



# OpenLink Virtuoso Technology Overview For Decision Makers

By Kingsley Idehen

Founder & CEO, OpenLink Software

# **Presentation Goals**

**Company Overview**

**Problem Analysis**

**Solution Breakdown**

**Virtuoso Product Overview**

**Virtuoso Product Features Usage Examples**

# Company Overview

# OpenLink Company Overview

[OpenLink](#) Software is a privately-held company founded in 1992 by its President & CEO, Kingsley Idehen. The company is an industry acclaimed technology innovator in the following areas:

- ☐ ODBC, JDBC, ADO.NET, and OLE-DB compliant Data Access Drivers for Oracle, SQL Server, Informix, Ingres, Sybase, Progress, MySQL, and PostgreSQL
- ☐ High-Performance & Scalable Multi-Model (Relational & Graph) Database Technology
- ☐ Data Integration Middleware (Data Virtualization Technology across a wide variety of Protocols & Formats)
- ☐ Web Application Server Technology
- ☐ Linked Data Deployment & Management
- ☐ Socially-enhanced Distributed Collaborative Applications Platforms (Weblogs, Wikis, Feed Aggregation and Syndication, Web File Systems, Discussion Forums, etc.)
- ☐ Identity Management.

# Products & Services

## Software Products

- [OpenLink Virtuoso](#) - available in **single server** and **cluster** editions that are instantiated via cloud and/or on-premise installation.
- [OpenLink Data Spaces](#) – Linked Open Data based Collaboration Platform
- [OpenLink YouID](#) – Mobile App and/or Web-based Identity Management Tool
- [OpenLink Structured Data Sniffer](#) – Browser Extension for metadata discovery and extraction
- [OpenLink Structured Data Editor](#) – Web-based Editor for RDF-based Structured Data
- [OpenLink SPASQL Query Builder](#) – Web-based Query Editor for SPARQL & SQL
- [OpenLink Data Explorer](#)
- [OpenLink Universal Data Access Drivers \(UDA\)](#) - High-performance data access drivers for ODBC, JDBC, ADO.NET, and OLE DB that provide transparent access to enterprise databases.
- [An Open Source Data Access SDK for ODBC](#)

Every product is delivered by download from the Internet (http, ftp, etc.). Temporary licenses are issued upon download and may be extended as needed, on a case-by-case basis. Permanent licenses are issued once payment is received.

# Products & Services

## Professional and Support Services

- [OpenLink](#) Product Support provides front-line email and phone support, [web-based online support](#), and a variety of premium services such as phone, emergency, and onsite support.
- Our Support staff is comprised of individuals with extensive knowledge of data access, data migration, database administration, programming APIs, and other relevant skills.
- Services are sold in either Standard "Bronze" or Premium "Platinum" Support packages, with varying hours of availability, response times, etc.
- We also offer Custom Development, Training, and other Consultancy services. These services can be offered on- or off-site. Expenses for travel, accommodations, food, etc., associated with on-site services are charged separately.

# Customers

[OpenLink](#)'s installed base is in excess of 10,000 customers worldwide.

Examples include:

- European Union
- US Govt (Data.gov, NIH etc.)
- Bank of America
- Elsevier
- French National Library
- Spanish National Library
- Globo
- Daimler Benz
- Bayer
- St Jude Medical
- Fujitsu
- Syngenta
- Nestle
- Eli Lilly
- Sanofi
- Bloomberg
- Nationwide
- and many more

# Office Locations

## USA

[OpenLink](#) Software, Inc  
10 Burlington Mall Road  
Suite 265  
Burlington, MA 01803  
Tel.: +1 781 273 0900  
Fax: +1 781 229 8030

## UK

[OpenLink](#) Software Ltd.  
Airport House  
Purley Way  
Croydon, Surrey CR0 0XZ  
Tel.: +44 (0)20 8681 7701  
Fax: +44 (0)20 8681 7702



# Problem Analysis

# The Problem

Data is growing exponentially along the following dimensions:

- ☐ Volume
- ☐ Velocity
- ☐ Variety
- ☐ Location Disparity.

All of this happens within a fixed 24 hour window i.e., days don't get any longer.

While producing an ever increasing number of **Data Silos !!!**



# **Achieving Data De-Silo-Fication (Component Breakdown)**

# NATURAL LANGUAGE & DATA

**“Natural Languages are the most sophisticated systems of communication ever developed.” – [John F. Sowa](#)**

**“Once you have a truly massive amount of information integrated as knowledge, then the human-software system will be superhuman, in the same sense that mankind with writing is superhuman compared to mankind before writing.” – [Douglas Lenat](#)**

# Natural Language & Data

- A **Word** or **Phrase** is an identifier that **names** an **Entity** (thing) via implicit [denotation] → [referent description document content] resolution
- A **Term** is a **Word** or **Phrase** that **names** an Entity via explicit, [denotation] → [referent description document content] resolution, using indirection.
- A **Sentence** is a syntax rules constrained arrangement of **Words** and **Phrases** that represent types of **Entity Relationships**.
- A **Statement** is a kind of **Sentence** constructed from **Terms**.

# Data (Recap)

- A **IRI** is an Internationalized **Identifier** that has the entity naming characteristics of a **Word** or **Phrase**.
- An **HTTP URI** is a kind of **IRI** that has the entity naming characteristics of a **Term** i.e., denotation (signification) and connotation (description) reference duality.
- **RDF** enables digital sentence construction where **IRIs** are used to name **Entities** participating in the **Subject**, **Predicate**, and **Object** relationship roles.
- **RDF** based **Linked Data** enables digital statement construction where **HTTP URIs** are used to denote **Entities** participating in the **Subject**, **Predicate**, and **Object** relationship roles.

# Natural Language & Data Connection

- An RDF triple represents a “Datum” – a Sentence comprised of Words or Phrases.
- An RDF based Linked Open Data Triple represents a “Webby Datum” – a Statement comprised of Terms.
- RDF triple collections represent Data – Sentences.
- RDF based Linked Open Data triple collections represent “Webby Data” – Statements.

# Digital Sentences

Leverage digital rendition of Natural Language to move data across data silos by:

- ☐ Using URIs as entity names
- ☐ Using HTTP URIs so that entity names function like terms
- ☐ Using RDF to create digital sentences or statements
- ☐ Using RDF based digital sentences to transmit information across data silos, via documents.

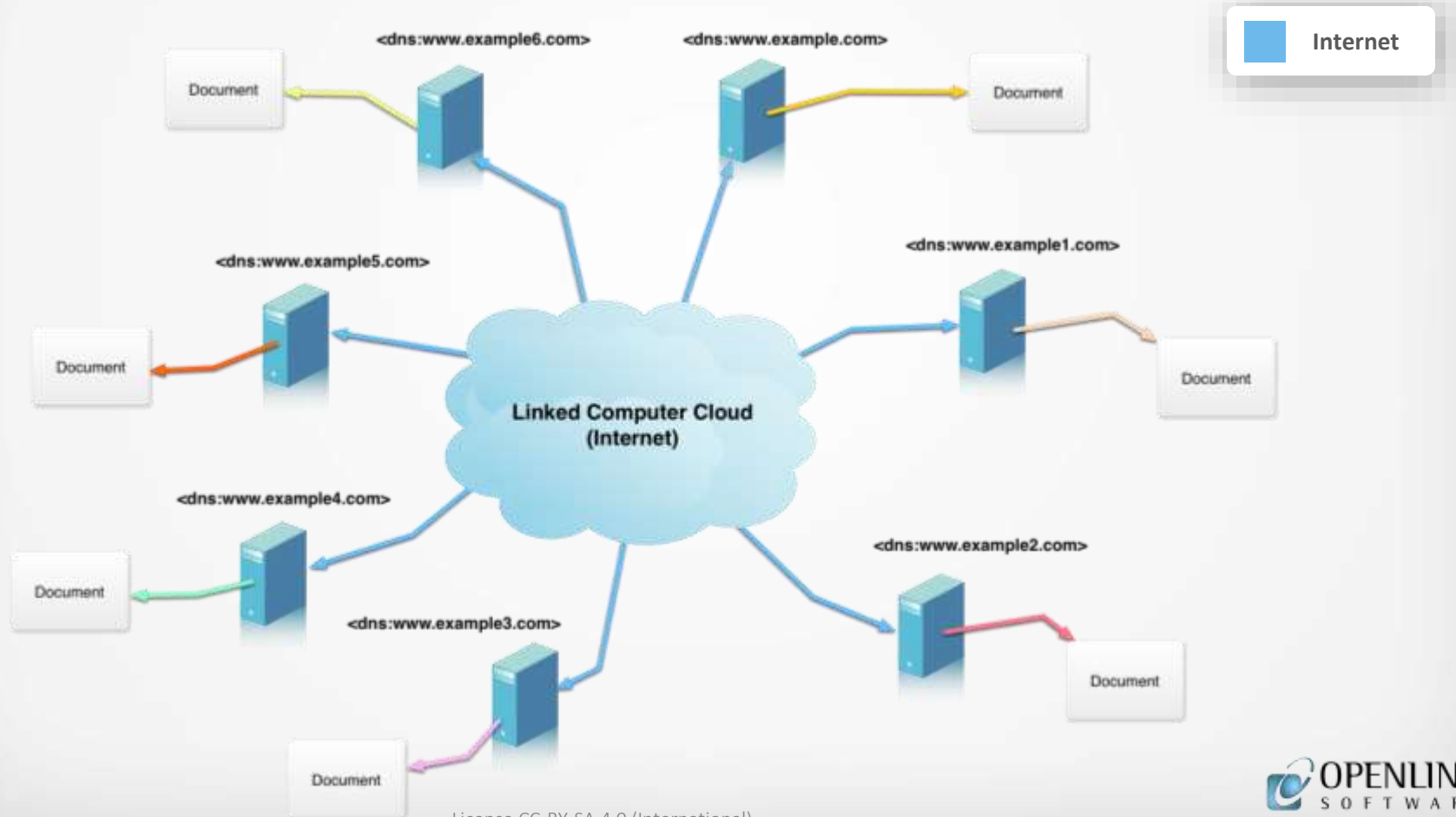


# **Digital Sentences (Data) & Network Abstraction**

# DNS based Linked Computer Network (Internet)

## Linked Computer Network (e.g., Internet)

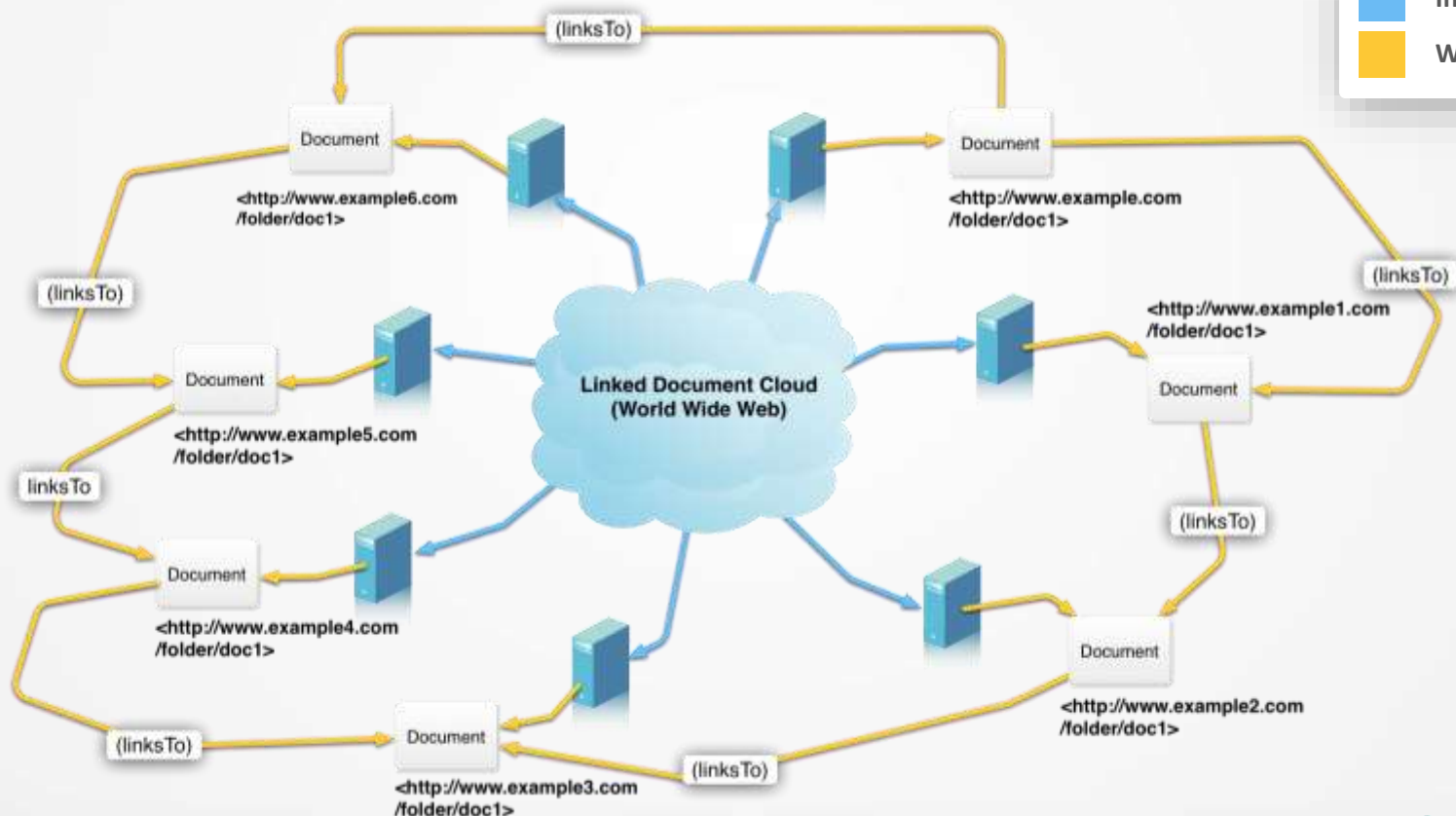
1. Computer (DNS CNAMEs) Names are Data Source Name
2. Actual Data Model and Data Access is Local and Machine OS hosted App. specific.



# HTTP based Linked Document Network (Web 1.0 & 2.0)

## Linked Document Network (e.g., World Wide Web)

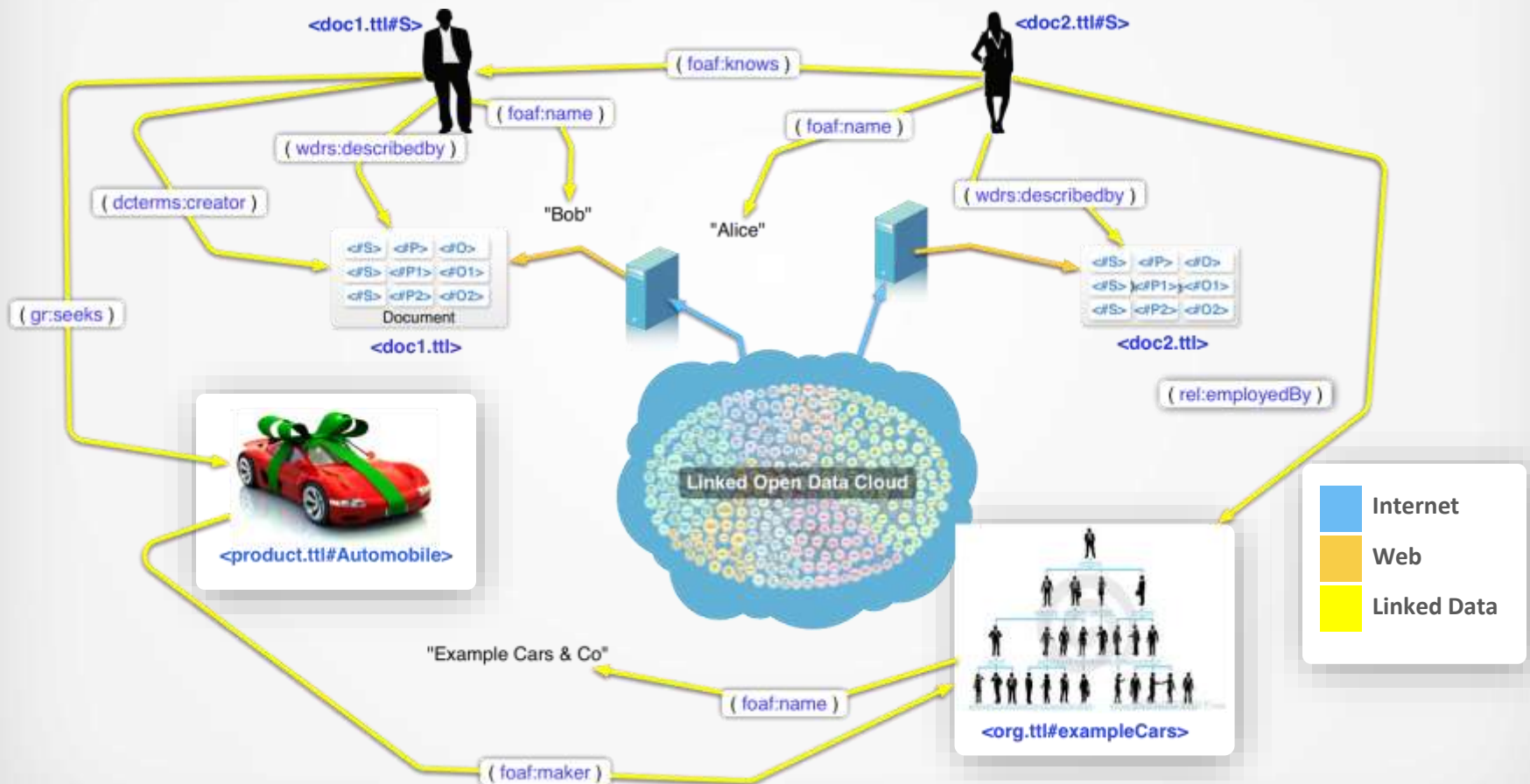
1. Computer (DNS CNAMEs) Names become irrelevant.
2. Document Locators / Addresses (HTTP URLs) are Data Source Names (DSNs).
3. One kind of Relation i.e., "LinksTo" is what connects the Documents.
4. To machines: actual Data Model, Entity Relation Semantics, and Representation Notations are indecipherable from content.



# HTTP based Linked Data Network (Web 3.0)

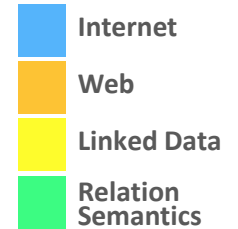
## Linked Data Network (e.g., Linked Open Data Cloud)

1. Entity Names (HTTP URIs) are Data Source Names (DSNs)
2. Computer (DNS CNAMEs) & Document Names (HTTP URLs) become irrelevant
3. Actual Data Model and Representation Notations are loosely coupled.

