

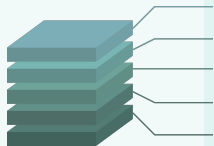
# Transitioning to Linked Data Formats to Prepare to an Artificial Intelligence Future

**José A. Vila**  
**University of Miami Libraries**

**4th Artificial Intelligence and Libraries Symposium,  
Santiago de Chile, Chile, April 12, 2024**

# Agenda

- 1. Introduction and scope.**
- 2. Linked Data and Bibframe.**
- 3. Relation between Linked Data and Artificial Intelligence.**
- 4. Our transition to Linked Data.**
- 5. Ex Libris Linked Data Focus Group.**



# University of Miami



**PRIVATE UNIVERSITY IN SOUTH FLORIDA**



**MORE THAN 19,000 STUDENTS**



**16,000 EMPLOYEES**

**11 SCHOOLS**



**AROUND 180 ACADEMIC PROGRAMS**

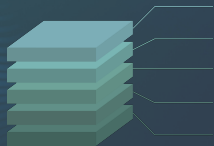


# Transitioning to Linked Data Formats

**MARC**



**BIBFRAME**



# Transitioning to Linked Data Formats

**MARC**

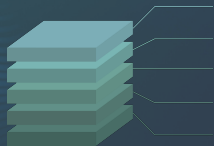


**BIBFRAME**



**Some limitations**

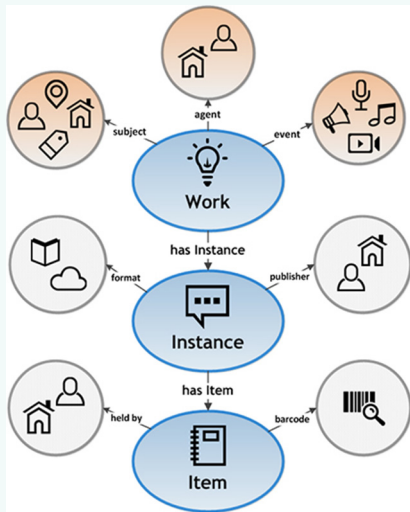
**limited interoperability and  
ability to effectively share  
and exchange data with  
other systems.**



# Bibframe

*A Linked Data format intended to replace MARC format*

- **Data model for bibliographic information.**
- **Organizes information into three core levels of abstraction: Work, Instance, and Item.**



# What is Linked Data?

- **Structured data** which contains links to other datasets.
  - Structured data are defined using schemas and ontologies that define the structure of classes, attributes, and relationships for a subject area.
  - These datasets are connected together and interpreted by machines.



# Linked Data



Better  
discoverability



Collaborative  
cataloging

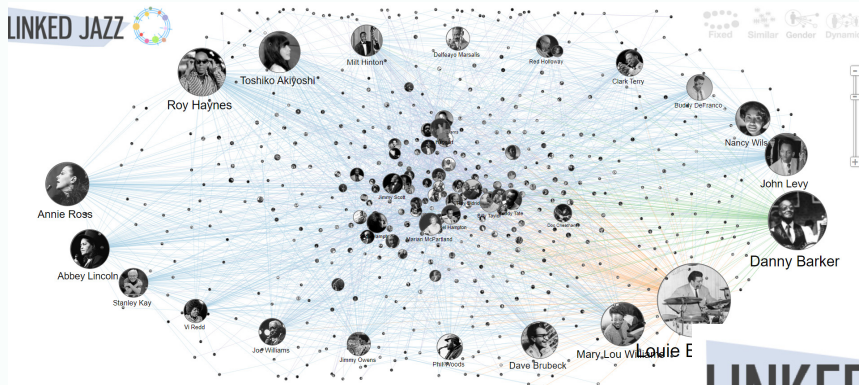


Global  
interoperability



# Linked Data in Action

<https://linkedjazz.org/>

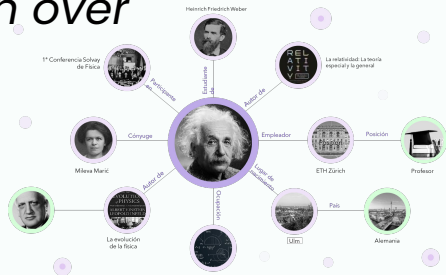


LINKED JAZZ



# Linked Data and Artificial Intelligence

*Linked Data and Artificial Intelligence are closely connected, with Linked Data providing a structured, interconnected foundation for AI applications to access, integrate, and reason over diverse datasets.*



