Semantic Web Platform for Personal Information Management

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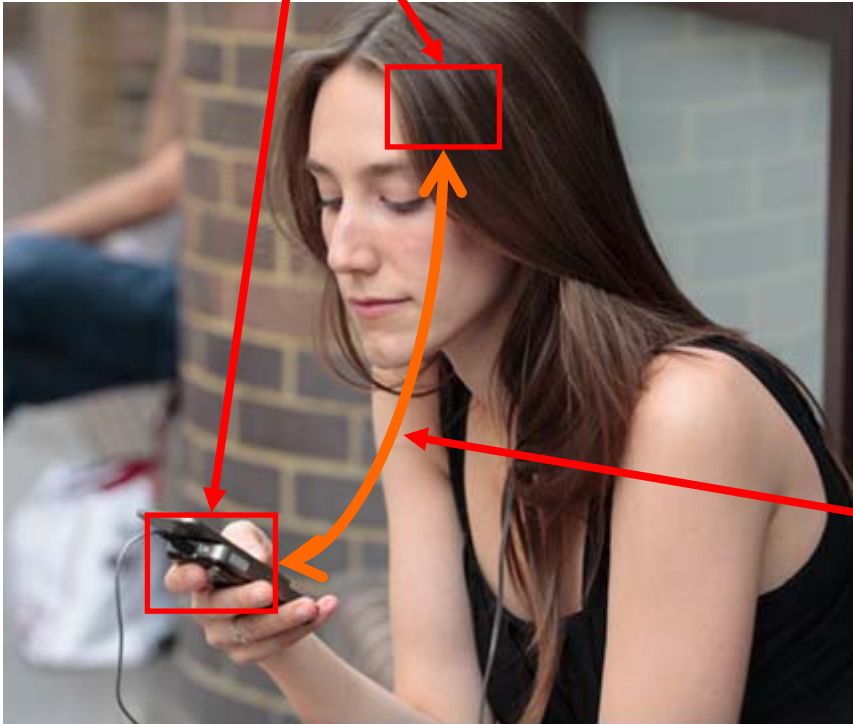**Visiting Scientist, MIT CSAIL**

Elected Member, W3C Advisory Board

Semantic Days, Stavanger, Norway, April 2008

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Motivation: "The Trouble with Information"

PIM

- **People, their information & devices**
- **How to organize information?**
- **How to interact?**

Information here tends to be an unorganized mess

Connecting the two is very hard

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Personal Information Management

- **What is personal information?**
  - traditional PIM (+ increasingly also "social" stuff)
  - all user-created content (blogs, photo metadata, etc.)
- **Today, mostly a mess… ("tyranny of applications")**
- **Changing nature of PIM:**
  - yesterday – all information created by user
  - today – <u>lots</u> of stuff from "elsewhere"
- **Critical need for data exploration**
- **Many technical challenges**
  - data: input, storage + access, manipulation, presentation
  - platforms: constrained but diverse
  - users: interaction, contexts, etc.

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Some Relevant Research Areas and Topics

Representation of Complex Information

> **Processing & Storage of Semantic Web data**

User Interaction

> **User Input & Access to Complex Data**

Context Awareness

> **Automatic Capture of Activity & Context**

> **Context-driven Automation (controlling apps & devices)**

> **Context Support for User Content & Tasks**

Why Semantic Web?

- Semantic Web is a vision of <u>personal computing</u>, and not only about the Web…

- Practical aspects:
  - maximally flexible data
  - "mash-ups for the rest of us"
  - connection to Semantic Desktop research

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Taking Notes in the Real World

