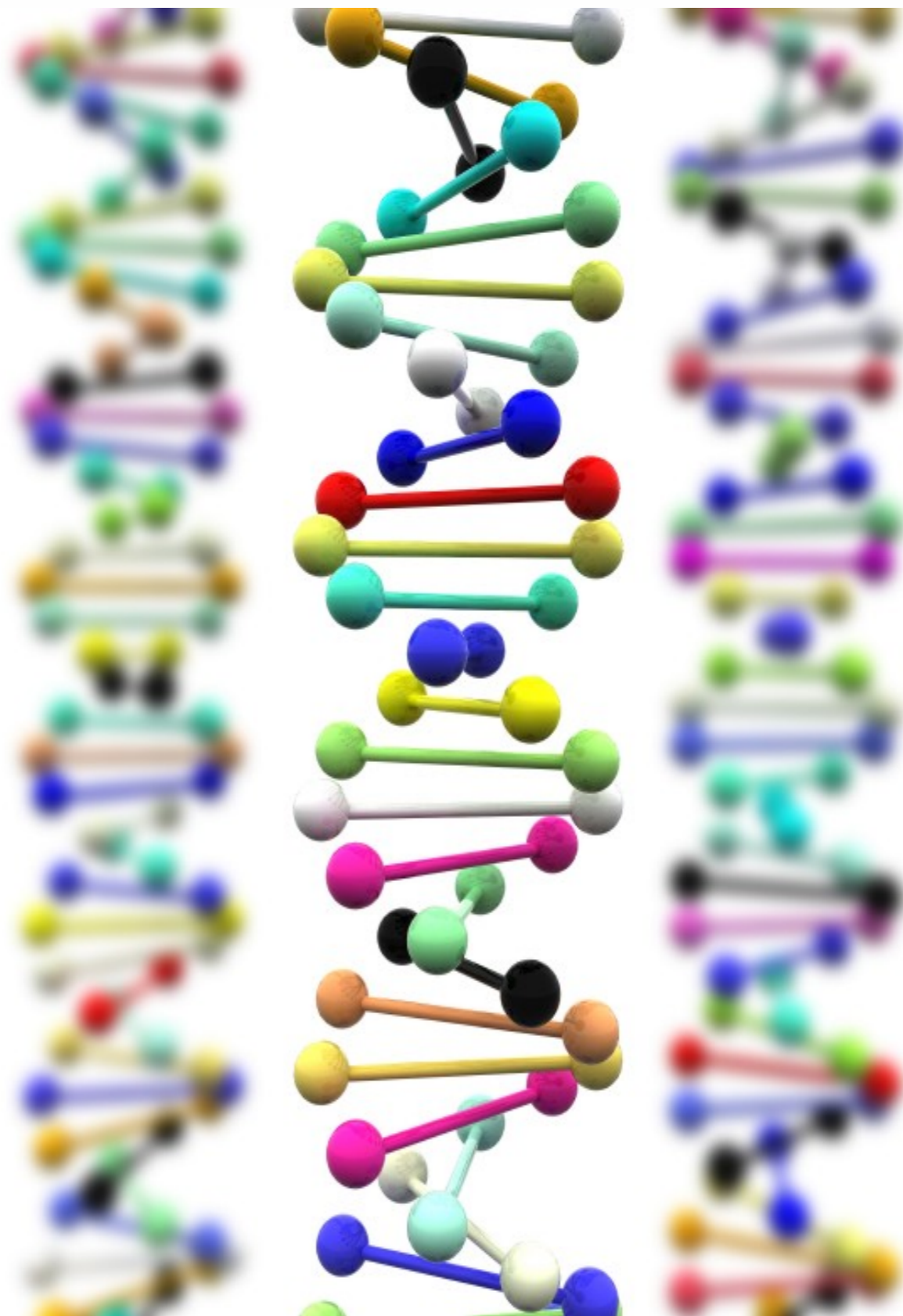


WebGUI & the Semantic Web

William McKee

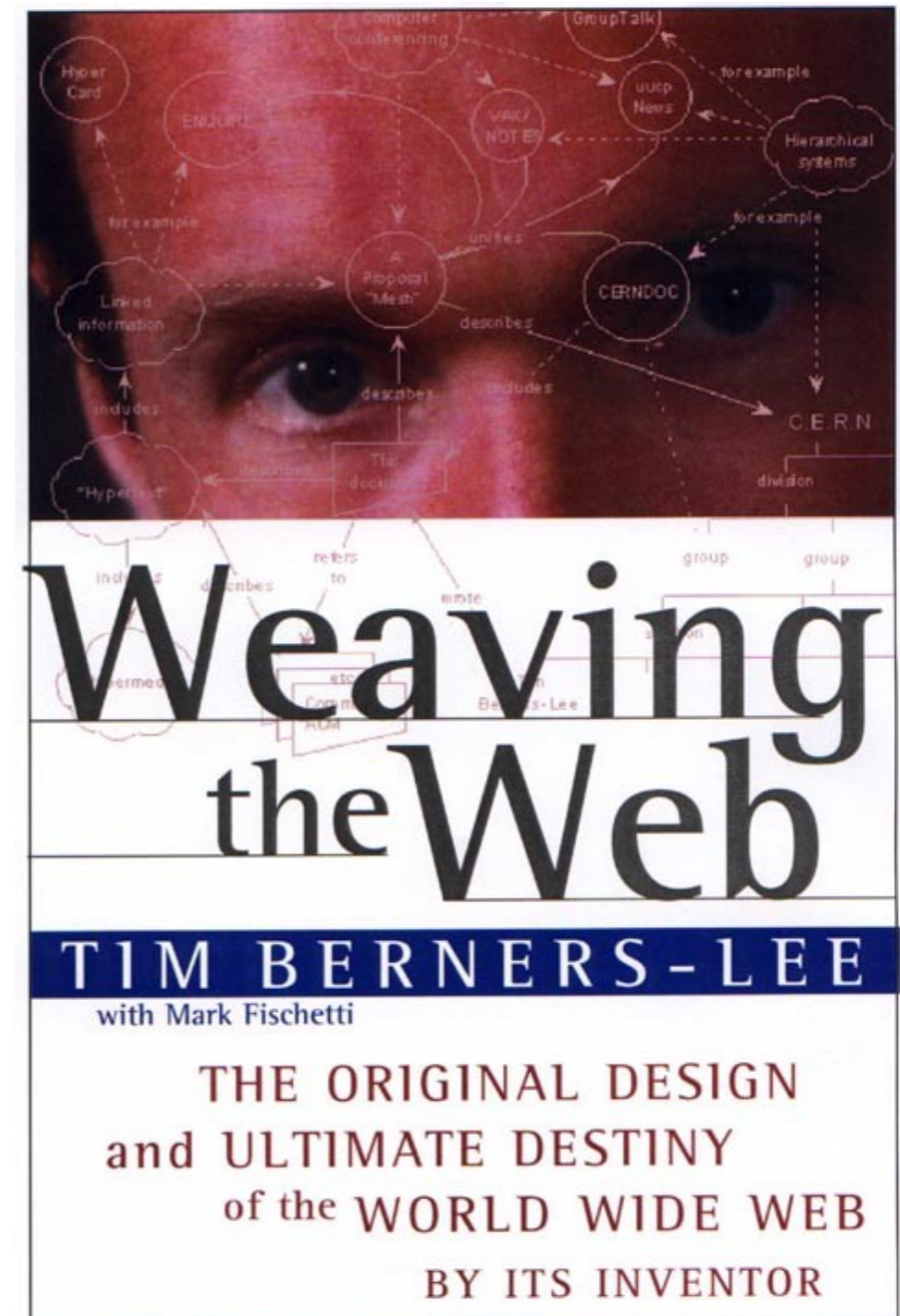
william@knowmad.com

WebGUI Users Conference 2009



Goals of this Presentation

- To learn more about the Semantic Web
- To share Tim Berners-Lee's vision of the Web
- To reinspire the WebGUI community around the potential of Web technology
- To show you how to implement Semantic Web technologies into your WebGUI site



Defining the Semantic Web



Defining the Semantic Web

Background & History

“The Web of Meaning” / Web 3.0

Many Possibilities

Background & History

- **The Web** – envisioned & developed in 1989 while working at CERN
- **Goal** – build a collaborative, information sharing network
- **Key Features** –
 - Browse & Create
 - Universal Access
 - Privacy
 - Trust



“The Web of Meaning”

Rise of the Semantic Web

- The vision for a Semantic Web came from Tim Berners-Lee's book Weaving the Web, ©1999
- Part 1 => human-human collaboration
- Part 2 => machine analysis of Web content



