

Metadata Standards and Applications

6. Vocabularies: Attributes and Values

Goals of Session

- ◆ Understand how different vocabularies are used in metadata
- ◆ Learn about relationships in vocabularies
- ◆ Understand methods of encoding vocabularies for various purposes
- ◆ Learn about how registries are used to document vocabularies

Vocabulary Issues

- ◆ Where vocabularies occur in metadata
- ◆ Establishment of formal relationships among terms (where appropriate)
- ◆ Testing and validation of terms
- ◆ The role of Metadata Registries

Why bother?

- ◆ To improve retrieval, i.e., to get an optimum balance of precision and recall
 - Precision – How many of the retrieved records are relevant?
 - Recall – How many of the relevant records did you retrieve?

Improving recall and precision

- ◆ Controlled Vocabularies improve recall by addressing synonyms [attire vs. dress vs. clothing]
- ◆ Controlled Vocabularies improve precision by addressing homographs [bridge (game) vs. bridge (structure) vs. bridge (dental device)]

Types of Controlled Vocabularies

- ◆ Lists
- ◆ Synonym Rings
- ◆ Taxonomy
- ◆ Thesaurus
- ◆ [Classification Schemes]
- ◆ Ontology

Thesauri & Classification

- ◆ Some knowledge management researchers feel that these are essentially the same, with the primary difference being whether the preferred term is a notation
- ◆ As the need to do machine readable encoding progresses, some additional differences are emerging

Lists

A list is a simple group of terms

Example:

Alabama

Alaska

Arkansas

California

Colorado

....

Frequently used in Web site pick lists
and pull down menus

Synonym Rings

- ◆ Synonym rings are used to expand queries for content objects
 - If a user enters any one of these terms as a query to the system, all items are retrieved that contain any of the terms in the cluster
- ◆ Synonym rings are often used in systems where the underlying content objects are left in their unstructured natural language format
 - the control is achieved through the interface by drawing together similar terms into these clusters
- ◆ Synonym rings are used in conjunction with search engines and provide a minimal amount of control of the diversity of the language found in the texts of the underlying documents

Taxonomies

A *taxonomy* is a set of preferred terms, all connected by a hierarchy or polyhierarchy

Example:

Chemistry

Organic chemistry

Polymer chemistry

Nylon

Frequently used in web navigation systems

Thesauri

A thesaurus is a controlled vocabulary with multiple types of relationships

Example:

Rice

UF paddy

BT Cereals

BT Plant products

NT Brown rice

RT Rice straw

Ontology

- ◆ A useful definition: “An arrangement of concepts and relations based on an underlying model of reality.”
 - Ex.: Organs, symptoms, and diseases in medicine
- ◆ No real agreement on definition—every community uses the term in a slightly different way

Thesaural Relationships

Relationship types:

- ◆ Use/Used For – indicates preferred term
- ◆ Hierarchy – indicates broader and narrower terms
- ◆ Associative – almost unlimited types of relationships may be used

It is the most complex format for controlled vocabularies and widely used.

Guidelines for the Construction, Format, and Management of Monolingual Controlled Vocabularies

Abstract: This Standard presents guidelines and conventions for the contents, display, construction, testing, maintenance, and management of monolingual controlled vocabularies. This Standard focuses on controlled vocabularies that are used for the representation of content objects in knowledge organization systems including lists, synonym rings, taxonomies, and thesauri. This Standard should be regarded as a set of recommendations based on preferred techniques and procedures. Optional procedures are, however, sometimes described, e.g., for the display of terms in a controlled vocabulary. The primary purpose of vocabulary control is to achieve consistency in the description of content objects and to facilitate retrieval. Vocabulary control is accomplished by three principal methods: defining the scope, or meaning, of terms; using the equivalence relationship to link synonymous and nearly synonymous terms; and distinguishing among homographs.

Z39.19 Types of Concepts

- ◆ Things and their physical parts
- ◆ Materials
- ◆ Activities or processes
- ◆ Events or occurrences
- ◆ Properties or states of persons, things, materials or actions
- ◆ Disciplines or subject fields
- ◆ Units of measurement
- ◆ Unique entities

Examples

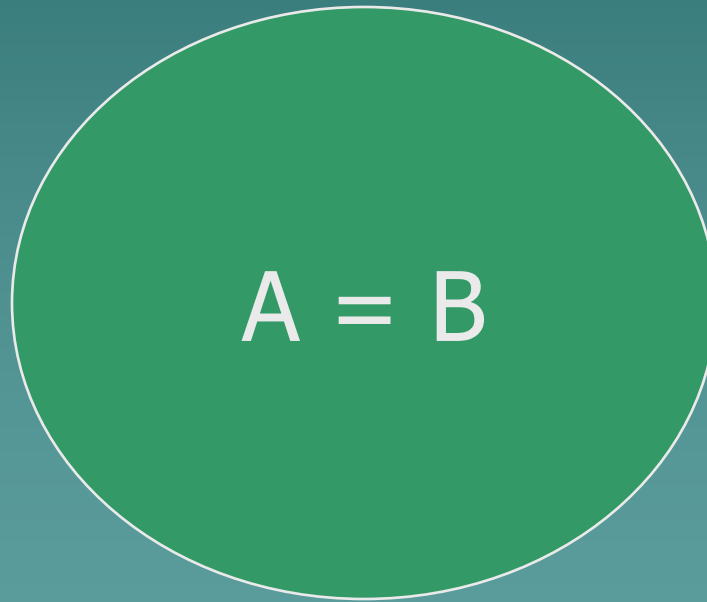
- ◆ Birds (things)
- ◆ Ornithology (discipline)
- ◆ Feathers (materials)
- ◆ Flying (activity or process)
- ◆ Bird counts (event)
- ◆ Barn Owl (unique entity)

