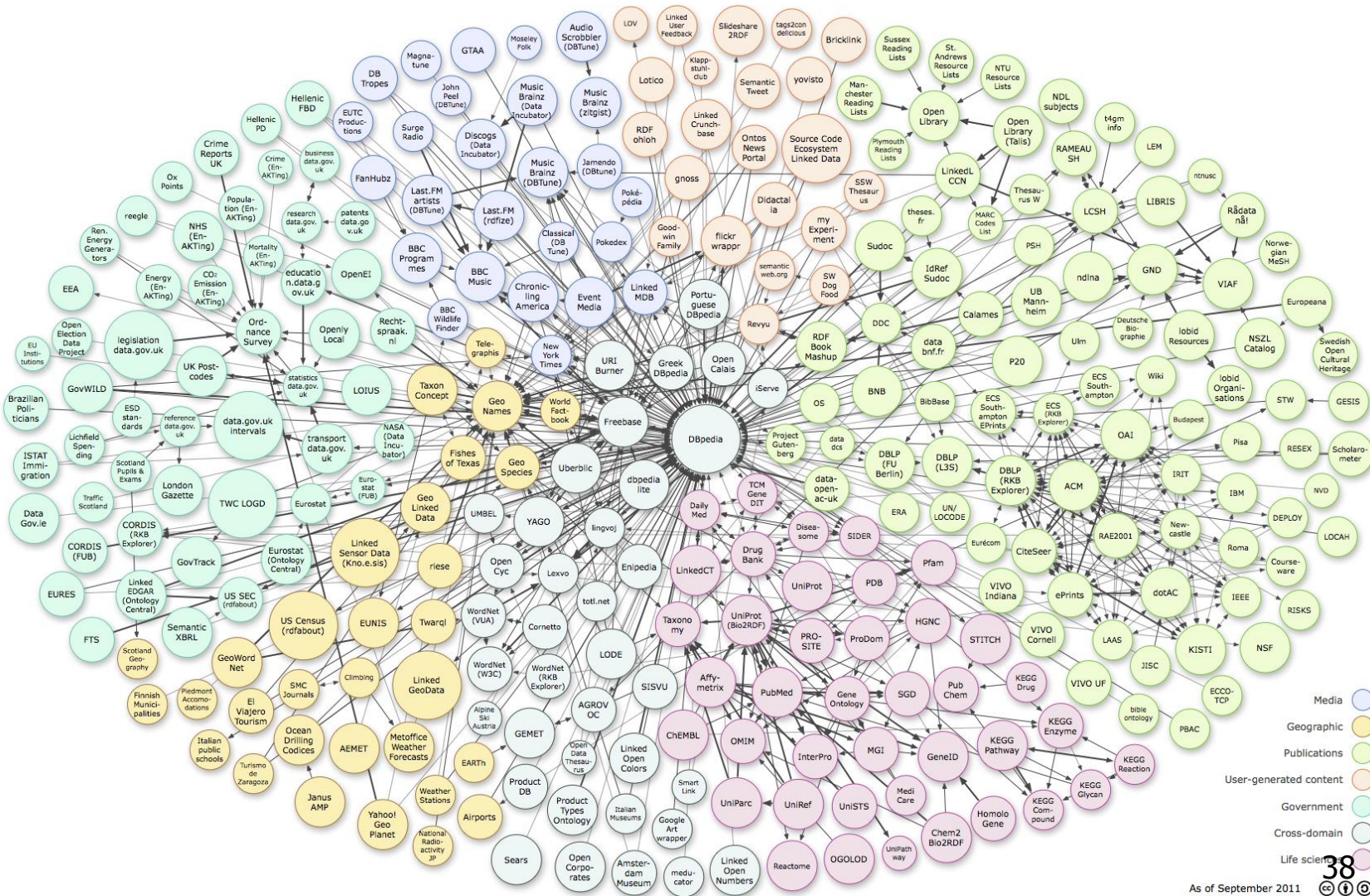
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WEB OF DATA – RESULTS OF LINKED DATA

LOD Data Cloud as of September 2011



Topology of the Web of Data

Domain	Number of datasets	Triples	%	(Out-)Links	%
Media	<u>25</u>	1,841,852,061	5.82 %	50,440,705	10.01 %
Geographic	<u>31</u>	6,145,532,484	19.43 %	35,812,328	7.11 %
Government	<u>49</u>	13,315,009,400	42.09 %	19,343,519	3.84 %
Publications	<u>87</u>	2,950,720,693	9.33 %	139,925,218	27.76 %
Cross-domain	<u>41</u>	4,184,635,715	13.23 %	63,183,065	12.54 %
Life sciences	<u>41</u>	3,036,336,004	9.60 %	191,844,090	38.06 %
User-generated content	<u>20</u>	134,127,413	0.42 %	3,449,143	0.68 %
	<u>295</u>	31,634,213,770		503,998,829	

Cross-Domain Data

▶ *DBpedia*

✿ A data set automatically extracted from publicly available Wikipedia dumps.

✿ <http://en.wikipedia.org/wiki/Birmingham> →
<http://dbpedia.org/resource/Birmingham>

▶ *Freebase, UMBEL, YAGO, and OpenCyc*

Geographic Data

▶ *Geonames*

- ✿ An open-license geographical database that publishes Linked Data about 8 million locations

▶ *LinkedGeoData*

- ✿ A Linked Data conversion of data from the *OpenStreetMap* project
 - ✿ Interlinking between Geonames, LinkedGeoData, and DBpedia
- ▶ Linked data versions of EuroStat, World Factbook, US Census data sets

LinkedGeoData Browser



LinkedGeoData.org

Adding a spatial dimension to the Web of Data.

Project created by:



Linked Geo Data Browser and Editor

The [LGD Browser and Editor](http://browser.linkedgeo.org) (available at <http://browser.linkedgeo.org>) allows to browse the world by using a slippy map. Once a region is selected, the browser analyzes the descriptions of nodes and ways in that region and generates facets for filtering. Once a facet or a specific facet value has been selected, matching elements are displayed as markers on the map and in a list. If the selected region is changed, these are updated accordingly.

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- RDF Mapping
- Use Cases
- LGD Browser
- Publications
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The screenshot shows the Linked Geo Data Browser interface. On the left is a map with several red diamond markers. A pop-up window titled "Edit Lukaskirche" is open over one of the markers, showing a form with fields for Name, Description, Image, Source_ref, amenity (place_of_worship), religion (christian), denomination (lutheran), and created_by (xybot). On the right, there is a search bar, a "Login >>" link, and a "Show updates in this area >>" link. Below these are "Properties" and "Instances" sections. The "Properties" section lists various categories with counts: highway (15), religion (3), amenity (31), denomination (3), historic (1), railway (2), leisure (5), man_made (1), shop (4), sport (1), and cuisine (1). The "Instances" section lists 11 items, including Lukaskirche, Club 11, amenity: recycling, amenity: parking, amenity: recycling, Lukas-Apotheke, amenity: pharmacy, amenity: school, amenity: parking, and Johanneskirche. At the bottom right, there is a note: "This faceted Linked Geo Data browser was developed by AKSW research group." The map includes a scale bar (100m / 500ft) and coordinates (13.7350, 51.03104).

If a user logs into the application by using her [OSM credentials](#), the displayed elements can directly be edited in the map view. For this, the browser generates a dynamic form based on existing properties. The form also allows to add arbitrary additional properties. In order

Media Data

▶ British Broadcasting Corporation (BBC)

✿ <http://www.bbc.co.uk/programmes>

✿ <http://www.bbc.co.uk/music>

✿ <http://bbc.openlinksw.com/>

▶ New York Times

✿ <http://data.nytimes.com/>

▶ Thomas Reuters: *Calais*

✿ <http://www.opencalais.com/>

Wang, Chien-Ming

<http://data.nytimes.com/N49334626954019256963>

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nyt:associated_article_count	64
nyt:first_use	2005-05-18
nyt:latest_use	2009-12-13
nyt:number_of_variants	1
nyt:search_api_query	http://api.nytimes.com/svc/search/v1/article?query=+nytd_per_facet%3A%5BWang%2C+Chien-Ming%5D&rank=newest&fields=abstract,author,body,byline,classifiers_facet,column_facet,date,day_of_week_facet,des_facet,desk_facet,fee,geo_facet,lead_paragraph,material_type_facet,multimedia,nytd_byline,nytd_des_facet,nytd_geo_facet,nytd_lead_paragraph,nytd_org_facet,nytd_per_facet,nytd_section_facet,nytd_title,nytd_works_mentioned_facet,org_facet,page_facet,per_facet,publishing_day,publishing_month,publishing_year,section_page_facet,small_image_height,small_image_url,small_image_width,source_facet,title,url,word_count,works_mentioned_facet
nyt:topicPage	http://topics.nytimes.com/top/reference/timestopics/people/w/chienming_wang/index.html
owl:sameAs	http://data.nytimes.com/wang_chien_ming_per
owl:sameAs	http://dbpedia.org/resource/Chien-Ming_Wang
owl:sameAs	http://rdf.freebase.com/ns/en.chien-ming_wang
rdf:type	http://www.w3.org/2004/02/skos/core#Concept
skos:definition - en	<p>Chien-Ming Wang joined the Yankees with a total lack of fanfare in 2005, but by this year had become manager Joe Girardi's choice to pitch on Opening Day, a spot traditionally reserved for the ace of the staff.</p> <p>Wang's pitching and personal styles are equally removed from those of previous Yankees aces, like Roger Clemens (Wang's boyhood idol) . On the mound, Wang shows as much emotion as someone taking a nap. Instead of strikeouts, he produces grounders almost as steadily as a coach tapping them to infielders.</p>
skos:inScheme	http://data.nytimes.com/elements/nytd_per
skos:prefLabel - en	Wang, Chien-Ming

<http://data.nytimes.com/N49334626954019256963.rdf>

cc:attributionName	The New York Times Company
cc:attributionURL	http://data.nytimes.com/N49334626954019256963

Libraries and Education

▶ VIAF

✿ <http://viaf.org/>

▶ American LC (Subject Heading)