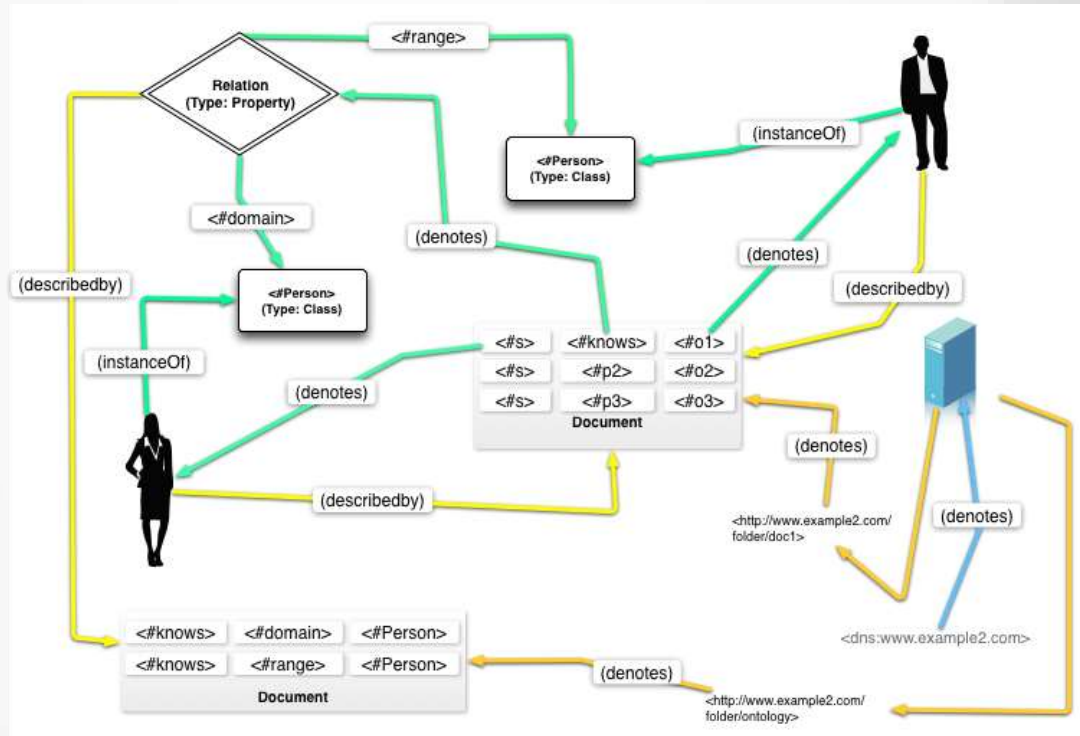


# RDF based Linked Open Data (Semantic Web)

## Semantically Enhanced Linked Data Network (e.g., Semantic Web of Big Linked Open Data)

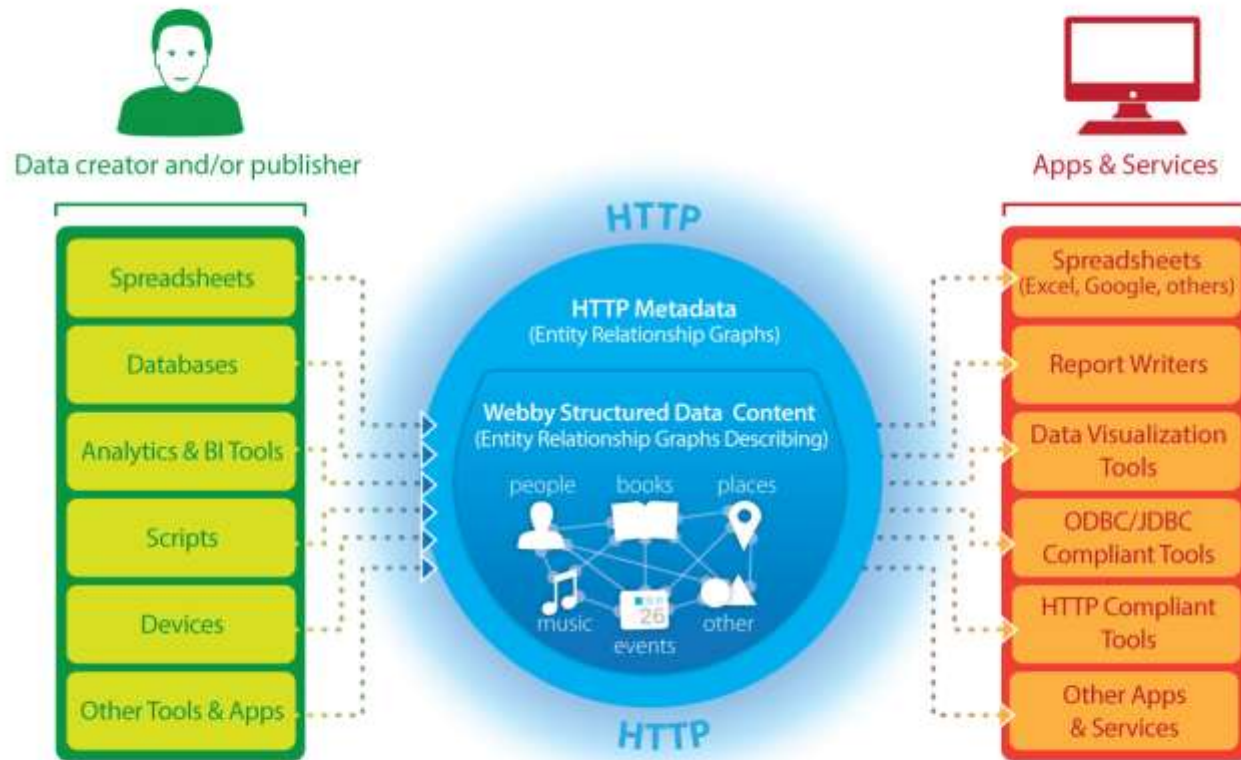


1. Entity Names (HTTP URIs) are Data Source Names (DSNs)
2. Computer (DNS CNAMEs) & Document Names (HTTP URLs) become irrelevant
3. Actual Data Model and Representation Notations are loosely coupled
4. **RDF & RDF Schema** Relation Semantics are accessible and comprehensible to humans and machines.



# The New Data Packet (Document)

Web payloads increasingly comprised of RDF documents,  
comprised of Webby Structured Data



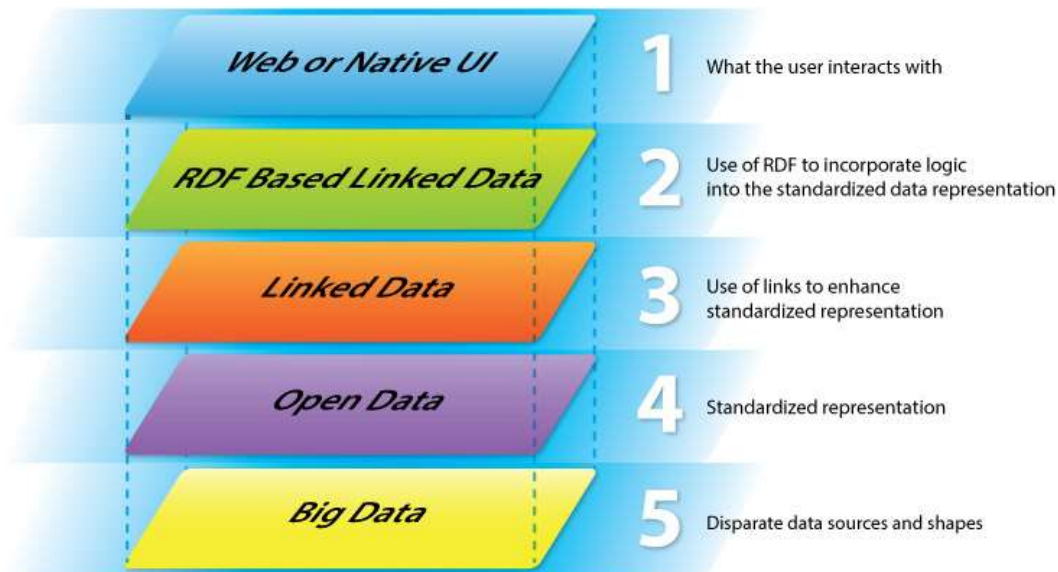
# **Virtuoso Universal Server**

**(Powerful Solution to Modern Data  
Access & Integration Challenges)**



# What's Your Fundamental Goal?

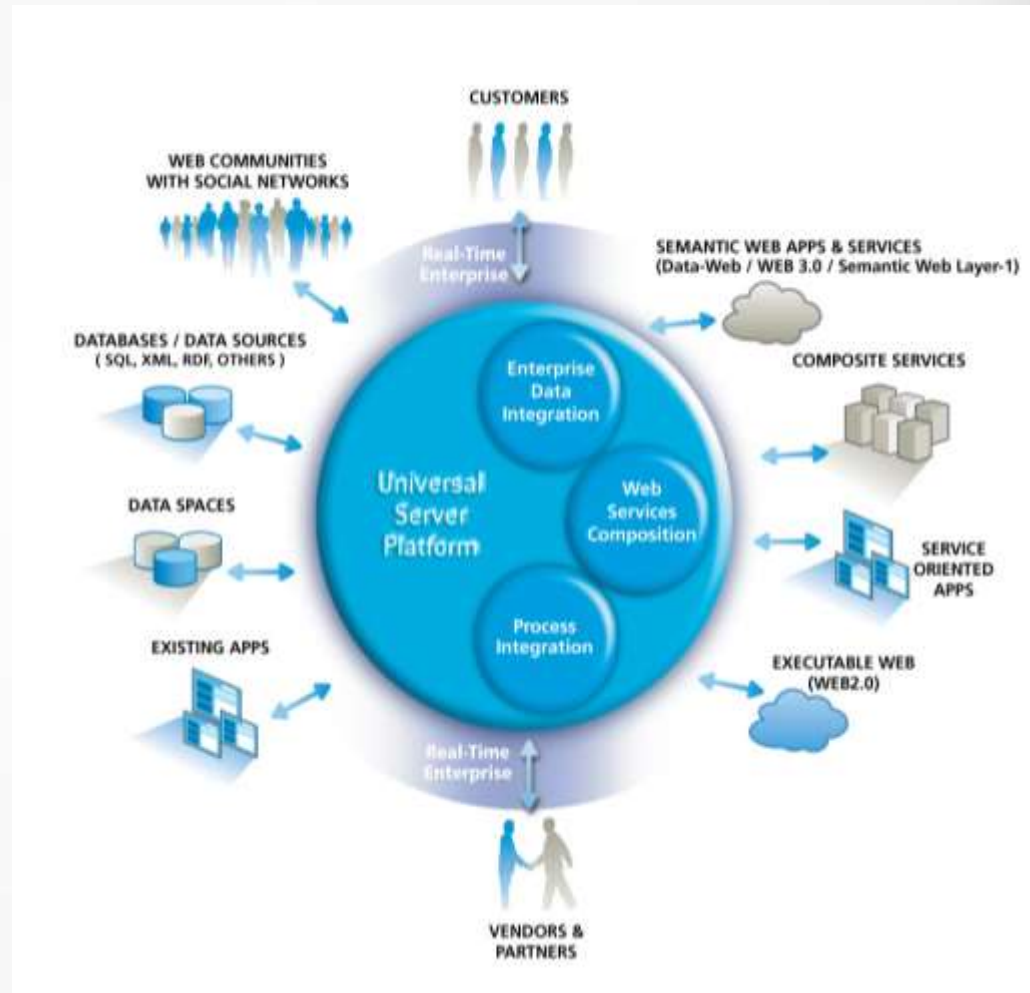
*Turn Data into Electricity that's transmitted via Hyperlinks  
(HTTP URIs), across Data Silos, fuelling unrivaled individual &  
enterprise agility!*





# Product Value Proposition

Enterprise and Individual  
Agility via Data  
Virtualization, without  
compromising  
performance, scalability,  
open standards  
compliance, and security.



# Product Benefits

- Maximum incorporation of current and future innovations with minimum (if any) disruption to existing infrastructure
  - Prior Investment Preservation via Open Standards support
  - Aids Loosely-Coupled Application Development
  - Enables mixing and matching of “best of class” products
- Digital Enterprise Agility
  - High-Performance & Scalability
  - Sophisticated Attributed-based Access Controls for Security
- Cost-Effective
  - Concurrent Resource Usage Licensing.

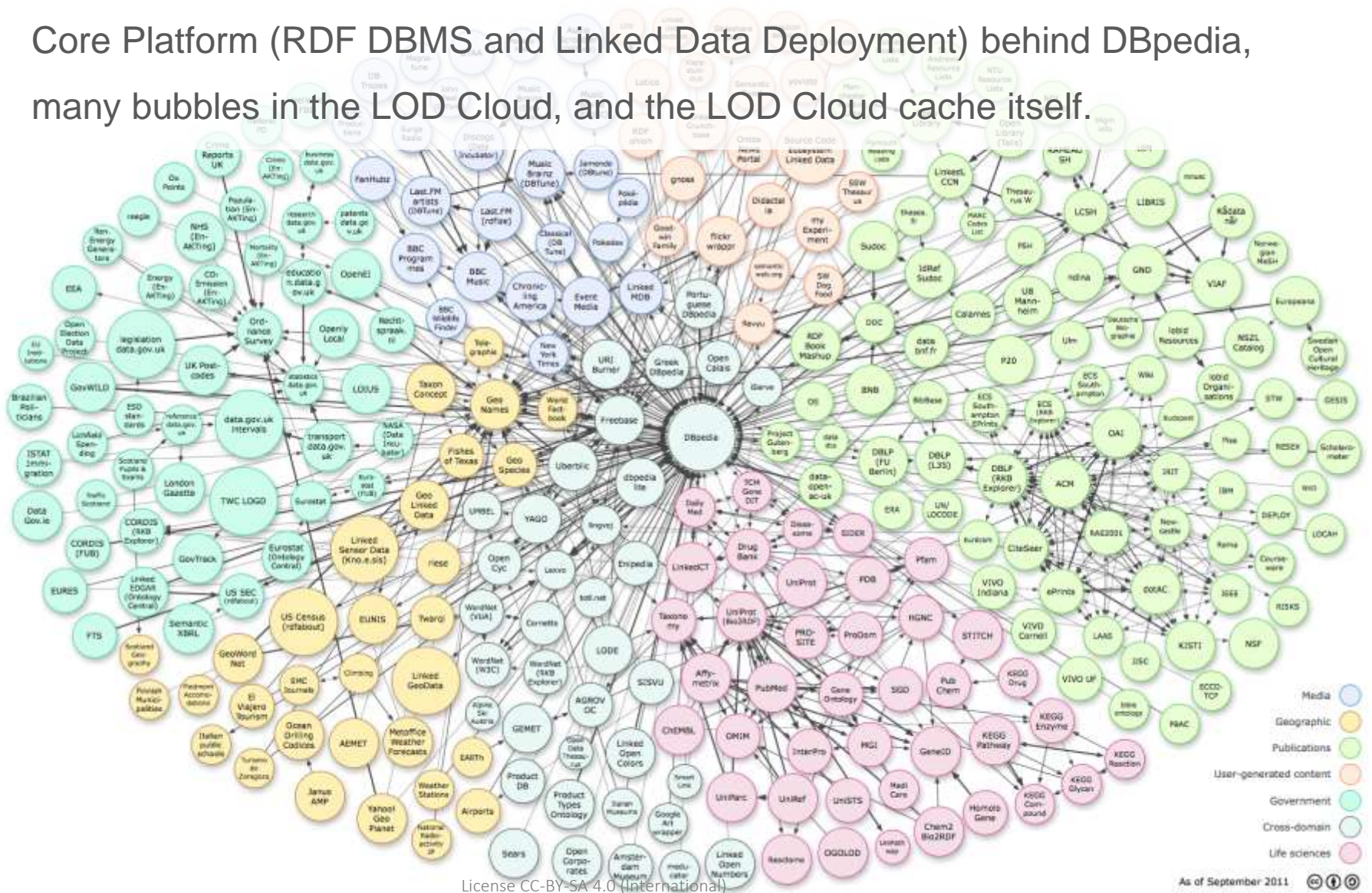
# Digital Business Exploitation Scenarios

- Business Development
  - Innovative Data-driven Product & Services Offers
- Marketing & Advertising
  - Market Research leveraging internal and external sources
  - Branding Search Engine Optimization
- Business Performance Optimization
  - Business Analytics
- Human Resources
  - Internal Skills Profiling
  - External Skills Profiling

# Virtuoso Showcases

# Core Platform behind LOD Cloud

Core Platform (RDF DBMS and Linked Data Deployment) behind DBpedia, many bubbles in the LOD Cloud, and the LOD Cloud cache itself.





# Performance & Scalability

We operate a [Live Linked Open Data Cloud Cache](#) comprised of:

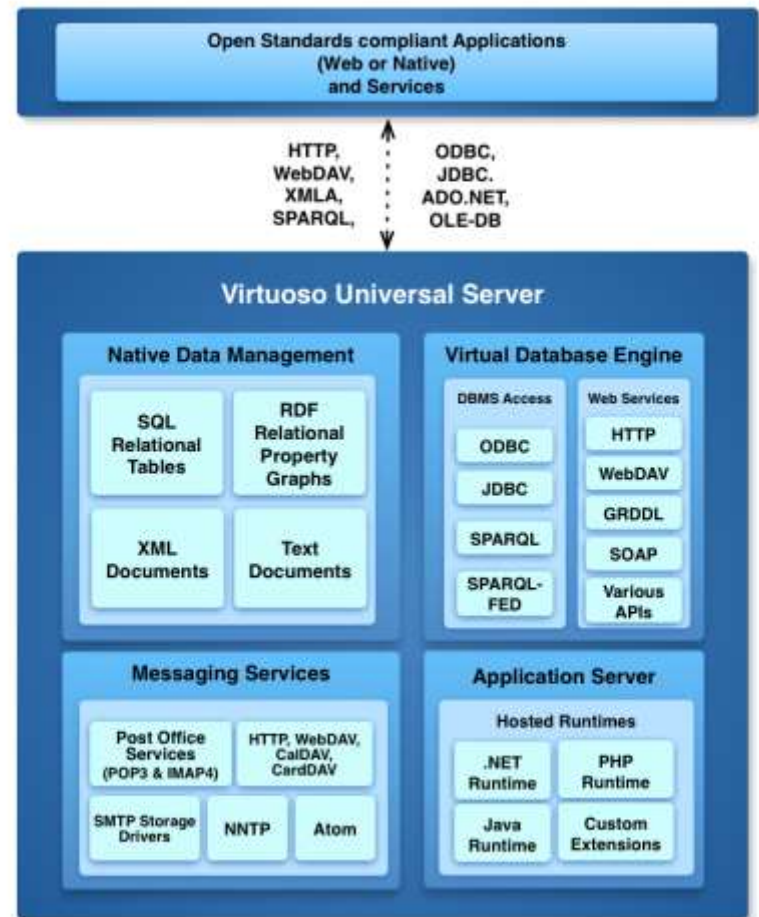
- ❑ 55 billion+ RDF statements (triples)
- ❑ Machine has 384 GB of RAM, 2TB disk
- ❑ Allows any Human or Machine perform live ad-hoc SPARQL queries (including inference & reasoning)
  - <http://lod.openlinksw.com/fct> -- Text Search + Faceted Browsing
  - <http://lod.openlinksw.com/sparql> -- SPARQL Query Service

# Performance & Scalability Reports

- [150 Billion RDF Triples Benchmark Report](#) (PDF)
- [Berlin SPARQL Benchmark](#)
- [Star Benchmark](#)
- [DBpedia Usage Analysis](#)
- [LOD Cloud Cache Commissioning Report](#)

# Product Architecture

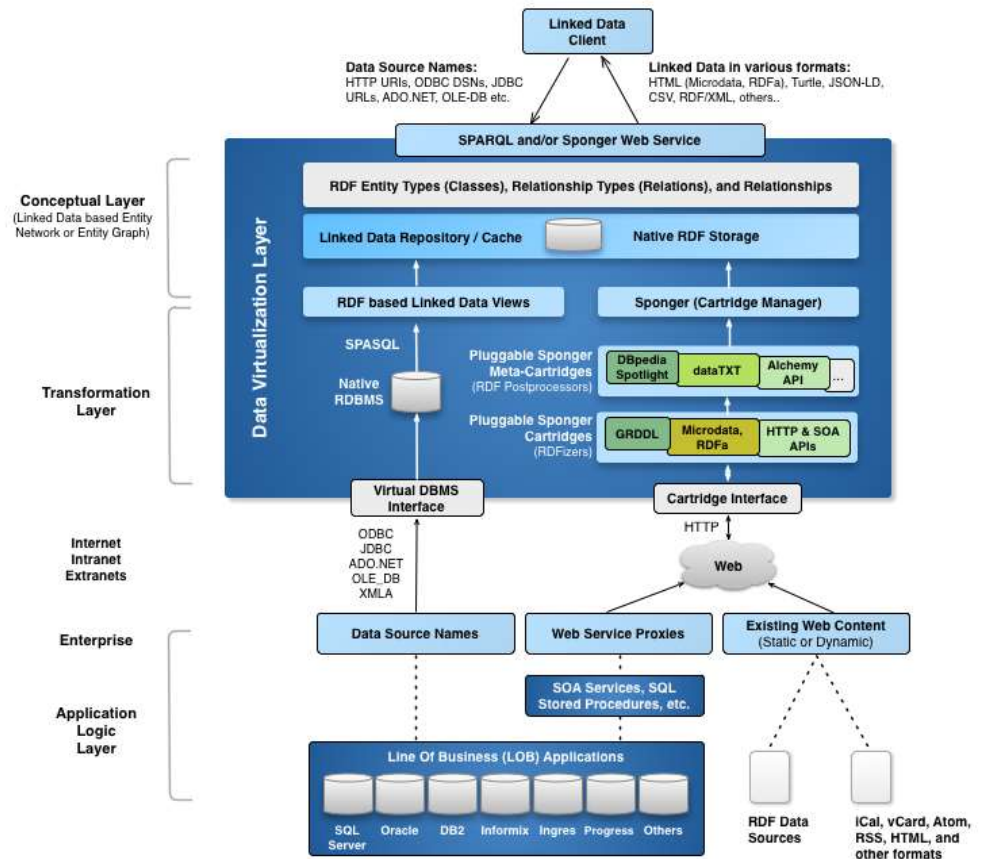
A high-performance, scalable, secure, and operating-system-independent server designed to handle contemporary challenges associated with data access, data integration, and data management.