- **Pencil + Paper – still unbeatable when taking notes**

- **But: there are problems with physical notes**

- **We would like replicate the best aspects of physical media in a digital environment**
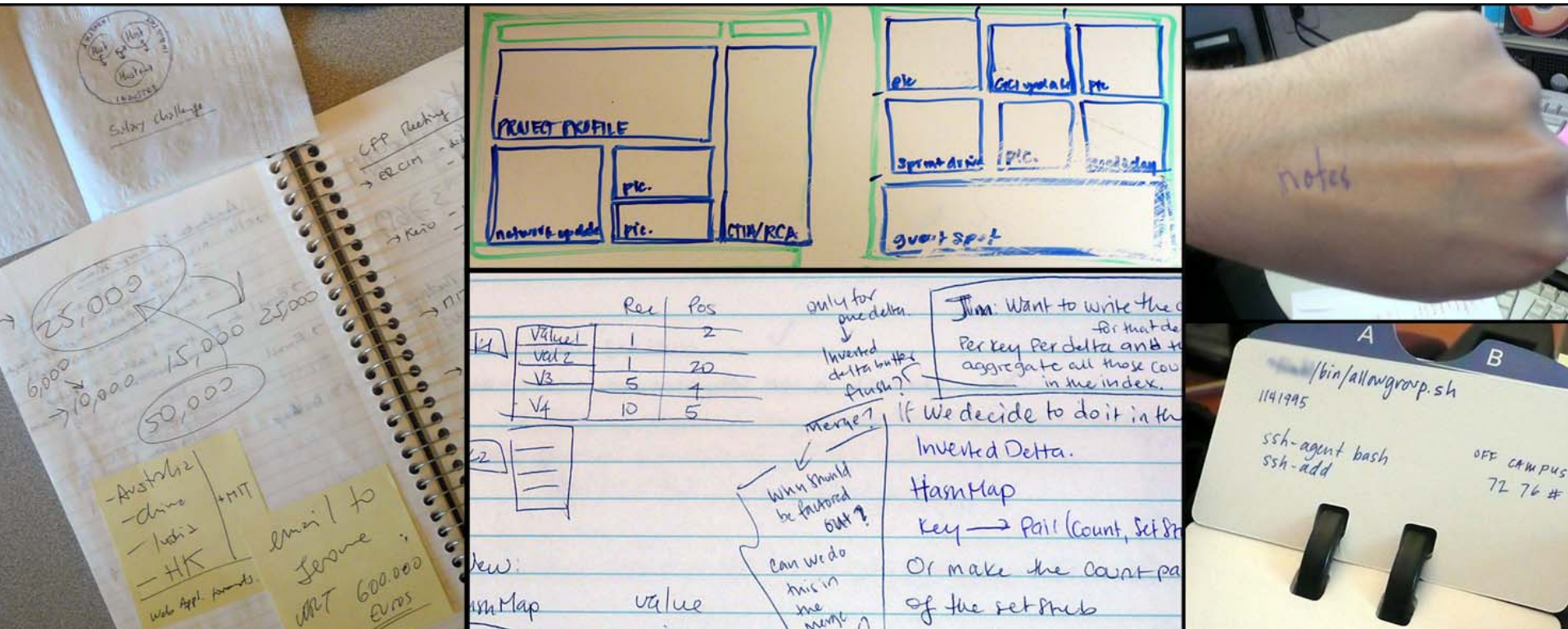
User Input of Structured Data

- **Fast typed input via "Simplified Artificial Natural Languages" – several designs**
  1. fixed grammars for common PIM concepts
     - e.g., "*todo by tomorrow night, call mom re:tickets*"
  2. end-user -defined templates (for RDF, Notation3)
  3. folksonomic, with simple syntactic rules
     - class [subject]?[, property value]+
     - e.g. "*todo call mom, about thanksgiving*"

- **Resulting "semantic" notes automatically organized**
  - addition of contextual cues helps with search

