VuFind and Koha integration
A comparison of three generations of connectivity approaches

Parthasarathi Mukhopadhyay, Kalyani University, WB, India
Union Catalogue

a list of the combined holdings of several libraries.  

(Classical definition)

a union catalogue is union files of the stock of several libraries merged into a central database to allow end users to search an array of library catalogues through a single-point access interface.  

(Modern view)

a well-developed, central system permit improved search functionality, payment mechanisms, direct user services and integration with journals databases and full-text along with OPAC functionalities.

(Futuristic view)
HEI in India : At a Glance

- There are **993 Universities, 39931 Colleges and 10725 Stand Alone Institutions**;
- 394 Universities are located in **rural areas**;
- 16 Universities are exclusively **for women**;
- 1 **Central Open** University, 14 **State Open** Universities and 1 **State Private Open** University, there are 110 **Dual mode** Universities (the maximum (13) of them are located in Tamil Nadu)
- There are **548 General**, **142 Technical**, **63 Agriculture & Allied**, **58 Medical**, **23 Law**, **13 Sanskrit** and **9 Language** Universities and rest **106** Universities are of other categories.
- Use of Integrated Library Systems (ILSs) are heterogeneous;
- Union catalogues (a few only) are far from the modern views of union catalogue.

AISHE Report 2018-19 (the latest one) @
http://aishe.nic.in/aishe/viewDocument.action?documentId=262
### ILSs in India - Categorization

<table>
<thead>
<tr>
<th>Origin</th>
<th>Application Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large System</td>
</tr>
<tr>
<td>ILSs of foreign origin</td>
<td>• Alice for WINDOWS&lt;br&gt;• Evergreen&lt;br&gt;• Koha (ver 3.x)&lt;br&gt;• Virtua ILS</td>
</tr>
<tr>
<td>ILSs developed over ILS of foreign origin</td>
<td>• NG-TLMS.NET (over TLMS package)</td>
</tr>
<tr>
<td>ILSs of Indian origin</td>
<td>• LIBSUITE&lt;br&gt;• LIBSYS</td>
</tr>
</tbody>
</table>

**Koha (ver 16.x to 20.x) and SOUL 2.x are now two mostly used ILSs in Indian HEIs**
Is it possible to develop a framework for Union Catalogue of academic libraries in India by using Koha ILS at the backend and VuFind discovery system in the front?

How and to what extent is it feasible to fuse OPAC functionalities (such as real-time item availability status, holds placement, holds preference settings and so on) in a union catalogue framework?
Backdrop

till date most of the national-level and global-scale union catalogues support only finding function of a catalogue and

- neglecting the other OPAC functionalities such as
  - real-time availability status;
  - holds placement, renew, article request etc;
  - use of ILSs credentials for authentication (SSO); and
  - extended search features like full-text search, faceted navigation etc.
  - FRBRized display/grouping of resources
## Metadata applications and management

<table>
<thead>
<tr>
<th>Title</th>
<th>Metadata applications and management</th>
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<tr>
<td>Author</td>
<td>Gorman, G. E.; Dorner, Daniel G.</td>
</tr>
<tr>
<td>Place &amp; Publisher</td>
<td>London, Facet Publishing</td>
</tr>
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<td>Date of Publication</td>
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<tr>
<td>Pages</td>
<td>359p.</td>
</tr>
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<td>Guru Nanak Dev University</td>
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<td>025.3</td>
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</table>
Union Catalogue of University Libraries in India: IndCat

- No real-time item-level status
- No OPAC functionalities
- No faceted navigation (only search refinements)
- No FRBRized display (all editions of a work are not in one place)
- No ILS based authentication
**National Union Catalogue: CSIR Knowledge Gateway**

(https://knowgate.niscair.res.in)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>CSIR Labs' Name</th>
<th>OPACs' Links</th>
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<tr>
<td>1</td>
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</tr>
</tbody>
</table>
Search Results

From knowledge abstraction to management: using Ranganathan's faceted schema to...
Suman, Aparajita.
CSIR - National Science Library (NSL-NICAIAR)
INTER LIBRARY LOAN FOR CSIR LABORATORY STAFF

Bibliographic information organization in the semantic web /
Willer, Mirna.; Dunsire, Gordon.
CSIR - National Science Library (NSL-NICAIAR)
INTER LIBRARY LOAN FOR CSIR LABORATORY STAFF

Web animation and interactivity the ultimate guide to web design
Christine Sauier
CSIR - National Science Library (NSL-NICAIAR)
INTER LIBRARY LOAN FOR CSIR LABORATORY STAFF | VIEW ORIGINAL

Web dot com web margdarshika (in Marathi)
Arunjit Singh; Prabhvir Sahami
CSIR - National Science Library (NSL-NICAIAR)
INTER LIBRARY LOAN FOR CSIR LABORATORY STAFF | VIEW ORIGINAL

Web dot com web margdarshika (in Hindi)
Arunjit Singh; Prabhvir Sahami
CSIR - National Science Library (NSL-NICAIAR)
No real-time item level
Status
No OPAC functionalities
Effective deduplication
No FRBRization
Metadata for information management and retrieval / David Haynes.