✿ <http://id.loc.gov/authorities/subjects/sh85042531>

▶ OpenLibrary

✿ <http://openlibrary.org/>

▶ DBLP

✿ <http://www.informatik.uni-trier.de/~ley/db/>







▶ Talis Aspire

✿ <http://www.talisaspire.com/>







VIAF

Uniform Title Links (147)

Preferred Forms

-   100 1 _ \$a Rowling, J. K. \$d 1965-
-   100 1 _ \$a Rowling, Joanne K. \$d 1
-   100 1 _ \$a Rowling, J. K. \$d 1965-

WORKS:

- Casual vacancy.
 -  EXPRESSIONS (3)
- Harry Potter   
- Harry Potter and the chamber of secrets  

```
<rdaGr2:dateOfBirth>1965-07-31</rdaGr2:dateOfBirth>
<owl:sameAs rdf:resource="http://d-nb.info/gnd/122340469"/>
<owl:sameAs rdf:resource="http://libris.kb.se/resource/auth/88158"/>
<owl:sameAs rdf:resource="http://www.idref.fr/050222937/id"/>
<owl:sameAs rdf:resource="http://data.bnf.fr/ark:/12148/cb135200136#foaf:Person"/>
<owl:sameAs rdf:resource="http://dbpedia.org/resource/J._K._Rowling"/>
</rdf:Description>
```

▼<!--


Controlled and alternate headings from various authority files

-->

```
<skos:Concept rdf:about="http://viaf.org/viaf/sourceID/NDL%7C00765052#skos:Concept">
  <skos:inScheme rdf:resource="http://viaf.org/authorityScheme/NDL"/>
  <skos:prefLabel>Rowling, J. K., 1965-</skos:prefLabel>
  <skos:altLabel>Rowling, Joanne Kathleen</skos:altLabel>
  <skos:altLabel>ローリング, J. K.</skos:altLabel>
  <foaf:focus rdf:resource="http://viaf.org/viaf/116796842"/>
</skos:Concept>
```

-   100 1 _ \$a Rowling, J. K.
-   100 1 _ \$a Rowling, Joanne K.
-   100 1 _ \$a رولينج, ج. ك. \$d 1965-
-   100 1 _ \$a Rowling, J.K. \$q (Joanne

EXPRESSIONS (17)

- Harry Potter and the philosopher's stone  
-  EXPRESSIONS (24)
- Harry Potter and the prisoner of Azkaban  
-  EXPRESSIONS (22)
- Harry Potter series 
- Serie Harry Potter 



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1 edition - first published in 2004



And then there were none by Channa Horwitz

1 edition - first published in 1978



And then there were none: a history of the Le Cadre family in the West Indies by Anthony De Verteuil

1 edition - first published in 1992

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 Hao-Ren Ke

Shigeo Sugimoto   

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2013

- [c35]    Wenling He, Tetsuya Mihara, Mitsuharu Nagamori, Shigeo Sugimoto: **Identification of works of manga using LOD resources: an experimental FRBRization of bibliographic data of comic books.** JCDL 2013: 253-256

2012

- [j7]    Jaeun Baek, Shigeo Sugimoto: **A task-centric model for archival metadata schema mapping based on the records lifecycle.** IJMSO 7(4): 269-282 (2012)
- [c34]    XiaoXiao Feng, Koichi Matsumoto, Shigeo Sugimoto: **Uncovering the Secrets of Daoism Fus Using Digital Dao-Fa Hui-Yuan.** ICADL 2012: 1-10
- [c33]    Tetsuya Mihara, Mitsuharu Nagamori, Shigeo Sugimoto: **A Metadata-Centric Approach to a Production and Browsing Platform of Manga.** ICADL 2012: 87-96
- [c32]    Erika Yumiya, Atsuyuki Morishima, Masami Takahashi, Shigeo Sugimoto, Hiroyuki Kitagawa: **Filtering and ranking schemes for finding inclusion dependencies on the web.** WWW (Companion Volume) 2012: 647-648

2011

- [c31]    XiaoXiao Feng, Koichi Matsumoto, Shigeo Sugimoto: **Digital Archive "Dao Fa Hui Yuan" for Daoism Research.** ICADL 2011: 26-34
- [c30]    Jan Askhoj, Shigeo Sugimoto, Mitsuharu Nagamori: **A Metadata Framework for Cloud-Based Digital Archives Using METS with PREMIS.** ICADL 2011: 118-127
- [c29]    Jan Askhoj, Mitsuharu Nagamori, Shigeo Sugimoto: **Archiving as a service: a model for the provision of shared archiving services using cloud computing.** iConference 2011: 151-158

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français

deutsch

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Le projet utilise les outils du [Web sémantique](#) et s'inscrit dans une démarche d'[ouverture des données](#). data.bnf.fr et Gallica ont reçu le [Stanford Prize for Innovation in Research Libraries \(SPIRL\)](#), et data.bnf.fr est lauréat du prix [Data intelligence awards](#).

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Most popular authors

Victor Hugo (1802-1885)

Guillaume Apollinaire (1880-1918)

Marie de Rabutin-Chantal Sévigné (marquise de, 1626-1696)

Alexandre Dumas (1802-1870)

Boris Vian (1920-1959)

Christine de Pisan (1363?-1431?)

Pierre de Saint-Cloud

Francis Poulenc (1899-1963)

Alexandre-Jean-Baptiste Parent-Duchâtelet (1790-1836)

Théophile Gautier (1811-1872)

Most popular works

Les trois mousquetaires

Les misérables

Traité de la police

Fables

Tableaux de la nature

Mille et une nuits

Critique de la faculté de juger

Économie et société

Études philosophiques

Le monde s'effondre

Born today (09-03-1910)



Samuel
Barber
(1910-1981)



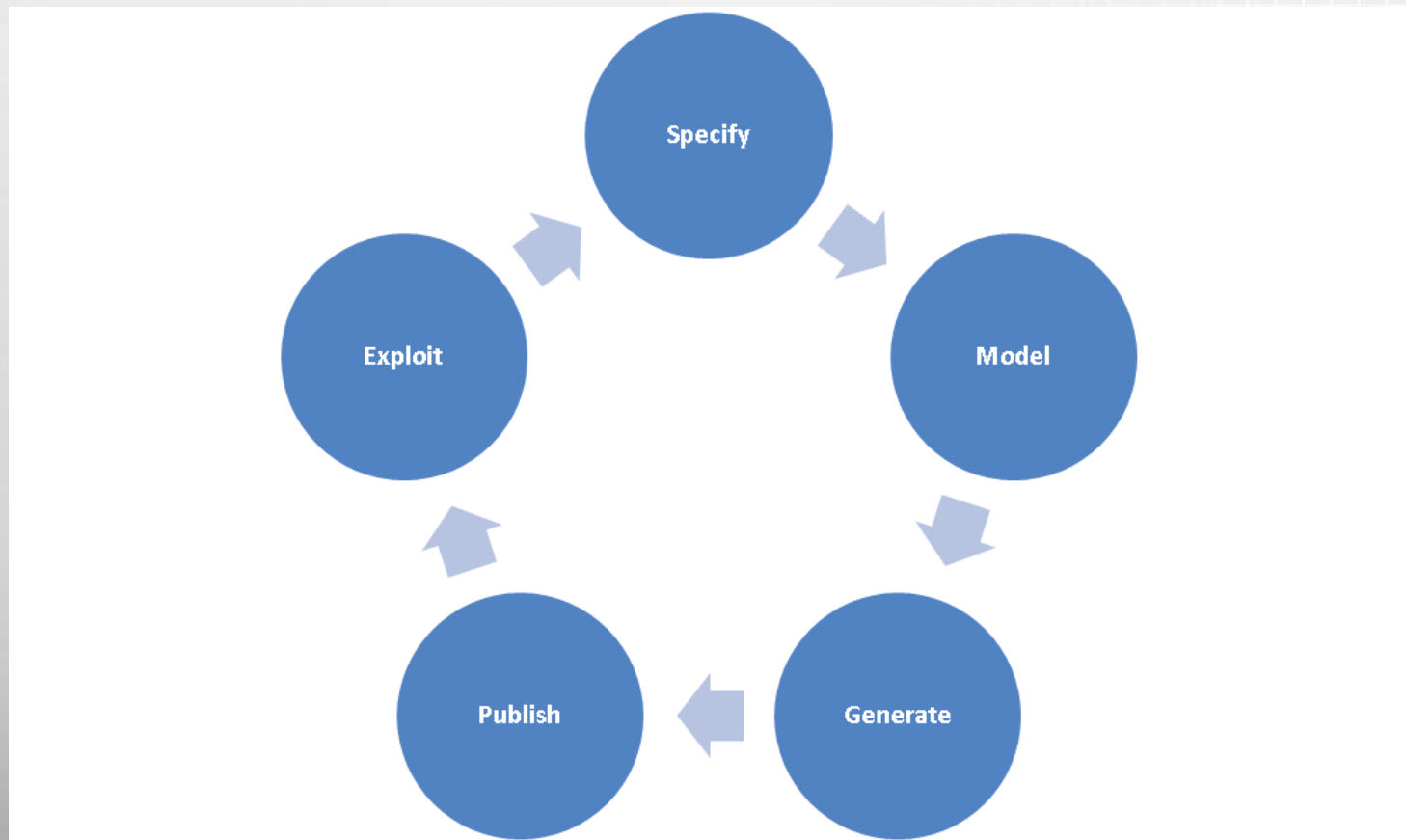
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- ✿ Library catalog
- ✿ Digital archives
- ✿ 「NBINet臺灣書目控制工作小組(權威建置)」 → 姓名權威、VIAF
- ✿ 《中文圖書分類法》、《中文主題詞表》
- ✿ 《全國新書資訊月刊》的書評、讀書人語，以及各種得獎紀錄
- ✿ ...

