Encoding DC in HTML, XML and RDF

Tutorial 1: Basic Sintax at DC-2005, Madrid
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About me…

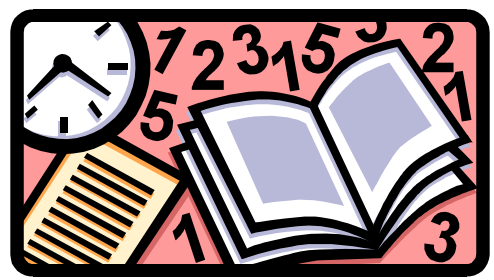
- Andy Powell
- UKOLN, University of Bath, UK
  - UKOLN is a ‘centre of expertise in digital information management for the UK’
- member of the DC Usage Board
- chair of the DC Architecture Working Group

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)?

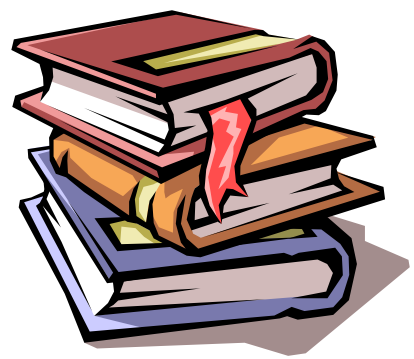
Contents

- 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”

sub-property

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

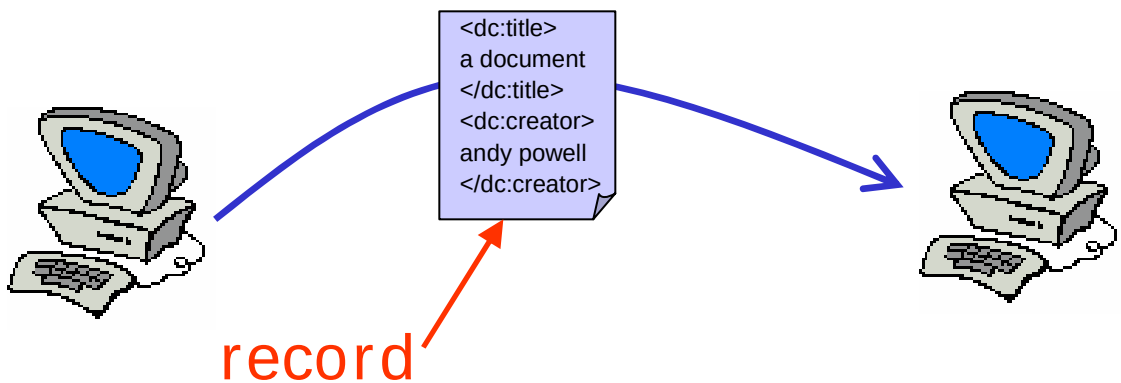
- notice that the model indicates that each *description* describes one, and only one, *resource*
- this is commonly referred to as the 1:1 principle
- however…

