Data Modeling 201

Building Models and Profiles with PCDM

bit.ly/C4LDataModeling201

Your Fearless Facilitators

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Link to Slides, Notes, Examples, Resources,
and Other Workshop Materials

Communication Channels

- Alert a facilitator if you need help or have questions
- Code4Lib Slack: **#c4l17-datamodeling** channel
- Information about Code4Lib Slack: **http://goo.gl/forms/p9Ayz93DgG**

Schedule

13:30-13:45	Introduction
13:45-14:15	Advanced Applied Data Modeling
14:15-14:35	State of PCDM & Implementations
14:35-14:50	*Break*
14:50-15:00	Setup for breakout groups
15:00-16:10	Breakout groups: Data Modeling Hard Cases
16:10-16:30	Supporting & Moving Work Forward

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Our Expectations of You

- Follow the Code4Lib Code of Conduct
- Follow the Recurse Center Social Rules (a.k.a. "Hacker School Rules")
- Be ready to work on data models!

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Code4Lib
Code of Conduct

http://2017.code4lib.org/conduct/

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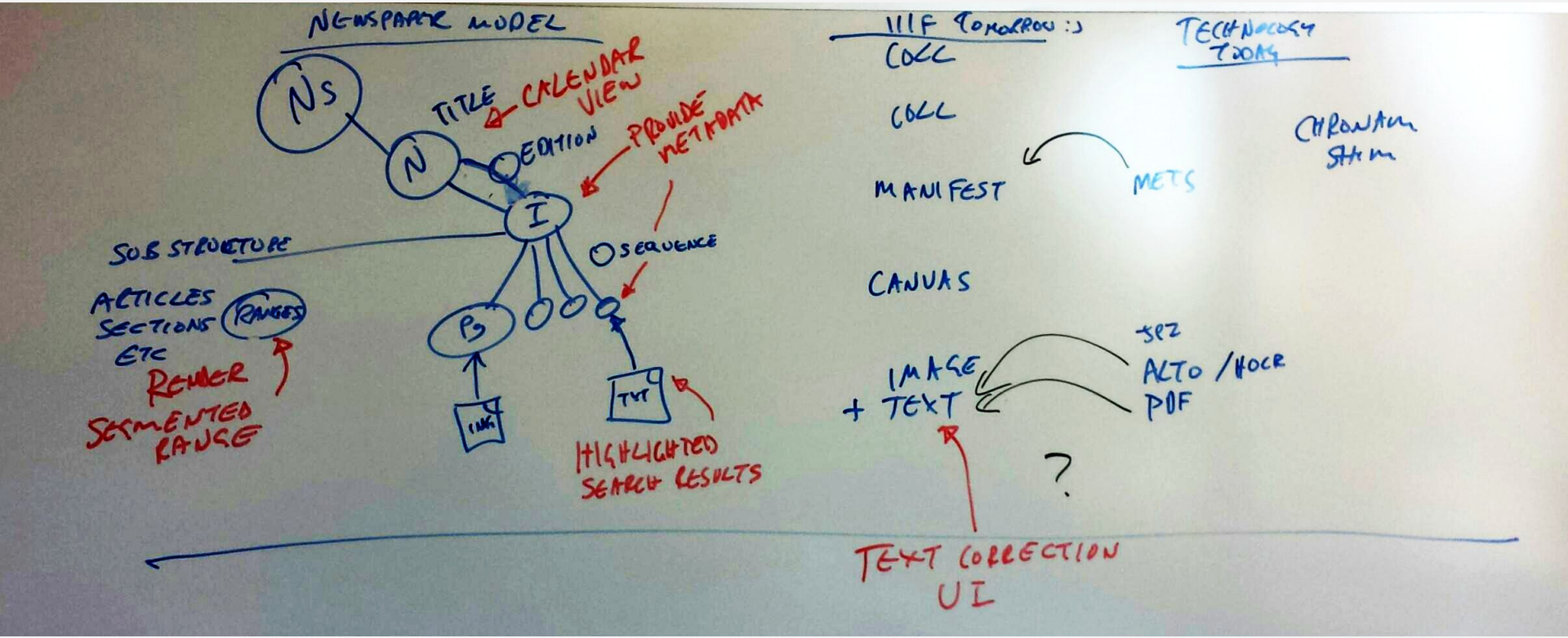
Recurse Center Social Rules
(a.k.a. Hacker School Rules)

https://www.recurse.com/manual#sub-sec-social-rules

- No feigning surprise
- No well-actually's
- No back-seat driving
- No subtle -isms
  - More info: https://www.recurse.com/blog/38-subtle-isms-at-hacker-school

Are you ready to data model?