Relationships

- ◆ Equivalence
- ◆ Hierarchical
- ◆ Associative

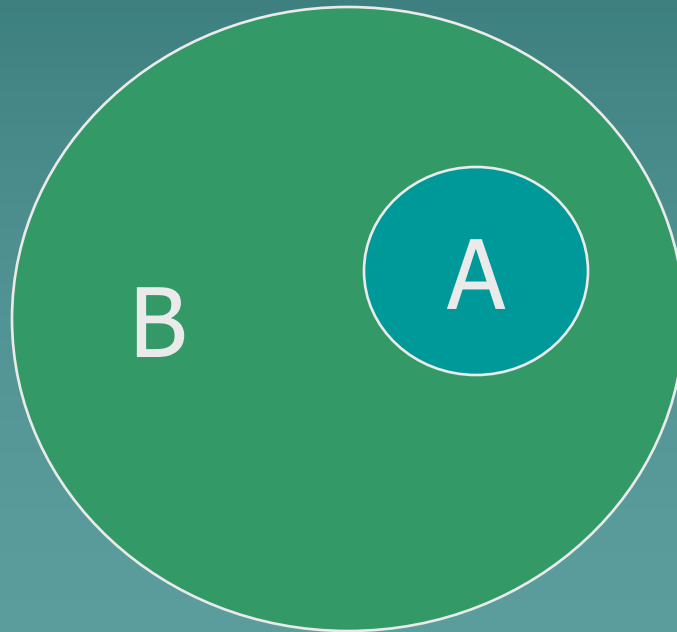
Equivalence Relationships

Term A and Term B overlap completely



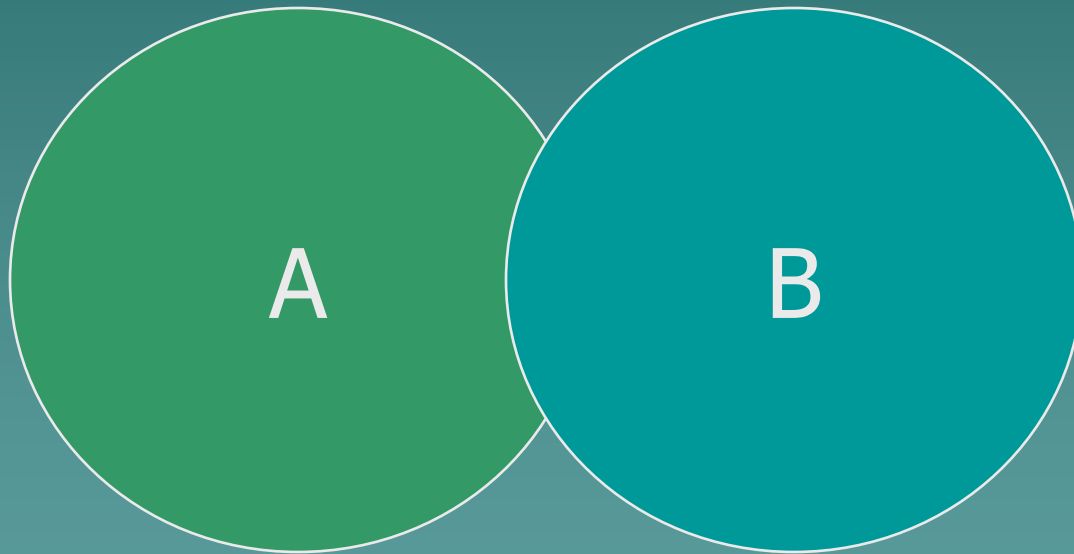
Hierarchical Relationships

- ◆ Term A is included in Term B



Associative Relationships

- ◆ Semantics of terms A and B overlap



Expressing Relationship

Relationship	Rel. Indicator	Abbreviation
Equivalence (synonymy)	Use Used for	None or U UF
Hierarchy	Broader term Narrower term	BT NT
Association	Related term	RT

Hierarchy rules

- ◆ Relationships must be independent of context
- ◆ Examples:
 - Mice (BT Rodents); Rodents (NT Mice)
 - NOT Mice (BT Pests); Pests (NT Mice)

Hierarchy rules

- ◆ Terms must represent the same type of entity
- ◆ Examples:
 - Shoes (BT Footwear); Footwear (NT Shoes)
 - NOT Shoes (BT Shoemaking); Shoemaking (NT Shoes)

Vocabulary Management

- ◆ The degree of control over a vocabulary is (mostly) independent of its type
 - **Uncontrolled** – Anybody can add anything at any time and no effort is made to keep things consistent
 - **Managed** – Software makes sure there is a list that is consistent (no duplicates, no orphan nodes) at any one time. Almost anybody can add anything, subject to consistency rules
 - **Controlled** – A documented process is followed for the update of the vocabulary. Few people have authority to change the list. Software may help, but emphasis is on human processes and custodianship

Informal Vocabularies

- ◆ New movement towards 'bottom up' classification goes by many names:
 - Tagging
 - Social bookmarking
 - Folksonomies
- ◆ Many in this movement, seeing problems of scale, are moving towards more formalization

Libraries/Museums and Tagging

◆ Penn Tags

- Still experimental, primarily internal to Penn
- <http://tags.library.upenn.edu/help/>

◆ Library of Congress Flickr project

- Open public tagging, still unclear how results will be used
- http://www.flickr.com/photos/library_of_congress/

◆ The Art Museum Social Tagging Project

- Research/software project focused on museum application
- <http://www.steve.museum/>

Current Encoding Standards: Authorities

- ◆ MARC 21
 - Authority Format used for names, subjects, series;
 - Classification Format used for subject classification
- ◆ MADS (a derivative of MARC authorities)
 - Used primarily for names

MARC 21 Authority Name

LDR *****nz###22*****n##4500

001 <control number>

003 <control number identifier>

005 19860107072428.3

008

860107	in#ac	annaa	#n###	####	##sa#	ana##	###u
--------	-------	-------	-------	------	-------	-------	------

010 ## \$aex#82221219#

040 ## \$a<organization code>\$c<organization code>

110 2# \$aOklahoma Council on Juvenile Delinquency

410 1# \$aOklahoma.\$bCouncil on Juvenile Delinquency

410 1# \$aOklahoma.\$bOklahoma Council on Juvenile Delinquency

510 2# \$wa\$aOklahoma Council on Juvenile Delinquency Planning

510 2# \$wb\$aOklahoma Council on Juvenile Justice

670 ## \$aOklahoma Council on Juvenile Delinquency Planning. Youth in trouble, 1971-1982 (a. e.)\$bv. 2, t.p. (Oklahoma Council on Juvenile Delinquency) v. 2, p. 3 (organized as Oklahoma Council on Juvenile Delinquency Planning in 1969)

