



鏈結資料在圖書館的應用

柯皓仁 教授
國立臺灣師範大學圖書資訊學研究所、
圖書館

1



Outline

- ▶ Semantic Web Overview
- ▶ Principles of Linked Data
- ▶ Web of Data – Results of Linked Data
- ▶ Start thinking your applications
- ▶ Conclusion

2

鏈結(開放)資料

- ▶ 鏈結(開放)資料 = Linked (Open) Data, L(O)D
- ▶ Linked Data is a set of best practices to publish and link structured data on the Web
- ▶ Linked data realizes Semantic Web

3

SEMANTIC WEB OVERVIEW

4



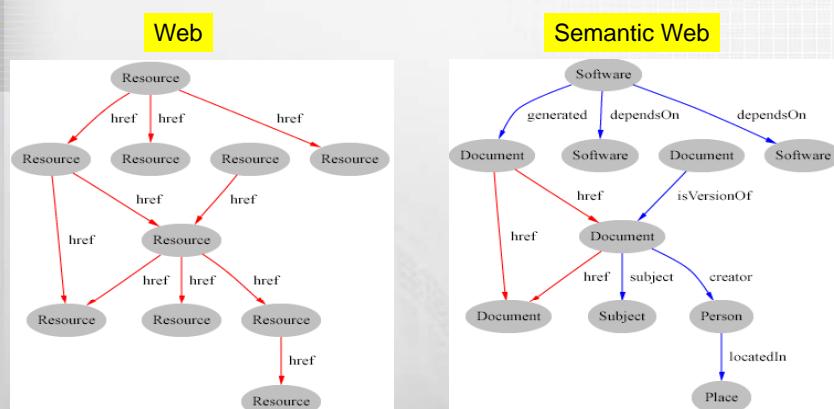
Weaving the Web – Vision of Tim Berners-Lee

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

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

5

Web vs. Semantic Web



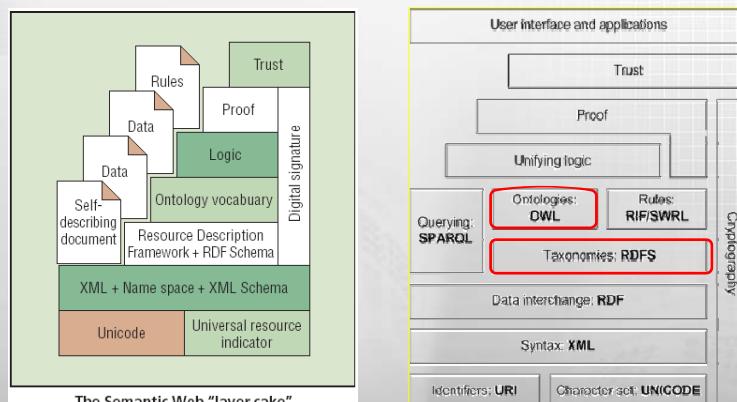
6

Definition of Semantic Web

- ➊ 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.
- ➋ The Semantic Web is not about links between web pages.
- ➌ The Semantic Web describes the **relationships between things** and the **properties of things**
- ➍ An infrastructure enables machines to **COMPREHEND** semantic documents and data

7

What achieves the Semantic Web?



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

8

Basic RDF Model

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

```

graph TD
    A([http://www.example.org/index.html]) -- "http://www.example.org/terms/creation-date" --> B[August 16, 1999]
    A -- "http://purl.org/dc/elements/1.1/creator" --> C([http://www.example.org/staffid/85740])
    A -- "http://purl.org/dc/elements/1.1/language" --> D[en]
    B -- "http://www.example.org/terms/creation-date" --> E[August 16, 1999]
    C -- "http://purl.org/dc/elements/1.1/creator" --> F([http://www.example.org/staffid/85740])
    D -- "http://purl.org/dc/elements/1.1/language" --> G[en]
  
