eXtensible Catalog and RDA

David Lindahl and Jennifer Bowen
Co-Executive Directors, XCO
What does XC have to do with RDA implementation?
• New data elements (3XX fields)
• Relationships ($e)
• Many, many new and changed practices
• New concepts, terminology (FRBR)
• New policies
• Training!
Welcome to the OCLC Connexion® service

Hello JENNIFER!

You will be using the service in FULL mode.

Message of the day

New provider-neutral cataloging policy changes the cataloging of eBook resources resulting in fewer bibliographic records. Provider-neutral records are the same as Aggregator-neutral records. They are bibliographic records which contain information common to all equivalent manifestations of an eBook. Information specific to any one provider is generally omitted except for the 856 field. Provider-neutral records are base records available in the shared cataloging environment of WorldCat to which libraries can add information locally as needed. OCLC staff have been working to neutralize existing eBook records. Catalogers are encouraged to create only one record to represent equivalent manifestations of an eBook. You may report duplicates to Quality Control. Some examples of records which are provider-neutral and where Duplicate Detection & Resolution has merged the other versions are: #71425188 #228168934 #191943299 See: http://www.oclc.org/worldcat/catalog/quality/expert/w6sessions.htm for a recording of a Provider-Neutral Webinar, as well as a PowerPoint presentation.

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OCLC Support: +614-793-8682 (International) e-mail: support@oclc.org

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• It is not far off (XC is working on it NOW)
• MARC and non-MARC implementations of RDA can overlap
• Moving forward does not have to be expensive
• We can (and should!) learn as we go
• RDA can evolve as we learn more
• This is where RDA can show its true potential!
• Works alongside MARC systems
• Enables re-use of MARC metadata
• Manages records for FRBR Group 1 entities
• Provides a risk-free platform for experimentation with metadata
• Creates metadata that is “Linked Data Ready”
• See what’s possible using RDA (and other) metadata in a highly-customizable, FRBRized discovery environment
Taking Control of Metadata

More Control over Metadata

More Options for Customizing the User Interface
Take Control.
eXtensible Catalog Software Portfolio
eXtensible Catalog (XC) is open source, user-centered, next generation software for libraries.

XC provides a *discovery interface* and a *set of tools* for libraries to manage metadata and build applications.
**Software Overview**

- **User Interface:**
  - Faceted, FRBRized, customizable search interface
  - Web application framework for libraries

- **Metadata Tools:**
  - Automated metadata processing: Enable libraries to aggregate metadata and run services on it

- **XC Schema**
  - New XML schema with Dublin Core terms, RDA elements and roles, MARC vocabularies, and XC elements
  - FRBR levels +: Work, Expression, Manifestation, Holdings, Item

- **Connectivity Tools:**
  - Harvest and synchronize metadata with OAI-PMH
  - Circulation and authentication with NCIP

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**User Interface**

- Drupal CMS
- XC Drupal Toolkit

**Metadata Tools**

- XC Metadata Services Toolkit

**XC Schema**

- Metadata Application Profile

**Connectivity Tools**

- ILS
- XC OAI Toolkit
- XC NCIP Toolkit
Partners and Contributors

- University of Rochester
- The Andrew W. Mellon Foundation
- Consortium of Academic and Research Libraries in Illinois (CARLI)
- University of Notre Dame
- Rochester Institute of Technology
- Kyushu University working with NTT-Data
- University of North Carolina at Charlotte
- Serials Solutions
- OCLC
- University at Buffalo
- Cornell University
- Yale University
- Ohio State University
- Nylink
XC Drupal Toolkit (User Interface)
XC Drupal Toolkit

- Discovery interface and library web application platform in one
- Faceted, FRBRized search of XC Schema metadata
- Extensive, easy customization
- Established open source community
- Data-driven web applications with web forms

User Interface

Drupal CMS

XC Drupal Toolkit
Live Demo

XC Drupal Toolkit
• An XC metadata service parses flat MARCXML records into linked FRBR-based records (work, expression, etc.)
• One input record results in several output records
• XC software maintains relationships between input records
Creating XC Schema data from MARC

- Parse MARCXML records into linked FRBR-based records
- MARC Holdings records produce XC Holdings records (enables mapping of MARC Summary Holdings, etc.)
- All XC records have globally unique identifiers, and a permanent host repository
- Uplinks created
• Dublin Core terms (all)
• RDA – subset of elements and role designators
• XC elements (newly-defined) – when necessary to contain MARC vocabularies, linking fields, etc.
XC Schema Elements: RDA

