Introduction to the Semantic Web and FOAF

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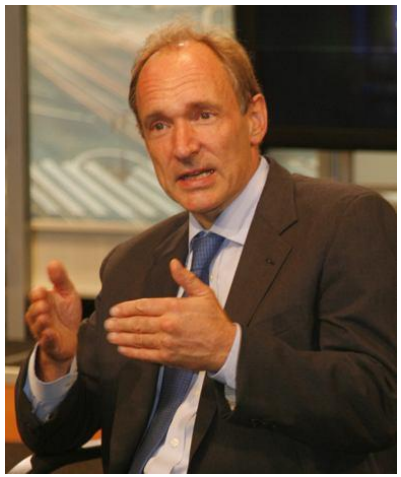
Overview

Web 1.0

- Invented 1991
- Tim Berners-Lee



Document **Web**

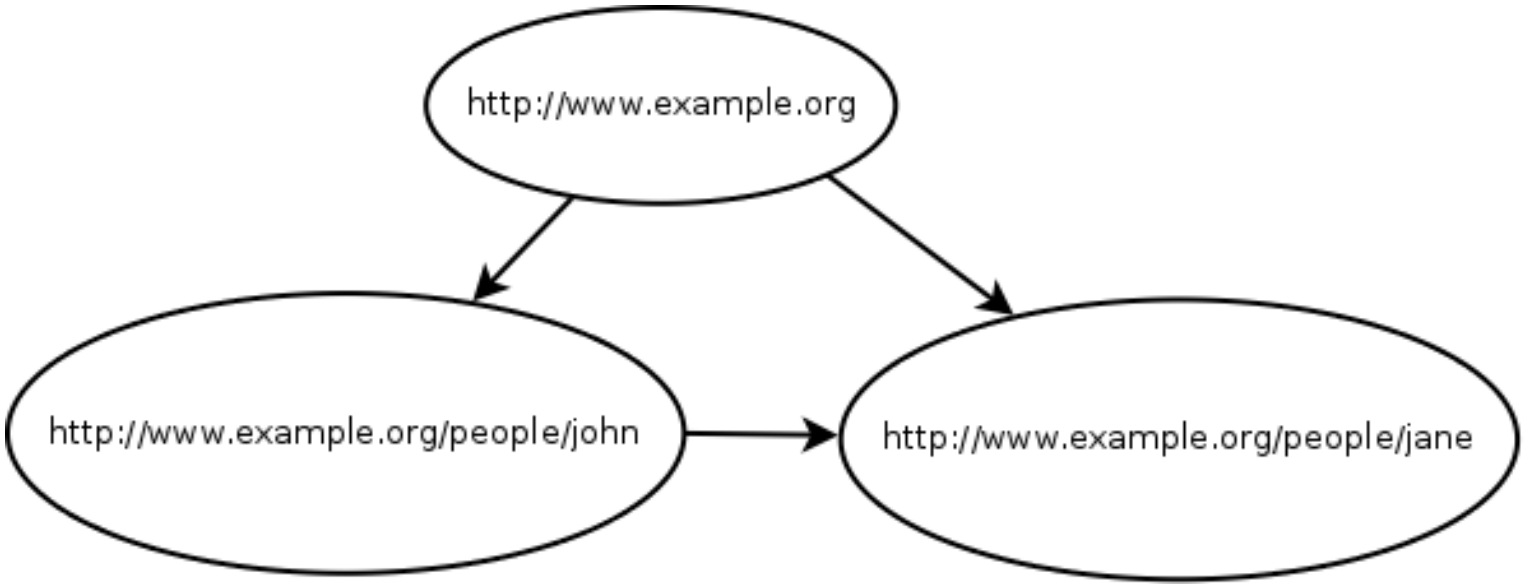
- **Web** of documents
- Connected by **URL** (Uniform resource locator)

