Metadata Standards and Applications

4. Metadata Syntaxes and Containers

Goals of Session

- Understand the origin of and differences between the various syntaxes used for encoding information, including HTML, XML and RDF
- Discover how container formats are used for managing digital resources and their metadata

Overview of Syntaxes

- HTML, XHTML: Hypertext Markup Language; eXtensible Hypertext Markup Language
- XML: Extensible Markup Language
- RDF: Resource Description Framework

HTML

- HyperText Markup Language
- HTML 4 is the current standard
- HTML is an SGML (Standard Generalized Markup Language) application conforming to International Standard ISO 8879
- Widely regarded as the standard publishing language of the World Wide Web
- HTML addressed the problem of SGML complexity by specifying a small set of structural and semantic tags suitable for authoring relatively simple documents

XHTML

- XML-ized version of HTML 4.0, tightens up HTML to match XML syntax
  - Requires ending tags, quoted attributes, lower case, etc., to conform to XML requirements
- XHTML is a W3C specification, redefining HTML as an XML implementation, rather than an SGML implementation
- Imposes requirements that are intended to lead to more well-formed, valid XML, easier for browsers to handle

An XHTML Example

```
<link rel="schema.DC" href="http://purl.org/dc/elements/1.1/" />
<link rel="schema.DCTERMS" href="http://purl.org/dc/terms/" />
<meta name="DC.title" content="Using Dublin Core" />
<meta name="DC.creator" content="Diane Hillmann" />
<meta name="DC.subject" content="documents; Bibliography; Model; meta; Glossary; mark; matching;
refinements; XHTML; Controlled; Qualifiers; Hillmann; mixing; encoding; Diane; Issues; Appendix; elements;
Simple; Special; element; trademark/service; DCMI; Dublin; pages; Section; Resource; Grammatical; Qualified;
XML; Using; Principles; Documents; licensing; OCLC; formal; Usageguide; Roles; Implementing; Contents;
Guidelines; Expressing; Table; Syntax; Content; Element; DC.dot; Home; document; Metadata; RDF/XML; Website;
metadata; privacy; schemes; liability; profiles; Elements; Copyright; Localization; schemas; HTML/XHTML; Core;
Guide; registry; Research; contact; Scope; Projects; languages; Maintenance; Application; available;
Internationalization; HTML; Recommended; link; Purpose; Abstract; AskDCMI; Vocabularies; software; Storage;
Introduction" />
<meta name="DC.description" content="This document is intended as an entry point for users of Dublin Core. For
non-specialists, it will assist them in creating simple descriptive records for information resources (for example,
electronic documents). Specialists may find the document a useful point of reference to the documentation of
Dublin Core, as it changes and grows." />
<meta name="DC.publisher" content="Dublin Core Metadata Initiative" />
<meta name="DC.type" scheme="DCTERMS.DCMIType" content="Text" />
<meta name="DC.format" content="text/html" />
<meta name="DC.format" content="31250 bytes" />
<meta name="DC.identifier" scheme="DCTERMS.URI" content="http://dublincore.org/documents/usageguide/" />
```

XML

- Extensible Markup Language
- A '*metamarkup' language*: has no fixed tags or elements
- Strict grammar imposes structure designed to be read by machines
- Two levels of conformance:
  - well-formed--conforms to general grammar rules
  - valid--conforms to particular XML schema or DTD (document type definition)

XML is the *lingua franca* of the Web

- Web pages increasingly use at least XHTML
- Business use for data exchange/messaging
- Family of technologies can be leveraged
  - XML Schema, XSLT, XPath, and Xquery
- Software tools widely available (many open source)
  - Storage, editing, parsing, validating, transforming and publishing XML
- Microsoft Office 2003 supports XML as document format (WordML and ExcelML)
- Web 2.0 applications are based on XML

