WebGUI
& the
Semantic Web

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Goals of this Presentation

- To learn more about the Semantic Web
- To share Tim Berners-Lee's vision of the Web
- To re-inspire 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

ManyPossibilities
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
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
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 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

Technologies
W3C Accomplishments
Implementations
Technologies

Structure: XML

XML

• Provides a structured format for marking content
• Makes content human and machine readable
Data Model: RDF

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

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

“For the web, ontology is about defining the description of web information and relationships.”

– W3Schools.com
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”

```xml
<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>
```
Query: SPARQL

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

```
SELECT ?title ?authorName WHERE {
  ?author foaf:name ?authorName .
} ORDER BY ?date LIMIT 3
```

- Result is returned as XML.
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

www.WolframAlpha.com
Knowledge-based computing

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,

```xml
<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>
                <span property="v:street-address">909 Central Ave, Ste. 4</span>,
                <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
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!

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Resources Available at
www.knowmad.com/wuc2009