

# 3 Round Stones

## Semantic Search:

We're Living in a Golden Age for Information

Bernadette Hyland, CEO & co-founder  
co-chair W3C Government  
Linked Data Working Group

**NKOS-CENDI Semantic Search Workshop - Washington DC**

6-December 2012










Photo credit: <http://www.flickr.com/photos/sjungling/5974860/>

# The Race to the Top for Openness and Innovation: Announcing Agency Open Government Plan Leading Practices

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## Big Data for Users/Leaders/Managers/Innovators/Investors and Asset Managers

 October 26, 2012 By [BobGourley](#)

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“ It has been a real revelation,  
finding a granular level of data that we  
never had before. ”

“The hottest tech trend  
of the year is Big Data.”

Forbes



Photo credit: <http://www.flickr.com/photos/glennharper/4452247708/>

# Big Data

Simple data

Complex data

Legacy data



***“Big Data Is Important, but  
Open Data Is More Valuable”***

*As change agents, enterprise architects can help  
their organizations become richer through  
strategies such as open data.*

David Newman, VP Research, Gartner

What am I  
publishing?

How can I  
structure it so it  
can be re-used?

How can I be  
more open?

# Open Government Data

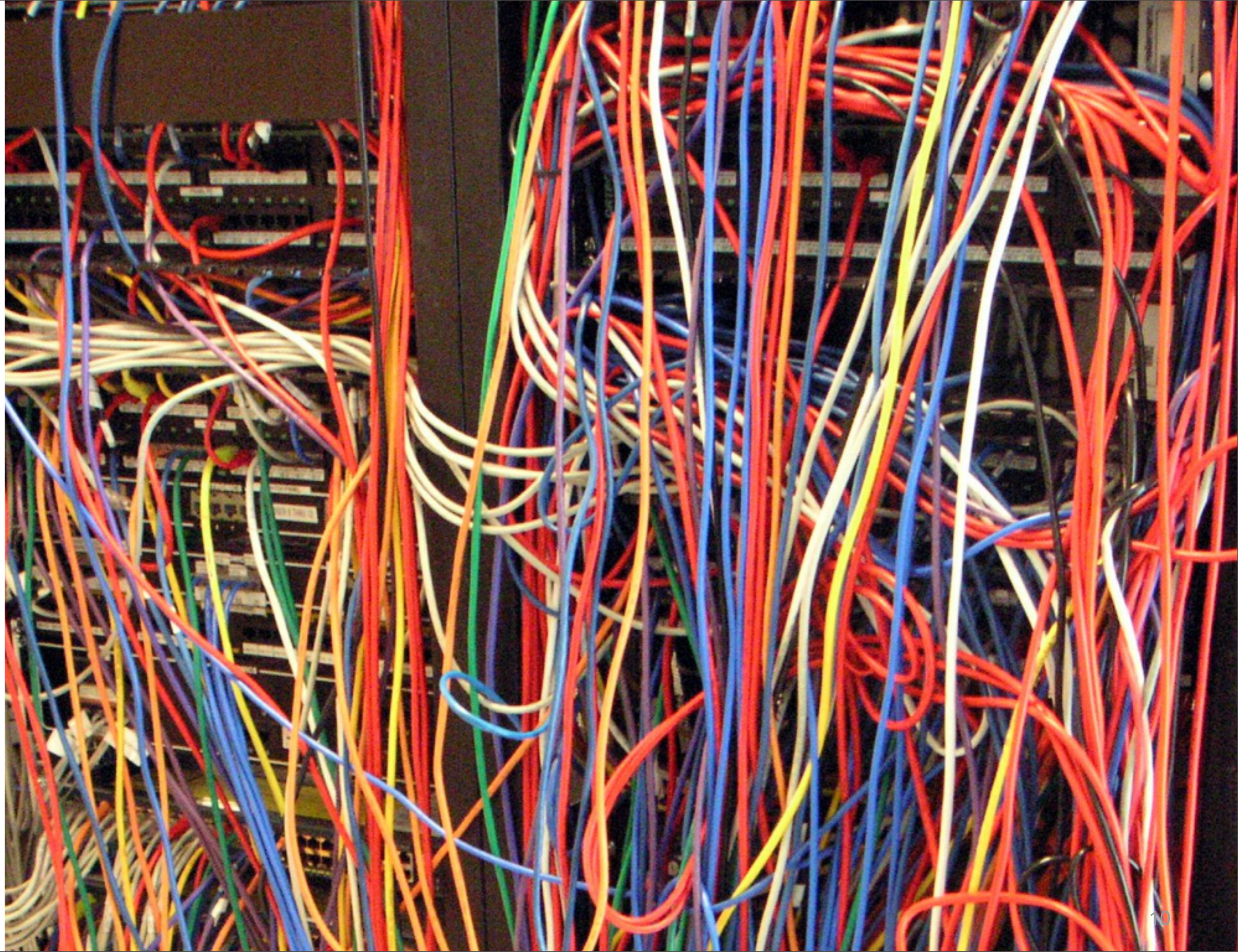
-  **Steven VanRoekel** @stevenvDC 23 May  
We need to get govt out of the presentation business and into the content and data business. [wh.gov/digitalgov](http://wh.gov/digitalgov) #digitalgov #tcdisrupt  
Expand
-  **Steven VanRoekel** @stevenvDC 23 May  
It's time to make govt data social [wh.gov/digitalgov](http://wh.gov/digitalgov) #digitalgov #tcdisrupt  
Expand Reply Retweet Favorite
-  **Steven VanRoekel** @stevenvDC 23 May  
Govt data needs to be open, machine-readable and available in timely manner—by default. [wh.gov/digitalgov](http://wh.gov/digitalgov) #digitalgov #tcdisrupt  
Expand
-  **Steven VanRoekel** @stevenvDC 23 May  
Everything should be an API [wh.gov/digitalgov](http://wh.gov/digitalgov) #digitalgov #tcdisrupt  
Collapse Reply Retweet Favorite



# Growing chorus ...

“We’re moving from managing documents to managing discrete pieces of open data and content which can be tagged, shared, secured, mashed up and presented in the way that is most useful for the consumer of that information.”

-- Report on Digital Government: Building a 21st Century Platform to  
Better Serve the American People



