Library Linked Data for the Uninitiated

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http://z.umn.edu/14cy
Library Technology Conference
March 2016
Intro/Agenda

- Linked Data
- BIBFRAME
- Workflow
- Case studies/more info
Why Linked Data?

• Linked data is the future of the web

• Data will no longer be in silos

• Relationships are powerful and worth the effort
Why Linked Data?

So what’s the problem with how things are now?
What a human sees

For readers who would like a quick reminder of the book and its main storyline, here is a summary of The Little Prince's travels and those he met along the way.

If Saint-Exupéry is to be believed, The Little Prince is a book for children written for grown ups. It can be read on many different levels to provide pleasure and food for thought for readers of all ages.

The author, an aviator, crashes his aeroplane in the middle of the Sahara desert. While he is trying to repair his aeroplane, a little boy appears and asks him to draw a sheep. The author learns that The Little Prince comes from asteroid B-612 where he has left behind three volcanoes and a rose.

Before reaching Earth, he has visited other planets and met some very odd people: a king, a conceited man, a drunkard, a lamplighter, a geographer. Since arriving on Earth, he has spoken to a fox who has taught him that to know someone or something, you must «tame» them, and that makes them unique. «What is essential is invisible to the eye, says the fox.»

In order to return to his planet and his rose, the Little Prince allows himself to be bitten by a poisonous snake. His planet is too far away, he cannot take his «shell». The aviator, who has succeeded in repairing his plane, also quits the desert. He still hopes The Little Prince will return one day and asks us to write and tell him if ever we should meet his friend.

More about the planets visited by the Little Prince
Each planet the Little Prince visits can be seen as an allegory of human nature. If you have already read the book, we invite you now to take a new look at the different planets.

The king - asteroid B 325
In the book, the Little Prince meets a king who claims to rule over all with absolute power. His only «subject», however, is an old rat that he hears at night. The king exercises his power over the sun by ordering it to set – but only at sunset. In order not to lose face, this oddity of a king gives only “reasonable” orders (“I order you to sit down”) – as good a way as any to satisfy his third for power. The Little Prince is not fooled, however, and sees the monarch as no more than another odd grown-up.
What a computer sees
What is Linked Data?

A set of principles and best practices for sharing data and building relationships between data on the web so that machines can “understand” and interpret the data.
What are the principles and best practices?
Resource Description Framework (RDF)

What is it?

RDF provides a way to describe anything you encounter in the world: people, places, concepts, words, documents, etc.

RDF provides a way to describe relationships: how one thing relates to another thing.
RDF Components

**Statement:** A combination of a Resource, a Property, and a Property value

Resource → Subject

Property → Predicate

Property Value → Object

Statements are usually referred to as **triples**
**Triple Example**

**Statement**
The creator of the Little Prince is Antoine de Saint-Exupéry

**Subject**
Little Prince

**Predicate**
creator

**Object**
Antoine de Saint-Exupéry
<?xml version="1.0" encoding="UTF-8"?>
<rdf:RDF
xmlns:rdf=http://www.w3.org/1999/02/22-rdf-syntax-ns#
xmlns:dc=http://purl.org/dc/elements/1.1/>

<rdf:Description
rdf:about=https://en.wikipedia.org/wiki/The_Little_Prince>
  <dc:creator>Antoine de Saint-Exupéry</dc:creator>
</rdf:Description>
</rdf:RDF>
RDF graph: The Little Prince
Saint-Exupéry, Antoine de 1900-1944
Saint-Exupéry, Antoine de (Antoine Jean Baptiste Marie Roger), 1900-1944
Saint-Exupéry, Antoine de
Сент-Экзюпери, А. 1900-1944 Антуан де
Antoine de Saint-Exupéry Aviateur et écrivain français
سان اکزیوپری، انتوان دی، 1900-1944
1900-1944 سنت-اکزپری، انتوان دو،
Сент-Экзюпери, Антуан де, 1900-1944
Saint-Exupéry, Antoine de (French author, 1900-1944)
سانت-عبوری، انتوان دو، 1944-1944
Saint-Exupéry, A. de 1900-1944 Antoine de
سان اکزپری، انتوان دو 1900-1944
VIAF ID: 93810507 (Personal)
Permalink: http://viaf.org/viaf/93810507
ISNI: 0000_0001_2096_6599
http://viaf.org/viaf/93810507

http://schema.org/name

Antoine de Saint-Exupéry
RDF Exercise

We are going to create some RDF of our own!

