



TWC



↔ <http://bit.ly/lebo-issues-2013>

Content-Preserving Graphics



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TWC

A screenshot of a web browser window. The title bar says "D Web Site Under Maintenance". The address bar shows the URL "dbpedia.org/resource/Baikonur_Cosmodrome". The main content area contains a yellow warning sign icon on the left and the following text in bold:

**The web-site you are currently trying to access is
under maintenance at this time.
We are sorry for any inconvenience this has caused.**



Outline

- Motivation
 - Visual Analytics [some problems]
 - Linked Data [some potential]
- Approach [content preserving graphics]
- Demo [data sculptor]
- Conclusions and Future Work



Motivation

- Technical barriers **slow analysts** down in *creating, understanding, trusting, and re-purposing* results.
- Linked Data offers a huge **potential** for establishing explicit, understandable connections within and across data sources.
- Linked Data is **ready to use**, **but not yet useful**.
- Linked Data currently suffers from an **irony of use**.

Hypothesis: Applying Linked Data principles to the analytical process **reduces the time required** for **analysts** to *create, understand, trust, and re-purpose* any existing result.



Practical Challenges in Visual Analytics

Among **35** data analysts from **25** commercial organizations:

- Most tedious and time-consuming task is **discovering** and **wrangling** data
- Analytical results are **static**
- Analytical results are **shared** via email, a shared file system, or during group meetings
- Difficulties discovering when **relevant** data becomes available
- Visualizations avoided because considered **a barrier to underlying data**

S. Kandel, A. Paepcke, J. Hellerstein, and J. Heer. Enterprise data analysis and visualization: An interview study. *Visualization and Computer Graphics, IEEE Transactions on*, 18(12):2917–2926, Dec. 2012.



An Example: How to *understand, trust, and re-purpose* this result?

Screenshot of the UCS Satellite Database website:

Union of Concerned Scientists
[About] [Issues] [Join] [Act] [Donate]

Nuclear Weapons & Global Security

Center for Science and Democracy

- Scientific Integrity
- Global Warming
- Clean Vehicles
- Clean Energy
- Nuclear Power
- Nuclear Weapons & Global Security
- Nuclear Weapons & Global Security 101**
- Nuclear Weapons

Get Database Updates
Sign up to be notified when The UCS S... than 1000 o... around Earth

TEXT SIZE A A A PRINT

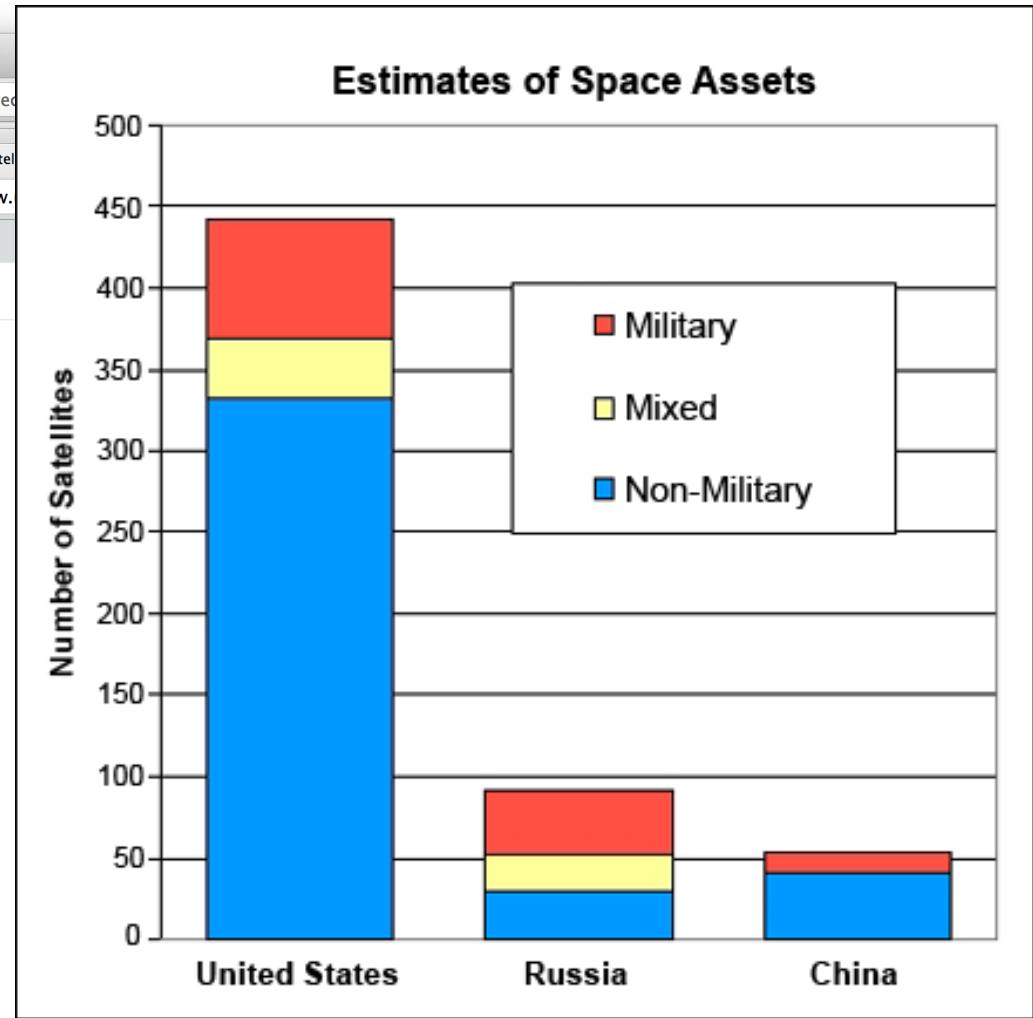
Home » Nuclear Weapons & Global Security

UCS Satellite Database
9-1-13 Satellite Database Downloads
Includes launches through 8/31/13

► Database (Excel format)	► Database (Excel format)
► Database (text format)	► Database (text format)

Changes to the database (pdf) Quick Guide Database

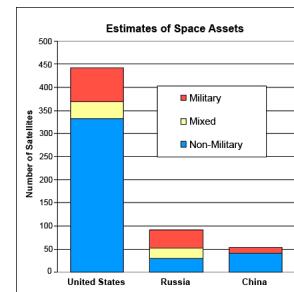
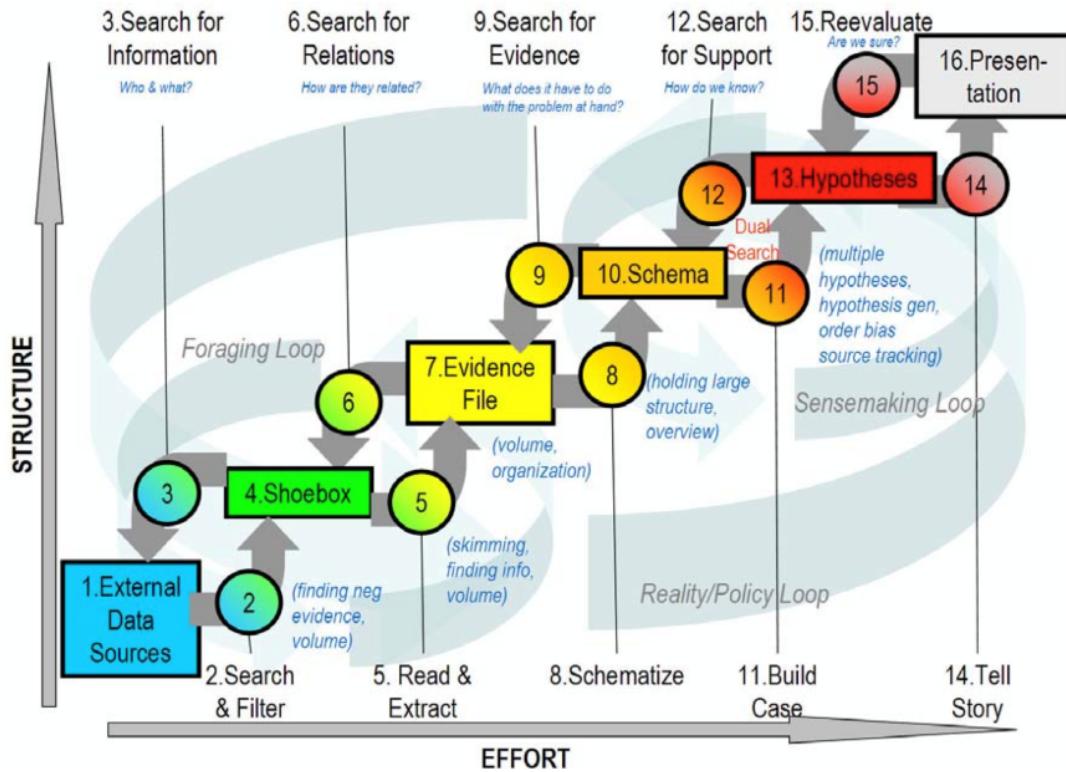
Common misconceptions (pdf) User's manual





