Introduction to the Linked Data Platform (LDP)

Hector Correa
hjc14@psu.edu
The Pennsylvania State University
Agenda

• What is the Linked Data Platform (LDP)
• Basic definitions of concepts and rules
• Examples
• Why this is important
• Q&A
Related Sessions

• **Linked data, URIs, and labels** by Trey Terrel

• **Introducing Hydra-works: PCDM in Hydra** by Lynette Rayle
Linked Data

First introduced by Tim Berners-Lee in 2006

“The Semantic Web isn't just about putting data on the web. It is about making links, so that a person or machine can explore the web of data”

- Identify things with valid URLs
- Use standards for representation
- Include other URLs in your data

See http://www.w3.org/DesignIssues/LinkedData.html
Abraham Lincoln

This article is about the American president. For other uses, see Abraham Lincoln (disambiguation).

Abraham Lincoln (February 12, 1809 – April 15, 1865) was the 16th President of the United States, serving from March 1861 until his assassination in April 1865. Lincoln led the United States through its Civil War—its bloodiest war and its greatest moral, constitutional, and political crisis. In doing so, he preserved the Union, abolished slavery, strengthened the federal government, and modernized the economy.

Born in Hodgenville, Kentucky, Lincoln grew up on the western frontier in Kentucky and Indiana. Largely self-educated, he became a lawyer in Illinois, a Whig Party leader, and a member of the Illinois House of Representatives, where he served from 1834 to 1846. Elected to the United States House of Representatives in 1846, Lincoln promoted rapid modernization of the economy through banks, tariffs, and railroads.

Because he had originally agreed not to run for a second term in Congress, and because his opposition to the Mexican–American War was unpopular among Illinois voters, Lincoln returned to Springfield and resumed his successful law practice. Reentering politics in 1854, he became a leader in building the new Republican Party, which had a statewide majority in Illinois. In 1856, while taking part in a series of highly publicized debates with his opponent and rival, Democrat Stephen A. Douglas, Lincoln spoke out against the expansion of slavery, but lost the U.S. Senate race to Douglas.

In 1860, Lincoln secured the Republican Party presidential nomination as a moderate from a swing state. With very little support in the slave-holding states of the South, he swept the North and was elected president in 1860. His victory prompted seven southern slave states to form the Confederate States of America before he moved into the White House - no compromise or reconciliation was found regarding slavery and secession. Subsequently, on April 12, 1861, a Confederate attack on Fort Sumter inspired the North to enthusiastically rally behind the Union in a declaration of war. As the leader of the moderate faction of the Republican Party, Lincoln confronted Radical Republicans, who demanded harsher treatment of the South, War Democrats, who called for more compromise, anti-war Democrats (called Copperheads), who despised him, and irreconcilable secessionists, who plotted his assassination. Politically, Lincoln fought back by pitigating his opponents against each other, by carefully planned political patronage, and by appealing to the American people with his powers of oratory. His Gettysburg Address became an iconic endorsement of the principles of nationalism, republican equality, liberty, and democracy.

Lincoln initially concentrated on the military and political dimensions of the war. His primary goal was to reunite the nation. He suspended habeas corpus, leading to the controversial ex parte Merryman decision, and he averted potential British intervention in the war by defusing the Trent Affair in late 1861. Lincoln diedly executed the order

https://en.wikipedia.org/wiki/Abraham_Lincoln
Linked Data

<table>
<thead>
<tr>
<th>Statement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abraham_Lincoln label &quot;Abraham Lincoln&quot;.</td>
<td></td>
</tr>
<tr>
<td>Abraham_Lincoln birthDate &quot;1809-02-12&quot;.</td>
<td></td>
</tr>
<tr>
<td>Abraham_Lincoln profession &quot;Lawyer&quot;.</td>
<td></td>
</tr>
<tr>
<td>[ . . . ]</td>
<td></td>
</tr>
<tr>
<td>Abraham_Lincoln birthPlace Hodgenville,_Kentucky.</td>
<td></td>
</tr>
</tbody>
</table>

http://dbpedia.org/resource/Abraham_Lincoln

http://dbpedia.org/resource/Hodgenville,_Kentucky

http://dbpedia.org/data/Abraham_Lincoln.n3
RDF 101

• Resource Description Framework
  http://www.w3.org/TR/rdf-primer/

• Data expressed in triples
  
  <subject> <predicate> <object>

• For example
  
  <hydraconnect> <location> “Minneapolis”
  <hydraconnect> <date> “2015-09-22”
From read-only to read-write

• How are we supposed to update Linked Data

• Intuitively
  – use HTTP GET/POST
  – Resource Description Framework (RDF)

• ...but what are the mechanics, the rules, how do we deal with containership
Linked Data Platform (LDP)

“defines a set of rules for HTTP operations on web resources, some based on RDF, to provide an architecture for read-write Linked Data on the web”  

http://www.w3.org/TR/ldp/

W3C Recommendation as of Feb/2015
Linked Data Platform (LDP) is an HTTP API for read-write Linked Data.