• 22 RDA elements
• 11 RDA role designators
• Retain granularity in current MARC data:
  – Frequency
  – Numbering of Serials
  – Coordinates of Cartographic Content
  – Plate number (music)
More About the XC Schema

- Flexible, extensible
- Optimized to enable XC functionality
- Not intended for individual record creation
- Can be as complex as it needs to be
- Gives us experience manipulating separate records that represent individual FRBR levels
Metadata Management in XC
• Users have many starting points for search because all the data is not available in a single system:
  – Integrated Library Systems
  – Institutional Repositories
  – Webpages
  – Subscription Databases

• Libraries don’t have good options for searching across all of these sources
Metadata Issues: Quality

- ILS MARC export issues
- Cataloging errors and variant practices
- End-user generated metadata
- Lack of authority control
- Libraries don’t have good options for making use of data at a range of quality levels
• MARC format is everywhere but does not support current metadata needs
• Multiple formats are useful to describe a range of resources, but difficult to search across consistently
• Libraries don’t have good options to try out new standards like RDA
• ILS OPAC interfaces are deficient in:
  – Ease of learning / ease of use
  – Precision and recall
  – Finding similar and related resources
Steps:
1. Convert from raw MARC to MARCXML (minor cleanup)
2. Normalize MARCXML (major cleanup)
3. Transform from MARCXML to XC (FRBRize)
4. Aggregate at each FRBR level (match and merge)
5. Index records / create WEMs (one for each unique Manifestation)
Following one MARC record through XC

Steps:
1. Convert from raw MARC to MARCXML (minor cleanup)
2. Normalize MARCXML (major cleanup)
3. Transform from MARCXML to XC (FRBRize)
4. Aggregate at each FRBR level (match and merge)
5. Index records / create WEMs (one for each unique Manifestation)
XC Software Components

1. Convert
2. Normalize
3. Transform
4.Aggregate
5. Index

ILS

XC OAI Toolkit

XC Metadata Services Toolkit

MARCXML Normalization
MARCXML to XC Transformation
XC Aggregation

Drupal CMS

XC Drupal Toolkit

Silo
Quality
Format
Usability

Silo
Quality
Format
Usability

Metadata Issue Handling
**XC OAI Toolkit**

Expose ILS metadata to XC’s next generation catalog interface and metadata tools

Synchronize ongoing changes in ILS records with XC software automatically

Convert raw MARC into MARCXML

Address data and identifier issues

Compatible with most ILSs
XC Metadata Services Toolkit

New type of staff client for processing large batches of metadata through an orchestrated set of services.

Harvest from multiple sources (silos) to address format and quality issues.

Aggregate and de-dupe metadata.

Automatic synchronization propagates changes in source metadata through services and on to discovery interface.
2. Normalize

3. Transform

4. Aggregate

XC Metadata Services Toolkit

MARCXML Normalization Service

- Transform language codes to spelled-out languages: e.g. fre becomes French
- Normalize forms of OCLC numbers so that they are all the same
- Substitute vocabulary terms for format/type of material codes in the MARC record (Leader, 006, 007, 008) to enable building facet values
- Substitute codes for audience level (juvenile, etc.) and type of material (fiction, non-fiction; identifies dissertation/thesis)
- “Deconstructs” LC Subject headings so we can map parts of them to different facets: geographic, genre, topic, etc.
XC Software Components


XC Metadata Services Toolkit

MARCXML to XC Transformation Service

- Parse flat MARC records to create linked FRBR-based records (work, expression, etc.) in XC Schema
- One input record results in several output records
- Manage relationships between records, including one to many relationships
- Creates multiple work and expression records for analytics
- Handles “bound-withs” (e.g. two books bound together)

**XC Metadata Services Toolkit**

**XC Aggregation Service**

- Aggregate records that represent the same resource at:
  - Manifestation-level
  - Work-level (depends on Authority service)
- Manage relationships between records (FRBR entities, etc.)
- Enable automated synchronization of updates for records at each FRBR level
- Sets stage for future “non-MARC” RDA implementation
eXtensible Metadata Services

1. Convert
2. Normalize
3. Transform
4. Aggregate
5. Index

XC OAI Toolkit

- MARCXML Normalization
- MARCXML to XC Transformation
- XC Aggregation

DC / Qualified DC Normalization
- DC to XC Transformation

<other> to <other> Transformation

MARCXML / XC Authority

XC to RDF (Linked data out)

ILS

XC Drupal Toolkit

Drupal CMS

DSpace
XC Drupal Toolkit

- Adds support for library metadata into Drupal (DC and XC schemas)
- Apache SOLR index of WEMs to enable faceted, FRBRized results navigation
- Single search interface across:
  - Library catalog
  - Digital repository
  - Website resources
- Extensive customization
- Integration with ILS circulation system (via XC NCIP Toolkit)
XC Metadata Services Toolkit