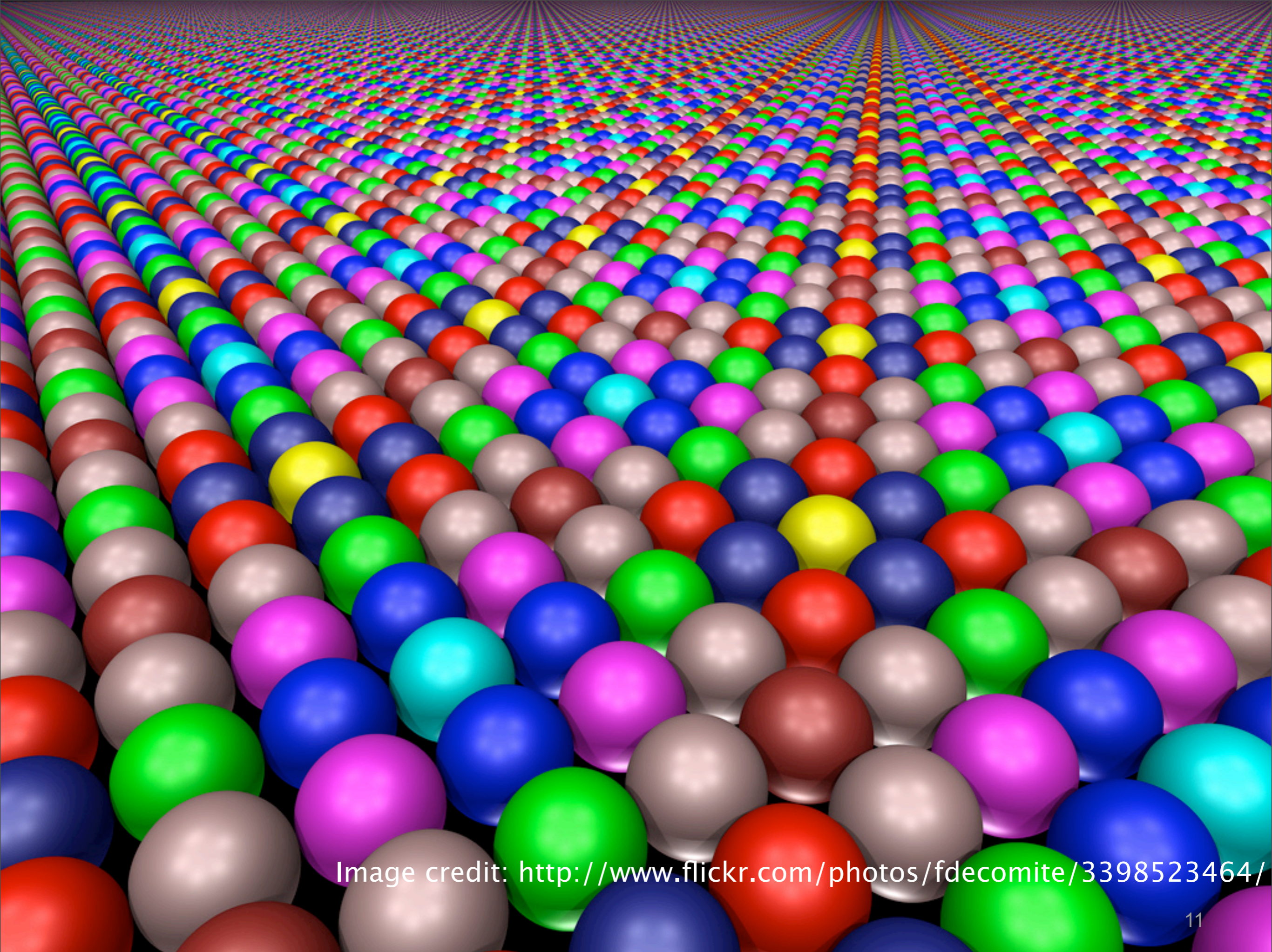
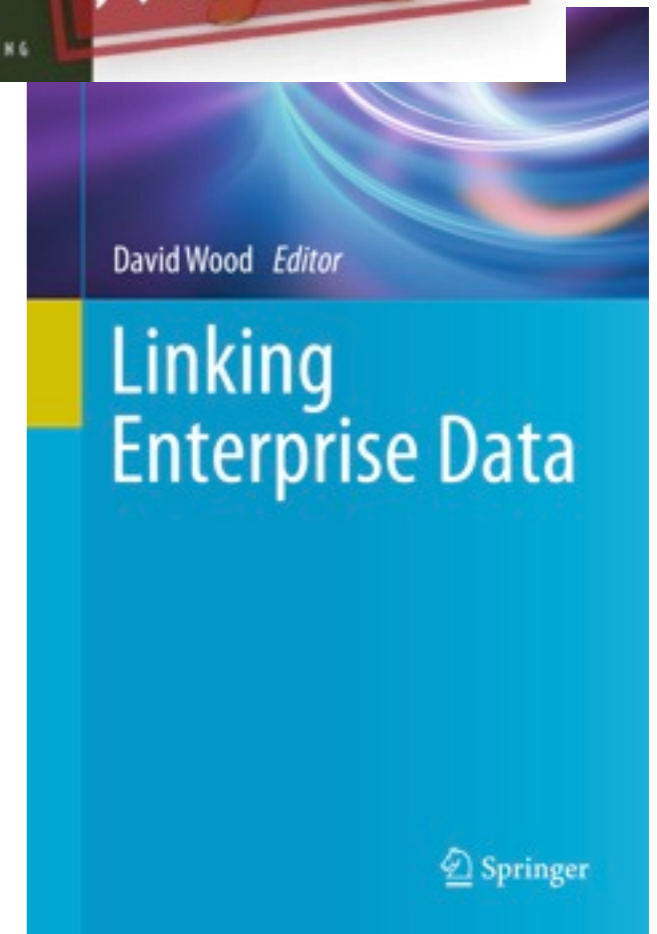
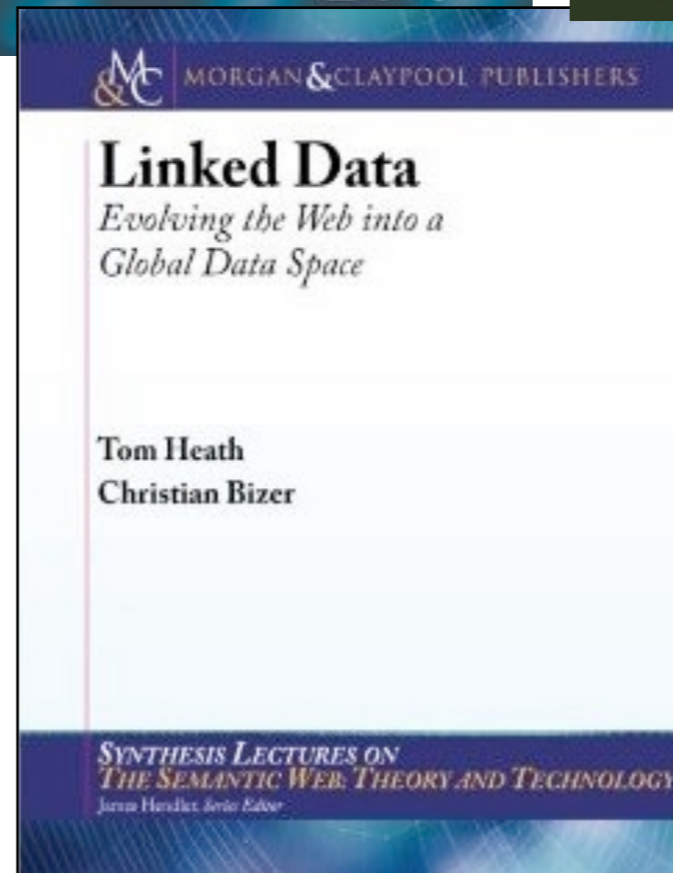
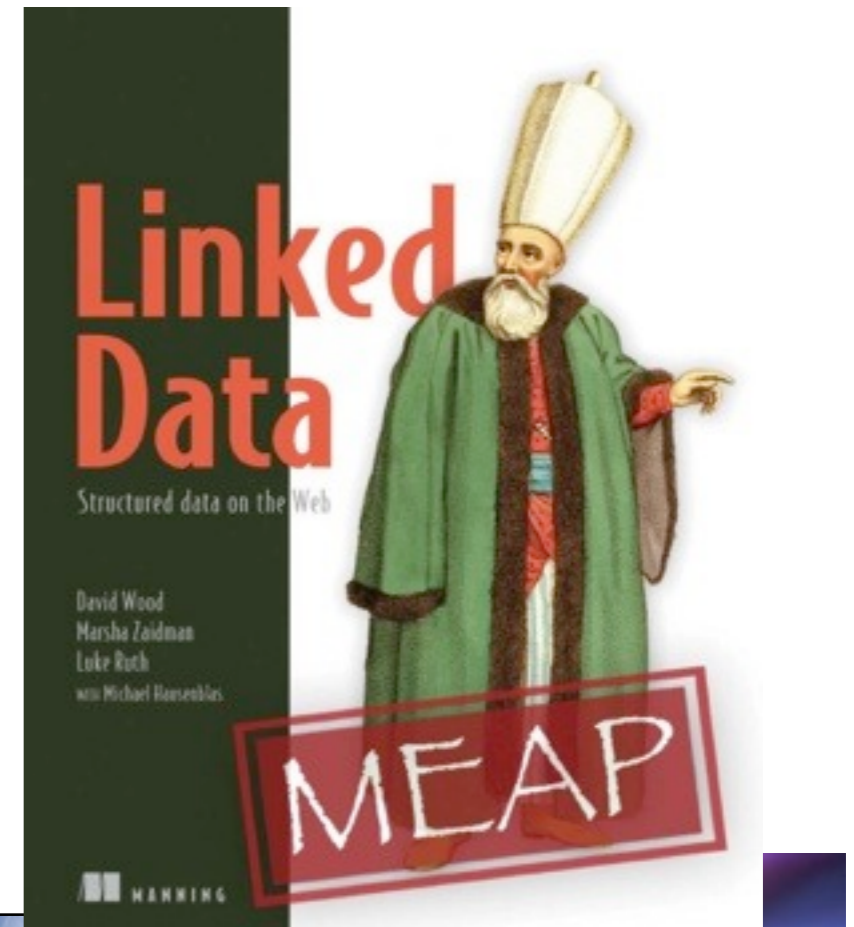
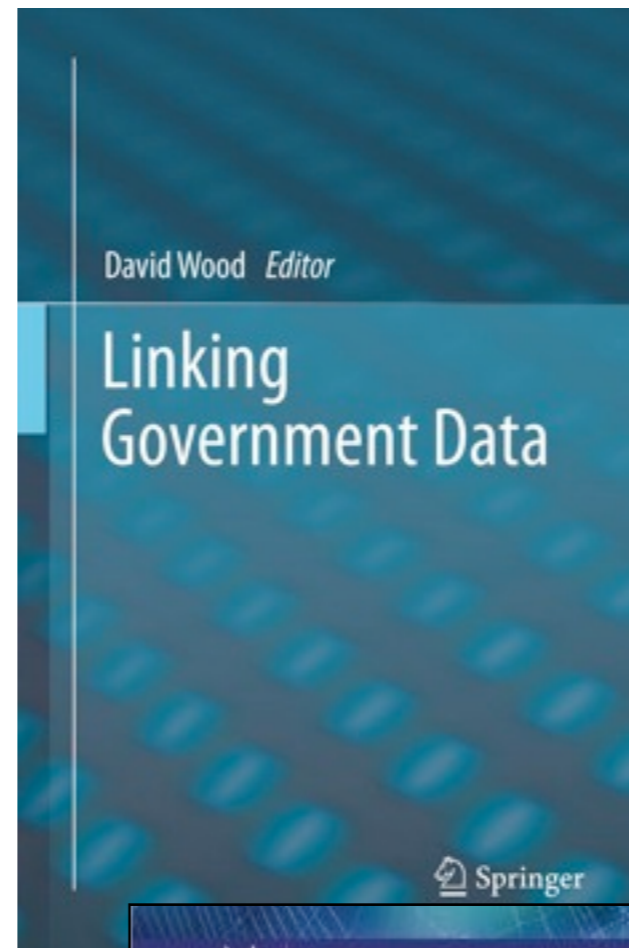