Author: Haynes, David [author]
Published: London : Facet Publishing 2017
Physical description: xiv, 267 pages : illustrations ; 24 cm
ISBN: 9781783301157 (hbk.)
9781856048248 (pbk.)
9781783302161 (e-book)
Local notes: Formerly CIP.

Holdings information at British Library
Live circulation data is not available.

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<tr>
<td>General Reference Collection, St Pancras Reading Rooms</td>
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Managing metadata in web-scale discovery systems / edited by Louise F. Spiteri

4 Editions under this title

Macquarie University. Macquarie University Library. 
National Library of Australia. 
RMIT University. RMIT University Library. 
University of Technology Sydney. University Library.

Effective Dedup
Marvelous FRBRization
No real-time status
COVID-19 Resources

Reliable information about the coronavirus (COVID-19) is available from the World Health Organization (current situation, international travel). Numerous and frequently-updated resource results are available from a search. OCLC’s WebJunction has pulled together information and resources to assist library staff as they consider how to handle coronavirus issues in their communities.

Search results for 'Managing metadata in web-scale discovery systems'

Results 1-10 of about 43 (.00 seconds)

Select All  Clear All  Save to: [New List]  Save

1. Managing Metadata in Web Scale Discovery Systems
   by Louise Spiteri;
   Print book
   Language: Spanish
   Publisher: London : Facet, 2016.

2. Managing metadata in web-scale discovery systems
   by Louise F Spiteri;
   eBook : Document  View all formats and languages »
   Language: English
   View all editions »

3. Managing metadata in web scale discovery systems
   by Louise Spiteri;
   Computer file : Audio book, etc. | Sound Recording | Book
   Language: English
   Publisher: Malmö : MTM, 2020

No FRBRization in WorldCat
No real time item-level status... referring to respective OPACs
Facts in a nutshell

- No union catalogue (national or global) is using ILS to design union catalogue;
- Union catalogues are using Discovery Interface (DI) as single-point search entity;
- Union catalogues are mostly depending on the process of harvesting to gather metadata of books (manifestation level) in a central index inside a discovery service;
- Most of these services implemented Deduplication (gathering all items of the same manifestation in one place);
- A few of these services have successfully implemented FRBRized display (gathering all manifestation of the same work in the display);
- But almost all of these union catalogue services failed to implement minimum OPAC functionalities like real-time item availability status, holds placement reservation, login with respective library credentials etc.

Why? Simple, ILSs don’t talk to DI there…….

But there are exceptions …….
No Dedup and No FRBRization but can produce real-time item-level status in detail page
Title: Managing metadata in web-scale discovery systems / edited by Louise F. Spiteri
Imprint: Chicago : Neal-Schuman, an imprint of the American Library Association, 2016

Library Holdings

<table>
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<tr>
<th>Library</th>
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<td>Dunbar 3rd Floor</td>
<td>Z666.7 .M36 2016</td>
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</table>

Description: ix, 197 pages ; Illustrations ; 24 cm
Note: "First published in the United Kingdom by Facet Publishing, 2016"--Title page verso
Includes bibliographical references and index

Subjects: Metadata -- Management
Information storage and retrieval systems
Cataloging

Author: Spiteri, Louise F., editor
LC NO: Z666.7 .M36 2016
OCLC #: 953796628
ISBN: 9780838914908 (paper)
083891490X (paper)
Isbn/Std #: (OCoLC)953796628

ILS-DI & OPAL ILS
Where ILS can talk to DI

Central Library Catalog

Print lending has resumed among participating libraries. To protect users, some delivery and processing procedures have changed, and items will take longer to arrive. Thank you for your patience!

Search: Managing Metadata in Web Scale Discover

Managing metadata in web-scale discovery systems / edited by Louise F. Spiteri
Book | Neal-Schuman, an imprint of the American Library Association | 2016 | U.S. edition

Link to this record
Permalink: http://catalog.ohiolink.edu/iii/encore/record/C__Rb37551908

Libraries
2 OhioLINK libraries own this item. Click here to check availability.
Achievements of Ohiolink

Managing metadata in web-scale discovery systems / edited by Louise F. Spiteri

Book | Neal-Schuman, an imprint of the American Library Association | 2016 | U.S. edition

Link to this record
Permalink: http://catalog.ohiolink.edu/lil/encore/record/C__Rb37551905

Libraries
2 OhioLINK libraries own this item. Click here to check availability.