Take Control.
• Get metadata into the MST
  – Add Repositories
  – Schedule Harvests

• Tell MST what to do with metadata
  – Install metadata services
  – Add processing rules

• Verify results / troubleshoot processing
  – Browse records
  – View error logs
Live Demo

XC Metadata Services Toolkit
What’s Next

Linked Data in XC
• The **Semantic Web** refers to a set of technologies that allow computers to understand the meaning of information on the web

• **Linked data** is a mechanism for exposing, sharing and connecting data on the web
• If *everything* has a unique identifier, then information from one website can be related to information from another via a computer program

• *Everything* includes people, places, things, vocabularies, metadata elements, web documents, ...
• A Uniform Resource Identifier (URI) is a string of characters used to identify a name (URN) or an resource on the internet (URL).

• Two kinds of resources
  – information resources – traditional web things like documents, images, etc.
  – non-information resources – these are real world objects like people, physical products, places, concepts, proteins, etc.
Turning information into Linked Data

RDF Triple defined:

- **Subject (URI)**
- **Predicate (URI from a defined vocabulary)**
- **Object (URI or literal)**

Example #1: Describe something...

Information that might be on a webpage, but cannot be readily understood by a computer: “David Lindahl is 40 years old.”

**Step 1:** Parse it into a Subject, Predicate, and Object:

- **Subject**: David Lindahl
- **Predicate**: foaf:age
- **Object**: 40

**Step 2:** Convert to URI’s:

- **Subject**: http://xc.org/resource/dlindahl
- **Predicate**: http://xmlns.com/foaf/spec/#term_age
- **Object**: 40
RDF Triple defined:

Subject (URI) → Predicate (URI from a defined vocabulary) → Object (URI or literal)

Example #2: Define a relationship...

Information that might be on a webpage, but cannot be readily understood by a computer: “David Lindahl knows Jennifer Bowen.”

Step 1: Parse it into a Subject, Predicate, and Object:

- Subject: David Lindahl
- Predicate: foaf:knows
- Object: Jennifer Bowen

Step 2: Convert to URI’s:

- Subject: http://xc.org/resource/dlindahl
- Predicate: http://xmlns.com/foaf/spec/#term_knows
- Object: http://xc.org/resource/jbowen
• XC Metadata Services Toolkit (MST):
  – Converts multiple formats into XC Schema
    • XC Schema is linked data ready
    • XC Schema uses defined vocabularies (rda, dcterms, xc)
  – Persistent OAI-PMH (web services) data repository
  – Plug-in service architecture can be extended support RDF technologies
Bibliographic Record #1564330  5/17/2010  3:05:43 PM

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To create Linked Data, we need:

– Software to transform legacy data

– Analysis: mapping of legacy metadata to Linked Data properties
• What XC software can do:
  – Convert MARC codes to vocabulary values
  – Remove extraneous data
  – Normalize inconsistencies
  – Map most MARC fields/subfields and parse to appropriate FRBR Group 1 entity records
• Problematic areas:
  – Some MARC fields/subfields are difficult to map to appropriate FRBR entities
  – Tracking relationships between FRBR entity records: How many relationships can we support with XC software?
By attempting to follow best practices in XC for Linked Data, we hope to facilitate eventual output of XC metadata in RDF.

- Unique identifiers for XC metadata records
- Data elements from registered schemas
- Registered vocabularies
RDF Triple

Subject: This resource
Predicate: has subject
Object: Poets, American

URIs for each?
RDF Triple – Record identifiers

Subject: oai:mst.rochester.edu: MST/MARCToXCTransformation/10081

Predicate: has subject

Object: Poets, American

This resource has subject Poets, American
Identifiers for XC Schema records

A persistent, globally unique identifier for each XC Schema record
This resource has subject Poets, American
Title: DCMI Metadata Terms

Creator: DCMI Usage Board

Identifier: http://dublincore.org/documents/2008/01/14/dcim-terms/

Date Issued: 2008-01-14


Replaces: http://dublincore.org/documents/2006/12/18/dcim-terms/

Translations: http://dublincore.org/resources/translations/

Document Status: This is a DCMI Recommendation.

Description: This document is an up-to-date specification of all metadata terms maintained by the Dublin Core Metadata Initiative. It includes syntax encoding schemes, and classes.

