



A Linked Data Approach for Integrating Multi-scale Models & Data for Human Health & the Environment

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Implementing Big Open Data in Government through Open Collaboration

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This presentation: <http://slideshare.net/3roundstones>

Problem statement:

- Harness increasingly larger & more complex datasets to evaluate the potential for ecological impacts & more accurately predict factors that contribute to illness or diagnose disease



Needed:

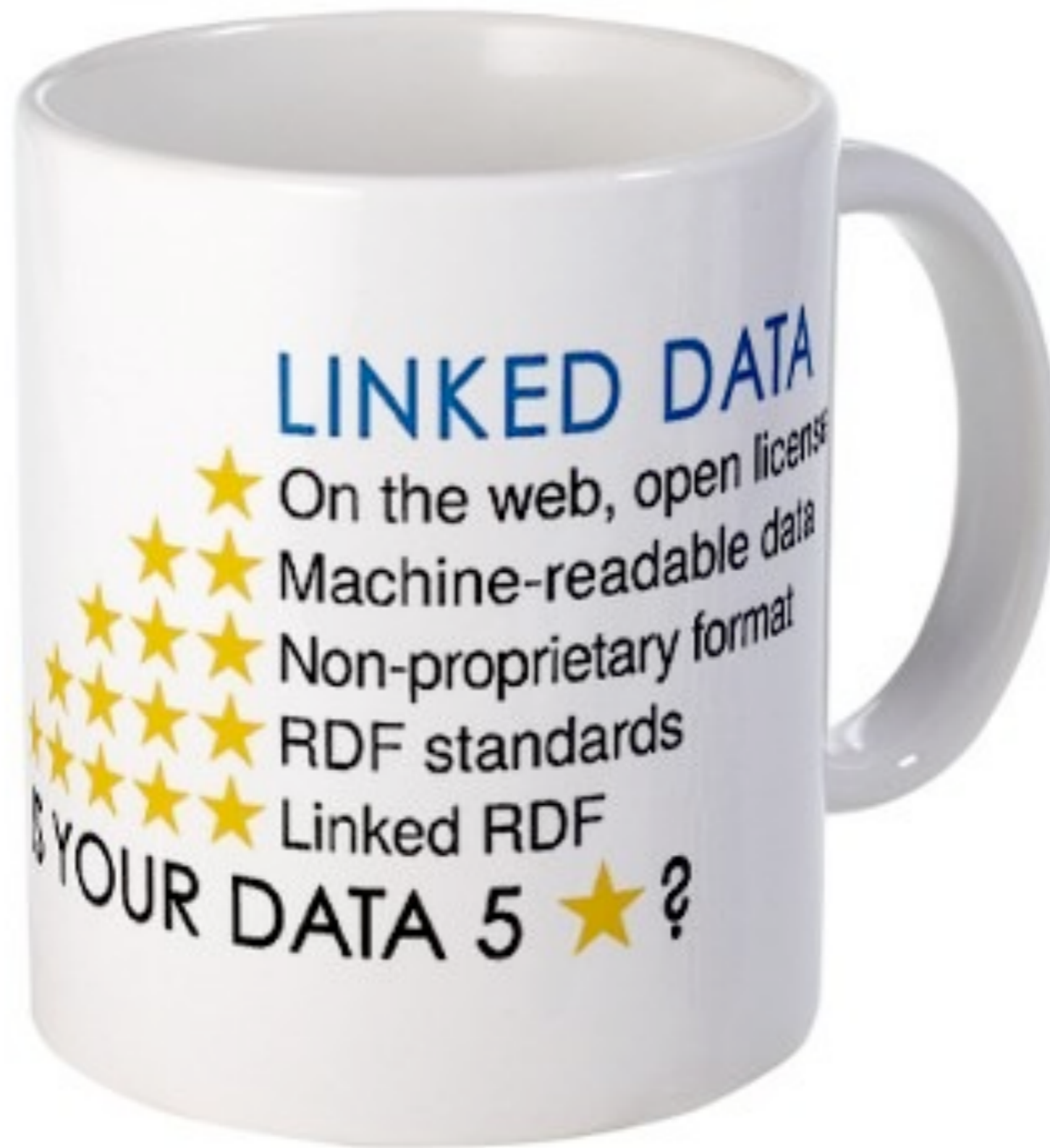
- The ability to integrate & manage large amounts of data in a rigorous & transparent manner
- Discovery through interaction of scientific communities, including biomedical informatics, evidence-based medicines, regulatory science, defense & intel communities



There is a better way to connect data ...

