

Dublin Core: The Road from Metadata to Linked Data

<http://www.niso.org/news/events/2010/dublincore>

- **Dublin Core in the Early Web Revolution**
– Makx Dekkers, Managing Director and CEO, DCMI, Ltd.
- **What Makes the Linked Data Approach Different**
– Thomas Baker, Chief Information Officer, DCMI, Ltd.
- **Designing Interoperable Metadata on Linked Data Principles**
– Thomas Baker, Chief Information Officer, DCMI, Ltd.
- **Bridging the Gap to the Linked Data Cloud**
– Makx Dekkers, Managing Director and CEO, DCMI, Ltd.



NISO/DCMI Webinar • August 25, 2010

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Dublin Core: The Road from Metadata Formats to Linked Data

Joint NISO/DCMI Webinar
25 August 2010
Makx Dekkers and Thomas Baker

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NISO 2010 Events

<http://www.niso.org/news/events/2010/>

- September Two-Part Webinar: Measuring Use, Assessing Success
 - September 8: Measure, Assess, Improve, Repeat: Using Library Performance Metrics
 - September 15: Count Me In: Measuring Individual Item Usage
- September 13 (Teleconference): IOTA (Improving OpenURLs Through Analytics) Working Group Update
- October 7 (NISO Forum - Chicago, IL): E-Resource Management: From Start to Finish (and Back Again)
- October 13 (Webinar): It's Only as Good as the Metadata: Improving OpenURL and Knowledgebase Quality
- October 18 (Teleconference): I2 (Institutional Identifiers) Working Group Update
- November 8 (Teleconference): DAISY Revision Working Group Update
- November 10 (Webinar): The Case of the Disappearing Journal: Solving the Title Transfer and Online Display Mystery
- December 8 (Webinar): Unprecedented Interaction: Providing Accessibility for the Disabled
- December 13 (Teleconference): Journal Article Versions (JAV) Survey

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<http://dublincore.org/>

Webinar overview

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<http://dublincore.org/>

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Dublin Core in the Early Web Revolution

Makx Dekkers, Managing Director and CEO, DCMI

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<http://dublincore.org/>

First steps

- In October 1994, informal discussion at second Web Conference, Chicago
- Identified a need for a “core” set of descriptors to help discover content on the Web
- 1-3 March 1995, OCLC/NCSA workshop in Dublin, Ohio at OCLC Headquarters

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Dublin Core: the original idea

- A basic description mechanism for digital information that:
 - can be used in all domains
 - can be used for any type of resource
 - is simple, yet powerful
- Making it easier to find information on the Web as it develops (1995!)

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1995: The Dublin Core

Elements

1. Identifier
2. Title
3. Creator
4. Contributor
5. Publisher
6. Subject
7. Description
8. Coverage
9. Format
10. Type
11. Date
12. Relation
13. Source
14. Rights
15. Language

- “Core” set, simple enough for non-experts to understand and create
- A “library catalog card” for Web objects
- Based on consensus across domains
- Standardized:
 - IETF RFC2413 (1998), RFC5013 (2007)
 - NISO Z39.85-2001, revised 2007
 - ISO 15836:2003, revised 2009

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1996: Modular metadata

- Not: “One size fits all”
- Different ways to describe one object:
 - MARC records for library catalogs
 - Dublin Core for simpler descriptions
 - Specialized metadata for terms and conditions of use
- Recognized need for a general framework for different types of metadata

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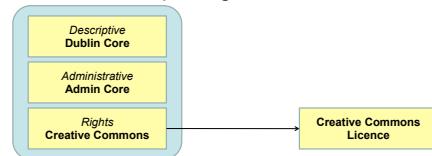
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1996: Towards metadata “frameworks”

- Warwick Framework: “packages” in “containers”



- W3C Resource Description Framework (RDF)
 - Generic, interoperable expression of metadata

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1997: Qualification to add precision

- Not just any Date, but a Date the resource was *Created*
- Not just any Subject, but a *Library of Congress Subject Heading*
- Dumb-down: ignore extra details to see just a “core” description

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2000: Application Profiles

Customized implementations

- Use “the Dublin Core” with other vocabularies
- Local rules and guidelines
- Application profile provides documentation so that others can follow
- Not “take it or leave it”, but “**take what you want, create what you need**”

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Dublin Core usage

- The Web exploded (now over a trillion pages!)
- Search engines took care of the open Web
- Dublin Core metadata came to be used widely in “controlled environments”
 - As a basic description mechanism
 - As a basic exchange format
- But never intended to be a “complete” solution

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Interoperability in the early Web

- No interoperability of **data** in the Open Web
 - Mostly pages with links for human navigation
- Controlled environments: “intra-operability” (cooperation between known partners)
 - But “intra-net” can be quite large, e.g., OAI-PMH
- Semantic Web/Linked Data intends to “open up” controlled environments (“silos”)
 - Global interoperability across silos through typed links

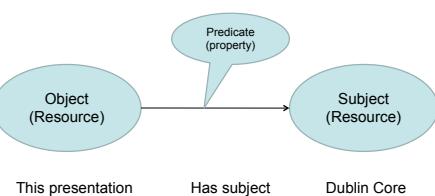
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Linked Data basic principle



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Dublin Core principles and Linked Data

- Dublin Core principles (1995-2005)
 - One-to-one (describe one and one thing only)
 - Dumb-down
 - Appropriate values
- Corresponding Linked Data design principle
 - A statement is “about” a named resource
 - Sub-property relations
 - Choice between text strings and links to other resources

Dublin Core was one of the inspirations for RDF

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Dublin Core development

- Started from a vision for the open Web (HTML)
- Came to be widely deployed in controlled environments (XML)
- Further developed since 2000 in conjunction with Semantic Web and Linked Data (RDF)
- From a “Core Metadata Element Set” for the Web to a “core vocabulary” for Linked Data

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Questions?

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 **Dublin Core® Metadata Initiative**
Making it easier to find information.
<http://dublincore.org/>

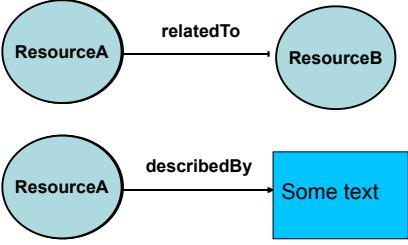
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 **RDF – a grammar for the language of data**



1. Describe resources using interrelated "statements" ("triples").
2. Use URIs – unique, globally managed identifiers – as the "words" of statements.