The Analytical Process is Tortuous

Analytical Process: expend **effort** to establish **structure**



- **Bottom-up** seeks, searches, filters *givens*
- **Top-down** adds *structure* based on mental model
- **Iterative, ad hoc**

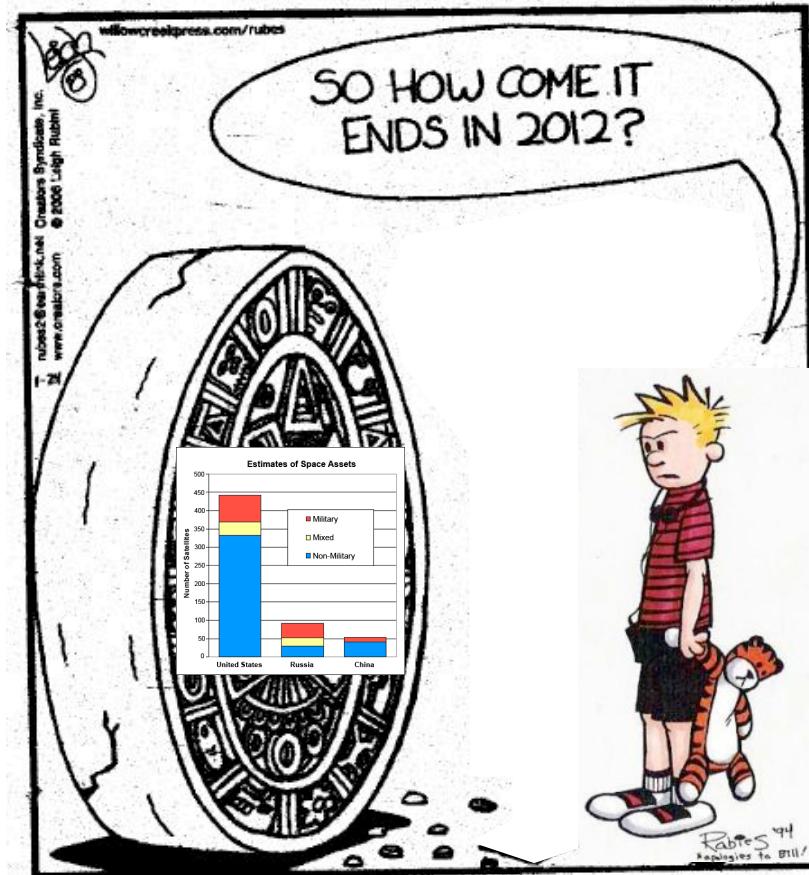
P. Pirolli and S. Card The sensemaking process and leverage points for analyst technology as identified through cognitive task analysis. In *Proceedings of International Conference on Intelligence Analysis*, 2005.



Interpreting Results is an Archaeological Endeavor



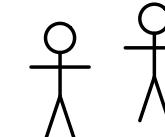
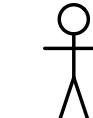
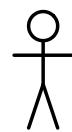
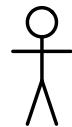
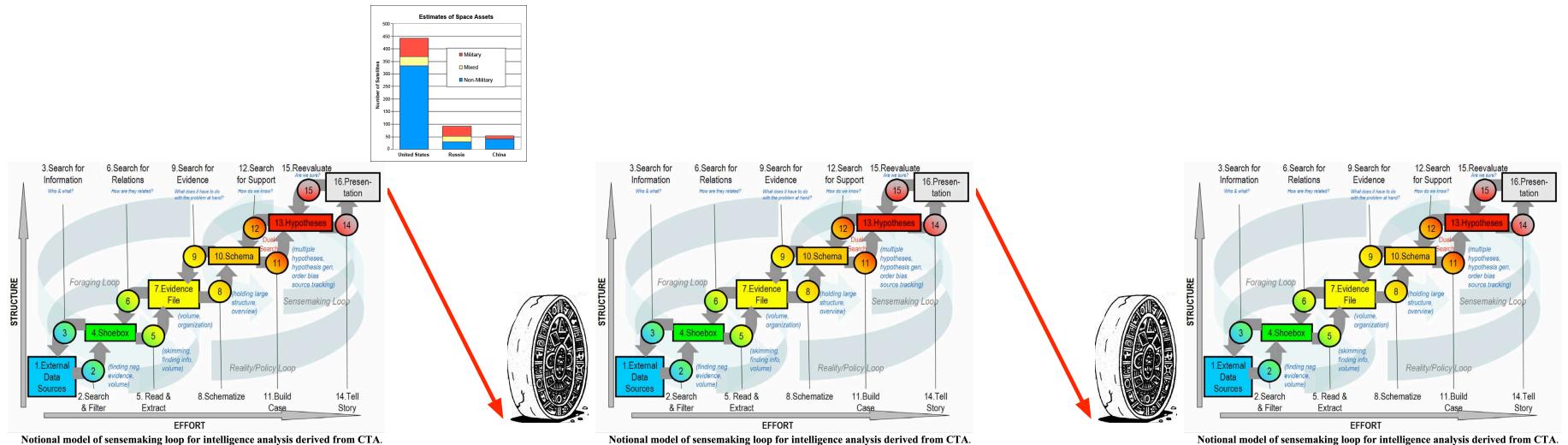
At last, the mystery of the Mayan calendar revealed.



A few years later, or the **same moment** somewhere else on the web.



Compounded Costs of Reusing Previous Analytical Results





Outline

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 - **Linked Data** [some potential]
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Linked Data Avoids Archaeological Endeavors

Linked Data offers a huge **potential** for establishing explicit, understandable connections within and across data sources.



Include **links** to other URIs, so that people can **discover** more things.



Use HTTP URIs to name things, so that people can **look up those names**.

Tim Berners-Lee
w3.org/DesignIssues/LinkedData

When someone looks up a URI, provide useful information in **RDF**.



Available as **non-proprietary** format.
(e.g. CSV instead of Excel)



Available as machine-readable **structured data**.
(e.g. Excel instead of image scan of a table)

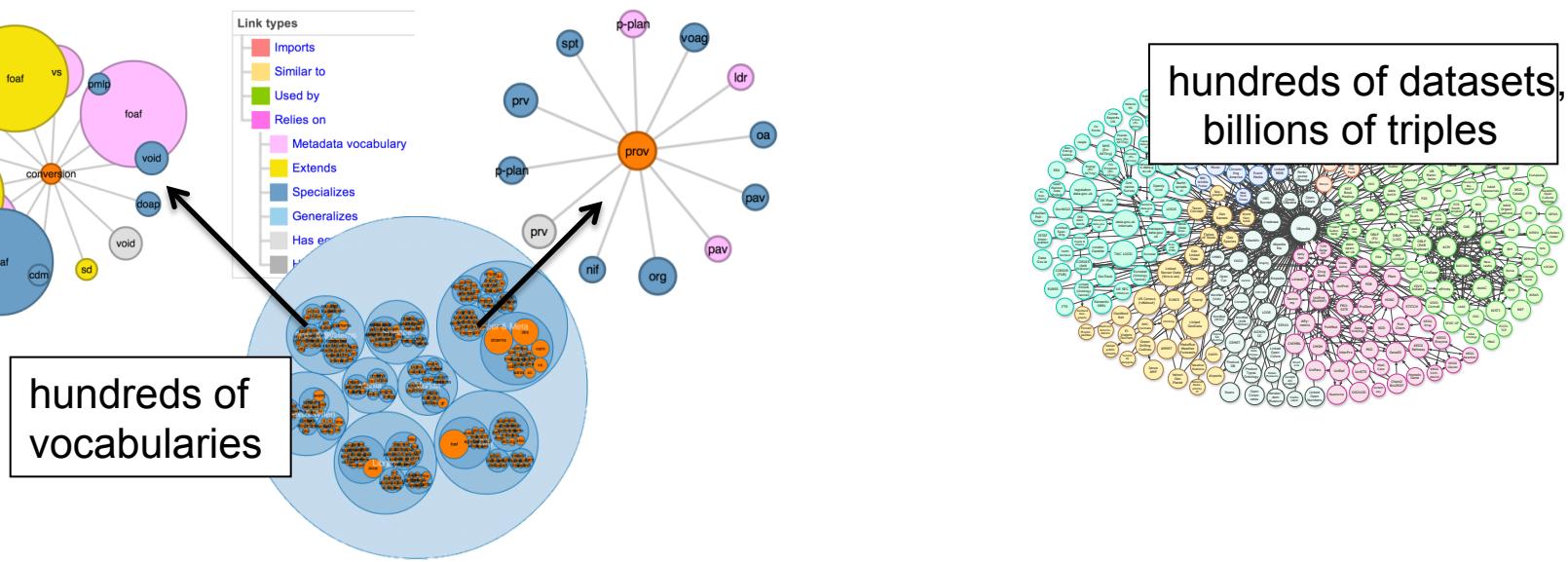


Available on the web (whatever format) but with an open license.