# Linked Data and AI

## Linked Data Network

Text

Visual

Metadata



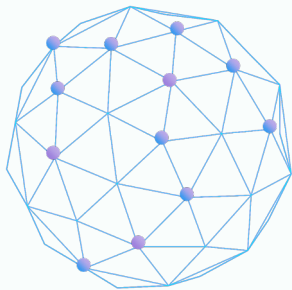
AI Models



AI Models



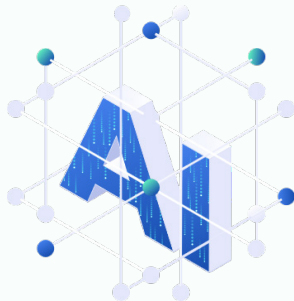
# Linked Data and AI



**Linked Data  
Network**



**Using  
enhanced  
relations**



**AI Models**



**Improved  
recommendation  
systems**

# Ex Libris Linked Data Focus Group



**UCDAVIS**



**11 members**

# Ex Libris Linked Data Focus Group

The image displays three overlapping screenshots of library systems against a background of a city map with colorful lines. The top-left screenshot is from SINOPIA, showing a 'Monograph Instance (BIBFRAME)' page with fields for Title Information, Edition Statement, and Transcribed Provider Statement. The top-right screenshot is from Alma, showing an 'Instance View' page with a list of records. The bottom-right screenshot is from Primo, showing a search result for 'Albert Einstein | 1879-1955' with a portrait and a list of titles written by him.

**SINOPIA**

**Alma**

**Primo**

**Ex Libris**

**Albert Einstein | 1879-1955**

German born theoretical physicist. Developer of the theory of relativity.

Albert Einstein was a German born theoretical physicist, widely acknowledged to be one of the greatest physicists of all time. Einstein is known for developing the theory of relativity, but his most significant contributions to the development of the theory of quantum mechanics. Relativity and quantum mechanics are together the two pillars of modern physics. His mass-energy equivalence formula  $E = mc^2$ , which arises from relativity theory, has been dubbed "the world's most famous equation". His work is also known for its influence on the philosophy of science. He received the Nobel Prize in Physics "for his services to theoretical physics, and especially for his discovery of the law of the photoelectric effect", a pivotal step in the development of quantum theory. His intellectual achievements and originality resulted in "Einstein" becoming synonymous with "genius".

Born: March 14, 1879, Ulm, Germany  
Died: April 18, 1955, Princeton, New Jersey, United States

Employer: University of Bern, Swiss Federal Institute of Intellectual Property, University of Zurich, German University in Prague, ETH Zurich, Kazan Federal Science, Prussian University

Occupation: Theoretical physicist, philosopher of science, musician, science writer, patentologist

Field of work: Physics

**Titles written by Albert Einstein**

- Relativity: the Special & the General Theory
- The world as I see it
- Einstein, Albert: Out of My Later Years
- Seven months: 1953, Albert Einstein, and the...
- Albert Einstein: A Biography
- Einstein: A Life: Einstein, Albert: Deutscher Taschenbuch...

# Sinopia

- **Linked data editor for metadata creation and reuse.**
- **Sinopia was created to enable catalogers to:**
  - **catalog in a linked data environment without having to set up and maintain tools locally.**
  - **explore cooperative cataloging in a linked data environment.**
- **The Sinopia tool is web-based, catalogers don't have to install any software; only need a web browser.**
- **Sinopia was developed by the Linked Data for Production: Pathway to Implementation (LD4P2) project.**

SINOPIA - DEV

<https://development.sinopia.io/>



SINOPIA - DEV

Dashboard Resource Templates Actions Search Sinopia

Find a resource template:

> Most recently used templates

Label / ID	Resource URI	Author	Group	Date	Declaring statement	Actions
<a href="#">_PCC BF2 Admin Metadata</a> <a href="#">pcc:BF2AdminMetadata</a>	<a href="http://id.loc.gov/ontologies/bibframe/adminMetadata">http://id.loc.gov/ontologies/bibframe/adminMetadata</a>	PCC	Program for Cooperative Cataloging	Sep 26, 2020		<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>
<a href="#">_PCC BF2 Instance (Audio recording)</a> <a href="#">pcc:BF2AudioRecordingInstance</a>	<a href="http://id.loc.gov/ontologies/bibframe/instance">http://id.loc.gov/ontologies/bibframe/instance</a>	PCC	Program for Cooperative Cataloging	Oct 26, 2021		<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>
<a href="#">_PCC BF2 Instance (Monograph)</a> <a href="#">pcc:BF2MonographInstance</a>	<a href="http://id.loc.gov/ontologies/bibframe/instance">http://id.loc.gov/ontologies/bibframe/instance</a>	PCC	PCC Template Managers	Mar 13, 2023	For books (single or multi-volume) & e-books	<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>
<a href="#">_PCC BF2 Instance (Monograph)_UCD</a> <a href="#">pcc:BF2MonographInstance_ucd</a>	<a href="http://id.loc.gov/ontologies/bibframe/instance">http://id.loc.gov/ontologies/bibframe/instance</a>	UC Davis	University of California, Davis	Feb 16, 2024	For books (single or multi-volume) & e-books (UC Davis copy of PCC template)	<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>
<a href="#">_PCC BF2 Instance (Serial)</a> <a href="#">pcc:BF2SerialInstance</a>	<a href="http://id.loc.gov/ontologies/bibframe/instance">http://id.loc.gov/ontologies/bibframe/instance</a>	PCC	Program for Cooperative Cataloging	Mar 13, 2023		<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>
<a href="#">_PCC BF2 Item (Monograph)</a> <a href="#">pcc:BF2ItemMonographItem</a>	<a href="http://id.loc.gov/ontologies/bibframe/item">http://id.loc.gov/ontologies/bibframe/item</a>	PCC	Program for Cooperative Cataloging	Sep 26, 2020		<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>
<a href="#">_PCC BF2 Item (Serial)</a> <a href="#">pcc:BF2ItemSerial</a>	<a href="http://id.loc.gov/ontologies/bibframe/item">http://id.loc.gov/ontologies/bibframe/item</a>	PCC	Program for Cooperative Cataloging	Oct 20, 2023		<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>
<a href="#">_PCC BF2 Work (Monograph)</a> <a href="#">pcc:BF2WorkMonographWork</a>	<a href="http://id.loc.gov/ontologies/bibframe/work">http://id.loc.gov/ontologies/bibframe/work</a>	PCC	Program for Cooperative Cataloging	Mar 13, 2023		<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>
<a href="#">_PCC BF2 Work (Monograph)_UCD</a> <a href="#">pcc:BF2WorkMonographWork_ucd</a>	<a href="http://id.loc.gov/ontologies/bibframe/work">http://id.loc.gov/ontologies/bibframe/work</a>	UC Davis	University of California, Davis	Feb 16, 2024	UC Davis copy of PCC template	<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>
<a href="#">_PCC BF2 Work (Music Work)</a> <a href="#">pcc:BF2WorkMusicWork</a>	<a href="http://id.loc.gov/ontologies/bibframe/work">http://id.loc.gov/ontologies/bibframe/work</a>	PCC	Program for Cooperative Cataloging	Oct 22, 2021		<a href="#">i</a> <a href="#">e</a> <a href="#">d</a>

# Cataloging in Sinopia

## Work: Author, languages, subjects

SINOPIA - DEV mperezmd · Help · Logout

Dashboard **Editor** Resource Templates Actions ▾ Search **Sinopia**

**\_PCC BF2 Work (Monograph)** **WORK**

URI for this resource: <https://api.development.sinopia.io/resource/4432d95f-9691-4f8e-9a7c-5ed5c0e75481>  Permissions

Unable to load the entire resource. The unused triples are listed below. View as:

Subject	Predicate	Object
http://id.loc.gov/vocabulary/languages/eng	http://www.w3.org/2000/01/rdf-schema#label	English

**Navigation** Versions Relationships

- Work Title ●
- Variant Work Title ●
- Primary Contribution ●
- Other creator(s)/contributor(s)
- Government Publication Type
- Date of Work ●
- Place of Origin of the Work
- Language ●
- Script
- (Geographic) Coverage of the Content of the Resource

Class **Work** (http://id.loc.gov/ontologies/bibframe/Work)

Optional classes

- Manuscript (http://id.loc.gov/ontologies/bibframe/Manuscript)
- Monograph (http://id.loc.gov/ontologies/bibframe/Monograph)
- Text (http://id.loc.gov/ontologies/bibframe/Text)