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          Information storage and retrieval systems
          Cataloging
Alt Name  Spiteri, Louise F., editor
LC NO  Z666.7 .M36 2016
OCLC #  953796628
ISBN  9780838914908 (paper)
       0838914900X (paper)
Issn/Std #  (OCoLC)953796628

Locations

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<td>Dunbar 3rd Floor</td>
<td>Z666.7 .M36 2016</td>
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</tbody>
</table>

RESTful APIs
Sierra ILS
&
Encore Duet discovery interface
Real-time item level status
No other OPAC functionalities
De-duplication, FRBRization and real-time status in DI
Real-time status in a given holding library
Information services today: an introduction

Hirsh, Sandra, toimittaja
2018

Vaski Libraries
- available 1 library units
- Turku
  - Turku Main Library, Non-fiction

Information technology: an introduction for today's digital world

Fox, Richard, 1964-2013

3UAS-libraries
- Laurea Leppävaara, Neljän viikon laina
  - (Shell: 61 FOX, RICHARD)
Basic OPAC functionalities are assured.
Generations of DI to ILS Connectivity

- Most of the union catalogues are discovery services by definition;
- Except a few many of these services are supporting only two objectives of a catalogue – ‘to find’ & ‘to select’ but not ‘to locate’
  - these services refer users to respective OPAC and thereby deviating from the basic objective of a DI – to provide bibliographic services in ‘single-window’;
  - OPAC functionalities are not there to serve users real-time item-level status, holds/reservations, profile management, login through ILS credentials etc
- VuFind may take care of all these OPAC functionalities as DI of a union catalogue, if configured in a multibackend driver environment to handle multiple backend ILSs; and
- DI and ILS connectivity approaches in VuFind have improved greatly in recent times.
Generations of ILS Connectivities in VuFind

- DI to ILS connectivity in VuFind may be categorized under three groups (referred as ‘three generations’ here):
  - **Generation I**: ‘Database Call’ approach (supports real-time item-level status in DI through database level authentication and refers to respective ILSs for other OPAC functionalities – like holds placements, holds cancellation etc); [From beginning]
  - **Generation II**: ‘ILS-DI’ protocol based approach (supports real-time item-level status in DI through database level authentication and also provides basic OPAC functionalities within the DI – like holds placements, profile update etc);
    - [Release 3.1 – Sept. 26, 2016]
  - **Generation III**: REST based connectivity (support real-time item-level status in DI without database level authentication (through OAuth2) and also provide enhanced OPAC functionalities within the DI – like holds placements, holds cancellation, profile update, article request etc);
    - [VoyagerRestful (Release 2.3 – Aug. 11, 2014; SierraRest (Release 4.1 - Oct. 2, 2017); KohaRest (Release 7.0 – July 20, 2020]
Test Plan
(look before you leap)

- Objective is to improve present union catalogue scenario in India but first by developing a pilot study as showcase.
- ILS: Koha 20.05.04 (released on Sept, 22, 2020).
  - Reason: the only open source ILS with all three generations of protocol support (Database call, ILS-DI and REST).
  - Reason: the only open source DI with support for all three connectivity approaches to interact with the backend Koha instances.
- Environment: Multibackend driver to connect each instances of Koha representing participating libraries.
- Data gathering: Through OAI/PMH from the backend Koha instances.
- Test size: 6 university libraries with 1000 MARCXML bibliographic records from each library (just a prototype)
- Question: What connectivity approaches will be suitable for ‘DI to ILS’ linking?
- Method: Prepare a single central index for all six libraries (maintaining unique id for each instance of Koha) and test all three approaches in a multibackend driver based environment.
What is ILS-DI?

“From the standpoint of libraries it would be ideal to be able to mix-and-match ILS and discovery platforms to suit local needs. To create such a rich environment the library and vendor community will need agreement on the specific technical details of how discovery and ILS systems are to integrate.”

- Peter Brantley, DLF Executive Director, 23/05/2007
http://blogs.lib.berkeley.edu/shimenawa.php/2007/05/23/ils_abstracQon_api
Berkeley Accord, 2008

- Basic set of functionality essential for libraries to take advantage of new discovery systems (ILS-BDI)
- Agreement from April 4, 2008
- Harvesting
  - Full and incremental, bib and holdings/circ
- Availability
  - Real-time availability of item
- Linking
  - Stable link to item in OPAC providing request links

- Talis
- Ex Libris
- LibLime
- BiblioCommons
- SirsiDynix
- Polaris Library Systems
- VTLS
- California Digital Library
- OCLC
- AquaBrowser
ILS-DI Standard

DLF ILS Discovery Interface Task Group (ILS-DI) Technical Recommendation

An API for effective interoperation between integrated library systems and external discovery applications

June 4, 2008

ILS-DI Task Group Members

John Mark Ockerbloom, Univ. of Penn. (chair)
Terry Reese, Oregon State Univ.
Patricia Martin, California Digital Library
Emily Lynema, North Carolina State Univ.
Todd Grappone, Univ. of Southern California
Dave Kennedy, Univ. of Maryland
David Bucknum, Library of Congress
Dianne McCutcheon, National Library of Medicine

https://old.diglib.org/architectures/ilsdi/DLF_ILS_Discovery_1.0.pdf (June 2008)
ILS-DI: Twenty five functions under Four Groups