- Look at the Dublin Core records
- Break the data into triples in the spreadsheet (use URIs if you can find them)
- We will mark it up as RDF/XML
Visualizing RDF

One of the most commonly used linked data sets is DBpedia.
https://en.wikipedia.org/wiki/The_Little_Prince
The Little Prince (French: Le Petit Prince; French pronunciation: [le.pə.ti.pʁɛs], first published in 1943, is a novella and the most famous work of the French aristocrat, writer, poet and pilot Antoine de Saint-Exupéry, and was voted the best book of the 20th century in France.

- **dbo:abstract**: The Little Prince (French: Le Petit Prince; French pronunciation: [le.pə.ti.pʁɛs], first published in 1943, is a novella and the most famous work of the French aristocrat, writer, poet and pilot Antoine de Saint-Exupéry. It is both the most-read and most-translated book in the French language, and was voted the best book of the 20th century. The book has sold over 140 million copies worldwide, and has been translated into over 300 languages. It tells the story of a young prince who journeys to Earth and encounters various characters, including a飞行员, a rose, a sheep, and an aviator. The novella is known for its philosophical insights and its universal themes of love, loneliness, and the nature of human relationships.

- **dbo:author**: Antoine de Saint-Exupéry

- **dbo:coverArtist**: Antoine de Saint-Exupéry

- **dbo:director**: Antoine de Saint-Exupéry

- **dbo:previousWork**: Flight to Arras

- **dbo:publisher**: Reynal & Hitchcock, Editions Gallimard


- **dbo:translator**: Richard Howard

  - http://books.google.com/books/about/The_Tale_of_the_Rose.html?id=0raX1VTh6sC
  - http://ntaurence.free.fr/DEA.pdf
  - http://www.patoche.org/lepetitprince/gallima.htm
  - http://www.petit-prince.at/
  - http://www.thelittleprince.com/
  - http://www.trussel.com/sant-ex/santexbib.htm#47
  - http://www.piccolo-principes-counseling.com
  - nyt: 1989/05/12/arts/in-the-footsteps-of-saint-exupery.html
  - http://www.tbs.co.jp/l-prince
  - http://books.google.co.uk/books?id=FlAEbADAAAJ
  - http://www.guardian.co.uk/world/2010/aug/01/little-prince-return-multimedia
  - http://www.sparknotes.com/l/littleprince/
  - http://www.lepetitprince.com/
Querying

Find all artists/bands that are originally from Wisconsin

**SPARQL:**
```sparql
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX : <http://dbpedia.org/resource/>
PREFIX dbpedia2: <http://dbpedia.org/property/>
PREFIX dbpedia: <http://dbpedia.org/>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>

PREFIX dbo: <http://dbpedia.org/ontology/>

SELECT ?person ?bandname ?description WHERE {
  ?person dbo:associatedBand ?bandname
  FILTER (LANG(?description) = 'en') .
  FILTER (regex(?born, "Wisconsin", "i"))
}
ORDER BY ASC(?person) ?bandname
```
Find all artists/bands that are originally from Wisconsin.
Another RDF visualization tool
en.lodlive.it
BIBFRAME Overview

Topics to cover:

• What is BIBFRAME?
• What does linked data have to do with BIBFRAME?
• How does BIBFRAME fit into the standards and best practices discussed earlier?
• How will I actually use BIBFRAME in my daily work?
Basic BIBFRAME Model