**Work Title\***

**Title--Work Title**

Property: Title (http://id.loc.gov/ontologies/bibframe/title)  
Class: http://id.loc.gov/ontologies/bibframe/Title

▼ Preferred Title for Work\*

Property: main title (http://id.loc.gov/ontologies/bibframe/mainTitle)  
Enter a literal

State v. Harris case file SINOPIA work





# Cataloging in Sinopia


Instance: Publisher, Place and date of publication, format

SINOPIA - DEV mperezmd · Help · Logout

Dashboard **Editor** Resource Templates Actions ▾ Search **Sinopia** State v. Harris case file

MARC ▾ **Export to Catalog** **Close** **Save**

**\_PCC BF2 Instance (Monograph)** **INSTANCE**  

URI for this resource: <https://api.development.sinopia.io/resource/db4262ed-f598-4643-910f-7cf23ac01732>  **Copy URI** Permissions

Unable to load the entire resource. The unused triples are listed below. View as: **Table (RDF)** ▾

Subject	Predicate	Object
b0_c14n0	http://id.loc.gov/ontologies/bibframe/source	OCLC [en]

**Navigation** Versions Relationships

- Instance of ●
- > Title proper ●
- > Parallel, Variant & Transliterated Titles
- Statement of Responsibility ●
- Edition Statement
- > Publication Information ●
- >
- Distribution, Manufacture, Production Information
- Copyright Date ●
- > Contribution to the Manifestation/Instance ●



Class



Optional classes

- Archival (http://id.loc.gov/ontologies/bibframe/Archival)
- Electronic (http://id.loc.gov/ontologies/bibframe/Electronic)
- Print (http://id.loc.gov/ontologies/bibframe/Print)


Instance of **i**

Property: Instance of (http://id.loc.gov/ontologies/bibframe/instanceOf)