**Group I**

Data aggregation

- Bulk harvesting for external apps that maintain local indexes
  - Incremental harvesting by date added / last updated
- HarvestBibliographicRecords
- HarvestHoldingsRecords
- HarvestExpandedRecords
- HarvestAuthorityRecords

**Group II**

Real time search

- On the fly access to real time data
- On the fly lookup of original record
- Federated real time searching
- Identifier lookup
  - GetAvailability
  - GetRecords
  - GetAuthorityRecords
- Searching
  - Search
  - Scan
  - SearchCourseReserves

**Group III**

Patron functionality

- Patron authentication and account information
- Delivery functionality as managed by the ILS
  - Patron Account
    - LookupPatron
    - AuthenticatePatron
    - GetPatronInfo
    - GetPatronStatus
    - RenewLoan
  - Delivery
    - HoldTitle
    - HoldItem
    - CancelHold
    - RecallItem
    - CancelRecall

**Group IV**

OPAC embed / escape

- Support rewriting OPAC displays to include external content / services
- Support output transformation of OPAC displays for use outside of ILS
- Possible behaviors:
  - OutputRewritablePage
  - OutputIntermediateFormat
Koha REST endpoints
https://wiki.koha-community.org/wiki/REST_api_RFCs

56+ endpoints
As on Sept 25, 2K20

Version 1
Still under development
More REST endpoints will emerge
More OPAC functionalities at DI end

<table>
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<tr>
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<th>Implementation status</th>
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<td>/acquisitions/budgets</td>
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<td>/acquisitions/budgets/{budget_id}/funds</td>
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<td>Done (matts)</td>
<td>19.05, 16.11.05</td>
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</tr>
<tr>
<td>/fill_requests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/import/oaipmh/biblios</td>
<td>WIP</td>
<td>(dcook)</td>
<td></td>
</tr>
<tr>
<td>/import_batch_profiles</td>
<td>WIP</td>
<td>amoyano</td>
<td></td>
</tr>
<tr>
<td>/items</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/items/{item_id}/pickup_locations</td>
<td>Voted</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Test site
https://koha.lapinkirjasto.fi/api/v1/doc/

Koha API Authentication parameters

You need to have a library card to consume our API, then you can add a new API Key for yourself from the OPAC.
You also need specific permissions to access most of these resources. Ask us!
Alternatively you can just login to Koha and use your Koha-session to authenticate and authorize. Make sure the 'Userid' and 'Api key' selections in this form are empty to fallback to Koha-session based authentication, when testing the REST endpoints in this document.

Authorization-header

Use Authorization-header: [ ]
Userid: [api_userid]
Api key: [api_key]

Date-header

Date RFC 1123: Sat, 26 Sep 2020 09:13:26 GMT

Authentication system explained:

Note! Parameters and model values with multitype values are not shown in "Example Value" view. Use the "Model View" instead.

Koha REST API

Created by Koha Development Team
See more at https://koha-community.org/
GPL v3

accountlines
articlerequests
auth
OAI/PMH vs ILSDI vs REST
<dc:title>Beyond book indexing</dc:title>
<dc:creator>Brenner, Diane.</dc:creator>
<dc:creator>Rowland, Marilyn.</dc:creator>
<dc:type>text</dc:type>
<dc:publisher>Phoenix, AZ : American Society of Indexers</dc:publisher>
<dc:date>2000</dc:date>
<dc:language>eng</dc:language>
<dc:description>Includes bibliographical references and index.</dc:description>
<dc:description>Preface / Enid L. Zafran -- Introduction / Diane Brenner &amp; Marilyn Rowland -- Contributors -- Pt. 1. Beyond stand-alone indexes: The world of embedded indexing / Jan C. Wright ; Indexing computer-related documents / Lynn Moncrief -- Pt. 2. Beyond the book: Subject-oriented web indexing / Dwight Walker ; Web indexing-- anchors away! / Kevin Broccoli &amp; Gerry Van Ravenswaay ; Ripping out the pages / Seth Maislin ; If based indexing: &lt;Meta&gt; tags / Marilyn J. Rowland ; Envisioning the word / X Bonnie Woods ; How to index windows-based online help / Susan Holbert -- Pt. 4. Beyond traditional marketing: Web site design for indexers / Marilyn J. Rowland ; Putting sample indexes on your web</dc:description>
<dc:subject>Indexing</dc:subject>
<dc:subject>Computer network resources</dc:subject>
<dc:subject>Electronic information resources</dc:subject>
<dc:subject>Web sites</dc:subject>
<record>
  <datafield ind1="1" ind2="" tag="700">
    <subfield code="a">Brenner, Diane.</subfield>
  </datafield>
  <datafield ind1="1" tag="700" ind2="">
    <subfield code="a">Rowland, Marilyn.</subfield>
  </datafield>
  <datafield ind2="" tag="942" ind1="">
    <subfield code="2">ddc</subfield>
    <subfield code="c">BK</subfield>
  </datafield>
</record>
What ILS-DI can do additionally?
ILS-DI

