

Library Linked Data Webinar 14 September 2021

# On the way to Library Linked Data: The view from OCLC Research



**Jeff Mixter**

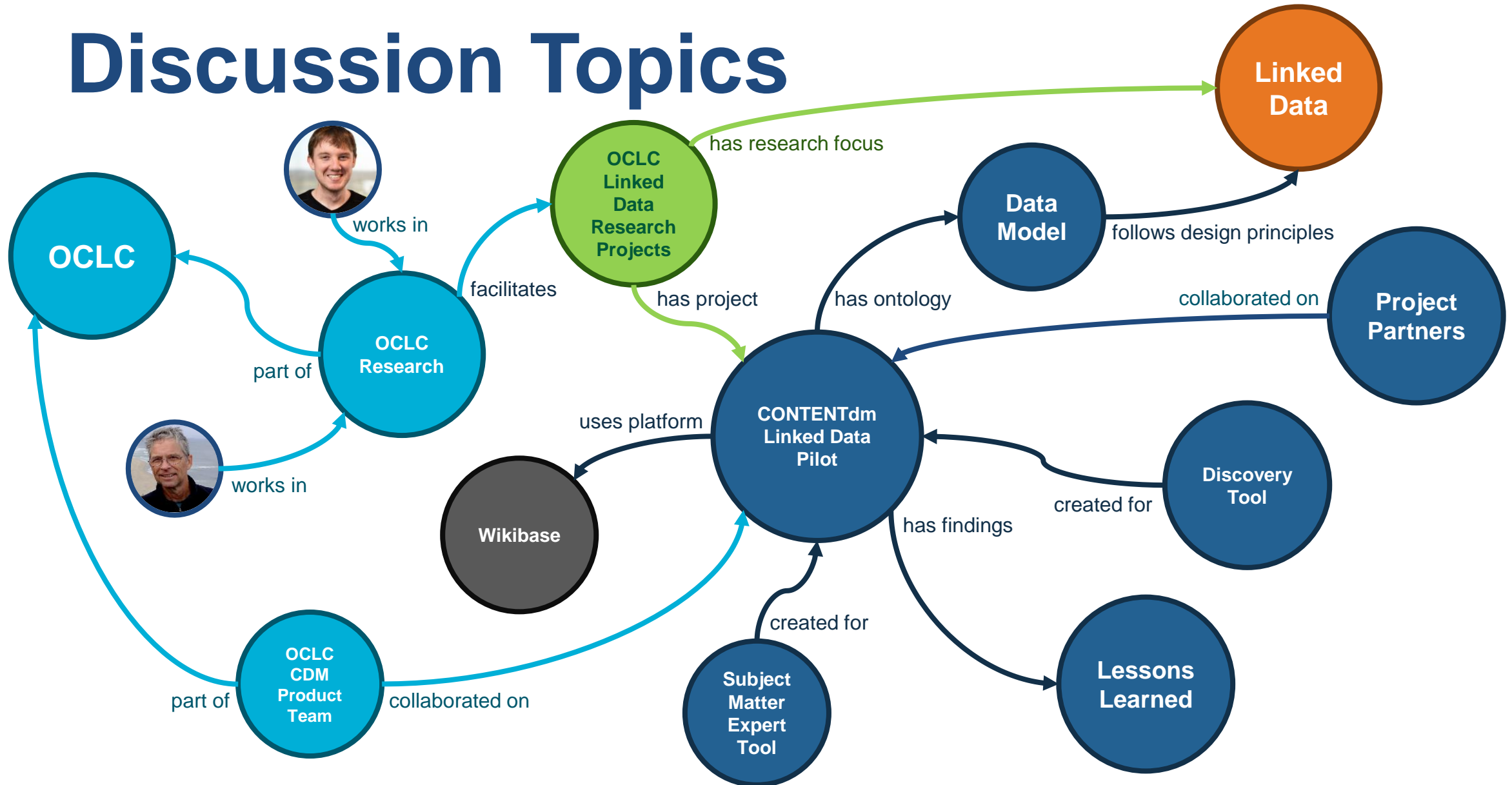
Lead Software Engineer  
OCLC Research



**Bruce Washburn**

Principal Software Engineer  
OCLC Research

# Discussion Topics



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# ABOUT OCLC RESEARCH

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# OCCLC's Research Division

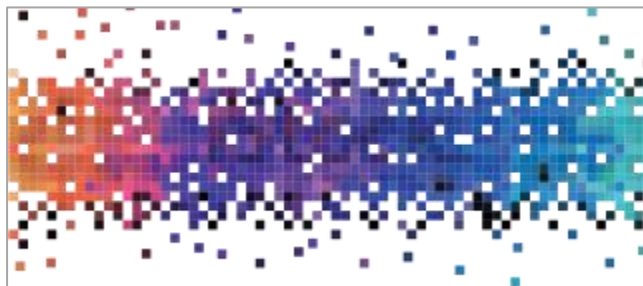
- is a **community resource** for the research-driven advancement of libraries and archives,
- provides **advanced development and consultation** for the teams that create and maintain OCLC's products, and
- enhances OCLC's **member and partner engagement** to mobilize the community around shared concerns.

# OCLC Research Areas



## The Collective Collection

Providing evidence and models that help libraries optimize access to collections.



## Research Collections & Support

Exploring new modes of researcher support and collection management.



## Data Science

Analyzing bibliographic data to derive new meaning, insights, and services.



## User Research

Studying trends in consumer technology and learning environments and sharing evidence.



## Libraries as Community Catalysts

Equipping library staff to respond to ever-evolving community needs.



## Library as Enterprise

Exploring how libraries organize internally, engage with their community, and act collectively.

**For more information about the  
people and programs of OCLC  
Research:**

**[www.oclc.org/research/](http://www.oclc.org/research/)**

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# THE LINKED DATA VALUE PROPOSITION

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# “Linked Data” refers to ...

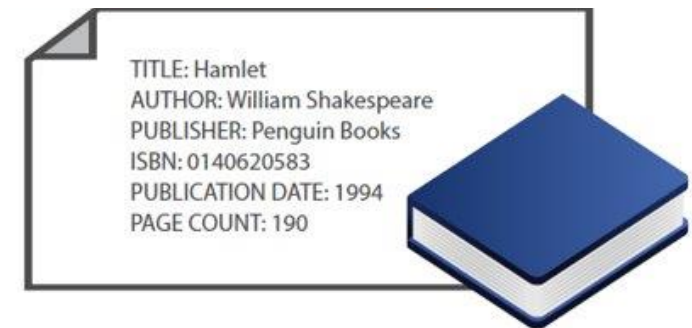
**a set of best practices for publishing structured data on the Web.**

1. Use URIs as names for things
2. Use HTTP URIs so that people can look up those names.
3. When someone looks up a URI, provide useful information.
4. Include links to other URIs so that they can discover more things.

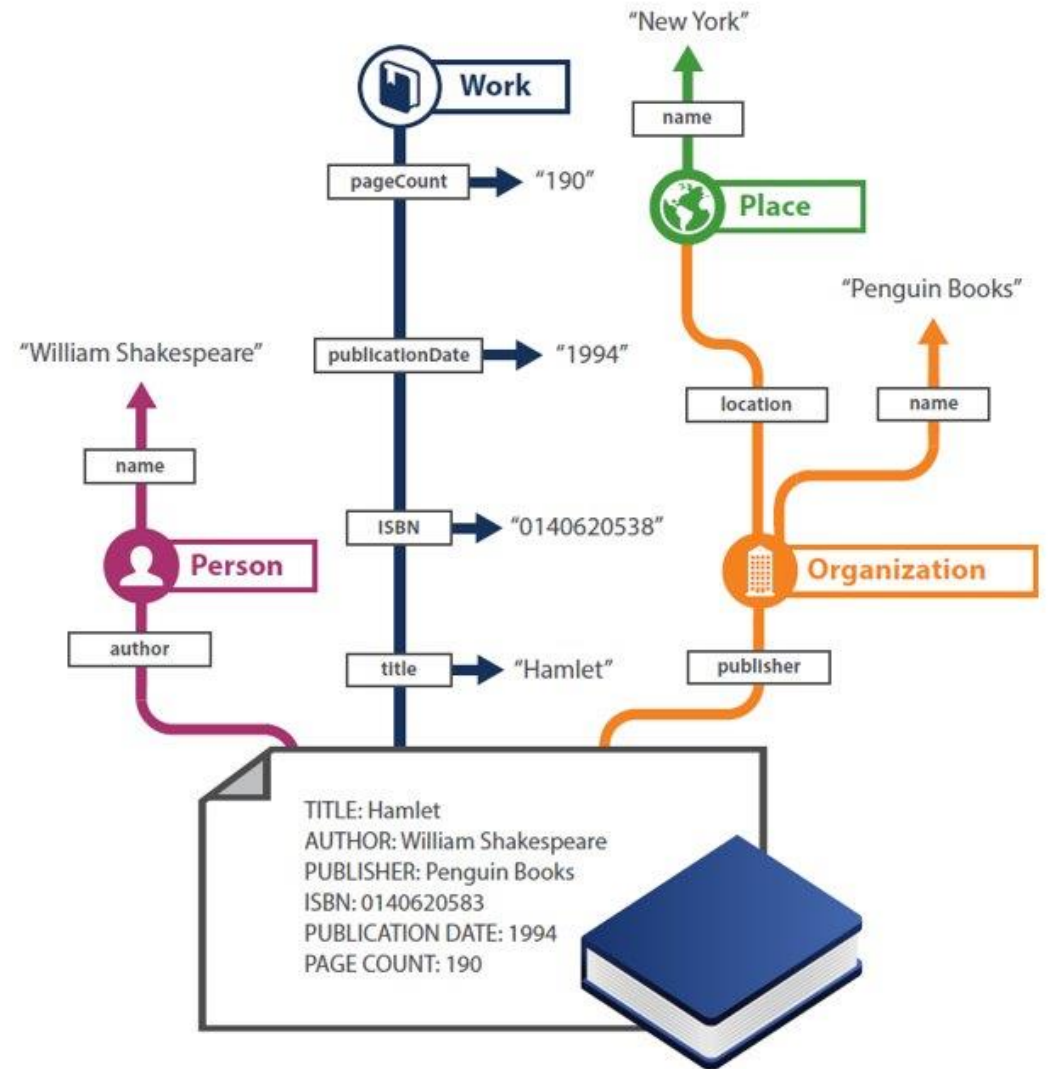
<https://www.w3.org/wiki/LinkedData>



# Moving from records to entities



# Moving from records to entities



# Linked data models reflect common-sense and in the long-term can save money

- Describe real world relationships between things
- Evolve and improve the data model inexpensively
- Avoid complex and inefficient database processes
- Obtain new skill sets and software frameworks

# Quality issues with legacy data can be found and fixed when viewed as linked data

- Reveal problematic data using identifiers and rules
- Set data constraints on the model's classes and properties
- A relational database problem can become a linked data problem unless completeness and quality is addressed
- Significant resources are needed for data modeling