- No one vendor owns it
- It scales ... to Web-scale
- Doesn't require a super model
- Based on International Data Exchange Standards (RDF, SPARQL)



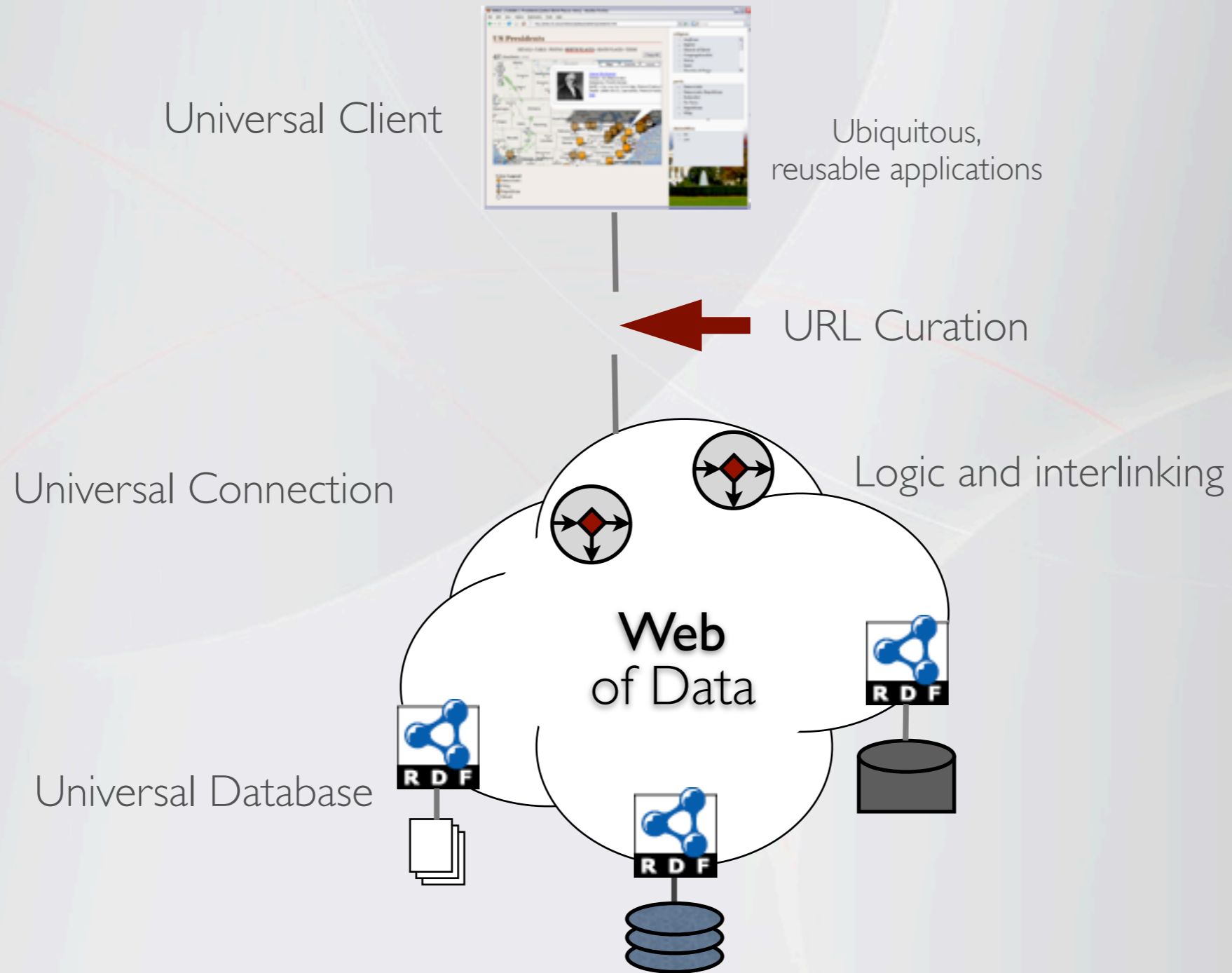


LINKED DATA

- ★ On the web, open license
- ★ Machine-readable data
- ★ Non-proprietary format
- ★ RDF standards
- ★ Linked RDF

YOUR DATA 5 ★ ?

Linked Data in Context



What is next for Open Data in the Web?