670 ## \$aLC data base, 1-21-87\$b(hdg.: Cameron, Simon, 1799-1889)

670 ## \$aOklahoma Council on Juvenile Justice. Report, 1983\$b p. 5 (Oklahoma Council on Juvenile Justice ... previously the Oklahoma Council on Juvenile Delinquency)

MARC 21 Authority Subject

LDR *****nz###22*****n##4500
 001 <control number>
 005 19860327145341.5
 008

860327	#n#an	znnba	bn###	#####	###a#	ana##	###u
--------	-------	-------	-------	-------	-------	-------	------

 010 ## \$aex#99789465#
 040 ## \$a<organization code>\$c<organization code>code>
 \$f<subject heading/thesaurus conventions code>
 151 ## \$aRome\$xAntiquities
 360 ## \$isubdivision\$aAntiquities, Roman\$iunder names of countries, cities, etc.
 450 ## \$aAntiquities, Roman
 450 ## \$aRoman antiquities

MARC 21 Classification LCC

LDR *****nw###22*****n##4500

001 <control number>

008 901001acaaaaaa

084 0# \$alcc

153 ## \$aHE380.8\$cHE560\$hTransportation and communications\$hWater
transportation\$jWaterways

680 0# \$iClass here the transportation economic aspects of waterways

MARC 21 Classification DDC

```
LDR          *****nw22*****n4500
001          <control number>
008          901001aaaaaaaa
084  0#      $addc$c21
153  ###     $a003.52$hGeneralities$hSystems$hTheory of communication and control$jPerception
              theory
685  00      $tPerception theory$iformerly located in$b001.534$d19890306$220
753  ###     $aPerception theory
```

What is MADS?

- ◆ Metadata Authority Description Schema
 - A companion to MODS for authority data using XML
 - Defines a subset of MARC authority elements using language-based tags
 - Elements have same definitions as equivalent MODS
- ◆ MADS can be used for metadata about people, organizations, events, subjects, time periods, genres, geographics and occupations

MADS Elements

◆ **Authority**

- name
- titleInfo
- topic
- temporal
- genre
- geographic
- hierarchicalGeographic
- occupation

◆ **Related**

- same subelements

◆ **Variant**

- same subelements

◆ **Note**

◆ **Affiliation**

◆ **url**

◆ **Identifier**

◆ **fieldOfActivity**

◆ **Extension**

◆ **recordInfo**

Example: MADS Name Record

```
<mads xsi:schemaLocation="http://www.loc.gov/mads/
http://www.loc.gov/mads/mads.xsd">
  <authority>
    <name type="personal">
      <namePart>Smith,John</namePart>
      <namePart type="date">1995-</namePart>
    </name>
  </authority>
  <variant type="other">
    <name>
      <namePart>Smith, J</namePart>
    </name>
  </variant>
  <variant type="other">
    <name>
      <namePart>Smith, John J</namePart>
    </name>
  </variant>
  <note type="history">Biographical note about John Smith.</note>
  <affiliation>
    <organization>Lawrence Livermore Laboratory</organization>
    <dateValid>1987</dateValid>
  </affiliation>
</mads>
```

New/Upcoming Standards: Authorities

- ◆ Functional Requirements for Authority Data (FRAD)
 - A new model for authority information
 - Developed by the IFLA Working Group on Functional Requirements and Numbering of Authority Records (FRANAR)
 - VIAF (Virtual International Authority File)
 - ◆ Prototype at: <http://orlabs.oclc.org/viaf/>
- ◆ A Review of the Feasibility of an International Authority Data Number (ISADN)
- ◆ Simple Knowledge Organization System (SKOS)—a W3C standard



Google™

Search

☒ IFLA ☐ www

IN THIS DOCUMENT

Scope

A Review of the Feasibility of an International Authority Data Number (ISADN)

Functional Requirements for Authority Data

Useful Addresses

LINKS:

Core Activity:
IFLA-CDNL Alliance for Bibliographic Standards (ICABS)

IV. Division of Bibliographic Control

Cataloguing Section

Bibliography Section

IV. Division of Bibliographic Control

WORKING GROUP ON FRANAR

Working Group on Functional Requirements and Numbering of Authority Records (FRANAR)

SCOPE

The Working Group on Functional Requirements and Numbering of Authority Records (FRANAR) was established in April 1999 by the IFLA Division of Bibliographic Control and the IFLA Universal Bibliographic Control and International MARC Programme (UBCIM). Following the end of the UBCIM Programme in 2003, the IFLA-CDNL Alliance for Bibliographic Standards (ICABS) took over joint responsibility for the FRANAR Working Group with the British Library as the responsible body.

The Working Group is charged by the IFLA Division IV:

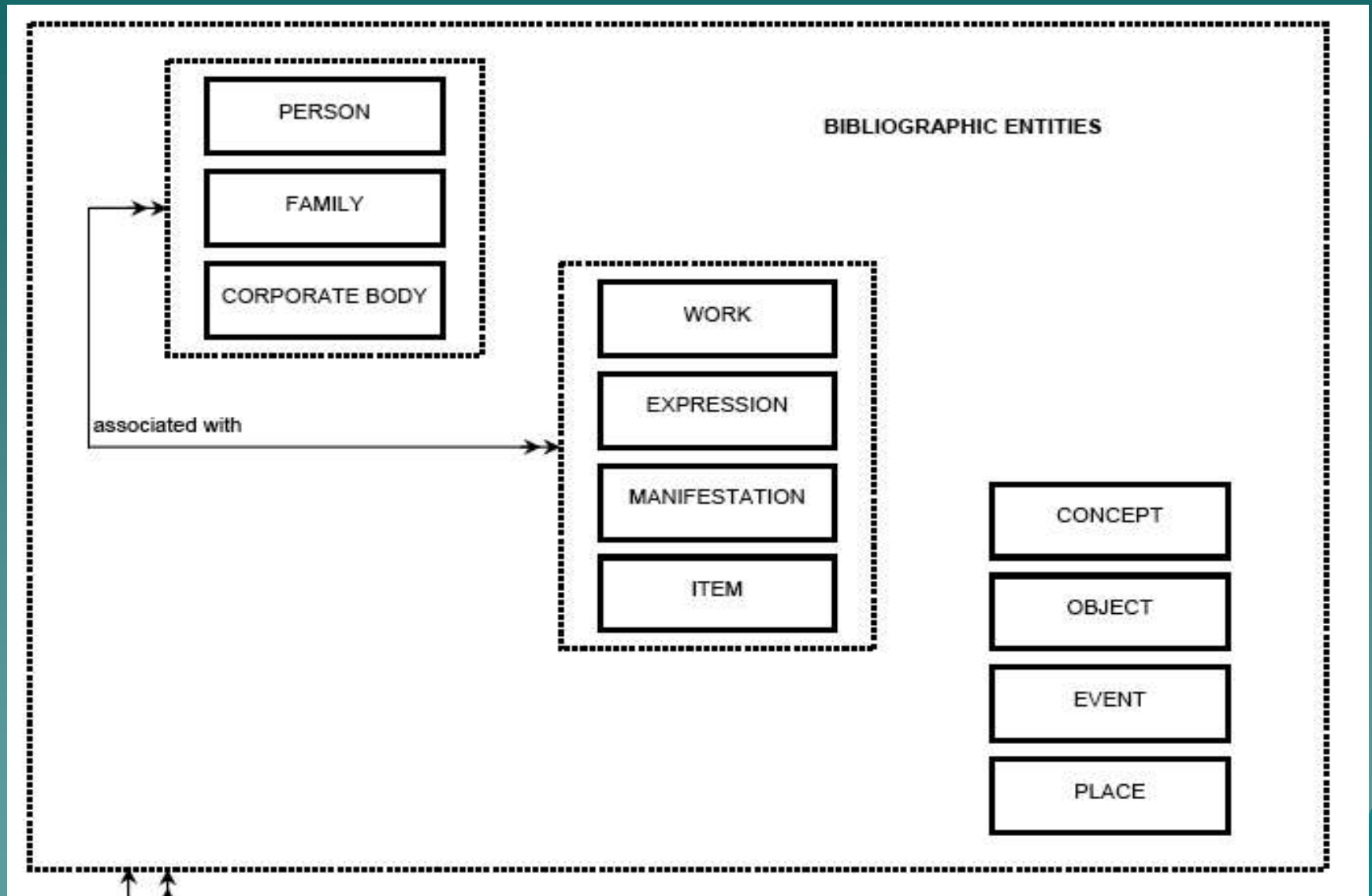
- To define functional requirements of authority records
- To study the feasibility of an International Standard Authority Data Number
- To serve as the official IFLA liaison to and work with other interested groups concerning authority files.

Functions of the Authority File

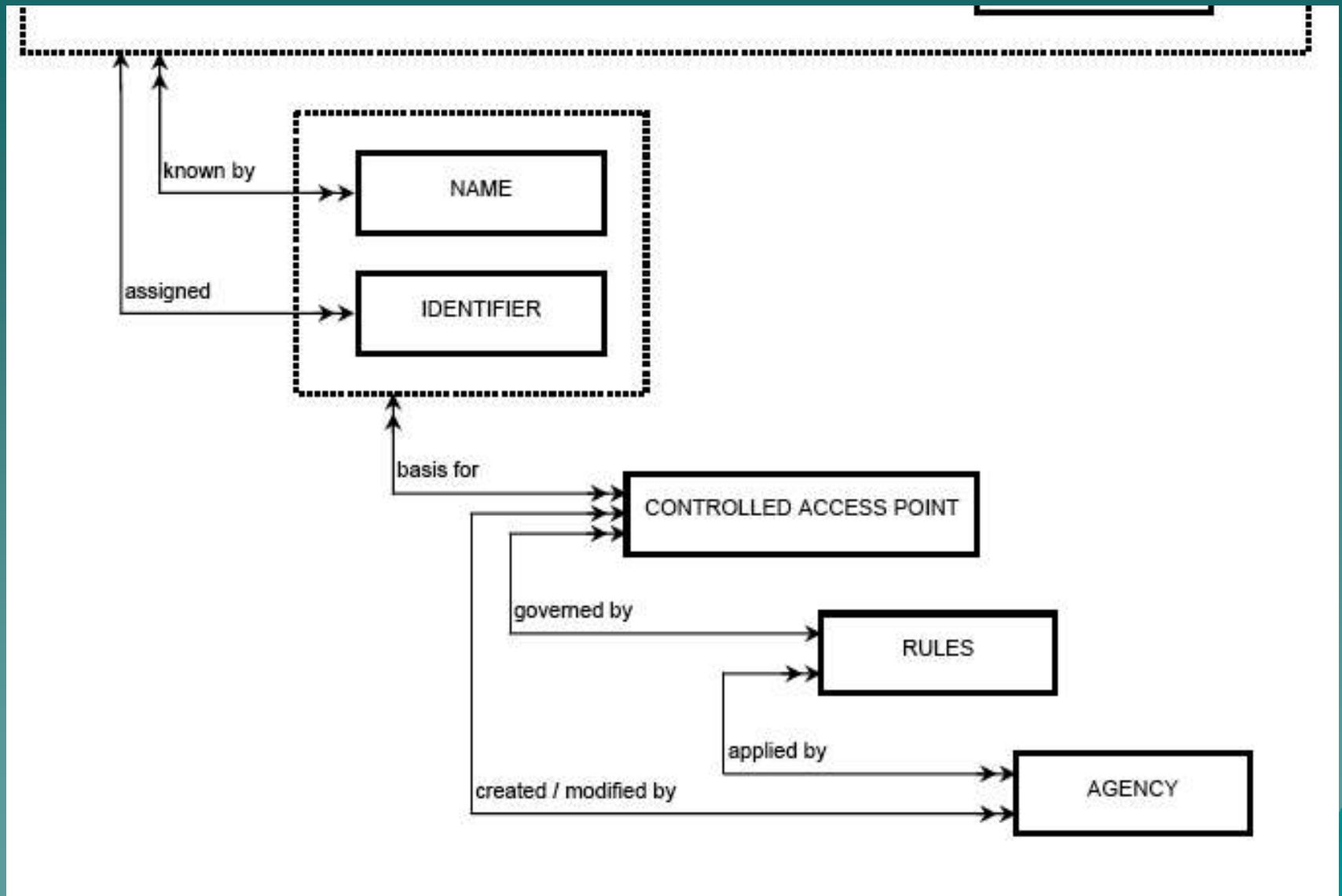
- ◆ Document decisions
- ◆ Serve as reference tool
- ◆ Control forms of access points
- ◆ Support access to bibliographic files
- ◆ Link bibliographic and authority files