# Attainable, incremental Linked Data projects produce solid results and lead to long-term goals.

- Build and test manageable subsets of the complete ontology in a graph-based data model
- While iterating, work towards a more comprehensive longer-term objective

Recommended reading: "[Overcoming Resistance to Technology Change: A Linked Data Perspective](#)", Tim Williams, UCB Biosciences Inc., PhUSE EU Connect 2018

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# LINKED DATA RESEARCH AT OCLC

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# A decade with Linked Data

[oclc.org/linkeddataresearch](https://oclc.org/linkeddataresearch)



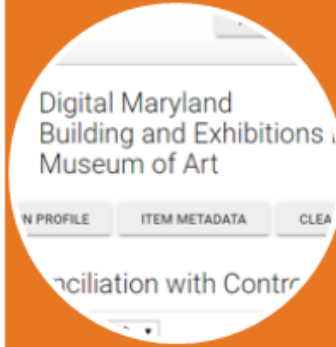
Publish linked data - FAST, VIAF, WorldCat (2009 - )



EntityJS Research Project (2013)



Person Entity Lookup Pilot (2014)



CONTENTdm Metadata Refinery (2015-16)



Project Passage (2017-18)

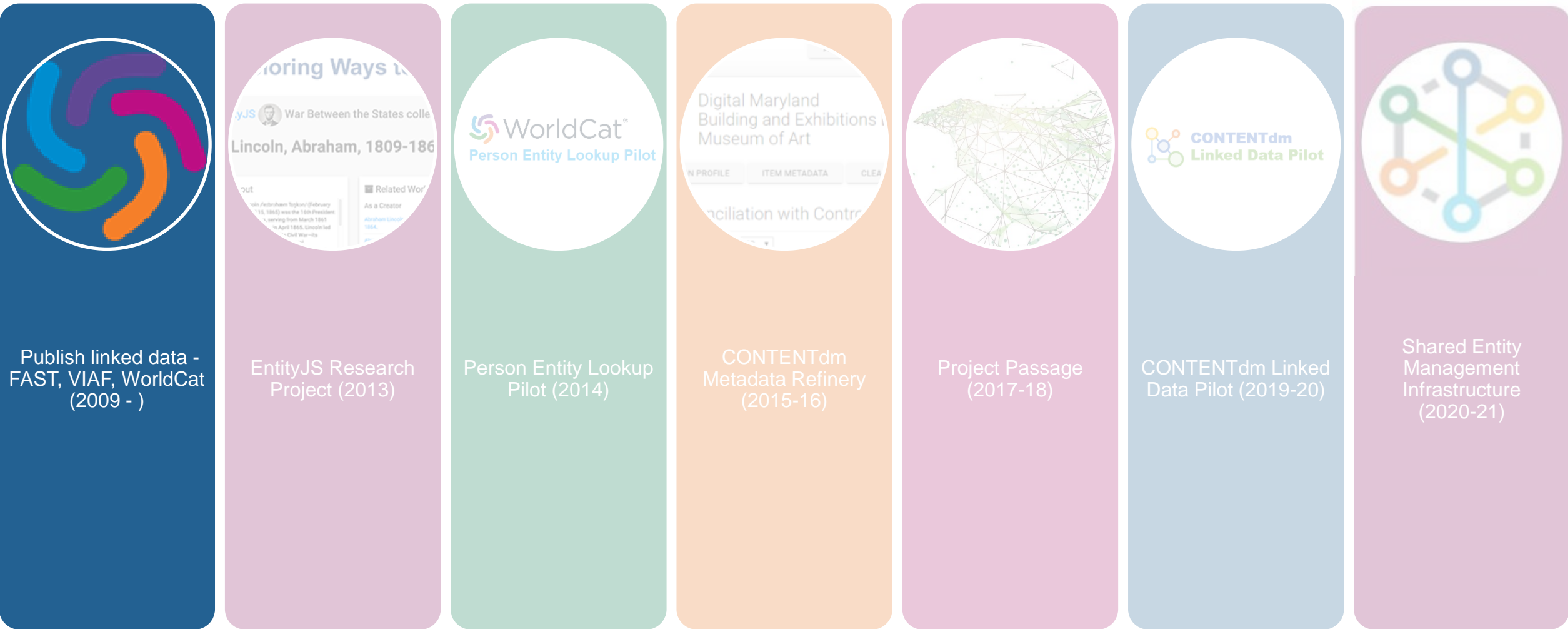


CONTENTdm Linked Data Pilot (2019-20)



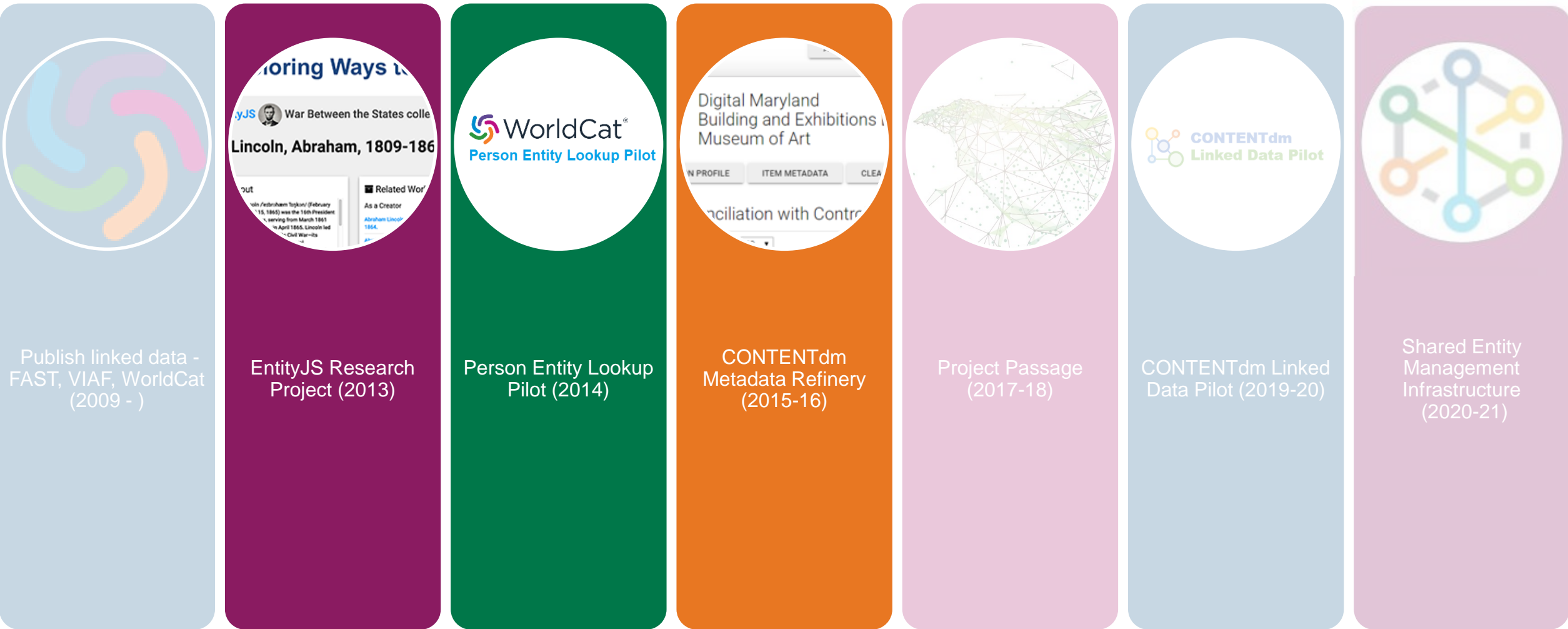
Shared Entity Management Infrastructure (2020-21)



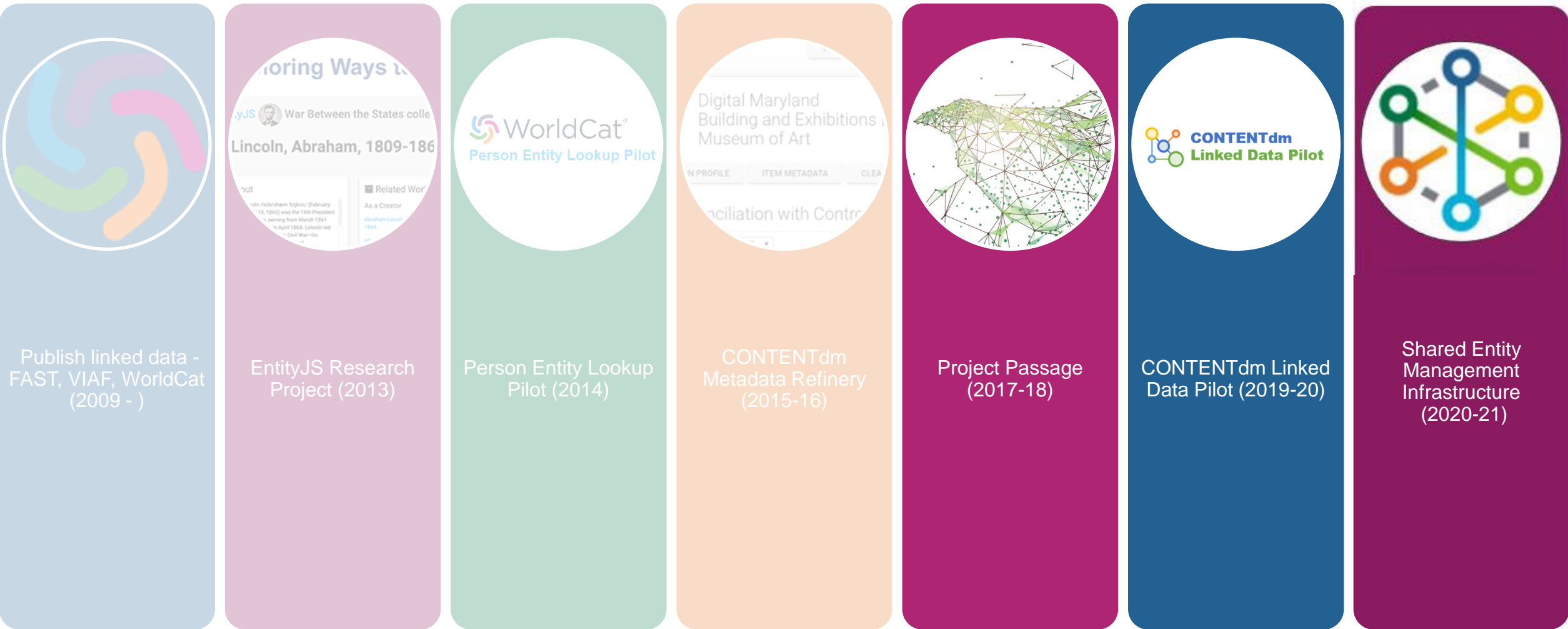


**VIAF, FAST, and WorldCat:** Publish Linked Data on the web with a UI, API, and downloadable datasets





**EntityJS:** Explore how Linked Data improves discovery of related entities  
**Person Entity Lookup Pilot:** Test use cases and interoperability for Linked Data as a web service  
**CONTENTdm Metadata Refinery:** Evaluate shared tools to manage the Linked Data workflow



