

Encoding DC in HTML, XML and RDF

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About me...

- Andy Powell
- UKOLN, University of Bath, UK
 - UKOLN is a 'centre of expertise in digital information management for the UK'
- member of the DC Usage Board
- chair of the DC Architecture Working Group

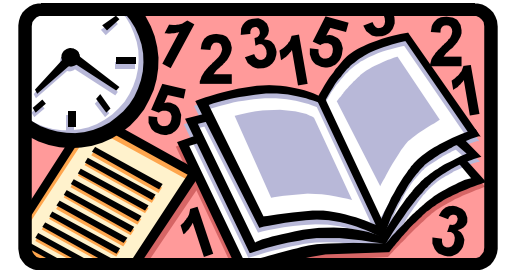
About you...

- How many of you are librarians?
- How many of you are software developers (computer programmers)
- How many of you have created a Dublin Core description in HTML (or XML or RDF/XML)?



Contents

- an abstract model for DC (30 mins)
- encoding DC in XHTML (15 mins)
- encoding DC in XML (15 mins)
- encoding DC in RDF/XML (5 mins)
- practical examples
 - OAI Protocol for Metadata Harvesting and RSS (20 mins)



Important DCMI documents...

- **DCMI Abstract Model**
<http://dublincore.org/documents/abstract-model/>
- **Expressing Dublin Core in HTML/XHTML meta and link elements**
<http://dublincore.org/documents/dcq-html/>
- **Guidelines for implementing Dublin Core in XML**
<http://dublincore.org/documents/dc-xml-guidelines/>
- **Expressing Simple Dublin Core in RDF/XML**
<http://dublincore.org/documents/dcmes-xml/>
- **Expressing Qualified Dublin Core in RDF/XML**
<http://dublincore.org/documents/dcq-rdf-xml/>
- **Namespace Policy for the DCMI**
<http://dublincore.org/documents/dcmi-namespace/>
- **DCMI Metadata Terms**
<http://dublincore.org/documents/dcmi-terms/>



Implementing DC

- this tutorial is about the mechanics of implementing DC in HTML, XML and RDF
- it doesn't really consider which implementation strategy is the best!
- ask yourself two questions...
 - what am I trying to achieve?
 - does using HTML, XML or RDF help me achieve it?
- do software and services exist that will support the creation and use of my metadata?



DCMI abstract model



Why an abstract model?

- the first part of this tutorial isn't going to show any syntax!
- why?
- because before we start creating DCMI descriptions we need to understand what kinds of things we want to be able to say about 'resources'
- known as the **DCMI abstract model**
- note: a very simplified view of the model is presented here



What is a resource?

- W3C/IETF definition of resource is



“...anything that has identity. Familiar examples include an electronic document, an image, a service (e.g., "today's weather report for Los Angeles"), and a collection of other *resources*. Not all *resources* are network "retrievable"; e.g., human beings, corporations, and bound books in a library can also be considered *resources*.”

- i.e. a *resource* is “anything”
 - physical things (books, cars, people)
 - digital things (Web pages, digital images)
 - conceptual things (colours, points in time, subjects)



DC and resources

- but... this seems to be too wide for the things we can describe with DC!
 - can we really describe people using DC?
 - do people have titles and subjects?
- no... in general we only use DC to describe a sub-set of all *resources*
- anything covered by the DCMIType list...
 - Collection, Dataset, Event, Image (Still or Moving), Interactive Resource, Service, Software, Sound, Text, Physical Object



DCMI abstract model

- a *description* is made up of
 - one or more *statements* (about one, and only one, *resource*) and
 - optionally, the URI of the *resource* being described (*resource URI*)
- each *statement* is made up of
 - a *property URI* (that identifies a *property*)
 - a *value URI* (that identifies a *value*) and/or one or more representations of the *value* (*value representations*)



Value strings

- each *value representation* may take the form of a *value string*, a *rich value* or a *related description*
- note: not going to discuss *rich values* and *related descriptions* in this tutorial
- each *value string* is a simple, human-readable string that represents the *resource* that is the *value* of the *property*
- each *value string* may have an associated *value string language* that is an ISO language tag (e.g. en-GB)



Elements and refinements

- within DCMI, we often use the phrases ‘element’ and ‘element refinement’
- an ‘element’ is just another word for a *property*
- an ‘element refinement’ is a special kind of *property* (a *sub-property*) that shares some meaning with one other *property* but has narrower semantics
 - e.g. if “Ben is the **illustrator** of a Book” then it is also true to say that “Ben is a **contributor** to the Book”

property →

← sub-property



Encoding schemes

- *values* and *value strings* can be ‘qualified’ by using *encoding schemes*
- a *vocabulary encoding scheme* is used to indicate the class of the *value*
 - e.g. the *value* is taken from LCSH
- a *syntax encoding scheme* is used to indicate how the *value string* is structured
 - e.g. the *value string* is a date structured according to the W3CDTF rules (“2004-10-12”)



The 1:1 principle

- notice that the model indicates that each *description* describes one, and only one, *resource*
- this is commonly referred to as the 1:1 principle
- however...