Image credit: <http://www.flickr.com/photos/fdecomite/3398523464/>

# The Web of Data

- A global network of linked **statements**
- A place where anyone can say anything about anything
- A vast collection of **machine-readable** knowledge (and opinion)
- **Statements** are linked, and links are **qualified**

- Linked Data is about publishing and consuming data using international data standards
- Based on 20 year old idea
- A system of linked information systems





ELSEVIER



GOVERNO FEDERAL  
**BRASIL**  
PAÍS RICO É PAÍS SEM POBREZA



The Open University



# Governments

Goals: Governmental transparency and/or improved internal efficiencies (data warehouses)



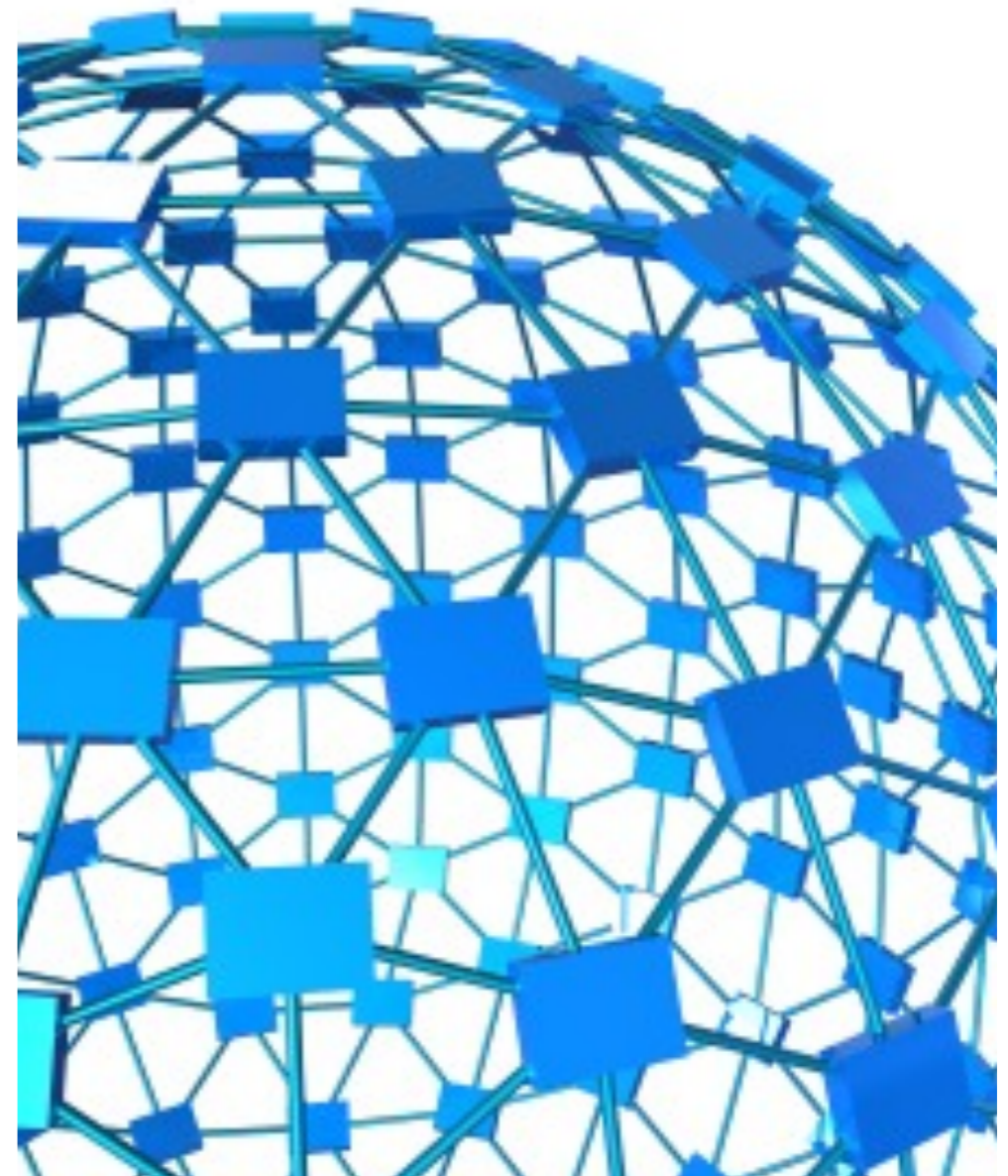
Open data + open standards +  
open platforms

**Highly scalable** computing &  
hosting via the **Cloud**

International Data Exchange  
**Standards**

**5 Star Data** (Linked Data)

**Open Source** tools







# Linked Data Improves Discoverability & Access

Linked Data - refers to a set of best practices for publishing and interlinking structured data for access by both humans and machines via the use of the RDF family of syntaxes (e.g., RDF/XML, N3, Turtle and N-Triples) and HTTP URIs.