**Project Passage:** Think big... Build a complete system based on Linked Data

**CONTENTdm Linked Data Pilot:** Think "long tail". Attend to the issues around the special and unique.

**Entity Management:** Build a full entity management infrastructure at global scale.

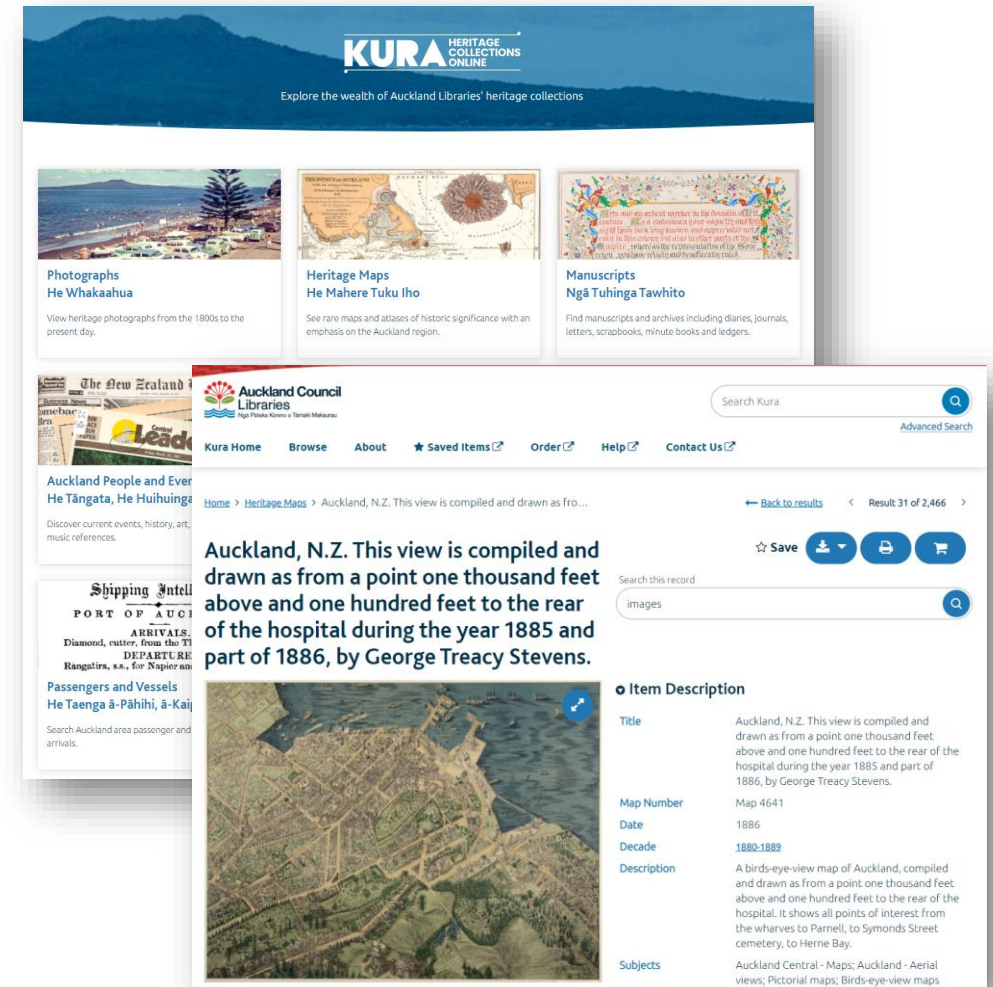
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# ABOUT THE CONTENTDM LINKED DATA PILOT PROJECT

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# What is CONTENTdm?

- OCLC's digital content management service.
- CONTENTdm builds and showcases digital collections.
- CONTENTdm securely manages digital materials in a cloud-based system.

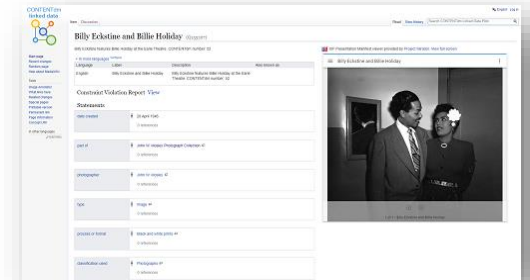


<https://kura.aucklandlibraries.govt.nz/>

# Research Areas of Interest

1. Divergent practice and collection assessment
2. Shared data models for diverse collections and institutions
3. Automated data processing and human attention
4. Tools for subject matter experts
5. Discovery tools to reveal hidden connections
6. The Linked Data paradigm shift

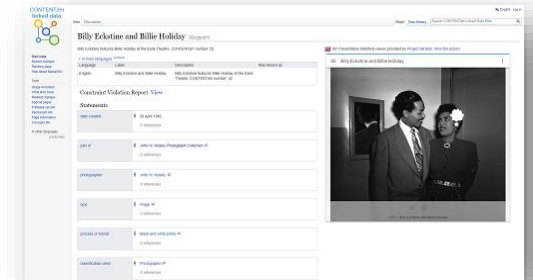
[oclc.org/ocld/](https://oclc.org/ocld/)



# Research Areas of Interest

1. Divergent practice and collection assessment
- 2. Shared data models for diverse collections and institutions**
3. Automated data processing and human attention
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[oclc.org/oclc/cdmlid](https://oclc.org/oclc/cdmlid)



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# BUILDING A LINKED DATA MODEL

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# Developing a Data Model

- CONTENTdm metadata is very heterogeneous, when comparing different institution's practices.
- There can be variability in vocabularies and data dictionaries even for different collections at the same institution.
- A single data model was needed for the Linked Data pilot project, as a single system would manage metadata for all institutions and collections.



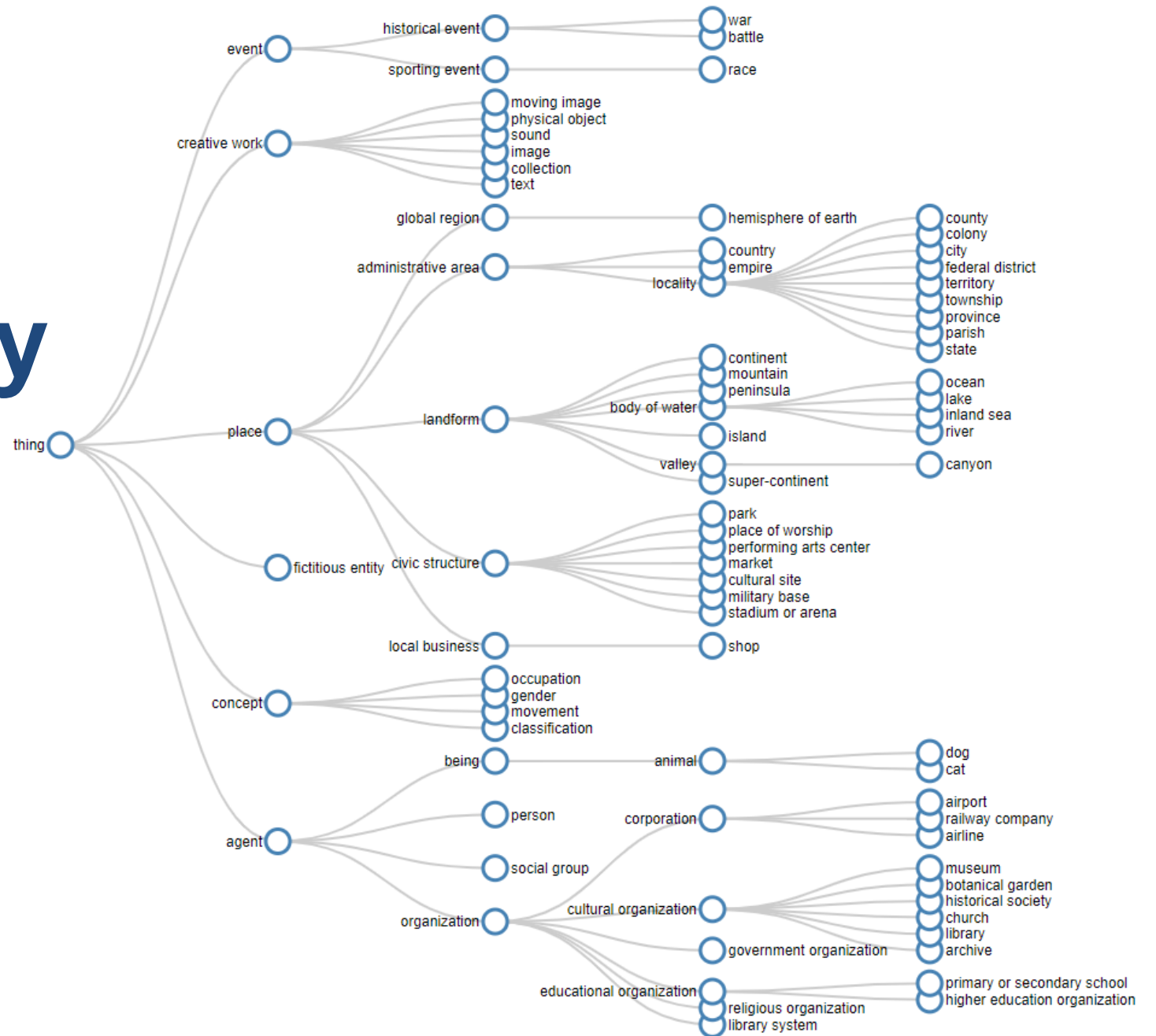
# Developing a Data Model

- The pilot project tested a hypothesis:
  - through sampling current CONTENTdm metadata, and looking for patterns and convergence, a model could be driven by data and avoid speculation.
- Properties and Classes in the data model were associated with their counterparts in other ontologies and vocabularies, to support transformation, export, and linking.

# Developing a Data Model

- Metadata analysis began with an inventory of CONTENTdm mapping of local data elements to Dublin Core.
- The most frequently encountered classes and relationships were identified.
- 13 million records were analyzed to find the most widely-used properties for creative works.
- The most frequently used terms were extracted to build an initial class taxonomy for creative works.
- Collaboration with project partners and colleagues revised this method.

# CONTENTdm Data Model Class Hierarchy



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# WIKIBASE AS A LINKED DATA PLATFORM

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# Why Wikibase?

- OCLC Research is very familiar with the Wikibase ecosystem.
- Wikibase is well-suited for the Linked Data investigations for the CONTENTdm pilot project.
- Using Wikibase helped OCLC Research and the project participants dive right in.