<http://5stardata.info>



Linked Data is *ready for use*, but not yet *useful*

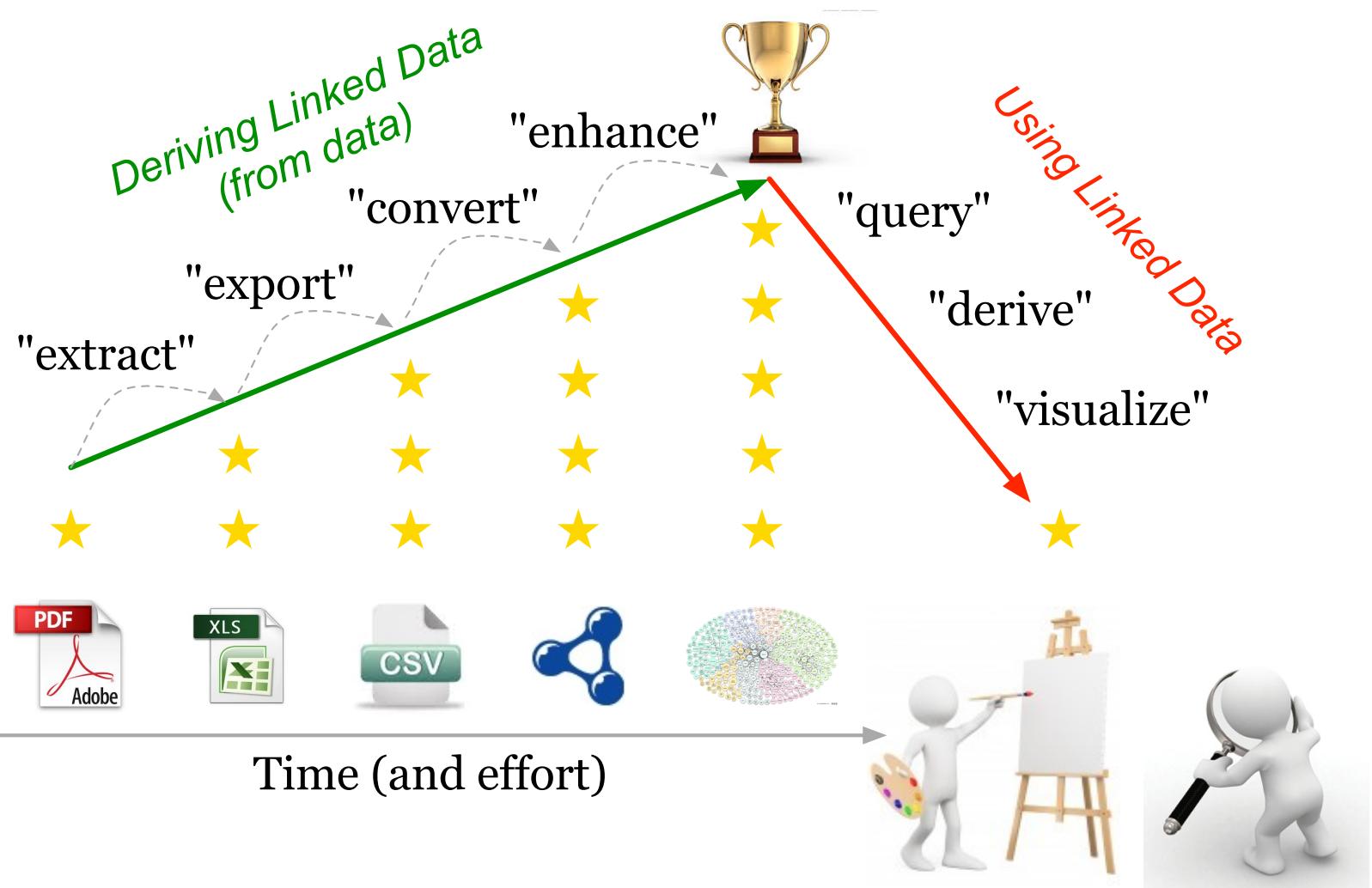


Bernard Vatant, Pierre-Yves
Vandenbussche <http://lov.okfn.org>

Richard Cyganiak,
Anja Jentzsch <http://lod-cloud.net>



The Irony of Using Linked Data





Why Linked Data Is Not Used

- Technical barriers **slow analysts** down in *creating, understanding, trusting, and re-purposing* results.
- Linked Data offers a huge **potential** for establishing explicit, understandable connections within and across data sources.
- Linked Data is **ready to use**, **but not yet useful**.
- Linked Data currently suffers from an **irony of use**.

Content-preserving graphics enables two new kinds of utility:

Interrogate visual results

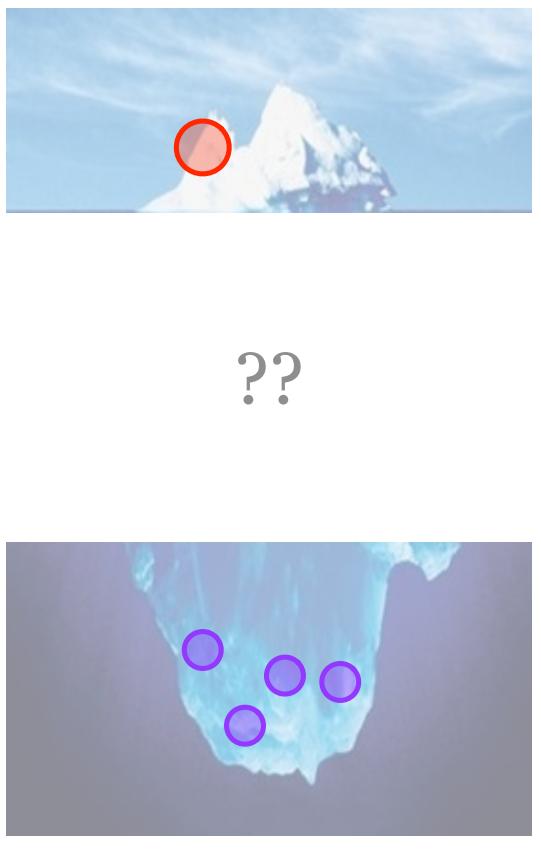
Re-purpose visual results



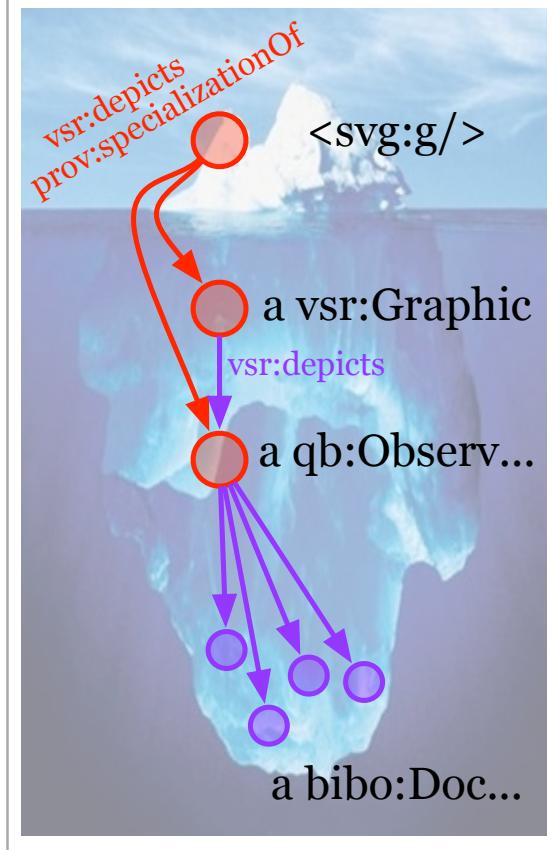
Content-Preserving Graphics

Useful Visual Handles on Useful Portions of LOD

Traditional Linked Data Applications



Content-Preserving Graphics



available by GRDDL

available by dereference

Concrete Visual Information

Abstract Visual Information

Derived Information

Existing Linked Data



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Demo!

file:/Users/lebot/afrl/projects/data-carver/svn/data-carver/data/source/agi-com/satellite-database/version/2013-Nov-07/automatic/Satellite

1/1 resources

http://localhost/source/norad-mil/dataset/satellite-catalog/25894
http://localhost/source/agi-com/vocab/Dataset
http://celesttrak.com/satcat/1992/1992-068.asp
http://www.n2yo.com/satellite/?s=37810
...