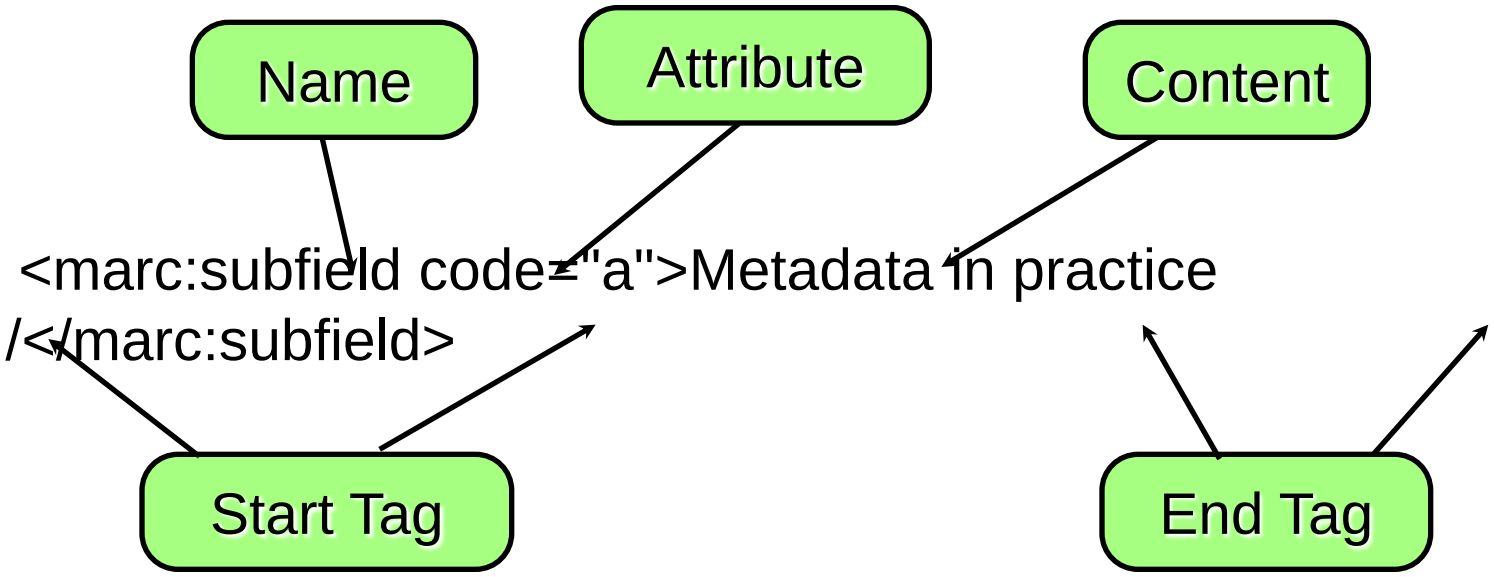
An XML Schema May Define:

- What elements may be used
- Of which types
- Any attributes
- In which order
- Optional or compulsory
- Repeatability
- Sub-elements
- Logic