```

9

Meta-online Store – Findbook.tw

作 者:	島田莊司	定 價:	280元
編/譯者:	郭溝華	特 價:	82折! 230元
出版社:	皇冠文化	用紅利價:	79折! 220元 (回饋4點)
ISBN:	9573322897	運 費:	0元(需到店取貨)
出版日:	2006.12.18	參考庫存量: 9本	
分 級:	普級	語 言:	中文
規 格:	中文平裝	<input type="checkbox"/> 加入購物清單	
		<input type="checkbox"/> 加入我的書店	<input type="checkbox"/> 推薦給好友

10

虛擬聯合目錄

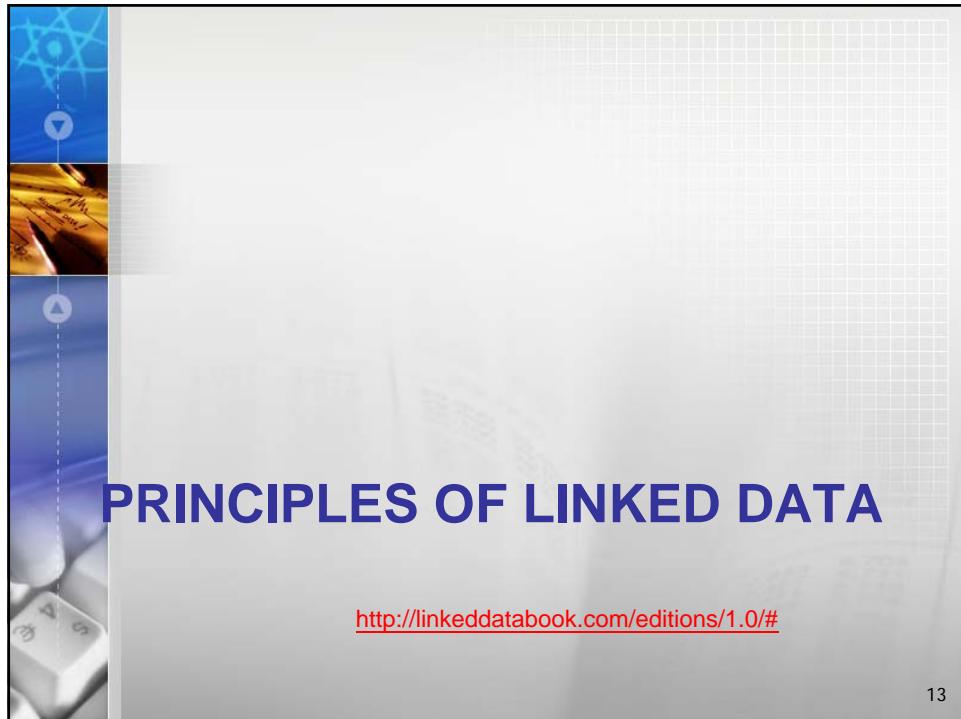
<http://metacat.ntu.edu.tw/metacat/app>

11

Housingmaps.com -- Mashup

Price	Type	Description	Location
\$1,595	3bd	Walk-in-Closets, Master Bath, 2nd Story, 2nd Story	Holiday Rv Park
\$1,600	3bd	Heated Garage, 1300 Sq Ft of Living Space	Aurora
\$1,675	4bd	Perfect living opportunity in Bradbury Ranch, comfortable floor plan	Parker
\$1,900	3bd	SPACIOUS Home Avail. 8/1 Must See!	Boulder
\$1,900	2bd	Denver City Lofts - Live in the heart of downtown	Denver
\$1,900	4bd	House for Rent, Great Condition, Walk to Malls	Denver
\$1,900	2bd	1BR 1BA House in Green Park, 2BD	Denver
\$1,950	3bd	Walk-through Closets	Boulder