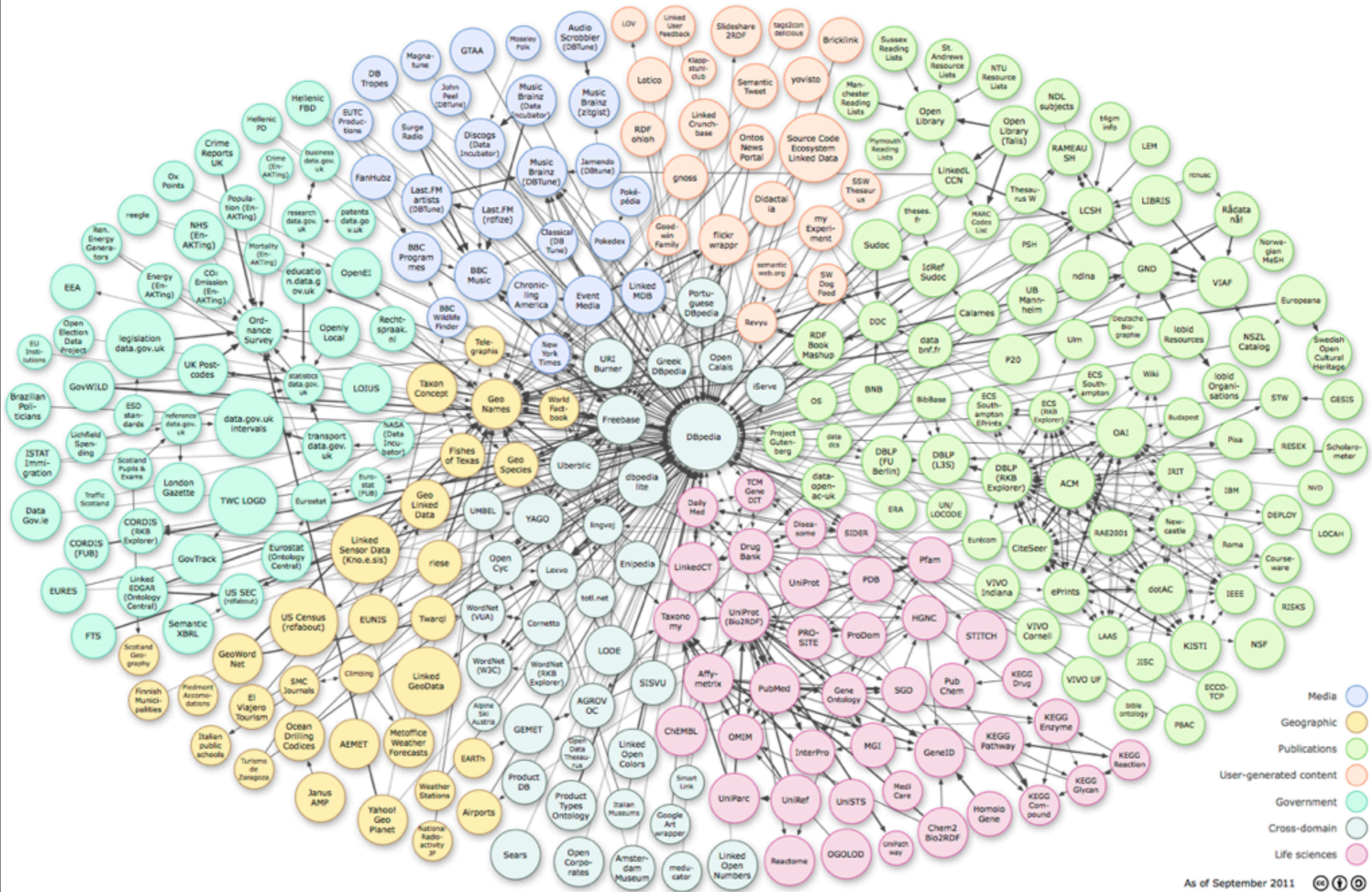
Linked Data can be published by an person or organization behind the firewall or on the public Web. If Linked Data is published on the public Web, it is generally called Linked Open Data.

- W3C Linked Data Glossary: <https://dvcs.w3.org/hg/gld/raw-file/default/glossary>

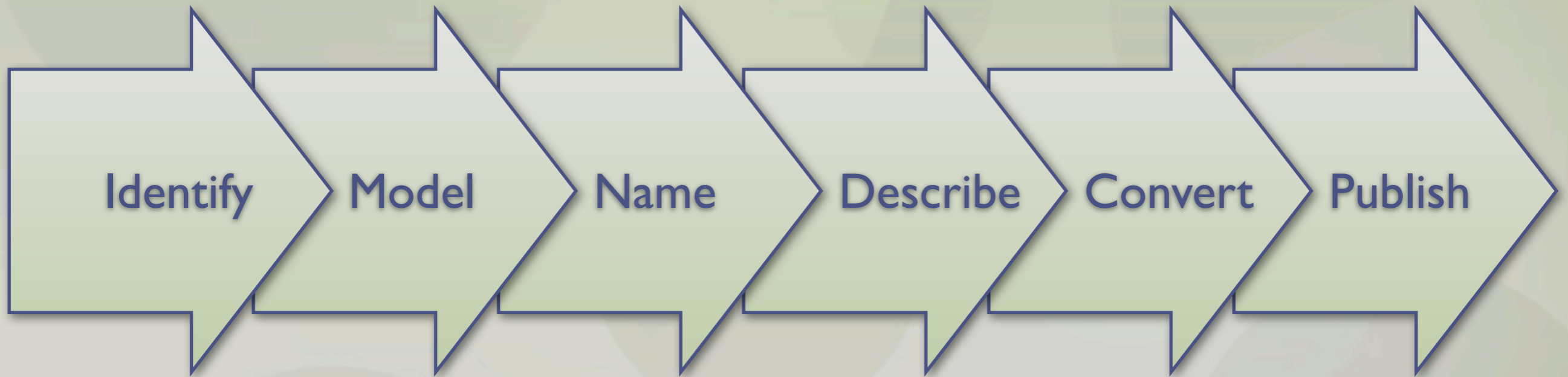
# Integrating ...

## Big data

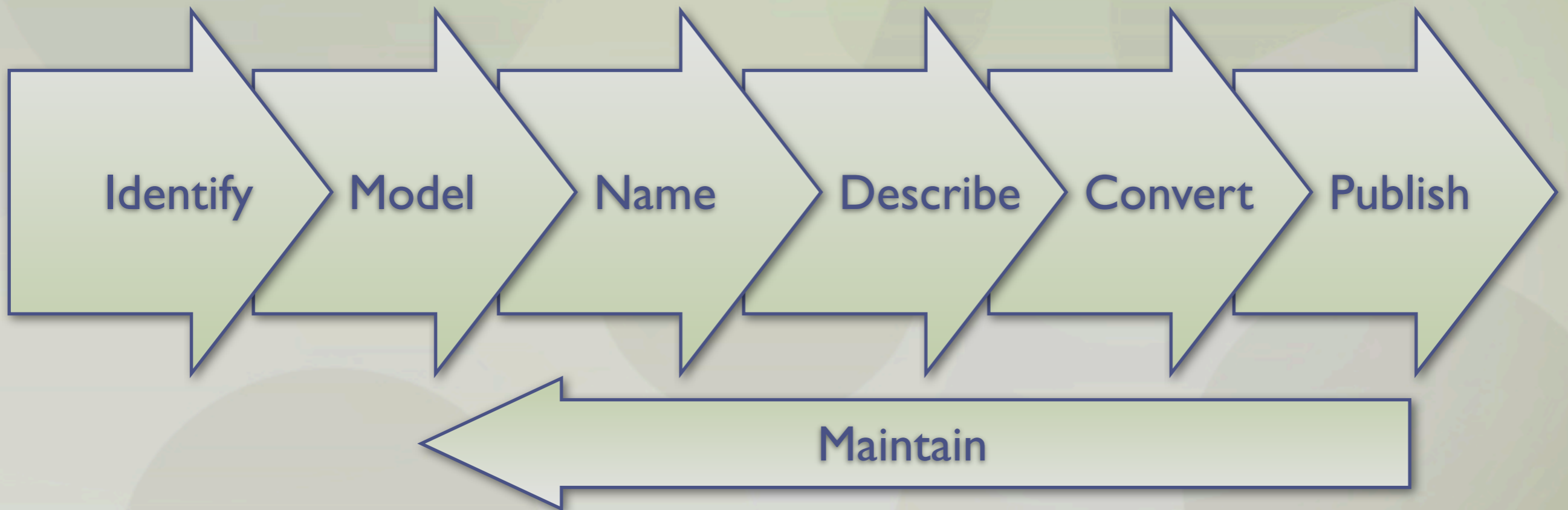
- Simple data
- Complex data
- Legacy data