- Structured data on the Web is rapidly becoming mainstream
- Authorities starting to publish in a new way
- In 2012 we're seeing Apps Challenges, hack-a-thons, funding (\$1M-\$200M)



Governments

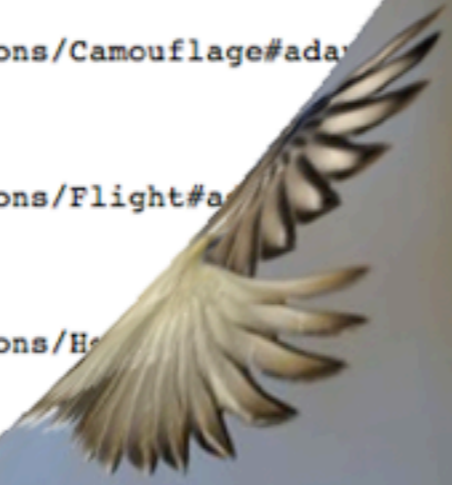
Goals: Governmental transparency and/or improved internal efficiencies (data warehouses)




```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .  
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .  
@prefix owl: <http://www.w3.org/2002/07/owl#> .  
@prefix foaf: <http://xmlns.com/foaf/0.1/> .  
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@prefix dctypes: <http://purl.org/dc/dcmitype/> .  
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  rdfs:label "Migration" .  
  
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  rdfs:label "Moulting"  
  
<http://www.bbc.co.uk  
  a wo:Reproduct  
  rdfs:label
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Mallards are the archetypal and most recognisable ducks. They are found wherever there is water, from rivers and lakes to remote ponds and coastal marshes. It is their adaptability to all kinds of environment that has brought mallards to towns and parks. The males have a glossy green head and white neck ring, but as the females lack in colour they make up for it with noise. The familiar 'quack' is the call of a female summoning her ducklings. Mallards are the ancestors of many breeds of domestic ducks and readily interbreed with them.

Search the BBC



Introduction

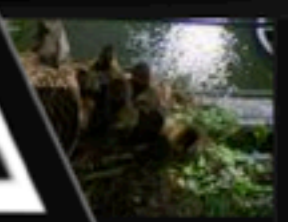
Local amenity
Bill Oddie Goes Wild
Duck ponds provide a useful resource for wild birds.

Bill Oddie
Urchfont's domestic ducks are a rowdy lot that still behave like wild ducks.

A mallard
plays a risky game to lure a mink away from her hidden chicks.

ducklings encounter
weir for the first time.

Top 10
up a
for a