Linked Data Life Cycles



Implementation Plan

- ▶ Define your model
 - ✿ URI, resources, relationships
- ▶ **Select** or define your metadata terms
 - ✿ Terms should be defined using an RDF-based standard (RDF or OWL)
- ▶ **Select** or define any controlled vocabularies
 - ✿ Each list of terms will be described in an RDF-compatible format (such as SKOS)
- ▶ Create links from your data (terms) to related data (terms) on the Web

From Library Record to LOD –

Take a record

Field/attribute	Value
Record ID	54321
Title	Museum archives: an introduction
Author	Wythe, Deborah
Date	2004
LCSH	Museum archives
Media/GMD	Electronic
Content form	Text

From Library Record to LOD – Disaggregate to single statements

Record	Attribute	Value
54321	(has) title	Museum archives: an introduction
54321	(has) author	Wythe, Deborah
54321	(has) date	2004
54321	(has) LCSH	Museum archives
54321	(has) media type	Electronic
54321	(has) content form	Text

From Library Record to LOD – Replace record ID with URI

URI	Attribute	Value
mlx:54321	(has) title	Museum archives: an introduction
mlx:54321	(has) author	Wythe, Deborah
mlx:54321	(has) date	2004
mlx:54321	(has) LCSH	Museum archives
mlx:54321	(has) media type	Electronic
mlx:54321	(has) content form	Text

“mlx” = QName (xmlns) = shorthand for “http://MyLibraryX.com/”

From Library Record to LOD – Replace attributes with URIs

URI	URI	Value
mlx:54321	isbd:P1014	Museum archives: an introduction
mlx:54321	rdarole:author	Wythe, Deborah
mlx:54321	isbd:P1018	2004
mlx:54321	dct:subject	Museum archives
mlx:54321	isbd:P1003	Electronic
mlx:54321	isbd:P1001	Text

From Library Record to LOD – Replace values with URIs

subject	predicate	object
mlx:54321	isbd:P1014	“Museum archives: an introduction”
mlx:54321	rdarole:author	viaf:31899419/#Wythe,+Deborah
mlx:54321	isbd:P1018	“2004”
mlx:54321	dct:subject	lcsch:/sh85088707#concept
mlx:54321	isbd:P1003	isbdmt:T1002
mlx:54321	isbd:P1001	isbdcf:T1009

From Library Record to LOD – Publish triples (linked data)

mlx:54321 | isbd:P1014 | "Museum archives: an introduction"

mlx:54321 | [rdarole:author](#) | [viaf:31899419/#Wythe,+Deborah](#) →

mlx:54321 | isbd:P1018 | "2004"

mlx:54321 | [dct:subject](#) | [lcsch:/sh85088707#concept](#) →

mlx:54321 | isbd:P1003 | isbdmt:T1002 →

mlx:54321 | isbd:P1001 | isbdcf:T1009 →

→ isbdcf:T1009 | [skos:prefLabel](#) | "text"@en

→ isbdcf:T1009 | [skos:prefLabel](#) | "tekst"@hr

英國國家圖書館鏈結書目資料之 對映

本體名稱 (縮寫)	取用詞彙元素	資料描述目標
Bibliographic Ontology (bibo)	bibo:isbn10	ISBN10
	bibo:isbn13	ISBN13
Dublin Core	dcterms:contributor	貢獻者
	dcterms:description	附註
	dcterms:extent	稽核項
	dcterms:identifier	識別機構
	dcterms:issued	日期
	dcterms:language	語言
	dcterms:publisher	出版者
	dcterms:subject	學科主題
	dcterms:title	題名
	dcterms:type	類別
	dcterms:creator	機構、會議名稱
dcterms:isPartOf	來自另一個資訊實體	

英國國家圖書館鏈結書目資料之 對映 (Cont.)

International Standard Bibliographic Description (ISBD)	isbd:P1016	出版地
	isbd:P1008	版本
	isbd:P1038	資源的材質屬性或特殊區域
	isbd:P1073	作品之特徵、目的、範圍、類型、 語言
SKOS	skos:Concept	表示為rdfs:type概念屬性
	skos:inScheme	描述權威資料來源URI
	skos:notation	表示杜威分類號
RDF Schema	rdfs:label	資源為文字描述
OWL	owl:Interval	表示時間區段
	owl:hasBeginning	
	owl:inXSDDateTime	
FOAF	foaf:Organization	表示實體為機構屬性
	foaf:Person	表示實體為個人屬性
the preliminary version of RDA	rda:placeOfPublication	做為出版地的空白節點
	rda:termsOfAvailability	表示價格，例：£18.95

德國國家圖書館鏈結書目資料之 對映

Bibliographic Ontology (bibo)	bibo:periodical	期刊
	bibo:series	叢書
	bibo:document	文件
	bibo:volume	卷冊
	bibo:coden	叢書或期刊的辨識碼
	bibo:issn	issn
	bibo:isbn	isbn
	bibo:shortTitle	題名縮寫
	bibo:contributorList	貢獻者列表
bibo:authorList	作者列表	

德國國家圖書館鏈結書目資料之 對映 (Cont.)

Dublin Core Terms

dcterms:format	格式 (例如: 文件)
dcterms:hasPart	描述的資源有附件時 (物理或邏輯性質)
dcterms:identifier	識別機構
dcterms:language	語言
dcterms:replaces	取代指定的資源
dcterms:subject	學科主題 (DDC)
dcterms:title	題名
dcterms:contributor	貢獻者
dcterms:isReplacedBy	被指定資源取代
dcterms:isFormatOf	被描述的資源的其他格式
dcterms:alternative	辨別題名及替代題名時

德國國家圖書館鏈結書目資料之 對映 (Cont.)

Dublin Core Elements	dc:publisher	出版者
International Standard Bibliographic Description (ISBD)	isbd:P0005	有另一個語言的標題時
	isbd:P1008	版本
	isbd:P1016	出版地
	isbd:P1018	出版日期 (年)
RDF Schema	rdfs:type	描述資源的類別屬性
	rdf:Seq	描述的資源為容器資源 (Container)
	rdf:_n	容器內的成員，或空白節點
OWL	owl:sameAs	有外部連結之URI
FOAF	foaf:isPrimaryTopicOf	表示資源之主題

Reusing Existing Terms

- ▶ The Dublin Core Metadata Initiative (DCMI) Metadata Terms vocabulary
 - ✿ defines general metadata attributes such as title, creator, date and subject.
- ▶ The Friend-of-a-Friend (FOAF) vocabulary
 - ✿ defines terms for describing persons, their activities and their relations to other people and objects.
- ▶ The Semantically-Interlinked Online Communities (SIOC)
 - ✿ designed for describing aspects of online community sites, such as users, posts and forums.
- ▶ The Description of a Project (DOAP) vocabulary
 - ✿ defines terms for describing software projects, particularly those that are Open Source.
- ▶ The Music Ontology
 - ✿ defines terms for describing various aspects related to music, such as artists, albums, tracks, performances and arrangements.
- ▶ The Programmes Ontology
 - ✿ defines terms for describing programmes such as TV and radio broadcasts.

Reusing Existing Terms (Cont.)

▶ The Good Relations Ontology

- ✿ defines terms for describing products, services and other aspects relevant to e-commerce applications.

▶ The Creative Commons (CC) schema

- ✿ defines terms for describing copyright licenses in RDF.

▶ The Bibliographic Ontology (BIBO)

- ✿ provides concepts and properties for describing citations and bibliographic references (i.e., quotes, books, articles, etc.).

▶ The OAI Object Reuse and Exchange vocabulary

- ✿ is used by various library and publication data sources to represent resource aggregations such as different editions of a document or its internal structure.

▶ The Review Vocabulary

- ✿ provides a vocabulary for representing reviews and ratings, as are often applied to products and services.

▶ The Basic Geo (WGS84) vocabulary

- ✿ defines terms such as lat and long for describing geographically-located things.

Schema.org

2a. schema.org types and properties

Not all web pages are about movies and people—in addition to the `Movie` and `Person` types described in section 1, schema.org describes a variety of other item types, each of which has its own set of properties that can be used to describe the item.

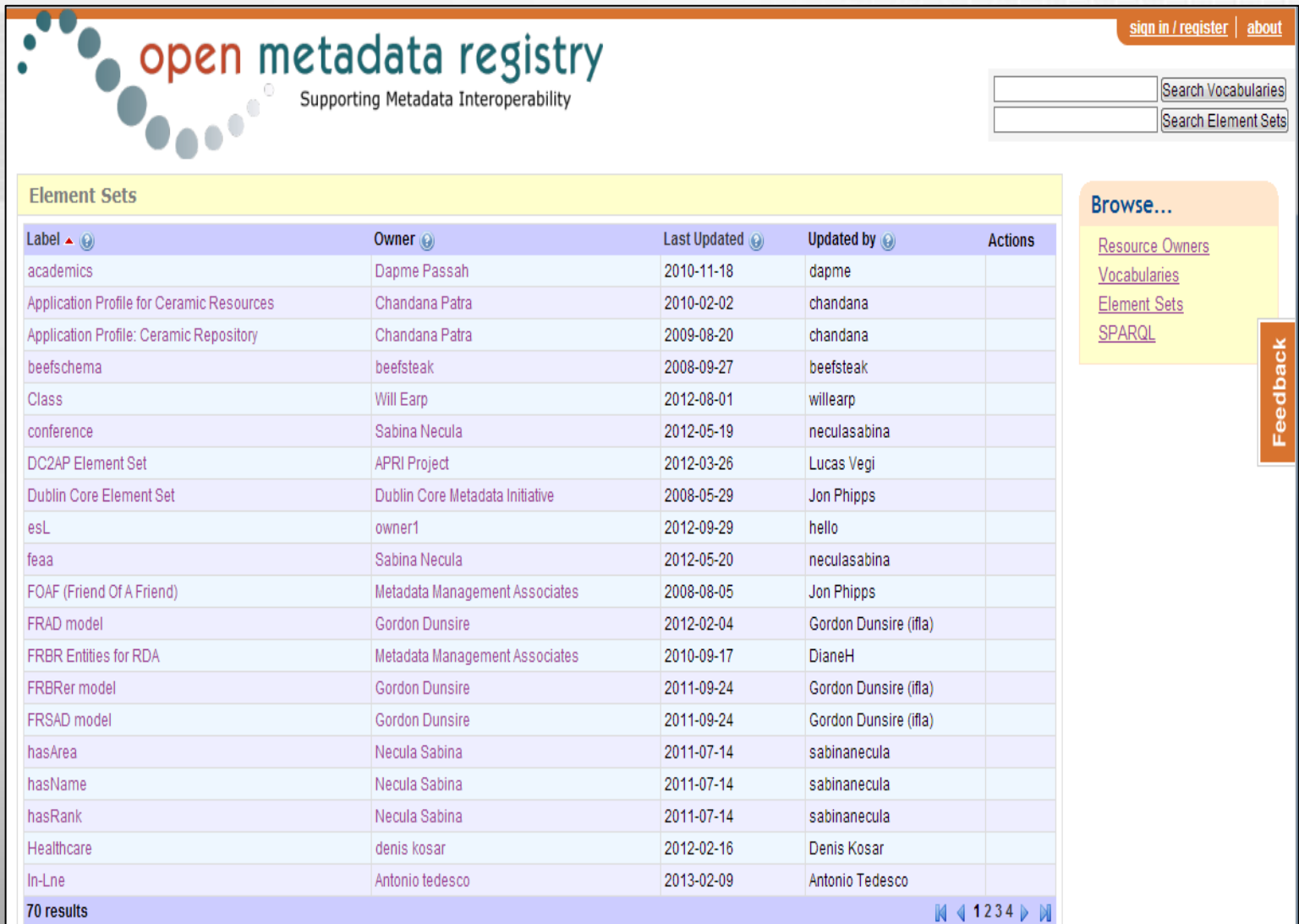
The broadest item type is `Thing`, which has four properties: `name`, `description`, `url`, and `image`. More specific types share properties with broader types. For example, a `Place` is a more specific type of `Thing`, and a `LocalBusiness` is a more specific type of `Place`. More specific items inherit the properties of their parent. (Actually, a `LocalBusiness` is a more specific type of `Place` *and* a more specific type of `Organization`, so it inherits properties from both parent types.)