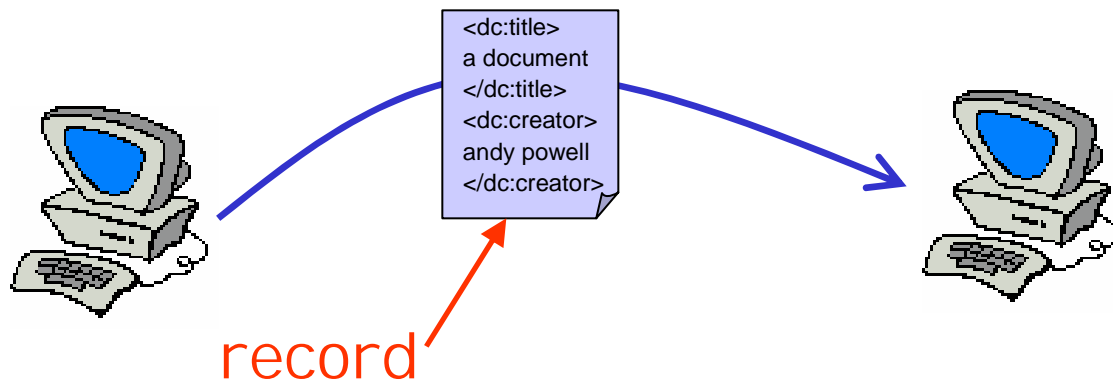
Description sets

- real-world metadata applications tend to be based on loosely grouped sets of *descriptions* (where the described *resources* are typically related in some way)
- known in the abstract model as *description sets*
- for example, a *description set* might comprise *descriptions* of both a painting and the artist



Records

- *description sets* are instantiated, for the purposes of exchange between software applications, in the form of metadata *records*
- each *record* conforms to one of the DCMI encoding guidelines (XHTML meta tags, XML, RDF/XML, etc.)



Simple vs. qualified DC?

- within DCMI, we often use the phrases “simple DC” and “qualified DC”
- “simple DC” only supports a single description using the 15 DCMES elements with *value strings*
- “qualified DC” supports all the features of the abstract model, and allows the use of all DCMI terms as well as other, non-DCMI, terms

note that not everyone agrees with my definitions!