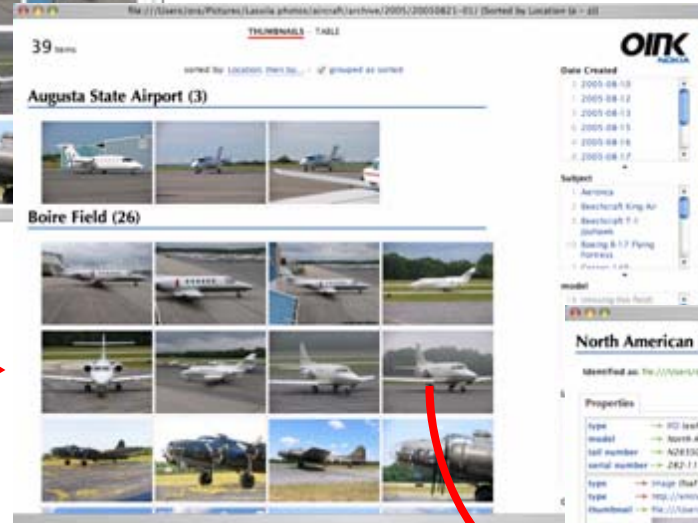- **User studies…**

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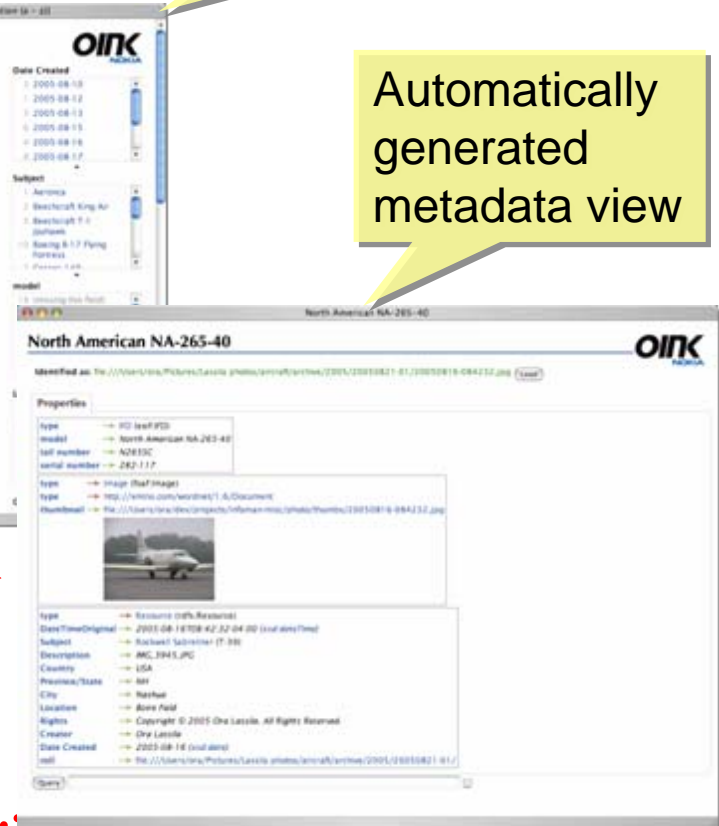Connecting People
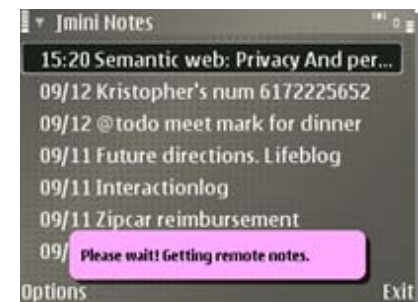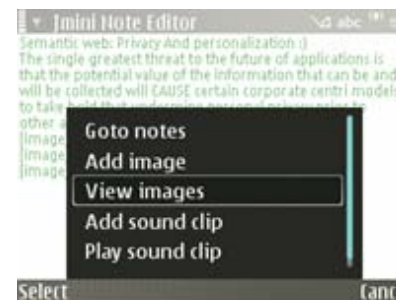
Exploring Complex Data

Customized interface for photo browsing

Automatically generated *faceted search* tool

Automatically generated metadata view

Automatically generated query from browsing history

User Access to Complex Data

- **Presentation of complex linked data as hypertext (OINK)**
  - node- and path-oriented view

- **Faceted search of structured data (Exhibit)**
  - collection-oriented view

- **Prototype system that integrates both approaches**
  - query results automatically turned into faceted search tools
  - access to node-oriented browsing from within faceted search results
 - automatic queries from browsing history

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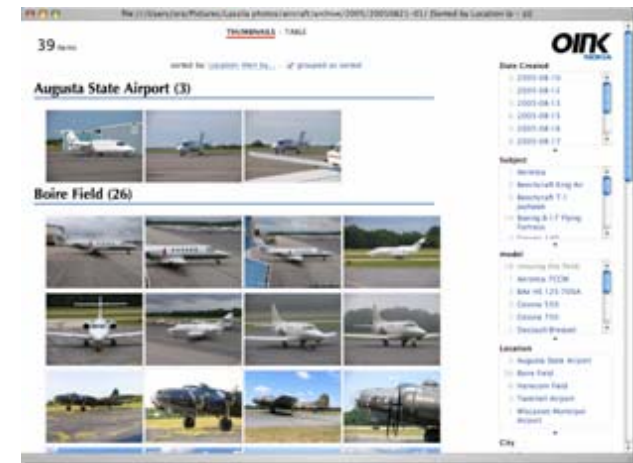
Automation & Autonomy (for Data)

- **Automating reactions to data feeds**
  - representation of state, driven by "context"
  - streams of information from RSS feeds, web sites and other external data sources
  - users can specify actions to trigger, conditioned on feed entries and state models