Antoine de Saint-Exupéry

Le Petit Prince

The Little Prince

subject
creator

hashinstance

publisher
publishedAt
format
State of progress

- Vocabulary 2.0 coming soon!
- New Core class: Items
- New core class: Events
- No more Authority layer – will go straight to Subject, Person, etc.
- More information here: http://www.loc.gov/bibframe/docs/index.html
BIBFRAME and Linked Data

• How do these two concepts connect?
  – BIBFRAME plays on the ideas of linked data to connect bibliographic data across the web.
  – Use of URIs instead of strings
  – Often shown/visualized/serialized in RDF triples
  – Not just a replacement for MARC!
BIBFRAME in the Wild

So what does it really look like when someone uses BIBFRAME?
US Army Corps of Engineers
US Army Corps of Engineers

The Little SAS Book: A Primer: a Programming Approach

Title: The Little SAS Book: A Primer: A Programming Approach
Author: Delwiche, Lora D.
ISBN: 9781599947269
Personal Author: Delwiche, Lora D.
Physical Description: xx, 358 p. : ill. ; 23 cm.
General Note: Includes index.
Contents: Getting started using SAS software -- Getting your data into SAS -- Working with your data -- Sorting, printing, and summarizing your data -- Enhancing your output with ODS (Output Delivery System) -- Modifying and combining SAS data sets -- Writing flexible code with the SAS macro facility -- Using basic graphical and statistical procedures -- Exporting your data -- Debugging your SAS programs -- Where to go from here -- Coming to SAS from SPSS -- Coming to SAS from a programming language -- Coming to SAS from SQL.
Abstract: Introduces the most commonly used features of the SAS programming language, including the DATA and PROC steps, inputting data, modifying and combining data sets, summarizing data, producing reports, and debugging SAS programs. New topics in the 4th ed. include ODS graphics for statistical procedures; SGPLOT procedure for graphics; creating new variables in PROC REPORT with a COMPUTE block; WHERE-data set option; SORTSEQ, LANGU, and ORDER options in PROC SORT; more functions, including ANYALPHA, CAT, PROPCASE, and YEARDIF.--P. [4] of cover.
Title Subject: SAS (Computer file)
Subject Term: Mathematical statistics -- Data processing.
Added Author: Slaughter, Susan J.
OCLC Number: 208435448
Copies: 1

Available: 1

Library: ERDC Hanover NH
Material Type: Book
Shelf Number: QA276.4 D45 2008
Item Category 1: PRINT
Location: Standard Shelving Location
Modeling Exercise

The Little Prince

Author: Antoine de Saint-Exupéry, Katherine Woods; Harcourt, Brace & World.
Database: WorldCat
Summary:
An aviator, whose plane is forced down in the Sahara Desert, encounters a little man from a small planet who describes his adventures in the universe, seeking the secret of what is really important in life.
Rating:

Subjects:
- Love
- Fairy tales
- Fantasy fiction
- More like this

Genre/Form:
- Children's stories
- French
- Fiction
- Juvenile works
- Fantasy fiction
- Illustrations (chiefly color)
- 23 cm

Material Type:
- Fiction
- Juvenile audience

Document Type:
- Book

All Authors / Contributors:
Antoine de Saint-Exupéry, Katherine Woods; Harcourt, Brace & World.

ISBN:
- 0152450004
- 9780152450004
- 0152450008
- 9780152450008

OCLC Number:
- 249900

Description:
- 91, [3] pages : illustrations (chiefly color) ; 23 cm

Responsibility:
written and drawn by Antoine de Saint-Exupéry ; translated from the French by Katherine Woods.

Abstract:
An aviator, whose plane is forced down in the Sahara Desert, encounters a little man from a small planet who describes his adventures in the universe, seeking the secret of what is really important in life.
Modeling Exercise

Work Data:
- Title
- Author
- Subjects
- Date of creation

Instance Data:
- Publisher
- Date of printing
- Pagination
- Cover art
What does it mean for my library?