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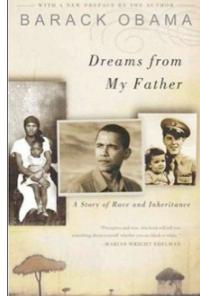
"Open World Mindset"

- “Closed” (“normal”) IT environments
 - Data sources carefully controlled.
 - Data formats “custom-defined” for an application.
- Linked data based on an “open world mindset”
 - Integrating data from the open Web
 - Systems designed to incorporate new information incrementally
 - By design, tolerance of incomplete information

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Source A: About a book by Barack Obama

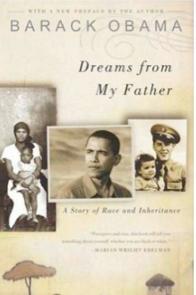


WITH A NEW PREFACE BY THE AUTHOR
BARACK OBAMA
Dreams from My Father
A Story of Race and Inheritance
“...there are times when one’s past weighs him down like a ton of bricks. But there are also times when it opens up a window of opportunity.”
MARLEY WRIGHT EOBMAN

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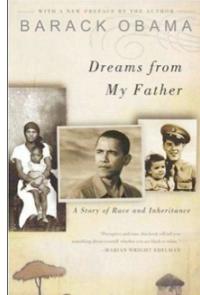
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Each bit of information about the book is expressed in the data as a **triple** – a three-part “statement”.

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http://isbn/978-14000082773	dc:title	“Dreams from My Father”
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24

Source A: About a book by Barack Obama

Each triple in the data corresponds to a link in a conceptual graph.

The book cover features a portrait of Barack Obama and his family, with the title 'Dreams from My Father' and subtitle 'A Story of Race and Inheritance'.

Each bit of information about the book is expressed in the data as a triple – a three-part “statement”.

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--	------------------------	-------------------------

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<code>http://isbn/978-14000082773</code>	<code>dct:title</code>	“Dreams from My Father”
<code>http://isbn/978-14000082773</code>	<code>x:published</code>	“2004”

27

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<code>http://isbn/978-14000082773</code>	<code>dct:creator</code>	<code>_:placeholder</code>

29

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<code>http://isbn/978-14000082773</code>	<code>dct:creator</code>	<code>_:placeholder</code>
<code>_:placeholder</code>	<code>foaf:name</code>	“Barack Obama”

30

Source A: About a book by Barack Obama

Each triple in the data corresponds to a link in a conceptual graph.

```

graph LR
    A([http://.../2773]) -- dct:title --> B["'Dreams from My Father'"]
    A -- dct:date --> C["2004"]
    A -- dct:creator --> D([_:placeholder])
    D -- foaf:name --> E["'Barack Obama'"]
  
```

Each bit of information about the book is expressed in the data as a triple – a three-part “statement”.

<code>http://.../isbn/978-14000082773</code>	<code>dct:title</code>	<code>"Dreams from My Father"</code>
<code>http://.../isbn/978-14000082773</code>	<code>x:published</code>	<code>"2004"</code>
<code>http://.../isbn/978-14000082773</code>	<code>dct:creator</code>	<code>_:placeholder</code>
<code>_:placeholder</code>	<code>foaf:name</code>	<code>"Barack Obama"</code>

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Source B: About the French translation

The French translation of the book is shown on the right.

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Source B: About the French translation

The French translation of the book is shown on the right.

`http://.../isbn/978-2258075979` `x:isTranslationOf` `http://.../isbn/978-14000082773`

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Source B: About the French translation

The French translation of the book is shown on the right.

`http://.../isbn/978-2258075979` `x:isTranslationOf` `http://.../2773`

34

Source B: About the French translation

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`http://.../isbn/978-2258075979` `x:isTranslationOf` `http://.../2773`

`http://.../isbn/978-2258075979` `x:isTranslationOf` `http://.../isbn/978-14000082773`

`http://.../isbn/978-2258075979` `dct:title` "Les rêves de mon père"

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Source B: About the French translation