\$1,950	3bd	North Evergreen Townhome/Clothes Dryer	Evergreen
\$1,950	3bd	Condo/House/Ranch House, Main Level, Air Conditioning	Boulder
\$1,995	4bd	Rock Creek home in Open Space	Superior
\$1,975	5bd	Heart of Cherry Creek	Denver
\$1,995	5bd	1251 1/2A mountain home	Evergreen
\$1,675	3bd	Private, quiet residence in Cherry Creek, Inc. Red Circle Co.	Parker
\$1,900	4bd	3 Bed, 2 Bath, 3-Car Garage, House For Rent	Denver
\$1,900	3bd	Historic Home	Denver
\$1,950	5bd	Part To Own Large Apartment Home - 2,600 Sq Ft	Aurora
\$1,900	4bd	On Harvard Park Line On Park, Detached Location	Denver
\$1,900	4bd	Detached, Luxury, 4-Bedroom Condo, 2 Bathrooms	Denver
\$1,675	1bd	Apartment w/ Private Center, Dog-friendly	Denver

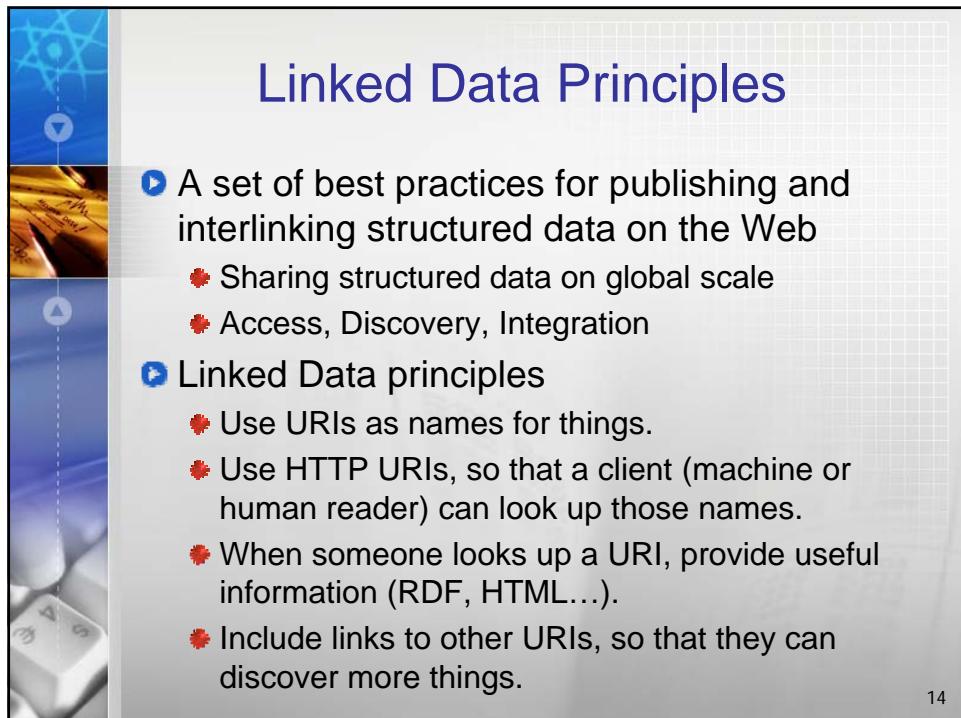
12



PRINCIPLES OF LINKED DATA

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

13



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 (RDF, HTML...).
 - Include links to other URIs, so that they can discover more things.