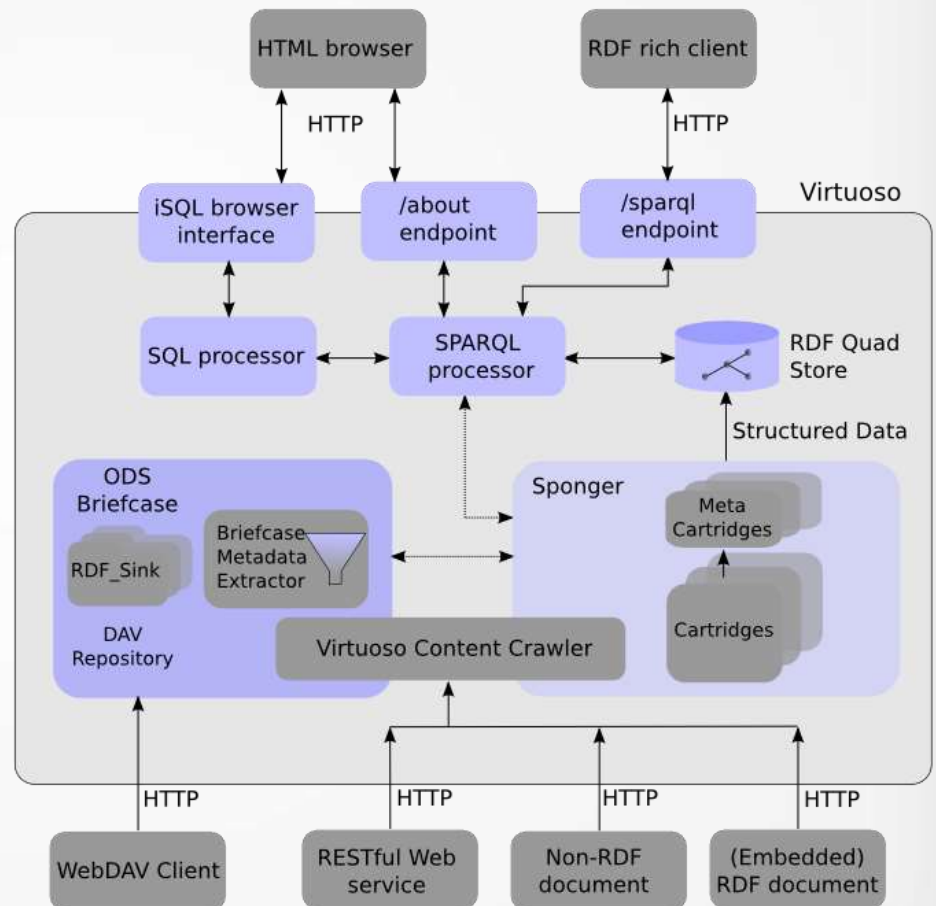
# Data Virtualization Middleware

An in-built middleware layer (“Sponger”) for creating Transient & Persistent Views over Heterogeneous Data Sources.



# Pluggable Linked Data Cartridges

A collection of prefabricated and customizable Data Extraction, Transformation, and Lookup cartridges (drivers) covering a vast ranges of data formats and data access protocols.



# Using Virtuoso

# How Do You Get Going?

[Download](#), [install](#), and experience the power of coherent integration of disparate [data sources](#), [data access protocols](#), and [data representation formats](#).

In an nutshell, [commence exploitation](#) of powerful business intelligence, socially enhanced collaboration, data virtualization, and entity analytics [without writing a line of code!](#)

# Data Generation & Flow

# Structured Data Sniffer Browser Extension

RDF-based Metadata (**JSON-LD notation**) revealed via single mouse-click on OSDS icon when viewing a [Web page](#).

The screenshot shows a web browser window with the address bar displaying <https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announ...>. The OSDS extension is active, displaying a panel with tabs for Microdata, JSON-LD (selected), RDFa, and POSH. The JSON-LD tab shows the following content:

**Statement Collection #7**  
Attributes  
[rdf:rest](#)

[rdf:rest](#) [See Statement Collection #7](#)

**Statement Collection #8**  
Attributes  
[rdf:rest](#)

[rdf:rest](#) [See Statement Collection #8](#)

The background of the browser window shows the Chan Zuckerberg BioHub logo and a photo of Mark Zuckerberg and Priscilla Chan on a stage. The OSDS extension interface is overlaid on the page, showing the JSON-LD data extracted from the page.

At the bottom of the OSDS interface, the version is 2.12.15, the license is CC-BY-SA 4.0 (International), and the copyright is © 2015-2016 OpenLink Software.

# Structured Data Sniffer Browser Extension

RDF-based Metadata (**RDFa notation**) revealed via single mouse-click on OSDS icon when viewing a [Web page](#).

The screenshot shows a web browser window with the URL <https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announ...>. The browser's address bar and tabs are visible. Below the browser window, the OSDS extension interface is displayed. It features a tabbed interface with 'Microdata', 'JSON-LD', 'RDFa' (selected), and 'POSH'. The 'RDFa' tab shows a 'Statement Collection #1' with the following details:

Entity	Value
Entity	<a href="https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/">https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/</a>
Attributes	
<a href="http://www.facebook.com/2008/fbmlapp_id">http://www.facebook.com/2008/fbmlapp_id</a>	*187288694643718"@en
<a href="http://www.facebook.com/2008/fbmladmins">http://www.facebook.com/2008/fbmladmins</a>	*543710097,771265067,1661021707,1550970059,663677613,1178144075,726995222,506404657,4700188"@en
article:publisher	* <a href="https://www.facebook.com/techcrunch">https://www.facebook.com/techcrunch</a> "@en
article:author	* <a href="https://www.facebook.com/JoshConstine">https://www.facebook.com/JoshConstine</a> "@en
<a href="#">og:site_name</a>	*TechCrunch"@en
<a href="#">og:site</a>	*social.techcrunch.com"@en
<a href="#">og:title</a>	*Chan Zuckerberg Initiative announces \$3 billion investment to cure disease"@en
<a href="#">og:description</a>	*The Chan Zuckerberg Initiative just announced a new program informally called Chan Zuckerberg Science to invest \$3 billion over the next decade to help cure..."@en
<a href="#">og:image</a>	* <a href="https://tctechcrunch2011.files.wordpress.com/2016/09/zuckerberg.jpg?w=764&amp;h=400&amp;crop=1">https://tctechcrunch2011.files.wordpress.com/2016/09/zuckerberg.jpg?w=764&amp;h=400&amp;crop=1</a> "@en
<a href="#">og:url</a>	* <a href="http://social.techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/">http://social.techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/</a> "@en
<a href="#">og:type</a>	*article"@en

At the bottom of the OSDS interface, the version is 2.12.15, and the license is CC-BY-SA 4.0 (International). The copyright is © 2015-2016 OpenLink Software.

# Structured Data Sniffer Browser Extension

RDF-based Metadata (**POSH notation**) revealed via single mouse-click on OSDS icon when viewing a [Web page](#).

Microdata JSON-LD RDFa **POSH**

[xhv:salithru.description](#)

[xhv:salithru.image.full](#)

[xhv:salithru.image.thumb](#)

[rdf:about](#)

[xhv:author](#)

[xhv:title](#)


[xhv:object\\_type](#)

[xhv:url](#)

[xhv:timestamp](#)

[xhv:content](#)

The Chan Zuckerberg Initiative just announced a new program informal called Chan Zuckerberg Science to invest \$3 billion over the next decade to help cure, prevent, or manage all disease.



<https://techcrunch2011.files.wordpress.com/2016/09/zuckerberg.jpg?w=50>

<https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/#TwitterCard>

Josh Constine

Chan Zuckerberg Initiative announces \$3 billion investment to cure disease

post

<https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/>

2016-09-21 11:02:17

The Chan Zuckerberg Initiative just announced a new program informal called Chan Zuckerberg Science to invest \$3 billion over the next decade to help cure, prevent, or manage all disease. The money comes from the \$45 billion organization Mark Zuckerberg and his wife Priscilla Chan started last year to advance human potential and equality. The project

ver: 2.12.15 OpenLink Structured Data Sniffer

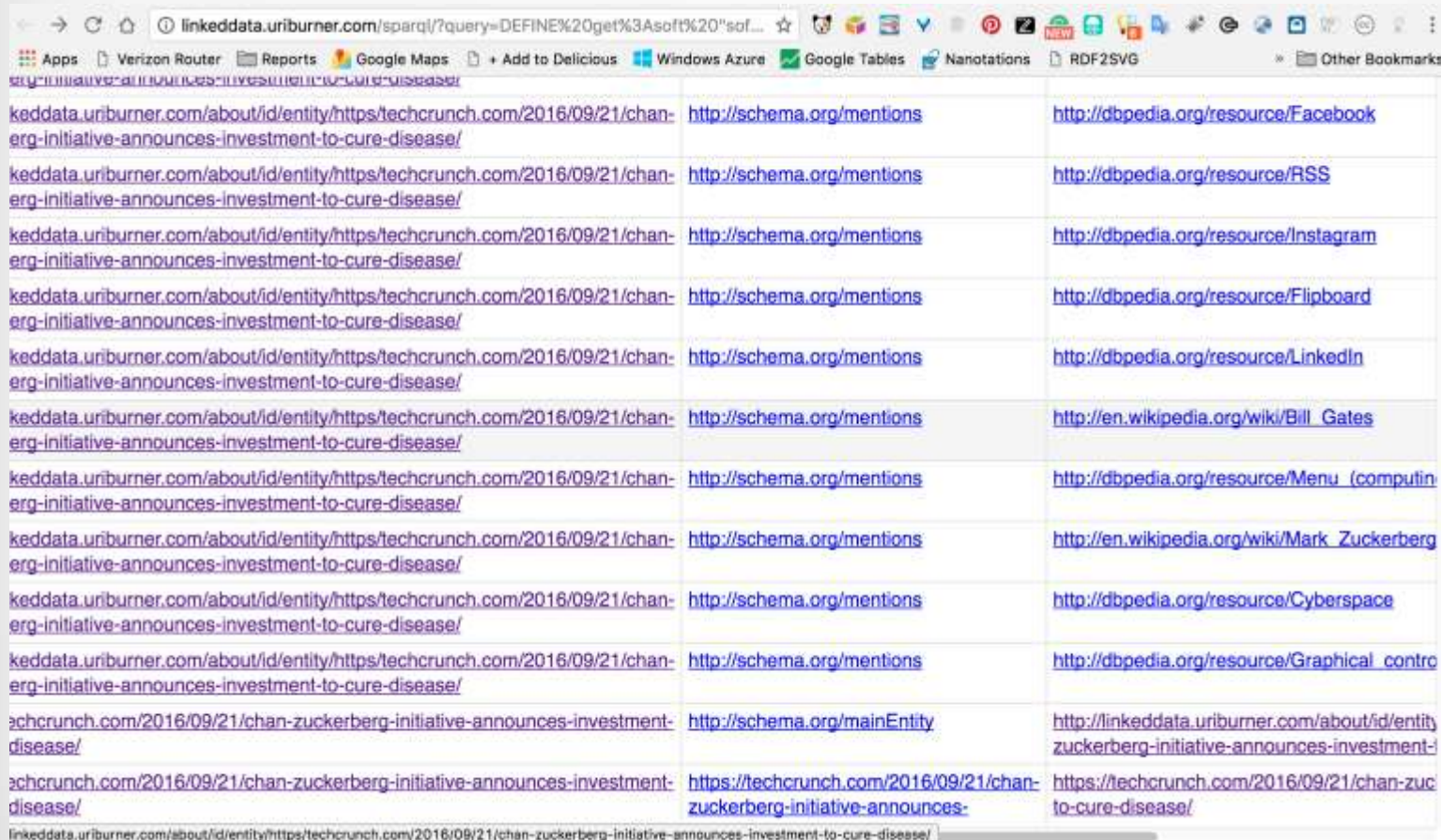
License CC-BY-SA 4.0 (International) Copyright © 2015-2016 OpenLink Software

OPENLINK SOFTWARE  
Making Technology Work For You®



# Structured Data Sniffer Browser Extension

SPARQL Query Results Page revealed by clicking OSDS LOD Cloud Lookup Query icon when viewing a [Web Page](#).



keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://dbpedia.org/resource/Facebook">http://dbpedia.org/resource/Facebook</a>
keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://dbpedia.org/resource/RSS">http://dbpedia.org/resource/RSS</a>
keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://dbpedia.org/resource/Instagram">http://dbpedia.org/resource/Instagram</a>
keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://dbpedia.org/resource/Flipboard">http://dbpedia.org/resource/Flipboard</a>
keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://dbpedia.org/resource/LinkedIn">http://dbpedia.org/resource/LinkedIn</a>
keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://en.wikipedia.org/wiki/Bill_Gates">http://en.wikipedia.org/wiki/Bill_Gates</a>
keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://dbpedia.org/resource/Menu_(computin">http://dbpedia.org/resource/Menu_(computin</a>
keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://en.wikipedia.org/wiki/Mark_Zuckerberg">http://en.wikipedia.org/wiki/Mark_Zuckerberg</a>
keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://dbpedia.org/resource/Cyberspace">http://dbpedia.org/resource/Cyberspace</a>
keddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan- erg-initiative-announces-investment-to-cure-disease/	<a href="http://schema.org/mentions">http://schema.org/mentions</a>	<a href="http://dbpedia.org/resource/Graphical_contro">http://dbpedia.org/resource/Graphical_contro</a>
techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment- disease/	<a href="http://schema.org/mainEntity">http://schema.org/mainEntity</a>	<a href="http://linkeddata.uriburner.com/about/id/entity/&lt;br/&gt;zuckerberg-initiative-announces-investment-i">http://linkeddata.uriburner.com/about/id/entity/ zuckerberg-initiative-announces-investment-i</a>
techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment- disease/	<a href="https://techcrunch.com/2016/09/21/chan-&lt;br/&gt;zuckerberg-initiative-announces-">https://techcrunch.com/2016/09/21/chan- zuckerberg-initiative-announces-</a>	<a href="https://techcrunch.com/2016/09/21/chan-zuc-&lt;br/&gt;to-cure-disease/">https://techcrunch.com/2016/09/21/chan-zuc- to-cure-disease/</a>
<a href="http://linkeddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/">linkeddata.uriburner.com/about/id/entity/https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/</a>		

SPARQL Query Editing Service revealed by changing **&query** parameter to **&qtxt** when viewing query-results page. This UI lets you change query results formats too!



# In-Built Entity Relation Graph Exploitation

Effect of clicking on a hyperlink in the SPARQL Query Results page i.e., hyperlink resolves to an Entity Description Page.

Screenshot of a web browser showing a SPARQL Query Results page. The browser address bar displays `linkeddata.uriburner.com/about/html/http://linkeddata.uriburner.com/abo...`. The page content includes a list of embedded JSON-LD statements and a news article snippet.

**container of**

- Embedded JSON-LD Statement 1
- Embedded JSON-LD Statement 2
- Embedded JSON-LD Statement 3
- Embedded JSON-LD Statement 4
- Embedded JSON-LD Statement 5
- [amores](#)

**Title**

- Chan Zuckerberg Initiative announces \$3 billion investment to cure disease | TechCrunch

**creator**

- Josh Constine

**described by**

- <https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/>

**description**

- The Chan Zuckerberg Initiative just announced a new program informally called Chan Zuckerberg Science to invest \$3 billion over the next decade to help cure,...

**content**

- 

The main content area displays a news article snippet with a donut chart titled "Disease" showing investment amounts for various diseases:

Disease	Investment Amount
Heart Disease	10.8M
Cancer	8.5M
Neurological Disease	8.2M
Other Disease	6.8M
	12.8M
	5.8M
	3.1M

Below the chart is a "NEWSLETTER SUBSCRIPTIONS" section with checkboxes for "The Daily Crunch", "TC Weekly Roundup", and "CrunchBase Daily". A QR code is also visible.

# In-Built Entity Relation Graph Exploitation - 1

Effect of clicking on a "Faceted Browsing" hyperlink in the footer section of the Entity Description Page.

OPENLINK SOFTWARE

Logged In as: Kingsley Uyi Idehan | Logout

Facets (new session) Description Metadata Settings

**About: Chan Zuckerberg Initiative announces \$3 billion investment to cure disease | TechCrunch**

[NotDistinct](#) [Permalink](#)

An Entity of Type : [schema:CreativeWork](#), within Data Space : [linkedata.unburner.com](#) associated with source [document\(s\)](#)

Type: [CreativeWork](#) [New Facet based on instances of this Class](#)

---

Attributes	Values
<a href="#">type</a>	<a href="#">CreativeWork</a>
<a href="#">seeAlso</a>	<a href="#">[Alchemy] positive sentiment: 0.207016</a>
<a href="#">sameAs</a>	<a href="https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/#this">https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/#this</a>
<a href="#">container of</a>	<a href="#">Embedded JSON-LD Statement 1</a> <a href="#">Embedded JSON-LD Statement 2</a> <a href="#">Embedded JSON-LD Statement 3</a> <a href="#">Embedded JSON-LD Statement 4</a> <a href="#">Embedded JSON-LD Statement 5</a> <a href="#">»more»</a>
<a href="#">Title</a>	Chan Zuckerberg Initiative announces \$3 billion investment to cure disease   TechCrunch
<a href="#">creator</a>	Josh Constine
<a href="#">described by</a>	<a href="https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/">https://techcrunch.com/2016/09/21/chan-zuckerberg-initiative-announces-investment-to-cure-disease/</a>
<a href="#">description</a>	The Chan Zuckerberg Initiative just announced a new program informally called Chan Zuckerberg Science to invest \$3 billion over the next decade to help cure...
<a href="#">content</a>	<a href="#">My Site</a> <a href="#">Reader</a>

QRCode



# In-Built Entity Relation Graph Exploitation - 2

Effect of clicking on a "Faceted Browsing" hyperlink in the footer section of the Entity Description Page.

The screenshot displays the OpenLink Software interface. At the top, the logo 'OPENLINK SOFTWARE' is visible on the left, and the user 'Kingsley Uyi Idehen' is logged in on the right. Below the header, there are tabs for 'Facets (new session)', 'Description' (which is active), 'Metadata', and 'Settings'. The main content area shows the title 'About: Chan Zuckerberg Initiative announces \$3 billion investment to cure disease | TechCrunch' with links for 'NotDistinct' and 'Permalink'. Below the title, it states 'An Entity of Type : schema:CreativeWork, within Data Space : linkeddata.uriburner.com associated with source document(s)'. The 'Type' is listed as 'CreativeWork' with a 'New Facet based on Instances of this Class' button. On the right side, there is a 'QRCode' section with a QR code. The 'Attributes Values' section is divided into two parts: 'links to' and 'has related'. The 'links to' section lists several URLs from TechCrunch. The 'has related' section lists various entities and data types, including 'Mark Zuckerberg', 'Chan Zuckerberg Science', 'Chan Zuckerberg Initiative', 'Chan Zuckerberg Initiative', 'Chan Zuckerberg', 'Bill Gates', 'Science', 'Education', 'Disease', 'Cure', and various social media profiles like 'Facebook', 'Instagram', 'Twitter', 'YouTube', 'Flipboard', and 'LinkedIn'.