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Reminder

This is an informal workshop - ask questions and let facilitators know how we can help you

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This workshop is an attempt to

- Create examples and models for digital objects using the Portland Common Data Model in a collaborative and hands-on fashion
- Solicit types of objects in need of data modeling
- Produce examples, documentation, model extensions and work that will be shared with the PCDM community

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Our goals for this workshop

- Expand understanding, usage and examples of PCDM work explicitly, RDF modeling for repository resources generally
- Give participants hands-on experience modeling to take back to their day-to-day work
- Involve more people from the Code4Lib Community in PCDM development efforts

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Now: your goals for this workshop?

- Why are you attending this workshop?
- What are your goals - immediate or long-term?
- What's your level of comfort and experience with data modeling?

We want to capture your goals, return to them throughout the workshop & going forward - feel free to add to responses to the shared notes.

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Advanced Data Modeling

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“Advanced” Data Modeling

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What is a Model?

“When we want to make resources and their metadata available in a structured manner on the web, we first need to decide what characteristics of theirs are the most important to be represented. By doing so, **we make an abstraction of the reality through the development of a model**.”

– Linked Data for Libraries, Archives & Museums, p. 12

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Open World Assumption

- Closed World Assumption (CWA) is the assumption that what is not known to be true must be false.
- Open World Assumption (OWA) is the opposite. In other words, it is the assumption that what is not known to be true is simply unknown.
- Our Global Knowledge Graph is OWA, i.e., incomplete.
- Where in Memory Institutions do we need OWA as opposed to CWA?
  - Patrons data
  - Collection Resources
  - Authorities

RDF & RDFS

Construct	Syntactic form	Description
Class (a class)	**C** rdf:type rdfs:Class	**C** (a resource) is an RDF class
Property (a class)	**P** rdf:type rdf:Property	**P** (a resource) is an RDF property
type (a property)	**I** rdf:type **C**	**I** (a resource) is an instance of **C** (a class)
subClassOf (a property)	**C1** rdfs:subClassOf **C2**	**C1** (a class) is a subclass of **C2** (a class)
subPropertyOf (a property)	**P1** rdfs:subPropertyOf **P2**	**P1** (a property) is a sub-property of **P2** (a property)
domain (a property)	**P** rdfs:domain **C**	domain of **P** (a property) is **C** (a class)
range (a property)	**P** rdfs:range **C**	range of **P** (a property) is **C** (a class)

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More on the RDF Data Model

- URI and IRI concepts
  - Used to reference resources unambiguously
- Literals
  - Describe data values with no clear identity like "100 km/h"
  - Literals may never be the origin of a node of an RDF graph
  - Edges may never be labeled with literals
- Blank nodes
  - Facilitate existential quantification for an individual with certain properties without naming it
- Lists
  - Container: adding new elements possible, ordered & unordered
  - Collections: ordered list; adding new elements impossible

Prince Example

RDF, RDFS, … OWL (Web Ontology Language)