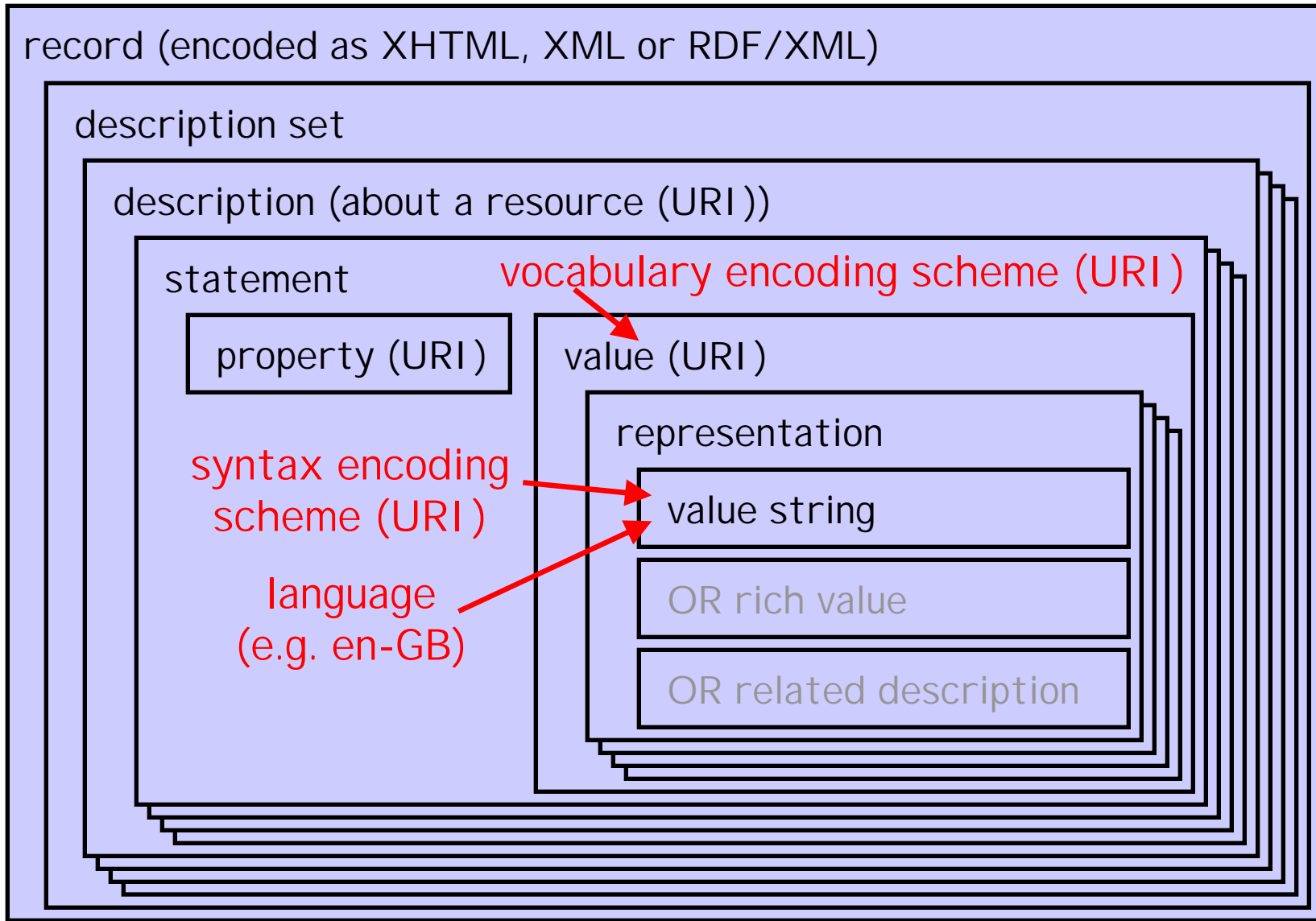
Dumb-down

- the process of translating qualified DC into simple DC is normally referred to as 'dumbing-down'

	element	value
uninformed	ignore any <i>property</i> that isn't in the Dublin Core Metadata Element Set	use <i>value URI</i> (if present) or <i>value string</i> as new <i>value string</i>
informed	recursively resolve sub-property relationships until one of the 15 properties in the DCMES is reached, otherwise ignore	use knowledge of <i>rich values</i> , <i>related descriptions</i> or the <i>value string</i> and the <i>syntax encoding scheme</i> to create a new <i>value string</i>



Model summary



Encoding DC in XHTML (and HTML!)



What is being described?

- a DC description embedded in an (X)HTML document describes that document
- if you want to describe something else, don't embed it in the (X)HTML document!



...not everyone would agree with this...



The basics

- the DC description is embedded into the <head> section of the (X)HTML document

```
<html >  
<head>  
...DC descri pti on goes here...  
</head>  
<body>  
...
```



DCMES elements

- use the 'name' and 'content' attributes of the XHTML <meta> element to encode the DC element (one of the 15 DCMES elements) and its *value string*. Use the following pattern:

```
<meta name="DC. element" content="Value string" />
```

- for example:

```
<meta name="DC.date" content="2001-07-18" />
```



...the element names of the 15 DCMES elements always have a lower-case first letter...



Value strings

- *value strings* go in the XHTML `<meta>` element 'content' attribute...
- the string in the 'content' attribute is defined to be CDATA, i.e. a sequence of characters from the document character set which may include character entities

...long value strings may be wrapped across multiple lines as necessary...



...will need to escape some characters, `&`, `<`, `>`, etc...



Value string language

- where the language of the *value string* is indicated, it should be encoded using the 'xml : l ang' attribute of the XHTML <meta> element. For example:

```
<meta name="DC. subject" xml : l ang="en"  
content="seafood" />
```

```
<meta name="DC. subject" xml : l ang="fr"  
content="fruits de mer" />
```



Repeated elements

- multiple property values should be encoded by repeating the XHTML `<meta>` element for that property, for example:

```
<meta name="DC. title" content="First title" />  
<meta name="DC. title" content="Second title" />
```



Other DC elements

- DC also has elements that are not part of the DCMES (the original 15), e.g. Audience
- use the same pattern but with a 'DCTERMS' prefix:

```
<meta name="DCTERMS. element" content="Value" />
```

- for example:

```
<meta name="DCTERMS. audience" content="software  
devel opers" />
```



...element names may be mixed-case but should always have a lower-case first letter...