“The Web of Meaning”

Requisites for a Semantic Web

- Organizing data, adding meaning & creating query tools
- Requires numerous technologies that work together to create a coherent output
- Know-how to implement a Semantic Web involves multiple disciplines (linguistics, information science, computer science, philosophy and more)



“The Web of Meaning”

W3C Definition

“The goal of the Semantic Web initiative is as broad as that of the Web: to create a universal medium for the exchange of data. It is envisaged to smoothly interconnect personal information management, enterprise application integration, and the global sharing of commercial, scientific and cultural data. Facilities to put machine-understandable data on the Web are quickly becoming a high priority for many organizations, individuals and communities.

“The Web can reach its full potential only if it becomes a place where data can be shared and processed by automated tools as well as by people. For the Web to scale, tomorrow's programs must be able to share and process data even when these programs have been designed totally independently.”



Many Possibilities

Use Cases

- Improved Search
- Distributed Database
- Intelligent Agents
- Web Services
- Trust Networks

See Resources for additional Case Studies & Use Cases.

State of the Semantic Web



State of the Semantic Web

Technologies

W3C Accomplishments

Implementations

Technologies

Structure: XML

XML

```
<?xml version="1.0"
<quiz>
  <question>
    Who was the forty-second
    president of the U.S.A.?
  </question>
  <answer>
    William Jefferson Clinton
  </answer>
  <!-- Note: We need to add
    more questions later.-->
</quiz>
```

XML

- Provides a structured format for marking content
- Makes content human *and* machine readable

Technologies

Data Model: RDF



```
<?xml version="1.0"?>
<rss version="2.0">
  <channel>
    <title>Lift Off News</title>
    <link>http://liftoff.msfc.nasa.
    <description>Liftoff to Space E
    <language>en-us</language>
    <pubDate>Tue, 10 Jun 2003 04:00
    <lastBuildDate>Tue, 10 Jun 2003
    <docs>http://blogs.law.harvard.
    <generator>Weblog Editor 2.0</g
    <managingEditor>editor@example.
    <webMaster>webmaster@example.co
    <ttl>5</ttl>
```



- Provides a language for describing Web resources
- Essentially a simple data model
- Uses tuples – subject, property, value

Technologies

Ontologies: Knowledge Representation

- Define relationships between objects
- Provide additional vocabulary along with a formal semantics.

*“For the web, ontology is an **Dublin Core** **OWL** description of web information and relationship **SKOS** on web information.”*

– W3Schools.com

FOAF

RDFS

Technologies

Ontologies: FOAF Example

- “The Friend of a Friend (FOAF) project is creating a Web of machine-readable pages describing people, the links between them and the things they create and do”

```
<foaf:Person rdf:about="#me" xmlns:foaf="http://xmlns.com/foaf/0.1/">  
  <foaf:name>Dan Brickley</foaf:name>  
  <foaf:mbox_sha1sum>241021fb0e6289f92815fc210f9e9137262c252e</foaf:mbox_sha1sum>  
  <foaf:homepage rdf:resource="http://danbri.org/" />  
  <foaf:img rdf:resource="/images/me.jpg" />  
</foaf:Person>
```

Technologies

Query: SPARQL

- Standard means of querying any store of RDF
- Enables the 'joining' of decentralized collections of RDF data.

```
SELECT ?title ?authorName WHERE {  
  ?paper dc:title ?title .  
  ?paper skos:subject [ skos:prefLabel "Semantic Web" ] .  
  ?paper dc:creator ?author .  
  ?author foaf:name ?authorName .  
  ?paper dc:date ?date .  
} ORDER BY ?date LIMIT 3
```

- Result is returned as XML.

Technologies

Where do we stand today?