# Why not just use Wikidata?

- Testing new properties and classes, but the short time-frame of the pilot didn't allow for the time needed to have these proposed, reviewed, and accepted in Wikidata.
- Participants would not have time to review and approve the metadata quality or be able to commit to maintaining it in Wikidata after the pilot project was over.

# Managing the Data Model in Wikibase

- Applies a workflow used in Wikidata.
- We reused the Wikidata templates for new Class and Property proposals.
- Even with a very small team, it was beneficial to establish a review practice and to remind ourselves of prior decisions.

The image displays two screenshots of the CONTENTdm linked data interface, illustrating the workflow for creating and reviewing property proposals.

**Top Screenshot: Creating the property proposal**

The page title is "CONTENTdm:Property proposal". The main content area is titled "Creating the property proposal" and lists five steps:

1. Check if the property already exists by looking at the list of properties.
2. Select the right datatype for the property.
3. Start writing the documentation based on the preloaded form.
4. Once consensus is reached, change **status** to **ready** on the template, to attract the attention of the system administrator.
5. Properties can be created within a week after the proposal, by the system administrator.

Below the steps is a form with a "Property name" input field and a "Create request page" button.

**Bottom Screenshot: Property proposal review**

The page title is "CONTENTdm:Property proposal/is defined by". The page is divided into several sections:

- Contents (hide):** A list of links including "1. Property Proposals", "1.1. New", "1.2. Approved but not yet added", "1.3. Discussed but not yet approved or rejected", "1.4. Added", "1.5. Rejected", "1.6. Deleted Properties", "2. See Also", and "3. Discussion Editing Guide".
- Property Proposals:** A section with a "New" subsection.
- Approved but not yet added:** A subsection.
- Discussed but not yet approved or rejected:** A subsection with a link to "Wikimedia Commons image".
- Added:** A subsection with a list of items: "keywords added as keywords (P114)", "related match added as related match (P115)", "creator, added as creator (P19)", "finding aid, added as finding aid URL (P16)", "note, added as note (P18)", and "historical note, added as historical note (P16)".
- is defined by:** A section with a "Done" status and a description: "Description a relationship between a class and a concept". It also lists "Data type: item", "Domain: class", and three examples: "Example 1 dog → Dogs", "Example 2 cat → cats", and "Example 3 horse → horses".
- Motivation:** A section with the text "Associate classes with related concepts Btwashburn (talk) 22:20, 3 July 2019 (UTC)".
- Discussion:** A section with a list of items: "Support, Bruce and Jeff M discussed and accepted this proposed property, 21 August 2019" and "Added as is defined by (P104)".

# Talk Pages for Managing Collections

- Leveraged a built-in Wikibase feature.
- A useful tool for communication and collaboration with partners.
- Helped us track differences and similarities across collections.

Item talk:Q148309

[John W. Mosley Photograph Collection](#)

OpenRefine Project

<http://18.217.24.229/project?project=1664881014972>

OpenRefine transformation notes

| CONTENTdm source field | Wikibase data element                                       | Transformation notes  | Example value  |
|------------------------|---|---|--|
| Title                  | label   |   | 1946 Cleveland Buckeyes  |
| Title                  | <a href="#">title (P124)</a>                                | Decided on using the newly created title property as staff can't easily confirm if titles are cataloger-supplied or original without access to and evaluation of each of the physical materials | 1946 Cleveland Buckeyes  |
| Date                   | <a href="#">date created (P21)</a>                          | Use for single dates.   | "1964-06-11", "1968, September, 09", "August 1954"                 |
| Date                   | <a href="#">approximate date (P123)</a>                     | Use for single circa dates.   | "circa 1965"   |
| Date                   | <a href="#">earliest date (P87)</a>                         | Use when there is a range of dates.   | "1940-1949"  |
| Date                   | <a href="#">latest date (P88)</a>                           | Use when there is a range of dates.   | "1940-1949"  |
| Photographer           | <a href="#">photographer (P60)</a> John W. Mosley (Q148310) | Same value in all records.  | Mosley, John W.  |
| Subject                | <a href="#">about (P2)</a>                                  | Split concatenated values, reconcile, and verify that these are generally "about" relationships rather than depictions  | Schools; Segregation; Demonstrations; Civil rights; Girard College |
| Organization-Building  | <a href="#">about (P2)</a>                                  | Split concatenated values, reconcile, and verify that these are generally "about" relationships rather than depictions  | Girard College; State Office Building (Philadelphia, Pa.)          |
| Intersection           |   | unmapped  | Broad and Spring Garden Streets (Philadelphia, Pa.);               |



# Implementing Authority Control

- CONTENTdm is a traditional, record-oriented system, with authority control based on the use of heading strings.
- Varying cataloging practices and sources can create discovery obstacles if searches do not use the preferred form of the heading.
- Wikibase takes multi-lingual data seriously and allows any number of variant forms to find matches, with an assigned unique identifier serving as the key.

The screenshot shows the Wikibase item page for 'Australian football' (Q168679). The page is titled 'Australian football (Q168679)' and includes a description: 'association football practiced in Australia'. Below the description, there is a table titled 'In more languages' with columns for 'Language', 'Label', 'Description', and 'Also known as'. The table lists three languages: English, русский, and Deutsch, each with a label and a description. The 'Also known as' column lists alternative names for the sport. Below the table, there is a 'Statements' section with two entries: 'type' and 'broader concept'. Each entry has a dropdown menu to select a value and buttons to add references or values.

| Language | Label                 | Description                                 | Also known as   |
|----------|-----------------------|---|---|
| English  | Australian football   | association football practiced in Australia | Aussie football<br>Aussie rules (Australian football)<br>Aussie rules football<br>Australian rules football |
| русский  | футбол в Австралии    | No description defined                      |   |
| Deutsch  | Fußball in Australien | No description defined                      |   |
| español  | fútbol en Australia   | No description defined                      | Futbol en Australia   |

**Statements**

| Property        | Value    | References   | Actions                        |
|-----------------|----------|--------------|--------------------------------|
| type            | concept  | 0 references | edit, add reference, add value |
| broader concept | Football | 0 references | edit, add reference, add value |

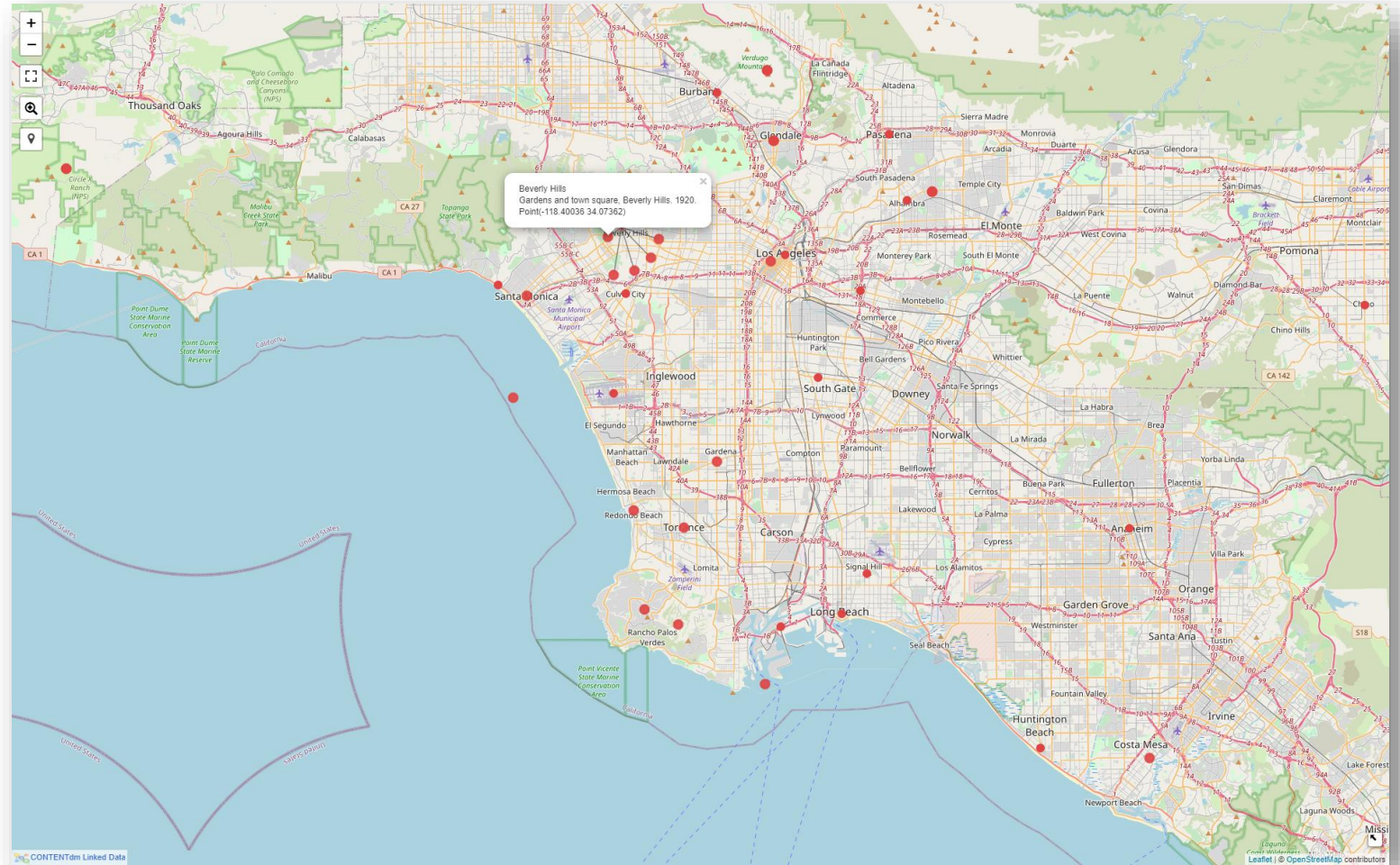
# Decreasing cataloging inefficiencies, increasing descriptive quality

- In CONTENTdm, information about a person related to a work needs to be repeated in every record related to that person.
- If the description changes, all the records need to be updated.
- In Wikibase, entities for works and related things are maintained separately.
- The description of the person can be entered and maintained in one entity.
- This efficiency gain could encourage richer descriptions.

|             |  |
|-------------|--|
| description | <p>Cleveland free speech activist Jasper Wood was a self-taught writer and photographer. His principal subjects were the residents of the Scovill Avenue area of Cleveland, with whom he became familiar while frequenting jazz clubs in the neighborhood in the late 1930s and early 1940s. He purchased his first camera in 1946 and first exhibited his work in 1947 at the Cleveland Museum of Art's annual (English)</p> <p>series ordinal 1</p> <p>0 references</p>  |
|             | <p>May Show. According to the Bulletin of the Cleveland Museum of Art, he won three first place May Show awards (1949, 1951, 1953) and two honorable mentions (1947, 1952) for his photographs. His last May Show entry was in 1958. Through his photographs, many of which were taken with a Contax 35mm camera, Wood attempted to capture what he called the "felt moment seen," or the emotional essence of (English)</p> <p>series ordinal 2</p> <p>0 references</p>   |
|             | <p>what he, the photographer, was seeing. Jasper Wood took photographs to feel alive and connected to the world. He did not sell his photographs or create a career from them. To him, the creative act was most significant. In 1951, Wood won first place in the 31st annual competition of American Photography magazine (September 1951, page 529). In 1953, Wood made a 15 minute poetic documentary titled (English)</p> <p>series ordinal 3</p> <p>0 references</p> |
|             | <p>Streetcar, which depicted life in a big American city (Cleveland) centered on the experience of riding its streetcars. The film can be viewed at the Library's YouTube account. One of Wood's images was included in Edward Steichen's 1955 exhibit The Family of Man (page 191 in the published catalog). Wood, who also took photographs in Mexico and Ohio Amish Country, took few photographs after 1960. (English)</p> <p>series ordinal 4</p>                     |

# Generating Data Visualizations

- The triplestore that maintains a linked data representation of Wikibase can be queried using SPARQL.
- The SPARQL Query UI provided by the Wikibase ecosystem makes it easy to query and visualize connections that would have been difficult or infeasible in a traditional record-oriented system.