Here's a set of commonly used item types:

- Creative works: `CreativeWork`, `Book`, `Movie`, `MusicRecording`, `Recipe`, `TVSeries` ...
- Embedded non-text objects: `AudioObject`, `ImageObject`, `VideoObject`
- `Event`
- `Organization`
- `Person`
- `Place`, `LocalBusiness`, `Restaurant` ...
- `Product`, `Offer`, `AggregateOffer`
- `Review`, `AggregateRating`

You can also see a [full list of all item types](#), listed on a single page.

Open Metadata Registry



The screenshot displays the Open Metadata Registry interface. At the top left is the logo with the text "open metadata registry" and "Supporting Metadata Interoperability". To the right are links for "sign in / register" and "about". Below these are two search boxes: "Search Vocabularies" and "Search Element Sets". The main content area is titled "Element Sets" and contains a table with the following columns: Label, Owner, Last Updated, Updated by, and Actions. The table lists 20 different element sets, such as "academics", "Application Profile for Ceramic Resources", and "beefschema". At the bottom of the table, it indicates "70 results". On the right side, there is a "Browse..." section with links for "Resource Owners", "Vocabularies", "Element Sets", and "SPARQL". A vertical "Feedback" button is located on the far right edge of the page.

open metadata registry
Supporting Metadata Interoperability

sign in / register | about

Search Vocabularies
Search Element Sets

Element Sets

Label	Owner	Last Updated	Updated by	Actions
academics	Dapme Passah	2010-11-18	dapme	
Application Profile for Ceramic Resources	Chandana Patra	2010-02-02	chandana	
Application Profile: Ceramic Repository	Chandana Patra	2009-08-20	chandana	
beefschema	beefsteak	2008-09-27	beefsteak	
Class	Will Earp	2012-08-01	willearp	
conference	Sabina Necula	2012-05-19	neculasabina	
DC2AP Element Set	APRI Project	2012-03-26	Lucas Vegi	
Dublin Core Element Set	Dublin Core Metadata Initiative	2008-05-29	Jon Phipps	
esL	owner1	2012-09-29	hello	
feaa	Sabina Necula	2012-05-20	neculasabina	
FOAF (Friend Of A Friend)	Metadata Management Associates	2008-08-05	Jon Phipps	
FRAD model	Gordon Dunsire	2012-02-04	Gordon Dunsire (ifla)	
FRBR Entities for RDA	Metadata Management Associates	2010-09-17	DianeH	
FRBRer model	Gordon Dunsire	2011-09-24	Gordon Dunsire (ifla)	
FRSAD model	Gordon Dunsire	2011-09-24	Gordon Dunsire (ifla)	
hasArea	Necula Sabina	2011-07-14	sabinanecula	
hasName	Necula Sabina	2011-07-14	sabinanecula	
hasRank	Necula Sabina	2011-07-14	sabinanecula	
Healthcare	denis kosar	2012-02-16	Denis Kosar	
In-Lne	Antonio tedesco	2013-02-09	Antonio Tedesco	

70 results

Browse...
[Resource Owners](#)
[Vocabularies](#)
[Element Sets](#)
[SPARQL](#)

Feedback

CKAN Registry



the Data Hub — The easy way to get, use and share data

[Search](#) [Groups](#) [About](#)

[Login](#) [Register](#)

Find datasets

Welcome to the Data Hub!

Find data

Library

the Data Hub contains **5222 datasets** that you can browse, learn about and download.

Share data

Add your own datasets to share them with others and to find other people interested in your data.

[Sign up »](#)

Collaborate

Find out more about working with open data by exploring these resources:

- [GetTheData.org](#)
- [DataPatterns.org](#)
- [Open Data Handbook](#)

Who else is here?

Canada

Datasets for <http://www.datadotgc.ca/>. DataDotGC, which launched, in February 2010, is a Canadian, citizen-led effort to promote open data and help share data that has already been...

Canada has **521 datasets**.

Economics Datasets

Group for Economics data especially that which is open data. This can be any kind of data related to economics from development to finance, and micro to macro. We run an open group policy...

Economics Datasets has **151 datasets**.

Linking Open Data Cloud

This group catalogs data sets that are available on the Web as Linked Data and contain data links pointing at other Linked Data sets. The descriptions of the data sets in this group are...

Linking Open Data Cloud has **338 datasets**.

OpenSpending

Datasets to be imported to the OpenSpending.org site. Packages listed here will automatically be available for selection in the OpenSpending web importer.

OpenSpending has **132 datasets**.

bioportal

This group reflects the collection of datasets (ontologies) in BioPortal.

bioportal has **244 datasets**.

Linguistic Resources (partly open)

Linguistic Resources (partly open) has **91 datasets**.

Swoogle

- ▶ Creator: eBiquity (University of Maryland, Baltimore County)
- ▶ Three search modes:
 - ✱ **ontology** searches the full text of ontology documents
 - ✱ **data** searches actual instance data
 - ✱ **term** searches only terms that have been defined as classes or properties

vocab.org

- ▶ Creator: Ian Davis
- ▶ The terms at vocab.org do not serve a particular application. For the most part, they are generalized vocabularies, each covering a narrow area.
- ▶ The vocab.org version of FRBR is currently the most used vocabulary for expressing FRBR in linked data, in part because it was the first expression of FRBR in RDF, but also because it is a relatively simple and therefore easy to understand implementation.

Subject List and Thesauri

▶ Non-library and General

- ✿ [DBpedia Ontology](#)
- ✿ [Freebase Types](#)
- ✿ [New York Times Subjects](#)
- ✿ Artificial Intelligence:
OpenCyc and UMBEL
 - ✓ [OpenCyc](#)
 - ✓ [UMBEL](#)

▶ Library-specific Subject Heading

- ✿ [Library of Congress Subject Headings \(LCSH\)](#)
- ✿ [National Agriculture Library \(NAL\)](#)
- ✿ [Thesaurus for Graphic Materials \(TGM\)](#)

Subject List and Thesauri (Cont.)

▶ Library Classification Schemes

- ✿ [Dewey Summaries](#)
- ✿ [Universal Decimal Classification \(UDC\)](#)

▶ Non-library-based List

- ✿ [Geoname](#)
- ✿ [BBC Wildlife Ontology](#)
- ✿ [Dublin Core Type Vocabulary](#)

▶ Library-based Lists

- ✿ [MARC Countries](#)
- ✿ [MARC Geographic Areas](#)
- ✿ [MARC Languages](#)
- ✿ [MARC Relators](#)
- ✿ [RDA Vocabularies](#)

▶ Name Authorities

- ✿ [Virtual International Authority File \(VIAF\)](#)
- ✿ [New York Times People and Organizations](#)