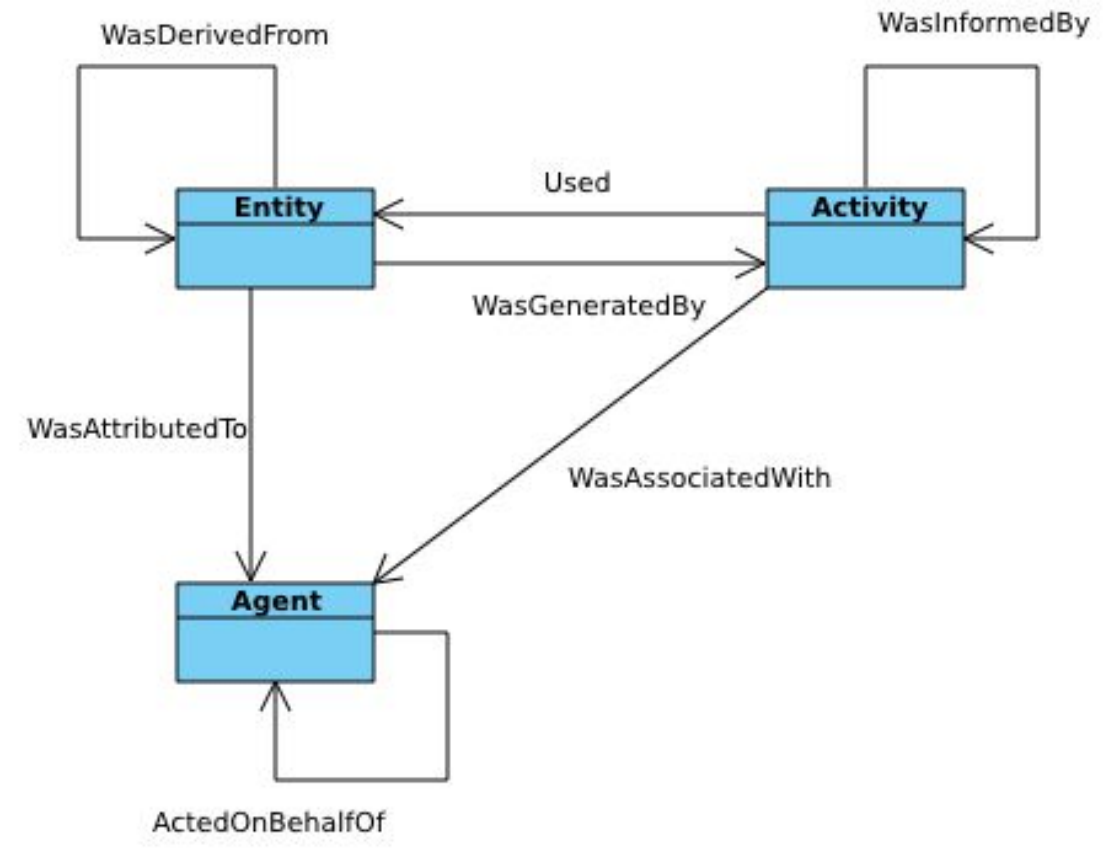
- Discussed RDF & RDFS this morning
- OWL is based on description logics, a family of logics that are decidable fragments of first-order predicate logic.
- OWL includes
  - Individuals
  - Subclasses & Subproperties
  - Class Constructors
  - Property Chain Axioms
  - Property Characteristics (inverse, disjoint, symmetry, …)
  - Punning

LD4L Ontology Example

PROV

- PROV-O encodes PROV Data Model in OWL2
- Set of classes, properties, and restrictions that can be used to represent provenance information.
- Can also be specialized to create new classes and properties for modeling provenance information specific to different domain applications