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6. Classes
7. DCMI Type Vocabulary
8. Terms related to the DCMI Abstract Model
The RDA (Resource Description and Access) Vocabularies

This page provides quick links for the Registered RDA Element Sets and Value Vocabularies. Each set of elements or vocabulary concepts has a link to the general description as well as a link to a list of elements or concepts.

**RDA Element Sets**
- FRBR Entities for RDA
- RDA Elements (Group 1)
- RDA Group 2 Elements
- RDA Group 3 Elements
- RDA Relationships for Concepts, Events, Objects, Places
- RDA Relationships for Persons, Corporate Bodies, Families
- RDA Relationships for Works, Expressions, Manifestations, Items
- RDA Roles

**RDA Vocabularies**
- RDA Applied Material
- RDA Aspect Ratio
- RDA Base Material
- RDA Base Material for Microfilm, Microfiche, Photographic Negatives, and Motion Picture Film
- RDA Book Format
- RDA Broadcast Standard
- RDA Carrier Type
- RDA Choruses
- RDA Colour
- RDA Colour of Moving Image
- RDA Colour of Still Image
- RDA Colour of Three-Dimensional Form
- RDA Configuration of Playback Channels
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Data elements from registered namespaces for DC terms, RDA roles and vocab, and XC
This resource has subject Poets, American
Poets, American

From Library of Congress Subject Headings

Details | Visualization | Suggest Terminology

Poets, American
URI
<http://id.loc.gov/authorities/sh85103735#concept>

XC Work record with embedded URI for LCSH “Poets, American”

<xfrbr xmlns:xc="http://www.extensiblecatalog.info/Elements" xmlns:subjid="id.loc.gov/authorities">
  <xc:entity type="work" id="oai:mst.rochester.edu:MST/MARCToXCTransformation/10081">
    ...
    <xc:subject xsi:type="dcterms:LCSH">Poets, American-20th century-Biography.</xc:subject>
    <xc:subject xsi:type="dcterms:LCSH" subjid="sh85103735#concept">Poets, American</xc:subject>
    <xc:temporal>20th century</xc:temporal>
    <xc:type>Biography</xc:type>
  </xc:entity>
</xfrbr>
This resource has subject Poets, American

Subject: oai:mst.rochester.edu: MST/MARCToXCTransformation/10081
Predicate: http://www.extensiblecatalog.info/Elements/subject
Object: http://id.loc.gov/authorities/sh85103735#concept
XC has set the stage for Linked Data by:

- Providing a platform for creating Linked Data using XC software
- Ensuring that XC Schema records can be converted to RDF triples as easily as possible
- Enabling others to build upon what we have accomplished done so far.
RDA Implementation Landscape

RDA in XC
• Works alongside MARC systems
• Enables re-use of MARC metadata
• Manages records for FRBR Group 1 entities
• Provides a risk-free platform for experimentation with metadata
• Creates metadata that is “Linked Data Ready”
• See what’s possible using RDA (and other) metadata in a highly-customizable, FRBRized discovery environment
• XC Schema Version 1.0 (once RDA registry has been approved/finalized)
• XC MST services take advantage of RDA/MARC coding (e.g. $e relationships)
• Lessons learned from XC can inform future RDA development as well as implementation policies
Possible Future Directions

• Experiment with FRBR-based public interfaces
• Enable Linked Data output from XC
• Enable XC to work with all RDA elements and vocabularies
• Enable XC to manage other FRBR/FRAD entity records (in addition to FRBR Group 1 WEM)
• Develop an RDA metadata editor for XC
Canned demos follow...
TITLE: Harry Potter and the half-blood prince /

CREATORS/AUTHORS: Rowling, J. K.  (Search WorldCat Identities)


EDITION/FORMAT: Text 1st American ed.

Find a Copy

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<td>Rhee's Popular Reading</td>
<td>Available</td>
<td>PZ7.R79835 Half 2005 &gt; Map it</td>
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Details

GENRE/FORM: Juvenile fiction — Text

MATERIAL TYPE: Fiction

DOCUMENT TYPE: Text

OTHER CONTRIBUTORS: GrandPré, Mary, ill. (contributor)

ISBN: 0439784549

NOTES: "Year 6"—Spine. — Sequel to: Harry Potter and the Order of the Phoenix.
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<tr>
<td>DESCRIPTION:</td>
<td>652 p. : 24 cm.</td>
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<td>OTHER TITLES:</td>
<td>Harry Potter and the half-blood prince /</td>
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<tr>
<td>RESPONSIBILITY:</td>
<td>by J.K. Rowling ; illustrations by Mary GrandPré.</td>
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<tr>
<td>ABSTRACT:</td>
<td>Harry Potter is beginning his sixth year at Hogwarts School of Witchcraft and Wizardry.</td>
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**Similar items**