Level 1: Basic discovery interfaces
- HarvestBibliographicRecords (Use OAI-PMH instead)
- HarvestExpandedRecords (Use OAI-PMH instead)
- GetAvailability
- GoToBibliographicRequestPage (Use OPAC instead)

Level 2: Elementary OPAC supplement
- HarvestAuthorityRecords (Use OAI-PMH instead)
- HarvestHoldingsRecords (Use OAI-PMH instead)
- GetRecords
- Search (Use SRU instead)
- Scan (Use SRU instead)
- GetAuthorityRecords
- OutputRewritablePage (Not supported yet)
- OutputIntermediateFormat (Not supported yet)

Level 3: Elementary OPAC alternative
- LookupPatron
- AuthenticatePatron
- GetPatronInfo
- GetPatronStatus
- GetServices
- RenewLoan
- HoldTitle
- HoldItem
- CancelHold
- RecallItem (Not supported by Koha)
- CancelRecall (Not supported by Koha)

Level 4: Robust/domain specific discovery platforms
- SearchCourseReserves (Not supported yet)
- Explain (Not supported yet)
ILS-DI call in Koha

http://localhost:7001/cgi-bin/koha/ilsdi.pl?service=GetAvailability&id=1+2&id_type=item

This XML file does not appear to have any style information associated with it. The document tree is shown below.

```
<dlf:collection xsi:schemaLocation="http://diglib.org/ilsdi/1.1 http://diglib.org/architectures/ilsdi/schemas/1.1/dlfexpanded.xsd">
  <dlf:record>
    <dlf:bibliographic id="1"/>
    <dlf:items>
      <dlf:item id="1">
        <dlf:simpleavailability>
          <dlf:identifier>1</dlf:identifier>
          <dlf:availabilitystatus>available</dlf:availabilitystatus>
          <dlf:location>Library1</dlf:location>
        </dlf:simpleavailability>
      </dlf:item>
    </dlf:items>
  </dlf:record>
  <dlf:record>
    <dlf:bibliographic id="1"/>
    <dlf:items>
      <dlf:item id="2">
        <dlf:simpleavailability>
          <dlf:identifier>2</dlf:identifier>
          <dlf:availabilitystatus>available</dlf:availabilitystatus>
          <dlf:location>Library1</dlf:location>
        </dlf:simpleavailability>
      </dlf:item>
    </dlf:items>
  </dlf:record>
</dlf:collection>
```
This XML file does not appear to have any style information associated with it. The document tree is shown below.

```xml
<GetPatronInfo>
  <updated_on>2017-08-23 20:13:55</updated_on>
  <sort1/>
  <firstname>Library1</firstname>
  <country/>
  <categorycode>FC</categorycode>
  <state/>
  <checkprevcheckout>inherit</checkprevcheckout>
  <sort2/>
  <title/>
  <B_address2/>
  <othernames/>
  <borrowernumber>2</borrowernumber>
  <B_state/>
  <login_attempts>0</login_attempts>
  <cardnumber>B-LL-001</cardnumber>
  <borrowernotes/>
  <contactname/>
  <branchcode>LIB1</branchcode>
  <branchname>Library1</branchname>
  <surname>User1</surname>
  <altcontactstate/>
  <privacy_guarantor_checkouts>0</privacy_guarantor_checkouts>
  <dateexpiry>2018-03-23</dateexpiry>
  <B_streetnumber/>
  <privacy>1</privacy>
  <dateenrolled>2017-08-23</dateenrolled>
  <lang>default</lang>
  <loans/>
  <category_type>P</category_type>
  <opencnote/>
  <B_country/>
  <sex/>
  <contactnote/>
  <altcontactcountry/>
  <description>Faculty (Library 1)</description>
</GetPatronInfo>
What REST API can do additionally?

- More and more End points
- Return data in JSON
- Can be more dynamic
- Conditions can be added
<table>
<thead>
<tr>
<th>Layer</th>
<th>Standard</th>
<th>Services</th>
<th>Tasks</th>
</tr>
</thead>
</table>
| **ILS layer** | OAI/PMH version 2.0                           | Enable OAI/PMH web service in Koha 20.05.04        | 1. Enable OAI/PMH, set archive ID and enable OAI-PMH:AutoUpdateSets  
|               |                                               |                                                    | 2. Check response                                                     |
|               | ILS-DI recommendation version 1.1             | Enable ILS-DI web service in Koha 20.05.04        | 1. Enable ILS-DI                                                     
|               |                                               |                                                    | 2. Check responses.                                                  |
|               | REST API v1                                   | Enable REST response and RESTOAuth2ClientCredentials in Koha 20.05.04 | 1. Enable REST related options                                      
|               |                                               |                                                    | 2. Create a user with minimum permission (as prescribed) and generate client id & client secret |
| **Middle layer** | ILS-DI                                        | Multibackend driver on the basis of ILS-DI        | No additional tasks                                                  |
|               | Koha-Rest-Plugin                             | Multibackend driver on the basis of REST/API      | Install Koha-rest-plugin (we used ver. 0.8.6) in Koha ILS            |
| **Discovery layer** | OAI/PMH version 2.0                          | Harvester in VuFind 7.0.1                         | 1. Set sections for each instance in oai.ini for harvesting bibliographic data in marcxml   
|               |                                               |                                                    | 2. Harvest each library                                               |
|               | Indexing                                      | Batch-import-march.sh in VuFind 7.0.1             | 1. Create separate import-properties file                           
|               |                                               |                                                    | 2. Index each library with -p switch to call respective import-properties file |
|               | Koha database call                            | Koha driver in VuFind 7.0.1                       | Create separate KohaI driver for each library                       |
|               | ILS-DI                                        | KohaILSDI driver in VuFind 7.0.1                 | Create separate KohaILSDI driver for each library                   |
|               | KohaRest driver                              | KohaRest driver in VuFind 7.0.1                  | Create separate KohaRest driver for each library                     |
|               | Multibackend                                 | Multibackend driver in VuFind 7.0.1              | Create three sets of Multibackend drivers for handling three generation of connectivities – Koha, KohaILSDI and KohaRest |
Issue 0: Creation of REST API user with prescribed minimum permission
Issue 1

How to provide Unique id for records from different Koha instances?

Koha Instance 1
Koha Instance 2
Koha Instance 3
Koha Instance 4
Koha Instance 5
Koha Instance 6

/opac-detail.pl?biblionumber=2

marc_local_kohails1.properties