# Adding the Mirador Viewer

- The Wikibase ecosystem has a “Gadget” extension to develop and add custom features to the user interface.
- CONTENTdm items all have IIIF Presentation Manifests.
- Mirador is an image viewer that uses IIIF Manifests to present images and metadata.
- The Gadget can embed the Mirador viewer, making the entity view more dynamic and connected to digital content.

The screenshot displays a Wikibase entity page for 'Map of Havana' (Q165895). The page includes a table of languages, a 'Statements' section with properties like 'date created', 'description', 'IIIF manifest URL', and 'width', and an embedded Mirador viewer showing a historical map of Havana.

**Map of Havana** (Q165895)

Map of the sewerage system in Havana with proposed changes in marginal lines, February 1902. CONTENTdm number: 5

Language Label Description Also known as

|         |               |  |  |
|---------|---------------|--|--|
| English | Map of Havana | Map of the sewerage system in Havana with proposed changes in marginal lines, February 1902. CONTENTdm number: 5 |  |
|---------|---------------|--|--|

All entered languages

Constraint Violation Report View

Statements

date created 1902 0 references

description Map of the sewerage system in Havana with proposed changes in marginal lines, February 1902 (English) series ordinal 1 0 references

IIIF manifest URL View in Mirador <https://cdm17191.contentdm.oclc.org/iiif/info/chc0468/5/manifest.js> on 0 references

width 94 inch 0 references

IIIF Presentation Manifest viewer provided by Project Mirador. View full screen

Plano de La Habana

1 of 1 • Plano de La Habana



# Showing Contextual Information

- A key Linked Data value proposition: link to related things in other systems.
- Pilot project entities sometimes have related identifiers for Wikidata entities.
- A Gadget, combined with a server-based application, uses Wikidata identifiers to find content in Wikipedia and supplements the entity display with contextual descriptions and images.

**CONTENTdm linked data**

English Log in

Read View history Search CONTENTdm Linked Data Pilot

## Melbourne (Q49428)

seat of a first-order administrative division in State of Victoria, Australia  
Melbourne City

[In more languages](#) [Configure](#)

| Language | Label            | Description   | Also known as  |
|----------|------------------|---|----------------|
| English  | Melbourne        | seat of a first-order administrative division in State of Victoria, Australia | Melbourne City |
| русский  | No label defined | No description defined  |                |
| Deutsch  | No label defined | No description defined  |                |
| español  | No label defined | No description defined  |                |

[Constraint Violation Report](#) [View](#)

### Statements

|                          |                         |              |
|--------------------------|-------------------------|--------------|
| type                     | locality <sup>61</sup>  | 0 references |
| administratively part of | Melbourne <sup>61</sup> | 1 reference  |
| geographic coordinates   | 37°48′50″S, 144°57′48″E | 1 reference  |
| population               | 4,248,375               | 1 reference  |

### Identifiers

|                  |         |              |
|------------------|---------|--------------|
| GeoNames ID      | 2158177 | 0 references |
| Wikidata Item ID | Q3141   | 0 references |

### Context and Background

Melbourne (/ˈmɛlbɜːn/ MEL-berrn;) is the capital and most-populous city of the Australian state of Victoria, and the second-most populous city in Australia and Oceania. Its name refers to a metropolitan area of 9,993 km<sup>2</sup> (3,858 sq mi), comprising an urban agglomeration of 31 local municipalities known as Greater Melbourne, although the name is also commonly used specifically for the local municipality of City of Melbourne based around its central business area. The city occupies much of the northern and eastern coastlines of Port Phillip Bay and spreads into the Mornington Peninsula and the hinterlands towards the Yarra Valley, the Dandenong and Macedon Ranges. It has a population of 5 million (19% of the population of Australia), and its inhabitants are commonly referred to as "Melburnians". Home to Aboriginal peoples for over 40,000 years, the Melbourne area served as a popular meeting place for local Kulin nation clans. Naarm is the traditional Boon wurrung name for one of the bays, and its usage as an alternative or dual name for Melbourne has been gaining in popularity. A short-lived penal settlement was built at Port Phillip, then part of the British colony of New South Wales, in 1803, but it was not until 1835, with the arrival of free settlers from Van Diemen's Land (modern-day Tasmania), that Melbourne was founded. It was incorporated as a Crown settlement in 1837, and named after the then British Prime Minister, William Lamb, 2nd Viscount Melbourne. In 1851, four years after Queen Victoria declared it a city, Melbourne became the capital of the new colony of Victoria. During the 1850s Victorian gold rush, the city entered a lengthy boom period that, by the late 1880s, had transformed it into one of the world's largest and wealthiest metropolises. After the federation of Australia in 1901, it served as the interim seat of government of the new nation until Canberra became the permanent capital in 1927. Today, it is a leading financial centre in the Asia-Pacific region and ranks 27th globally in the 2020 Global Financial Centres Index. Melbourne is home to many of Australia's best-known landmarks, such as the Melbourne Cricket Ground, the National Gallery of Victoria and the World Heritage-listed Royal Exhibition Building. Noted for its cultural heritage, the city gave rise to Australian rules football, Australian impressionism and Australian cinema, and has more recently been recognised as a UNESCO City of Literature and a global centre for street art, live music and theatre. It hosts major annual international events, such as the Australian Grand Prix and the Australian Open, and also hosted the 1956 Summer Olympics and the 2006 Commonwealth Games. Melbourne consistently ranked as the world's most liveable city for much of the 2010s. The Melbourne Airport, also known as the Tullamarine Airport, is the second-busiest airport in Australia, and the Port of Melbourne is the nation's busiest seaport. Its main metropolitan rail terminus is Flinders Street station and its main regional rail and road coach terminus is Southern Cross station. It also has Australia's most extensive freeway network and the largest urban tram network in the world.

Sources: [DBpedia](#) [Wikipedia](#) [Wikimedia Commons](#)

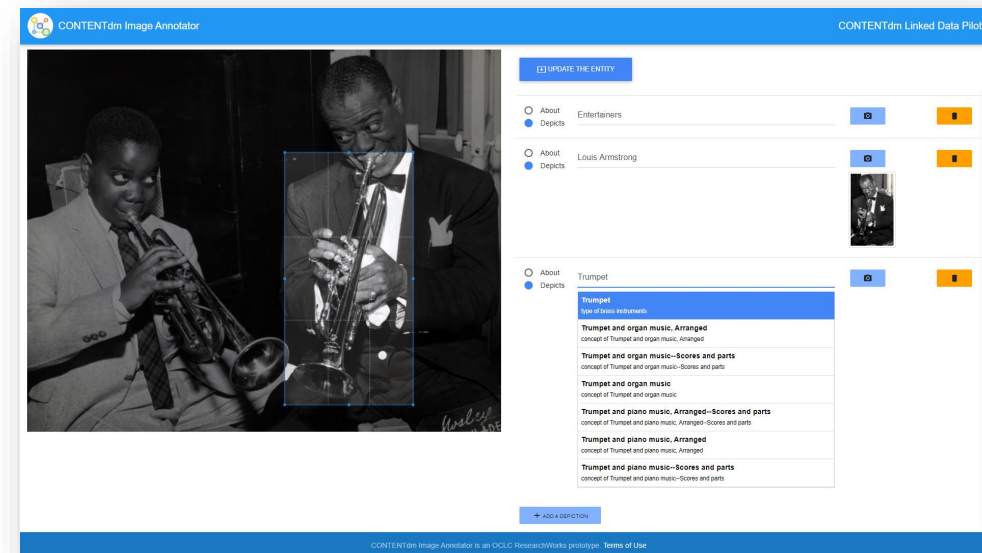
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# TOOLS FOR SUBJECT MATTER EXPERTS

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# Tools for Subject Matter Experts

- Differentiating between what a work is “about” and what it “depicts”.
- Testing Wikibase as a platform for tool development.
- Help subject matter experts correct and supplement transformed metadata.



Item Discussion

Read

View history



Search CONTENTdm Linked Data Pilot



## Louis Armstrong and Jake Armstrong (Q155370)

Daniel Louis "Satchmo" Armstrong with his son, Jake Armstrong, at the Academy of Music.

edit

IIIF Presentation Manifest viewer provided by Project Mirador. View full screen

In more languages Configure

| Language | Label                              | Description   | Also known as |
|----------|------------------------------------|---|---------------|
| English  | Louis Armstrong and Jake Armstrong | Daniel Louis "Satchmo" Armstrong with his son, Jake Armstrong, at the Academy of Music. |               |

### Statements

|              |  |
|--------------|--|
| date created | <div><div><div></div><div></div></div><div>22 March 1956</div><div><div>edit</div></div></div> <div><div>0 references</div><div><div>+ add reference</div><div>+ add value</div></div></div> |
|--------------|--|

|         |   |
|---------|---|
| part of | <div><div><div></div><div></div></div><div>John W. Mosley Photograph Collection</div><div><div>edit</div></div></div> <div><div>0 references</div><div><div>+ add reference</div><div>+ add value</div></div></div> |
|---------|---|

|              |   |
|--------------|---|
| photographer | <div><div><div></div><div></div></div><div>John W. Mosley</div><div><div>edit</div></div></div> <div><div>0 references</div><div><div>+ add reference</div><div>+ add value</div></div></div> |
|--------------|---|

|      |  |
|------|--|
| type | <div><div><div></div><div></div></div><div>image</div><div><div>edit</div></div></div> <div><div>0 references</div><div><div>+ add reference</div><div>+ add value</div></div></div> |
|------|--|

|                   |   |
|-------------------|---|
| process or format | <div><div><div></div><div></div></div><div>Black and white prints</div><div><div>edit</div></div></div> |
|-------------------|---|