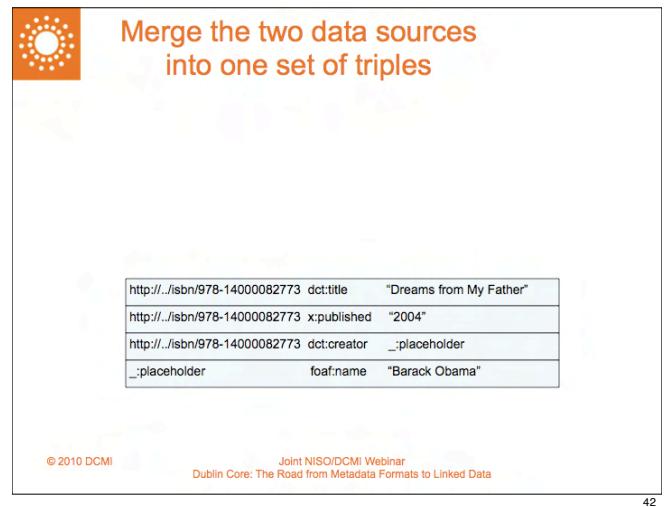
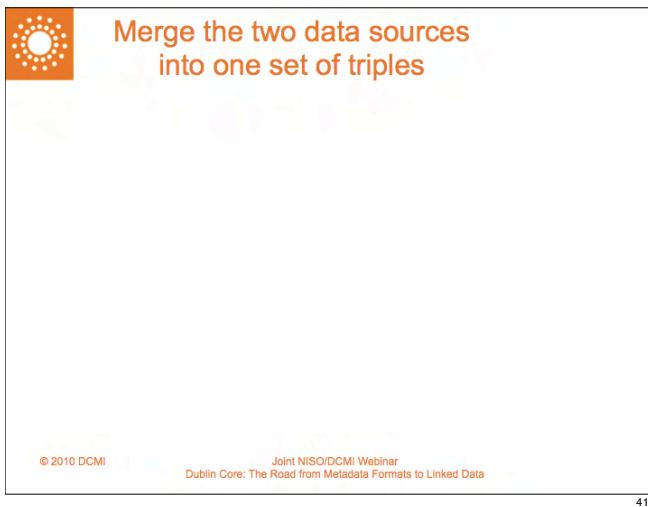
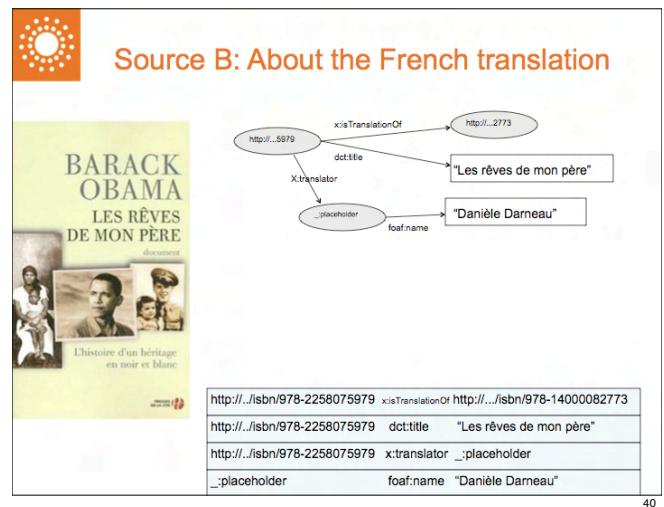
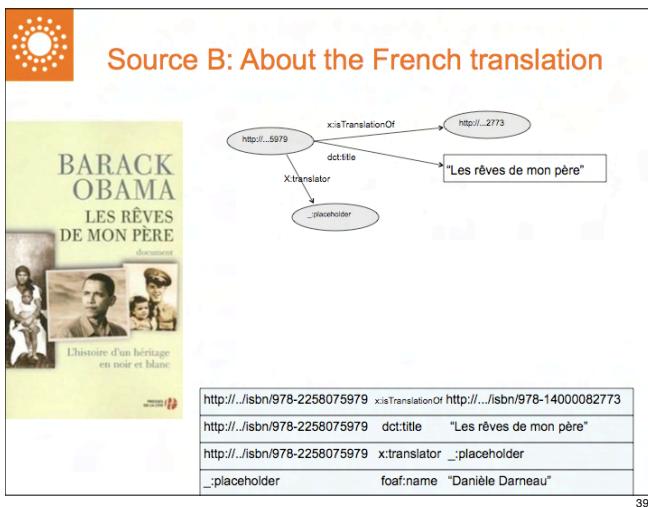
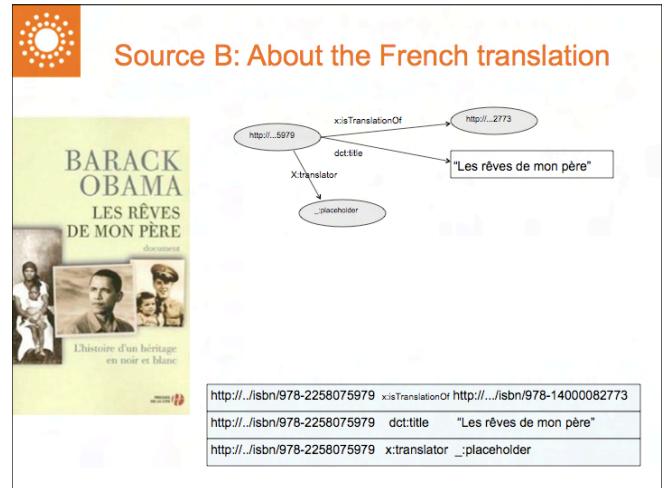
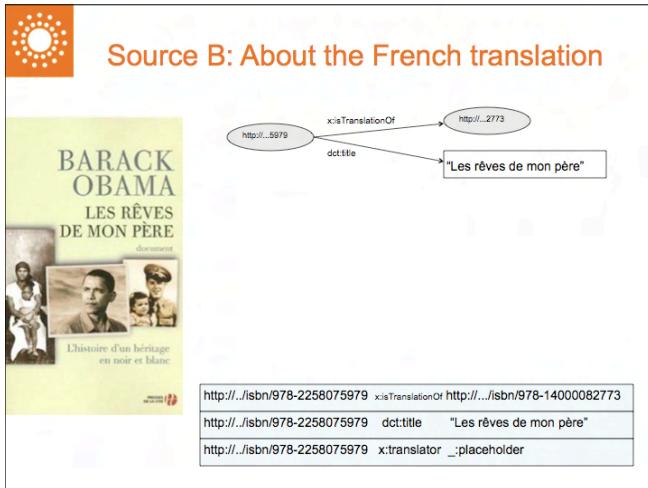
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`http://.../isbn/978-2258075979` `dct:title` "Les rêves de mon père"

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Merge the two data sources into one set of triples

http://isbn/978-2258075979	x:isTranslationOf	http://isbn/978-14000082773
http://isbn/978-2258075979	dct:title	"Les rêves de mon père"
http://isbn/978-2258075979	x:translator	_placeholder
_placeholder	foaf:name	"Danièle Darneau"
http://isbn/978-14000082773	dct:title	"Dreams from My Father"
http://isbn/978-14000082773	x:published	"2004"
http://isbn/978-14000082773	dct:creator	_placeholder
_placeholder	foaf:name	"Barack Obama"

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Software detects matching URIs...

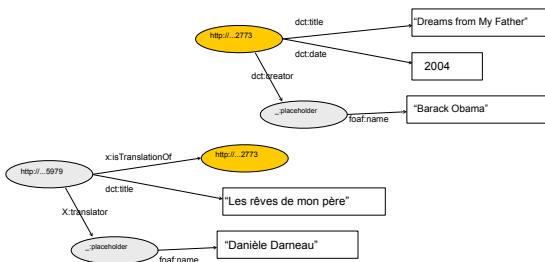
http://isbn/978-2258075979	x:isTranslationOf	http://isbn/978-14000082773
http://isbn/978-2258075979	dct:title	"Les rêves de mon père"
http://isbn/978-2258075979	x:translator	_placeholder
_placeholder	foaf:name	"Danièle Darneau"
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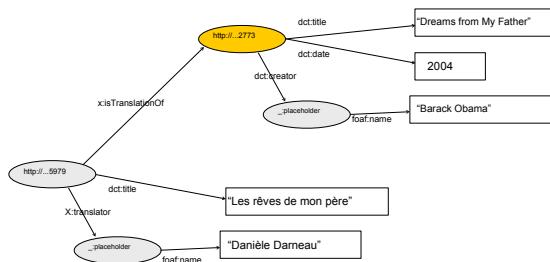
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...and merges the data



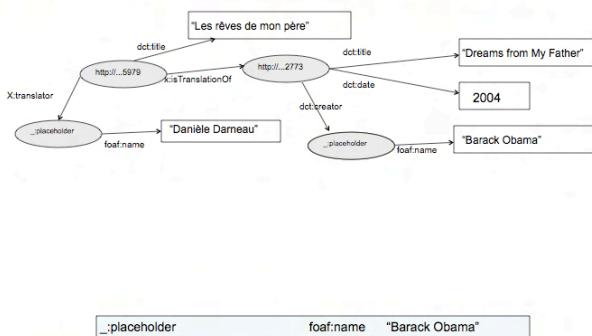
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"Enrich" the data with a DBpedia URI identifying Barack Obama...