# THERE IS A PROCESS



# THERE IS A PROCESS





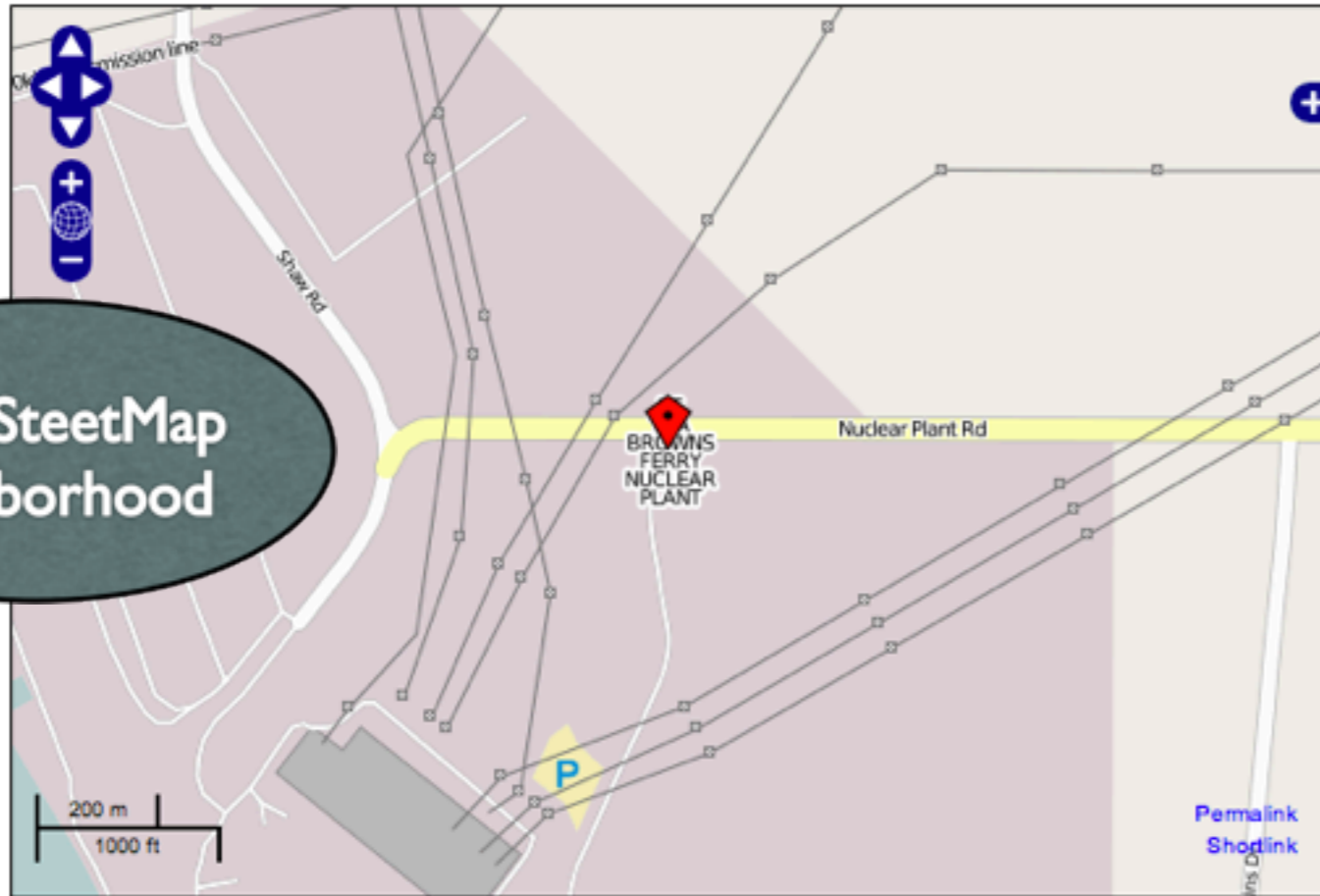
# U.s. Tva Browns Ferry Nuclear Plant

Facility ID: 110000589355

OpenStreetMap

log in | sign up

View Edit History Export GPS Traces User Diaries



OpenSteetMap neighborhood

ABT Associates ownership data

**Owner**  
 Tennessee Valley Authority (TVA)  
 ◦ Ultimate parent: Tennessee Valley Authority

**Operator**  
 Tennessee Valley Authority (TVA)

**Street Address**  
 Shaw Rd At Nuclear Plant Rd.  
 Athens, AL  
 35611

**Mailing Address**  
 Carroll R Cooper  
 Decatur, Al  
 35609

FRS

**Involved**

- Electric Power Generation, Transmission and Distribution
- Nuclear Electric Power Generation
- Electric Power Distribution

**Released**

- 03lbs of Lead in 2010
- 03lbs of Lead in 2009
- 03lbs of Lead in 2008
- 02lbs of in 2008
- 1lbs of Lead in 2007
- 1lbs of Lead in 2006
- 03lbs of Lead in 2005
- 03lbs of Lead in 2004
- 03lbs of Lead in 2003
- 03lbs of Lead in 2002
- 03lbs of Lead in 2001
- 04lbs of in 2000
- 04lbs of Tetrachloroethylene in 1999
- 04lbs of in 1999
- 04lbs of Tetrachloroethylene in 1998
- 04lbs of in 1998

TRI & SRS

You are here: EPA Linked Data » U.s. Tva Watts Bar Nuclear Plant

Login Contact Us Share

# U.s. Tva Watts Bar Nuclear Plant

## Facility ID: 110006887173

The Watts Bar Nuclear Generating Station is a Tennessee Valley Authority (TVA) [...]

OpenStreetMap

log in | sign up

View Edit History Export



### Linked Data

- Describe Data
- View Data as RDF/XML
- View Data as Turtle

View Source

### Street Address

6868 Watts Bar Highway  
 Spring City, TN  
 37381-4601

### Mailing Address

Watts Bar\_state Highway 68 E  
 Spring City, Tn  
 37381

### Involved in

- Hydroelectric Power Generation
- Nuclear Electric Power Generation
- Electric Power Distribution