OPENLINK SOFTWARE  
Logged in as: Kingsley Uyi Idehen | Logout

Facets (new session) | Description | Metadata | Settings

**About: Chan Zuckerberg Initiative announces \$3 billion investment to cure disease | TechCrunch** [Gato](#) [Sponge](#)

[NotDistinct](#) [Permalink](#)  
An Entity of Type : `schema:CreativeWork`, within Data Space : `linkeddata.uriburner.com` associated with source `document(s)`  
Type: `CreativeWork` New Facet based on Instances of this Class

---

**Attributes Values**

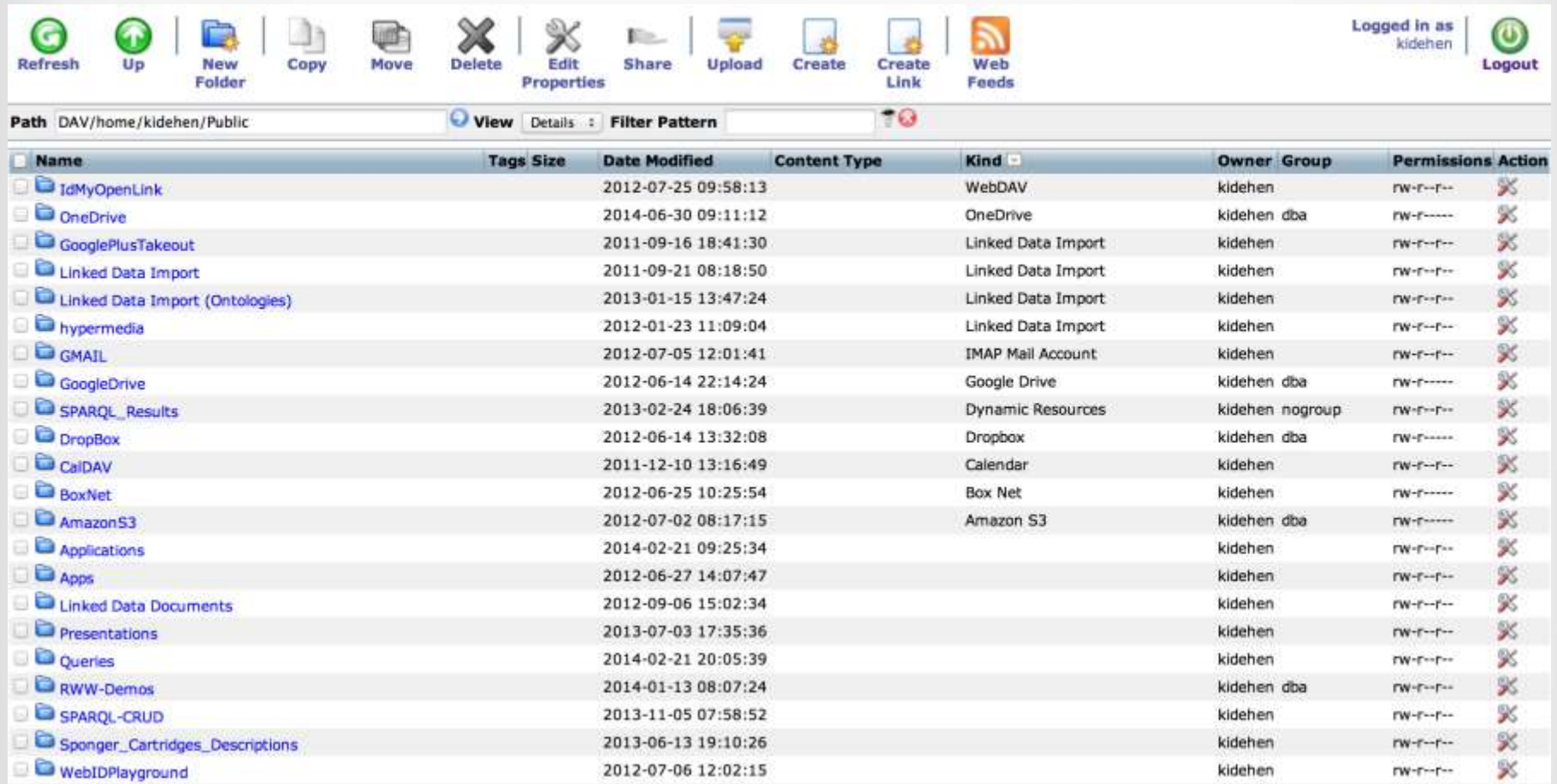
links to <https://techcrunch.com/event-type/crunchies/>  
<https://techcrunch.com/event-type/meetups/>  
<https://techcrunch.com/event-type/international-city/>  
<https://techcrunch.com/event-type/hackathon-2/>  
<https://techcrunch.com/events/include-more>

has related [\[Alchemy\] Mark Zuckerberg](#)  
[\[Alchemy\] Chan Zuckerberg Science](#)  
[\[Alchemy\] Chan Zuckerberg Initiative](#)  
[\[Alchemy\] Chan Zuckerberg Initiative](#)  
[\[Alchemy\] Chan](#)  
[\[Alchemy\] Bill Gates](#)  
[\[dataTXT\] Science](#)  
[\[dataTXT\] Education](#)  
[\[dataTXT\] Disease](#)  
[\[dataTXT\] Cure](#)  
[\[Babelify\] TechCrunch \[char.offset: 77-86\]](#)  
[\[Babelify\] Menu \(computing\) \[char.offset: 88-91\]](#)  
[\[Babelify\] Facebook \[char.offset: 110-117\]](#)  
[\[Babelify\] Instagram \[char.offset: 119-127\]](#)  
[\[Babelify\] Twitter \[char.offset: 129-135\]](#)  
[\[Babelify\] YouTube \[char.offset: 137-143\]](#)  
[\[Babelify\] Flipboard \[char.offset: 145-153\]](#)  
[\[Babelify\] LinkedIn \[char.offset: 155-162\]](#)

QRCode

# File Create, Save, and Share UI/UX

ODS-Briefcase which is also a Data Junction Box to Diverse Data Sources



The screenshot displays the ODS-Briefcase user interface, which functions as a Data Junction Box. The top navigation bar includes icons for Refresh, Up, New Folder, Copy, Move, Delete, Edit Properties, Share, Upload, Create, Create Link, and Web Feeds. On the right, it shows the user is logged in as 'kidehen' with a Logout button.

The main area shows the path `DAV/home/kidehen/Public` and a view toggle set to 'Details'. Below this is a table listing various data sources and their properties.

Name	Tags	Size	Date Modified	Content Type	Kind	Owner	Group	Permissions	Action
IdMyOpenLink			2012-07-25 09:58:13		WebDAV	kidehen		<code>rw-r--r--</code>	
OneDrive			2014-06-30 09:11:12		OneDrive	kidehen dba		<code>rw-r-----</code>	
GooglePlusTakeout			2011-09-16 18:41:30		Linked Data Import	kidehen		<code>rw-r--r--</code>	
Linked Data Import			2011-09-21 08:18:50		Linked Data Import	kidehen		<code>rw-r--r--</code>	
Linked Data Import (Ontologies)			2013-01-15 13:47:24		Linked Data Import	kidehen		<code>rw-r--r--</code>	
hypermedia			2012-01-23 11:09:04		Linked Data Import	kidehen		<code>rw-r--r--</code>	
GMAIL			2012-07-05 12:01:41		IMAP Mail Account	kidehen		<code>rw-r--r--</code>	
GoogleDrive			2012-06-14 22:14:24		Google Drive	kidehen dba		<code>rw-r-----</code>	
SPARQL_Results			2013-02-24 18:06:39		Dynamic Resources	kidehen nogroup		<code>rw-r--r--</code>	
DropBox			2012-06-14 13:32:08		Dropbox	kidehen dba		<code>rw-r-----</code>	
CalDAV			2011-12-10 13:16:49		Calendar	kidehen		<code>rw-r--r--</code>	
BoxNet			2012-06-25 10:25:54		Box Net	kidehen		<code>rw-r-----</code>	
AmazonS3			2012-07-02 08:17:15		Amazon S3	kidehen dba		<code>rw-r-----</code>	
Applications			2014-02-21 09:25:34			kidehen		<code>rw-r--r--</code>	
Apps			2012-06-27 14:07:47			kidehen		<code>rw-r--r--</code>	
Linked Data Documents			2012-09-06 15:02:34			kidehen		<code>rw-r--r--</code>	
Presentations			2013-07-03 17:35:36			kidehen		<code>rw-r--r--</code>	
Queries			2014-02-21 20:05:39			kidehen		<code>rw-r--r--</code>	
RWW-Demos			2014-01-13 08:07:24			kidehen dba		<code>rw-r--r--</code>	
SPARQL-CRUD			2013-11-05 07:58:52			kidehen		<code>rw-r--r--</code>	
Sponger_Cartridges_Descriptions			2013-06-13 19:10:26			kidehen		<code>rw-r--r--</code>	
WebIDPlayground			2012-07-06 12:02:15			kidehen		<code>rw-r--r--</code>	

# File Create, Save, and Share UI/UX

ODS-Briefcase showing collection of RDF-Turtle Documents

The screenshot displays the ODS-Briefcase web interface. The browser address bar shows the URL: [kingsley.idehen.net/public\\_home/kidehen/Public/Linked%20Data%20Doc...](http://kingsley.idehen.net/public_home/kidehen/Public/Linked%20Data%20Doc...). The interface includes a top navigation bar with various application icons (Apps, Verizon Router, Reports, Google Maps, etc.) and a toolbar with file management actions (Refresh, Up, New Folder, Copy, Move, Delete, Edit Properties, Share, Upload, Create, Create Link, Web Feeds, QR Code). The main content area shows a file list for the path `DAV/home/kidehen/Public/Linked Data Documents/Nanotations`. The file list table has columns for Name, Tags, Size, Date Modified, Content Type, Kind, Owner, Group, Permissions, and Action.

Name	Tags	Size	Date Modified	Content Type	Kind	Owner	Group	Permissions	Action
<a href="#">techcrunch-notes.ttl</a>		8 KB	2016-09-21 18:05:26	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-about-smart-agents.ttl</a>		37 KB	2016-09-20 17:36:15	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-discussion-threads.ttl</a>		4 KB	2016-09-16 14:08:35	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">test.ttl</a>		759 B	2016-09-11 15:45:48	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-about-iot-data-privacy.ttl</a>		6 KB	2016-06-06 18:13:20	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-data-lake.ttl</a>		4 KB	2016-06-02 18:02:05	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-data-virtualization.ttl</a>		1 KB	2016-05-27 08:14:34	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-job-titles-roles.ttl</a>		1 KB	2016-05-25 08:15:51	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-about-language.ttl</a>		1 KB	2016-05-23 15:44:55	text/turtle	RDF Turtle	dav	administrators	rw-r--r--	
<a href="#">notes-describing-bigdata-market.ttl</a>		6 KB	2016-05-22 13:24:35	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-magazine-article.ttl</a>		6 KB	2016-05-18 11:20:52	text/turtle	RDF Turtle	kidehen	dba	rw-r--r--	
<a href="#">random-notes-about-analytics.ttl</a>		7 KB	2016-05-06 18:40:01	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-bigdata-semantic-web-notes.ttl</a>		5 KB	2016-04-29 11:21:41	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-about-product-announcements.ttl</a>		6 KB	2016-04-25 17:03:17	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">uniburner.ttl</a>		4 KB	2016-04-25 16:56:24	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-unicorns.ttl</a>		1 KB	2016-04-04 10:38:14	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-nosql-notes.ttl</a>		2 KB	2016-04-01 18:55:55	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">rdf-editor.ttl</a>		4 KB	2016-03-17 13:48:56	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">random-notes-advertising-business.ttl</a>		3 KB	2016-02-11 11:00:24	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">linkedin-business-issues.ttl</a>		2 KB	2016-02-10 08:21:38	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	
<a href="#">linkedin-post-comment-shadrake.ttl</a>		1 KB	2016-02-04 14:15:37	text/turtle	RDF Turtle	kidehen	kidehen	rw-r--r--	

# Sophisticated Content Crawler

DBMS hosted Content Crawler that leverages loosely coupled binding to the Sponger Middleware component for transformation of unstructured and semi-structured data into Linked Data.

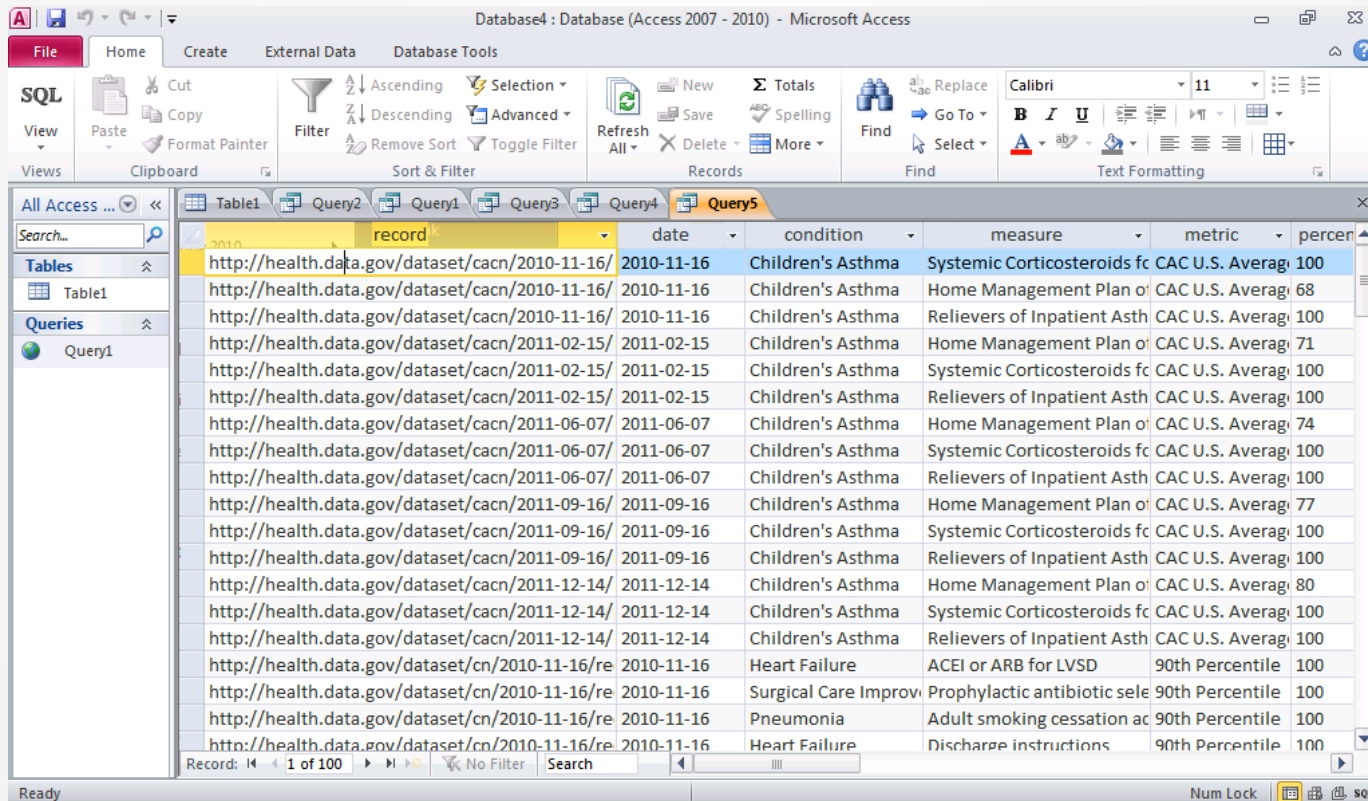
The screenshot displays the Virtuoso Conductor web interface. The top navigation bar includes links for Home, System Admin, Database, Replication, Web Application Server, XML, Web Services, and Linked Data. The main menu on the left lists various tools like Interactive SQL (ISQL), WebDAV Browser, OpenLink Data Spaces, and Virtuoso Start Menu. The central panel is titled 'Create content import target' and features a 'Content Imports' tab. The form contains several input fields and checkboxes for configuring a content import target, including Target description, Target URL, Login name on target, Login password on target, Copy to local DAV collection, Local resources owner, Download only newer than, Follow links matching, Do not follow links matching, Custom HTTP headers, Number of HTTP redirects to follow, XPath expression for links extraction, Crawling depth limit, Update Interval (minutes), Number of threads, Crawl delay (sec), Store Function, Extract Function, and Semantic Web Crawling. A 'Browse...' button is visible next to the 'Copy to local DAV collection' field.



# **Loosely-Coupled Data Interaction (Various Tools)**

# Powerful Standards Support

**ODBC compliance** enables use of client applications (e.g. [Microsoft Access](#)) as front-ends for Virtuoso functioning as a **Virtual Data Junction Box** for 3rd party RDBMS engines, and the World Wide Web hosted Linked Open Data Cloud.

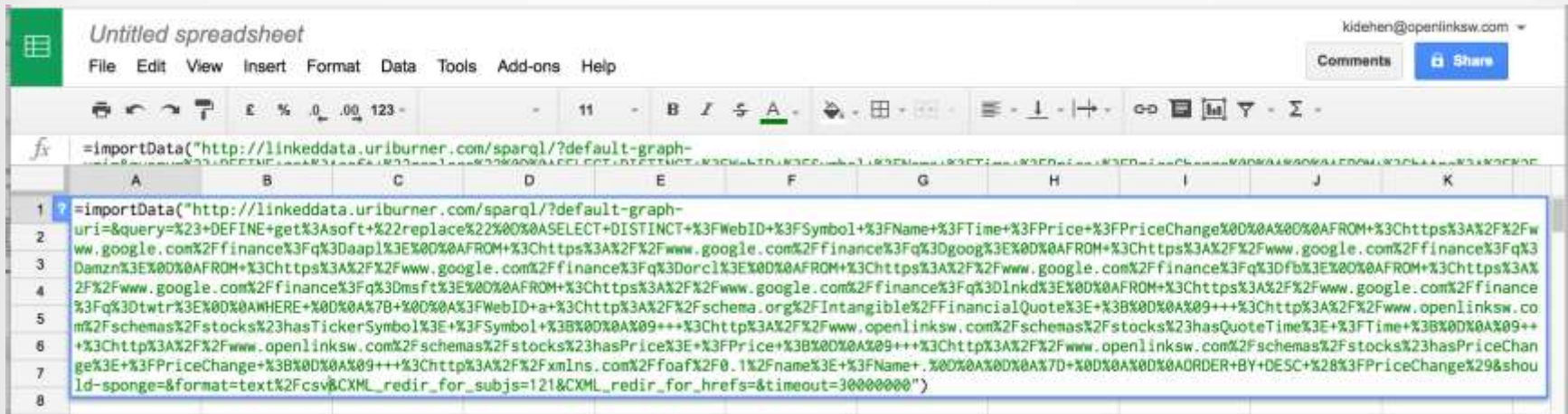


The screenshot shows the Microsoft Access interface with a table named 'Table1' open. The table contains health data with columns for URL, date, condition, measure, metric, and percentage. The data is filtered to show records from 2010-11-16 to 2011-12-14. The status bar at the bottom indicates 'Record: 1 of 100'.

record	date	condition	measure	metric	percent
<a href="http://health.data.gov/dataset/cacn/2010-11-16/">http://health.data.gov/dataset/cacn/2010-11-16/</a>	2010-11-16	Children's Asthma	Systemic Corticosteroids for	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cacn/2010-11-16/">http://health.data.gov/dataset/cacn/2010-11-16/</a>	2010-11-16	Children's Asthma	Home Management Plan o	CAC U.S. Average	68
<a href="http://health.data.gov/dataset/cacn/2010-11-16/">http://health.data.gov/dataset/cacn/2010-11-16/</a>	2010-11-16	Children's Asthma	Relievers of Inpatient Asth	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cacn/2011-02-15/">http://health.data.gov/dataset/cacn/2011-02-15/</a>	2011-02-15	Children's Asthma	Home Management Plan o	CAC U.S. Average	71
<a href="http://health.data.gov/dataset/cacn/2011-02-15/">http://health.data.gov/dataset/cacn/2011-02-15/</a>	2011-02-15	Children's Asthma	Systemic Corticosteroids for	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cacn/2011-02-15/">http://health.data.gov/dataset/cacn/2011-02-15/</a>	2011-02-15	Children's Asthma	Relievers of Inpatient Asth	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cacn/2011-06-07/">http://health.data.gov/dataset/cacn/2011-06-07/</a>	2011-06-07	Children's Asthma	Home Management Plan o	CAC U.S. Average	74
<a href="http://health.data.gov/dataset/cacn/2011-06-07/">http://health.data.gov/dataset/cacn/2011-06-07/</a>	2011-06-07	Children's Asthma	Systemic Corticosteroids for	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cacn/2011-06-07/">http://health.data.gov/dataset/cacn/2011-06-07/</a>	2011-06-07	Children's Asthma	Relievers of Inpatient Asth	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cacn/2011-09-16/">http://health.data.gov/dataset/cacn/2011-09-16/</a>	2011-09-16	Children's Asthma	Home Management Plan o	CAC U.S. Average	77
<a href="http://health.data.gov/dataset/cacn/2011-09-16/">http://health.data.gov/dataset/cacn/2011-09-16/</a>	2011-09-16	Children's Asthma	Systemic Corticosteroids for	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cacn/2011-09-16/">http://health.data.gov/dataset/cacn/2011-09-16/</a>	2011-09-16	Children's Asthma	Relievers of Inpatient Asth	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cacn/2011-12-14/">http://health.data.gov/dataset/cacn/2011-12-14/</a>	2011-12-14	Children's Asthma	Home Management Plan o	CAC U.S. Average	80
<a href="http://health.data.gov/dataset/cacn/2011-12-14/">http://health.data.gov/dataset/cacn/2011-12-14/</a>	2011-12-14	Children's Asthma	Systemic Corticosteroids for	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cacn/2011-12-14/">http://health.data.gov/dataset/cacn/2011-12-14/</a>	2011-12-14	Children's Asthma	Relievers of Inpatient Asth	CAC U.S. Average	100
<a href="http://health.data.gov/dataset/cn/2010-11-16/re">http://health.data.gov/dataset/cn/2010-11-16/re</a>	2010-11-16	Heart Failure	ACEI or ARB for LVSD	90th Percentile	100
<a href="http://health.data.gov/dataset/cn/2010-11-16/re">http://health.data.gov/dataset/cn/2010-11-16/re</a>	2010-11-16	Surgical Care Improv	Prophylactic antibiotic sele	90th Percentile	100
<a href="http://health.data.gov/dataset/cn/2010-11-16/re">http://health.data.gov/dataset/cn/2010-11-16/re</a>	2010-11-16	Pneumonia	Adult smoking cessation ac	90th Percentile	100
<a href="http://health.data.gov/dataset/cn/2010-11-16/re">http://health.data.gov/dataset/cn/2010-11-16/re</a>	2010-11-16	Heart Failure	Discharge instructions	90th Percentile	100