(Slide from Glenn Patton)

FRANAR Concept Model, top



FRANAR Concept Model, bottom



FRAD person attributes

From FRBR (AACR2 additions to names):

- Dates associated with the person
- Title of person
- Other designation associated with the person

New:

- Gender
- Place of birth
- Place of death
- Country
- Place of residence
- Affiliation
- Address
- Language of person
- Field of activity
- Profession/occupation
- Biography/history

(Slide from Ed Jones)

VIAF Search Result

Virtual International Authority File

Hosted by OCLC Research

Names

kurt vonnegut

Search

3 headings found for *kurt vonnegut*

	Name	Authority File	Sample Title	Links
1	Vonnegut, Kurt†1922-2007	DNB	schlachthof 5 oder der kinderkreuzzug	LC BNF
2	Vonnegut, Kurt	LC	slaughterhouse five or the childrens crusade a duty dance with death	DNB BNF
3	Vonnegut†Kurt†1922-2007	BNF	pianiste dechaine roman	DNB LC

VIAF DNB Display

DNB Record for Vonnegut, Kurt ‡d 1922-2007

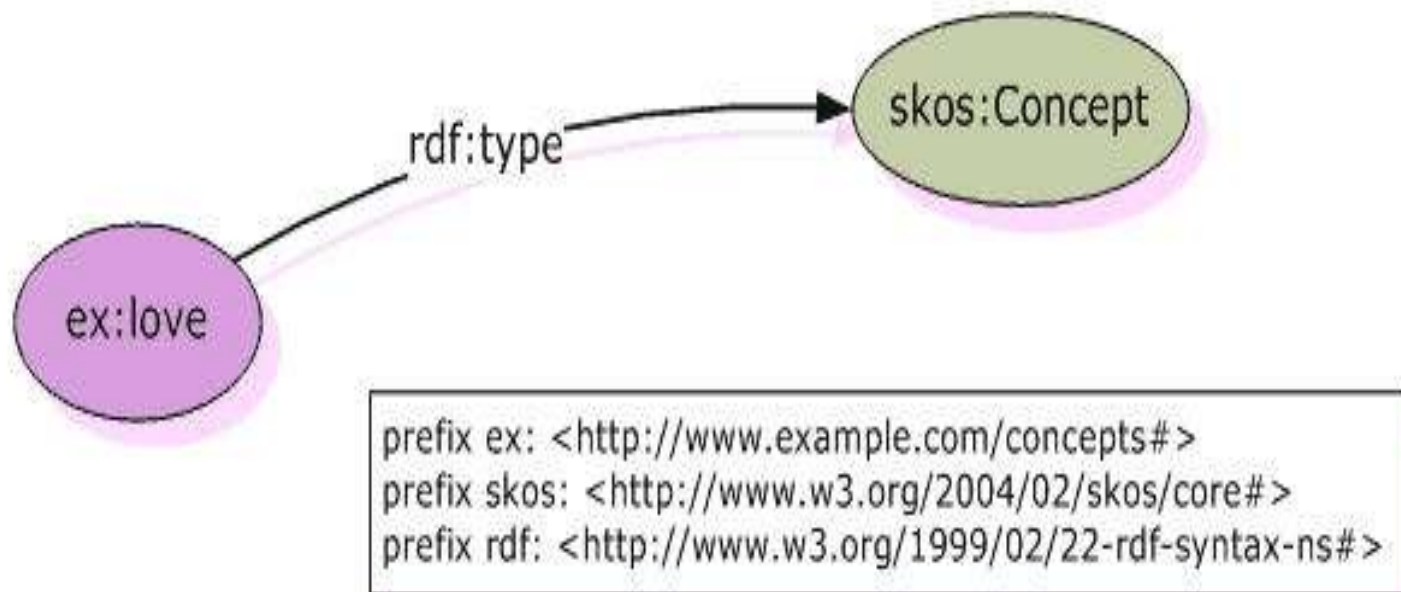
Fixed	<u>Rec stat</u>	n	<u>Entered</u>	1988-07-01	Replaced	2008-01-18T15:15:23.0		
	<u>Type</u>	z	<u>Upd status</u>	a	<u>Enc lvl</u>	<u>Source</u>	d	
	<u>Roman</u>		<u>Ref status</u>	a	<u>Mod rec</u>	<u>Name use</u>	a	
	<u>Govt agn</u>		<u>Auth status</u>	a	<u>Subj</u>	z	<u>Subj use</u>	a
	<u>Series</u>	n	<u>Auth/ref</u>	a	<u>Geo subd</u>		<u>Ser use</u>	
	<u>Ser num</u>	n	<u>Name</u>	a	<u>Subdiv tp</u>		<u>Rules</u>	z
<u>001</u>	<u>DNB 118770306</u>							
<u>998</u>	Vonnegut, Kurt ‡2 <u>LC n 79062641</u> ‡3 title: (1.00, " breakfast of champions or goodbye blue monday ", " breakfast of champions or goodbye blue monday ") ‡3 lccn: n79-62641							
<u>998</u>	Vonnegut ‡b Kurt ‡f 1922-2007 ‡2 <u>BNF FRBNF119286787</u> ‡3 date: (True, 1922, 2007)							
<u>010</u>	<u>n 79062641</u>							
<u>016</u>	7	118770306 ‡2 <u>GyFmDB</u>						
<u>035</u>	(SWD)4108572-3							
<u>040</u>	DNB ‡b ger ‡d DNB ‡f RAK-PND							
<u>043</u>	XD-US--- ‡2 <u>SWD-ISO3166</u>							
<u>045</u>	2	‡b d1922 ‡b d2007						
<u>065</u>	12.2p ‡5 SWD							
<u>100</u>	1	Vonnegut, Kurt ‡d 1922-2007						
<u>550</u>	‡w g ‡a Biochemie, Anthropologie							
<u>550</u>	‡w g ‡a Schriftsteller ‡5 SWD							
<u>551</u>	Indianapolis <Ind.>							
<u>551</u>	New York <NY>							
<u>670</u>	LCAuth, M							
<u>678</u>	Meldete sich 1943 als Freiwilliger für die US-Armee; in deutscher Kriegsgefangenschaft; nach dem II. Weltkrieg arbeitete er als Polizeireporter und als PR-Fachmann, seit 1950 als freier Schriftsteller; ‡a m							