### Released

- Zinc compounds in 2000
- Hydrazine in 2000
- Hydrazine in 2001
- Zinc compounds in 2001
- Chromium in 2001
- Lead in 2001
- Manganese in 2001
- Nickel in 2001



```

@prefix place: <http://purl.org/ontology/places#> .
@prefix geographis: <http://www.telegraphis.net/ontology/geography/geography#>
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix sl: <http://usepa.3roundstones.net/id/us/fed/agency/epa/srs/label/>
@prefix geo: <http://www.w3.org/2003/01/geo/wgs84_pos> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix sq: <http://usepa.3roundstones.net/id/us/fed/agency/epa/srs/code/>
@prefix sd: <http://www.w3.org/ns/sparql-service-description#> .
@prefix ns1: <http://health.data.gov/def/medicare/> .
@prefix sxl: <http://www.w3.org/2008/05/skos-xl#> .
@prefix msg: <http://www.openrdf.org/rdf/2011/messaging#> .
@prefix tri: <http://usepa.3roundstones.net/id/us/fed/agency/epa/tri/>
@prefix hosp: <http://health.data.gov/def/hospital/> .
@prefix wv: <http://vocab.org/waiver/terms/norms> .
@prefix callimachus: <http://usepa.3roundstones.net/callimachus/>
@prefix calli: <http://callimachusproject.org/rdf/2009/framework/>
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix po: <http://purl.org/ontology/po/> .
@prefix cc: <http://web.resource.org/cc/> .
@prefix dbpediaowl: <http://dbpedia.org/ontology/> .
@prefix tri-report: <http://usepa.3roundstones.net/id/us/tri-report/>
@prefix vs: <http://www.w3.org/2003/06/sw-vocab-status/ns#>
@prefix org: <http://www.w3.org/ns/org#> .
@prefix snt: <http://usepa.3roundstones.net/id/us/fed/agency/epa/snt/>
@prefix dcterms: <http://purl.org/dc/terms/> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix hoco: <http://health.data.gov/def/hospital/>
@prefix dctypes: <http://purl.org/dc/dcmitype/>
@prefix zip: <http://3roundstones.com/ZipCodes/>
@prefix comp: <http://health.data.gov/def/comp/>
@prefix keyword: <http://www.openrdf.org/rdf/keyword/>
@prefix void: <http://rdfs.org/ns/void#> .
@prefix audit: <http://www.openrdf.org/rdf/audit/>
@prefix vcard: <http://www.w3.org/2006/vcard/>
@prefix eg: <http://example.com#> .
@prefix s: <http://3roundstones.com/epa/s/>
@prefix frs: <http://usepa.3roundstones.net/id/us/fed/agency/epa/frs/>
@prefix rif: <http://www.w3.org/2007/rif/>
@prefix xsd: <http://www.w3.org/2001/XMLSchema#>
@prefix wdr: <http://www.w3.org/2007/wdr/>
@prefix skos: <http://www.w3.org/2004/skos/>
@prefix callimachusproject: <http://callimachusproject.org/rdf/2009/framework/>

```

```

<http://usepa.3roundstones.net/id/us/fed/agency/epa/frs/1000881133>
  rdfs:label "Watts Bar Nuclear Generating Station"
  dbpediaowl:operator "U.S. Nuclear Energy Research and Development Administration"
  dbpediaowl:abstract "Watts Bar Nuclear Generating Station is a nuclear power plant located in Adams County, Pennsylvania, United States. It is owned and operated by Constellation Energy. The plant has two pressurized water reactors (PWRs) and is a major source of electricity in the region."
  foaf:depiction <http://www.3roundstones.com/epa/frs/1000881133/depiction/>
  foaf:page <http://www.3roundstones.com/epa/frs/1000881133/>
  foaf:name "U.S. Nuclear Energy Research and Development Administration"
  frs:facilities "Nuclear Electric Power Generation"
  frs:region "Pennsylvania"
  vcard:adr <http://www.3roundstones.com/epa/frs/1000881133/adr/>
  frs:location <http://www.3roundstones.com/epa/frs/1000881133/location/>
  place:point <http://www.3roundstones.com/epa/frs/1000881133/point/>
  place:in <http://www.3roundstones.com/epa/frs/1000881133/in/>
  frs:may <http://www.3roundstones.com/epa/frs/1000881133/may/>
  frs:ac <http://www.3roundstones.com/epa/frs/1000881133/ac/>

```

The screenshot shows the EPA website interface. At the top, there is a search bar and navigation links for 'Login', 'Contact Us', and 'Share'. The main content area features a map of the Watts Bar Nuclear Generating Station in Adams County, Pennsylvania. A red circle highlights the 'Data' section, which includes options to 'Describe Data', 'Data as RDF/XML', and 'Data as Turtle'. Below the map, there is a list of released substances:

- Nuclear Electric Power Generation
- Electric Power Distribution

A 'Released' section lists the following substances and their release years:

- Zinc compounds in 2000
- Hydrazine in 2000
- Hydrazine in 2001
- Zinc compounds in 2001
- Chromium in 2001
- Lead in 2001
- Manganese in 2001
- Nickel in 2001

The background of the screenshot shows a large blue banner with the EPA logo and the text 'U.S. Nuclear Energy Research and Development Administration' and 'SCIENCE & TECHNOLOGY'.

# We've Seen This Before

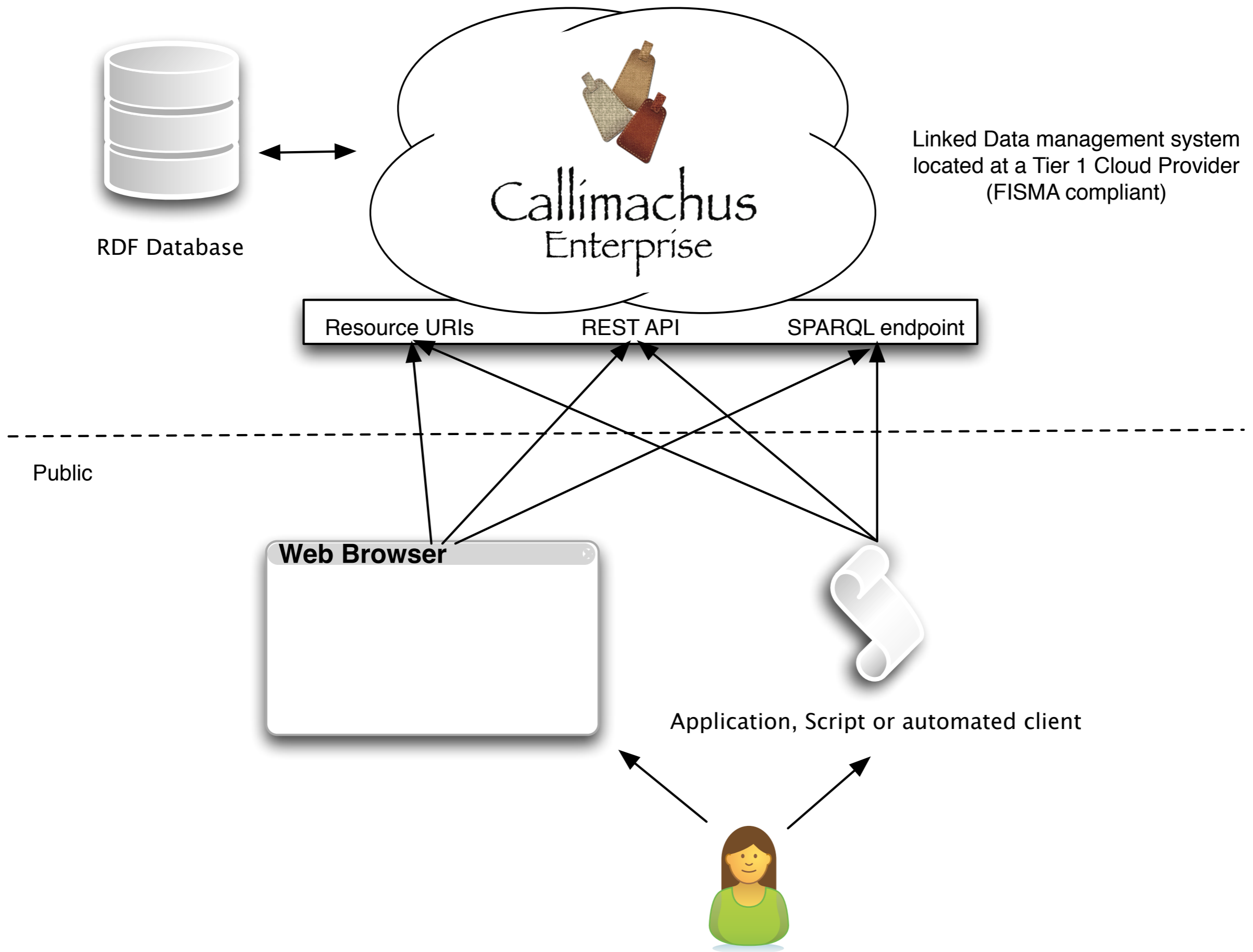


# LINKED DATA PLATFORM

- Callimachus is an open source, open standards platform for Web developers to create data-driven applications
- <http://callimachusproject.org>