Element refinements

- use the same pattern for element refinements:

```
<meta name="DCTERMS. elementRefinement"  
      content="Value" />
```

- for example:

```
<meta name="DCTERMS. modified"  
      content="2001-07-18" />
```



Encoding schemes

- encoding schemes are encoded using the 'scheme' attribute of the XHTML <meta> element, using the following pattern:

```
<meta name="DC. element"  
      scheme="DCTERMS. Scheme"  
      content="Value" />
```

- for example:

```
<meta name="DC. date"  
      scheme="DCTERMS. W3CDTF"  
      content="2001-07-18" />
```



The case of names

- *elements, element refinements and encoding schemes* should use the names specified in

DCMI Metadata Terms

<http://dublincore.org/documents/dcmi-terms/>



The case of names (2)

- element and element refinement names may be mixed-case but should always have a lower-case first letter
- encoding scheme names may be mixed-case but should always start with an upper-case letter

```
<meta name="DCTERMS. temporal "  
scheme="DCTERMS. Period" content="name=The  
Great Depression; start=1929; end=1939;" />
```



Handling namespaces...

- the 'DC.' and 'DCTERMS.' prefixes are used to indicate the namespace from which the property is taken
- put the namespace URI in an XHTML <link> element:

```
<link rel="schema.DC"  
href="http://purl.org/dc/elements/1.1/" />  
<link rel="schema.DCTERMS"  
href="http://purl.org/dc/terms/" />
```

- while any string is allowable as the prefix, current practice is to use 'DC.' and 'DCTERMS.'



Value URIs

- where the value of a property is the URI of another resource (e.g. DC.relation) an alternative form of encoding using the XHTML `<link>` element is preferred. Use the following pattern:

```
<link rel="propertyName" href="valueURI" />
```

- for example:

```
<link rel="DC.relation"  
href="http://www.example.org/" />
```

```
<link rel="DCTERMS.references"  
href="http://www.example.org/176459.pdf" />
```



Mixing DC and non-DC

- DC metadata can be mixed with non-DC metadata in XHTML `<meta>` elements
- the following example embeds DC, AGLS and unspecified metadata properties in the same XHTML Web page:

```
<link rel="schema.DC"
href="http://purl.org/dc/elements/1.1/" />
<link rel="schema.AGLS"
href="http://www.naa.gov.au/recordkeeping/gov_online/agls/1.2" />
<meta name="DC.title" content="Services to
Government" />
<meta name="keywords" content="archives,
information management, public administration" />
<meta name="AGLS.Function" scheme="AGIFT"
content="recordkeeping standards" />
```



A couple of examples

- Simple DC

[example 1](#)

- Qualified DC

[example 2](#)

- [ScreenCam](#) of using DC-dot

<http://www.ukoln.ac.uk/metadata/dcdot/>



Encoding DC in XML



Properties and values

- encode *properties* as XML elements and *value strings* as the content of those elements
- the name of the XML element should be an XML qualified name (QName) of the property

```
<dc: title>Dubl i n Core i n XML</dc: ti tle>
```

- do not use constructs like

```
<dc: ti tle val ue="Dubl i n Core i n XML" />
```



DCMES property names

- the *property* names for the 15 DCMES elements should be all lower-case

<dc: ti t l e>Dubl i n Core i n XML</dc: ti t l e>

- do **not** use

<dc: Ti t l e>Dubl i n Core i n XML</dc: Ti t l e>



Repeating properties

- multiple *value strings* should be encoded by repeating the XML element for that *property*

```
<dc: ti t l e>Fi rst  ti t l e</dc: ti t l e>  
<dc: ti t l e>Seco nd  ti t l e</dc: ti t l e>
```



Value string language

- where the language of the *value* is indicated, it should be encoded using the 'xml : lang' attribute

```
<dc: subject xml : lang="en" >  
  seafood  
</dc: subject >  
<dc: subject xml : lang="fr" >  
  fruits de mer  
</dc: subject >
```