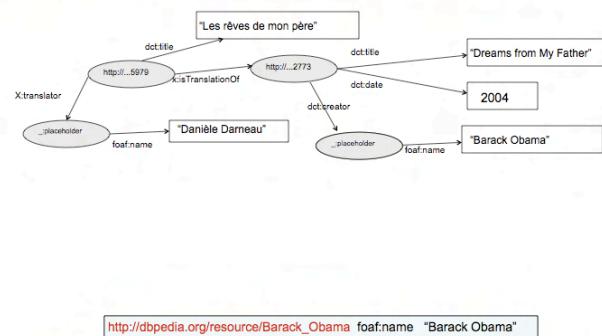
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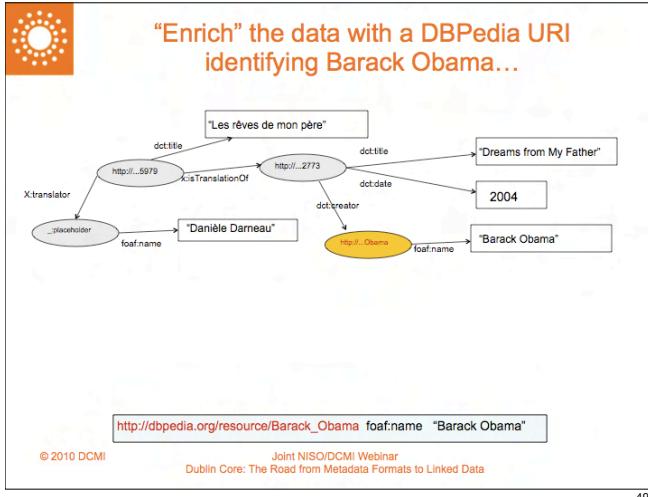
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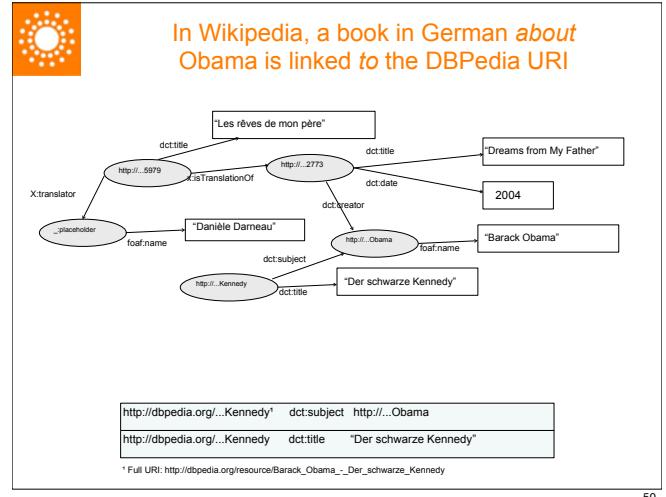
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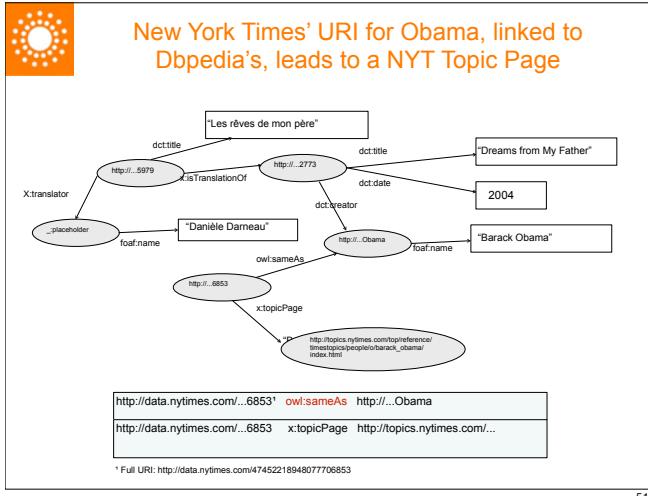
48



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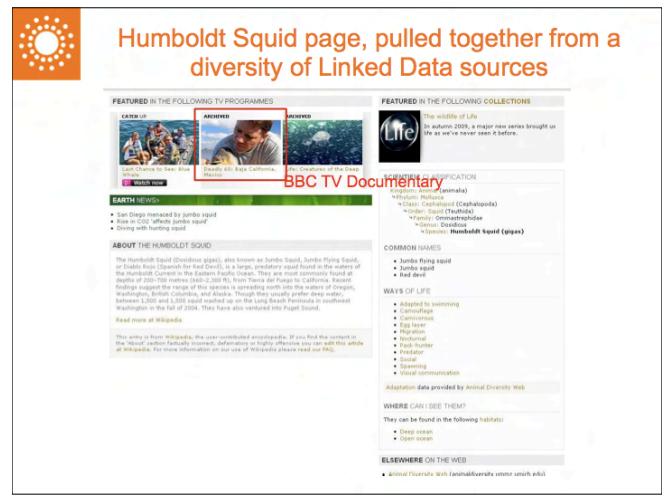
51



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Humboldt Squid page, pulled together from a diversity of Linked Data sources

FEATURED IN THE FOLLOWING TV PROGRAMMES

- CATCH UP     
- ANSWERED    
- REHIVED 

BBC TV Documentary

FEATURED IN THE FOLLOWING COLLECTIONS

- The width of Life 

COMMON NAMES

- Jumbo Flying squid
- Giant squid
- Red devil

WAYS OF LIFE

- Adapted to swimming
- Carnivorous
- Concentrates
- Egg layers
- Hop alien
- Herbivore
- Predator
- Reproductive
- Social
- Swimming
- Visual communication

Adaptation data provided by Animal Diversity Web

WHERE CAN I SEE THEM?

They can be found in the following habitats:

- Deep ocean
- Open ocean

ELSEWHERE ON THE WEB

- Animal Diversity Web (animaldiversity.universityofMichigan.edu)

ABOUT THE HUMBOLDT SQUID

The Humboldt Squid (*Douglasia gigas*), also known as Jumbo Squid, Jumbo Flying Squid, or California Flying Squid, is a large, predatory squid found in the waters of the California Current in the Eastern Pacific Ocean. They are most commonly found at depths of 200–700 metres (660–2,300 ft), from Tijuana off Baja California, Mexico, south to the Gulf of California, and up to the coast of Oregon, Washington, British Columbia, and Alaska. Though they usually prefer deep water, they have been seen as far north as the San Juan Islands off the coast of Washington, in the Puget Sound. They have also ventured into Puget Sound.