**RELATED SUBJECTS:**

- Potter, Harry (Fictitious character)-Juvenile fiction
- Hogwarts School of Witchcraft and Wizardry (Imaginary organization)-Juvenile fiction
- Wizards-Juvenile fiction
- Magic-Juvenile fiction
- Schools-Juvenile fiction
- Potter, Harry (Fictitious character)
- Hogwarts School of Witchcraft and Wizardry (Imaginary organization)
- Wizards
- Magic
- Schools

**Region**

- England-Juvenile fiction
- England

**BROWSE SIMILAR ITEMS:**

- [Harry Potter and the chamber of secrets](#) / by Rowling, J. K.
- [Harry Potter and the deathly hallows](#) / by Rowling, J. K.
- [Harry Potter and the sorcerer's stone](#) / by Rowling, J. K.
- [Harry Potter and the sorcerer's stone](#)
TITLE: Harry Potter and the half-blood prince /
CREATORS/AUTHORS: Rowling, J. K (Search WorldCat Identities)
EDITION/FORMAT: Text 1st American ed.

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Location | Availability | Call number
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Rhees Popular Reading | Available | PZ7.R79835 Half 2005 > Map it

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The XC Schema combines metadata fields from multiple standard schemas (RDA and DC) plus adds new XC schema elements.
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</table>
Telling the MST about a repository is easy. Assign a name of your choice and enter the URL.

After adding a repository, the MST will automatically do a “handshake” with it and provide “Success” or “Error” messages for each step in the handshake.

When successful, the MST reports on what formats and sets are available in the remote database.

The MST supports all XML schemas, but individual services are schema-specific.
The next step is to schedule the harvesting of metadata from the remote repository.

Options
- Set the schedule
- Choose start and end dates
- Select sets and formats
The next step is to install a metadata service.

A service is a separate program, written in Java, that is managed by the MST.

Services can be downloaded from the XC website or you can write your own by following the developer’s manual.

In order to use a service, you place the downloaded file in a directory by following the MST manual.

This screen can then be used to install the service in the MST.
This example shows two services already installed in this Metadata Services Toolkit (MST): MARC Normalization and MARC-to-XC-Transformation.

Now we need to tell the MST which metadata records we want processed through which services, and in what order. This is called service orchestration.

We will now add a “Processing Rule”
“Browse Records” is a feature of the MST that includes faceted browse and full-text search.

The MST has a local copy of all harvested metadata and all metadata produced by each installed service.
Library staff use “Browse Records” to verify that services are functioning properly and to debug any issues.
Each service can register error messages with the MST upon installation. In this example the MARC Normalization service has attached errors to specific records.

Errors are facets in the MST.

The “i” icon links to a customizable webpage with instructions for staff to address the error.
Whenever a record is processed by a service, the original record is preserved and one or more new records may be produced. These records are called successors.

Navigation links take you to predecessor and successor records. In this case, links connect MARC records to their normalized successor. In another case, links connect a normalized MARC record to its successor Work, Expression and Manifestation records.
**MST: View Full Record**

**Metadata Services Toolkit**

- **Service:** Normalization Service
- **Schema:** marcxml

**Subset:** MARCXML Holding Records

**Created at:** Wed Sep 23 13:04:44 EDT 2009
- **Updated at:** Wed Sep 23 16:14:47 EDT 2009
- **Last updated:** Wed Sep 23 13:04:44 EDT 2009
- **OAI identifier:** oai:URMST:Normalization_Service/10001

**XML viewer (supports any XML schema)**

**Full Record Display:** MARC Holdings Record

- Administrative metadata managed by the MST
- Predecessor and successor links

```xml
<?xml version="1.0" encoding="UTF-8"?>
  <marc:leader tag="003">NRU</marc:leader>
  <marc:controlfield tag="001">1995.0001</marc:controlfield>
  <marc:controlfield tag="005">00000000</marc:controlfield>
  <marc:controlfield tag="008">9512070a 0 4001u u oo000000</marc:controlfield>
  <marc:controlfield tag="040">01131953</marc:controlfield>
  <marc:controlfield tag="041">1168190</marc:controlfield>
  <marc:controlfield tag="049">1168191</marc:controlfield>
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  <marc:controlfield tag="089">51b Storage</marc:controlfield>
  <marc:controlfield tag="1" subfield code="h">M1620</marc:controlfield>
  <marc:controlfield tag="1" subfield code="1">3378</marc:controlfield>
</marc:record>
```
This page shows MST system log files. Each installed service as well as harvest-in and harvest-out logs are available.