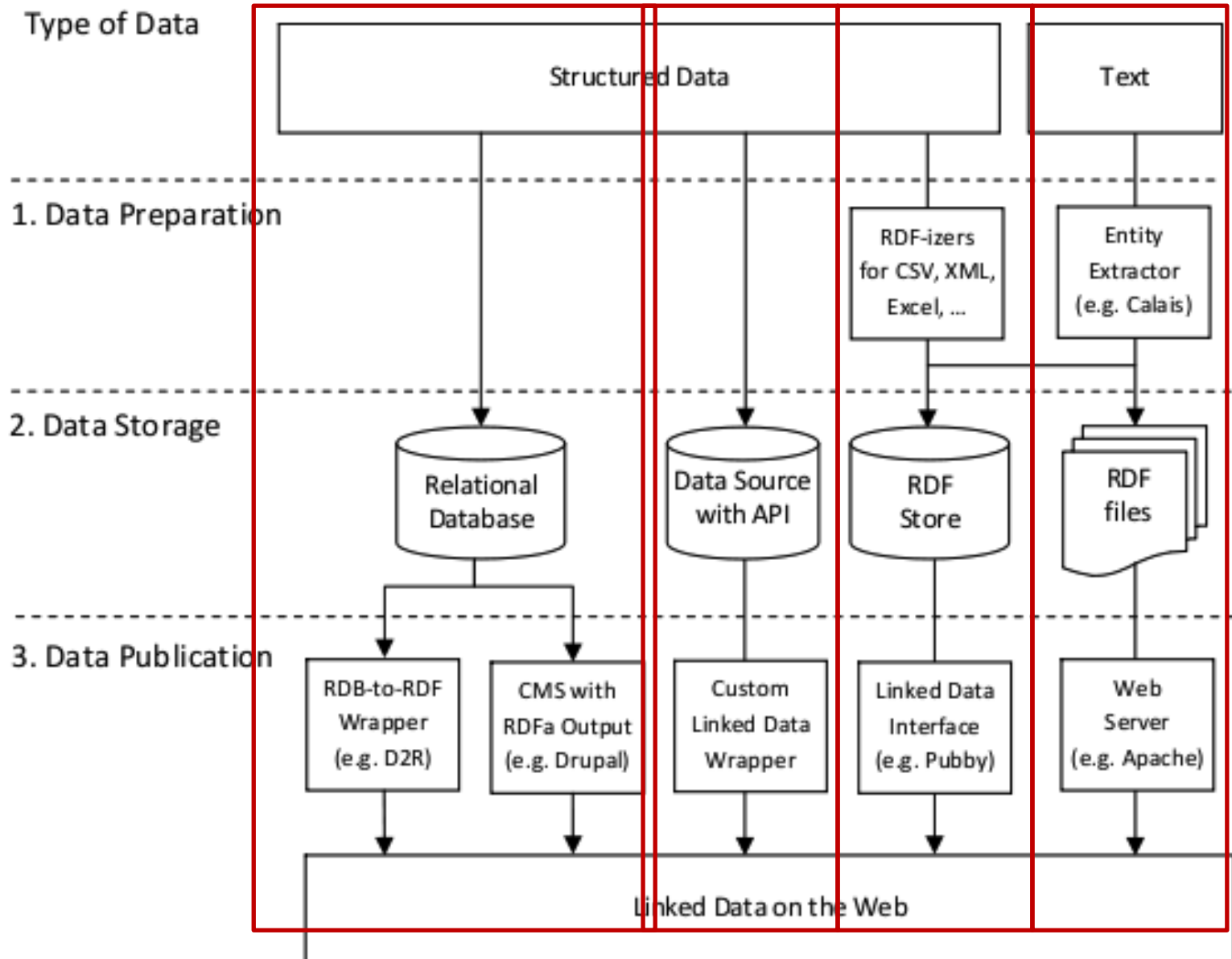
Subject List and Thesauri (Cont.)

▶ Preservation

✿ LC Preservation Level Role and Preservation Events

- ✓ [Library of Congress Preservation Events](#)
- ✓ [Library of Congress Preservation Level Role](#)

Patterns in a Nutshell



Consuming Linked Data

- ▶ Enrich your library catalog
- ▶ Browse catalog by classification
- ▶ FRBRization
- ▶ Union Catalog
- ▶ ...

Browse by Classification

圖片來源：玄奘大學圖書館

本館分類法種類如下：

[中國圖書分類法](#)
[美國國會分類法](#)

您可直接輸入分類號
查詢或利用右邊類目
查詢：

查詢書刊

清除

目前是中國圖書分類法類表

1. [總類\(000-099\)](#)
2. [哲學類\(100-199\)](#)
3. [宗教類\(200-299\)](#)
4. [自然科學類\(300-399\)](#)
5. [應用科學類\(400-499\)](#)
6. [社會科學類\(500-599\)](#)
7. [史地類\(中國\)\(600-699\)](#)
8. [史地類\(世界\)\(700-799\)](#)
9. [語文類\(800-899\)](#)
10. [美術\(900-999\)](#)

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查詢或利用右邊類目
查詢：

查詢書刊

清除

目前是中國圖書分類法-->語文類 [回上頁](#)

1. [語言文字學\(800-809\)](#)
2. [文學\(810-819\)](#)
3. [中國文學\(820-829\)](#)
4. [總集\(830-839\)](#)
5. [別集\(840-849\)](#)
6. [特種文藝\(850-859\)](#)
7. [東方文學\(860-869\)](#)
8. [西洋文學\(870-879\)](#)
9. [俄國文學\(880-889\)](#)
10. [新聞學\(890-899\)](#)

Browse by Classification

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5. [應用科學類\(400-499\)](#)
6. [社會科學類\(500-599\)](#)
7. [史地類\(中國\)\(600-699\)](#)
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5. [別集\(840-849\)](#)
6. [特種文藝\(850-859\)](#)
7. [東方文學\(860-869\)](#)
8. [西洋文學\(870-879\)](#)
9. [俄國文學\(880-889\)](#)
10. [新聞學\(890-899\)](#)

Google Knowledge Graph

「達文西」相關廣告 ⓘ

[2013故宮-達文西傳奇 - monalisa500.mediasphere.com.tw](http://monalisa500.mediasphere.com.tw)

monalisa500.mediasphere.com.tw/ ▼

義大利珍藏亞洲首展；真跡首次來台！杜象／達利／雷捷·經典詮釋蒙娜麗莎

[李奧納多·達文西 - 維基百科](http://zh.wikipedia.org/zh-tw/列奧納多·達·芬奇)

zh.wikipedia.org/zh-tw/列奧納多·達·芬奇 ▼

目前已知最早有日期紀錄的達文西作品是1473年8月5日以阿莫谷 (Arno valley) 的筆及墨水繪成的畫作。在1476年至1478年間達文西接受了兩件畫約，由此臆斷當時...

生平 - 職業生涯 - 科學與工程 - 個人生平

「達文西」的圖片搜尋結果 - 檢舉圖片



[蒙娜麗莎500年：達文西傳奇 - Taipei, Taiwan - Esthetics, Fairground ...](https://www.facebook.com/MonaLisa500)

<https://www.facebook.com/MonaLisa500> ▼

蒙娜麗莎500年：達文西傳奇, Taipei, Taiwan. 6129 likes · 1050 talking about this. 展覽日期：2013年10月31日~2014年2月10日，全年無休展覽時間：週一至...

...

[蒙娜麗莎500年：達文西傳奇 - 國立故宮博物院](http://www.npm.gov.tw/zh-tw/Article.aspx?sNo=04005034)

www.npm.gov.tw/zh-tw/Article.aspx?sNo=04005034 ▼

2013/10/24 - 本展覽主要以一種「女性姿態」的方式呈現，與文藝復興時期最具代表性的人物有關：達文西及其夥伴，以及達文西的影響力與他在不同時代的機運。

達文西

vr.theatre.ntu.edu.tw/fineart/painter-wt/davinci/davinci.htm ▼

達文西是義大利文藝復興與盛期美術家、自然科學家、工程師。繪畫方面，他把科學知識和藝術想像有機地結合起來。他的思想活躍，從不迷信教條，認為藝術應該體驗人...

李奧納多·達文西



李奧納多·達文西，又譯達芬奇，全名李奧納多·迪·瑟皮耶羅·達文西，是義大利文藝復興時期的一個博學者；除了是畫家，他還是雕刻家、建築師、音樂家、數學家、工程師、發明家、解剖學家、地質學家、製圖師，植物學家和作家。維基百科

出生：1452年4月15日，義大利芬奇

逝世：1519年5月2日，法國昂布瓦斯

身高：1.94公尺

父母：瑟皮耶羅·達文西，卡特琳娜·達文西

作品



蒙娜麗莎
1517年



最後的晚餐
1498年



維特魯威人
1490年



抱銀鼠的女子
1490年



岩間聖母
1486年

其他人也搜尋了以下項目



米開朗基羅



拉斐爾·聖齊奧



文森·梵谷



巴勃羅·畢卡索



克勞德·莫內

[意見回饋/更多資訊](#)

Your E-Portfolio





中華民國圖書館學會
Linked data

Find More Linked Data

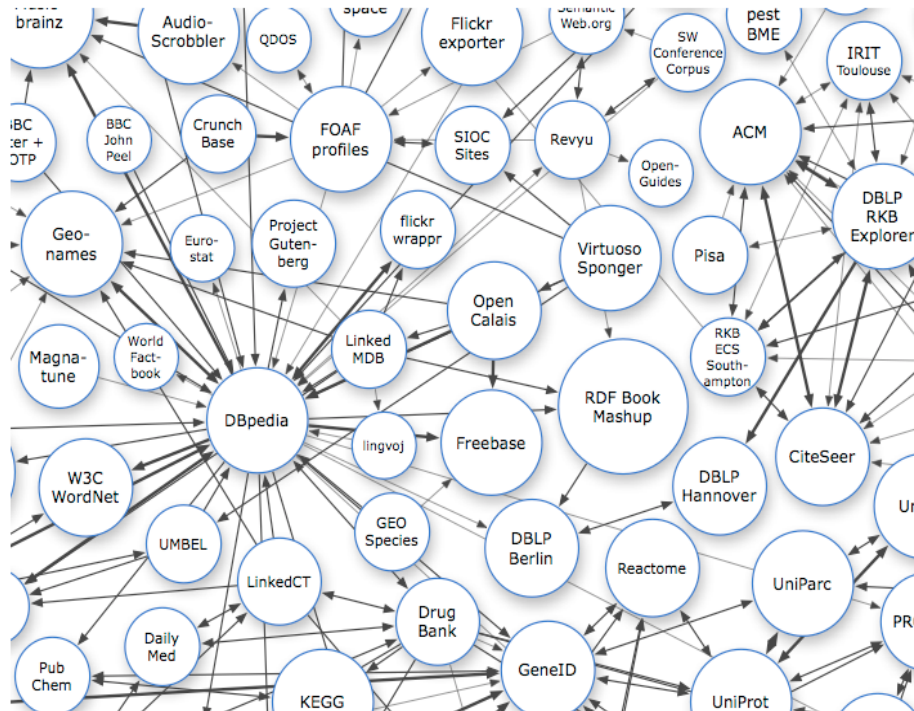
Linked Data - Connect Distributed Data across the Web

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Linked Data

Linked Data is about using the Web to connect related data that wasn't previously linked, or using the Web to lower the barriers to linking data currently linked using other methods. More specifically, Wikipedia defines Linked Data as "a term used to describe a recommended best practice for exposing, sharing, and connecting pieces of [data](#), [information](#), and [knowledge](#) on the Semantic Web using [URIs](#) and [RDF](#)."