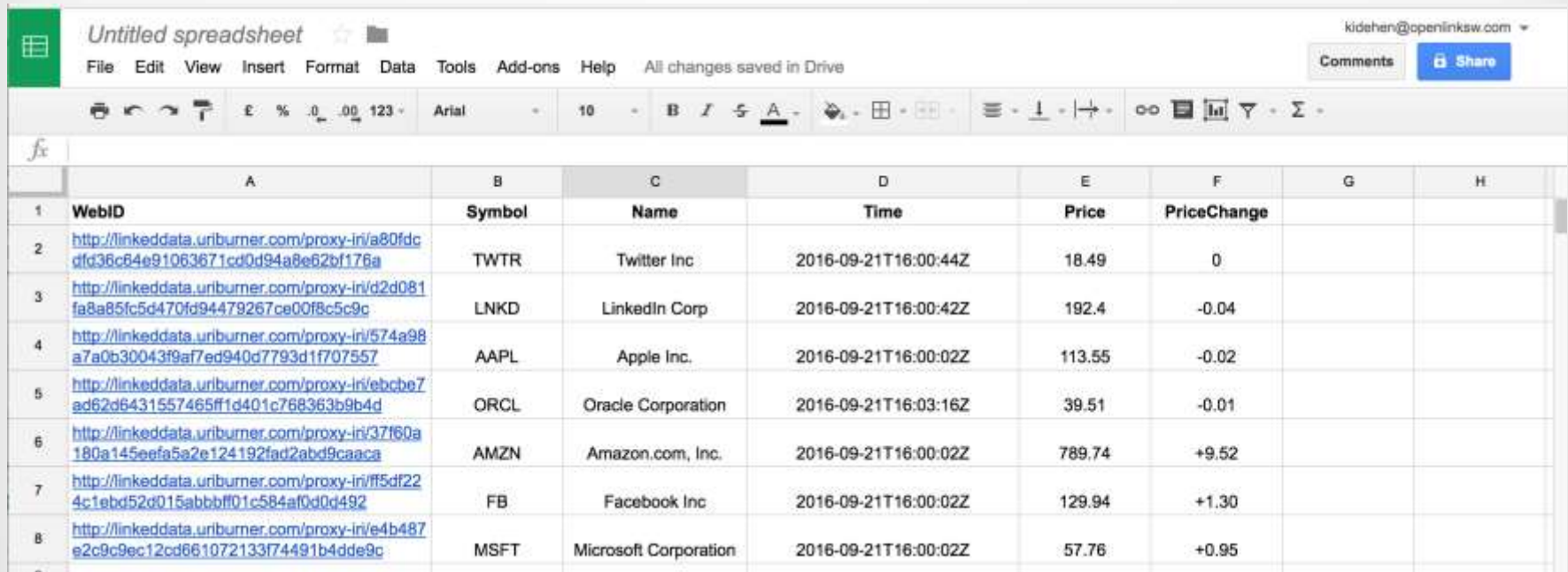
# Spreadsheet Integration - 1

Using SPARQL [Query Results Page URL](#) as input to Google Spreadsheet via ImportData() function



# Spreadsheet Integration - 2

Using SPARQL Query Results Page URL as input to [Google Spreadsheet](#) via ImportData() function



	A	B	C	D	E	F	G	H
1	WebID	Symbol	Name	Time	Price	PriceChange		
2	<a href="http://linkeddata.uriburner.com/proxy-iri/a80fdc4fd36c64e91063671cd0d94a8e62bf176a">http://linkeddata.uriburner.com/proxy-iri/a80fdc4fd36c64e91063671cd0d94a8e62bf176a</a>	TWTR	Twitter Inc	2016-09-21T16:00:44Z	18.49	0		
3	<a href="http://linkeddata.uriburner.com/proxy-iri/d2d081fa8a85fc5d470fd94479267ce00f8c5c9c">http://linkeddata.uriburner.com/proxy-iri/d2d081fa8a85fc5d470fd94479267ce00f8c5c9c</a>	LNKD	LinkedIn Corp	2016-09-21T16:00:42Z	192.4	-0.04		
4	<a href="http://linkeddata.uriburner.com/proxy-iri/574a98a7a0b30043f9af7ed940d7793d1f707557">http://linkeddata.uriburner.com/proxy-iri/574a98a7a0b30043f9af7ed940d7793d1f707557</a>	AAPL	Apple Inc.	2016-09-21T16:00:02Z	113.55	-0.02		
5	<a href="http://linkeddata.uriburner.com/proxy-iri/ebcbe7ad62d6431557465ff1d401c768363b9b4d">http://linkeddata.uriburner.com/proxy-iri/ebcbe7ad62d6431557465ff1d401c768363b9b4d</a>	ORCL	Oracle Corporation	2016-09-21T16:03:16Z	39.51	-0.01		
6	<a href="http://linkeddata.uriburner.com/proxy-iri/37f60a180a145eeefa5a2e124192fad2abd9caaca">http://linkeddata.uriburner.com/proxy-iri/37f60a180a145eeefa5a2e124192fad2abd9caaca</a>	AMZN	Amazon.com, Inc.	2016-09-21T16:00:02Z	789.74	+9.52		
7	<a href="http://linkeddata.uriburner.com/proxy-iri/f5df224c1ebd52d015abbff01c584af0d0d492">http://linkeddata.uriburner.com/proxy-iri/f5df224c1ebd52d015abbff01c584af0d0d492</a>	FB	Facebook Inc	2016-09-21T16:00:02Z	129.94	+1.30		
8	<a href="http://linkeddata.uriburner.com/proxy-iri/e4b487e2c9c9ec12cd661072133f74491b4dde9c">http://linkeddata.uriburner.com/proxy-iri/e4b487e2c9c9ec12cd661072133f74491b4dde9c</a>	MSFT	Microsoft Corporation	2016-09-21T16:00:02Z	57.76	+0.95		

# Google Docs Integration

Creating RDF-based Structured Data using a [Google document](#).

The screenshot shows the OneNote Online interface. The document is titled "Nanotation Collection" and is dated "Sunday, February 22, 2016 - 6:45 PM". The content includes a section titled "Demonstrating Semantic Web Benefits" with a sub-section "StaxXSS4:". The text describes a stumble across a post about the Semantic Web and introduces the use of RDF sentences. Below the text, there is a code block containing RDF data:

```
<https://www.linkedin.com/pulse/ai-from-venus-machine-learning-mars-geoffrey-moore#this>
  a schema:WebPage, schema:BlogPosting;
  schema:name "AI is from Venus, Machine Learning is from Mars" |
  schema:hasPart <GeoffreyMooreComment-2016-09-16>; schema:url
  <https://www.linkedin.com/pulse/ai-from-venus-machine-learning-mars-geoffrey-moore>
  .
  #GeoffreyMooreComment-2016-09-16
  a schema:Comment; schema:author <https://www.linkedin.com/in/geoffreymoore#this>
  |
  schema:name "GeoffreyMooreComment-2016-09-16";
  schema:text "AI develops conceptual models of the world that are underpinned by set
  theory and natural language. In this context, every noun or noun phrase represents a set.
  Every predicate indicates that set in other sets. If all human beings are mortal, and you
```

The screenshot shows the OneNote Online interface. The document is titled "Nanotation Collection" and is dated "Sunday, February 22, 2016 - 6:45 PM". The content includes a section titled "Demonstrating Semantic Web Benefits" with a sub-section "StaxXSS4:". The text describes a stumble across a post about the Semantic Web and introduces the use of RDF sentences. Below the text, there is a code block containing RDF data:

```
<https://www.linkedin.com/pulse/ai-from-venus-machine-learning-mars-geoffrey-moore#this>
  a schema:WebPage, schema:BlogPosting;
  schema:name "AI is from Venus, Machine Learning is from Mars" |
  schema:hasPart <GeoffreyMooreComment-2016-09-16>; schema:url
  <https://www.linkedin.com/pulse/ai-from-venus-machine-learning-mars-geoffrey-moore>
  .
  #GeoffreyMooreComment-2016-09-16
  a schema:Comment; schema:author <https://www.linkedin.com/in/geoffreymoore#this>
  |
  schema:name "GeoffreyMooreComment-2016-09-16";
  schema:text "AI develops conceptual models of the world that are underpinned by set
  theory and natural language. In this context, every noun or noun phrase represents a set.
  Every predicate indicates that set in other sets. If all human beings are mortal, and you
```

The screenshot shows the OneNote Online interface. The document is titled "Nanotation Collection" and is dated "Sunday, February 22, 2016 - 6:45 PM". The content includes a section titled "Demonstrating Semantic Web Benefits" with a sub-section "StaxXSS4:". The text describes a stumble across a post about the Semantic Web and introduces the use of RDF sentences. Below the text, there is a code block containing RDF data:

```
<https://www.linkedin.com/pulse/ai-from-venus-machine-learning-mars-geoffrey-moore#this>
  a schema:WebPage, schema:BlogPosting;
  schema:name "AI is from Venus, Machine Learning is from Mars" |
  schema:hasPart <GeoffreyMooreComment-2016-09-16>; schema:url
  <https://www.linkedin.com/pulse/ai-from-venus-machine-learning-mars-geoffrey-moore>
  .
  #GeoffreyMooreComment-2016-09-16
  a schema:Comment; schema:author <https://www.linkedin.com/in/geoffreymoore#this>
  |
  schema:name "GeoffreyMooreComment-2016-09-16";
  schema:text "AI develops conceptual models of the world that are underpinned by set
  theory and natural language. In this context, every noun or noun phrase represents a set.
  Every predicate indicates that set in other sets. If all human beings are mortal, and you
```

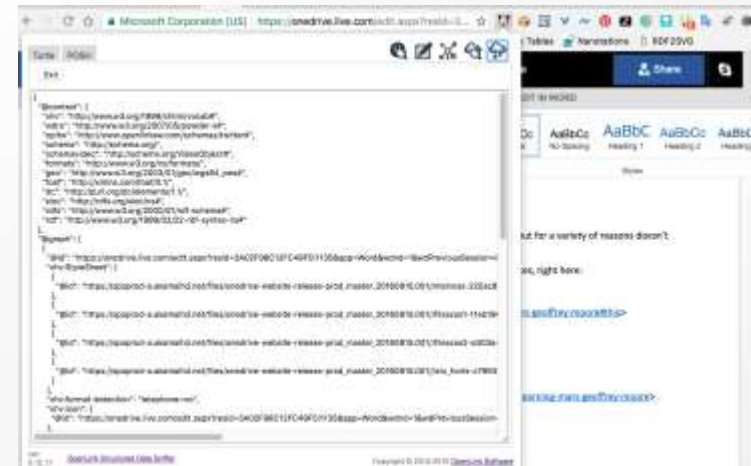
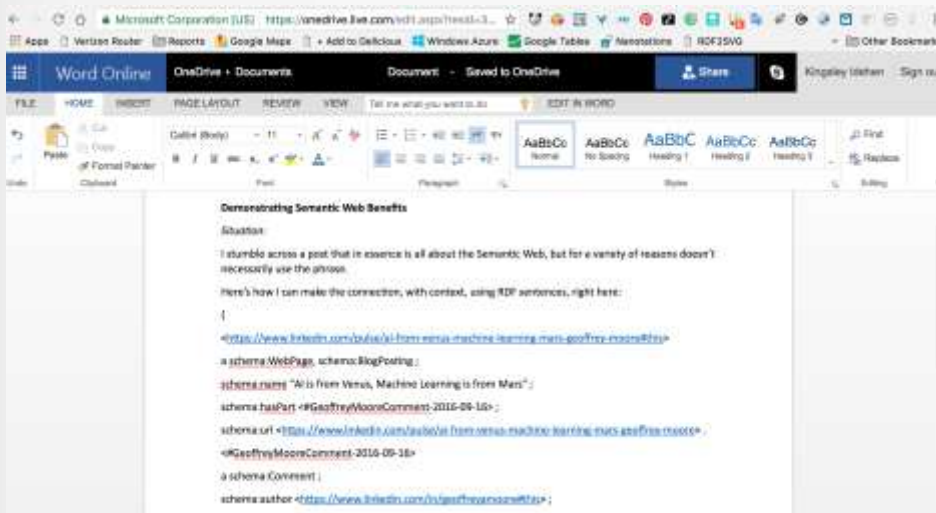
The screenshot shows the OneNote Online interface. The document is titled "Nanotation Collection" and is dated "Sunday, February 22, 2016 - 6:45 PM". The content includes a section titled "Demonstrating Semantic Web Benefits" with a sub-section "StaxXSS4:". The text describes a stumble across a post about the Semantic Web and introduces the use of RDF sentences. Below the text, there is a code block containing RDF data:

```
<https://www.linkedin.com/pulse/ai-from-venus-machine-learning-mars-geoffrey-moore#this>
  a schema:WebPage, schema:BlogPosting;
  schema:name "AI is from Venus, Machine Learning is from Mars" |
  schema:hasPart <GeoffreyMooreComment-2016-09-16>; schema:url
  <https://www.linkedin.com/pulse/ai-from-venus-machine-learning-mars-geoffrey-moore>
  .
  #GeoffreyMooreComment-2016-09-16
  a schema:Comment; schema:author <https://www.linkedin.com/in/geoffreymoore#this>
  |
  schema:name "GeoffreyMooreComment-2016-09-16";
  schema:text "AI develops conceptual models of the world that are underpinned by set
  theory and natural language. In this context, every noun or noun phrase represents a set.
  Every predicate indicates that set in other sets. If all human beings are mortal, and you
```



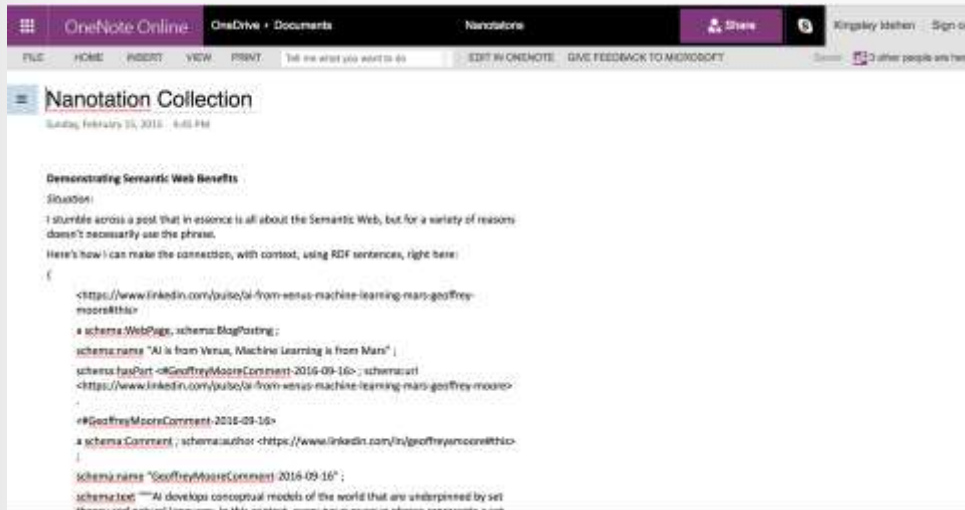
# Microsoft Word Integration

Creating RDF-based Structured Data using a [Microsoft Word \(365 Online Edition\) Doc.](#)



# Microsoft OneNote Integration

Creating RDF-based Structured Data using a [OneNote document](#).



# Etherpad Note Integration

Creating RDF-based Structured Data using an [Etherpad document](#).





# Powerful Standards Support - 1

ODBC & HTML5 compliance enables development of rich client apps. that leverage the [WebDB-ODBC](#) bridge for accessing data across: Virtuoso, 3rd party RDBMS engines.

The screenshot displays the WebDB-ODBC interface. At the top, it shows the XMLA URL as '/XMLA', the DSN as 'DSN=Local\_instance', the user as 'vdb', and the version as '1.43'. Below this, there are tabs for 'Structure', 'Primary Keys', 'Foreign Keys', 'Super Keys', and 'Execute SQL'. The 'Execute SQL' tab is active, showing a query: 'SELECT \* FROM [sqlserver].[northwind].[Customers]'. Below the query, there is a 'RunSQL' button and a status bar indicating 'Query returns :91 rows'. The main area displays a table with 4 columns: '#', 'CustomerID', 'CompanyName', 'ContactName', and 'ContactTitle'. The table contains 25 rows of data, including customers like 'Alfreds Futterkiste', 'Ana Trujillo Emparedados y helados', and 'France restauration'. On the left side, there is a tree view showing the database structure, with 'Customers' selected under the 'northwind' database.

#	CustomerID	CompanyName	ContactName	ContactTitle
00	ALFKI	Alfreds Futterkiste	Maria Anders	Sales Representative
01	ANATR	Ana Trujillo Emparedados y helados	Ana Trujillo	Owner
02	ANTON	Antonio Moreno Taquería	Antonio Moreno	Owner
03	AROUT	Around the Horn	Thomas Hardy	Sales Representative
04	BERGS	Berglunds snabbköp	Christina Berglund	Order Administrator
05	BLAUS	Blauer See Delikatessen	Hanna Moos	Sales Representative
06	BOLID	Blondesddsl père et fils	Frédérique Citeaux	Marketing Manager
07	BOLID	Bólido Comidas preparadas	Martin Sommer	Owner
08	BONAP	Bon app'	Laurence Lebihan	Owner
09	BOTTM	Bottom-Dollar Markets	Elizabeth Lincoln	Accounting Manager
10	BSBEV	B's Beverages	Victoria Ashworth	Sales Representative
11	CACTU	Cactus Comidas para llevar	Patricio Simpson	Sales Agent
12	CENTC	Centro comercial Moctezuma	Francisco Chang	Marketing Manager
13	CHOPS	Chop-suey Chinese	Yang Wang	Owner
14	COMMI	Comércio Mineiro	Pedro Afonso	Sales Associate
15	CONSH	Consolidated Holdings	Elizabeth Brown	Sales Representative
16	DRACD	Drachenblut Delikatessen	Sven Ottlieb	Order Administrator
17	DUMON	Du monde entier	Janine Labrune	Owner
18	EASTC	Eastern Connection	Ann Devon	Sales Agent
19	ERNSH	Ernst Handel	Roland Mendel	Sales Manager
20	FAMIA	Familia Arquibaldo	Aria Cruz	Marketing Assistant
21	FISSA	FISSA Fabrica Inter. Salchichas S.A.	Diego Roel	Accounting Manager
22	FOLIG	Folies gourmandes	Martine Rancé	Assistant Sales Agent
23	FOLKO	Folk och få Hb	Maria Larsson	Owner
24	FRANK	Frankenversand	Peter Franken	Marketing Manager
25	FRANR	France restauration	Carine Schmitt	Marketing Manager

# Powerful Standards Support -2

ODBC & HTML5 compliance enables development of rich client apps. that leverage the [WebDB-ODBC](#) bridge for accessing data across the World Wide Web hosted Linked Open Data Cloud.