SKOS

- ◆ Simple Knowledge Organisation System (SKOS)
 - A World Wide Web Consortium (W3C) standard
 - Based on RDF and OWL
 - Currently resolving “last call” comments, will be finalized in early 2009
 - <http://www.w3.org/skos/>

The **skos:Concept** class allows you to assert that a resource is a *conceptual resource*.

That is, the resource *is itself* a concept.



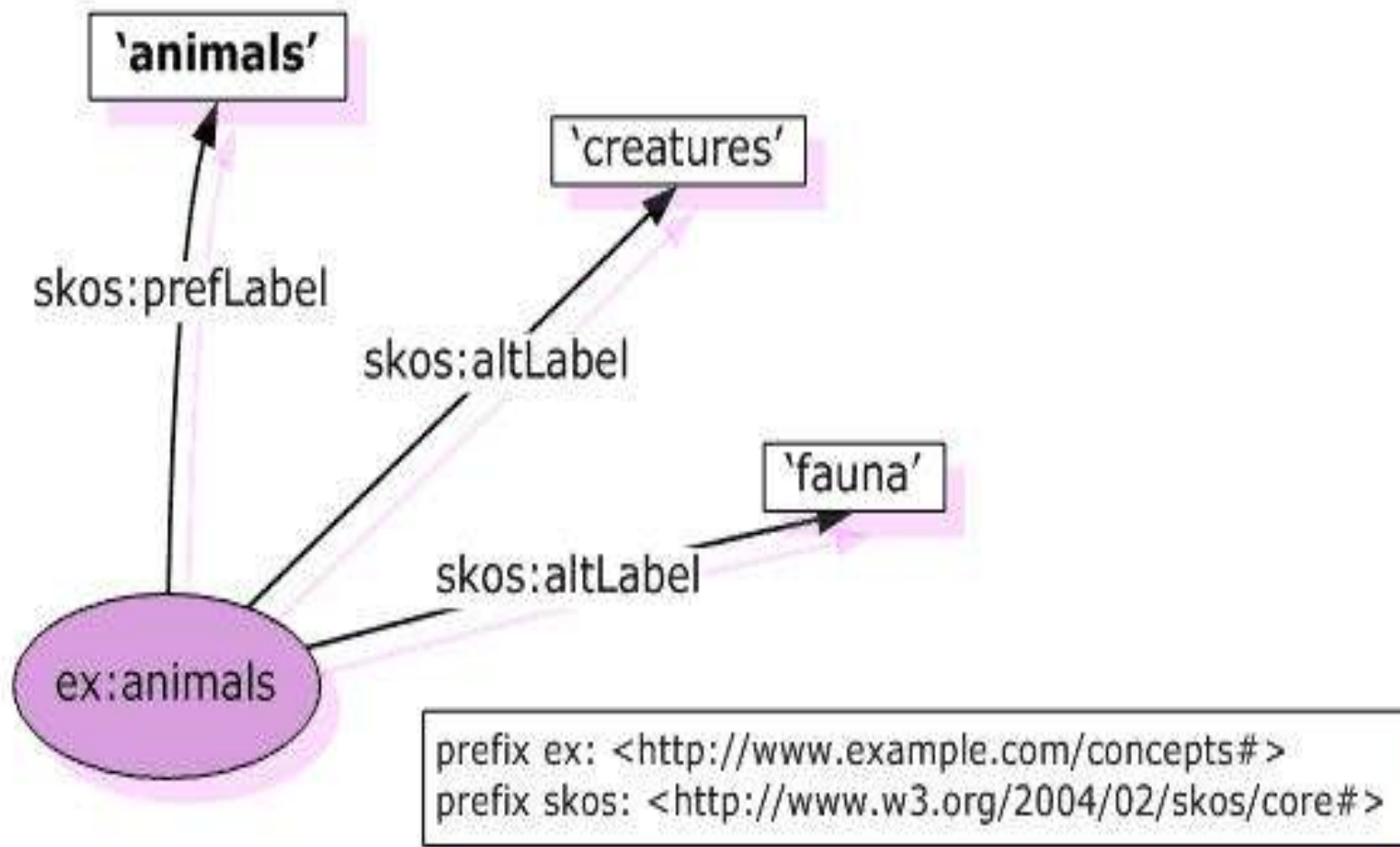
The RDF/XML Encoded Version

```
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">

  <rdf:Description rdf:about="http://www.example.com/concepts#love">
    <rdf:type rdf:resource="http://www.w3.org/2004/02/skos/core#Concept"/>
  </rdf:Description>

</rdf:RDF>
```