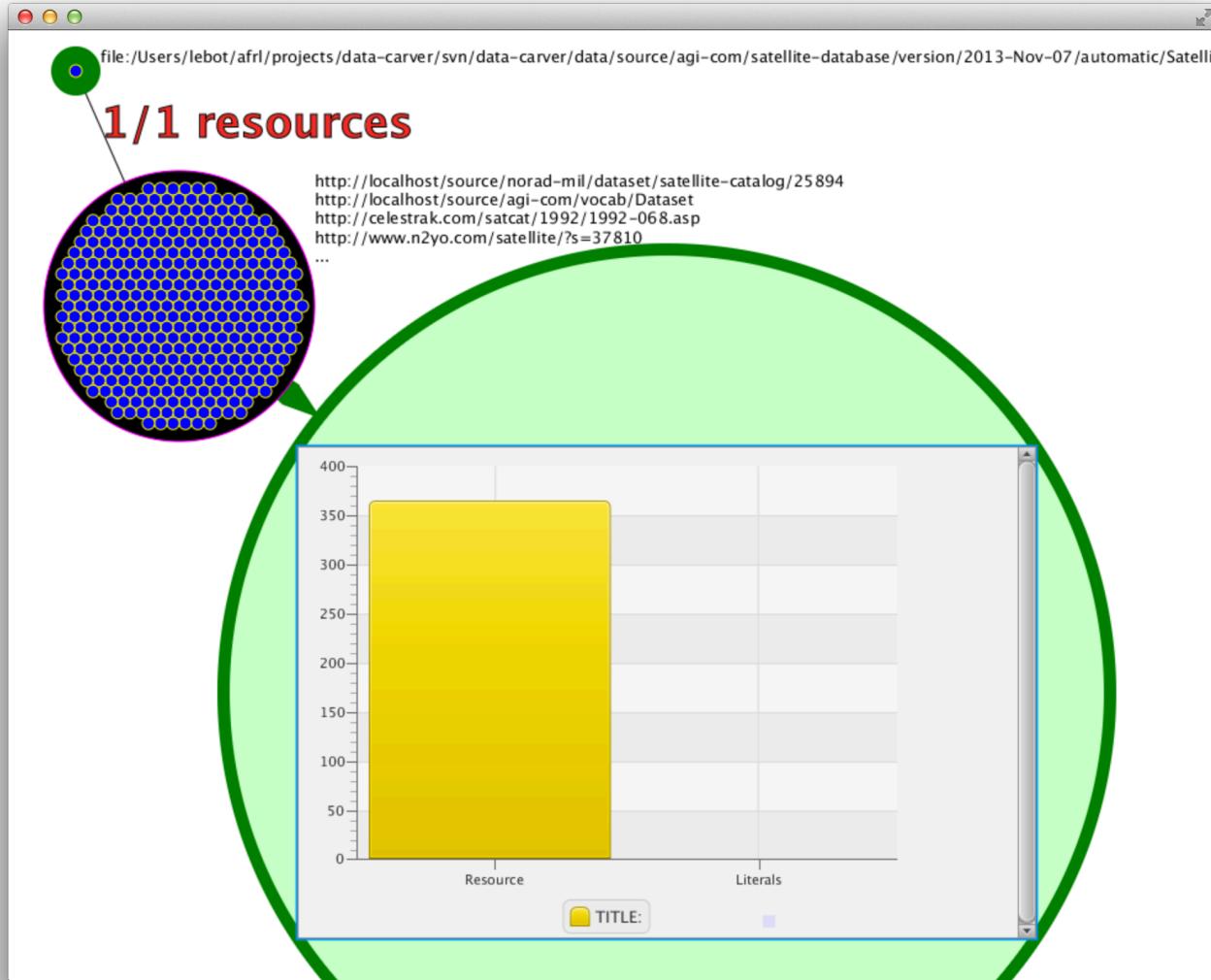
366/366 resources

Operations:
Referencing
Requesting

Basins:
Group of graph nodes



Demo!

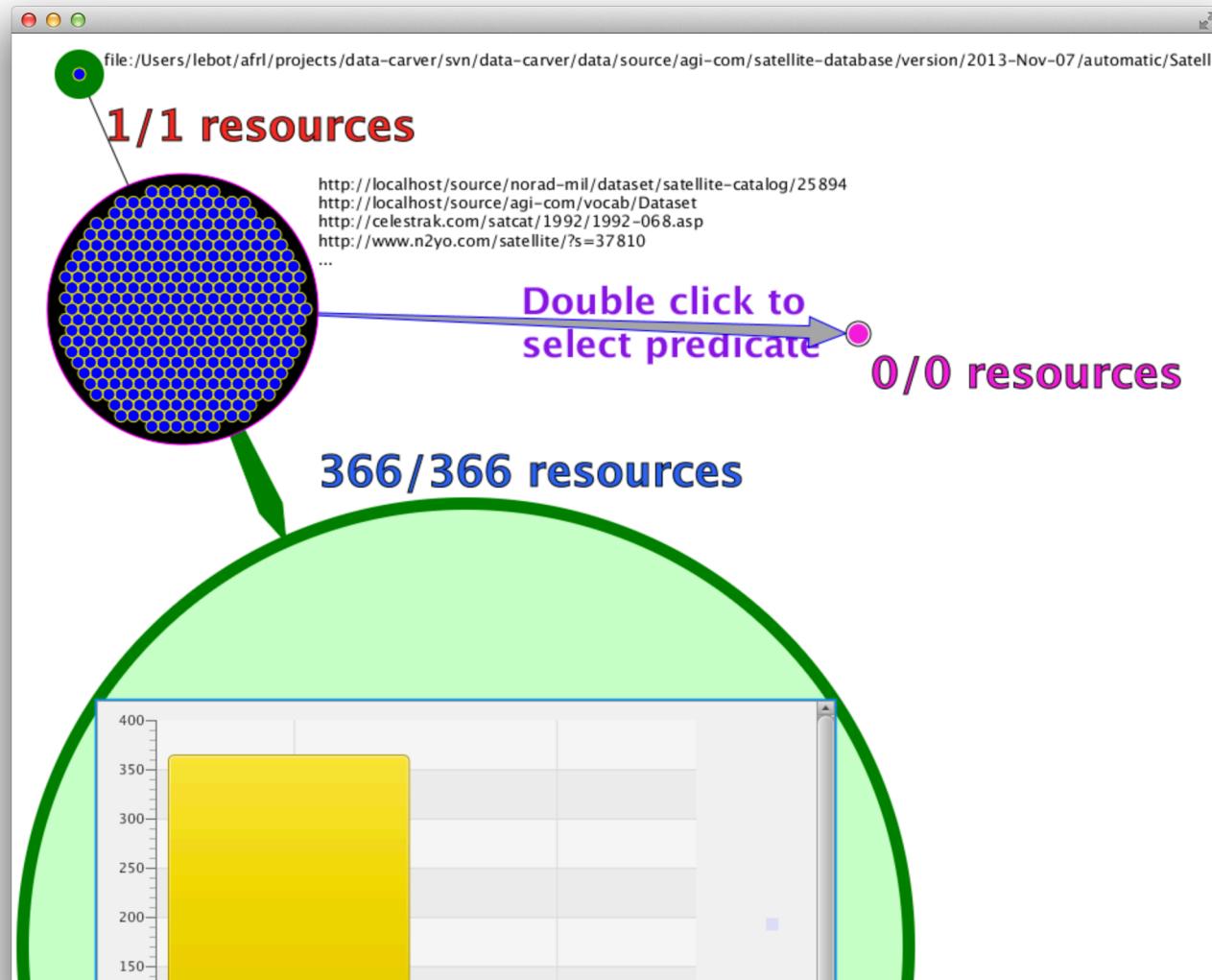


Operations:
Referencing
Requesting
Viewing

Invariants:
Nodes shown in view



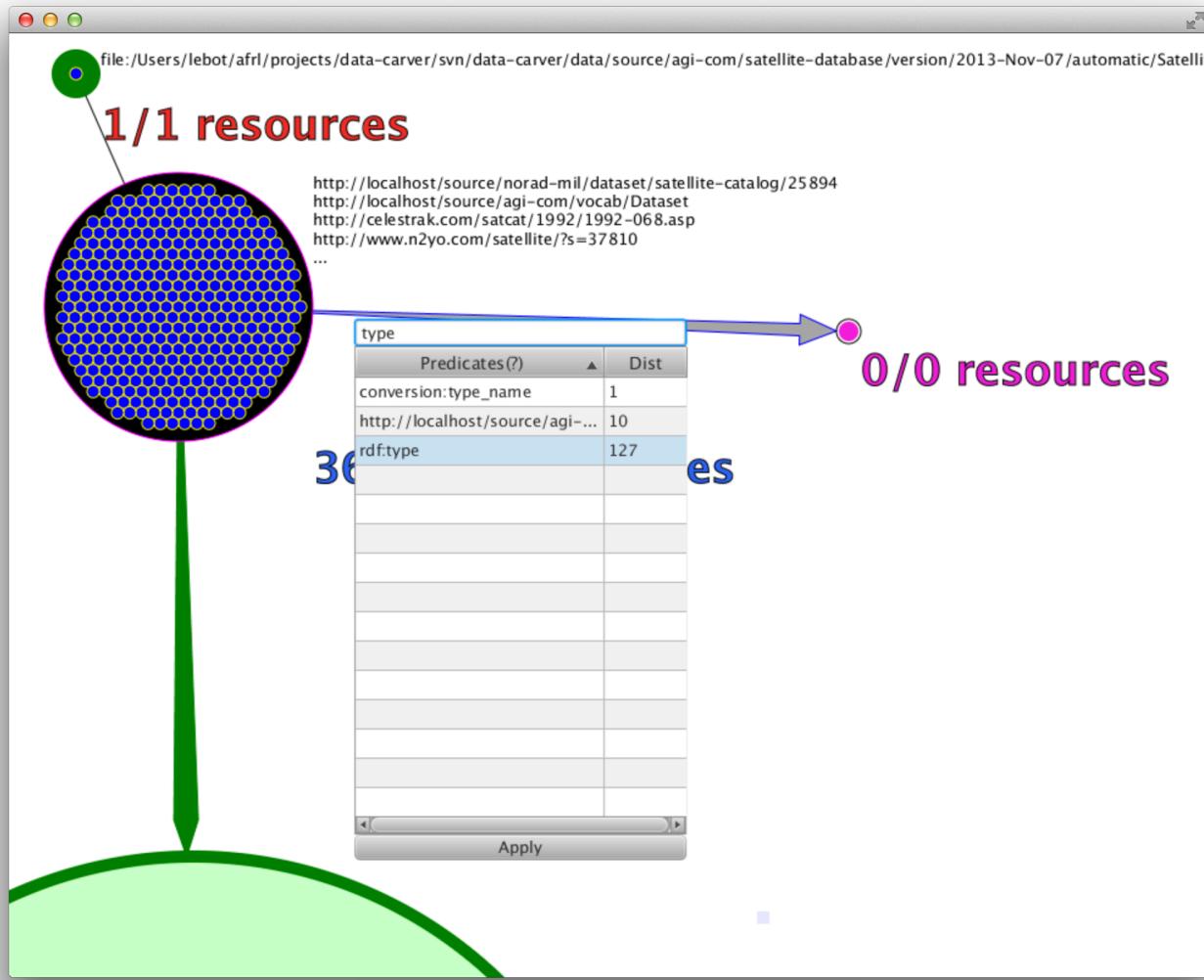
Demo!