Read more at Wikipedia

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- Animal Diversity Web (animaldiversity.universityofMichigan.edu)

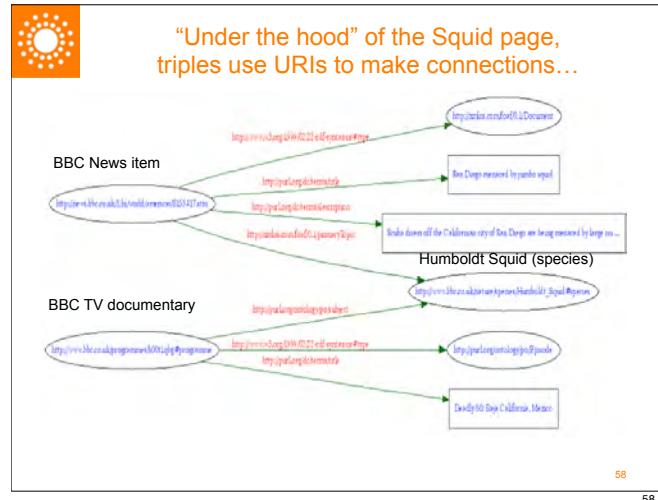
ABOUT THE HUMBOLDT SQUID

The Humboldt Squid (*Douglasia gigas*), also known as Jumbo Squid, Jumbo Flying Squid, or California Flying Squid, is a large, predatory squid found in the waters of the California Current in the Eastern Pacific Ocean. They are most commonly found at depths of 200–700 metres (660–2,300 ft), from Tijuana off Baja California, Mexico, south to the Gulf of California, and up to the coast of Oregon, Washington, British Columbia, and Alaska. Though they usually prefer deep water, they have been seen as far north as the San Juan Islands off the coast of Washington, in the Puget Sound. They have also ventured into Puget Sound.

Read more at Wikipedia

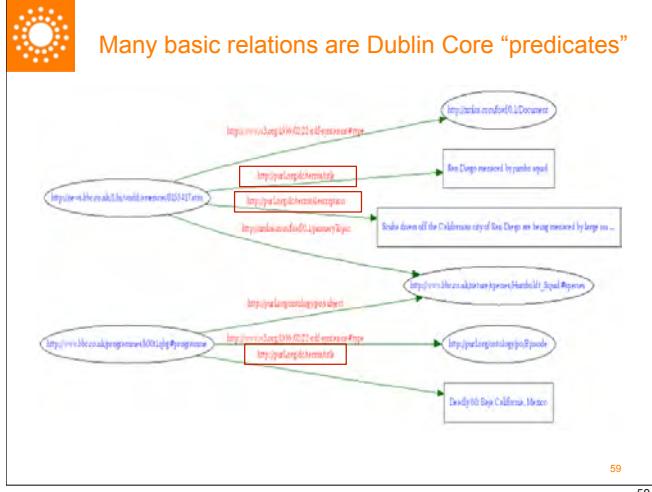
This entry is from Wikipedia, the user-contributed encyclopedia. If you find the content in the "About" section factually incorrect, defamatory or highly offensive you can edit this article at Wikipedia. For more information on our use of Wikipedia please read our FAQ.

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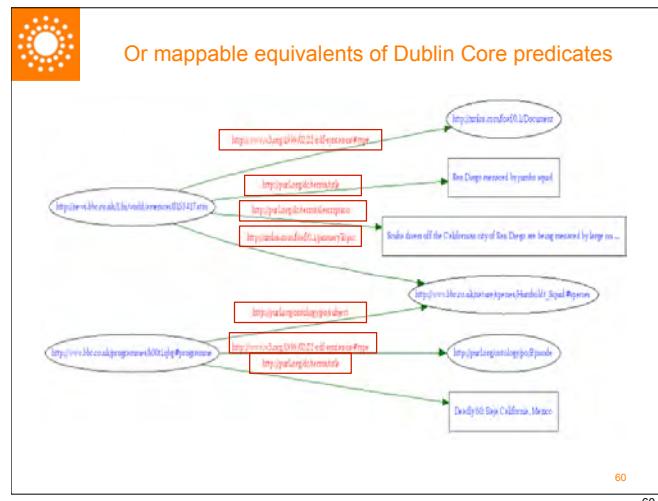
Many basic relations are Dublin Core "predicates"