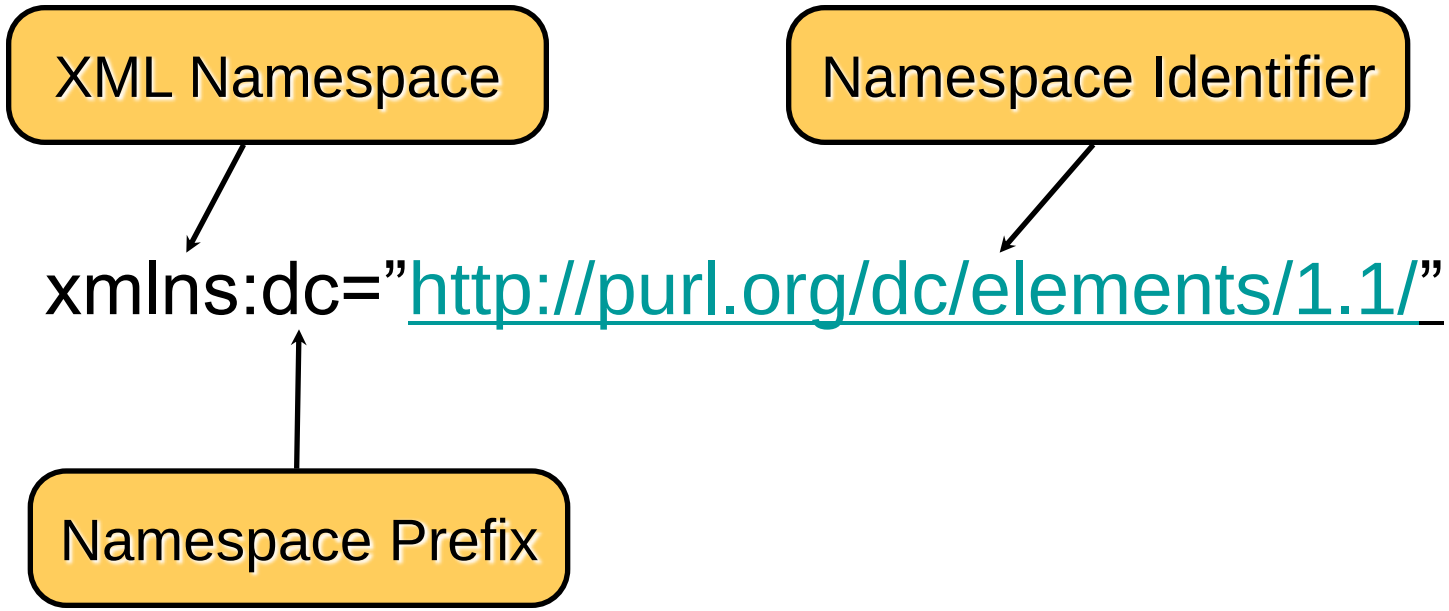
Anatomy of an XML Record

- XML declaration--prepares the processor to work with the document
- Namespaces (uses xmlns:*prefix* and a URI to attach a prefix to each element and attribute)
  - Distinguishes between elements and attributes from different vocabularies that might share a name (but not necessarily a definition) using association with URIs
  - Groups all related elements from an application so software can deal with them
  - The URIs are the standardized bit, not the prefix, and they don't necessarily lead anywhere useful, even if they look like URLs

XML Anatomy Lesson



Namespace Anatomy Lesson



RDF

- Resource Description Framework--A language for describing resources for the web
- Structure based on “triples”
- Focused on exchange of information between different kinds of organizations and usages
- Considered an essential part of the Semantic Web
- Can be expressed using XML

Some RDF Concepts

- A **Resource** is anything that you want to describe; it's most often identified with a URI, such as: http://dublincore.org/documents/usageguide/
- A **Class** is a category; it is a set that comprises individuals
- A **Property** is a Resource that has a name, such as "creator" or "homepage"
- A **Property value** is the value of a Property, such as "George Washington" or "http://dublincore.org" (note that a property value can be another resource)

RDF Statements

- The combination of a **Resource**, a **Property**, and a **Property value** forms a *Statement* (includes a subject, predicate and object)
- An example *Statement*: "The editor of http://dublincore.org/documents/usageguide/ is Diane Hillmann"
  - The subject of the statement above is: http://dublincore.org/documents/usageguide/
  - The predicate is: editor
  - The object is: Diane Hillmann

RDF and OWL

- RDF does not have the language to specify all relationships
- Web Ontology Language (OWL) can specify richer relationships, such as equivalence, inverse, unique
- RDF and OWL may be used together
- Resource Description Framework Schema (RDFS): a syntax for expressing relationships between elements

An XML/RDF Example

```
<rdf:RDF
   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
   xmlns:dc="http://purl.org/dc/elements/1.1/">
   <rdf:Description rdf:about="http://www.dlib.org">
     <dc:title>D-Lib Program - Research in Digital Libraries</dc:title>
     <dc:description>The D-Lib program supports the community of people
      with research interests in digital libraries and electronic
      publishing.</dc:description>
     <dc:publisher>Corporation For National Research Initiatives</dc:publisher>
     <dc:date>1995-01-07</dc:date>
     <dc:subject>
       <rdf:Bag>
         <rdf:li>Research; statistical methods</rdf:li>
         <rdf:li>Education, research, related topics</rdf:li>
         <rdf:li>Library use Studies</rdf:li>
       </rdf:Bag>
     </dc:subject>
     <dc:type>World Wide Web Home Page</dc:type>
     <dc:format>text/html</dc:format>
     <dc:language>en</dc:language>
   </rdf:Description>
</rdf:RDF>
```

Note rdf:about

Note unordered list

Overview of Container Formats

- A container format is used to package together all forms of metadata and digital content
- Use of a container is compatible with, and an implementation of, the OAIS information package concept
- METS: packages metadata with objects or links to objects and defines structural relationships
- MPEG 21 DID: represents digital objects

METS

- Metadata Encoding & Transmission Standard
- Developed by the Digital Library Federation, maintained by the Library of Congress
- "... an XML document format for encoding metadata necessary for both management of digital library objects within a repository and exchange of such objects between repositories (or between repositories and their users)."
- METS is open source and developed by open discussion
- Cultural heritage community is the main audience