PROV Core Data Model



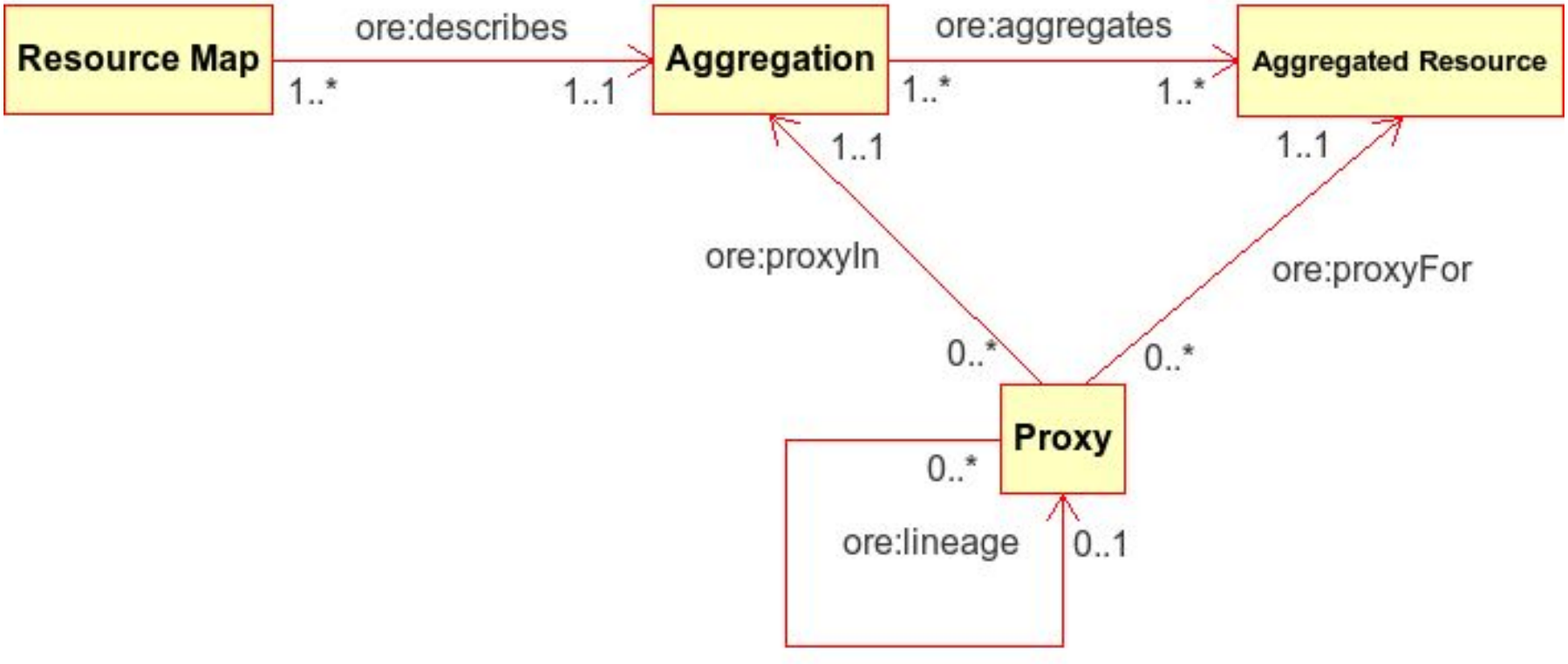
https://www.w3.org/TR/prov-dm/

OAI-ORE (OAI Object Reuse and Exchange)

- Managed by Open Archives Initiative, the creators of OAI-PMH
- Started in 2006
- Generated to “Augment Interoperability”, i.e.:

“Develop, identify, and profile extensible standards and protocols to allow repositories, agents, and services to interoperate in the context of use and reuse of compound digital objects.”

OAI-ORE (OAI Object Reuse and Exchange)



https://www.openarchives.org/ore/1.0/datamodel

Tools for Data Modeling in RDF

- Protégé & Webprotégé
- TopBraid
- StarDog
- OntoStudio
- & diagramming interfaces like yEd with Graphoo

Querying RDF

- SPARQL - Getty SPARQL Endpoint for a demo
- LDPath

Conversions & Mappings

- RML / RDF Mapping Language and Convertor Engine
- Catmandu
- BF Convertor(s)

Validation & Expectations

- ShEx (Shapes Expressions)
  - ShEx Tester
- SHACL (Shapes Constraint Language)

Graph Stores & Triple Stores

- Fedora 4 (Graph Store)
- Cavendish
- Apache Cassandra
- Fuseki
- SDB/TDB
- Blazegraph
- Jena
- …