Operations:
Referencing
Requesting
Viewing
Traversing



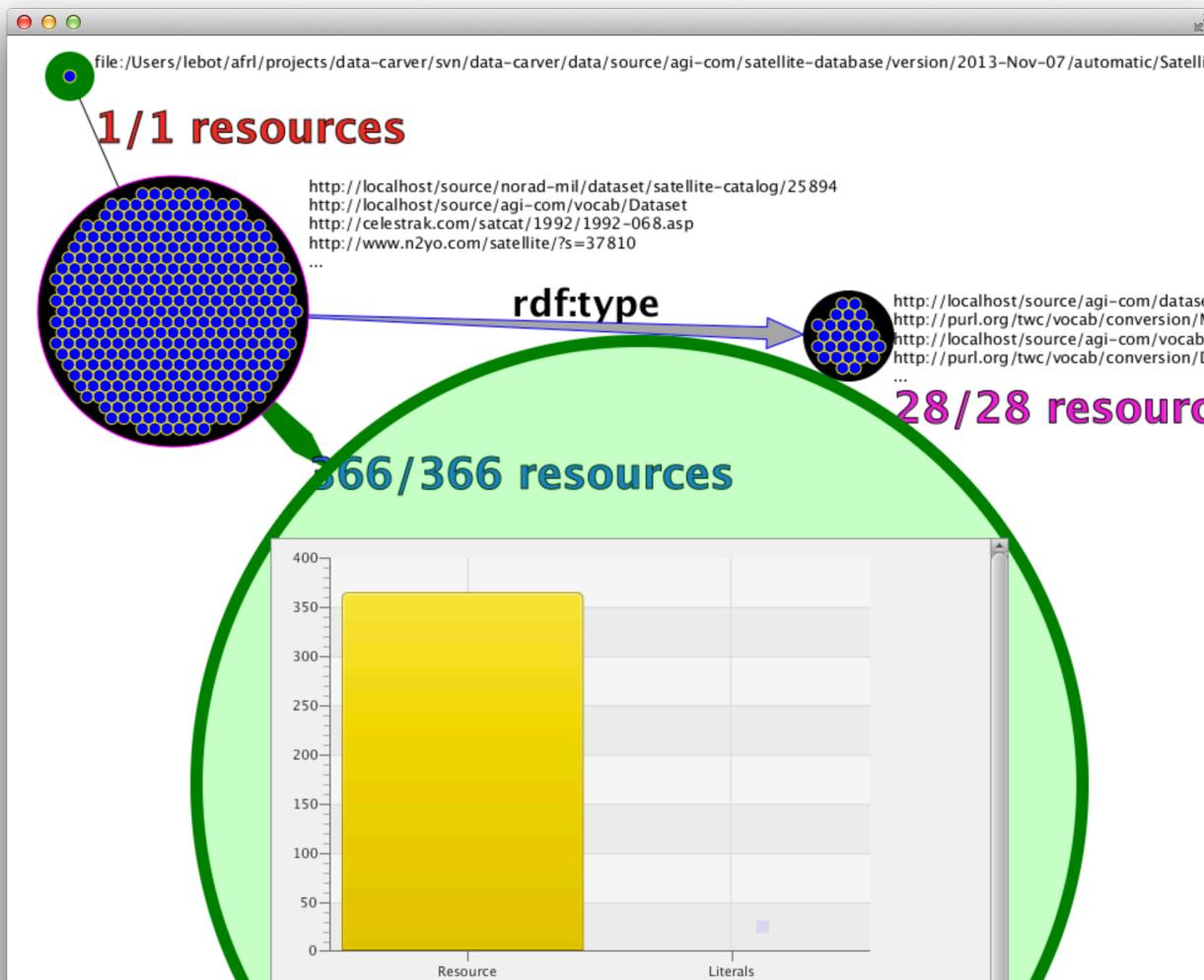
Demo!



Operations: Referencing Requesting Viewing **Traversing**



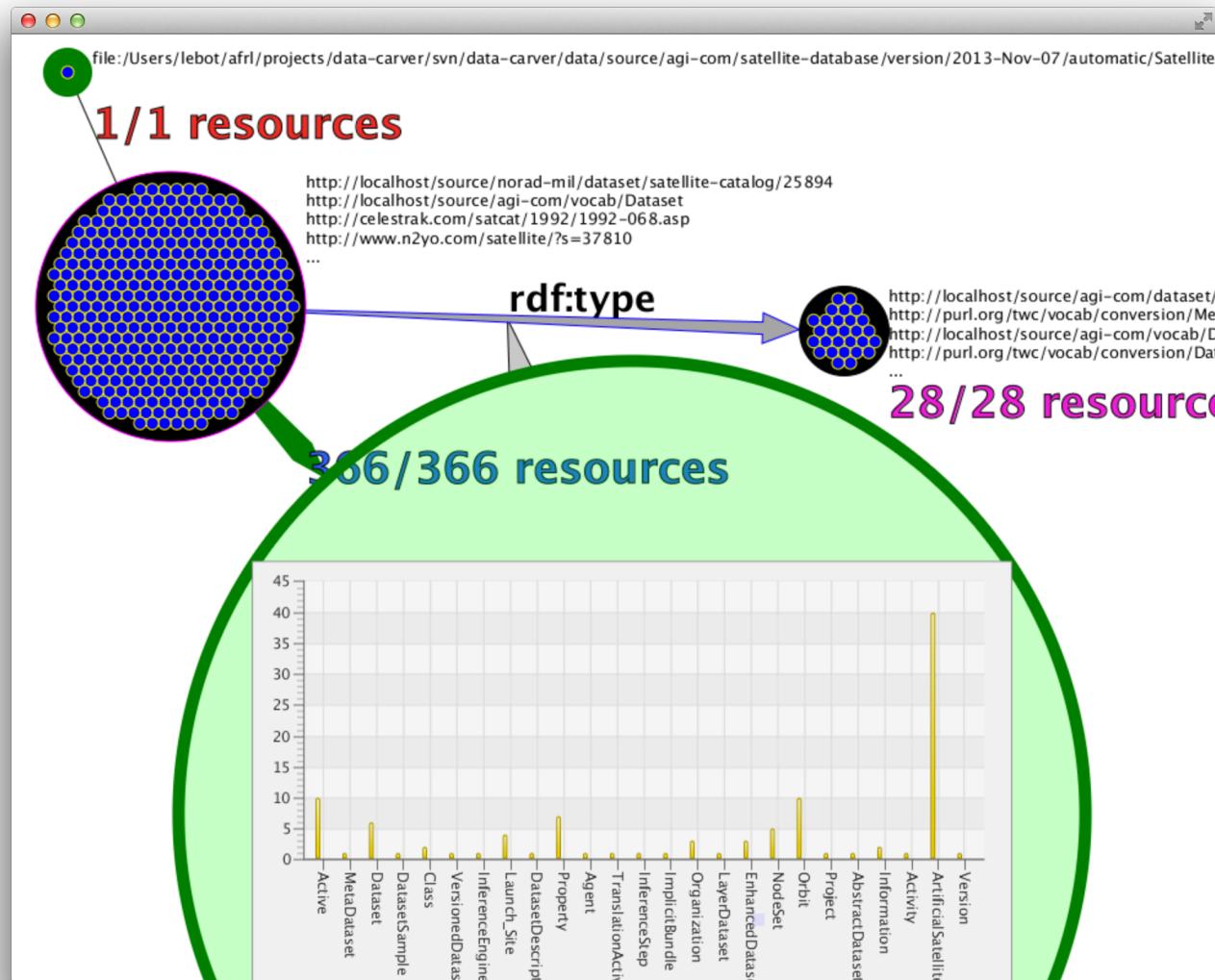
Demo!



