Semantic Web Approach to Personal Information Management on Mobile Devices

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About the Semantic Web

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  [Berners-Lee, Hendler & Lassila 2001]
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- as such, it is very much centered around
  - Personal Information Management (PIM)
  - social relations

- subtext: transition from tools to systems working on our behalf
  - we have had tools for thousands of years, very little has changed so far...
Interesting Characteristics of the Semantic Web

• uniformity of data
  • simplifies information interchange
  • may simplify application development
  • note: uniform *metamodel*, data itself does not need to be uniform

• future-proofing
  • (because there will always be things you did not anticipate...)

• data integration
  • easier, when data carries its semantics (some things can be automated)
  • reasoning is important
  • provenance tracking is possible
Challenges in Adopting Semantic Web Technologies

• cultural resistance
  • religious beliefs, similarity to the “AI Winter”
  • “Semantic Web is a technology for problems yet to be articulated” (and no, I am not kidding...)

• lack of business models
  • Semantic Web is an interoperability technology, hard to put a price tag on (or to generate direct revenue from)

• difficult programming models
  • if you are using RDF data as a graph data structure, why bother?
  • reasoning is important (yet mostly unfamiliar to developers)
  • my solution: hide the reasoner
Interesting Characteristics of Mobile Computing

- always with you, always “on”, always connected
  - the true Personal Computer
  - trusted device

- location-awareness
  - if the device already knows where you are, you don’t need to tell it

- context-awareness
  - modern mobile devices come with many mechanisms for deriving context

- we think of mobile devices as being limited (in comparison to PCs)
  - small screen, awkward keyboard, etc.
  - true limitations are a result of usage situations (“attention-constrained”)

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Changing Nature of Personal Information Management

• traditional PIM:
  • small number of schemata (contacts, calendar, etc.)
  • most – if not all – data created by the user

• “new” PIM:
  • lots of different types of data
  • most data created by other parties
  • social connection
Use Cases

• Prototypes of systems exploiting Semantic Web from NRC Cambridge
  • OINK – generic browsing-style access to data
  • Jourknow – effortless note-taking
  • Virpi – virtual personal assistant with speech/dialogue UI
Use Cases – “OINK”

- OINK is a generic data browser and a platform for SW applications
  - type-driven customization of presentation
  - makes use of data schemata (and reasoning) in determining how to render
  - “best-effort” rendering of unknown & unanticipated data
- built on the Wilbur infrastructure (PCs, Nokia tablets, Nokia S60 phones)
  - graph storage, query engine, reasoner
  - (also used by the Sedvice system you heard about in Dr. Oliver’s talk yesterday)
RDF++ – extending RDF

• working with social networks revealed some interesting shortcomings
• identity in RDF is heavily reliant on URIs
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- identity in RDF is heavily reliant on URIs
- RDF++ borrows owl:InverseFunctionalProperty

![Diagram with nodes labeled Bob Smith and foaf:mbox connected by foaf:mbox property, with bob@email.com as a label]

Bob Smith

foaf:mbox

bob@email.com
RDF++ – extending RDF

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Bob Smith

Robert Smith

+1 800 CALL BOB
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Bob Smith

Robert Smith

+1 800 CALL BOB

bob@email.com

rdf:type

foaf:inverse functional property

rdfs:domain

rdfs:range

owl:InverseFunctionalProperty
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![Diagram of RDF++ relationships]

Bob Smith

<table>
<thead>
<tr>
<th>owl:sameAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>foaf:mbox</td>
</tr>
</tbody>
</table>

Robert Smith

<table>
<thead>
<tr>
<th>foaf:phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1 800 CALL BOB</td>
</tr>
</tbody>
</table>

bob@email.com

| foaf:mbox |
| rdf:type |

owl:InverseFunctionalProperty
Use cases – “OINK”

Customized interface for photo browsing
Use cases – “OINK”

Customized interface for photo browsing

Automatically generated faceted search tool

Use cases – “OINK”
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Customized interface for photo browsing
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Automatically generated metadata view

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Customized interface for photo browsing
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Use cases – “OINK”

- Customized interface for photo browsing
- Automatically generated faceted search tool
- Automatically generated metadata view
- Automatically generated query from browsing history
Use Cases – “Jourknow”

• tool for effortless note-taking
  • inspired by our user study on how people take notes and manage information
  • “lightweight” interpretation of user’s notes → structured data (RDF)

• relies on our context-capture infrastructure
  • contextual “cues” (also RDF data) are associated with every note
  • make it easier to find notes afterwards

• versions for PCs, Nokia tablets, Nokia S60 phones
Use Cases – “Virpi”

• speech and dialog based user interfaces
  • dialog behavior based on a rich data model
• mitigation of the “attention-constrained” situations
• ultimate goal: speech access to unlimited domains
  • challenge: currently, speech solutions are carefully crafted and fine-tuned for specific application and data domains
  • we need “best effort” rendering of data in speech also
What’s Missing…?

• we need fine-grained control over data ⇒ “policy-awareness”

• our relations to other people often “define” us, but software applications typically do not make use of these relations ⇒ social awareness

• our observation: policy-awareness is heavily reliant on social awareness
  • typical policies are written in a “social vocabulary”
What Is Our Ultimate Goal?

• (not technology…)
• perhaps we just want to simplify our lives
Questions?

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