An API stands for Application Programming Interface. An API defines the rules to communicate with a program.
Basic HTTP workflow

- LDP Client
- LDP Server

- HTTP GET
- Response (RDF or Non-RDF)

- HTTP POST (RDF or Non-RDF)
- Response
Everything is a **Resource**

**RDF Sources**: expressed in Resource Description Framework (triples)

**Non-RDF Sources**: everything else (web pages, PDFs, image/audio/video files, binaries, et cetera)

http://www.w3.org/TR/ldp/
Create a New RDF Source

HTTP request
POST localhost/
Slug: hydraconnect2015

<> dcterms:title "Hydra Connect 2015".
<> dcterms:subject "Hydra conference in Minneapolis".

HTTP response
HTTP/1.1 201 Created
Location: http://localhost/hydraconnect2015/

HTTP POST to create a new RDF Source (hydraconnect2015)
Triples for the new resource
Yup, created...
...and here is the URL of the new resource
Fetch an Existing RDF Source

Client makes HTTP request
GET localhost/hydraconnect2015

Server returns HTTP response
HTTP/1.1 200 OK
Content-Type: text/turtle
Link: <http://www.w3.org/ns/ldp#BasicContainer>; rel="type",
      <http://www.w3.org/ns/ldp#Resource>; rel="type"

<html/>
  a ldp:BasicContainer;
  dc:title "Hydra Connect 2015";
  dc:subject ""Hydra conference in Minneapolis" .

HTTP GET request
RDF source that is a container
HTTP Headers
HTTP Body
Create a New Non-RDF Source

HTTP request
POST localhost/
Slug: logo.jpg
Content-Type: image/jpeg
Content-Length: 1020
[binary of the image goes here]

HTTP response
HTTP/1.1 201 Created
Location: http://localhost/logo.jpg

...and here is the URL of the new resource
Concepts (expanded)

Resource

Non-RDF Source

RDF Source

Container

Basic Container

Direct Container

Indirect Container

http://www.w3.org/TR/ldp/
Adding an RDF Source to a Basic Container (1/2)

HTTP request
- POST localhost/hydraconnect2015/
  - Slug: session1

  <> dcterms:title “Welcome to Hydra Connect 2015”.
  <> dcterms:subject “blah blah”.

HTTP response
- HTTP/1.1 201 Created
  - Location: http://localhost/hydraconnect2015/session1
Adding an RDF Source to a Basic Container (2/2)

HTTP request
GET localhost/hydraconnect2015/ HTTP/1.1

HTTP response
[the usual HTTP headers go here]

<localhost/hydraconnect2015/> a ldp:BasicContainer;
   dc:title "Hydra Connect 2015";
   dc:subject ""Hydra conference in Minneapolis";

Fetch the Basic Container

Adding an RDF Source to a Basic Container (2/2)

New triple automatically added by the LDP Server
Welcome to Hydra Connect

Hi Everybody

Minneapolis
September/2015

hydraconnect2015

Legend

- Basic Container
- Direct Container

- Added by LDP Client
- Added by LDP Server
Direct Containers (1/2)

HTTP request
POST localhost/ HTTP/1.1
Slug: speakers

<> dcterms:title “People that speakers at conferences”.
<> rdf:DirectContainer .
<> ldp:hasMemberRelation hasSpeaker.

HTTP request
POST localhost/speakers HTTP/1.1
Slug: janedev

<> dcterms:title “Jane Developer”.
Direct Container (2/2)

HTTP request
GET localhost/hydraconnect2015

HTTP response
[bunch of HTTP headers go here]

<localhost/hydraconnect2015/> a ldp:BasicContainer ;
dc:title "Hydra Connect 2015" ;
dc:subject ""Hydra conference in Minneapolis" ;
ldp:contains <localhost/hydraconnect2015/session1> ;
hasSpeaker <localhost/speakers/janedev> .

...has new triple with hasMemberRelation predicate
...pointing to the new resource
Welcome to Hydra Connect
Hi Everybody

Minneapolis
September/2015

People that speak at conferences

Legend
Basic Container
Direct Container

Added by LDP Client
Added by LDP Server
Containers

• “Containers are at the heart of LDP”—Robert Sanderson

• Indirect Container you can link to a totally different resource than the one added

• Direct and Indirect Containers you can revert the relationship (hasMemberRelation vs isMemberOfRelation)

• Shameless plug: LDP Containers for the Perplexed http://tinyurl.com/ldp-containers

• Read the W3C LDP Recommendation http://www.w3.org/TR/ldp/
Updates

- Updates have not been standardized :(  

- The Linked Data Platform Working Group is currently favoring LD Patch but still is deciding.

- Other candidates include SPARQL 1.1, SparqlPatch, TurtlePatch, and RDF Patch

- As of July/2015, Linked Data Patch Format (LD Patch) is a note, not a recommendation

- LD Patch [http://www.w3.org/TR/2015/NOTE-ldpatch-20150728/](http://www.w3.org/TR/2015/NOTE-ldpatch-20150728/)
Why is LDP important to Hydra?

- **Fedora 4 is an LDP Server**

- The Hydra Stack (i.e. your app) is an LDP Client
  - gems: LDP, ActiveTriples, ActiveFedora

* Some restrictions apply
Thanks!

Slides and notes available at

http://hectorcorrea.com/introduction-to-ldp