14

Items, Things, Resources

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

15

Naming Things with URIs

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

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

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



16

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

<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

<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



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

19



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

20

About: 王建民	
An Entity of Type: athlete , from Named Graph: http://dbpedia.org , within Data Space: dbpedia.org	
	
Property	Value
dbpedia-owl:abstract <p>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首位先發投手後，在2006和2007年成為洋基隊最多勝投手，曾被「体育画报」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，成為華人當中的無數人物。台灣媒體常稱「建民」、「臺灣之光」。目前為華盛頓國民隊的先發投手。</p>	
dbpedia-owl:award <ul style="list-style-type: none"> • dbpedia_Win_Series • dbpedia_Win-loss_record_(pitching) • dbpedia_American_League 	
dbpedia-owl:battlingSide <p>Right</p>	
dbpedia-owl:birthDate <p>1980-03-31 (xsd:date)</p>	
dbpedia-owl:birthPlace <ul style="list-style-type: none"> • dbpedia_Taiwan • dbpedia_Taipei 	
dbpedia-owl:formerTeam <ul style="list-style-type: none"> • dbpedia_New_York_Yankees 	
dbpedia-owl:number <p>40 (xsd:integer)</p>	
dbpedia-owl:position <p>Starting pitcher</p>	
dbpedia-owl:statisticLabel <p>dbpedia_Win-loss_record_(pitching)</p>	
dbpedia-owl:statisticValue <p>59.000000 (xsd:float)</p>	
dbpedia-owl:team <ul style="list-style-type: none"> • dbpedia_Washington_Nationals • dbpedia_New_York_Yankees 	
dbpedia-owl:throwingSide <p>Right</p>	
dbpedia-owl:thumbnail <ul style="list-style-type: none"> • http://upload.wikimedia.org/wikipedia/commons/thumb/e/e2/MG_3905_Chien-Ming_Wang.jpg/200px-MG_3905_Chien-Ming_Wang.jpg • http://www.youtube.com/watch?v=ATV1sdQzqVc • http://www.frankfieldofteams.com/reference/viangcm.htm 	
dbprop:at <ul style="list-style-type: none"> • dbpedia_Josh_Beckett 	
dbprop:awards <ul style="list-style-type: none"> • "Led AL in wins" 2006 Starting Pitcher of the Year Award * World Series champion 	
dbprop:bats <p>Right</p>	
http://dbpedia.org/page/Chien-Ming_Wang	
21	



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 URLs identifying the same entity
 - ✿ <http://www.w3.org/2002/07/owl#sameAs>
- ▶ Quality Control

<code>dcterms:label</code>	<ul style="list-style-type: none"> ▪ Wang Chien-ming ▪ Chien-Ming Wang ▪ Chien-Ming Wang ▪ 王建民 ▪ 웅치엔밍 ▪ 王建民
<code>owl:sameAs</code>	<ul style="list-style-type: none"> ▪ http://ja.dbpedia.org/resource/王建民 ▪ http://it.dbpedia.org/resource/Chien-Ming_Wang ▪ http://de.dbpedia.org/resource/Wang_Chien-ming ▪ http://ko.dbpedia.org/resource/웡치엔밍 ▪ freebase:王建民
<code>vdr:describedby</code>	<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.jrdf ▪ http://dbpedia.org/data/Chien-Ming_Wang.jsonld ▪ http://dbpedia.org/data/Chien-Ming_Wang.atom
<code>http://www.w3.org/ns/prov#wasDerivedFrom</code>	http://en.wikipedia.org/wiki/Chien-Ming_Wang?oldid=495288273
<code>oa:depiction</code>	<ul style="list-style-type: none"> ▪ http://upload.wikimedia.org/wikipedia/commons/e/ed/IMG_3905_Chien-Ming_Wang.jpg
<code>oa:givenName</code>	<ul style="list-style-type: none"> ▪ Chien-Ming
<code>oa:isPrimaryTopicOf</code>	http://en.wikipedia.org/wiki/Chien-Ming_Wang
<code>oa:name</code>	<ul style="list-style-type: none"> ▪ Chien-Ming Wang
<code>oa:surname</code>	<ul style="list-style-type: none"> ▪ Wang
<code>s:dbpedia-owl:wikiPageDisambiguates</code> of	<ul style="list-style-type: none"> ▪ dbpedia:CMW
<code>s:dbpedia-owl:wikiPageRedirects</code> 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:Chien-Ming_Wang ▪ dbpedia:Chin_Ming_Wong ▪ dbpedia:Chin_Ming_Wong
	23