Document Web

- Web for **documents**
- Specifies **looks**
- HTML, CSS

Web as a simple graph

- Pages as graph nodes
- Links as graph links



Web 2.0

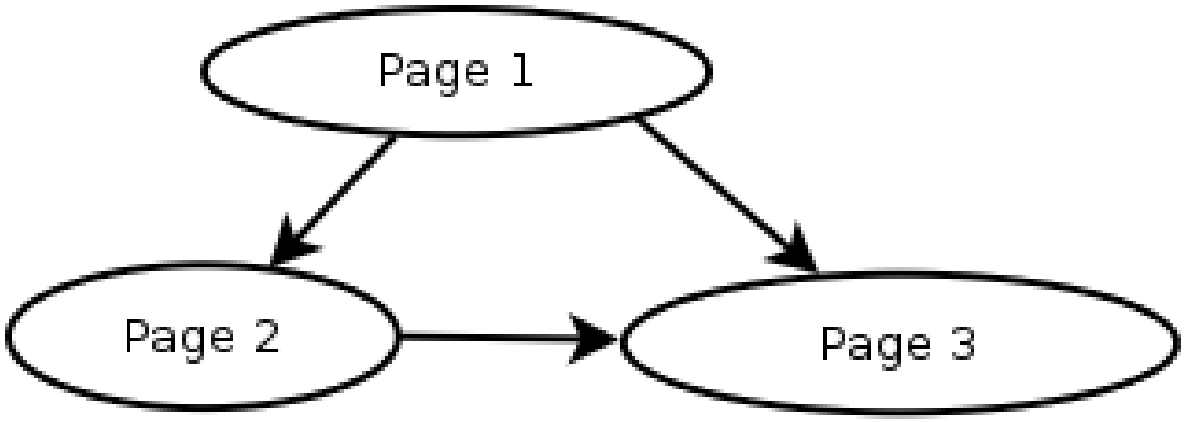
Application Web

- Web applications
- AJAX, JavaScript frameworks...
- *jargon*

Web 1.0/2.0

Machine unreadable

- Lacks semantics
- No page (graph node) description
- No link (graph link) description

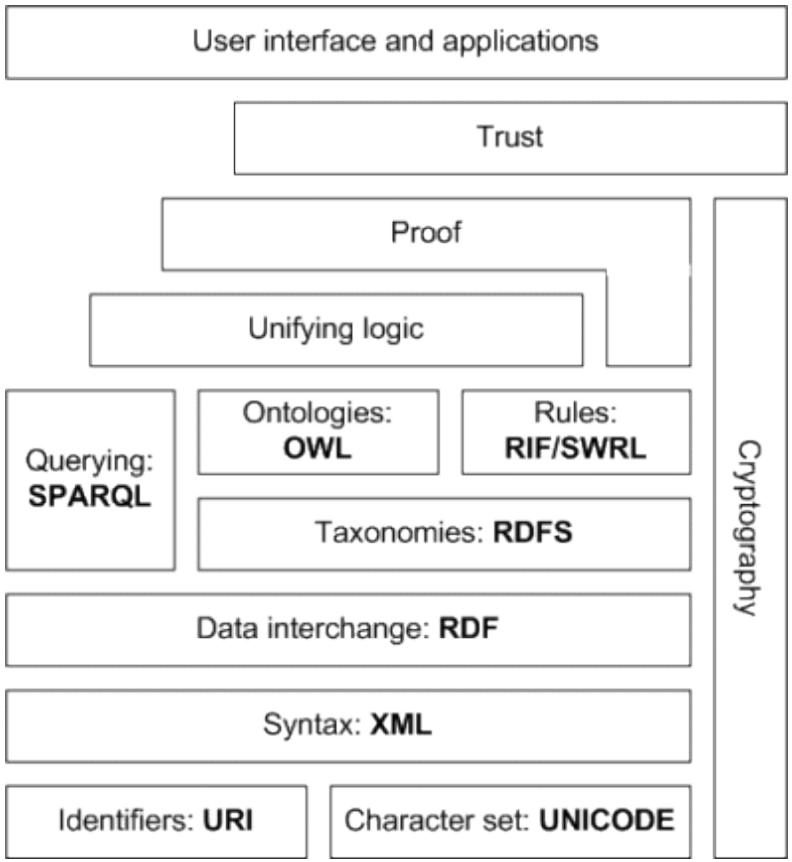


Semantic Web

- **Data** Web
- Machine readable

Semantic Web layer cake

- Layers of abstraction
- Hierarchy of languages



Layer 0: Identifiers & Character set

Unicode

Display and manipulate text in most world languages.

URI

Uniquely identify Web resources:

- URL http://example.org/people/john
- URN urn:issn:1535-3613

Layer 1: Syntax

XML

Structure data

XML Schema

Specifies type of XML document

XML Namespace

Removes ambiguity with unique naming

Layer 2: Data intercharge

RDF

Represents a graph Statements in the form of triplets

Layer 3: Taxonomies & Queries

RDF Schema

Vocabulary for RDF

SPARQL

Query language

Layer 4: Ontologies & Rules

OWL

Extends on RDFS

RIF/SWRL

- SWRL: rule language
- RIF: rule interchange
- (SQWRL for reasoning)

An alternative look on the layer cake...

FOAF Ontology

- An OWL based ontology
- Ontology for the **social web**

FOAF Ontology

Key entities

- Agent, Person, Group, Document, Project
- foaf:Agent, foaf:Person, foaf:Group, foaf:Document, foaf:Project

FOAF Ontology

Key entities

- Agent, Person, Group, Document, Project
- **foaf**:Agent, **foaf**:Person, **foaf**:Group, **foaf**:Document, **foaf**:Project
- foaf namespace = http://xmlns.com/foaf/0.1/

FOAF Ontology

Key entities

- Agent, Person, Group, Document, Project
- foaf:**Agent**, foaf:**Person**, foaf:**Group**, foaf:**Document**, foaf:**Project**
- OWL classes
- Person is an Agent subclass
- Document and Project are subclasses of owl:Thing

FOAF Ontology

Person properties

Data properties

- First name, foaf:firstName
- Last name, foaf:lastName
- Mail, foaf:mbox
- Nick, foaf:nick
- Homepage, foaf:homepage
- Age, foaf:age
- ...