```
collection = "Catalogue - Kalyani University"
institution = "Kalyani University"
building = "Central Library, Kalyani University"
id = 999c, (pattern_map.id_prefix), first
pattern_map.id_prefix.pattern_0 = (.+)=>KohalLS1.$1
```

marc_local_kohails2.properties

```
collection = "Catalogue - Burdwan University"
institution = "Burdwan University"
building = "Central Library, Burdwan University"
id = 999c, (pattern_map.id_prefix), first
pattern_map.id_prefix.pattern_0 = (.+)=>KohalLS2.$1
```

import-kohails1.properties

```
solr.indexer.properties =
marc.properties,
marc_local_kohails1.properties
```

import-kohails2.properties

```
solr.indexer.properties =
marc.properties,
marc_local_kohails2.properties
```

Indexing / Importing

```
./batch-import-marc.sh -p /usr/local/vufind/local/import/import-kohails1.properties KohalLS1
./batch-import-marc.sh -p /usr/local/vufind/local/import/import-kohails2.properties KohalLS2
```
**Issue 2: The Multibackend environment**

How to handle multiple ILS drivers (Koha, KohaILSDI, KohaRest) at the DI end?

<table>
<thead>
<tr>
<th>Koha Instance Library 1</th>
<th>Koha ILSDI driver (ILSDI call)</th>
<th>Koha KohaILSDI KohaRest drivers for Instance 1</th>
<th>Koha KohaILSDI KohaRest drivers for Instance 2</th>
<th>Koha KohaILSDI KohaRest drivers for Instance 3</th>
<th>Koha KohaILSDI KohaRest drivers for Instance 4</th>
<th>Koha KohaILSDI KohaRest drivers for Instance 5</th>
<th>Koha KohaILSDI KohaRest drivers for Instance 6</th>
<th>M U L T I B A C K E N D</th>
<th>D I S C O V E R Y L A Y E R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koha Instance Library 2</td>
<td>Koha driver (database call)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koha Instance Library 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koha Instance Library 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koha Instance Library 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koha Instance Library 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Three sets to handle each type
Issue 2: The Multibackend environment
How to handle multiple ILS drivers (Koha, KohaILSDI, KohaRest) at the DI end?

Koha Instance 1  ->  KohaILSDI driver 1  ->  Multibackend driver (ILSDI based)  ->  DI

KohalLS1.ini

```
[Catalog]
; database host, port, user, password, database
host     = 192.168.1.172
port     = 3306
username = koha_koharaka_2001
password = ****************
database = koha_koharaka_2001

; Url to the ILS-DI API
url      = http://192.168.1.172:1001/cgi-bin/koha/ilsdi.pl
```

KohalLS2.ini

```
[Catalog]
; database host, port, user, password, database
host     = 192.168.1.172
port     = 3306
username = koha_koharaka_2002
password = ****************
database = koha_koharaka_2002

; Url to the ILS-DI API
url      = http://192.168.1.172:1002/cgi-bin/koha/ilsdi.pl
```

KohalILSDI driver 1

```
[General]
........