State of PCDM & Implementations

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Implementations

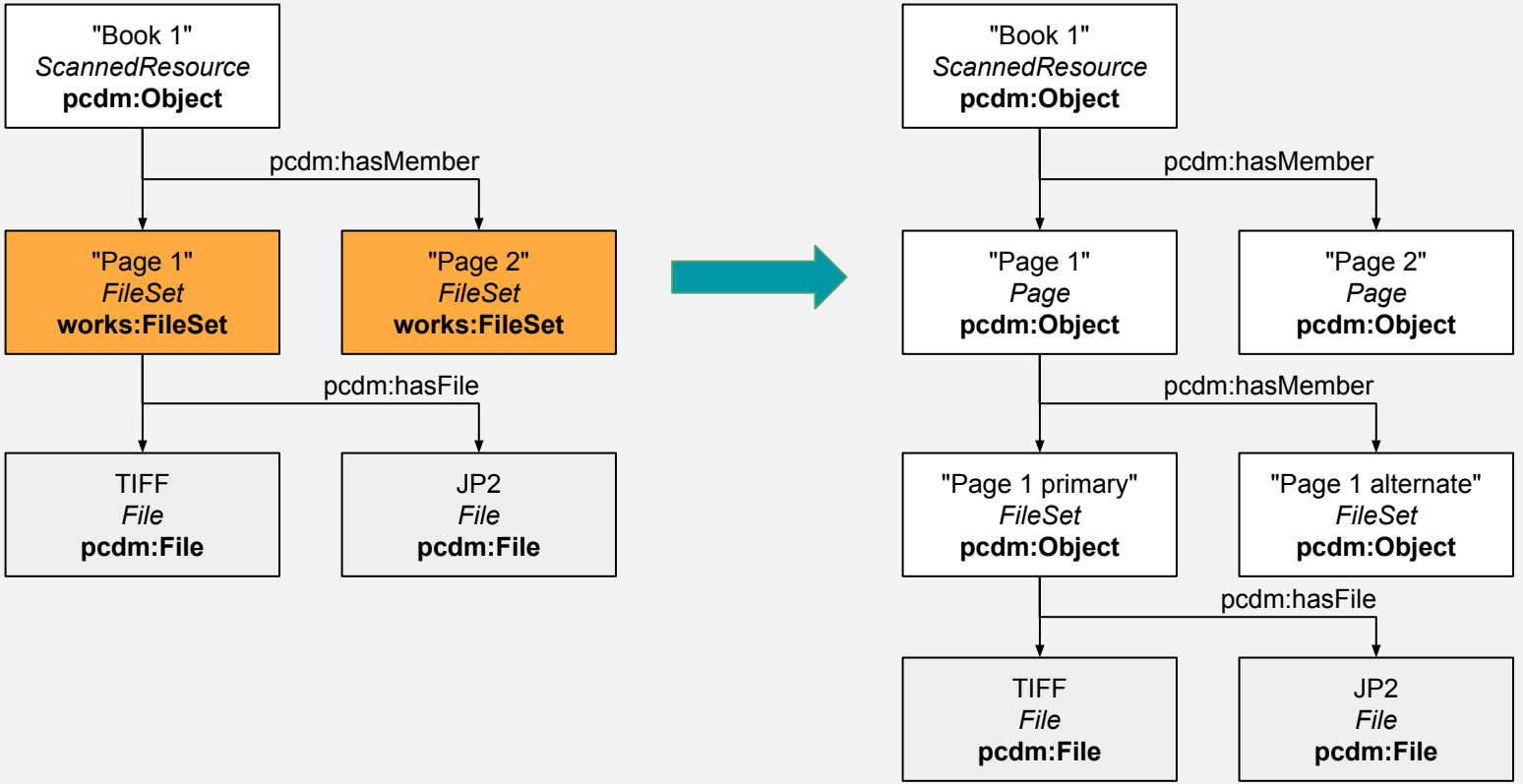
- Hydra
  - Hydra::PCDM, Hydra::Works, CurationConcerns & Sufia 7
  - CurationConcerns and Sufia are merging into Hyrax
  - Hyrax 1.0: migration path for Sufia 7.x
  - Hyrax 2.0: migration path for CC 1.x/2.x

- Islandora
- Others

Evolving data models

- Works extension
  - Used by Hydra implementation
  - But not really the current thinking
- FileSets
  - Also used by the Hydra implementation (and being built upon)
  - Not embraced by the rest of the community
- (Top)Range
  - From IIIF
  - Logical vs. physical structure

Evolving data models



Community

- PCDM Wiki
  - https://github.com/duraspace/pcdm/wiki
  - Profiles
- Mailing list
  - http://groups.google.com/group/pcdm
- Monthly calls
  - https://github.com/duraspace/pcdm/wiki/PCDM-Community-Meetings
- Workshops

15 Minute Break
Reconvene at 2:40 PM

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Supporting Interoperability via “Profiles”