long leap for fledging ducklings.



WE'VE SEEN THIS BEFORE



Why is RDF important?

- It is an international standard for publishing data on the Web (public and private)
- Data exchange model
 - Serializations include RDF/XML, N-triples, N3, Turtle ...
- It is the future of using the Web



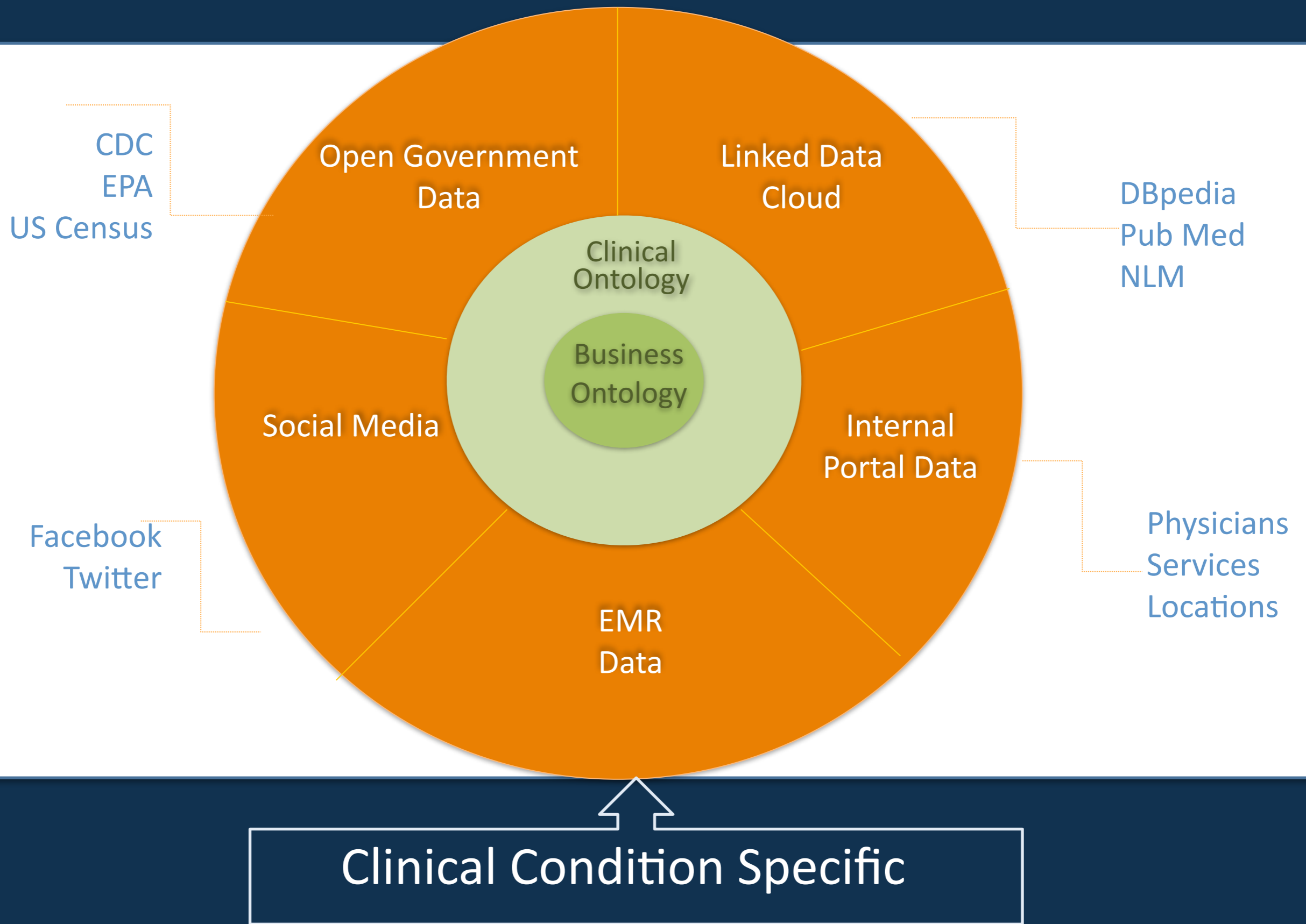
What you can do ...

- Good = Use Data Standards (RDF) to publish metadata about data and models
- Better = Use a Linked Data approach to publish **all** your open data on the Web
- Best = Link your data + models using a Linked Data approach
- Web architecture, Web-scale





S E N T A R A[®]



Value Proposition

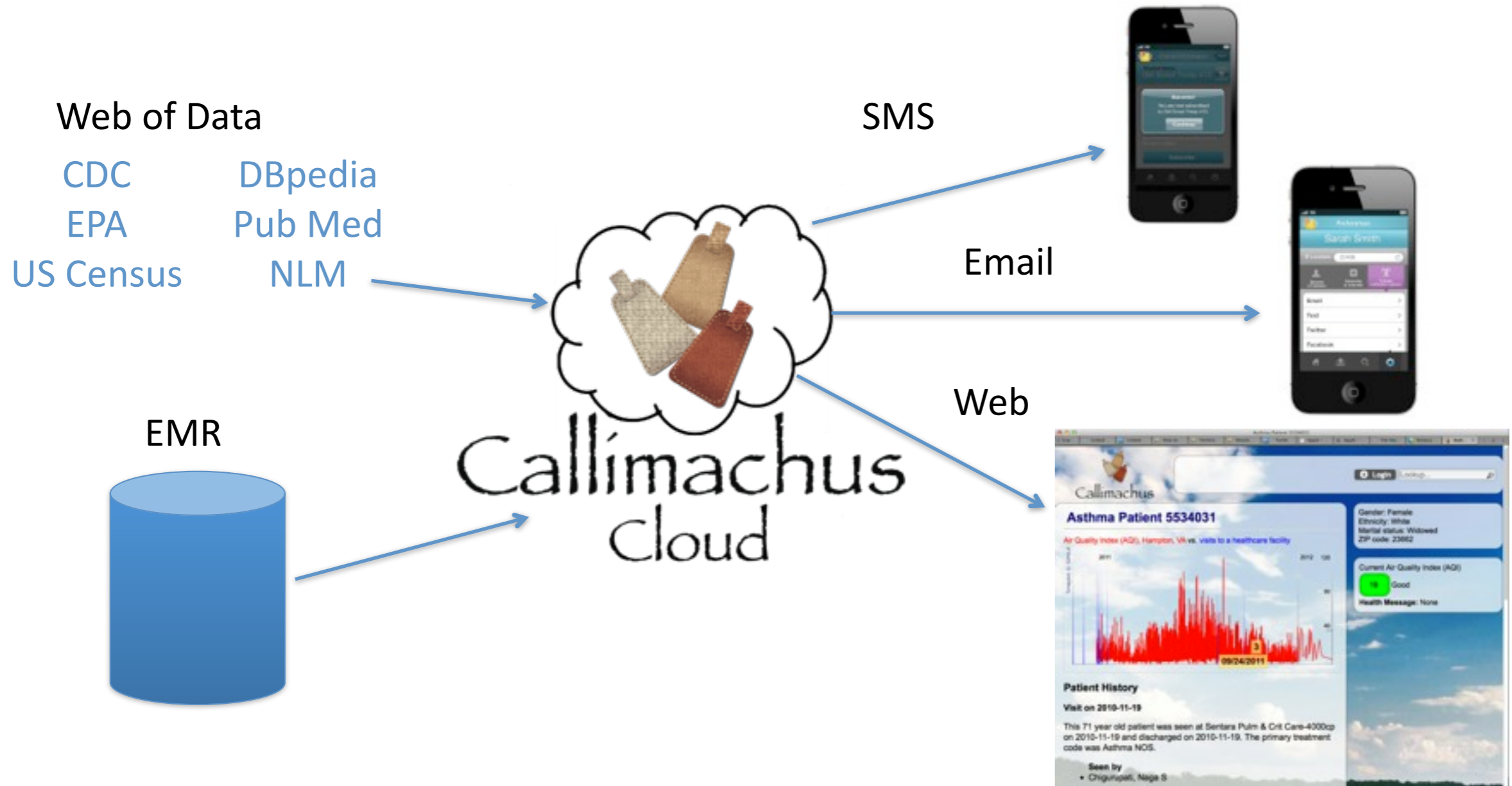
- Decrease costly emergency department visits
- Reduce hospital re-admissions after treatment
- Improved self-care and medication compliance
- Education of triggers and disease management



Functional Model

1. Define target population and clinical data from electronic medical record
2. Identify sources of open government data related to environmental, weather, and other variables related to chronic pulmonary disease exacerbations
3. Combine open content from NLM, PubMed, Medline to support education
4. Leverage a Linked Data approach, using Open Source and international data exchange standards (RDF)
5. Alert patient of possible hazardous conditions and recommend appropriate actions

Leverage Linked Data, Open Source & Standards





» rdf » 2012 » sentara » index

Today's Asthma Forecast

Today's EPA forecast

[Implications of forecast for athmatics](#)

High Alert

Personalized Recommendations

What you can do

- 1. Stay indoors
- 2. Avoid stress
- 3. Avoid dust, smoke and pollutants

If you are experiencing these symptoms, then call your doctor

- 1. Bluish color to the lips and face
- 2. Extreme difficulty breathing
- 3. Severe anxiety due to shortness of breath