- **Challenge: how to specify rules?**

"notify me when an upcoming.org feed contains an event occurring today at my current location by an artist currently in my iTunes top 20 most played playlist."
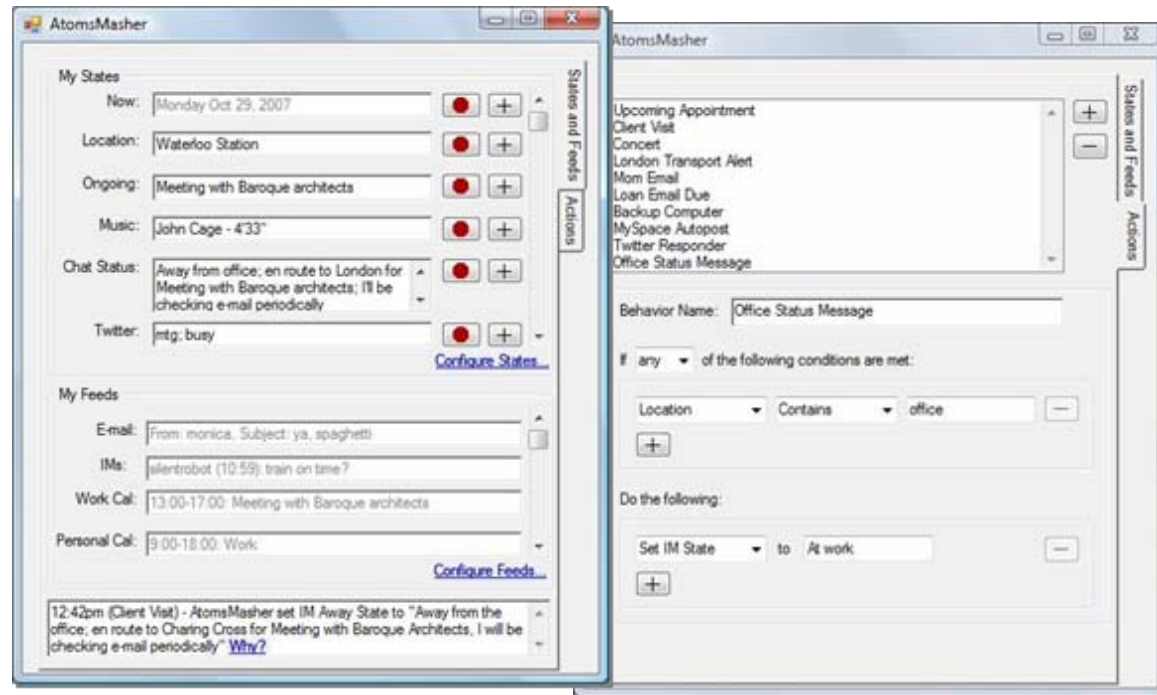
Automation & Autonomy (Devices)

- ## <u>Why:</u> Users should be able to:
  - control interruptions from the device, and
  - control access to information on device

- ## <u>How:</u> Control behavior via access control "policies"
  - allows us to reuse research on policy modeling

- ## <u>Goal:</u> need to make policies <u>usable</u> for end-users
  - easy definition of policies, support for <u>intensional</u> definitions
  - express conditions using a "social vocabulary"
  - ability to group and view policies using different criteria
  - sharing and <u>reuse</u> of policy definitions & policy templates
  - use of <u>context</u> in policy definitions

- ## User studies…

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On Representation

- **Wilbur toolkit**
  - "RDF++" = RDF(S) + some features from OWL
  - path query language
  - reasoning via query rewriting

- **Using relational databases for Semantic Web data**
  - prototypes using MySQL, SQLite, BDB, and Symbian DB
  - optimization of path queries to maximally expressive relational queries
  - reasoning over persistent data
  - "Piglet" – small triple store, written in C++, uses SQLite3

- **Alternative storage approaches**
  - vertically partitioned storage for Semantic Web data
  - potential major performance improvement

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Future Research Directions

- **New input & output modalities (speech & dialog)**

- **Speech-based interaction across multiple domains**
  - how can Semantic Web representations be used to generate natural language dialogs?

- **Continuing to target "small" platforms**
  - Maemo tablets (Nokia N810)
  - Nokia S60 smartphones

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Questions?

- **Joint NRCC + MIT project team:**
  - Ora Lassila (Nokia, co-PI)
  - David Karger (MIT, co-PI)
  - Deepali Khushraj (Nokia)
  - Max van Kleek (MIT & Nokia)
  - Michael Bernstein (MIT)
  - Adam Marcus (MIT)
  - Alessandra Toninelli (University of Bologna)
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  - NRCC + MIT Speech UI project team

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