[UPDATE THE ENTITY](#)

- |  |                               |                          |
|--|-------------------------------|--------------------------|
| <input checked="" type="radio"/> About | Philadelphia                  | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |
| <input checked="" type="radio"/> About | Entertainers                  | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |
| <input checked="" type="radio"/> About | Musicians                     | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |
| <input checked="" type="radio"/> About | Singers                       | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |
| <input checked="" type="radio"/> About | Jazz                          | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |
| <input checked="" type="radio"/> About | African Americans             | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |
| <input checked="" type="radio"/> About | Composers                     | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |
| <input checked="" type="radio"/> About | African American entertainers | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |
| <input checked="" type="radio"/> About | Jazz musicians                | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |
| <input checked="" type="radio"/> About | African American men          | <input type="checkbox"/> |
| <input type="radio"/> Depicts          |                               |                          |

[UPDATE THE ENTITY](#)

|  |                               |  |  |
|--|-------------------------------|--|--|
| <input checked="" type="radio"/> About   | Philadelphia                  |  |  |
| <input type="radio"/> Depicts            |                               |  |  |
| <input type="radio"/> About              | Musicians                     |  |  |
| <input checked="" type="radio"/> Depicts |                               |  |  |
| <input checked="" type="radio"/> About   | Singers                       |  |  |
| <input type="radio"/> Depicts            |                               |  |  |
| <input checked="" type="radio"/> About   | Jazz                          |  |  |
| <input type="radio"/> Depicts            |                               |  |  |
| <input type="radio"/> About              | African Americans             |  |  |
| <input checked="" type="radio"/> Depicts |                               |  |  |
| <input type="radio"/> About              | Composers                     |  |  |
| <input checked="" type="radio"/> Depicts |                               |  |  |
| <input type="radio"/> About              | African American entertainers |  |  |
| <input checked="" type="radio"/> Depicts |                               |  |  |
| <input type="radio"/> About              | Jazz musicians                |  |  |
| <input checked="" type="radio"/> Depicts |                               |  |  |
| <input type="radio"/> About              | African American men          |  |  |
| <input checked="" type="radio"/> Depicts |                               |  |  |
| <input checked="" type="radio"/> About   | African American pioneers     |  |  |
| <input type="radio"/> Depicts            |                               |  |  |

[UPDATE THE ENTITY](#)

☐ About Jazz musicians

☒ Depicts



☐ About African American men

☒ Depicts



☒ About African American pioneers

☐ Depicts



☒ About African American icons

☐ Depicts



☒ About Composers--United States

☐ Depicts



☒ About Innovators

☐ Depicts



☐ About Entertainers

☒ Depicts



☐ About Louis Armstrong

☒ Depicts

[+ ADD A DEPICTION](#)



[UPDATE THE ENTITY](#)

☐ About  
☒ Depicts

Entertainers



☐ About  
☒ Depicts

Louis Armstrong



☐ About  
☒ Depicts

Trumpet



### Trumpet

type of brass instruments

#### Trumpet and organ music, Arranged

concept of Trumpet and organ music, Arranged

#### Trumpet and organ music--Scores and parts

concept of Trumpet and organ music--Scores and parts

#### Trumpet and organ music

concept of Trumpet and organ music

#### Trumpet and piano music, Arranged--Scores and parts

concept of Trumpet and piano music, Arranged--Scores and parts

#### Trumpet and piano music, Arranged

concept of Trumpet and piano music, Arranged

#### Trumpet and piano music--Scores and parts

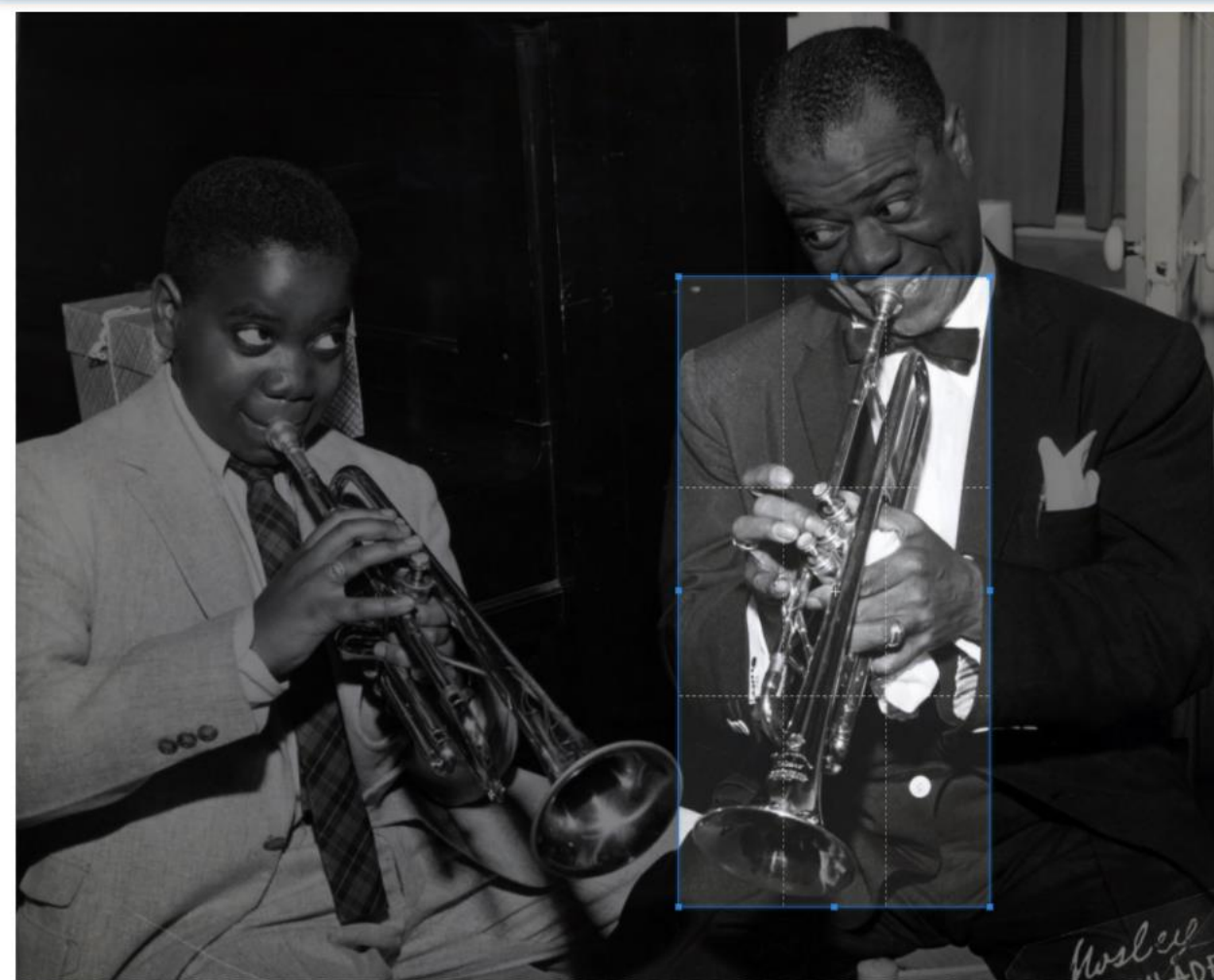
concept of Trumpet and piano music--Scores and parts

[+ ADD A DEPICTION](#)

 UPDATE THE ENTITY

concept of Trumpet and piano music--Scores and parts

+ ADD A DEPICTION

[UPDATE THE ENTITY](#)

☐ About African American entertainers

☒ Depicts



☐ About Jazz musicians

☒ Depicts



☐ About African American men

☒ Depicts



☐ About Entertainers

☒ Depicts



☐ About Louis Armstrong

☒ Depicts



☐ About Selmer

☒ Depicts




**Henri Selmer Paris K-Modified B-flat trumpet**  
trumpet manufactured by Henri Selmer, Paris, in 1954

**Henri Selmer Paris**  
musical instrument company, a predecessor of Conn-Selmer

[+ ADD A DEPICTION](#)

depicts

 [Louis Armstrong](#) 


digital representation URL

<https://cdm16002.contentdm.oclc.org/digital/iiif/p15037coll17/55/1489,16,1330,2255/full/0/default.jpg>



▼ 0 references



[Henri Selmer Paris K-Modified B-flat trumpet](#) 

digital representation URL

<https://cdm16002.contentdm.oclc.org/digital/iiif/p15037coll17/55/1560,630,731,1492/full/0/default.jpg>



▼ 0 references


 edit

CONTENTdm  
linked data



Main page  
Recent changes  
Random page  
Help about MediaWiki

Tools  
What links here  
Related changes  
Upload file  
Special pages  
Printable version  
Permanent link  
Page information  
Concept URI

In other languages  
 Add links

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Item [Discussion](#)

[Read](#)

[View history](#)



## Henri Selmer Paris K-Modified B-flat trumpet (Q221428)

 edit







trumpet manufactured by Henri Selmer, Paris, in 1954

[Selmer B \$\flat\$  trumpet](#) | [Selmer trumpet](#) | [Selmer K-Modified B \$\flat\$  trumpet](#) | [K-Modified B \$\flat\$  trumpet](#) | [K-Modified trumpet](#) | [Selmer B-flat trumpet](#) | [Selmer B flat trumpet](#)

▼ In more languages [Configure](#)

| Language | Label  | Description  | Also known as   |
|----------|--|--|---|
| English  | Henri Selmer Paris K-Modified B-flat trumpet | trumpet manufactured by Henri Selmer, Paris, in 1954 | Selmer B $\flat$ trumpet<br>Selmer trumpet<br>Selmer K-Modified B $\flat$ trum...<br>K-Modified B $\flat$ trumpet<br>K-Modified trumpet<br>Selmer B-flat trumpet<br>Selmer B flat trumpet |

### Statements

|               |  |
|---------------|--|
| type          |  physical object  <a href="#">edit</a><br>▼ 0 references<br><a href="#">+ add reference</a><br><a href="#">+ add value</a> |
| is defined by |  Trumpet  <a href="#">edit</a><br>▼ 0 references<br><a href="#">+ add reference</a><br><a href="#">+ add value</a>         |
| material used |  Brass  <a href="#">edit</a><br>▼ 0 references   |

[+ add reference](#)

[+ add value](#)



# Image Annotator Findings

“Think Aloud” user study results were mostly positive.

Subject matter expertise adds new access points and enriched relationships.

“About” vs. “Depicts” remains a puzzle.