[Drivers]
KohaILS1 = KohaILSDI
KohaILS2 = KohaILSDI
KohaILS3 = KohaILSDI
KohaILS4 = KohaILSDI
KohaILS5 = KohaILSDI
KohaILS6 = KohaILSDI

[Login]
drivers[] = KohaILS1
drivers[] = KohaILS2
drivers[] = KohaILS3
drivers[] = KohaILS4
drivers[] = KohaILS5
drivers[] = KohaILS6
```

MultiBackend.ini

```
[General]
........

[Drivers]
KohaILS1 = KohaILSDI
KohaILS2 = KohaILSDI
KohaILS3 = KohaILSDI
KohaILS4 = KohaILSDI
KohaILS5 = KohaILSDI
KohaILS6 = KohaILSDI

[Login]
drivers[] = KohaILS1
drivers[] = KohaILS2
drivers[] = KohaILS3
drivers[] = KohaILS4
drivers[] = KohaILS5
drivers[] = KohaILS6
```
Issue 2: The Multibackend environment
How to handle multiple ILS drivers (Koha, KohaILSDI, KohaRest) at the DI end?

Koha Instance 1 & 2
KohaRest driver 1 & 2
Multibackend driver (REST based)
DI

KohalLS1.ini

[Catalog]
; The API address without any version such as v1
host = "http://localhost:2001/api"

; OAuth2 client ID
clientId = "bce208b1-4915-445f-bc7d-7caddfbdc590"

; OAuth2 client secret
clientSecret = "b9bde3be-00dc-495a-9768-ce1bff9fe76f"

KohalLS2.ini

[Catalog]
; The API address without any version such as v1
host = "http://localhost:2002/api"

; OAuth2 client ID
clientId = "0162cd0a-0f9e-40d3-a43c-04ba8ef9fd36"

; OAuth2 client secret
clientSecret = "605a3dfb-f02b-49b8-9359-c26235f89cef"

MultiBackend.ini

[General]
………

[Drivers]
KohalLS1 = KohaRest
KohalLS2 = KohaRest
KohalLS3 = KohaRest
KohalLS4 = KohaRest
KohalLS5 = KohaRest
KohalLS6 = KohaRest

[Login]
drivers[] = KohalLS1
drivers[] = KohalLS2
drivers[] = KohalLS3
drivers[] = KohalLS4
drivers[] = KohalLS5
drivers[] = KohalLS6
Login facility in Multibackend driver mode for all three generations

Users can access DI by using their respective ILSs login
<table>
<thead>
<tr>
<th>Title</th>
<th>Author</th>
<th>Year</th>
<th>Call Number</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beyond Book Indexing</td>
<td>Moncrief &amp; Dwight Walker</td>
<td>2000</td>
<td>025.3/0258</td>
<td>Library 1</td>
</tr>
<tr>
<td>Implementing web-scale discovery services: a practical guide for librarians</td>
<td>Thompson, JoLinda</td>
<td>2014</td>
<td>025.04</td>
<td>Library 3</td>
</tr>
<tr>
<td>Library automation and OPAC 2.0: information access and services in the 2.0 landscape</td>
<td>Ho, Birong</td>
<td>2013</td>
<td>025.3/13</td>
<td>Library 2</td>
</tr>
<tr>
<td>Information resource description: creating and managing metadata</td>
<td>Philip. 1971</td>
<td>2013</td>
<td>025.3</td>
<td>Library 1</td>
</tr>
</tbody>
</table>
Results

- Security and confidence building in partners
  - In case of ‘Koha database’ call and ‘KohaILSDI’ approaches, partners need to share Koha database admin credentials (or user having access to Koha database, not even superlibrarian password will do);
  - A bit risky for a partnerships based initiative like union catalogue;
  - In case of ‘KohaRest’ approach, partners need to share only client id & client secret (with minimum privileges) for OAuth2 protocol based access to Koha database through koha-rest-plugin;
  - A revolutionary improvement in security over the Gen I and Gen II approaches and can build necessary confidence among partners;
Results

- Enhanced OPAC functionalities
  - ‘Koha database’ call provides – ILS based login and can retrieve dataset like ‘checked out items’, ‘Loan history’, ‘Holds & Recalls’ and ‘Fines’ from the ILS dynamically; can see brief user profile but
    - Can’t Place or Cancel holds in Multibackend driver mode;
    - Can’t change/modify user profile;
  
  - ‘KohaILSDI’ approach supports all the activities as supported by ‘Database call’ approach and additionally provides features like – Holds placement, Recall, Profile update (password change option) but
    - Holds cancellation is not allowed;
    - Article request facility not available;
  
  - ‘KohaRest’ driver apart from supporting all the features as available in Gen I & Gen II drivers also extends supports for – Holds cancellation, Extensive profile data and Storage Retrieval Requests but
    - Bit slower in transferring datasets from ILS in comparison with Gen I & Gen II drivers
    - Password change option is not there like KohaILSDI.
Library automation and OPAC 2.0: information access and services in the 2.0 landscape

“This book brings library automation back to the forefront of cutting-edge research, encompassing today’s age of Web 2.0 and social networking”–Provided by publisher.

Format: Book
Language: English
Published: Hershey PA: Information Science Reference, [2013]