- Friend
- Doctor
- Pharmacy
- ER

Learn About Asthma

Information

- [General](#)
- [Research](#)
- [Kids info](#)

Community

- [Well talk](#)
- [Breathe blog](#)
- [Facebook](#)

Questions

- [Ask a Nurse](#)
- [Wellness hotline](#)

Anticipate and Prevent

Your Asthma history

- [30 Jan 2011](#) - Trip to ER
- [2 Mar 2011](#) - Doctor's visit *new medication*
- [6 May 2011](#) - Doctor's visit
- [9 Jul 2011](#) - Trip to ER
- [12 Aug 2011](#) - Doctor's visit *new medication*
- [6 Oct 2011](#) - Doctor's visit *new medication*
- [3 Apr](#) - Trip to ER

View | Edit | Discussion | Describe | History

Directory

- About
- Directory listing
- View by categories
- Directory statistics
- Add organization
- Raw directory data

Site

- Main article
- Home folder
- Site map
- Recent changes

3 Round Stones

- Linked Data Demo

Sample apps

- Annotation Demo
- HelloWorld
- School Wards
- Create a new Journal

Toolbox

- What links here
- Related changes
- Introspect resource
- Permissions
- Print this page

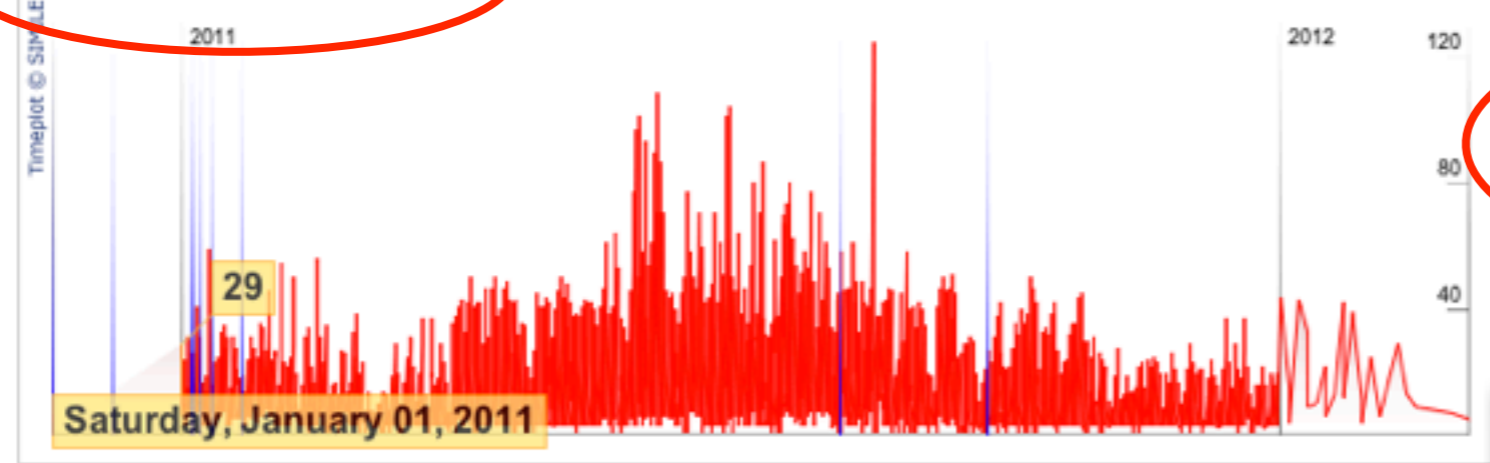


This resource was last modified at 12:45 pm, 25 Apr



Asthma Patient 5534031

Air Quality Index (AQI), Hampton, VA vs. visits to a healthcare facility



Gender: Female
Ethnicity: White
Marital status: Widowed
ZIP code: 23662

Current Air Quality Index (AQI)
19 Good
Health Message: None

Patient History

Visit on 2010-11-19

This 71 year old patient was seen at Sentara Pulm & Crit Care-4000cp on 2010-11-19 and discharged on 2010-11-19. The primary treatment code was Asthma NOS.

Seen by

- Chigurupati, Naga S

Visit on 2010-12-09

This 71 year old patient was seen at Sentara Careplex Hospital Sentara Pulm & Crit Care-4000cp on 2010-12-09 and discharged on 2010-12-09. The primary treatment code was Asthma NOS.

Seen by

- Chigurupati, Naga S Goldberg, Alan

Visit on 2011-01-04