Callimachus



23320

Enter a VA ZIP code above

Fri 30

Sat 1 Sun 2

## Weather

59° 

Partly cloudy

## Humidity

41%

## Air Quality

49<sub>pm2.5</sub>

Category: Good

## UV Index

2 of 11

Alert: False

Asthma

## Asthma

Asthma (from the Greek "panting") is the common chronic inflammatory disease of the airways characterized by variable and recurring symptoms, reversible airflow obstruction, and bronchospasm. Symptoms include wheezing, coughing, chest tightness, and shortness of breath. Asthma is clinically classified according to the frequency of symptoms, forced expiratory volume in 1 second, and peak expiratory flow rate. Asthma may also be classified as atopic (extrinsic) or non-atopic (intrinsic). It is thought to be caused by a combination of genetic and environmental factors. Treatment of acute symptoms is usually with an inhaled short-acting

Hydrocodone Acetaminophen

## Hydrocodone Acetaminophen

**WARNINGS**Respiratory Depression: At high doses or in sensitive patients, hydrocodone may produce dose-related respiratory depression by acting directly on the brain stem respiratory center. Hydrocodone also affects the center that controls respiratory rhythm, and may produce irregular and periodic breathing. Head Injury and Increased Intracranial Pressure: The respiratory depressant effects of narcotics and their capacity to elevate cerebrospinal fluid pressure may be markedly exaggerated in the presence of head injury, other intracranial lesions or a preexisting increase in intracranial pressure. Furthermore, narcotics produce adverse reactions which may

23320

User

Enter a VA ZIP code above

Fri 30

Sat 1 Sun 2

Weather

59°



NOAA

Humidity

41%

Partly cloudy

Air Quality

US EPA AirNow

Category: Good

UV Index

US EPA SunWise

Alert: False

Asthma

### Asthma

Asthma (from the Greek "panting") is the common chronic inflammatory disease of the airways characterized by variable and recurring symptoms, respiratory obstruction, and bronchospasm. Symptoms include coughing, chest tightness, and shortness of breath. Asthma is clinically classified according to the frequency of symptoms, forced expiratory volume in 1 second, and peak expiratory flow rate. Asthma may also be classified as atopic (extrinsic) or non-atopic (intrinsic). It is thought to be caused by a combination of genetic and environmental factors. Treatment of acute symptoms is usually with an inhaled short-acting

DBpedia

Hydrocodone Acetaminophen

### Hydrocodone Acetaminophen

WARNINGS Respiratory Depression: At high doses or in sensitive patients, hydrocodone may cause respiratory depression by acting on the respiratory center. Hydrocodone also may depress respiratory rhythm, and may produce increased intracranial pressure. Head Injury and Increased Intracranial Pressure: The depressant effects of narcotics and their capacity to elevate cerebrospinal fluid pressure may be markedly exaggerated in the presence of head injury, other intracranial lesions or a preexisting increase in intracranial pressure. Furthermore, narcotics produce adverse reactions which may

National Library of Medicine

# Data driven Web apps using Callimachus

US Legislation + enterprise data



**Decision Form**

Decision Information

Official Decision Name:	
Blue Book Caption:	
Colloquial Name:	
Case Name:	
Case Name Abbreviation:	
Language:	
Paragraph Number:	
Product ID:	
Decision Date:	
Case Number:	
Attorney Name:	

United States Court of Appeals  
For the First Circuit

No. 09-1504  
ARTIFAS CEMENT CORPORATION,  
Plaintiff, Appellee,  
v.  
LUIS FORTUO, Governor of the Commonwealth of Puerto Rico,  
ANTONIO W. SORRISO-DE-OLIVERA, Secretary of the Department of  
Justice LUIS G. RODRIGUEZ, Secretary of the Department of  
Consumer Affairs ROGER A. RODRIGUEZ-DE-OLIVERA, Secretary of the  
Department of Transportation and Public Works,  
Defendants, Appellants,  
ORDE DE FORTUO RUIZ, INC., F/KA Puerto Rico Cement Co., Inc.,  
Defendant,

No. 09-1503  
ARTIFAS CEMENT CORPORATION,  
Plaintiff, Appellee,  
v.  
ORDE DE FORTUO RUIZ, INC., F/KA Puerto Rico Cement Co., Inc.,  
Defendant, Appellant,  
LUIS FORTUO, Governor of the Commonwealth of Puerto Rico,  
ANTONIO W. SORRISO-DE-OLIVERA, Secretary of the Department of  
Justice LUIS G. RODRIGUEZ, Secretary of the Department of  
Consumer Affairs ROGER A. RODRIGUEZ-DE-OLIVERA, Secretary of the  
Department of Transportation and Public Works,  
Defendants.

Clinical Trials + enterprise linked data

DBpedia + enterprise datasets

Callimachus Enterprise

Search:  Go

Studies by indication

Enter indication:  Run

Show 10 entries

Disease	Study	Title	Project
Asthma	D5890C00018	A follow-up programme for patients using Symbicort Turbuhaler maintenance and reliever therapy in normal clinical practice	SYMBICORT
Asthma	D5890L00022	A Pan-European study comparing the efficacy and cost-effectiveness of Symbicort® Maintenance And Reliever Therapy (Symbicort® SMART) used maintenance dose of Symbicort 160/4.5µg 1 or 2 inhalations daily. EUROSMART	SYMBICORT
Asthma	D5897C00003	A 6-week, phase III, double-blind, randomised, multi-centre, parallel-group study evaluating the efficacy and safety of 2 actuations Symbicort® (budesonide/formoterol) pMDI 40/2.25 µg twice daily compared with 1 inhalation Symbicort Turbuhaler® 80/4.5 µg twice daily and 1 inhalation Pulmicort® (budesonide) Turbuhaler® 100 µg twice daily in adult and adolescent asthmatics	SYMBICORT
Asthma	D6257000001	A methodology study to investigate inhalation flow profiles from asthmatic children and COPD patients using exploratory inhalation devices	NONE
Asthma	D9818C00001	A 6-month randomized, double-blind, parallel-group, multicentre, placebo-controlled Phase II study to compare anti-asthmatic	NEXIUM

Virtual Machine Laboratory - Mechanics - Hydraulics

boom\_lift\_UDP\_joy.exe

Variable	Value	Min	Max
Cylinder1.portB.flow	0		
Cylinder1.portB	0.00000000		
Cylinder1.portA.flow	0.120373		
Cylinder1.portA	452145.4		
Cylinder1.portB.pressure	207453.4		
Cylinder1.portA.pressure	333761.5		
Cylinder1.position	0.21		
Cylinder1.body.2.1.position.3	214.00000000		
Cylinder1.body.2.1.position.1	154660.00000000		
Cylinder1.body.2.1.position.2	54993.7		
Cylinder1.body.2.1.orientation.3	36301.7		
Cylinder1.body.2.1.orientation.1	24398.2		
Cylinder1.body.2.1.orientation.2	84002.2		
Cylinder1.body.2.1.orientation.3	143774.1		
cross_press_040-900-1.position.0	203486.1		
cross_press_040-900-1.position.1			
cross_press_040-900-1.position.2			
cross_press_040-900-1.orientation.0			
cross_press_040-900-1.orientation.1			
cross_press_040-900-1.orientation.2			
cross_press_040-900-1.orientation.3			

**PD060PB04SRS5AC00S100PB00**

Parker 2000 euros

P1/PD: The Parker P1 / PD medium duty pump has been developed to cover the mobile (P1) as well as the industrial (PD) market comes to medium duty applications. P1 / PD has a 3D CA computer optimized design that leads to a considerable noise reduction. Due to minimized size and weight as well as an advanced compensator design installation is very easy. The pump shows overall efficiency and wide operating temperature capability.