The screenshot shows the Sindice.com homepage. At the top, there's a navigation bar with links for About, Search, Submit Your Data, Jobs, Support, and Dev. Below the navigation is a search bar with options for term, property, advanced, and SIGMA, along with a search button. The main content area features a sidebar with "Sindice - Data Web Services" information and a "LATEST DATA" section showing recent triple uploads. The main content includes a "HIGHLIGHTS" section with a "Anything to Triples Any23" card, a "SINDICE IS HIRING" section, and a "SINDICE BLOG" section with several posts. The overall theme is blue and white, with a background image of a computer keyboard.

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>

 Sindice

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](#).

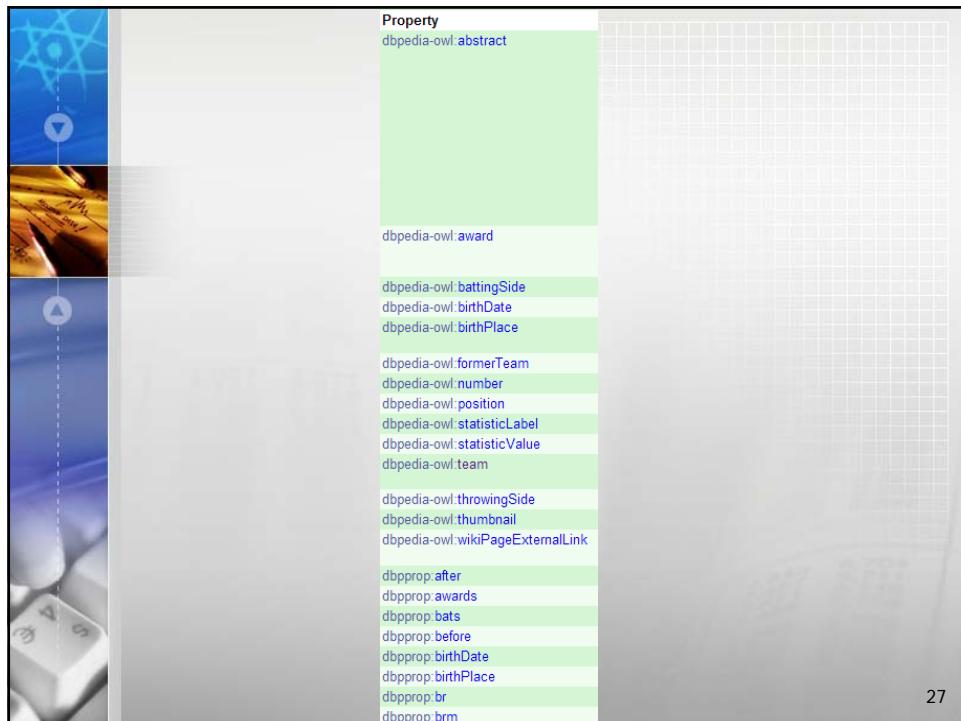
Or you can look at one of the [sub-stores](#).

Now over 150 Million URIs!
Currently serving over 150 406 368 URLs 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!