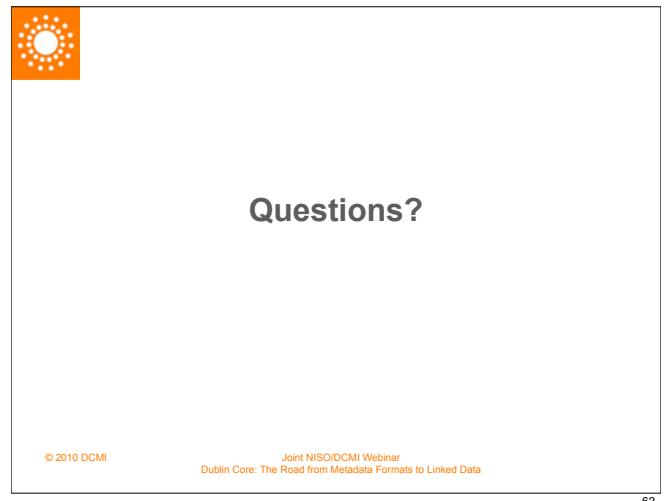
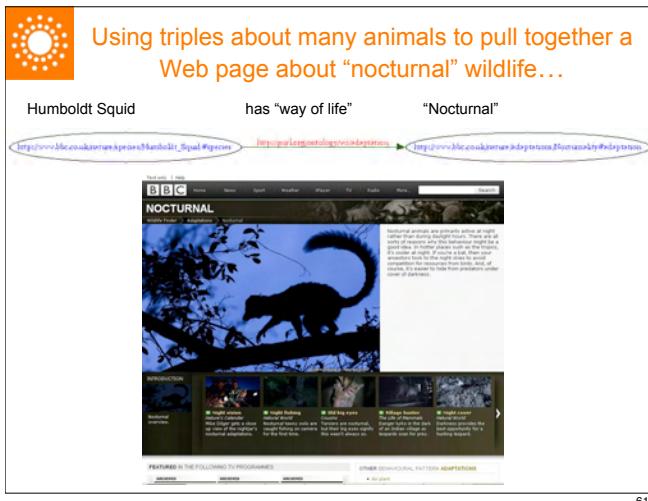
```

graph TD
    BBCNewsItem["BBC News item"] -- "http://purl.org/dc/terms/type" --> BBCTVDoc["BBC TV documentary"]
    BBCNewsItem -- "http://purl.org/dc/terms/isPartOf" --> BBCTVDoc
    BBCNewsItem -- "http://purl.org/dc/terms/subject" --> SquidSpecies["Humboldt Squid (species)"]
    BBCTVDoc -- "http://purl.org/dc/terms/type" --> SquidSpecies
    BBCTVDoc -- "http://purl.org/dc/terms/isPartOf" --> SquidSpecies
    BBCTVDoc -- "http://purl.org/dc/terms/subject" --> SquidLocation["Daddy 60 Bay California, Mexico"]
    SquidSpecies -- "http://purl.org/dc/terms/type" --> SquidLocation
    SquidSpecies -- "http://purl.org/dc/terms/isPartOf" --> SquidLocation
    SquidSpecies -- "http://purl.org/dc/terms/subject" --> SquidName["Ben Diego measured by jumbo squid"]
    SquidName -- "http://purl.org/dc/terms/type" --> SquidLocation
    SquidName -- "http://purl.org/dc/terms/isPartOf" --> SquidLocation
    SquidName -- "http://purl.org/dc/terms/subject" --> SquidDescription["Beaks down off the California city of Ben Diego are being measured by large ro..."]
    SquidDescription -- "http://purl.org/dc/terms/type" --> SquidLocation
    SquidDescription -- "http://purl.org/dc/terms/isPartOf" --> SquidLocation
    SquidDescription -- "http://purl.org/dc/terms/subject" --> SquidName
  
```

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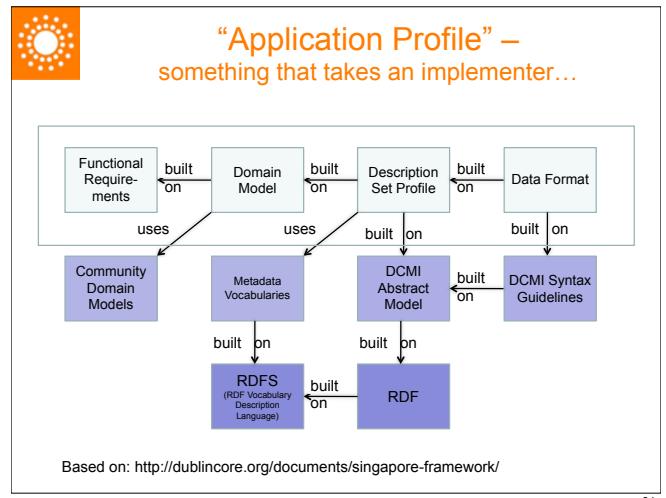
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Designing Interoperable Metadata on Linked Data Principles

Thomas Baker, Chief Information Officer, DCMI

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...from Functional Requirements and a Domain Model

```

graph TD
    FR[Functional Requirements] -- built on --> DM[Domain Model]
    DM -- built on --> DDP[Description Set Profile]
    DDP -- built on --> DF[Data Format]
  
```

What a metadata application must do

- “Support navigation between ‘versions’.”
- “Enable searching on the ‘owner’ of a collection.”

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...from Functional Requirements and a Domain Model

```

graph TD
    FR[Functional Requirements] -- built on --> DM[Domain Model]
    DM -- built on --> DDP[Description Set Profile]
    DDP -- built on --> DF[Data Format]
  
```

➤ “Support navigation between ‘versions’.”

➤ “Enable searching on the ‘owner’ of a collection.”

➤ Resources (generically)