This site exists to provide a home for, or pointers to, resources from across the Linked Data community.



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Navigation

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Syndicate



Conclusion and Issues

- ▶ Linked Data is a set of best practices to realize Semantic Web
- ▶ Linked Data improves the access, discovery, and integration of Web data by using open standards
- ▶ Linked Data → Linked Open Data → Big Data

Conclusion and Issues (Cont.)

- ▶ Why is Linked Data important for libraries?
 - ✿ People can more easily find library resources on the Web
 - ✿ More creative applications based on library metadata
 - ✿ Opportunities for cataloging efficiency and innovation
- ▶ Issues
 - ✿ Where to find relevant datasets
 - ✿ How to build links automatically
 - ✿ Killer applications
 - ✿ Quality



RESOURCE DESCRIPTION FRAMEWORK (RDF)

What is RDF?

▶ Resource Description Framework

- ✿ RDF is a language for representing information about **Web** resources (Ah...metadata)
- ✿ RDF can be used to represent information about things that can be identified on the Web, even when they cannot be directly retrieved on the Web
- ✿ Intended for situations in which information needs to be processed by applications, rather than being only displayed to people. (Ah... **Semantic Web**...)

RDF Data Model

- ▶ A model for describing
 - ✿ resources
 - ✿ named properties
 - ✿ property values
- ▶ (resource, property, value)

Resource

- ▶ Any object that is uniquely identifiable by an Uniform Resource Identifier (URI) plus optional anchor ids (URIsrefs)
 - ✱ An entire Web page
 - ✱ Part of a Web page
 - ✱ **An object not directly accessible via the Web (e.g. a printed book, person, car...)**

Property and Values

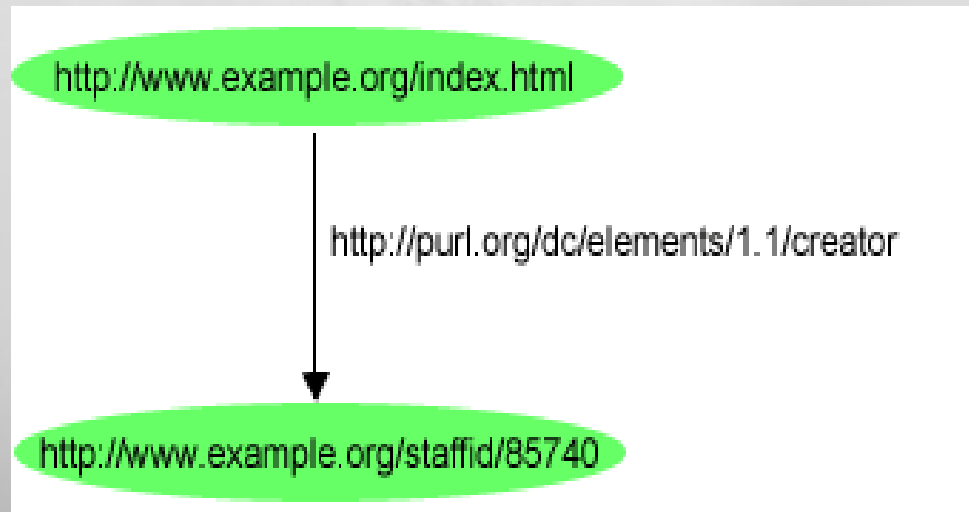
- ▶ A specific aspect, characteristics, **attribute**, or **relation** used to describe a resource
 - ✱ Specific meaning
 - ✱ Permitted values
 - ✱ Types of resources it can describe
 - ✱ Relationship with other properties
- ▶ Properties and values are identified by URIs
 - ✱ **WHY???**

Statement

- ▶ A specific resource together with a named property plus the value of that property for that resource
 - ✿ Subject – Resource
 - ✿ Predicate – Property
 - ✿ Object – Property value
 - ✓ Literal or another resource
- ▶ Description: A collection of the properties that refers to the same resource

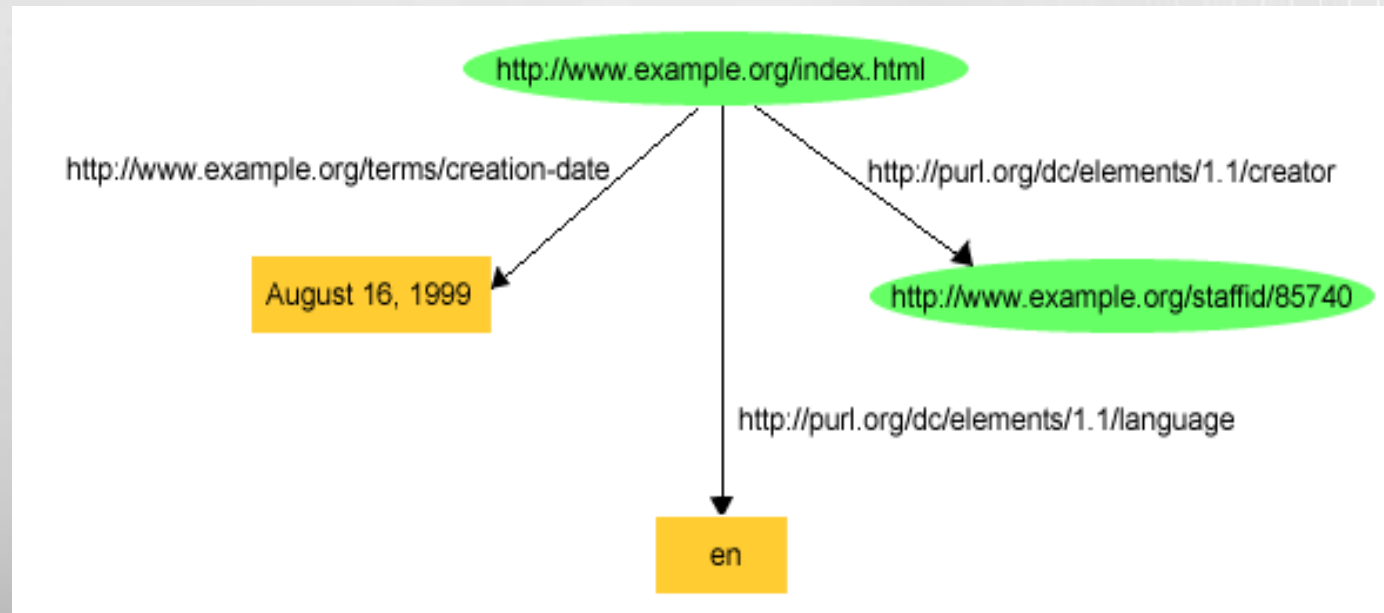
Example 1

- ▶ <http://www.example.org/index.html> has a creator whose value is John Smith
 - ✿ A subject <http://www.example.org/index.html>
 - ✿ A predicate <http://purl.org/dc/elements/1.1/creator>
 - ✿ An object <http://www.example.org/staffid/85740>



Example 2

- ▶ <http://www.example.org/index.html> has a creation-date whose value is August 16, 1999
- ▶ <http://www.example.org/index.html> has a language whose value is English



Objects in RDF statements may be either URIs, or constant values (called literals)

Triple Notation

▶ Triple Notation of Example 2

- * `<http://www.example.org/index.html>`
`<http://purl.org/dc/elements/1.1/creator>`
`<http://www.example.org/staffid/85740>` .
- * `<http://www.example.org/index.html>`
`<http://www.example.org/terms/creation-date>` "August 16, 1999" .
- * `<http://www.example.org/index.html>`
`<http://purl.org/dc/elements/1.1/language>` "en" .

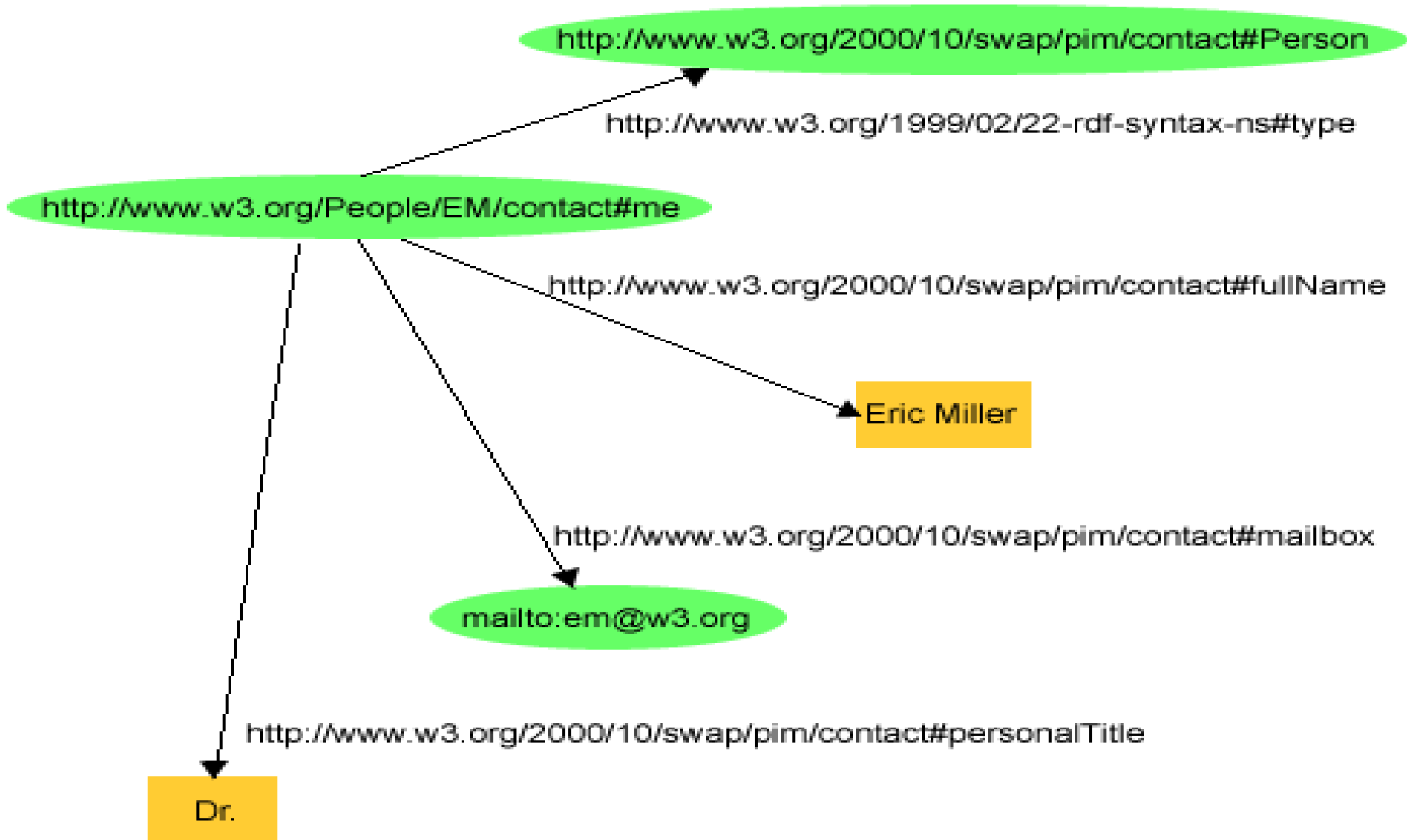
▶ Shorthand Triple Notation – Giving prefix (Namespace)