The screenshot displays the WebDB-ODBC interface. At the top, it shows the XMLA URL as /XMLA, the DSN as Local Instance, the User as vdb, and the version as 1.43. The interface is divided into several sections. On the left, there is a tree view of database catalogs, including BLOG, DB, Demo, Oracle, W5, XQ, db2, db2ma, Informix, stores, ingres, progress9, and isports. The 'stores' catalog is selected, showing a list of tables and views such as call\_type, call\_typeCount, catalog, catalogCount, cust\_calls, cust\_callsCount, customer, customerCount, informix\_\_Total, items, itemsCount, manufact, manufactCount, msqs, msqsCount, orders, ordersCount, state, stateCount, stock, stockCount, stores\_\_Total, and storesCount. The main area displays a SPARQL query: 

```
SELECT DISTINCT ?s ?nick
WHERE {
  ?s foaf:Person .
  foaf:nick ?nick .
}
LIMIT 20
```

 Below the query, there is a 'RunSQL' button and a message 'Query returns :20 rows'. The results are displayed in a table with two columns: '# s:' and 'nick'. The results list 20 rows of data, each containing a URL and a name. A 'permalink' link is visible at the bottom right of the results table.

# s:	nick
00 <a href="http://dbpedia.org/resource/Tomas_Vaitkus">http://dbpedia.org/resource/Tomas_Vaitkus</a>	Tomas the Tank Engine, KiloVaitkus
01 <a href="http://dbpedia.org/resource/David_Millar">http://dbpedia.org/resource/David_Millar</a>	Millar-Time
02 <a href="http://dbpedia.org/resource/Joseph_Chamberlain">http://dbpedia.org/resource/Joseph_Chamberlain</a>	"Our Joe"
03 <a href="http://dbpedia.org/resource/Erik_Zabel">http://dbpedia.org/resource/Erik_Zabel</a>	Ete
04 <a href="http://id.myopenlink.net/dataspace/person/kidehen#this">http://id.myopenlink.net/dataspace/person/kidehen#this</a>	kidehen
05 <a href="http://demo.openlinksw.com/dataspace/person/WebCal#this">http://demo.openlinksw.com/dataspace/person/WebCal#this</a>	WebCal
06 <a href="http://demo.openlinksw.com/dataspace/person/VS_B_1#this">http://demo.openlinksw.com/dataspace/person/VS_B_1#this</a>	VS_B_1
07 <a href="http://id.myopenlink.net/dataspace/person/KingsleyUyiIdehen#this">http://id.myopenlink.net/dataspace/person/KingsleyUyiIdehen#this</a>	KingsleyUyiIdehen
08 <a href="http://infomesh.net/2003/people#CodyW">http://infomesh.net/2003/people#CodyW</a>	d8uv
09 <a href="http://bbfish.net/people/henry/card#me">http://bbfish.net/people/henry/card#me</a>	bbfish
10 <a href="http://diq.csail.mit.edu/2008/webdav/timbl/foaf.rdf#edd">http://diq.csail.mit.edu/2008/webdav/timbl/foaf.rdf#edd</a>	edd
11 <a href="http://inamidst.com/sbp/foaf#Sean">http://inamidst.com/sbp/foaf#Sean</a>	sbp
12 <a href="http://inamidst.com/sbp/foaf#Sean">http://inamidst.com/sbp/foaf#Sean</a>	SeanP
13 <a href="http://www.w3.org/People/Berners-Lee/card#i">http://www.w3.org/People/Berners-Lee/card#i</a>	TimBL
14 <a href="http://www.w3.org/People/Berners-Lee/card#i">http://www.w3.org/People/Berners-Lee/card#i</a>	timbl
15 <a href="http://www.w3.org/People/Connolly/#me">http://www.w3.org/People/Connolly/#me</a>	DanCon
16 <a href="http://demo.openlinksw.com/dataspace/person/CRAT52#this">http://demo.openlinksw.com/dataspace/person/CRAT52#this</a>	CRAT52
17 <a href="http://demo.openlinksw.com/dataspace/person/SLOAN2#this">http://demo.openlinksw.com/dataspace/person/SLOAN2#this</a>	SLOAN2
18 <a href="http://demo.openlinksw.com/dataspace/person/ULOAN2#this">http://demo.openlinksw.com/dataspace/person/ULOAN2#this</a>	ULOAN2
19 <a href="http://demo.openlinksw.com/dataspace/person/LOAN2#this">http://demo.openlinksw.com/dataspace/person/LOAN2#this</a>	LOAN2

# Powerful Standards Support - 3

Using [SPARQL to enhance SQL](#) via an ODBC connection over HTTP. Naturally, this also works via JDBC, ADO.NET, and OLE DB connections too! Use “vdb” for uid and pwd when prompted

The screenshot shows the OpenLink SQL Builder web application. The browser address bar displays `demo.openlinksw.com/spasqlqb/spasqlqb.html?permalink_e=["v":1,"url":"/...]`. The application interface includes a sidebar with a list of databases: DB, DB2, Demo, Oracle, PrestoDB, SQLServer, WS, XQ, csv, informix, Ingres, postgres, progress9, and sybase12. The main panel has tabs for Structure, Primary Keys, Foreign Keys, References, and Execute SQL. The Execute SQL tab is active, showing a SPARQL query:

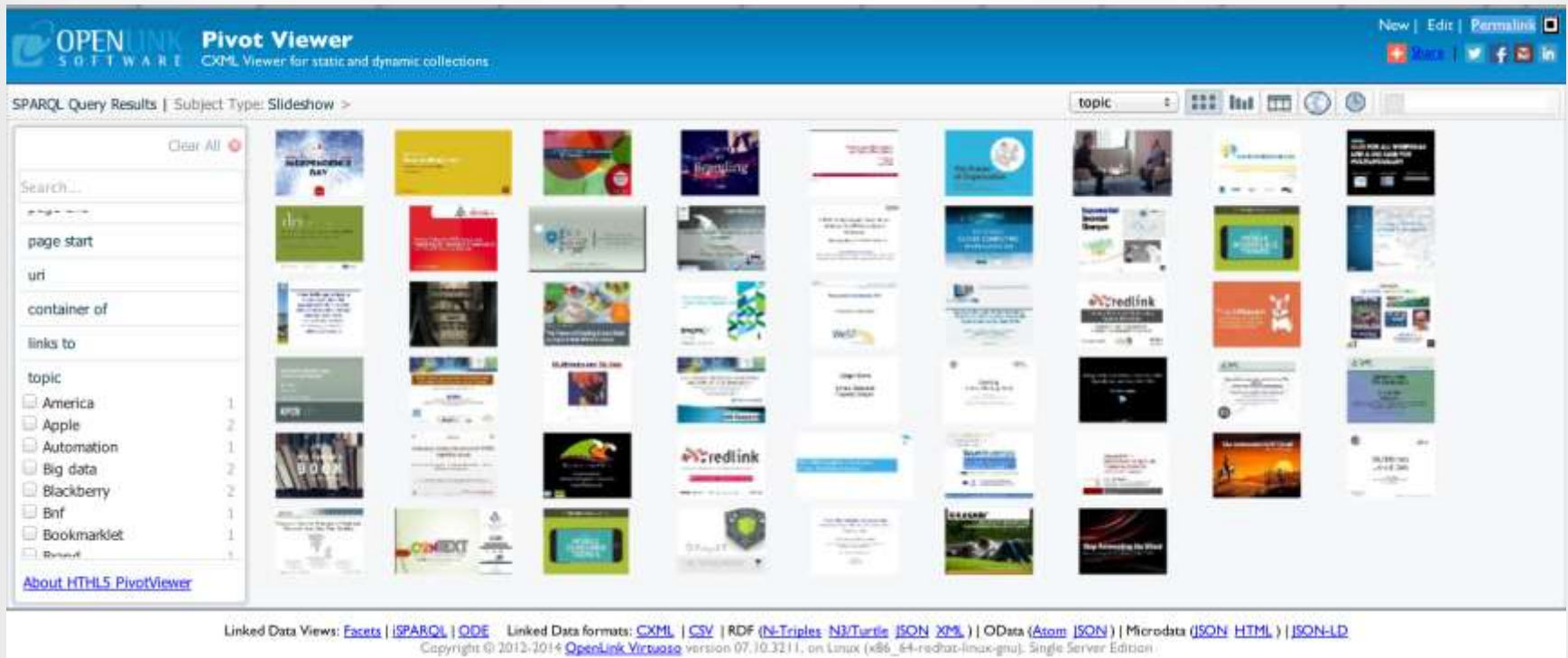
```
SELECT PersonInstance.webid, PersonInstance.name
FROM
(SPARQL
SELECT DISTINCT *
WHERE { ?webid a foaf:Person;
        foaf:name ?name ;
        FILTER (isIRI(?webid))
        FILTER (?name != "")
        FILTER (xsd:string(?webid) NOT IN ( "%urnburner%" ) )
} ) AS PersonInstance
```

Below the query, there is a "RunSQL" button and a status message "Query returns :326 rows". The results are displayed in a table with two columns: "webid" and "name". The first 18 rows are visible:

#	webid	name
000	<a href="http://danbri.org/foaf.rdf#danbri">http://danbri.org/foaf.rdf#danbri</a>	Dan Brickley
001	<a href="http://dig.csail.mit.edu/2007/wiki/people/RobertHoffmann#RMH">http://dig.csail.mit.edu/2007/wiki/people/RobertHoffmann#RMH</a>	Robert Hoffmann
002	<a href="http://dig.csail.mit.edu/2008/webdav/timbl/foaf.rdf#cm">http://dig.csail.mit.edu/2008/webdav/timbl/foaf.rdf#cm</a>	Coralie Mercier
003	<a href="http://inamidst.com/sbp/foaf#Sean">http://inamidst.com/sbp/foaf#Sean</a>	Sean Palmer
004	<a href="http://myopenlink.net/dataspace/person/kidehen#this">http://myopenlink.net/dataspace/person/kidehen#this</a>	Kingsley Idehen
005	<a href="http://norman.walsh.name/knows/who#norman-walsh">http://norman.walsh.name/knows/who#norman-walsh</a>	Norman Walsh
006	<a href="http://people.csail.mit.edu/lkagal/foaf#me">http://people.csail.mit.edu/lkagal/foaf#me</a>	Lalana Kagal
007	<a href="http://people.w3.org/simon/foaf#i">http://people.w3.org/simon/foaf#i</a>	Simon J. Hernandez
008	<a href="http://qdos.com/people/tom.xrdf#me">http://qdos.com/people/tom.xrdf#me</a>	Tom Ilube
009	<a href="http://rit.mellon.org/Members/ihf/foaf.rdf#me">http://rit.mellon.org/Members/ihf/foaf.rdf#me</a>	Ira Fuchs
010	<a href="http://swordfish.rdfweb.org/people/libby/rdfweb/webwho.xrdf#me">http://swordfish.rdfweb.org/people/libby/rdfweb/webwho.xrdf#me</a>	Libby Miller
011	<a href="http://www.aaronsw.com/about.xrdf#aaronsw">http://www.aaronsw.com/about.xrdf#aaronsw</a>	Aaron Swartz
012	<a href="http://www.dajobe.org/foaf.rdf#i">http://www.dajobe.org/foaf.rdf#i</a>	Dave Beckett
013	<a href="http://www.isi.edu/~gill/foaf.rdf#me">http://www.isi.edu/~gill/foaf.rdf#me</a>	Yolanda Gill
014	<a href="http://www.isi.edu/~gill/foaf.rdf#me">http://www.isi.edu/~gill/foaf.rdf#me</a>	Yolanda Gil
015	<a href="http://www.w3.org/People/Connolly/#me">http://www.w3.org/People/Connolly/#me</a>	Dan Connolly
016	<a href="http://www.w3.org/People/EM/contact#me">http://www.w3.org/People/EM/contact#me</a>	Eric Miller
017	<a href="http://www.w3.org/People/djweitzner/foaf#DJW">http://www.w3.org/People/djweitzner/foaf#DJW</a>	Daniel J. Weitzner
018	<a href="http://www.w3.org/People/Berners-Lee/card#amy">http://www.w3.org/People/Berners-Lee/card#amy</a>	Amy van der Hiel

# Insight Discovery & Exploration

[HTML5 based PivotViewer](#) based Front-End for visualizing SPARQL Query results



The screenshot displays the OpenLink Pivot Viewer interface. The top header bar is blue and contains the OpenLink Software logo, the title "Pivot Viewer", and the subtitle "CXML Viewer for static and dynamic collections". On the right side of the header, there are links for "New", "Edit", and "Permalink", along with social media icons for "Share", "Twitter", "Facebook", "YouTube", and "LinkedIn". Below the header, a navigation bar shows "SPARQL Query Results" and "Subject Type: Slideshow >". A search bar is located on the left side of the main content area. Below the search bar, there is a list of filters: "page start", "uri", "container of", "links to", and "topic". The "topic" filter is expanded, showing a list of topics with their respective counts: America (1), Apple (2), Automation (1), Big data (2), BlackBerry (2), Bnf (1), Bookmarklet (1), and Bluetooth (1). The main content area displays a grid of document thumbnails, each representing a different document. The bottom of the interface features a footer with "Linked Data Views: Facets | SPARQL | ODE" and "Linked Data formats: CXML | CSV | RDF (N-Triples | N3/Turtle | JSON | XML) | OData (Atom | JSON) | Microdata (JSON | HTML) | JSON-LD". The footer also includes the copyright information: "Copyright © 2012-2014 OpenLink Virtuoso version 07.10.3211, on Linux (x86\_64-redhat-linux-gnu). Single Server Edition".



# Insight Discovery & Exploration

[HTML5 based PivotViewer](#) based Front-End for visualizing SPARQL Query results (Bar Chart based Grouping)



# Insight Discovery & Exploration

[HTML5 based PivotViewer](#) based Front-End for visualizing SPARQL Query results (specific item of interest selection)

The screenshot displays the OpenLink Pivot Viewer interface. The top header bar is blue with the OpenLink Software logo and the text "Pivot Viewer XML Viewer for static and dynamic collections". On the right of the header are links for "New", "Edit", and "Permalink", along with social media icons for "Share", "Twitter", "Facebook", "Google+", and "LinkedIn".

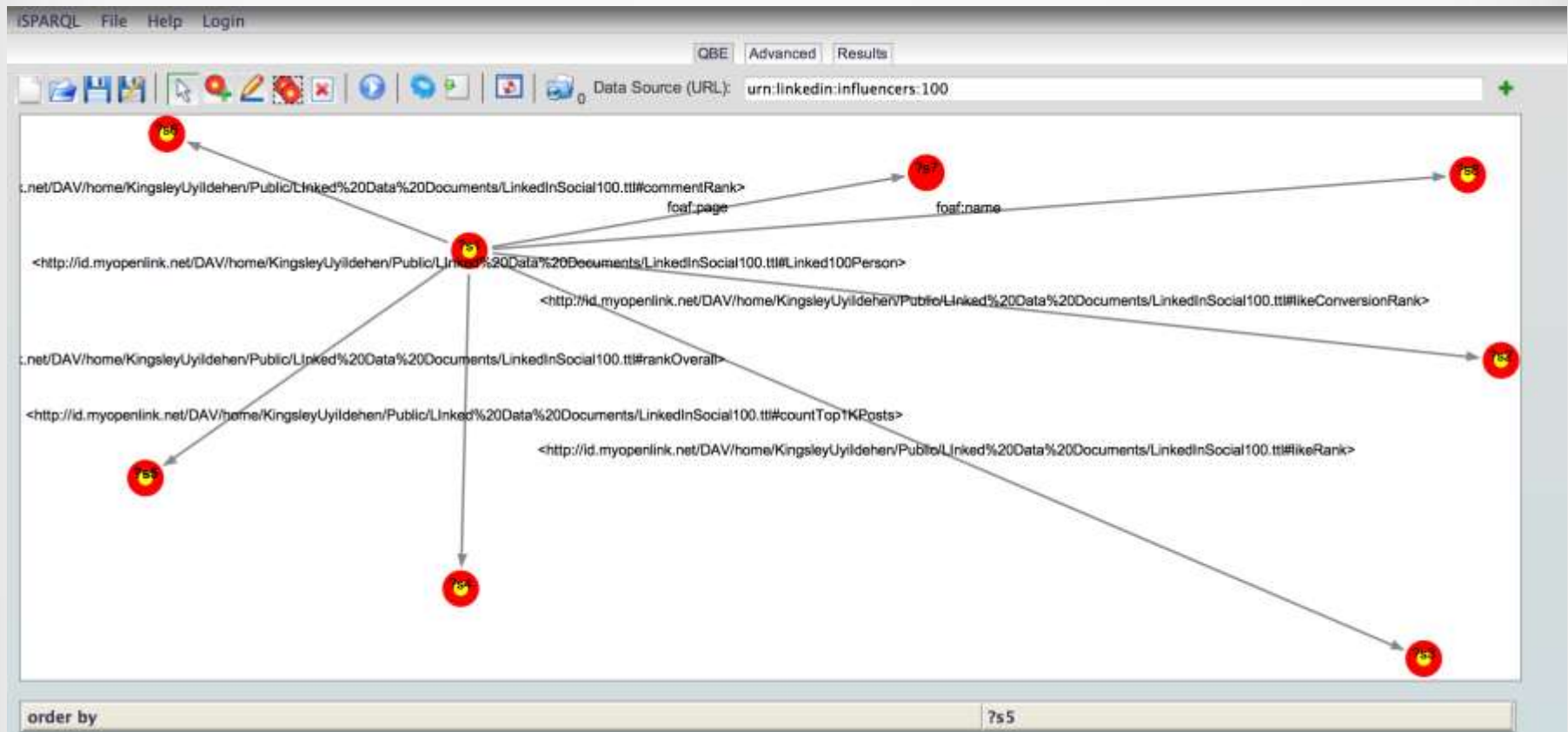
Below the header, the main content area is titled "SPARQL Query Results | Subject Type: Slideshow >". On the left, there is a search bar and a list of filters. The filters include "page start", "uri", "container of", "links to", and "topic". Under the "topic" filter, a list of topics is shown with counts: America (1), Apple (2), Automation (1), Big data (2), BlackBerry (2), Bnf (1), Bookmarklet (1), and Bsnat (2). Below the filters is a link to "About HTML5 PivotViewer".

The main area displays three slides. The first slide is a solid yellow rectangle. The second slide is a colorful abstract graphic with the text "JWT | THE CIRCULAR ECONOMY" and "JUNE 2014". The third slide is a dark image with the word "Br" visible. To the right of the slides, there is a detailed view of the selected item, "JWT: The Circular Economy (June 2014)". This view includes a summary paragraph: "Among some of the world's top corporate leaders, there's a growing understanding that traditional business models—built on the presumption of unlimited and cheap natural resources—must be reworked for 21st". Below the summary are several metadata fields: "has\_code" (9520LRE), "has\_curi" (1), "Created" (2014-06-24T17:48:33+02:00), and "has creator" (lwtintelligence).

At the bottom of the interface, there is a footer section with the text "Linked Data Views: Facets | SPARQL | QDE" and "Linked Data formats: CXML | CSV | RDF (N-Triples | N-Turtle | JSON | XML) | OData (Atom | JSON) | Microdata (JSON | HTML) | JSON-LD". Below this is the copyright notice: "Copyright © 2012-2014 OpenLink Virtuoso version 07.10.3211, on Linux (x86\_64-redhat-linux-gnu), Single Server Edition".

# Powerful SPARQL Query Builder

Use Query By Example (QBE) Patterns to [Construct](#) & [Share](#) Query Results.