**Resources**

- homepage
- symbol
- data
- rfile

**Technical information**

PILOT OPERATED PRESSURE LIMITER CONTROL WITH PROPORTIONAL ELECTRONIC ADJUSTMENT

Circuit	Displacement	Nominal Pressure	Pea
open	60	280	350
	<b>Max Speed</b>	<b>Max Flow</b>	<b>Flow</b>
	2800	179	81

# Key points

- No 'one size fits all'
  - Simple, **complex** and legacy data require different approaches
  - Search, discovery and **access** are coming together
- Open Standards
  - Linked Data **improves** search, discovery & access
  - HTML5 for great user experience, mobile
- Biggest **win** for government & the public is ease of **combining** data sets



# Government Linked Data Working Group Charter

The **mission** of the [Government Linked Data \(GLD\) Working Group](#) is to provide standards and other information which help governments around the world publish their data as effective and usable [Linked Data](#) using [Semantic Web](#) technologies. The group, a part of the [eGovernment Activity](#) and closely connected with the [Semantic Web Activity](#), will collect and make available information about government Linked Data activities around the world. It will use that information and the experience of its participants to develop W3C Recommendations for Best Practices and for RDF Vocabularies necessary for publication of government data in RDF, as Linked Data. Concurrently with this Working Group, W3C has chartered the [eGovernment Interest Group](#) for broad community discussion of government use of the Web

## [How to Join the GLD Working Group](#)

<b>Start Date</b>	June 2011
<b>End date</b>	31 May 2013
<b>Confidentiality</b>	Proceedings are <a href="#">public</a>
<b>Chairs</b>	George Thomas, US HHS Bernadette Hyland
<b>Staff Contact</b>	Sandro Hawke (0.3 FTE)
<b>Usual Meeting Schedule</b>	Teleconferences: Weekly, plus optional task forces Face-to-face: 2-4 per year, possibly multisite with video

The **mission** of the [Government Linked Data \(GLD\) Working Group](#) is to provide standards and other information which help governments around the world publish their data as effective and usable [Linked Data](#) using [Semantic Web](#) technologies.

- Additional information available on the Web, in books ...

<http://linkeddatabook.com/editions/1.0/>  
<http://3roundstones.com/linking-enterprise-data/>  
<http://3roundstones.com/linking-government-data/>  
<http://www.manning.com/dwood/>  
[http://www.w3.org/2011/gld/wiki/Linked\\_Data\\_Cookbook](http://www.w3.org/2011/gld/wiki/Linked_Data_Cookbook)

- Commercially supported Open Source Web data platform

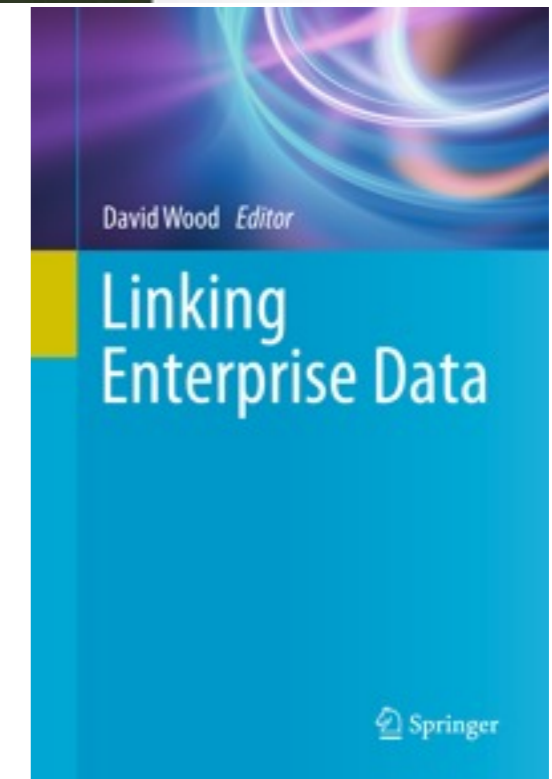
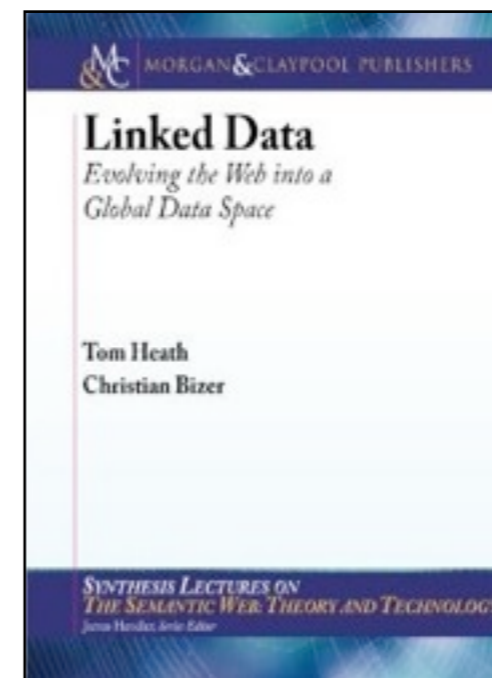
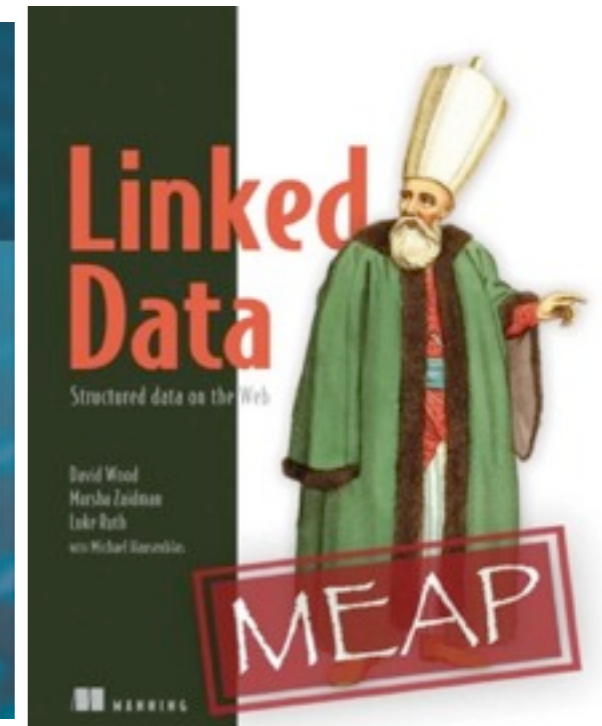
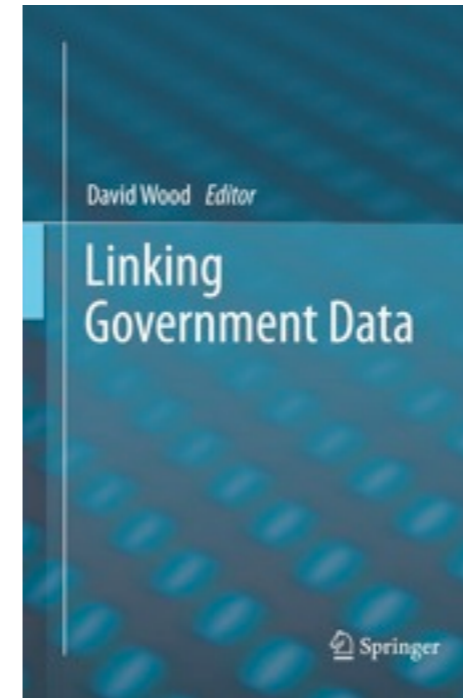
<http://3roundstones.com/products>

Bernadette Hyland

**@BernHyland**

**bhyland@3roundstones.com**

Based in Virginia





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to Remix — to adapt the work

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# Credits

David Newman	Gartner: "Innovation Insight: Linked Data Drives Innovation Through Information-Sharing Network Effects" Published: 15 December 2011
David Wood, ed.	Linking Government Data, Springer (2011) <a href="http://3roundstones.com/linking-government-data/">http://3roundstones.com/linking-government-data/</a>
US Executive Branch	Digital Government Strategy: Building a 21st Century Platform to Better Serve the American People, <a href="http://www.whitehouse.gov/sites/default/files/omb/egov/digital-government/digital-government.html">http://www.whitehouse.gov/sites/default/files/omb/egov/digital-government/digital-government.html</a>
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