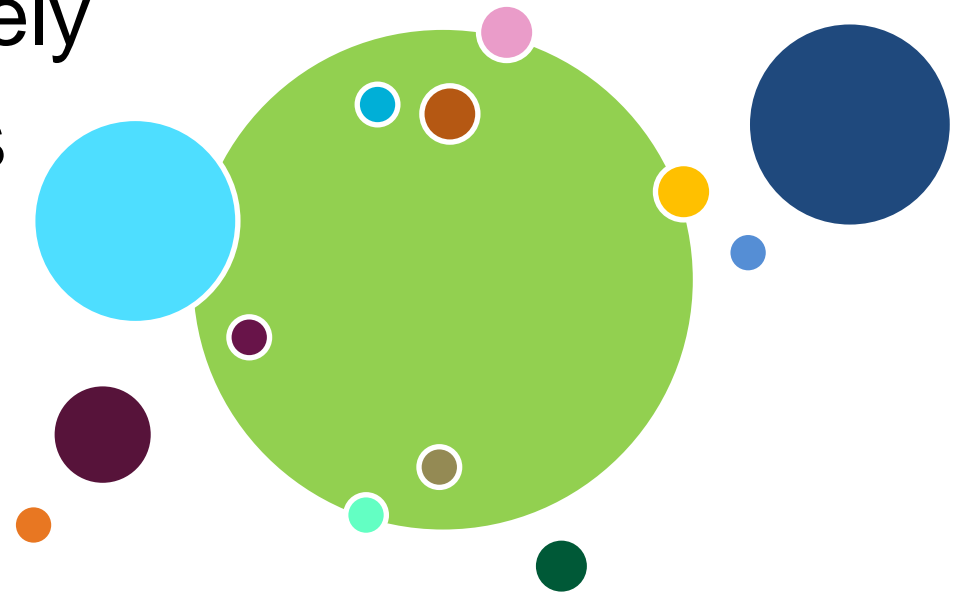
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# TOOLS FOR DISCOVERY

---

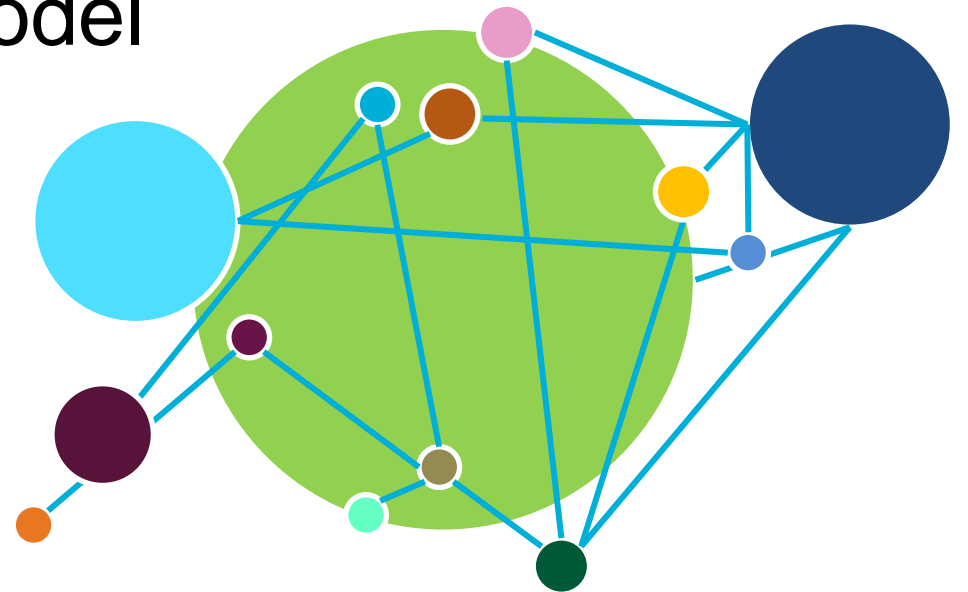
# Discovery Tools

- CONTENTdm sites are individuals
- Searched separately, not collectively
- Faceted searching has challenges
- Content overlaps separate sites



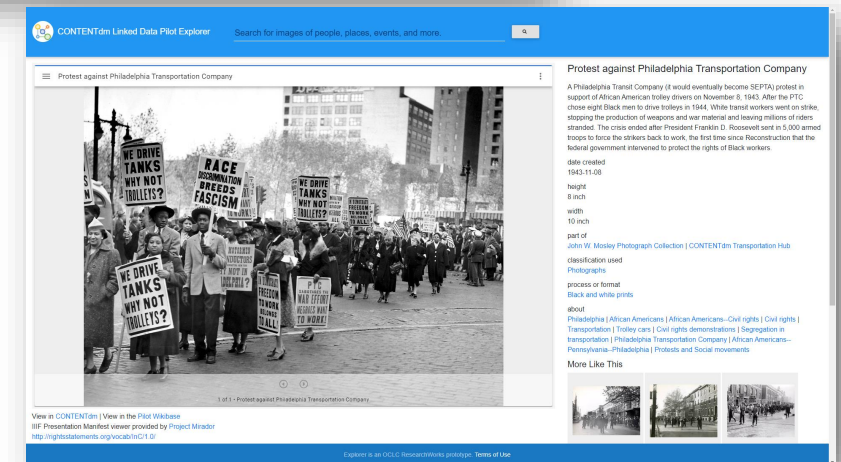
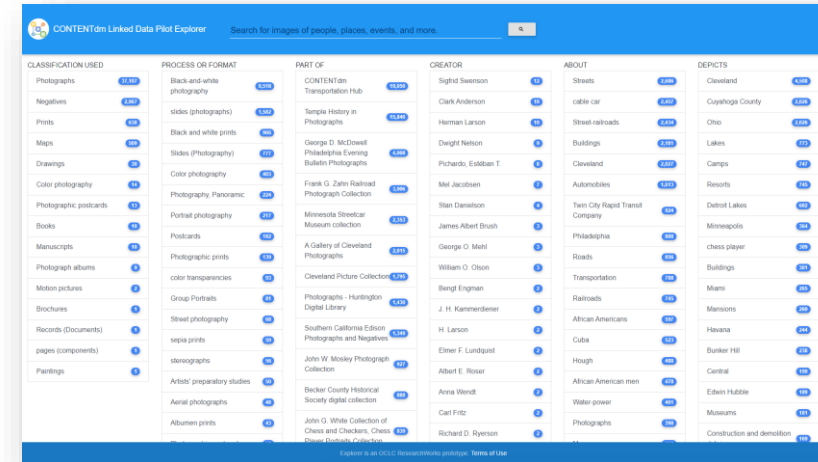
# Discovery Tools

- Opportunity to test cross-site discovery
- Descriptions use a shared data model
- Browse a graph of linked entities
- Reveal related content from decentralized sources



# The CONTENTdm Explorer

- Focus on the most frequently occurring connections.
- See relationships described by different institutions, for different items, in different collections.
- Look for thematically related content.
- Follow links to related entities.





[about](#)



[classification used](#)



[contributor](#)



[creator](#)



[depicts](#)



[part of](#)



CONTENTdm Transportation Hub

19,050

George D. McDowell Philadelphia Evening Bulletin Photographs

4,008

Frank G. Zahn Railroad Photograph Collection

3,906

Minnesota Streetcar Museum collection

2,353

A Gallery of Cleveland Photographs

2,015

Southern California Edison Photographs and Negatives

1,347

Photographs - Huntington Digital Library

967

Cleveland Picture Collection

650

University of Minnesota Duluth, Kathryn A. Martin Library, NEMHC Collections

306

Floyd and Marion Rinhart Photograph Collection

250

Jay T. Last Collection of Graphic Arts and Social History

236

< PREVIOUS

4061 to 4080 of 10,000 results for *part\_of:Q202314*.

NEXT >



East 6th Street 1930 CP06024

[READ MORE](#)



Public Square 1896 CP04167

[READ MORE](#)



Public Square 1915 CP04217

[READ MORE](#)



Chevrolet Truck 1928 CP0102

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Public Square 1905 CP04189

[READ MORE](#)



Carnegie Avenue 1940 CPO5932

[READ MORE](#)



Superior Avenue 1896, CP06853  
Centennial Celebration

[READ MORE](#)



Euclid Avenue 1912 CP06258

[READ MORE](#)





about



classification used



depicts



part of



CONTENTdm Transportation Hub

218

George D. McDowell Philadelphia Evening Bulletin Photographs

203

Cleveland Picture Collection

7

John W. Mosley Photograph Collection

5

Temple History in Photographs

5

A Gallery of Cleveland Photographs

2

Jay T. Last Collection of Graphic Arts and Social History

1

University of Minnesota Duluth, Kathryn A. Martin Library, NEMHC Collections

1

Lake County Historical Society

1

Guillermo "Willy" González Collection

1

photographer



process or format



1 to 20 of 226 results for *strike*.

NEXT >



Truck brings employees home during P.T.C. walkout

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"Strike Pickets"

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"Trolley strike"

[READ MORE](#)



Crowded train station during the P.T.C. strike

[READ MORE](#)



Crowded train station during the P.T.C. strike

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PTC employees photographed with strike signs

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Attempted strike break

[READ MORE](#)



Workers end strike

[READ MORE](#)



☰ Truck brings employees home during P.T.C. walkout

⋮



1 of 1 - Truck brings employees home during P.T.C. walkout

## Truck brings employees home during P.T.C. walkout

A man helps several women into the back of a truck at 25th and Hunting Park Avenue. The truck is picking up employees from Budd Manufacturing Company in order to get them home during the P.T.C. walkout. With clipping

part of

[CONTENTdm Transportation Hub](#) | [George D. McDowell Philadelphia Evening Bulletin Photographs](#)

classification used

[Photographs](#)

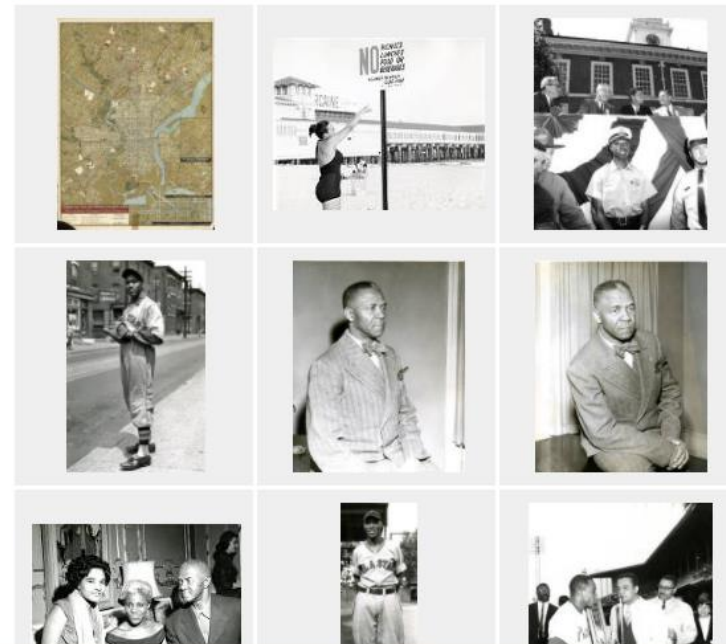
about

[Philadelphia transit strike of 1944](#) | [Philadelphia](#)

depicts

[Trucks](#) | [Persons](#)