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

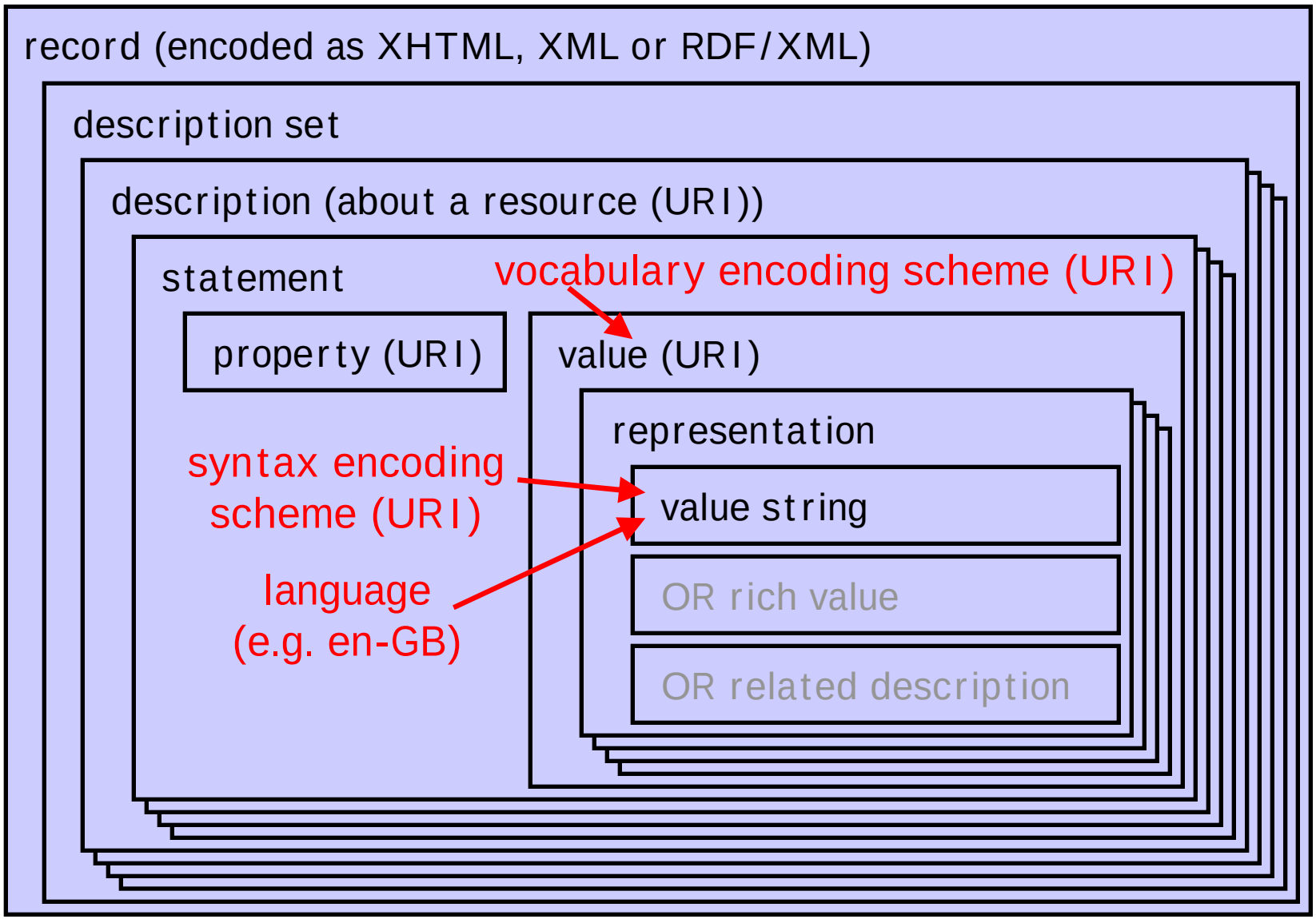
note that not everyone agrees with my definitions!

Dumb-down

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

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

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 description 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:lang`' attribute of the XHTML `<meta>` element. For example:

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

…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_onl
ine/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>Dublin Core in XML</dc:title>
```

- do not use constructs like

```
<dc:title value="Dublin Core in XML" />
```

DCMES property names

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

```
<dc:title>Dublin Core in XML</dc:title>
```

- do **not** use

```
<dc:Title>Dublin Core in XML</dc:Title>
```

Repeating properties

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

```
<dc:title>First title</dc:title>
<dc:title>Second title</dc:title>
```

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

- e*lement 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:identifier xsi:type="dcterms:URI">
  http://www.ukoln.ac.uk/
</dc:identifier>
```

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

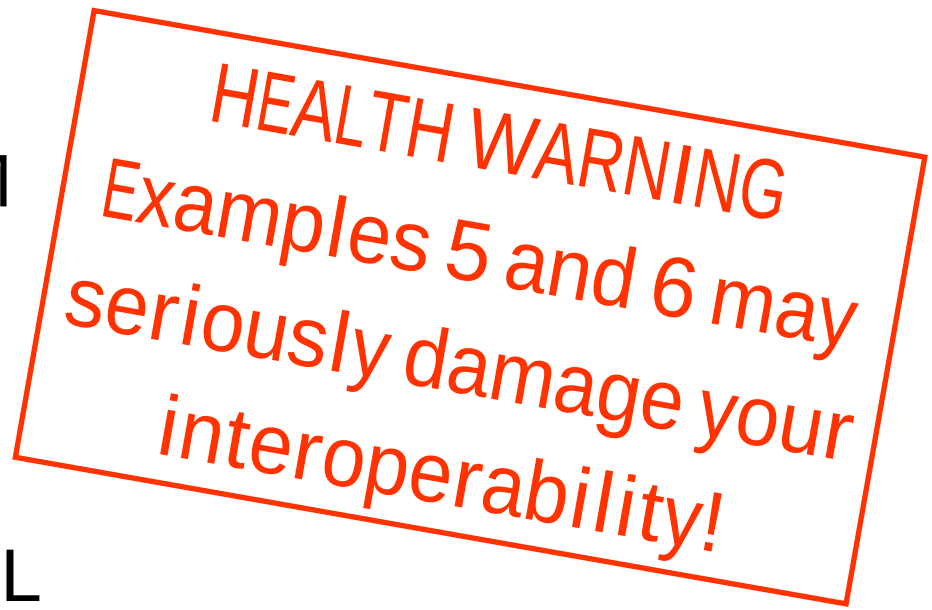
  example 4

- DC and IEEE LOM

  example 5

- DC, IMS and ODRL

  example 6



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:lcoa1.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?