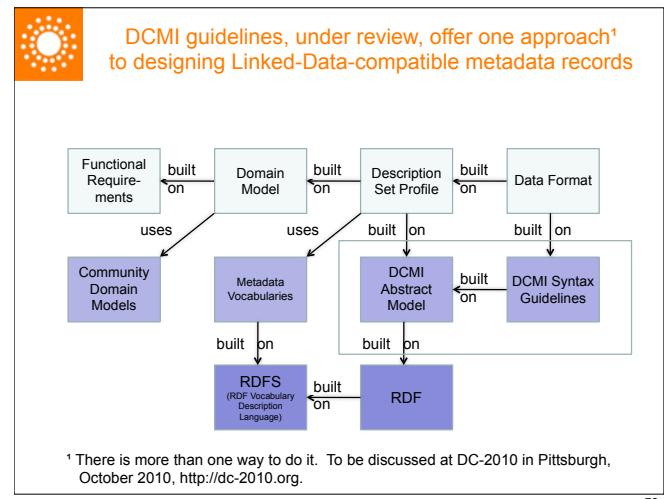
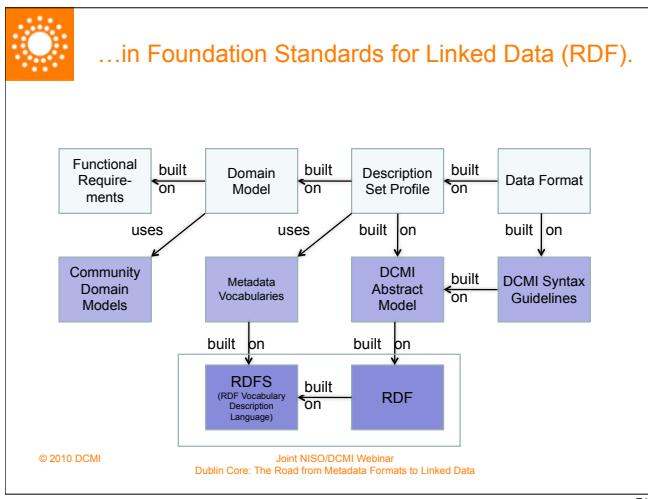
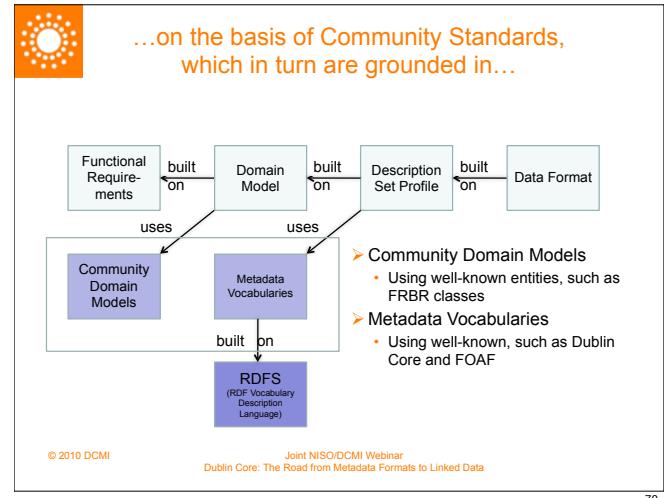
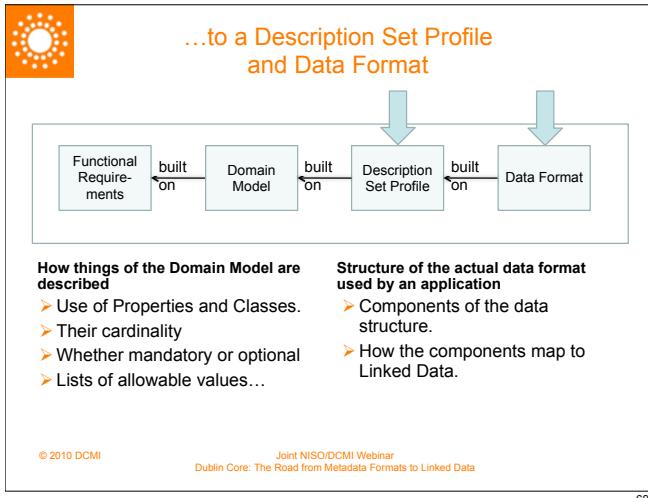
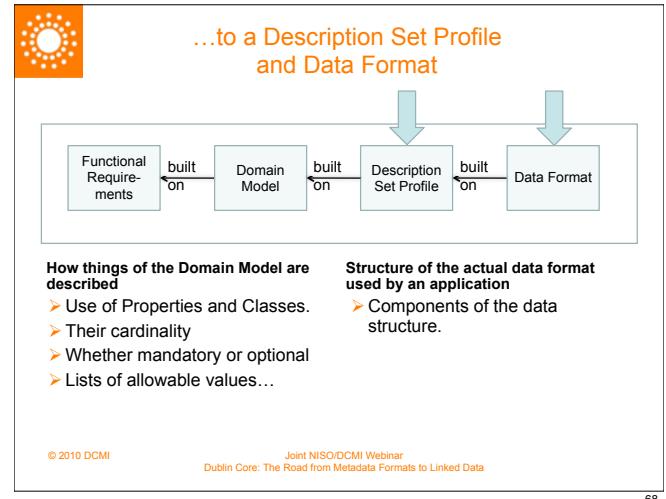
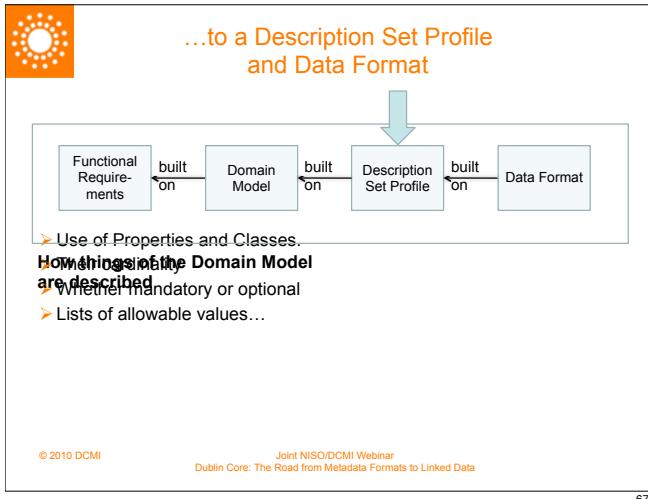
➤ Authors and Books

➤ Scholarly Works, Expressions, Manifestations, Items, Agents

- as in Functional Requirements for Bibliographic Records (FRBR)

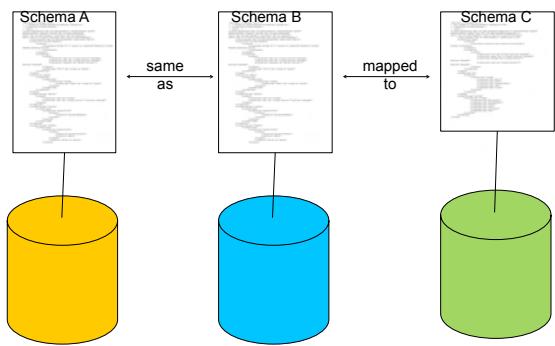
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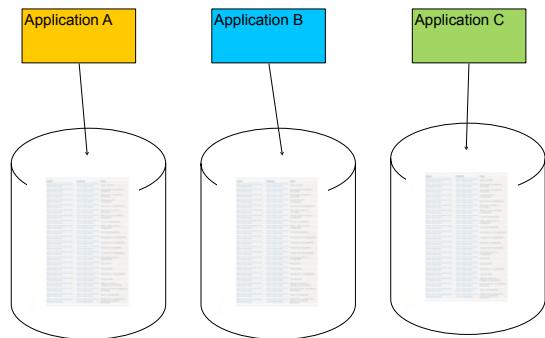
"Closed" ("normal") IT: Integrate across silos by mapping ad-hoc data structures



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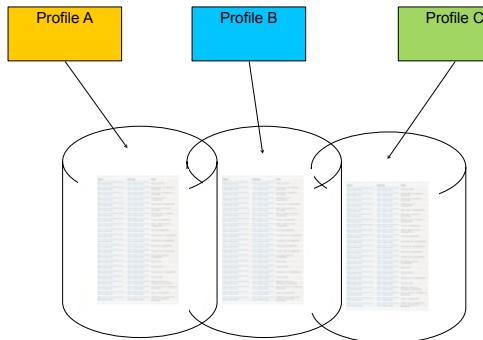
New Linked Data approach:
Diverse applications create good triples



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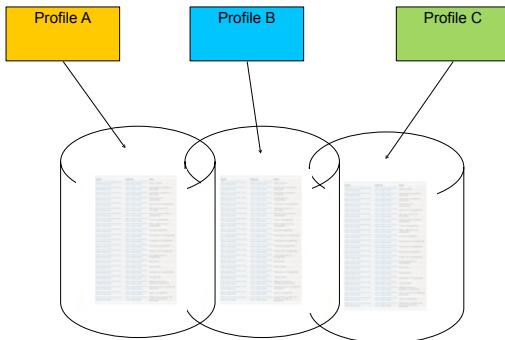
Good triples can be merged coherently



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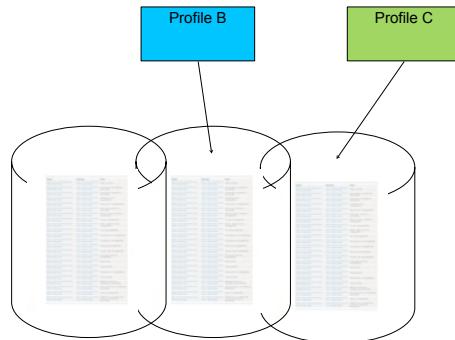
Applications come and go...