### More Like This







## Protest against Philadelphia Transportation Company



1 of 1 • Protest against Philadelphia Transportation Company

## Protest against Philadelphia Transportation Company

A Philadelphia Transit Company (it would eventually become SEPTA) protest in support of African American trolley drivers on November 8, 1943. After the PTC chose eight Black men to drive trolleys in 1944, White transit workers went on strike, stopping the production of weapons and war material and leaving millions of riders stranded. The crisis ended after President Franklin D. Roosevelt sent in 5,000 armed troops to force the strikers back to work, the first time since Reconstruction that the federal government intervened to protect the rights of Black workers.

date created

1943-11-08

height

8 inch

width

10 inch

part of

[John W. Mosley Photograph Collection](#) | [CONTENTdm Transportation Hub](#)

classification used

[Photographs](#)

process or format

[Black and white prints](#)

about

[Philadelphia](#) | [African Americans](#) | [African Americans--Civil rights](#) | [Civil rights](#) | [Transportation](#) | [Trolley cars](#) | [Civil rights demonstrations](#) | [Segregation in transportation](#) | [Philadelphia Transportation Company](#) | [African Americans--Pennsylvania--Philadelphia](#) | [Protests and Social movements](#)

## More Like This

[View in CONTENTdm](#) | [View in the Pilot Wikibase](#)IIIF Presentation Manifest viewer provided by [Project Mirador](#)<http://rightsstatements.org/vocab/InC/1.0/>





Public Square 1899 CP04179



1 of 1 • Public Square 1899 CP04179

View in [CONTENTdm](#) | View in the [Pilot Wikibase](#)  
IIIF Presentation Manifest viewer provided by [Project Mirador](#)  
<http://rightsstatements.org/vocab/NoC-US/1.0/>

## Public Square 1899 CP04179

Showing the crowds surrounding the first cars to reach the downtown section during a street car strike. These cars were on the Euclid Line. The clock at the extreme right housed the store of Wm. Taylor, Son and Co.

date created  
1899

height  
6.125 inch

width  
8.125 inch

part of  
[Cleveland Picture Collection](#) | [CONTENTdm Transportation Hub](#)

classification used  
[Photographs](#)

depicts  
[Cleveland](#)



Streetcars parked on street during a strike



1 of 1 • Streetcars parked on street during a strike

View in [CONTENTdm](#) | View in the [Pilot Wikibase](#)  
IIIF Presentation Manifest viewer provided by [Project Mirador](#)  
<http://rightsstatements.org/vocab/InC/1.0/>

## Streetcars parked on street during a strike

Written on slide frame: "Tranvías, calle Reina, huelga"

part of  
[CONTENTdm Transportation Hub](#) | [Guillermo "Willy" González Collection](#)

classification used  
[Photographs](#)

process or format  
[slides \(photographs\)](#)

about  
[cable car](#) | [Cuba](#) | [Havana](#) | [General strikes](#) | [Pedestrians](#)

depicts  
[Havana](#)

# CONTENTdm Explorer Findings

Aggregation adds value.

The 80/20 rule was about right for automated reconciliation.

Completing the 20% will be challenging.

CONTENTdm Linked Data Plot Explorer

Search for images of people, places, events, and more.

| CLASSIFICATION USED          | PROCESS OR FORMAT                  | PART OF  | CREATOR                  | ABOUT                                 | DEPicts                           |
|------------------------------|------------------------------------|--|--------------------------|---------------------------------------|-----------------------------------|
| Photographs 15,101           | Black and white photography 5,000  | CONTENTdm Transportation Hub 15,101                                | Sigrid Swenson 15        | Streets 1,400                         | Cleveland 1,400                   |
| Negatives 4,500              | slides (photographs) 1,500         | Temple History in Photographs 1,500                                | Clark Anderson 15        | cable car 1,400                       | Cuyahoga County 1,400             |
| Prints 1,500                 | Black and white prints 1,500       | George D. McDowell Philadelphia Evening Bulletin Photographs 1,500 | Herman Larson 15         | Street railroads 1,400                | Ohio 1,400                        |
| Maps 1,500                   | Slides (Photography) 1,500         | Frank G. Zeln Railroad Photograph Collection 1,500                 | Dwight Nelson 15         | Buildings 1,400                       | Lakes 1,400                       |
| Drawings 1,500               | Color photography 1,500            | Minnesota Streetcar Museum collection 1,500                        | Pichardo, Esteban T. 15  | Cleveland 1,400                       | Camps 1,400                       |
| Color photography 1,500      | Photography, Panoramic 1,500       | A Gallery of Cleveland Photographs 1,500                           | Met Jacobson 15          | Automobiles 1,400                     | Resorts 1,400                     |
| Photographic postcards 1,500 | Portrait photography 1,500         | Cleveland Picture Collection 1,500                                 | Stan Danielson 15        | Twin City Rapid Transit Company 1,400 | Detroit Lakes 1,400               |
| Books 1,500                  | Postcards 1,500                    | Photographs - Huntington Digital Library 1,500                     | James Albert Bush 15     | Roads 1,400                           | Minneapolis 1,400                 |
| Manuscripts 1,500            | Photographic prints 1,500          | Southern California Edison Photographs and Negative 1,500          | George O. Malt 15        | Philadelphia 1,400                    | Chess player 1,400                |
| Photograph albums 1,500      | color transparencies 1,500         | John W. Mosley Photograph Collection 1,500                         | William O. Olson 15      | Transportation 1,400                  | Buildings 1,400                   |
| Microfilm pictures 1,500     | Group Portraits 1,500              | Albert E. Roser 1,500  | Bengt Engman 15          | Railroads 1,400                       | Miami 1,400                       |
| Brochures 1,500              | Street photography 1,500           | Elmer F. Lundquist 1,500   | J. H. Kammendesser 15    | African Americans 1,400               | Mansions 1,400                    |
| Records (Documents) 1,500    | sepia prints 1,500                 | Carl Fritz 1,500   | H. Larson 15             | Cuba 1,400                            | Havana 1,400                      |
| pages (components) 1,500     | stereographs 1,500                 | Richard D. Ryerson 1,500   | Elmer F. Lundquist 1,500 | Trough 1,400                          | Bunker Hill 1,400                 |
| Paintings 1,500              | Artists' preparatory studies 1,500 | John G. White Collection of Chess and Checkers, Chess 1,500        | Albert E. Roser 1,500    | African American men 1,400            | Central 1,400                     |
|                              | Aerial photographs 1,500           |  | Anna Wendt 1,500         | Water-power 1,400                     | Eden Hubble 1,400                 |
|                              | Albumen prints 1,500               |  | Carl Fritz 1,500         | Photographs 1,400                     | Museums 1,400                     |
|                              |                                    |  |                          |                                       | Construction and demolition 1,400 |

CONTENTdm Linked Data Plot Explorer

Search for images of people, places, events, and more.

Protest against Philadelphia Transportation Company

1 of 1 - Protest against Philadelphia Transportation Company

A Philadelphia Transit Company (PTC) would eventually become SEPTA) protest in support of African American trolley drivers on November 8, 1943. After the PTC chose eight Black men to drive trolleys in 1944, white transit workers went on strike, stopping the production of weapons and war material and leaving millions of riders stranded. The crisis ended after President Franklin D. Roosevelt sent in 5,000 armed troops to force the strikers back to work, the first time since Reconstruction that the federal government intervened to protect the rights of Black workers.

date created 1943-11-08

height 8 inch

width 10 inch

part of John W. Mosley Photograph Collection | CONTENTdm Transportation Hub

classification used Photographs

process or format Black and white prints

about Philadelphia | African Americans | African Americans—Civil rights | Civil rights | Transportation | Trolley cars | Civil rights demonstrations | Segregation in transportation | Philadelphia Transportation Company | African Americans—Pennsylvania—Philadelphia | Protests and Social movements

More Like This

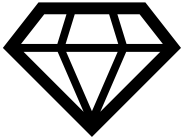
View in CONTENTdm | View in the Plot Wikibase

IRF Presentation Manifest viewer provided by Project Mirador

<http://irfmanifests.org/vocab/IRF1.0/>

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# CONTENTdm Linked Data pilot findings



## Testing the Linked Data value proposition

A Linked Data strategy can succeed when descriptions use a shared data model, headings are replaced with identifiers for entities, and entities and their relationships are presented in a single discovery system.



## Evaluating a shared data model

A solid set of initial classes and properties can be generated from existing standards, and then responsively extended as more data needs arise.



## Selecting and transforming metadata

Tools should be shared, and workflows decentralized.  
Domain expertise is needed for accurate data transformations.



## Continuing the journey to Linked Data

Substantial resource commitments are required.  
Benefits accrue long before the journey is completed.  
It's a paradigm shift; takes time and long-term strategies.



[oclc.org/transform-linked-data](https://oclc.org/transform-linked-data)

# Working partnerships represent strength in numbers



THE HUNTINGTON  
Library, Art Museum, and Botanical Gardens



LIBRARIES



MINNESOTA  
DIGITAL LIBRARY






Libraries



CLEVELAND PUBLIC LIBRARY

# Resources and Contacts

- The Pilot Project report
  -  [oclc.org/transform-linked-data](https://oclc.org/transform-linked-data)
- Jeff Mixter, OCLC Research
  -  jeff\_mixter@oclc.org
- Bruce Washburn, OCLC Research
  -  bruce\_washburn@oclc.org





# Shared entity management infrastructure



- Address infrastructure needs identified by libraries
  - Start with Persons and Works...
  - Expand on “native” metadata management
  - Link library data to non-library data... and shared data to local data
  - Provide ID creation services to help “at the point of need”
  - Persistent and maintained entity URIs
- Operate at a large scale – and be sustainable
- Complement other efforts—LD4, PCC, DCMI, etc.

[oclc.org/sharedentitymgmt](https://oclc.org/sharedentitymgmt)

OCLC awarded Mellon Foundation grant to develop infrastructure to support linked data management initiatives

*'Entity Management Infrastructure' will advance use of linked data and ultimately improve discoverability of scholarly materials on the web*

DUBLIN, Ohio, 9 January 2020—OCLC has been awarded a grant from The Andrew W. Mellon Foundation to develop a shared "Entity Management Infrastructure" that will support linked data management initiatives underway in the library and scholarly communications community. When complete, this infrastructure will be jointly curated by the community and OCLC, and will ultimately make scholarly materials more connected and discoverable on the web.

The two-year grant, for \$2.436 million, will support work on the project that will run from January 2020 to December 2021. The Mellon grant funding represents approximately half of the total cost of the Entity Management Infrastructure project. OCLC is contributing the remaining half of the required investment.

"OCLC has been a leader in library linked data research for years, and we have developed prototypes, innovative pilot programs and partnerships that continue to inform our work," said Skip Prichard, OCLC President and CEO. "OCLC enables libraries to work together to achieve economies, efficiencies, and consistency in metadata creation. We're grateful to The

# Convene, Understand, Share



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