- Workload/workflow changes
- Connectivity
- What will the catalog/cataloging look like?
Workflow Example: BIBFRAME Editor

Create Resource

- Monograph
  - Instance
  - Work
  - Work, Instance
- Cartographic
- BluRay DVD
- Audio CD
Workflow Example: BIBFRAME Editor

<table>
<thead>
<tr>
<th>Create Resource</th>
<th>RDA Work Elements - Monographs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monograph</td>
<td>Creator of Work (RDA 19.2)</td>
</tr>
<tr>
<td></td>
<td>Principal Creator</td>
</tr>
<tr>
<td></td>
<td>Other Creators</td>
</tr>
<tr>
<td></td>
<td>Preferred Title for the Work</td>
</tr>
<tr>
<td></td>
<td>(RDA 6.2.2)</td>
</tr>
<tr>
<td></td>
<td>Title</td>
</tr>
<tr>
<td></td>
<td>Variant Title for the Work</td>
</tr>
<tr>
<td></td>
<td>(RDA 6.2.3)</td>
</tr>
<tr>
<td></td>
<td>Title</td>
</tr>
<tr>
<td></td>
<td>Form of Work</td>
</tr>
<tr>
<td></td>
<td>(RDA 6.3)</td>
</tr>
<tr>
<td></td>
<td>Form of Work</td>
</tr>
<tr>
<td></td>
<td>Date of Work (RDA 6.4)</td>
</tr>
<tr>
<td></td>
<td>Date of Work (RDA 6.4)</td>
</tr>
<tr>
<td></td>
<td>Place</td>
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<tr>
<td></td>
<td>Other Distinguishing Characteristic of the Work (RDA 6.6)</td>
</tr>
<tr>
<td></td>
<td>Nature of the Content (RDA 7.2)</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td>Dissertation or Thesis Information (RDA 7.9)</td>
</tr>
<tr>
<td></td>
<td>Other Person, Family, Corporate Body Associated With a Work (RDA 19.3)</td>
</tr>
<tr>
<td></td>
<td>Other Person, Family, Corporate Body Associated With a Work (RDA 19.3)</td>
</tr>
<tr>
<td></td>
<td>Subject of the Work (RDA Chapter 23)</td>
</tr>
<tr>
<td></td>
<td>Topic</td>
</tr>
<tr>
<td></td>
<td>Place</td>
</tr>
<tr>
<td></td>
<td>Person</td>
</tr>
<tr>
<td></td>
<td>Corporate Body</td>
</tr>
<tr>
<td></td>
<td>Family (LCSH)</td>
</tr>
<tr>
<td></td>
<td>Meeting</td>
</tr>
<tr>
<td></td>
<td>RDA Work Elements - Monographs</td>
</tr>
<tr>
<td></td>
<td>RDA Work Elements - Monographs</td>
</tr>
<tr>
<td></td>
<td>DDC Classification (RDA Chapter 23)</td>
</tr>
<tr>
<td></td>
<td>Dewey Classification Information</td>
</tr>
<tr>
<td></td>
<td>Related Works (RDA Chapter 25 and Appendix J)</td>
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<tr>
<td></td>
<td>RDA Work Elements - Monographs</td>
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<tr>
<td></td>
<td>Contents Note (LC-PCC PS 25.1)</td>
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<td></td>
<td>Contents Note (LC-PCC PS 25.1)</td>
</tr>
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Workflow Example: BIBFRAME Editor
Workflow Example: BIBFRAME Editor