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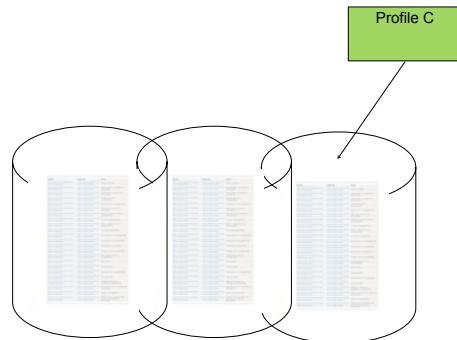
Applications come and go...



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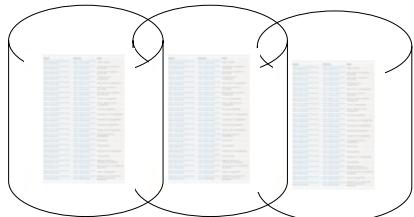
Applications come and go...



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Applications come and go...



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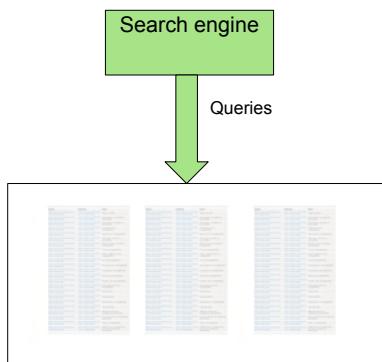
The data remains



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Good triples, based on known vocabularies such as Dublin Core, make data “self-descriptive”



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Questions?

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Bridging the Gap to the Linked Data Cloud

Mark Dekkers, Managing Director and CEO, DCMI

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This is **not** about starting all over

- A lot of metadata already exists
 - Formal collections: libraries, enterprise data
 - Embedded descriptions (e.g., captions, tags)
- A lot of metadata is being produced now, manually and automatically
 - Catalogue data, product descriptions
 - Device-generated data
- Linked Data to leverage what is already there

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Metadata is where the meaning is

- Metadata adds meaning to resources
- Specific statements about specific data
- No Linked Data without meaning
- Technology is a tool not the goal
 - Linked data technology may (will) change
 - The meaning of data is anchored in the real world
 - Any implementation will need to allow evolution

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How open is open?

- “Open World” assumption does **not** mean all data must be available without restrictions
- Private data will have to remain private
 - Personal information, commercial secrets
- Linked Open Data vs. Linked Enterprise Data
 - Both types of implementation are useful
- Open paradigm allows data to be shared more easily if and when necessary

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Convert or expose?

- Existing metadata approaches are based on business needs and will therefore live on
- Consider future needs for flexibility and sharing
- There is a choice:
 - Create RDF from existing database format and expose (e.g., for harvesting, get better ranking)
 - Migrate database to triple store with emerging tools (maximum flexibility in return for investment)

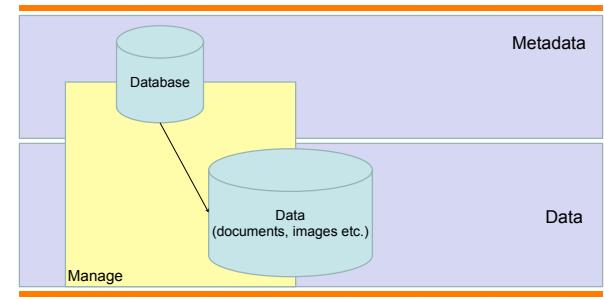
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Migration path



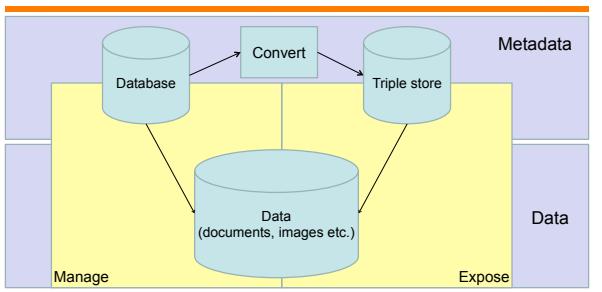
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Migration path



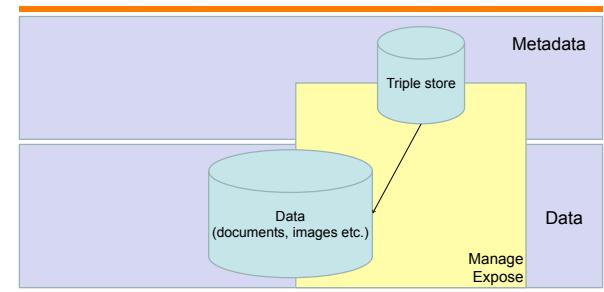
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Migration path



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Using Linked Data vocabularies

- Linked Data provides enormous flexibility
- A choice to be made:
 - Define your own vocabulary
 - Use existing (“standard”) vocabularies
- Using trusted vocabularies reduces complexity for interoperability
- Well-known vocabularies:
 - Dublin Core, Good Relations, FOAF, SKOS

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DCMI trusted operational principles

- Development and maintenance of the Dublin Core vocabulary, “DCMI Terms”
 - Open consensus building
 - International scope and participation
 - Neutrality of purposes and business models
 - Neutrality of technology
 - Cross-disciplinary focus
- Unrestricted use of specifications and guidelines

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DC-2010

- Tenth International Conference on Dublin Core and Metadata Applications
 - Pittsburgh Hilton, 20-22 October 2010
- Sessions and presentations on:
 - Modularity, migration, models, communities
 - Practical examples, tools, knowledge management
 - ... and a lot of Linked Data
- <http://dc-2010.org/>

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Questions

All questions will be posted with presenter answers on the NISO website following the webinar:

www.niso.org/news/events/2010/dublincore

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