URI   

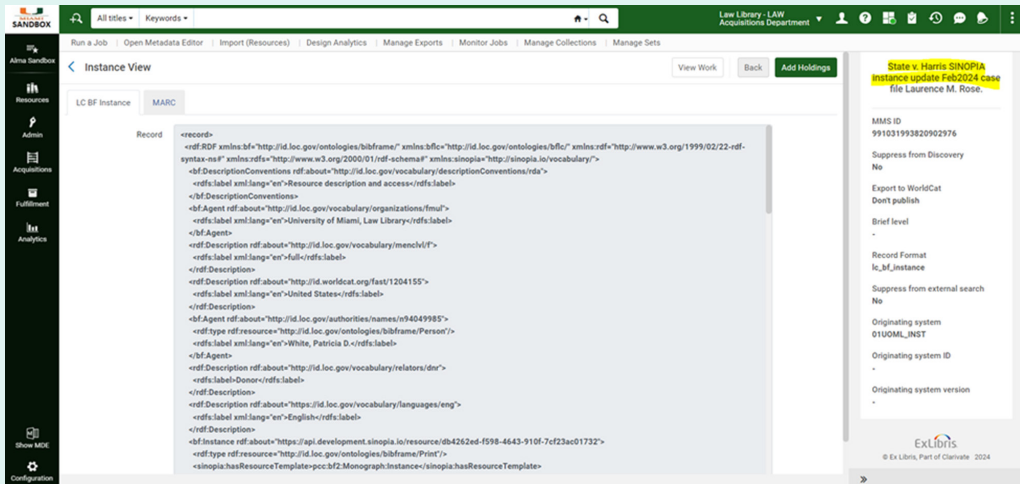
Label    en

+ Add another Instance of

Title proper 

# Cataloging in Sinopia

## Instance - XML Tags



The screenshot shows the Sinopia Instance View interface. The top navigation bar includes the Alma SandBox logo, search filters for 'All titles' and 'Keywords', and the user's role 'Law Library - LAW Acquisitions Department'. Below the navigation bar, the 'Instance View' section is active, showing tabs for 'LC BF Instance' and 'MARC'. A 'Record' tab is selected, displaying the XML content of the instance. The XML content is as follows:

```
<record>
<rdf:RDF xmlns:bf="http://id.loc.gov/ontologies/bibframe/" xmlns:bflc="http://id.loc.gov/ontologies/bflc/" xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#" xmlns:sinopia="http://sinopia.io/vocabulary/">
<bf:DescriptionConventions rdf:about="http://id.loc.gov/vocabulary/descriptionConventions/rda">
<rdfs:label xml:lang="en">Resource description and access</rdfs:label>
</bf:DescriptionConventions>
<bf:Agent rdf:about="http://id.loc.gov/vocabulary/organizations/fmul">
<rdfs:label xml:lang="en">University of Miami, Law Library</rdfs:label>
</bf:Agent>
<rdf:Description rdf:about="http://id.loc.gov/vocabulary/mencvlv1">
<rdfs:label xml:lang="en">full</rdfs:label>
</rdf:Description>
<rdf:Description rdf:about="http://id.worldcat.org/fast/1204155">
<rdfs:label xml:lang="en">United States</rdfs:label>
</rdf:Description>
<bf:Agent rdf:about="http://id.loc.gov/authorities/names/n94049985">
<rdf:type rdf:resource="http://id.loc.gov/ontologies/bibframe/Person"/>
<rdfs:label xml:lang="en">White, Patricia D.</rdfs:label>
</bf:Agent>
<rdf:Description rdf:about="http://id.loc.gov/vocabulary/relators/dnr">
<rdfs:label>Donor</rdfs:label>
</rdf:Description>
<rdf:Description rdf:about="https://id.loc.gov/vocabulary/languages/eng">
<rdfs:label xml:lang="en">English</rdfs:label>
</rdf:Description>
<bf:Instance rdf:about="https://api.development.sinopia.io/resource/db4262ed-f598-4643-910f-7cf23ac01732">
<rdf:type rdf:resource="http://id.loc.gov/ontologies/bibframe/Print"/>
<sinopia:hasResourceTemplate>pcc:bf2:Monograph:instance</sinopia:hasResourceTemplate>
</bf:Instance>
</rdf:RDF>
</record>
```

On the right side of the interface, there is a metadata sidebar for the instance 'State v. Harris SINOPIA instance update Feb2024 case file Laurence M. Rose'. It lists various identifiers and settings:

- MMS ID: 991031993820902976
- Suppress from Discovery: No
- Export to WorldCat: Don't publish
- Brief level: -
- Record Format: lc\_bf\_instance
- Suppress from external search: No
- Originating system: 01UOML\_INST
- Originating system ID: -
- Originating system version: -

At the bottom right, the ExLibris logo is visible, along with the text '© Ex Libris, Part of Clarivate 2024'.

# Cataloging in Sinopia

Edit BF record, add inventory: holdings, items

The screenshot displays the Sinopia cataloging interface. At the top, the header includes the 'MELAMET SANDBOX' logo, search filters for 'All titles', 'Keywords', and 'State v. Harris', and the 'Law Library - LAW Acquisitions Department' information. Below the header, navigation tabs include 'Run a Job', 'Open Metadata Editor', 'Import (Resources)', 'Design Analytics', 'Manage Exports', 'Monitor Jobs', 'Manage Collections', and 'Manage Sets'. The main interface is divided into several sections:

- Records Section:** Shows 'MARC21 Bib (1)', 'LC BF Instance (1)', 'Holdings (1)', and 'DC'. A search bar is present with the text 'Search in list'.
- Record Information:** Displays the record title 'State v. Harris SINOPIA instance update Feb2024 cas...' with ID '(22434469060002976)' and a 'View Only' button.
- XML Editor:** A text area containing RDF/XML code for the record, including namespaces for bibframe, bfic, schema, sinopia, and various vocabularies. The code includes elements for description, agent, and donor.
- Holdings Section:** Shows a table with columns for LDI, barcode, and price. The table contains one entry: LDI '#####nx##a22#####1n#4500', barcode '00€ 1011252u####8###4001uueg0000000', and price '85% \$b LAW \$c \$h \$i'.

# Complete workflow

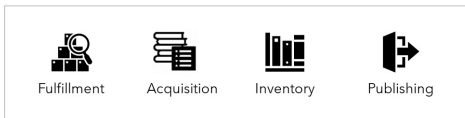
SINOPIA



Cataloging - BIBFRAME



ExLibris Alma



Management



Discovery



Analytics

Goal: Bibframe  
in production  
by May 2024

## Conclusions

- **Feel like the transition to Linked Data formats is getting more traction.**
- **AI and Linked Data feed one another.**
- **Ex Libris Linked Data Focus Group:**
  - **Great learning experience.**
  - **Libraries will have the option to catalog in MARC AND/OR Bibframe.**



**Thank You**  
jvila@miami.edu