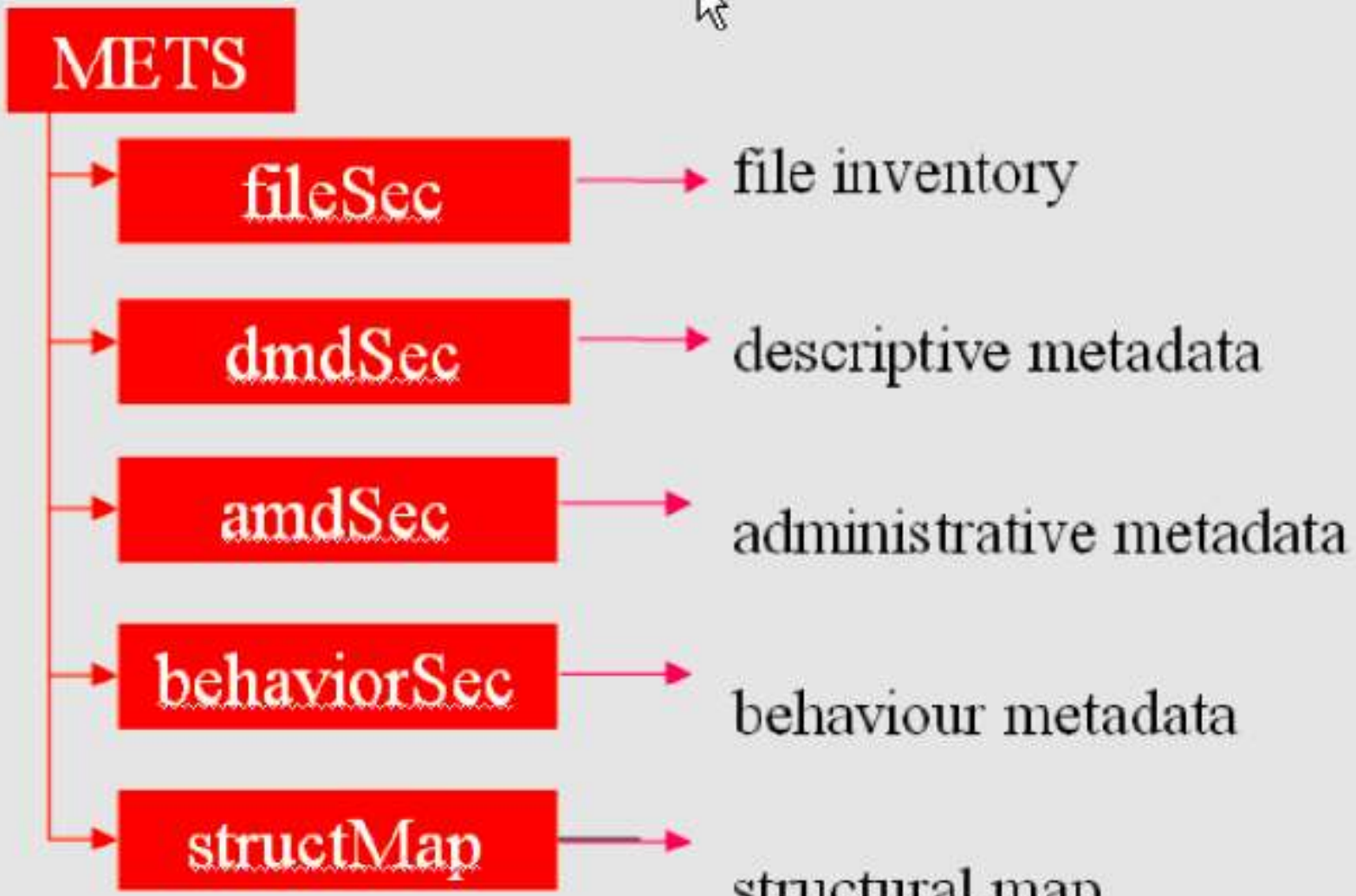
METS Usage

- To package metadata with digital object in XML syntax
- For retrieving, storing, preserving, serving resource
- For interchange of digital objects with their metadata
- As an information package in a digital repository (may be a unit of storage or a transmission format)