- * `ex:index.html dc:creator exstaff:85740` .
- * `ex:index.html exterms:creation-date` "August 16, 1999" .
- * `ex:index.html dc:language` "en" .

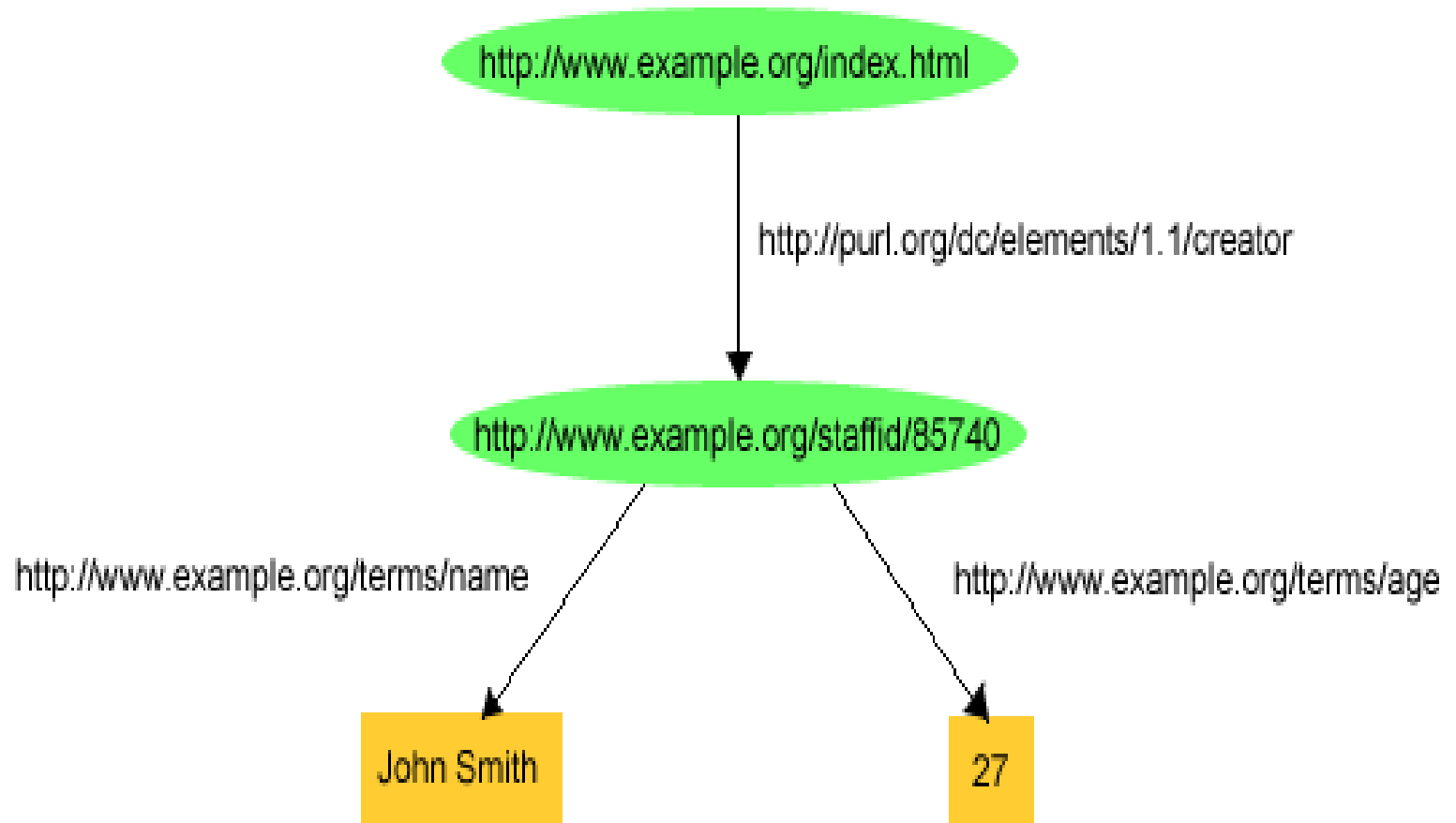
Example 3

- ▶ There is a Person identified by <http://www.w3.org/People/EM/contact#me>, whose name is Eric Miller, whose email address is em@w3.org, and whose title is Dr.

Example 3 (Cont.)



Example 4



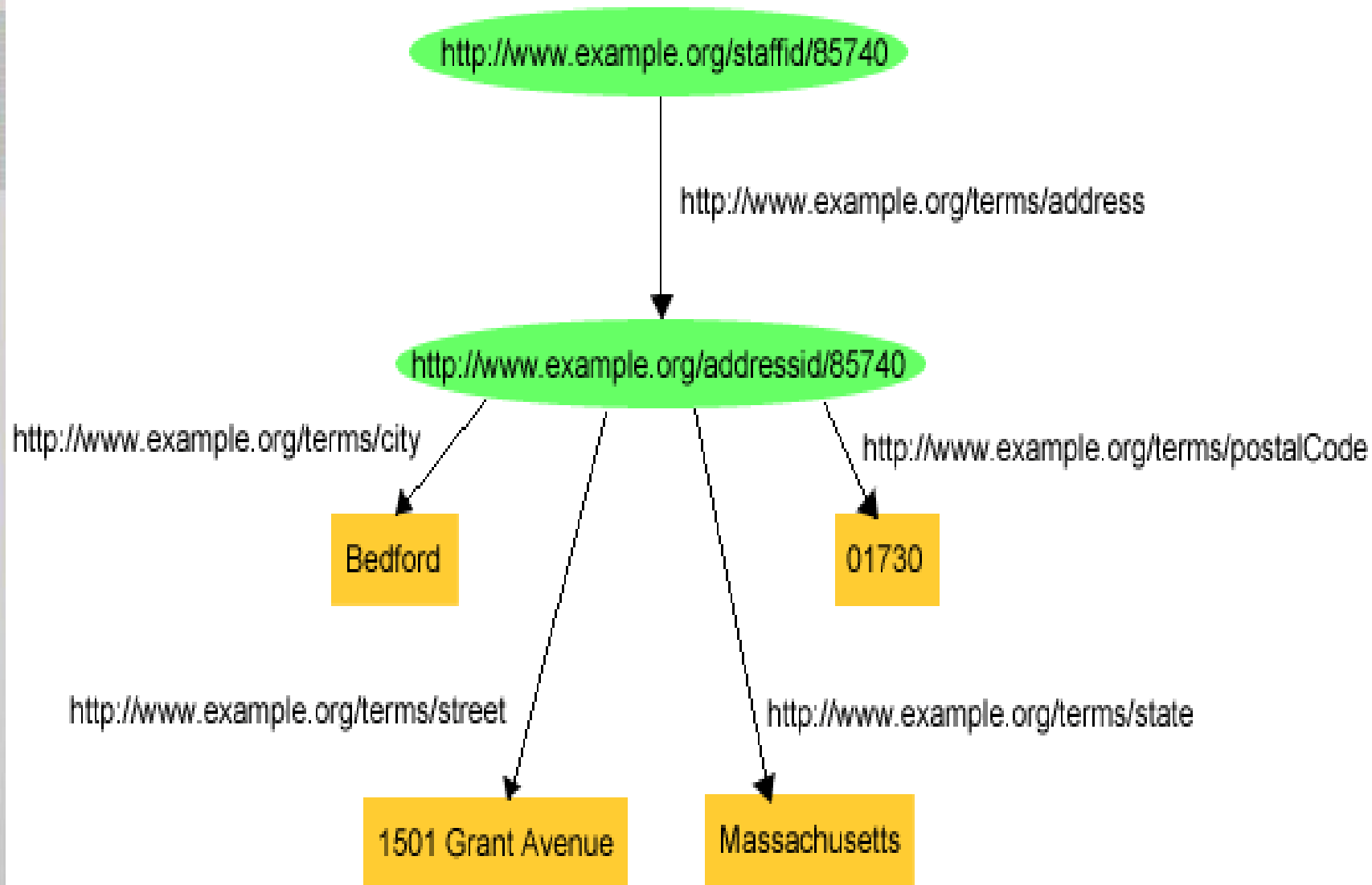
Why Use URIs?