- Many of the above mentioned technologies are W3C recommendations
- Reaching critical mass of technologies necessary to implement a web of meaning
- There are still many incomplete components and challenges for realizing a Semantic Web
 - Rules – inferring new information
 - Unifying Logic
 - Proof & Trust
 - Cryptography

W3C Accomplishments



- Pushing for Web Standards since 1994
- Currently has 356 member organizations
- Semantic Web specifications
 - XML, RDF – stable specifications since 2004
 - OWL – standard since 2004
 - SPARQL – standard since 2008
 - SKOS – became latest recommendation in August
- Claims that there are “over 10 million Semantic Web documents on the Web” today

Implementations

- Formats
 - RSS
 - Microformats
 - RDFa
- Public Datasets
 - dbpedia – Wikipedia as RDF 
 - RDF Book Mashup – merges Amazon & Google data
 - IngentaConnect – over 200 million bibliographic entries

Implementations

Semantic Web Services



computational... knowledge engine

Input interpretation: *Mathematica form*
Madison, Wisconsin city population

Result:
228 775 people (2007 estimate)

Nearby larger cities: *Show metric units*

Milwaukee, Wisconsin	73 miles east	602 191 people
Chicago, Illinois	121 miles southeast	2.837 million people

Computed by: *Wolfram Mathematica* [Source information >](#) Download as: [PDF](#) | [Live Mathematica](#)

www.WolframAlpha.com
Knowledge-based computing




SEMANTIC INFORMATION MASHUP

[Add More Info](#) [Start New](#)

Tim Berners-Lee

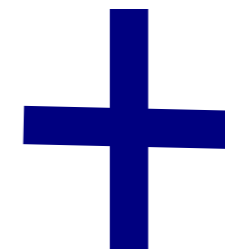
picture:



given name: Tim [1,6,15]
family name: Berners-Lee [1,6,15]
comment: Sir Timothy John Berners-Lee OM KBE FRS FREng FRSA (born 8 June 1955) is an inventor of the World Wide Web. On 25 December 1990 he implemented the first successful server via the Internet with the help of Robert Cailliau and a young student staff at CERN. He is also the founder of the World Wide Web Consortium (W3C) and the World Wide Web Foundation.

www.Sig.ma
Live views on the Web of Data

Implementing Semantic Technologies in WebGUI



Implementing Semantic Web

Marking up your content

Linking data into your site

Perl libraries

Marking up your content

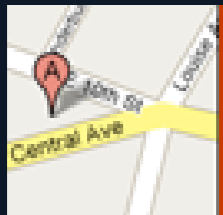
Using RDFa

PHYSICAL ADDRESS:

Knowmad Technologies

909 Central Ave. Ste. 4

Charlotte,



```
<div xmlns:v="http://rdf.data-vocabulary.org/#" typeof="v:Organization">
  <div id="contact-info">
    <h3>Physical Address:</h3>
    <div rel="v:address">
      <p>
        <span property="v:name">Knowmad Technologies</span><br />
        <span property="v:street-address">909 Central Ave. Ste. 4</span><br />
        <span property="v:locality">Charlotte</span>,
        <span property="v:region">NC</span>
        <span property="v:postal-code">28204</span>
      </p>
    </div>
  </div>
</div>
```

Linking Data

- Power of RDF/SPARQL vs API's (RDF Book Mashup integrates data from Amazon & Google)
- Requires data providers



WebGUI Content Managers Guide 7.6

Kristi McCombs

<http://www4.wiwiwi.de/>

```
-<rdf:RDF>
```

```
-<rdf:Description rdf:about="http://www4.wiwiss.fu-berlin.de/bookmashup/  
  <dc:license rdf:resource="http://www.amazon.com/AWS-License-home-pa  
  node=3440661&no=12738641&me=A36L942TSJ2AJA"/>
```

```
  <dc:license rdf:resource="http://www.google.com/terms_of_service.html",  
</rdf:Description>
```

```
-<foaf:Document rdf:about="http://www4.wiwiss.fu-berlin.de/bookmashup/d  
  <foaf:maker rdf:resource="http://www4.wiwiss.fu-berlin.de/is-group/reso  
  <foaf:primaryTopic rdf:resource="http://www4.wiwiss.fu-berlin.de/bookn  
</foaf:Document>
```

```
-<rdf:Description rdf:about="http://www4.wiwiss.fu-berlin.de/is-group/reso  
  <rdfs:label>RDF Book Mashup</rdfs:label>  
</rdf:Description>
```

```
</rdf:RDF>
```