Container elements



- note that it is anticipated that *records* will be encoded within one or more container XML element(s) of some kind
- this tutorial makes no recommendations for the name of any container element, nor for the namespace that the element should be taken from
- candidate container element names include `<dc>`, `<dublinCore>`, `<resource>`, `<record>` and `<metadata>`



Simple DC example

- [example 3](#)



Element refinements

- *element refinements* should be treated in the same way as other *properties*
- for example:

```
<dcterms: available>2002-06</dcterms: available>
```

- do not use any of the following:

```
<dc: date refinement="available" >  
2002-06</dc: date>
```

```
<dc: date type="available" >2002-06</dc: date>
```

```
<dc: date>
```

```
  <dcterms: available>2002-06
```

```
  </dcterms: available>
```

```
</dc: date>
```



Encoding schemes

- *encoding schemes* should be implemented using the 'xsi : type' attribute of the XML element for the *property*
- the name of the encoding scheme should be given as the attribute value, and should be in the form of an XML qualified name (QName):

```
<dc: i denti fi er xsi : type="dcterms: URI ">  
  http: //www. ukol n. ac. uk/  
</dc: i denti fi er>
```



The case of names

- *elements, element refinements* and *encoding schemes* should use the names specified in

DCMI Metadata Terms

<http://dublincore.org/documents/dcmi-terms/>

...note, the 15 DCMES element names all start with a lowercase letter...



Some examples

- Qualified DC

[example 4](#)

- DC and IEEE LOM

[example 5](#)

- DC, IMS and ODRL

[example 6](#)

HEALTH WARNING
Examples 5 and 6 may
seriously damage your
interoperability!



Encoding DC in RDF



What is RDF?

- Resource Description Framework
- W3C recommendation for metadata
- model and syntax(es)
- RDF is commonly encoded as XML for use on the Web
- underpins the 'semantic Web'

W3C - Resource Description Framework (RDF)

<http://www.w3.org/RDF/>



Why use RDF?

- RDF provides shared metadata 'model' ...
- ...shared 'meaning'
- metadata can be shared between applications that have little or no knowledge about each other
- e.g. an RDF-based bibliographic application can consume RDF-based geospatial metadata and have 'some' knowledge of what it means



...with (X)HTML and XML encodings, software applications must have 'understanding' hard-coded into them...



DC in RDF

- DC abstract model maps easily onto the RDF model (because RDF was the basis for it!)
- DC in RDF/XML syntax is an encoding of the RDF model in XML
- simple DC is similar to the non-RDF XML we've seen already...
- ...but with the addition of `<rdf: RDF>` and `<rdf: Description>` container elements
- [example 7](#)
- qualified DC is too complex to cover here!



Practical examples – OAI and RSS



OAI-PMH

- OAI Protocol for Metadata Harvesting
- simple protocol for sharing metadata records between applications
- currently at version 2.0
- based on HTTP, XML, XML Schema and XML namespaces
- allows a harvester to ask a remote repository for some or all of its metadata records



OAI-PMH (2)

- simple DC is default (mandatory) record format
- supports any record format provided it can be encoded using XML (e.g. DC, IEEE LOM, MARC, ODRL, ...)

Open Archives Initiative

<http://www.openarchives.org/>



OAI-PMH example

- record from the American Memory repository at the Library of Congress

`http://memory.loc.gov/cgi-bin/oai2_0`

- [example 8](#)
- [ScreenCam](#) of using the '[repository explorer](#)'
- GetRecord for record identifier

`oai:loca1.loc.gov:loc.gmd/g3701p.rr003570`



RSS

- RDF Site Summary or Rich Site Summary (or even Really Simple Syndication)
- at least 3 different versions (0.91, 1.0 and 2.0)
- all based on XML but not compatible
- simple format for sharing news feeds on the Web
- RSS 'channel' – list of 'items'
- channels updated by updating XML file
- RSS clients gather XML on regular basis



RSS 1.0 and DC example

- RSS 1.0 based on RDF
- most flexible and extensible of the RSS 'family' - not necessarily the most widely deployed
- can include DC in both 'channel' and 'item' descriptions
- [example 9](#)
- full documentation at:

RDF Site Summary 1.0 Modules: Qualified Dublin Core

<http://web.resource.org/rss/1.0/modules/dcterms/>



What have we learned?

- an abstract model for DC
- encoding DC in XHTML
- encoding DC in XML
- encoding DC in RDF/XML
- two practical examples
 - OAI Protocol for Metadata Harvesting
 - RSS



Questions?