- ▶ Unambiguous
- ▶ Using URIs as subjects, predicates, and objects in RDF statements supports the development and use of shared vocabularies on the Web, since people can discover and begin using vocabularies already used by others to describe things, reflecting a shared understanding of those concepts

Structured Property Value

- ▶ Structure property
 - ✿ Name: first name, middle name, last name
 - ✿ Address: street, city, state, postal code
- ▶ Structured information is represented in RDF by considering the aggregate thing to be described as a resource, and then making statements about that new resource
- ▶ This way of representing structured information in RDF can involve generating numerous "intermediate" URIs to represent aggregate concepts such as John's address.
 - ✿ Such concepts may never need to be referred to directly from outside a particular graph, and hence may not require "universal" identifiers

Breaking Up John's Address



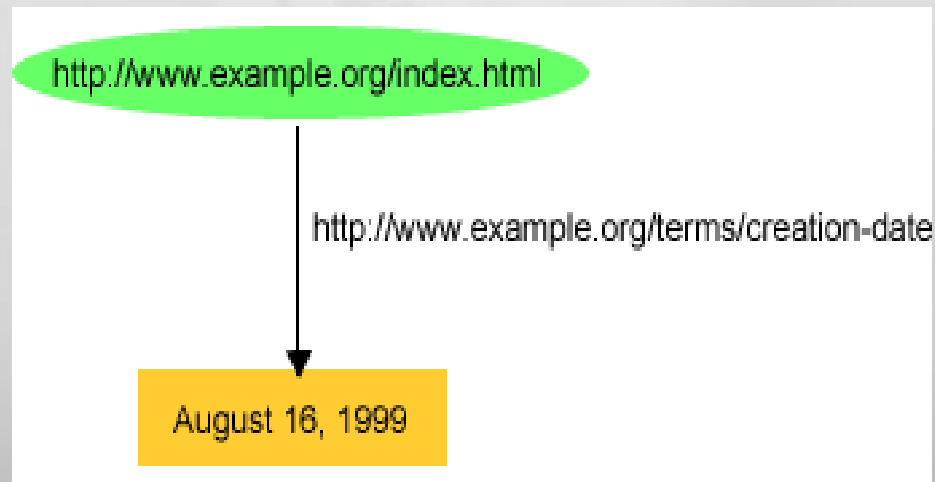
An XML Syntax for RDF: RDF/XML

- ▶ The RDF data model provides an abstract, conceptual framework for defining and using resource.
- ▶ A concrete syntax is also needed for the purposes of creating and exchanging this data model.
 - ✱ XML
 - ✱ Alternate syntaxes, like S-expression, are also possible

Describing a Web Page

`http://www.example.org/index.html` has a `creation-date` whose value is `August 16, 1999`

`ex:index.html` `externs:creation-date` "August 16, 1999" .



`ex1.xml`

Schemas and Namespaces

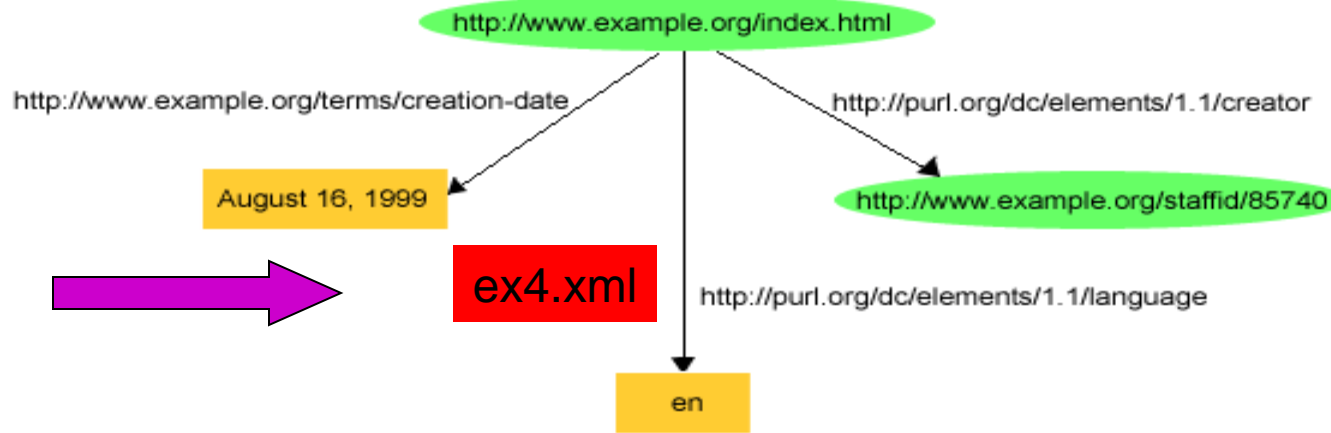
- ▶ Meaning in RDF is expressed through reference to a schema
 - ✿ Defines the terms used in RDF statements
 - ✓ Metadata element (like Dublin Core...)
- ▶ RDF uses the XML namespace facility for encoding schemas

Describing a Web Page (Cont.)

ex:index.html extermis:creation-date "August 16, 1999" .
ex:index.html dc:language "en" .

ex2.xml

ex:index.html dc:creator exstaff:85740 .
ex:index.html extermis:creation-date "August 16, 1999" .
ex:index.html dc:language "en" .



ex3.xml

ex4.xml

Basic Syntax

- ▶ Group multiple statements for the same resource into a Description element
 - ✱ about: described resource
 - ✓ about = URIref
- ▶ propertyElt: Property of a resource
 - ✱ Property names must be associated with a schema
 - ✓ By qualifying the element names with namespace prefix
- ▶ Value
 - ✱ Literal in value
 - ✱ resource in attribute
 - ✓ resource=id

Container

- ▶ Frequently, it is necessary to refer to a collection of resources
 - ✿ A work was created by more than one person
 - ✿ List the students in a course
 - ✿ List the software modules in a package
- ▶ RDF **containers** are used to hold such lists of resources or literals

RDF Container Model (I)

▶ Bag

- ✿ Unordered list of resources or literals
- ✿ Multiple values and no significant order

▶ Sequence

- ✿ Ordered list of resources or literals
- ✿ Multiple values and with significant order

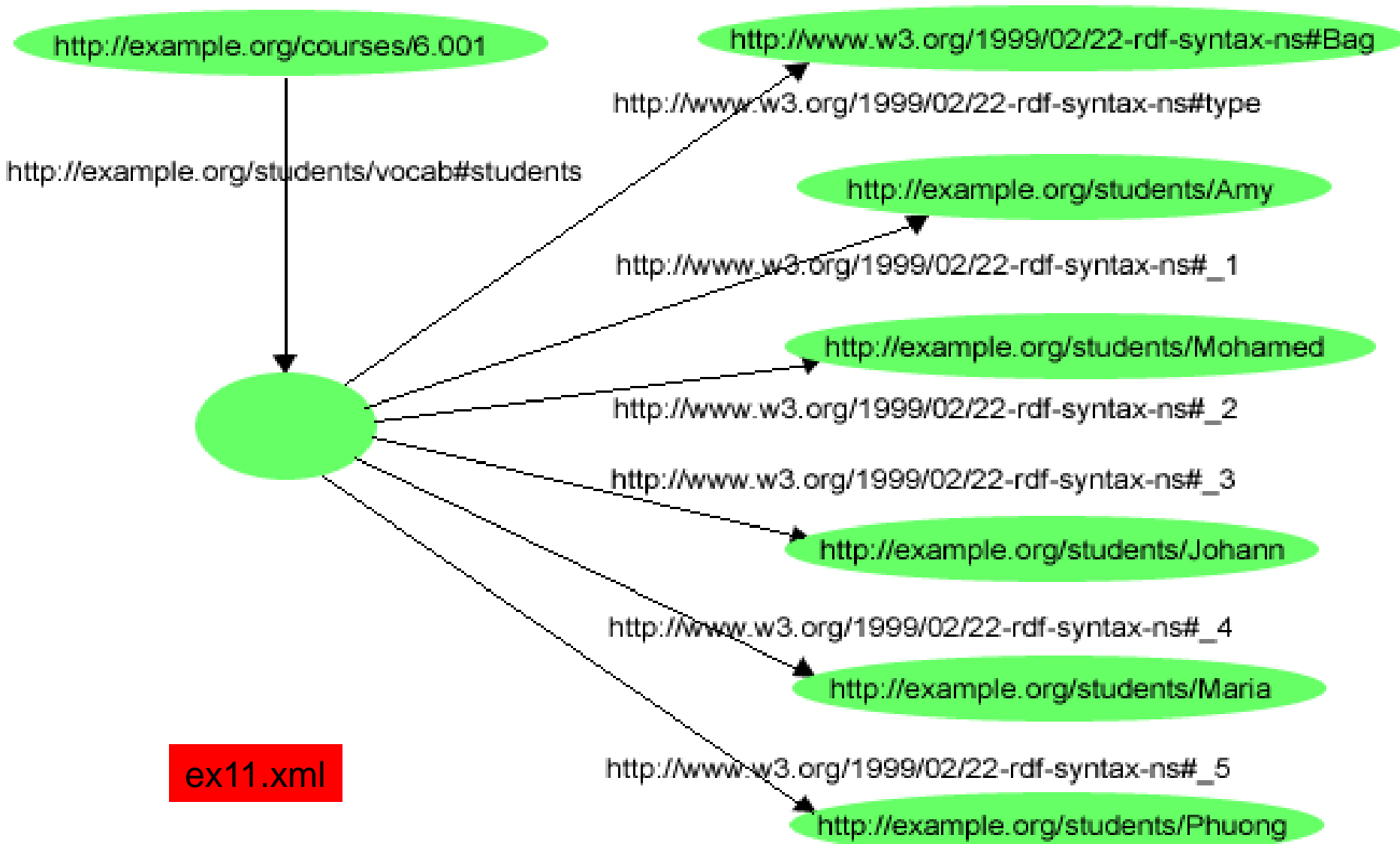
▶ Alternative (At least one is needed)

- ✿ Alternatives for the (single) value of a property
- ✿ choose any one of the items in the list as appropriate

RDF Container Model (II)

- ▶ An additional resource that identifies the specific collection
 - ✿ A type property to denote the container type
 - ✿ Membership properties are named simply "_1", "_2", "_3", etc.
- ▶ A common use of containers is as the value of a property

Container Example I



ex11.xml

Container Example II