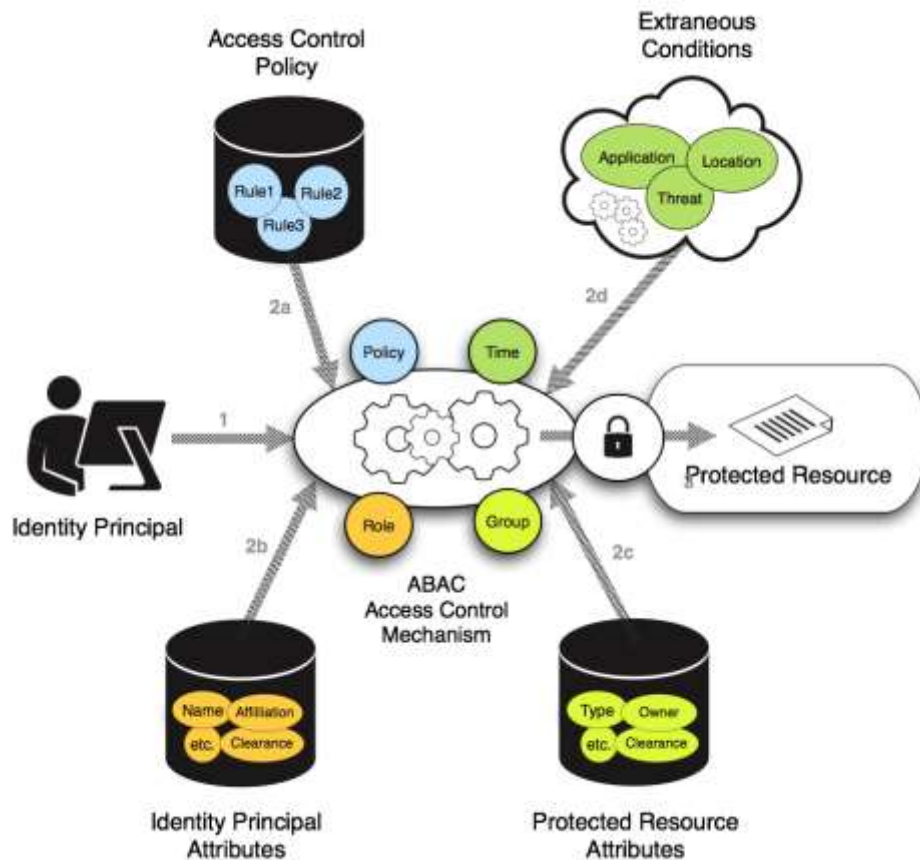
# Data Interaction (Read-Write)



# Read-Write Interaction needs ABAC based Access Controls

This is about fine-grained access to protected resources driven by attributes (characteristics, features, properties, predicates, relations etc.) of the resource requestor (an Identity Principal).

# Attributed Based Access Controls (ABAC) Breakdown



1. Identity Principal Requests Access to Protected Resource
2. Protected Resource Server Assesses:
  - ☐ Identity Principal Validity (RDF based Identity Claims)
  - ☐ Access Control Rules (RDF based ACLs)
3. Subject is Given Access to Protected Resource or Rejected

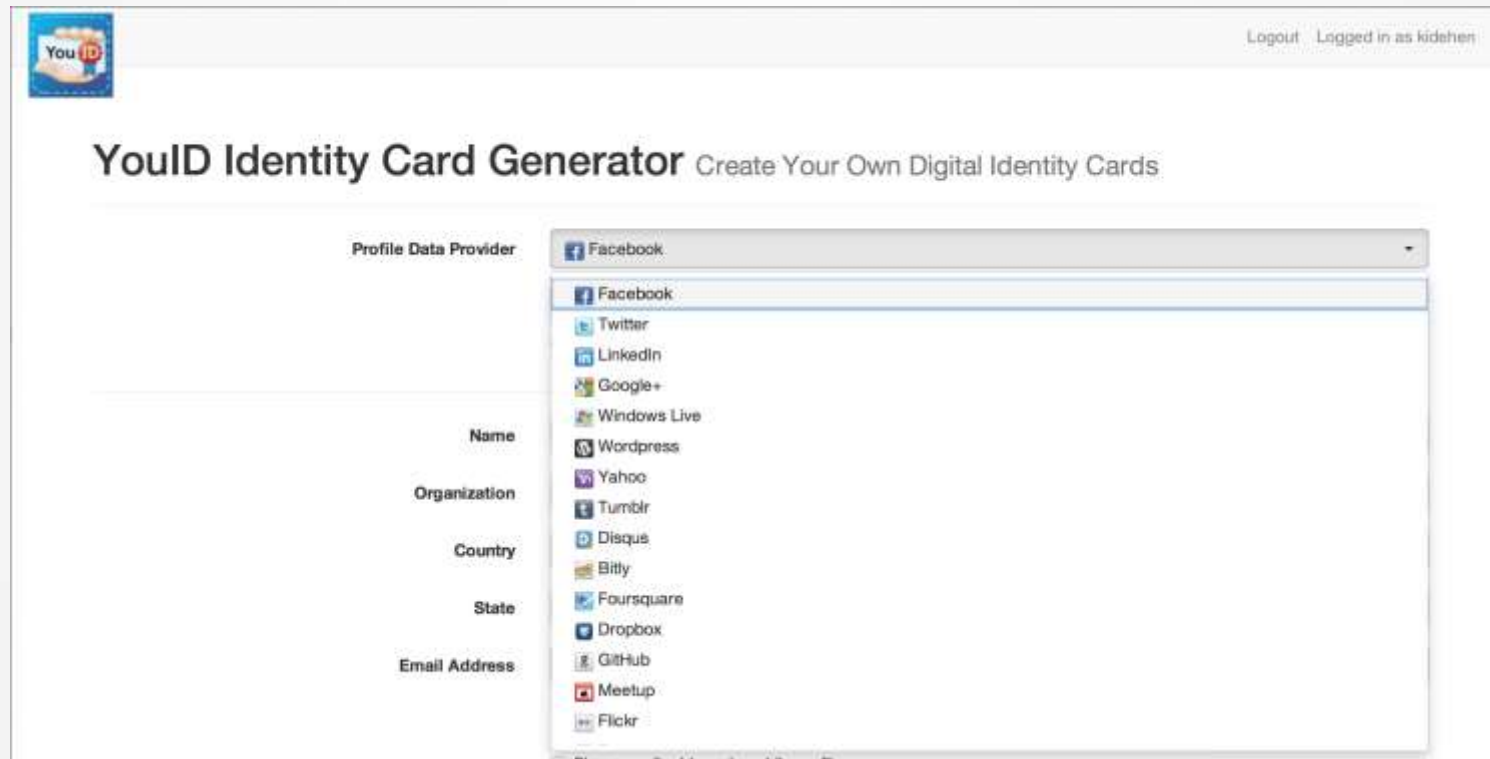
# ABAC Challenges?

- Identifier Types – NetID vs WebID Issues
- Data Access Protocols – LDAP vs HTTP issues
- Data Representation – Data Virtualization issues
- Data Integration – RDF based Linked Open Data
- Data Access Performance & Scalability –  
Virtuoso!

# **Identity Management for Attribute Based Access Controls**

# Digital Identity Card Generation – PdP Selection

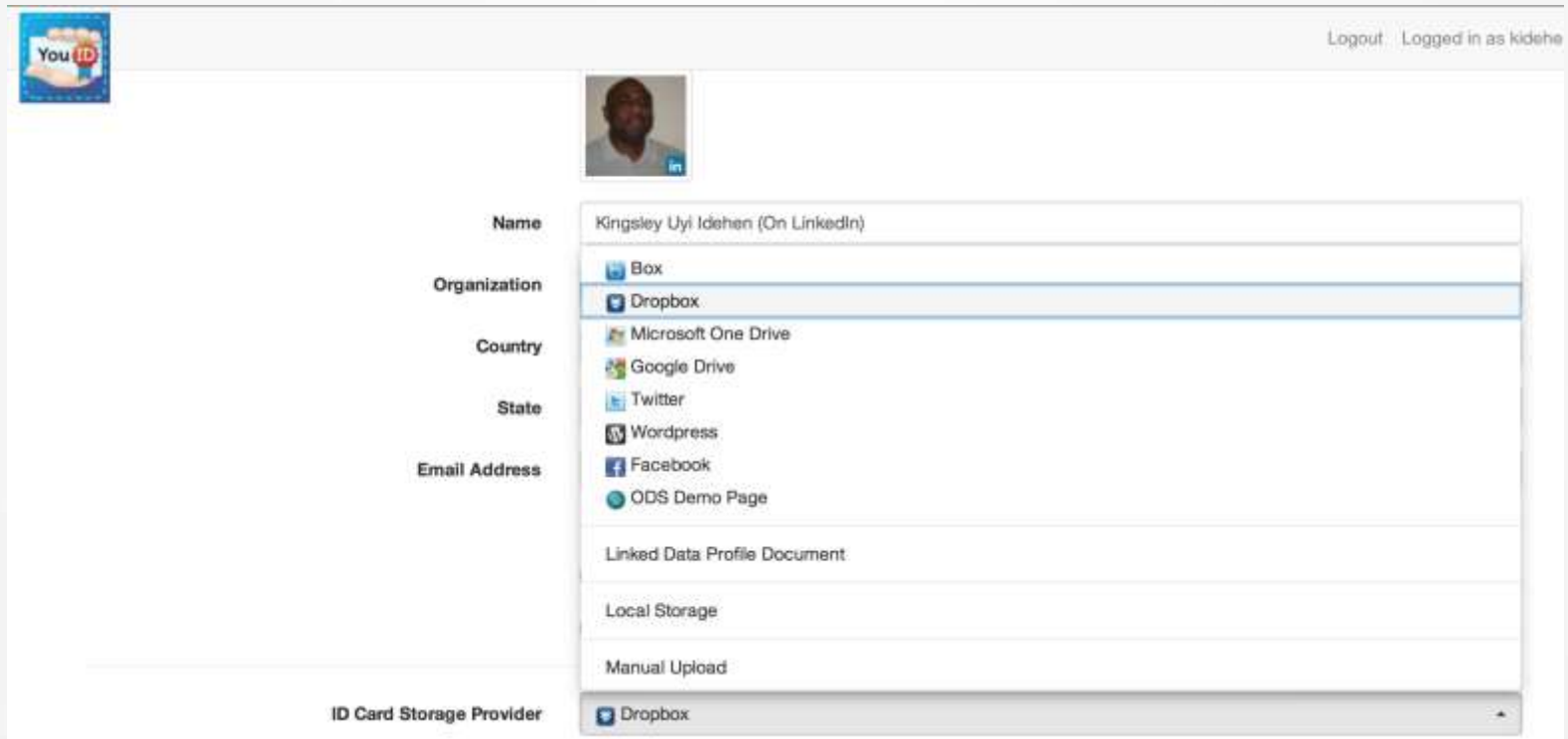
Vast & Configurable Collection of Profile Data Providers (PdPs)



The screenshot displays the 'YouID Identity Card Generator' web application. At the top left is the 'YouID' logo, and at the top right are links for 'Logout' and 'Logged in as kidehen'. The main heading is 'YouID Identity Card Generator' with the subtitle 'Create Your Own Digital Identity Cards'. Below this, there is a form with a 'Profile Data Provider' dropdown menu currently set to 'Facebook'. A list of other providers is visible in the dropdown: Facebook, Twitter, LinkedIn, Google+, Windows Live, Wordpress, Yahoo, Tumblr, Disqus, Bitty, Foursquare, Dropbox, GitHub, Meetup, and Flickr. To the left of the dropdown are input fields for 'Name', 'Organization', 'Country', 'State', and 'Email Address'. At the bottom of the dropdown menu, there is a link that says 'Show email address in public profile'.

# Digital Identity Card Generation – IdP Selection

Vast & Configurable Collection of Identity Card Storage Providers (IdPs)



The screenshot displays the 'You ID' web application interface. At the top left is the 'You ID' logo, and at the top right are links for 'Logout' and 'Logged in as kidehe'. Below the logo is a profile picture of a man. To the left of the main form are labels for 'Name', 'Organization', 'Country', 'State', and 'Email Address'. The main form area shows a dropdown menu for selecting an 'ID Card Storage Provider'. The dropdown is open, showing a list of options: Box, Dropbox (highlighted), Microsoft One Drive, Google Drive, Twitter, Wordpress, Facebook, ODS Demo Page, Linked Data Profile Document, Local Storage, and Manual Upload. At the bottom of the dropdown, 'Dropbox' is also listed as the selected provider.

Field	Value
Name	Kingsley Uyi Idehen (On LinkedIn)
Organization	Box
Country	Dropbox
State	Microsoft One Drive
Email Address	Google Drive
ID Card Storage Provider	Twitter

Dropdown Menu Options:

- Box
- Dropbox
- Microsoft One Drive
- Google Drive
- Twitter
- Wordpress
- Facebook
- ODS Demo Page
- Linked Data Profile Document
- Local Storage
- Manual Upload

Selected ID Card Storage Provider: Dropbox

# Generated Identity Card

## Your Web-Scale Verifiable Digital Identity Card



Common Name

[Kingsley Uyi Idehen \(LinkedIn\)](#)

Organization

LinkedIn Social Network

Country

US

State/Province

MA

Email Address

[kidehen@openlinksw.com](mailto:kidehen@openlinksw.com)

Web Page

<http://www.linkedin.com/in/kidehen>

Issued

2014-06-05T17:38:25Z

Expiry

2014-06-20T17:38:25Z



[Get Your ID Card](#)



[Add to Contacts](#)



[Public Key](#)

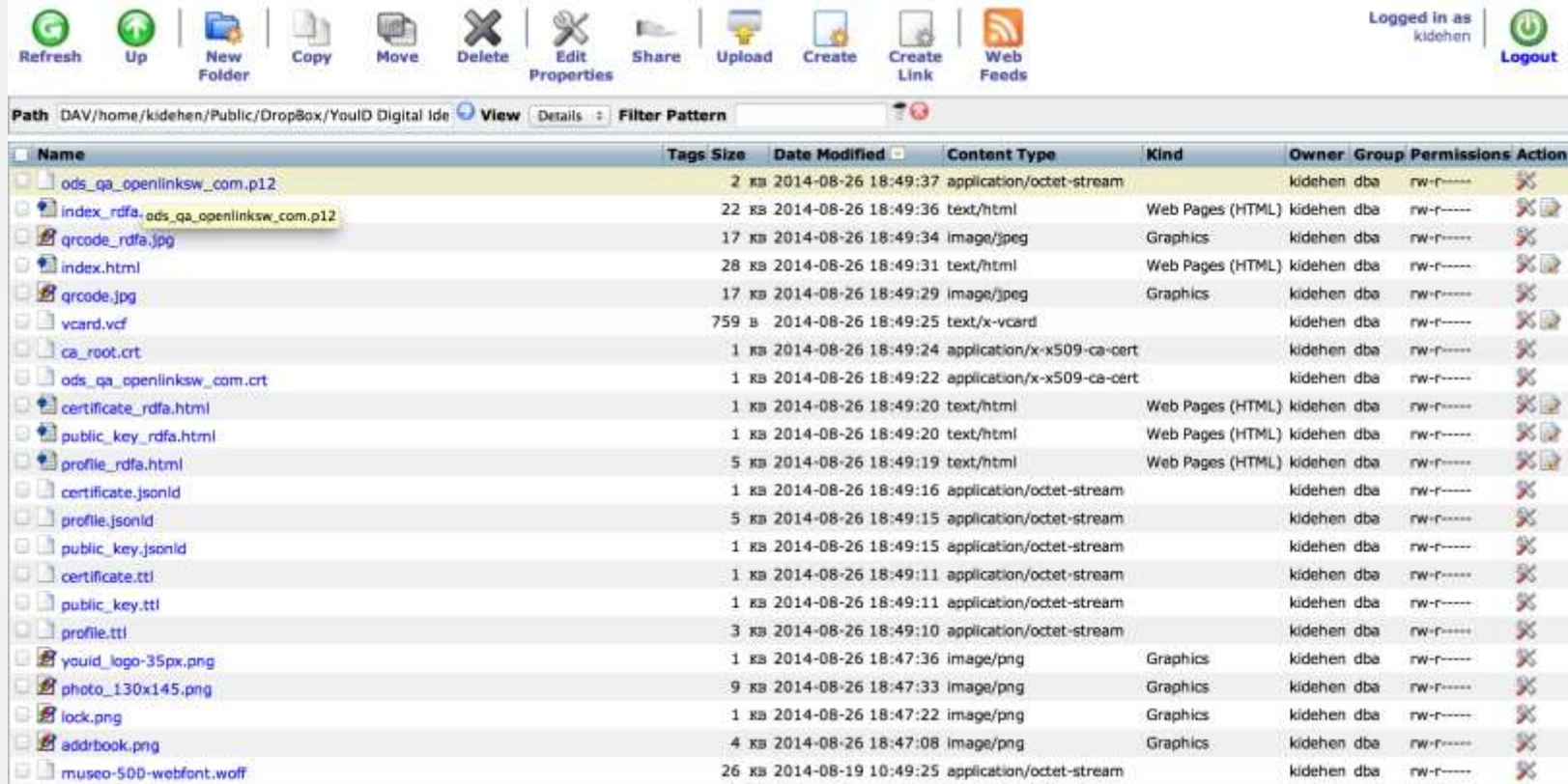


[Issuer Public Key](#)

A Document comprised of content in the form of identity claims that coalesce around an identifier (e.g., HTTP URI) that denotes the Identity Card's subject.

Basically, a document comprised of content that connotes (describes) its subject.

# Other Identity Credentials Related Artifacts



The screenshot shows a web interface for a file storage service. At the top, there is a toolbar with icons for Refresh, Up, New Folder, Copy, Move, Delete, Edit Properties, Share, Upload, Create, Create Link, and Web Feeds. On the right, it says 'Logged in as kidehen' with a Logout button. Below the toolbar, the path is 'DAV/home/kidehen/Public/DropBox/YouID Digital Identity'. The main area is a table listing files and folders.

Name	Tags	Size	Date Modified	Content Type	Kind	Owner	Group	Permissions	Action
ods_qa_openlinksw_com.p12		2 KB	2014-08-26 18:49:37	application/octet-stream		kidehen	dba	rw-r-----	
index_rdfa_ods_qa_openlinksw_com.p12		22 KB	2014-08-26 18:49:36	text/html	Web Pages (HTML)	kidehen	dba	rw-r-----	
qrcode_rdfa.jpg		17 KB	2014-08-26 18:49:34	image/jpeg	Graphics	kidehen	dba	rw-r-----	
index.html		28 KB	2014-08-26 18:49:31	text/html	Web Pages (HTML)	kidehen	dba	rw-r-----	
qrcode.jpg		17 KB	2014-08-26 18:49:29	image/jpeg	Graphics	kidehen	dba	rw-r-----	
vcard.vcf		759 B	2014-08-26 18:49:25	text/x-vcard		kidehen	dba	rw-r-----	
ca_root.crt		1 KB	2014-08-26 18:49:24	application/x-x509-ca-cert		kidehen	dba	rw-r-----	
ods_qa_openlinksw_com.crt		1 KB	2014-08-26 18:49:22	application/x-x509-ca-cert		kidehen	dba	rw-r-----	
certificate_rdfa.html		1 KB	2014-08-26 18:49:20	text/html	Web Pages (HTML)	kidehen	dba	rw-r-----	
public_key_rdfa.html		1 KB	2014-08-26 18:49:20	text/html	Web Pages (HTML)	kidehen	dba	rw-r-----	
profile_rdfa.html		5 KB	2014-08-26 18:49:19	text/html	Web Pages (HTML)	kidehen	dba	rw-r-----	
certificate.jsonld		1 KB	2014-08-26 18:49:16	application/octet-stream		kidehen	dba	rw-r-----	
profile.jsonld		5 KB	2014-08-26 18:49:15	application/octet-stream		kidehen	dba	rw-r-----	
public_key.jsonld		1 KB	2014-08-26 18:49:15	application/octet-stream		kidehen	dba	rw-r-----	
certificate.ttl		1 KB	2014-08-26 18:49:11	application/octet-stream		kidehen	dba	rw-r-----	
public_key.ttl		1 KB	2014-08-26 18:49:11	application/octet-stream		kidehen	dba	rw-r-----	
profile.ttl		3 KB	2014-08-26 18:49:10	application/octet-stream		kidehen	dba	rw-r-----	
youid_logo-35px.png		1 KB	2014-08-26 18:47:36	image/png	Graphics	kidehen	dba	rw-r-----	
photo_130x145.png		9 KB	2014-08-26 18:47:33	image/png	Graphics	kidehen	dba	rw-r-----	
lock.png		1 KB	2014-08-26 18:47:22	image/png	Graphics	kidehen	dba	rw-r-----	
addrbook.png		4 KB	2014-08-26 18:47:08	image/png	Graphics	kidehen	dba	rw-r-----	
museo-500-webfont.woff		26 KB	2014-08-19 10:49:25	application/octet-stream		kidehen	dba	rw-r-----	

**HTML+Microdata, HTML+RDFa, RDF-TURTLE, and JSON-LD**  
Identity Cards. Basically, no distracting RDF document content format and digital sentence notation wars!



# Virtualized Identity Claims Authentication (Web Single-Sign-On)


Identity Authentication Provider:  
ods-qa.openlinksw.com ?

**OPENLINK**  
SOFTWARE  
Making Technology Work For You®

**Authenticate to access**  
[YouID Identity Card Generator](#)

kidehen ..... Login

Or Login Using: WebID-TLS TLS f t in More... ?