This 71 year old patient was seen at Sentara Careplex Hospital on 2011-01-04 and discharged on 2011-01-04. The primary treatment code was Asthma NOS.

Seen by

Shows:

- 1) Air Quality data from US EPA
- 2) Anonymized EMR data
- 3) Doctor's details from CSV file

Uses Callimachus, a Linked Data Management Platform

Tools & best practices?

- Large and small vendors are involved in Linked Data
 - From Oracle, IBM to 3 Round Stones
 - Listing of active projects, companies and research See <http://dir.w3.org/>
 - Best practices, see <http://www.w3.org/2011/gld/charter>

- Callimachus is a framework for data-driven applications based on [Linked Data](#) principles
- Callimachus allows Web developers to easily create data driven applications for the Web
- It is Open Source (FLOSS)
- <http://callimachusproject.org>



Callimachus





- Scope
- Deliverables
- Dependencies and Liaisons
- Participation**
- Communication
- Decision Policy**
- Patent Policy**
- About this Charter**

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](#)

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

<http://www.w3.org/2011/gld/charter>

Recommendations

- Leverage the work of others and work cooperatively...
- Be prepared for the scientific community & public to demand that data be published in **re-usable format** (RDF)
- Demand your vendors use **Open Source** whenever possible
- Incentivize industry & STM publishers to do the right thing
- Open vs. proprietary technologies & data formats ... be **OPEN**
- Beware of semantic “pixie dust” - be “an educated consumer” (and scientist!)
- Solutions must embrace International Standards and published Best Practices (W3C, OGC, IETF, OMG)
- Define a URI Policy and Strategy, document it and ensure scientists use it!
- **Our future is all connected!**





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