Operations:
Referencing
Requesting
Viewing
Traversing



Demo!

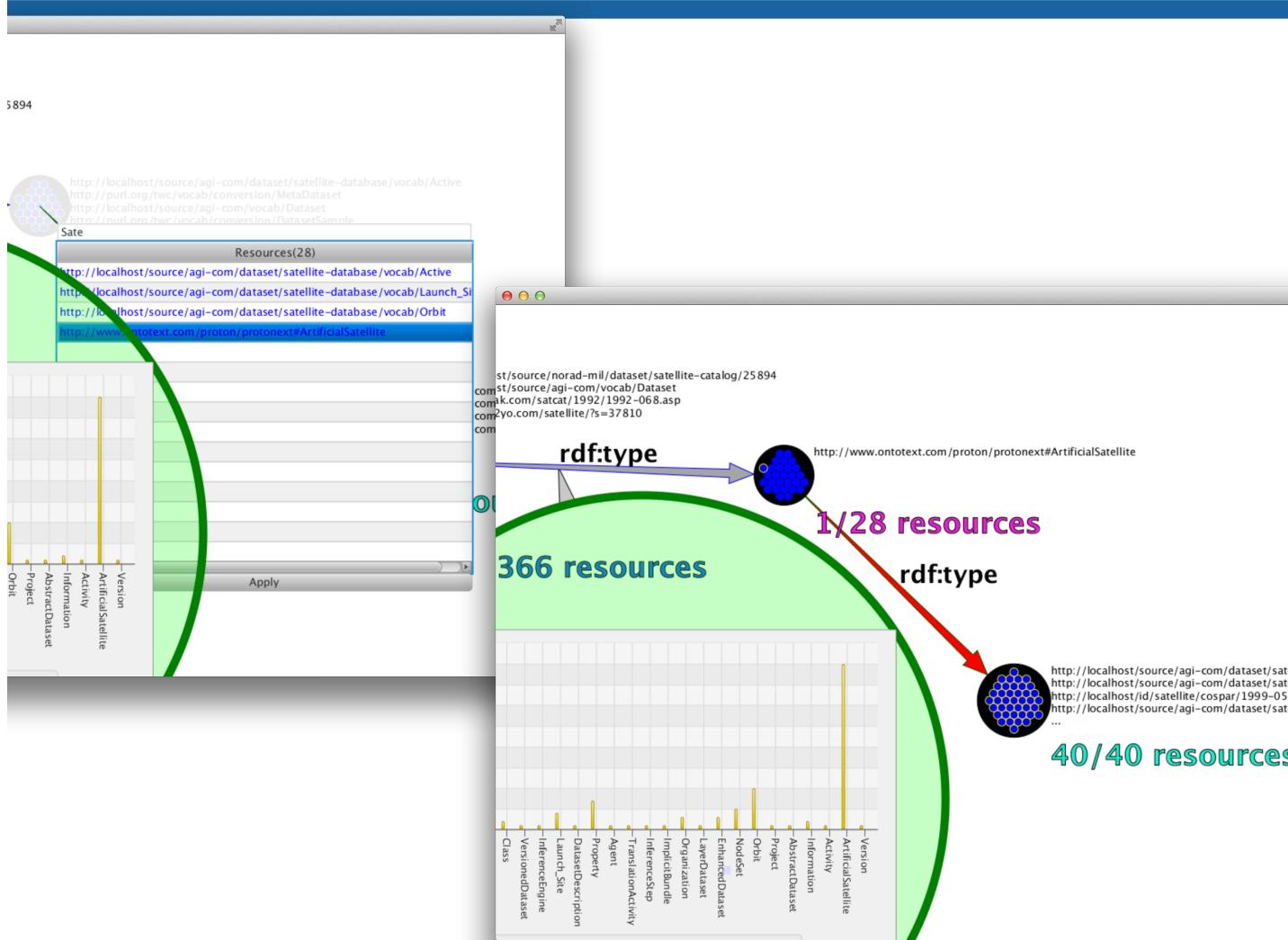


Operations:
Referencing
Requesting
Viewing
Traversing

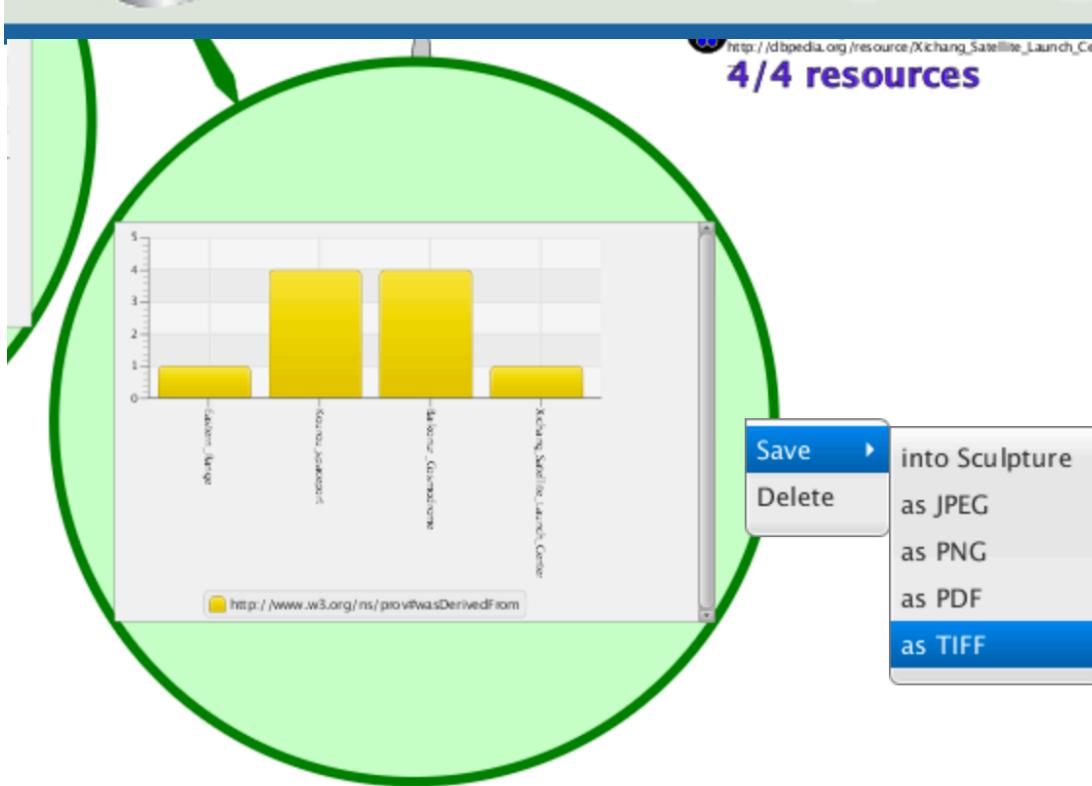
Components:
Relations shown in view

Demo!

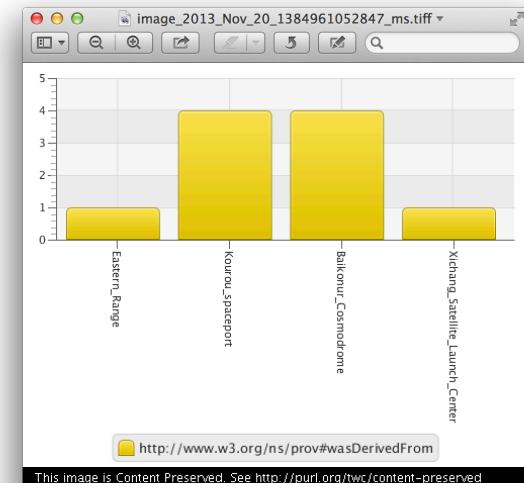
Operations:
Referencing
Requesting
Viewing
Traversing
Selecting



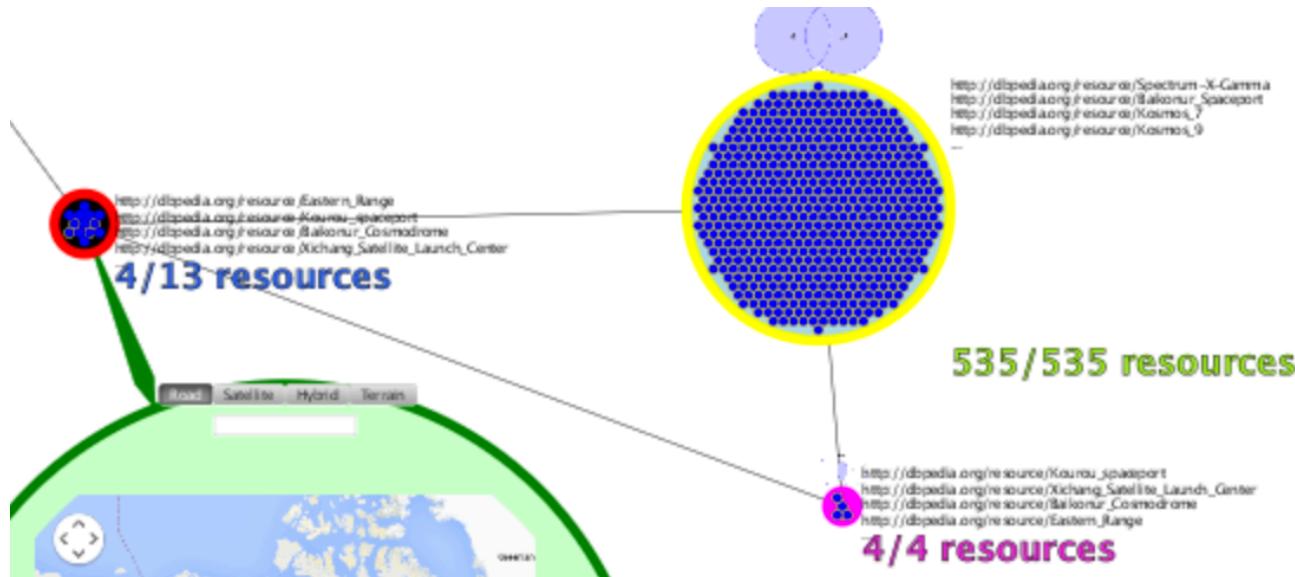
Demo!