Preferred and Alternative Lexical Labels



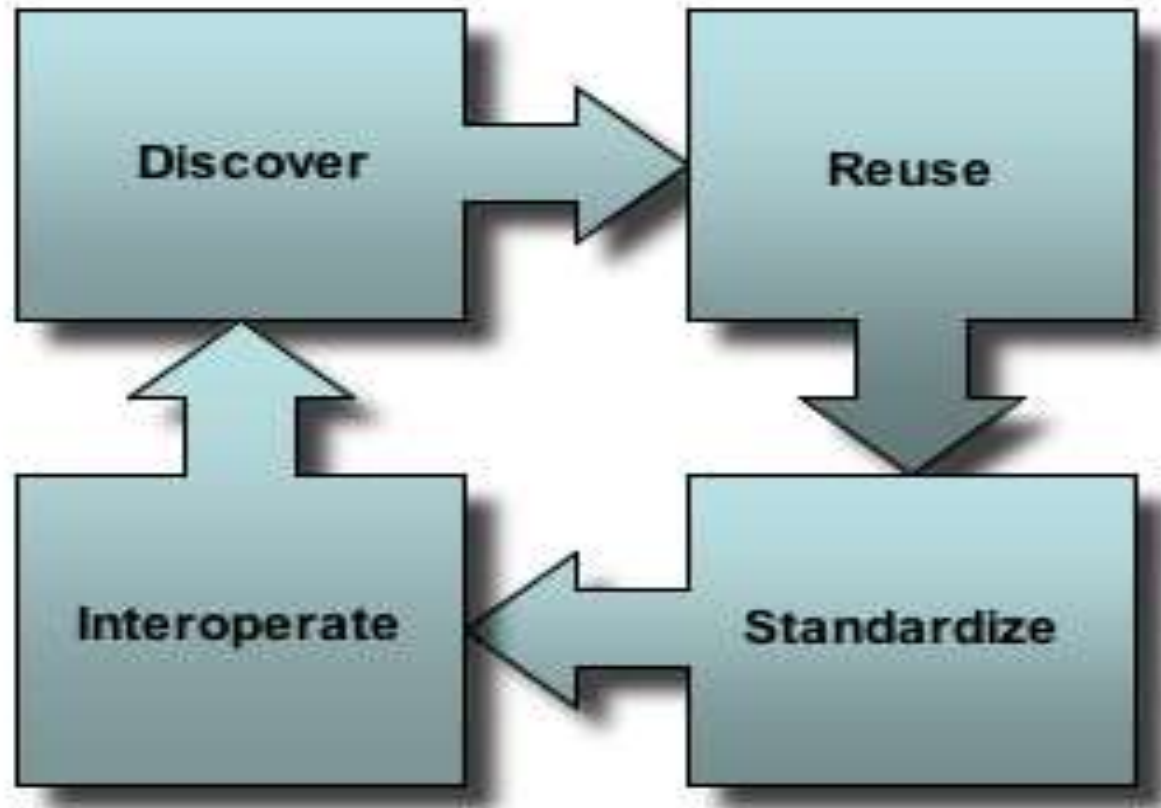
The RDF/XML Encoded Version

```
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:skos="http://www.w3.org/2004/02/skos/core#">

  <skos:Concept rdf:about="http://www.example.com/concepts#animals">
    <skos:prefLabel>animals</skos:prefLabel>
    <skos:altLabel>creatures</skos:altLabel>
    <skos:altLabel>fauna</skos:altLabel>
  </skos:Concept>

</rdf:RDF>
```

Registries: the Big Picture



(Adapted from Wagner & Weibel, "The Dublin Core Metadata Registry: Requirements, Implementation, and Experience" JoDI, 2005)

Why Registries?

- ◆ Support the “interoperability cycle”:
 - Discovery of available schemes and schemas for description of resources
 - Promote reuse of extant schemes and schemas
 - Access to machine-readable and human-readable services
 - Support for crosswalking and translation
- ◆ Coping with a “state of perpetual metadata heterogeneity” (Bianchi and Petrone)

What Do Registries Register?

- ◆ Metadata Schemas (element sets, formats)
 - Crosswalks between metadata schemas
- ◆ Controlled Vocabularies
 - Mappings between vocabularies
- ◆ Application Profiles
 - Schema and vocabulary information in combination with specific usage instruction

Dublin Core Registry—Term Level

The Dublin Core Metadata Registry

Promoting the discovery and reuse of metadata.

v 3.3.8

[Browse](#) | [Search](#)[Language Preference](#)

Browse the registry by classification type

Display:

Terms Overview

Browse

http://purl.org/dc/terms/accrualMethod		View:
Label	Accrual Method [en-US]	RDF/XML
Definition	The method by which items are added to a collection. [en-US]	N-TRIPLE
Description	Recommended best practice is to use a value from a controlled vocabulary. [en-US]	N3
Is Defined By	http://purl.org/dc/terms/	
RDF Type	Property	
Type	element	
Has Version	accrualMethod-001	
Issued	2005-06-13	

Please direct questions, comments and suggestions to: webmaster@dublincore.org

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NSDL Registry—Property Vocabulary List