Field Name	AF Model	Subject (can be iterated)	Domain	Predicate	Range	Obligation	"Concept"
Collection Abstract	BasicMetadata	Digital Collection	HydraWorks:Collection	dcterms:abstract	literal	{0,1}	abstract
Collection Date	BasicMetadata	Digital Collection	HydraWorks:Collection	dcterms:date	literal (EDTF)	{0,1}	date
Collection Identifier	models/collection.rb	Digital Collection	HydraWorks:Collection	dcterms:identifier	literal	{1,n}	identifier
Collection Publisher	*BasicMetadata*	*Digital Collection*	*HydraWorks:Collection*	*dc:publisher*	*literal*	*{0,n}*	*publisher*
Collection Publisher URI	BasicMetadata	Digital Collection	HydraWorks:Collection	dcterms:publisher	URI < dcterms:Agent	{0,n}	publisher_URI
Collection Related URL	models/collection.rb	Digital Collection	HydraWorks:Collection	dcterms:relation	URL	{0,n}	relatedURL
Collection Title	RequiredMetadata	Digital Collection	HydraWorks:Collection	dcterms:title	literal	{1,1}	title
Collection Subject	*PROPOSED*	*Digital Collection*	*HydraWorks:Collection*	*dc:subject*	*literal*	*{0,n}*	*subject*
Collection Subject URI	PROPOSED	Digital Collection	HydraWorks:Collection	dcterms:subject	URI	{0,n}	subject_URI
Collection Curator	*PROPOSED*	*Digital Collection*	*HydraWorks:Collection*	*rdau:P60376*	*literal for now*	*{0,n}*	*curator*
Collection		*Digital*	*HydraWorks:Coll*				

Breakouts

3 Parts to Our Breakouts

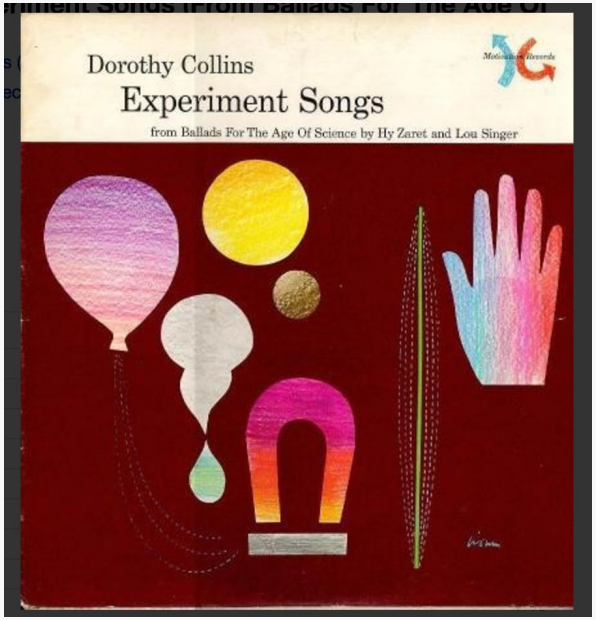
Break into 6-ish groups and...

Part 1 (20 minutes): Create a Model Profile for your group's assigned object - Use papers, markers, Google Drive, etc.

Part 2 (20 minutes): Create Profiles/Models/Examples/Mappings for your group's choice (see those provided here)

Part 3 (20 minutes): Everyone Together! Compare and discuss models for the two assigned objects

Shared Objects



https://www.discogs.com/Dorothy-Collins-Experiment-Songs-From-Ballads-For-The-Age-Of-Science/release/1628463

http://sinaipalimpsests.org/about-project

Resources

- Definitions: http://pcdm.org/2016/04/18/models
- Domain Model: https://github.com/duraspace/pcdm/wiki#domain-model

Breakouts

2:50 - 3:10: Part 1, PCDM Profile for shared object

3:10 - 3:30: Part 2, PCDM Profile for Your Object Choice

3:30 - 3:50: Part 3, Pair & Share

Breakouts Recap

- What are the differences among models for shared objects?
- Is that okay that things differ?
- Where does this create confusion?
- What Communication Issues did you encounter reviewing another group’s work?

Building Out the PCDM Data Modeling Communities

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Maintaining PCDM Momentum

- IRC: #pcdm on Freenode
- PCDM mailing list
- Notes & Shared Resources from Workshop - Keep Adding to this!

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Broader or Related Communities Working on Modeling

- Hydra Metadata Interest Group
  - #metadata on project-hydra Slack
- Fedora 4 (& Fedora broadly)
- Islandora
  - CLAW / Islandora & Fedora 4 Architecture
  - Islandora Interest Groups (Includes Metadata)

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Data Modeling Tools & Resources

- Data Modeling Resources Going Forward
  - Starter List of Tools
  - Some Links to Modeling Work in Cultural Heritage Institutions
- Data Modeling Needs in PCDM & Related Communities:
  - Location for Open Discussions & Issues
  - github.com/duraspace/pcdm/issues

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Your ideas to continue support for data modeling in communities?

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Thank you!

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