WebGUI Prime

Kristi McCombs

<http://www4.wiwiwi.de/>



WebGUI Comr

Kristi McCombs

<http://www4.wiwiwi.de/>

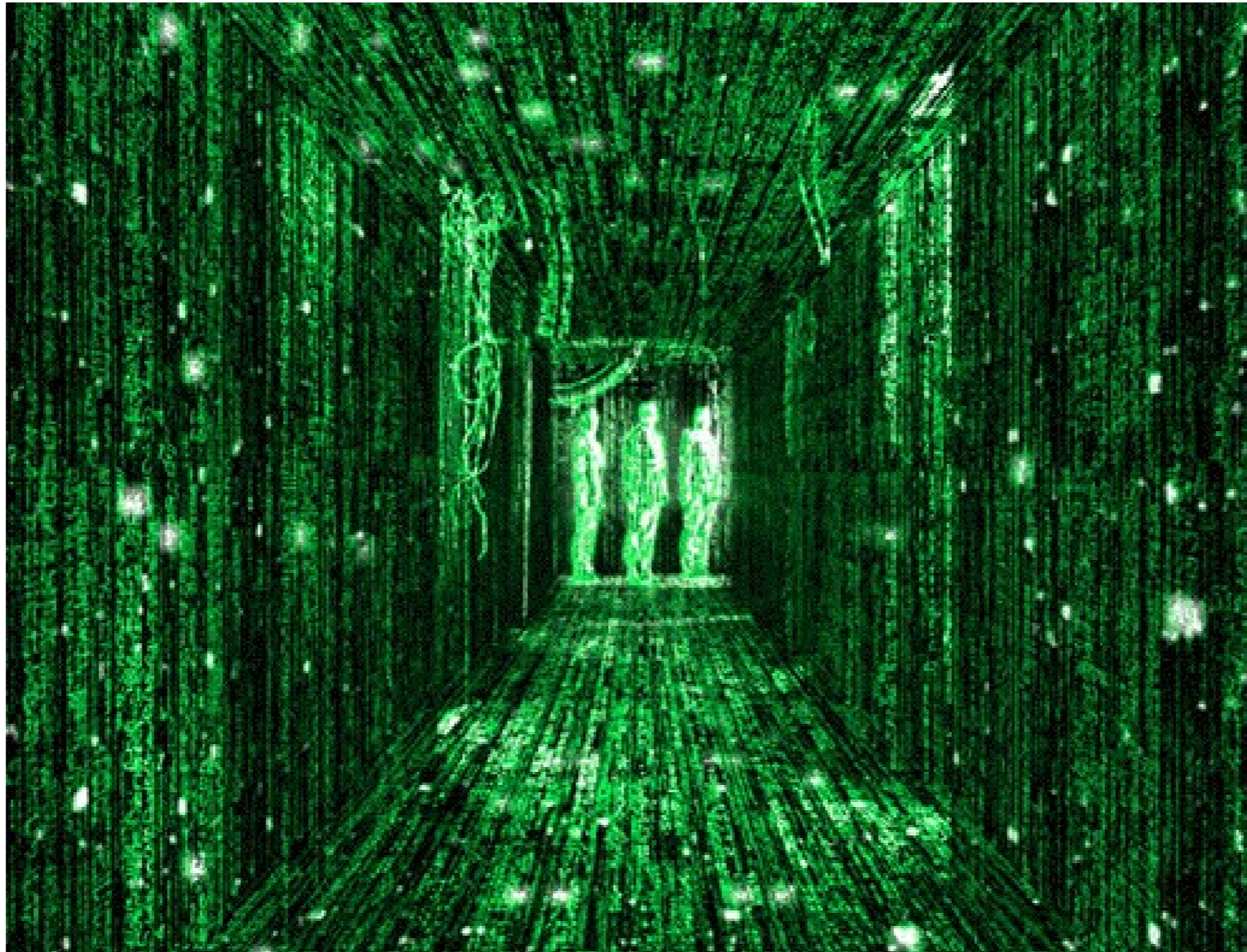
Perl Libraries

- XML
 - hundreds of options
 - XML::Simple (part of WRE)
- RDF
 - RDF::Helper
 - RDF::Notation3
 - Class::RDF
 - RDF::Simple::Serialiser
 - and more...

Perl Libraries

- Ontologies
 - Class::OWL
 - XML::FOAF
 - DublinCore::Record
 - HTML::DublinCore
- SPARQL
 - RDF::Query

The Future of the Semantic Web



Future Directions:

HTML5 & semantic markup

Linked data – information with relationships

Emergent Properties – lots of data allows lots of connections

Future Directions:



Where do you
think we're going?

Thank You!



William McKee

WebGUI Forums: knowmad

IRC: knowmad

Email: william@knowmad.com

Resources Available at
www.knowmad.com/wuc2009