NSDLREGISTRY

Supporting Metadata Interoperability

Schema: Show detail for RDA Elements

Detail Properties History Maintainers

Label ▲	URI	Status	Updated	Last Updated by	Actions
Abbreviated title	.../Elements/abbreviatedTitle	New-Proposed	2008-07-13 18:27	kcoylenet	
Accessibility content	.../Elements/accessibilityContent	New-Proposed	2008-07-30 7:09	DianeH	
Additional scale information	.../additionalScaleInformation	New-Proposed	2008-08-03 11:33	DianeH	
Applied Material	.../Elements/appliedMaterial	New-Proposed	2008-04-12 18:52	DianeH	
Artistic and/or technical credits	.../artisticAndOrTechnicalCredits	New-Proposed	2008-07-30 8:19	DianeH	
Aspect ratio	.../Elements/aspectRatio	New-Proposed	2008-07-30 8:08	DianeH	
Awards	.../Elements/awards	New-Proposed	2008-04-13 8:44	DianeH	
Base Material	.../Elements/baseMaterial	New-Proposed	2008-04-12 18:51	DianeH	
Base material for microfilm, etc.	.../baseMaterialforMicrofilm	New-Proposed	2008-07-23 7:00	kcoylenet	
Book format	.../Elements/bookFormat	Deprecated	2008-08-24 17:52	DianeH	
Book format	.../Elements/bookFormat	New-Proposed	2008-07-23 7:09	kcoylenet	
Broadcast standard	.../Elements/broadcastStandard	New-Proposed	2008-07-23 13:20	kcoylenet	
Capture Detail	.../Elements/captureDetail	New-Proposed	2008-04-13 8:37	DianeH	
Carrier Characteristics	.../carrierCharacteristics	New-Proposed	2008-04-12 18:56	DianeH	
Carrier Type	.../Elements/carrierType	New-Proposed	2008-04-12 18:47	DianeH	
Cataloguer's note	.../Elements/cataloguersNote	New-Proposed	2008-08-03 11:30	DianeH	
Chronological designation of first issue or part	.../DesignationOfFirstIssueOrPart	New-Proposed	2008-07-23 11:45	DianeH	
Chronological designation of first issue or part of new sequence	.../FirstIssueOrPartOfNewSequence	New-Proposed	2008-07-23 12:02	DianeH	
Chronological designation of last issue or part	.../DesignationOfLastIssueOrPart	New-Proposed	2008-07-23 11:51	DianeH	
Chronological designation of last issue or part of first sequence	.../LastIssueOrPartOfFirstSequence	New-Proposed	2008-07-23 11:57	DianeH	
250 results					1 2 3 4 5

NSDL Registry—Property Vocabulary Detail

NSDLREGISTRY

Supporting Metadata Interoperability

Schema: RDA Elements

Properties: Base Material

Detail

Elements

History

Metadata +

Detail

Label:	Base Material
Name:	baseMaterial
URI:	http://RDEVocab.info/Elements/baseMaterial
Description:	Base material is the underlying physical material on which the content of a resource is stored.
Comment:	Associated with the FRBR Manifestation entity.
Type:	property
Status:	New-Proposed
Language:	English
Note:	Definition source: RDA 3.6.0.1.1

 List |  Get RDF



Element Detail RDF

```
- <rdf:RDF xml:base="http://RDVocab.info/Elements">
  <!-- Schema: RDA Elements -->
  - <rdf:Description rdf:about="http://RDVocab.info/Elements">
    <dc:title xml:lang="en">RDA Elements</dc:title>
    <skos:note rdf:resource="This is the provisional registration of the RDA Element Vocabulary, managed by the DCMI/RDA Task Group."/>
    <foaf:homepage rdf:resource="http://dublincore.org/dcmirdataskgroup/">
  </rdf:Description>
  <!--Property: Base material for microfilm, etc.-->
  - <rdf:Property rdf:about="http://RDVocab.info/Elements/baseMaterialforMicrofilm">
    <rdfs:label xml:lang="en">Base material for microfilm, etc.</rdfs:label>
    <rdfs:subPropertyOf rdf:resource="http://RDVocab.info/Elements/baseMaterial"/>
    <rdfs:isDefinedBy rdf:resource="http://RDVocab.info/Elements"/>
    <reg:status rdf:resource="http://metadataregistry.org/uri/RegStatus/1002"/>
  </rdf:Property>
</rdf:RDF>
```

Concept Vocabulary Detail

NSDLREGISTRY

Supporting Metadata Interoperability

Vocabulary: Show detail for RDA base material

Detail Concepts History Versions Maintainers

Detail

Owner: [Metadata Management Associates](#)

Name: RDA base material

URL:

Note: Base material is the underlying physical material on which the content of a resource is stored.

Community: Libraries, Information Services

Status: New-Proposed

Language: English

URI

Base Domain: <http://RDVocab.info/termList/>

Token: RDAbaseMaterial

URI: <http://RDVocab.info/termList/RDAbaseMaterial>

Users +

[List](#) | [Get RDF](#) | [Get XML Schema](#)

Concept Vocabulary XML Schema

```
- <xs:schema targetNamespace="http://RDVocab.info/termList/RDABaseMaterial" elementFormDefault="qualified" attributeFormDefault="unqualified" version="1.00.000">
  - <xs:annotation>
    - <xs:documentation xml:lang="en">
      RDA base material XML Schema XML Schema for http://RDVocab.info/termList/RDABaseMaterial namespace Date created: 2008-05-23 11:25:41 Date of last update: 2008-05-23 11:25:41 Base
      material is the underlying physical material on which the content of a resource is stored. Further information about this schema is available at http://RDVocab.info/termList/RDABaseMaterial.html
    </xs:documentation>
  </xs:annotation>
  - <xs:simpleType name="DCMType">
    - <xs:restriction base="xs:string">
      <xs:enumeration value="bristol board"/>
      <xs:enumeration value="canvas"/>
      <xs:enumeration value="cardboard"/>
      <xs:enumeration value="ceramic"/>
      <xs:enumeration value="glass"/>
      <xs:enumeration value="hardboard"/>
      <xs:enumeration value="illustration board"/>
      <xs:enumeration value="ivory"/>
      <xs:enumeration value="leather"/>
      <xs:enumeration value="metal"/>
      <xs:enumeration value="paper"/>
      <xs:enumeration value="parchment"/>
      <xs:enumeration value="plaster"/>
      <xs:enumeration value="plastic"/>
      <xs:enumeration value="porcelain"/>
      <xs:enumeration value="shellac"/>
      <xs:enumeration value="skin"/>
      <xs:enumeration value="stone"/>
      <xs:enumeration value="synthetic"/>
      <xs:enumeration value="textile"/>
      <xs:enumeration value="vellum"/>
      <xs:enumeration value="vinyl"/>
      <xs:enumeration value="wax"/>
      <xs:enumeration value="wood"/>
    </xs:restriction>
  </xs:simpleType>
</xs:schema>
```

Please Play!

- ◆ The NSDL Registry has a “sandbox” where anyone can try out the registry software:
 - <http://sandbox.metadataregistry.org>
- ◆ Please feel free to play in the Registry Sandbox!
- ◆ Note: The production registry is open as well, but not for play ...

Acknowledgements

- ◆ Some slides used here are from presentations by Marcia Zeng and Alistair Miles