Tags: No Tags. Be the first to tag this record! Add Tag

Similar Items
- Automated library systems: a librarian’s guide and teaching manual / by Duval, Beverly K. Published: (1992)
- Implementing web-scale discovery services: a practical guide for librarians / by Thompson, JoLinda, Published: (2014)
- A Reader on choosing an automated library system / Published: (1983)
- Implementing the automated library system / by Corbin, John. Published: (1988)
- An automation primer for school library media centers and small libraries / by Schultz-Jones, Barbara. Published: (2006)
Library automation and OPAC 2.0: information access and services in the 2.0 landscape / "This book brings library automation back to the forefront of cutting-edge research, encompassing today's age of Web 2.0 and social networking"--Provided by publisher.

**Format:** Book

**Language:** English

**Published:** Hershey PA : Information Science Reference, [2013]

**Subjects:**
- Online library catalogs.
- Libraries > Automation.
- Libraries > Information technology.
- Library science > Computer programs.
- Web 2.0.

**Tags:** No Tags, Be the first to tag this record!  Add Tag

---

**Holdings**  Description  Table of Contents  Comments  Similar Items  Staff View

### General Stacks

**Call Number:** 025.3/13 TRA/L

**Copy c1**

Available  Place a Hold

**Copy c1**

Available  Place a Hold

---

**Similar Items**

- Automated library systems: a librarian's guide and teaching manual / by: Duval, Beverly K. Published: (1992)
- Implementing web-scale discovery services: a practical guide for librarians / by: Thompson, JoLinda. Published: (2014)
- A Reader on choosing an automated library system / by: Corbin, John. Published: (1988)
- Implementing the automated library system / by: Schultz-Jones, Barbara. Published: (2006)
- An automation primer for school library media centers and small libraries / by: Schultz-Jones, Barbara. Published: (2006)
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<table>
<thead>
<tr>
<th>Format:</th>
<th>Book</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language:</td>
<td>English</td>
</tr>
<tr>
<td>Published:</td>
<td>Hershey PA: Information Science Reference, [2013]</td>
</tr>
<tr>
<td>Subjects:</td>
<td>Online library catalogs, Libraries &gt; Automation, Libraries &gt; Information technology, Library science &gt; Computer programs, Web 2.0</td>
</tr>
<tr>
<td>Tags:</td>
<td>No Tags, Be the first to tag this record!</td>
</tr>
</tbody>
</table>

Library 2: General Shelf

<table>
<thead>
<tr>
<th>Call Number:</th>
<th>025.3/13 TRA/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy c1</td>
<td>Available</td>
</tr>
<tr>
<td>Copy c1</td>
<td>Available</td>
</tr>
</tbody>
</table>
KohaRest is the champion but ....

A search involving documents from all Six libraries takes almost 30 seconds to upload real-time item-level status for set 1 (20 retrieved records) for a total of 12 sets (236 retrieved records) but availability status in detail page is instantaneous.
Conclusion …..

- It is too early to conclude as KohaRest is only 3 months old but the conceptual framework that supports REST based interaction between VuFind and Koha is brilliant;
- KohaRest is more secured approach in a multi ILS environment in comparison with KohaILSDI and Koha drivers;
- KohaRest does not require additional configuration in Mysql/MariaDB when Koha instances are in different machines, whereas KohaILSDI and Koha drivers need this additional work;
- KohaRest is independent of structural changes in Koha side whereas KohaILSDI and Koha drivers need adjustments with changes in Koha side (for example, in VuFind 4.1 KohaILSDI required major changes when Koha community decided to remove marcxm out of the bibliioitems table in Koha 17.05 — see https://github.com/vufind-org/vufind/pull/1007);
- REST endpoints at Koha side will be growing with the time (unlike fixed 25 parameters in ILSDI) and more and more OPAC functionalities will be added in KohaRest driver in future (you have already noticed the ‘article request’ option in KohaRest);
- At this point of time KohaRest driver is bit slower in comparison with KohaILSDI and Koha drivers but I am sure it will be solved in the forthcoming version VuFind 7.2; and
- De-duplication and FRBRized display may be the next target for such a framework.
Thank you...

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Parthasarathi Mukhopadhyay (psmukhopadhyay@gmail.com)

Stay Safe

Special thanks to: Demian Katz and Ere Maijala for their help and guidance.