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

26

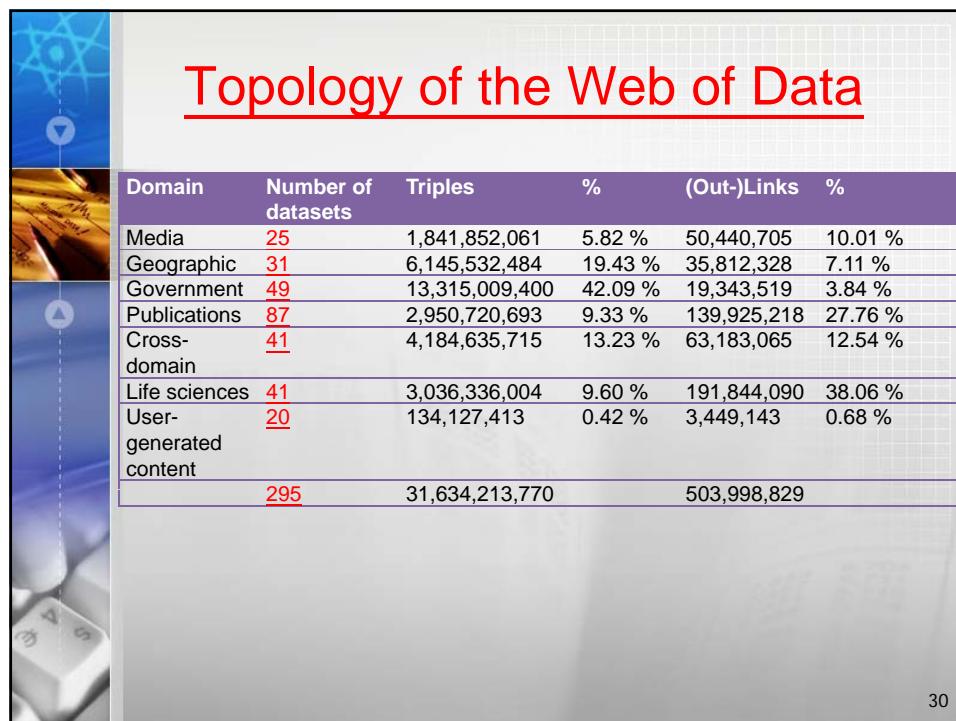
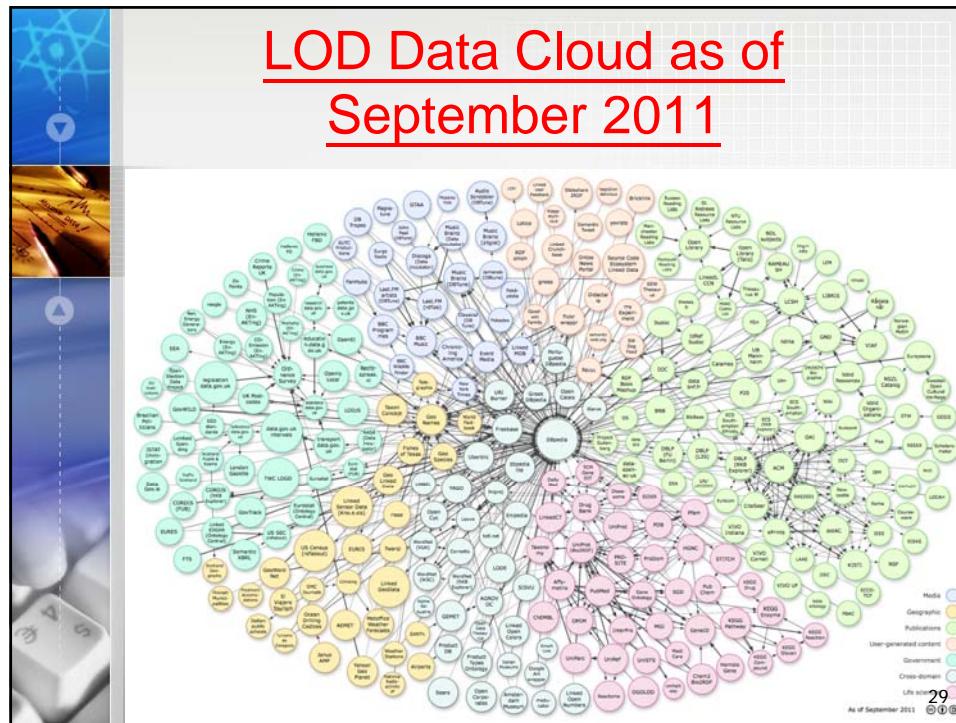