In-built support for authenticating Identity Claims -- across a variety of open standards based authentication protocols.

# Data Access Control & Policies

# Data Interaction (Read-Write) Example

# Controlling Access to a SPARQL Endpoint

# Conditional Group Description

Turtle based Description of a Conditional Group (denoted by the URI: <#groupBasicNetID>) for Identity Principals

```
## NetID Conditional Group Description
## This Group provides the foundation for
## virtualization of authentication protocols
## used to control access to a SPARQL Endpoint

<#groupBasicNetID>
a <http://www.openlinksw.com/ontology/acl#ConditionalGroup> ;
<http://xmlns.com/foaf/0.1/name> "Identities Denoted using a NetID based Identifier" ;
<http://www.openlinksw.com/ontology/acl#hasCondition>
  [
    a <http://www.openlinksw.com/ontology/acl#GroupCondition>,
      <http://www.openlinksw.com/ontology/acl#GenericCondition> ;
    <http://www.openlinksw.com/ontology/acl#hasCriteria>
      <http://www.openlinksw.com/ontology/acl#NetID> ;
    <http://www.openlinksw.com/ontology/acl#hasComparator>
      <http://www.openlinksw.com/ontology/acl#IsNotNull> ;
    <http://www.openlinksw.com/ontology/acl#hasValue> 1
  ] .
```

# Conditional Group Loading Template

SPARQL 1.1 based loading of Conditional Group description into  
Virtuoso

```
## Template for Using SPARQL 1.1 to load the NetID Conditional Group Description

WITH GRAPH <http://{CNAME}/acl/graph/groups/http%3A%2F%2Fwww.openlinksw.com%2Fontology%2Facl%23DefaultRealm>
INSERT {
  <#groupBasicNetID>
  a <http://www.openlinksw.com/ontology/acl#ConditionalGroup> ;
  <http://xmlns.com/foaf/0.1/name> "Identities Denoted using a NetID based Identifier" ;
  <http://www.openlinksw.com/ontology/acl#hasCondition>
    [
      a <http://www.openlinksw.com/ontology/acl#GroupCondition>,
        <http://www.openlinksw.com/ontology/acl#GenericCondition> ;
      <http://www.openlinksw.com/ontology/acl#hasCriteria>
        <http://www.openlinksw.com/ontology/acl#NetID> ;
      <http://www.openlinksw.com/ontology/acl#hasComparator>
        <http://www.openlinksw.com/ontology/acl#IsNotNull> ;
      <http://www.openlinksw.com/ontology/acl#hasValue> 1
    ] .
}
```

# SPARQL Endpoint ACL Description Template

Turtle based Description of an ACL (denoted by the URI:  
<#NetIDSpongerAccessRule1>)

```
## Description of ACL rule that grants Sponger access to any identity authenticated using NetID

<#NetIDSpongerAccessRule1>
<http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://www.w3.org/ns/auth/acl#Authorization> ;
rdfs:comment ""This ACL rule grants Sponger access to any identity denoted by a URI where identity claims
              are de-referenced and then verified using a variety of authentication protocols e.g., HTTP Digest
              OAuth, WebID-TLS, OpenID, or Mozilla Persona
              "" ;
<http://xmlns.com/foaf/0.1/maker> {AGENT-NETID-OR-WEBID} ;
<http://www.w3.org/ns/auth/acl#agent> {AGENT-NETID-OR-WEBID} | ;
<http://www.w3.org/ns/auth/acl#accessTo> <urn:virtuoso:access:sparql> ;
<http://www.openlinksw.com/ontology/acl#hasAccessMode> <http://www.openlinksw.com/ontology/acl#Sponge> ;
<http://www.openlinksw.com/ontology/acl#hasRealm> <http://www.openlinksw.com/ontology/acl#DefaultRealm> ;
<http://www.openlinksw.com/ontology/acl#hasScope> <http://www.openlinksw.com/ontology/acl#Query> .
```



# SPARQL ACL Loading Template

SPARQL 1.1 based loading of Conditional Group description into  
Virtuoso


```
## loading Rule into Virtuoso using SPARQL 1.1 INSERT

WITH GRAPH <http://{CNAME}/acl/graph/rules/http%3A%2F%2Fwww.openlinksw.com%2Fontology%2Fac1%23DefaultRealm>
INSERT
{
  <#NetIDSpongerAccessRule1>
  <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://www.w3.org/ns/auth/acl#Authorization> ;
  rdfs:comment """"This ACL rule grants Sponger access to any identity denoted by a URI where
                identity claims are de-referenced and then verified using a variety of authentication
                protocols e.g., HTTP Digest, TLS basic, OAuth, WebID-TLS, OpenID, or Mozilla Persona
                """" ;
  <http://xmlns.com/foaf/0.1/maker> {AGENT-NETID-OR-WEBID};
  <http://www.w3.org/ns/auth/acl#agent> <#groupBasicNetID> ;
  <http://www.w3.org/ns/auth/acl#accessTo> <urn:virtuoso:access:sparql> ;
  <http://www.openlinksw.com/ontology/acl#hasAccessMode> <http://www.openlinksw.com/ontology/acl#Sponge> ;
  <http://www.openlinksw.com/ontology/acl#hasRealm> <http://www.openlinksw.com/ontology/acl#DefaultRealm>;
  <http://www.openlinksw.com/ontology/acl#hasScope> <http://www.openlinksw.com/ontology/acl#Query> .
}
```

# Controlled Access to a SPARQL Endpoint Example

# Insert, Update, Delete – Step 1

Page showing errant data (note “AQ”) from a Nanotation laced Tweet

 OPENLINK SOFTWARE

Logged in as: dba | Logout

FacetsDescriptionMetadataSettings





**About:** <http://t.co/09kKNULYwZ> Goto: [Sponge](#) [NotDistinct](#) [Permalink](#)  
An Entity of Type: [schema:WebPage](#), within Data Space: [link:ddata.uri:burner.com](#) associated with source [document\(s\)](#)

Type: [WebPage](#) Command: [Start New Facet](#) [Go](#)

AQ covering magnitude of Facebook data centers.

**Properties Objects**  
[type](#) [WebPage](#)  
[comment](#) [AQ covering magnitude of Facebook data centers.](#)  
[described by](#) <https://twitter.com/kidehen/status/50713330566699264>  
[is link of](#) [datacenterknowledge.com/the-facebook-d...](#)  
[is subject of](#) [\[2014-09-03 14:47:55\]: Embedded Turtle Statement 1](#)  
[\[2014-09-03 14:47:55\]: Embedded Turtle Statement 2](#)

Faceted Search & Find service v1.13.61  
Alternative Linked Data Views: [PivotViewer](#) | [SPARQL](#) | [QDE](#) | Raw Data in: [CXML](#) | [CSV](#) | [RDF](#) ( [N-Triples](#) [N3/Turtle](#) [JSON/XML](#) ) | [OData](#) ( [Atom](#) [JSON](#) ) | [Microdata](#) ( [JSON](#) [HTML](#) ) | [JSON-LD](#) | [About](#)

OpenLink Virtuoso version 07.10.3211, on Linux (x86\_64-redhat-linux-gnu), Single-Server Edition (378 GB total memory)  
Data on this page belongs to its respective rights holders.  
Virtuoso Faceted Browser Copyright © 2009-2014 OpenLink Software

# Insert, Update, Delete – Step 2

SPARQL 1.1 based Insert, Update, Delete via Basic SPARQL Query Editor



The screenshot displays the OpenLink Virtuoso SPARQL Query Editor web interface. The header includes the OpenLink Software logo and the title "OpenLink Virtuoso SPARQL Query Editor". Below the header, there is a navigation bar with links for "About", "Namespace Prefixes", "Inference rules", "Permalink", and "SPARQL". The main content area is divided into two sections: "Default Graph URI" and "Query Text". The "Query Text" section contains a SPARQL query for inserting and deleting data.

Logged in as [dba](#) | [Change Login](#) | [Logout](#)

[About](#) | [Namespace Prefixes](#) | [Inference rules](#) | [Permalink](#) | [SPARQL](#)

Default Graph URI

Run Query

Query Text

```
# INSERT and UPDATE Query
# Fixing a Typo from a Sponged Tweet that includes RDF based nanotations

WITH <https://twitter.com/xidehen/status/50713330566699264>
DELETE { <http://t.co/09kKNULYwZ> rdfs:comment "AQ covering magnitude of Facebook data centers." }
INSERT { <http://t.co/09kKNULYwZ> rdfs:comment "FAQ covering magnitude of Facebook data centers." }
WHERE { <http://t.co/09kKNULYwZ> rdfs:comment "AQ covering magnitude of Facebook data centers." }
```

# Insert, Update, Delete – Step 2


SPARQL 1.1 based Insert, Update, Delete via Basic SPARQL Query Editor








# Insert, Update, Delete – Step 2

SPARQL 1.1 based Insert, Update, Delete via Basic SPARQL Query Editor

Identity Authentication Provider:  
linkeddata.uriburner.com ?

 **OPENLINK**  
SOFTWARE  
Making Technology Work For You®

**Authenticate to access**  
[Private Graph <https://twitter.com/kidehen/status/507144832125792256>](https://twitter.com/kidehen/status/507144832125792256)

Or Login Using:       ?

# Insert, Update, Delete – Step 3

Successful SPARQL 1.1 based Insert, Update, Delete via Basic SPARQL Query Editor

**callret-0**

Modify <<https://twitter.com/kidehen/status/507133305666699264>>, delete 1 (or less) and insert 1 (or less) triples -- done



# Insert, Update, Delete – Step 3

Page showing correction of errant data (note “FAQ” where it was “AQ”) from a  
Nanotation laced Tweet

The screenshot displays the OpenLink Virtuoso Faceted Search & Find service interface. At the top, the OpenLink Software logo is visible on the left, and the user is logged in as 'dba' with a 'Logout' link on the right. Below the header, there are tabs for 'Facets', 'Description', 'Metadata', and 'Settings'. The 'Description' tab is currently selected.

The main content area shows the following information:

- About:** <http://t.co/09kKNULYwZ> [Goto Sponser](#) [NoDistances](#) [Permalink](#)
- An Entity of Type : `schema:WebPage`, within Data Space : `linkeddata.urlliburner.com` associated with source document(s)
- Type: `WebPage` Command: `Start New Facet`

A text box contains the corrected data: *FAQ covering magnitude of Facebook data centers.*

Below this, the 'Properties Objects' section lists the following:

- `type`: `WebPage`
- `comment`: `FAQ covering magnitude of Facebook data centers.`
- `is link of`: `datacenterknowledge.com/the-facebook-d...`
- `is subject of`: `[2014-09-03 15:48:26]: Embedded Turtle Statement 1`  
`[2014-09-03 15:48:26]: Embedded Turtle Statement 2`

At the bottom of the interface, there is a footer section with the following information:

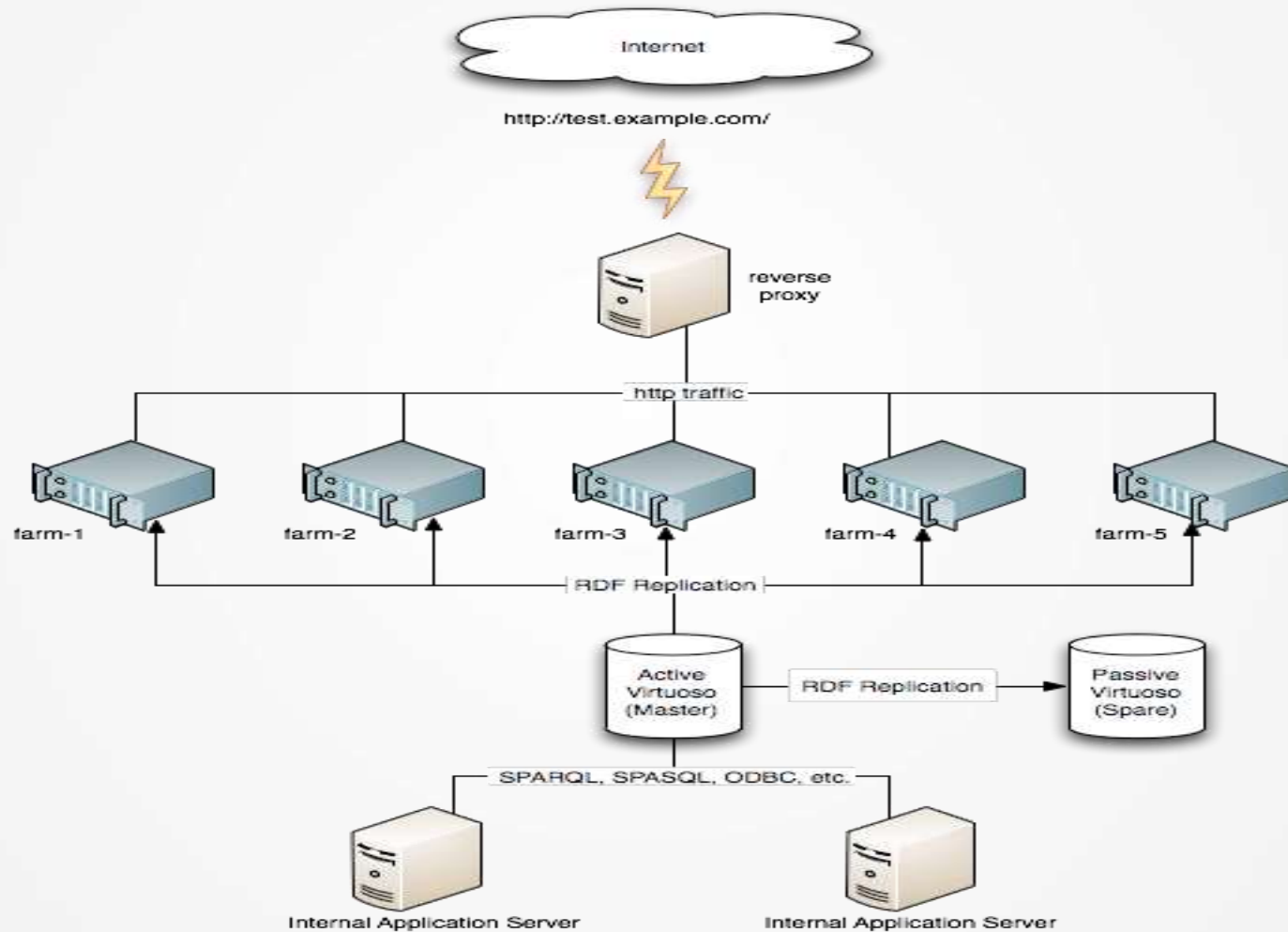
- Faceted Search & Find service v1.13.61
- Alternative Linked Data Views: [FirstView](#) | [SPARQL](#) | [ODE](#)
- Raw Data in: [CXML](#) | [CSV](#) | [RDF](#) | [N-Triples](#) | [N3/Turtle](#) | [JSON XML](#) | [OData](#) | [Atom](#) | [JSON](#) | [Microdata](#) | [JSON HTML](#) | [JSON-LD](#) | [About](#)
- OpenLink Virtuoso version 07.10.3211, on Linux (x86\_64-redhat-linux-gnu), Single-Server Edition (378 GB total memory)
- Data on this page belongs to its respective rights holders.
- Virtuoso Faceted Browser Copyright © 2009-2014 OpenLink Software

# Clustering & High Availability

# Cluster Configuration Options

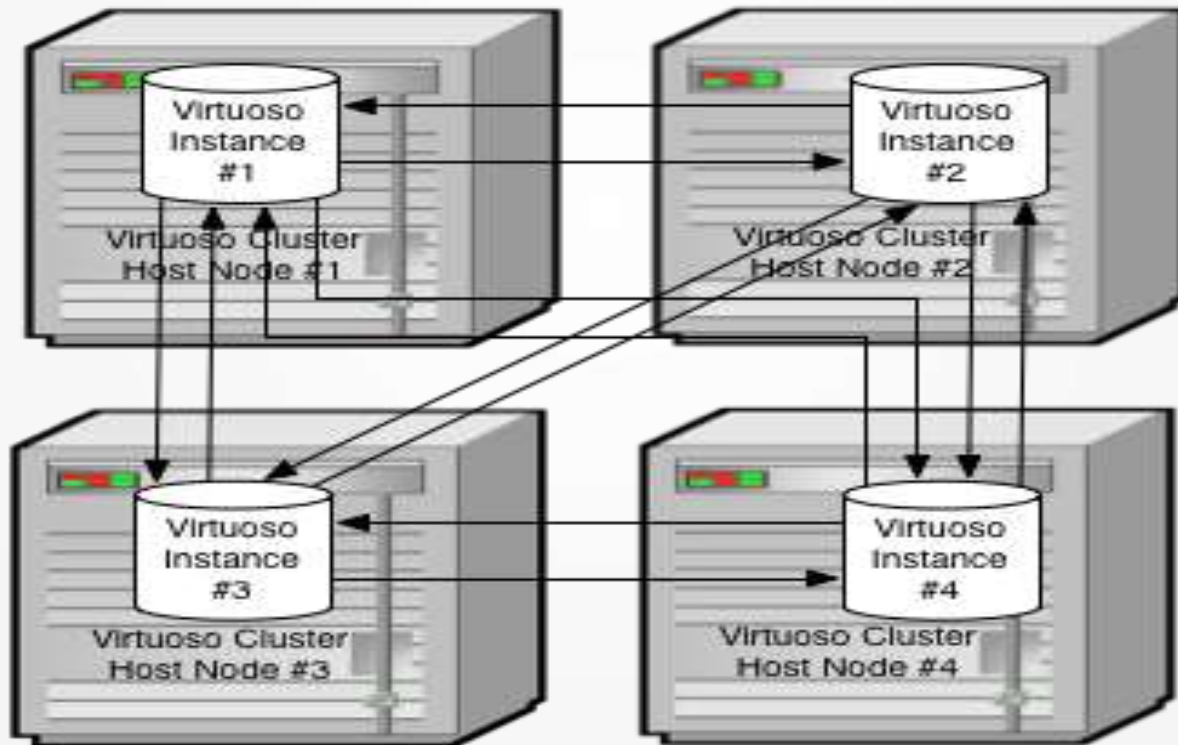
- ❑ Data is replicated on a transactional basis (i.e., near real-time basis) using different replication topologies
- ❑ Data is partitioned horizontally across machines
- ❑ Partitions may be paired up in quorums for additional redundancy and high availability
- ❑ Elastic mode ensures no data loading as cluster machine constituency evolves.

# RDF Graph Replication Cluster



# Cluster Architecture Diagrams

**Shared-Nothing Cluster:  
4 Virtuoso Instances,  
4 Cluster Nodes,  
4 Cluster Host Node**



# Blog Post Links

- [Preloaded & Preconfigured Virtuoso Instances on Amazon EC2 Cloud](#)
- [Simple Linked Open Data Deployment Tutorial](#)
- [Linked \(Open\) Data vs Linked \(Local\) Data based SQL Data Virtualization](#)
- [Oracle Data De-Silo-Fication](#)
- [SQL Server Data-De-Silo-Fication](#)
- [DB2 Data De-Silo-Fication](#)
- [Loosely Coupled Read-Write Web Interactions](#)
- [YouID Digital Identity Card Generator App for iOS and Android](#)

# Additional Collateral Links

- [Virtuoso Features & Benefits Guide](#)
- [Virtuoso HowTo Guides](#)
- [Virtuoso Description Document](#)
- [Virtuoso Linked Data Document Collection](#)
- [Universal Data Access Drivers Description Document](#)
- [OpenLink Software Linked Data Document Collection](#)
- [Understanding Data Presentation](#)
- [Glossary of Terms](#)



# Additional Information

## Web Sites

[OpenLink Software](#)

[YouID](#) – Digital Identity Card (Certificate) Generator

[OpenLink Data Spaces](#) – Semantically enhanced Personal & Enterprise Data Spaces & Collaboration Platform

[OpenLink Virtuoso](#) - Hybrid Data Management, Integration, Application, and Identity Server

[Universal Data Access Drivers](#) - High-Performance ODBC, JDBC, ADO.NET, and OLE-DB Drivers

[LDAP and NetID-TLS](#) – How to use LDAP scheme URIs with NetID-TLS Authentication

## Social Media Data spaces

<http://kidehen.blogspot.com> (*weblog*)

<http://www.openlinksw.com/blog/~kidehen/> (*weblog*)

<https://plus.google.com/112399767740508618350/posts> (*Google+*)

<https://twitter.com/#!/kidehen> (*Twitter*)

Hashtag: #LinkedData (*Anywhere*).