![BIBFRAME Editor Interface](image)
Workflow Example: BIBFRAME Editor

RDA Work Elements - Monographs

<table>
<thead>
<tr>
<th>Creator of Work (RDA 19.2)</th>
<th>Principal Creator</th>
<th>Other Creators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saint-Exupéry, Antoine de, 1900-1944</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Preferred Title for the Work (RDA 6.2.2)</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>The Little Prince</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variant Title for the Work (RDA 6.2.3)</th>
<th>Title</th>
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<table>
<thead>
<tr>
<th>Form of Work (RDA 6.3)</th>
<th>Form of Work</th>
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<tbody>
<tr>
<td>Fiction</td>
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<table>
<thead>
<tr>
<th>Date of Work (RDA 6.4)</th>
<th>Date of Work (RDA 6.4)</th>
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<table>
<thead>
<tr>
<th>Place of Origin of the Work (RDA 6.5)</th>
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<tr>
<td>Paris (France)</td>
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<table>
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<tr>
<th>Other Distinguishing Characteristic of the Work (RDA 6.6)</th>
<th>Other Distinguishing Characteristic of the Work (RDA 6.6)</th>
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</table>

<table>
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<tr>
<th>Nature of the Content (RDA 7.2)</th>
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</table>

<table>
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<tr>
<th>Coverage of the Content (RDA 7.3)</th>
<th>Coverage of the Content (RDA 7.3)</th>
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<tr>
<th>Intended Audience (RDA 7.7)</th>
<th>Intended Audience (RDA 7.7)</th>
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</table>

<table>
<thead>
<tr>
<th>Dissertation or Thesis Information (RDA 7.9)</th>
<th>Dissertation or Thesis Information (RDA 7.9)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other Person, Family, or Corporate Body Associated With a Work (RDA 19.9)</th>
<th>Other Person, Family, Corporate Body Associated With a Work (RDA 19.9)</th>
</tr>
</thead>
</table>
Workflow Example: BIBFRAME Editor

RDA Expression Elements - Monograph

<table>
<thead>
<tr>
<th>Element</th>
<th>Value</th>
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<tbody>
<tr>
<td>Expression of</td>
<td>RDA Work Elements - Monographs</td>
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<tr>
<td>Content Type (RDA 6.9)</td>
<td>text</td>
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<tr>
<td>Language of Expression (RDA 6.11)</td>
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<tr>
<td>Other Distinguishing Characteristic of the Expression (RDA 6.12)</td>
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<tr>
<td>Summary of Content (RDA 7.10)</td>
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<tr>
<td>Language of the Content (RDA 7.12)</td>
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<tr>
<td>Script (RDA 7.13.2)</td>
<td></td>
</tr>
<tr>
<td>Illustrative Content (RDA 7.15)</td>
<td></td>
</tr>
<tr>
<td>Supplementary Content (RDA 7.16)</td>
<td></td>
</tr>
</tbody>
</table>
Workflow Example: BIBFRAME Editor
### Workflow Example: BIBFRAME Editor

#### Instance/Manifestation - Monograph

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lookup</td>
<td>Lookup</td>
</tr>
<tr>
<td>Instance of</td>
<td>RDA Work Elements - Monographs</td>
</tr>
<tr>
<td></td>
<td><a href="http://bibframe.org/resources/works/SaQ1...">http://bibframe.org/resources/works/SaQ1...</a></td>
</tr>
<tr>
<td>Title Proper (RDA 2.3.2)</td>
<td>Title</td>
</tr>
<tr>
<td>Parallel Title Proper (RDA 2.3.3)</td>
<td>Title</td>
</tr>
<tr>
<td>Other Title Information (RDA 2.3.4)</td>
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</tr>
<tr>
<td>Variant Title (RDA 2.3.6)</td>
<td>Title</td>
</tr>
<tr>
<td>Statement of Responsibility Relating to Title Proper (RDA 2.4.2)</td>
<td>Statement of Responsibility Relating to Title Proper (RDA 2.4.2)</td>
</tr>
<tr>
<td>Designation of Edition (RDA 2.5.2)</td>
<td>Designation of Edition (RDA 2.5.2)</td>
</tr>
<tr>
<td>Statement of Responsibility Relating to the Edition (RDA 2.5.4)</td>
<td>Statement of Responsibility Relating to the Edition (RDA 2.5.4)</td>
</tr>
<tr>
<td>Publication Statement (RDA 2.8)</td>
<td>Enter Publication Information</td>
</tr>
<tr>
<td>Distribution Statement (RDA 2.9)</td>
<td>Enter Distribution Information</td>
</tr>
<tr>
<td>Manufacturer Statement (RDA 2.10)</td>
<td>Enter Manufacturer Information</td>
</tr>
<tr>
<td>Copyright Date (RDA 2.11)</td>
<td>Copyright Date (RDA 2.11)</td>
</tr>
</tbody>
</table>
Workflow Example: BIBFRAME Editor