METS Sections

- Defined in METS schema for navigation & browsing
  - 1. Header (XML Namespaces)
  - 2. File inventory
  - 3. Structural Map & Links
  - 4. Descriptive Metadata (not part of METS but uses an externally developed descriptive metadata standard, e.g. DC, MODS)
  - 5. Administrative Metadata (points to external schemas):
    - 1. Technical, Source
    - 2. Digital Provenance
    - 3. Rights

The structure of a METS file



METS Extension Schemas

- "Wrappers" or "sockets" where elements from other schemas can be plugged in
  - Uses the XML Schema facility for combining vocabularies from different Namespaces
- Endorsed extension schemas:
  - Descriptive: DC, MODS, MARCXML
  - Technical metadata: MIX (image); textMD (text)
  - Preservation related: PREMIS

MPEG-21 Digital Item Declaration (DID)

- ISO/IEC 21000-2: Digital Item Declaration
  - An alternative to represent Digital Objects
  - Supported by some repositories, e.g., aDORe, DSpace, Fedora
- Model that represents compound objects (recursive "item")
- MPEG DID is an ISO standard and has industry support, but it is often implemented in a proprietary environment and the standards development is closed (as is ISO in general)

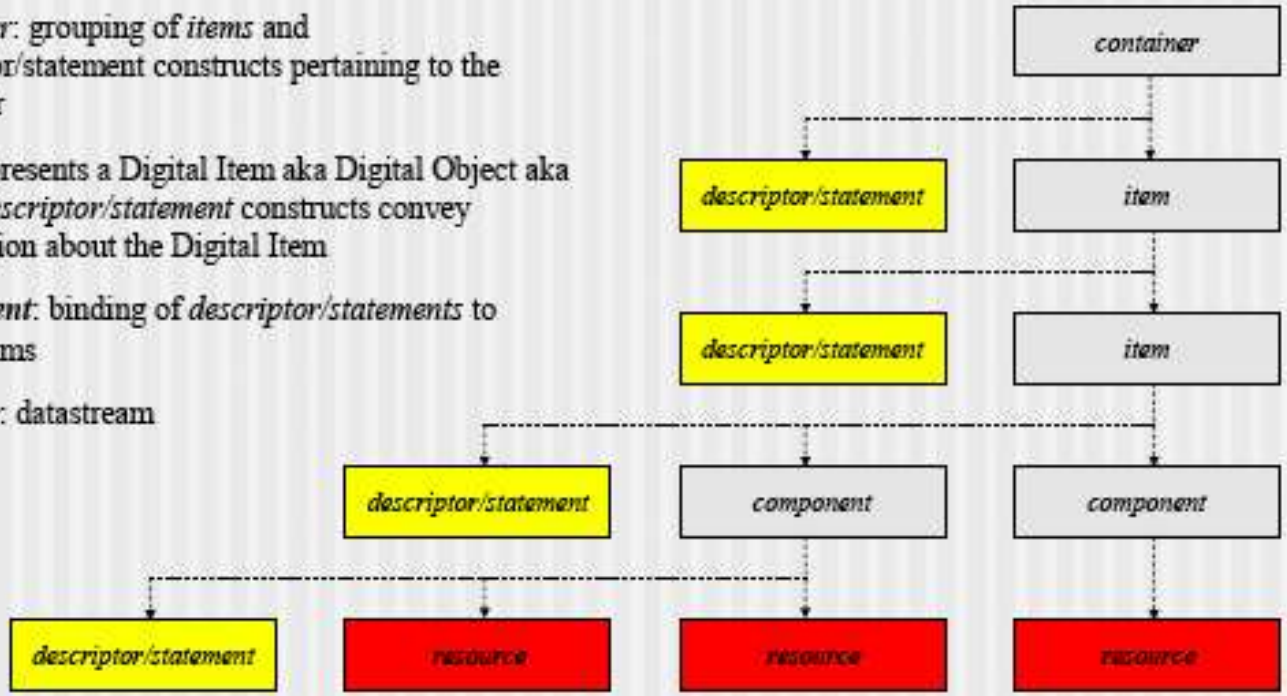
MPEG 21 Abstract Model

container: grouping of *items* and descriptor/statement constructs pertaining to the container

item: represents a Digital Item aka Digital Object aka asset. *Descriptor/statement* constructs convey information about the Digital Item

component: binding of *descriptor/statements* to datastreams

resource: datastream



An Exercise

- *Encode a simple resource in both DC and MARC using XML*
- *Use the template forms provided*