Operations:
Referencing
Requesting
Viewing
Traversing
Selecting
Content-Preserving



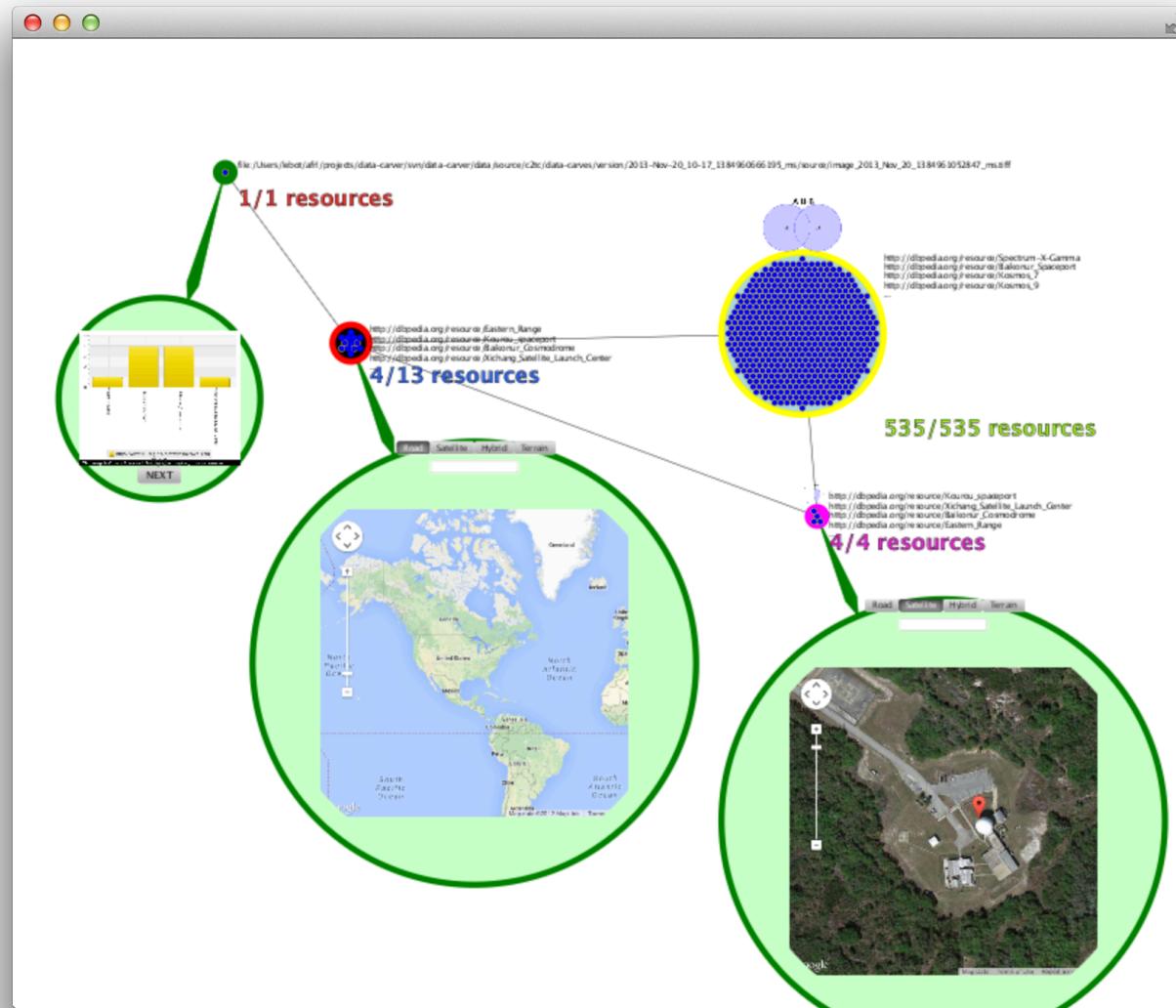
Demo!



Operations:
Referencing
Requesting
Viewing
Traversing
Selecting
Content-Preserving
Compositing

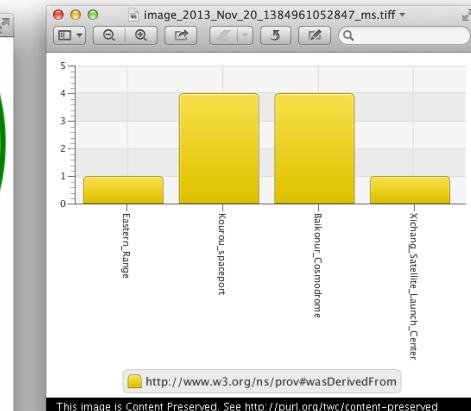
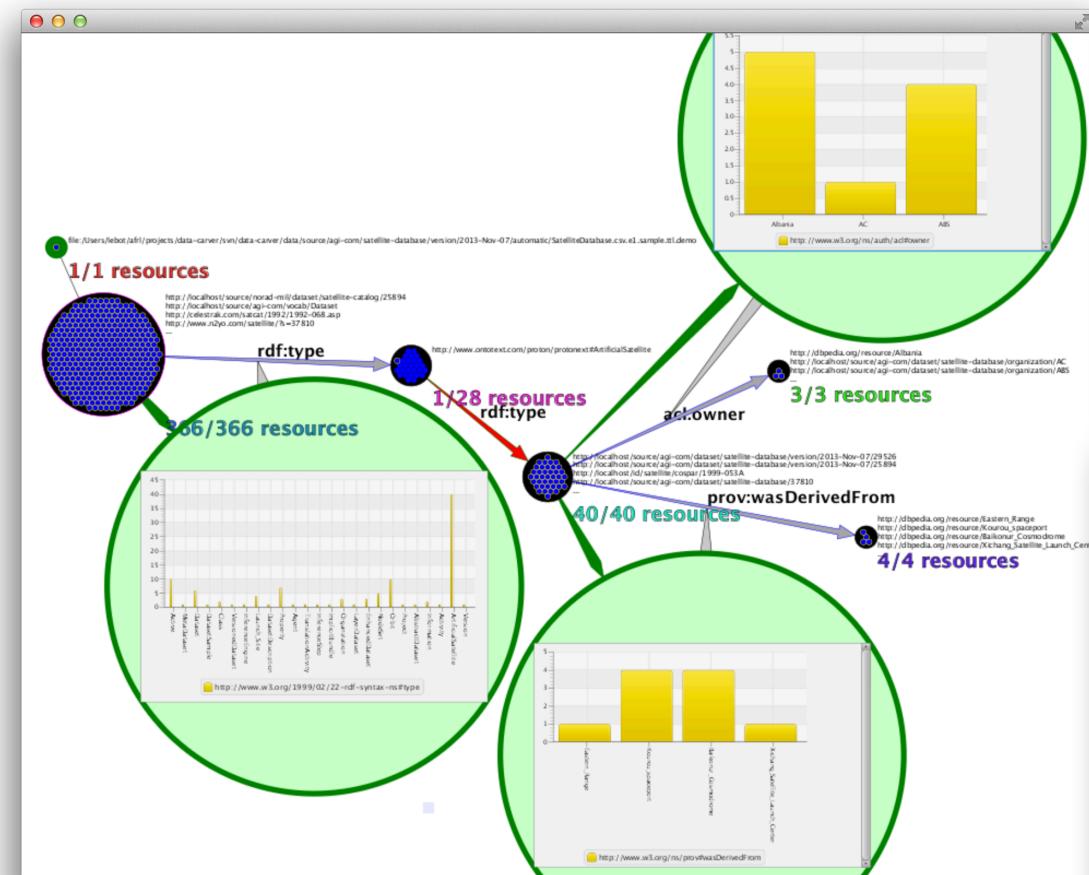


Demo!