Property
dbpedia-owl:abstract
dbpedia-owl:award
dbpedia-owl:battingSide
dbpedia-owl:birthDate
dbpedia-owl:birthPlace
dbpedia-owl:formerTeam
dbpedia-owl:number
dbpedia-owl:position
dbpedia-owl:statisticLabel
dbpedia-owl:statisticValue
dbpedia-owl:team
dbpedia-owl:throwingSide
dbpedia-owl:thumbnail
dbpedia-owl:wikiPageExternalLink
dbpprop:after
dbpprop:awards
dbpprop:bats
dbpprop:before
dbpprop:birthDate
dbpprop:birthPlace
dbpprop:br
dbpprop:brm

27



28



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

31

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

32

LinkedGeoData Browser

LinkedGeoData.org Adding a spatial dimension to the Web of Data.

Project created by AKSW

Linked Geo Data Browser and Editor

The LGD Browser and Editor (available at <http://browser.linkedgodata.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.

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>

[About This Page](#)

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,publication_day,publication_month,publication_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	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. 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.
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/>

The screenshot shows the VIAF interface with a search result for "J.K. Rowling". The results are organized into sections: Preferred Forms, WORKS, and Expressions. The WORKS section includes links to "Casual vacancy.", "EXPRESSIONS (9)", and "Harry Potter" (with a small thumbnail). Below this is an RDF snippet:

```

<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"/>

```

Below the RDF snippet is a note about controlled and alternate headings from authority files, followed by a section for SKOS Concepts:

```

<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>

```

The page footer indicates page 37.

The screenshot shows the OpenLibrary interface with a search result for "And then there were none". The results are organized into sections: SUBJECTS, AUTHORS, LISTS, RECENTLY, and HELP. The AUTHORS section includes links to Agatha Christie, G.D. Hinton, and Jonathon Clemmer. The LISTS section includes links to "And Then There Were None" (3 editions, first published in 1940), "And then there were none" (2 editions, first published in 2001), "And Then There Were None" (1 edition, first published in 2000), "And then there were none" (1 edition, first published in 2004), and "And then there were none: a history of the Le Cadre family in the West Indies" (1 edition, first published in 1992). The right sidebar provides filters for EBOOK? (yes 24, no 77), AUTHOR (Agatha Christie 13, Colleen McCullough 3, Walter Moyle 2, Anthony De Verteuil 2, Ronald E. Wade 1, more), and SUBJECTS (Accessible book 24, Protected DAISY 13, In library 12, History 9, Fiction 8).

The page footer indicates page 38.

The screenshot shows the dblp homepage with a sidebar featuring a blue and yellow logo and the text "computer science bibliography". The main content area displays a search result for "Shigeo Sugimoto". At the top right, there are links for "home", "browse", "search", and "about". A note at the top right states: "Please note: This is a beta version of the new dblp website. You can find the classic dblp view of this page here." Below this is a search bar with the query "Mas-Ren Ke". The results list is titled "[c] 2010 – today 0". It contains several entries from 2013, 2012, 2011, and 2010, each with a small icon, a title, and a link. The titles include experimental FRBRization of bibliographic data of comic books, a task-centric model for archival metadata schema mapping, uncovering secrets of Daoism, and filtering and ranking schemes for finding inclusion dependencies on the web.

39

START THINKING YOUR APPLICATIONS

40

Publishing Linked Data

► Enrich the Web of Data

- 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
- ...

41

Implementation Plan

► Define your model

- URI, resources, relationships

► Select or define your metadata terms

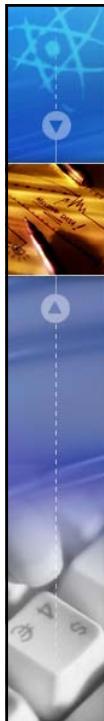
- Terms should be defined using an RDF-based standard (RDF or OWL)

► 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

42



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.