ID: http://bibframe.org/resources/works/vtr1457985791
  Type(s): http://bibframe.org/vocab/Text
  bf:relator
    __:bnodeWx1457985914
  bf:workTitle
    __:bnodezmp1457986211
  bf:genre
    __:bnodeYd1457986221
  bf:originPlace
    __:bnodefR1457988258

ID: http://bibframe.org/resources/works/YPp1457985794
  Type(s): http://bibframe.org/vocab/Work
  bf:expressionOf
    http://bibframe.org/resources/works/vtr1457985791
  bf:contentCategory
    http://id.loc.gov/vocabulary/contentTypes/txt

ID: http://id.loc.gov/vocabulary/contentTypes/txt
  bf:label
    text

ID: __:bnodeG0v51457985885
  bf:relatorRole
    http://id.loc.gov/vocabulary/relators/aut

ID: http://id.loc.gov/vocabulary/relators/aut
  bf:label
    Author
Example Workflow UNLV

- Exported records from CONTENTdm
- Imported data into Open Refine. Cleaned it up, created triples, and exported it as RDF.
- Used Mulgara and OpenLink Virtuoso Pivot Viewer to store and visualize their data (open source)

FUTURE GOAL: To publish all digital collections as linked data
Example Case Study
OCLC

- OCLC has been publishing bibliographic linked data since 2012
- How make use of data and demonstrate how it adds value to librarians and users?
  - Looking at Google Research Knowledge Vault model
- The Knowledge Vault will contain triples that can be used by next-generation library services and apps
Lincoln, Robert Todd, 1843-1926

About
- Born: Aug 1, 1843
- Died: Jul 26, 1926
- Robert Todd Lincoln (August 1, 1843 – July 26, 1926) was an American lawyer and Secretary of War, and the first son of President Abraham Lincoln and Mary Todd Lincoln. Born in Springfield, Illinois, United States, he was one of two of Lincoln’s four sons to live to adulthood, and the only one to survive into the 1900s.
- Father: Abraham Lincoln
- Mother: Mary Todd Lincoln
- Spouse: Mary Eunice Harlan

Related Works
- As a Creator
  - [Letter] 1911 April 28 [to] Mr. Starrett?
  - Autograph letter signed from Robert Todd Lincoln, Chicago, to Miss Post 1901 January 25.
  - Autograph signature of Robert Lincoln to a typewritten letter: Chicago, to Mr. Morgan, 1908 Jan. 20.
  - Letter : Chicago, to Belle F. Keyes, Boston, 1885 Dec. 16.
  - Letter : Chicago, to Clinton L. Conkling.

Related Media

Related People
- Abraham Lincoln
- Mary Todd Lincoln
- William Eleazar Barton
- Mrs. James G. Blaine

Related Organizations
- William E. Barton Collection of Lincolniana
- Republican Party (U.S. : 1854-)
- United States. Supreme Court.
- United States. War Department

Related Places
- United States
- Illinois
- Illinois--Chicago
- New York (State)
Example Case Study
Innovative Linked Data

1. Library Local Database
2. Extract MARC Records and Transform to MARCXML
3. RDF Conversion to BIBFRAME
4. Published on Library.Link Network
5. Harvesting and Linking via Web and Linked Data Applications
Thank You!

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All handouts/resources
http://z.umn.edu/14cy