Example FOAF Person

```
<foaf:Person>
    <foaf:name>John Doe</foaf:name>
    <foaf:firstName>John</foaf:firstName>
    <foaf:lastName>Doe</foaf:surname>
    <foaf:nick>johndoe</foaf:nick>
</foaf:Person>
```

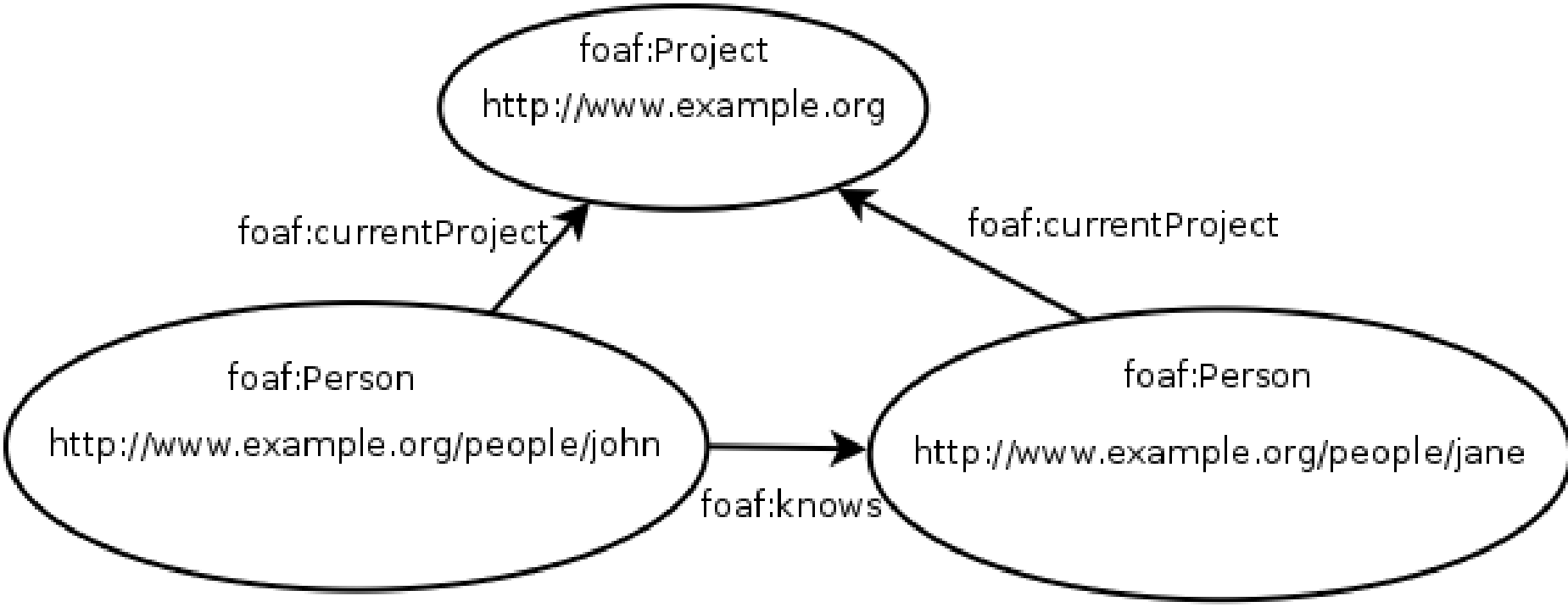
FOAF Ontology

Entity relationships

Object propeties

- John knows Jane, foaf:knows (Person->Person)
- John is a member of the Semantic Interest Group, foaf:member (Person->Group)
- John made a book called "Semantic Web for Dummies", foaf:made, (Agent->Thing)
- John is working on a project "The New SQWRL reasoner", foaf:currentProject, (Person->Thing)

FOAF Semantic Network



Using FOAF data

- XML tools with RDF/XML
- With SPARQL
- Transform to proprietary format

List people's names and emails

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name ?email
WHERE {
    ?person a foaf:Person.
    ?person foaf:name ?name.
    ?person foaf:mbox ?email.
}
```

List people who know someone named John

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
SELECT ?name
WHERE {
    ?person a foaf:Person.
    ?person foaf:name ?name.
    ?john a foaf:Person.
    ?john foaf:name "John".
    ?person foaf:knows ?john.
}
```

FOAF Use Case

- Rank people based on their popularity
- Use data from FOAF networks

Implementation

- Crawl through available FOAF sites
- Load FOAF using an RDF/OWL parser
- Query interesting data with SPARQL
- Extract to a proprietary format

FOAF data

FOAF as a graph

- foaf:Person entities as graph nodes
- foaf:knows relationships as graph links
- Algorithms for graph analysis (HITS, PageRank)

The End