43



Open Metadata Registry

[sign in / register](#) | [about](#)

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)	
FRS4D 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-Line	Antonio Tedesco	2013-02-09	Antonio Tedesco	

70 results

Browse...

[Resource Owners](#)

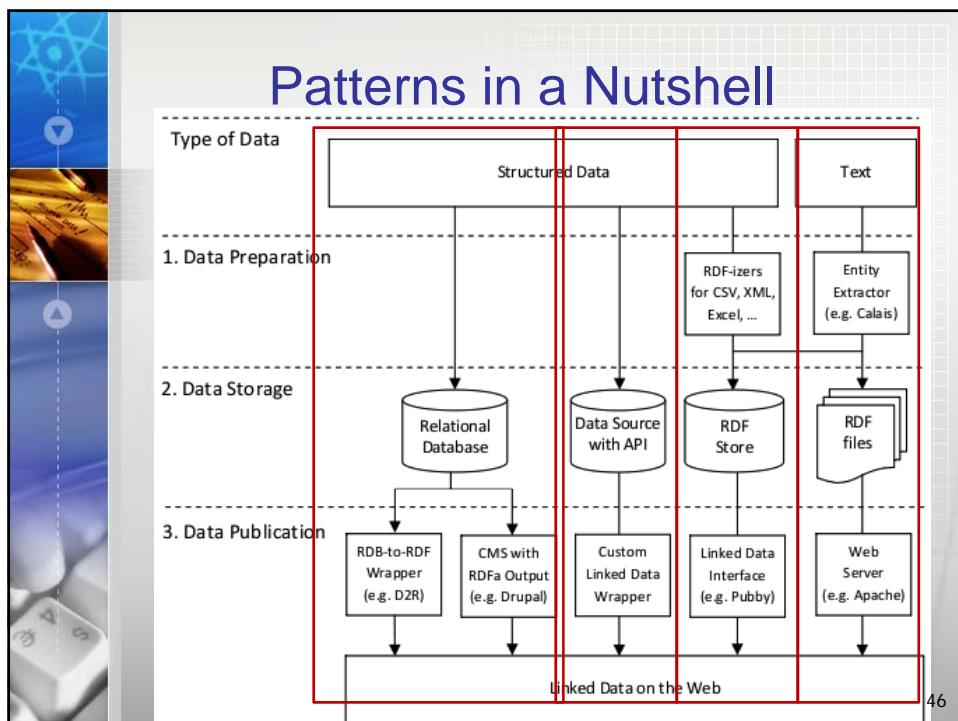
[Vocabularies](#)

[Element Sets](#)

[SPARQL](#)

44

The screenshot shows the CKAN Registry Data Hub homepage. At the top, there's a navigation bar with the CKAN logo, search, groups, and about links, along with login and register buttons. Below the header, a banner says "Welcome to the Data Hub!". It features three main sections: "Find data" (with a magnifying glass icon), "Share data" (with a cloud and upload icon), and "Collaborate" (with a gears icon). Each section has some descriptive text and a "Sign up" button. Below these are sections for "Who else is here?", listing groups like "Canada", "Linking Open Data Cloud", "bioportal", "Economics Datasets", "OpenSpending", and "Linguistic Resources (partly open)". A sidebar on the right lists datasets from these groups. The page number 45 is in the bottom right corner.





Consuming Linked Data

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

47



Enrich your catalog



48

Browse by Classification

圖片來源：玄奘大學圖書館

本館分類法種類如下： 目前是中國圖書分類法類表

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：

1. 細類(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)

查詢書刊 清除

本館分類法種類如下： 目前是中國圖書分類法-->語文類 [回上頁](#)

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：

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. 英國文學(880-889)
10. 新聞學(890-899)

查詢書刊 清除

49

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

50



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

51