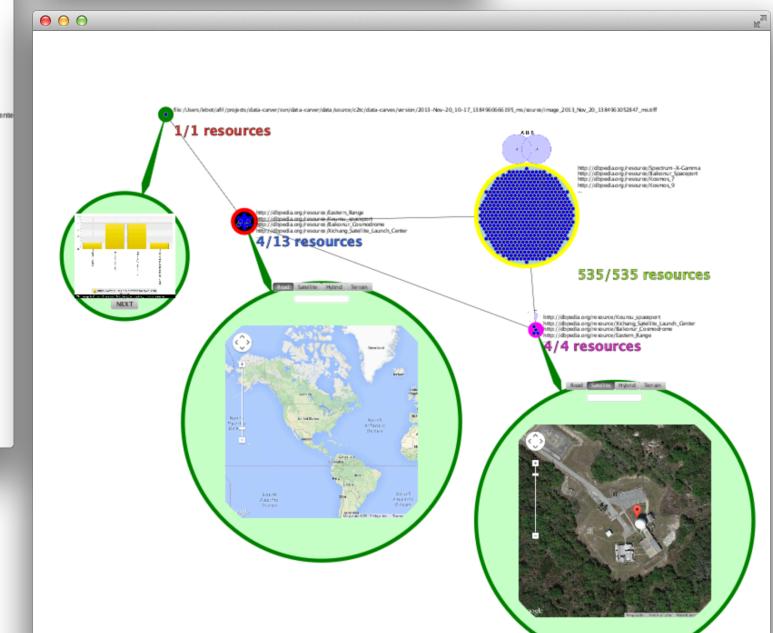




Demo!



Analyst 2



Analyst 1

20 Nov 2013

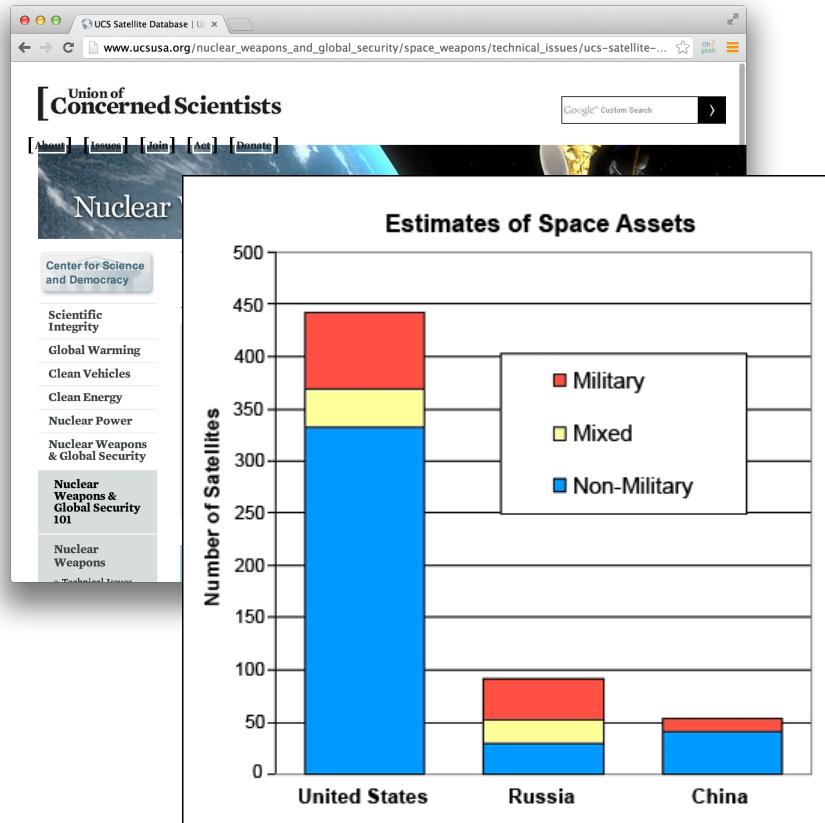
@timrdf <http://bit.ly/lebo-issues-2013>

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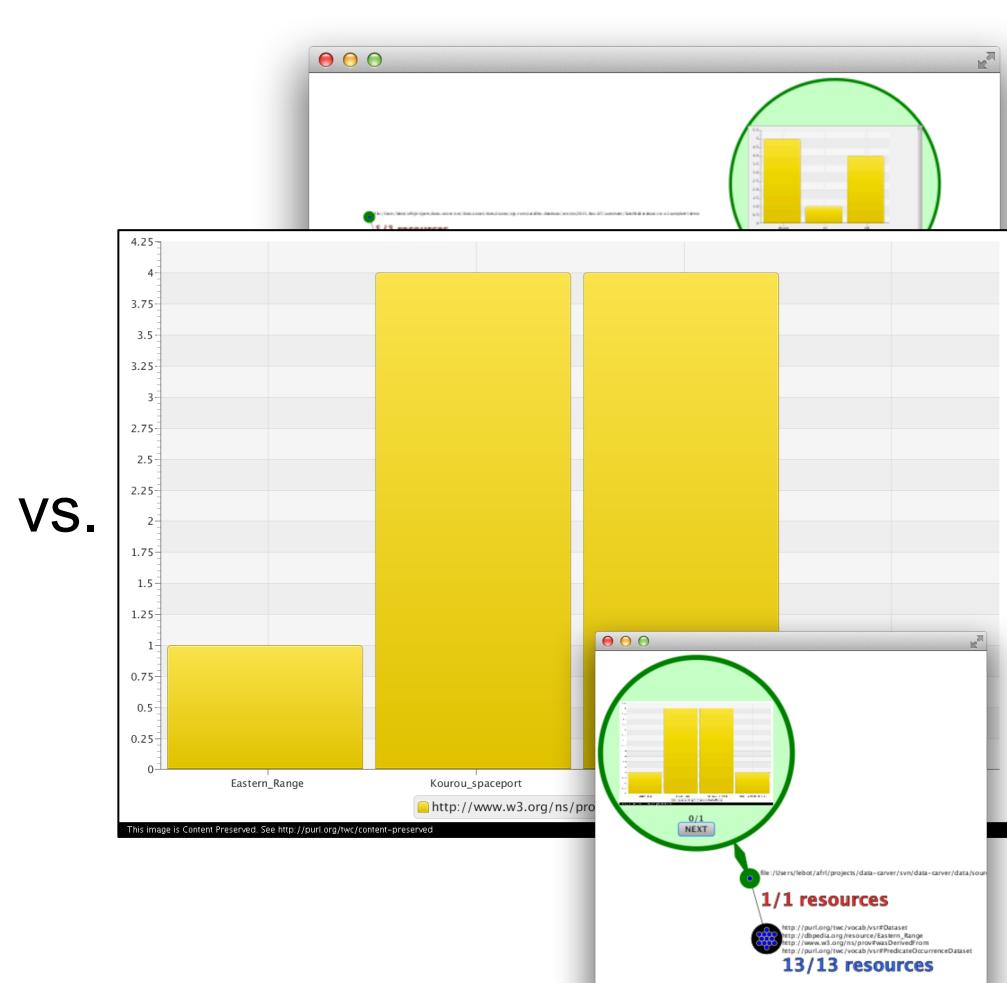


A New Paradigm for Visual Analytics / Communication

Traditional



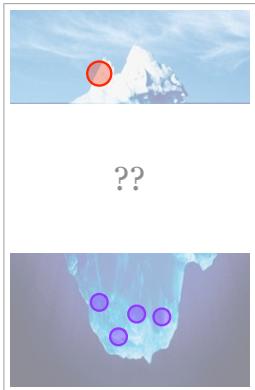
Content-Preserved





Conclusions

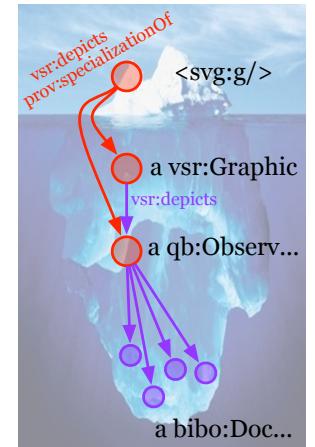
Objective: Reducing the time required for analysts to create, understand, trust, and re-purpose any existing result.



Hypothesis: A dearth of *explicit, meaningful connections* within and among analytical results is a significant factor for the challenges currently facing practitioners of data analytics.

Approach:

Maintain machine-understandable connections
among data,
between data and view,
among views.





Future Work: It's All Just Data

- Solve: Analyzing Data
- Be able to analyze for free:
 - File System (a simple case)
 - Metadata
 - Provenance
 - “Where did this data come from, how was it created?”
 - Ontology
 - What does “Person” and “parentFeature” mean?
 - Meta-analysis (Sculpt others’ Sculptures)
 - “Who else is analyzing X?”
 - Sculptor system performance
 - E.g. query times, amount of use



Future Work

- Evaluation!
 - Use cases from Visual Analytics community
 - Use cases from Linked Data community
- Towards Formal Visualization Knowledge
 - More view types
 - Developing an ontology for views and mappings
 - Intelligent, automated visualization construction
 - Modeling user needs and capabilities



Thanks!



- Patrick Fisher



- Tim Lebo
- Alvaro Graves



Deborah McGuinness