SwapMe

Semantic Web Application Platform for the Mobile Ecosystem

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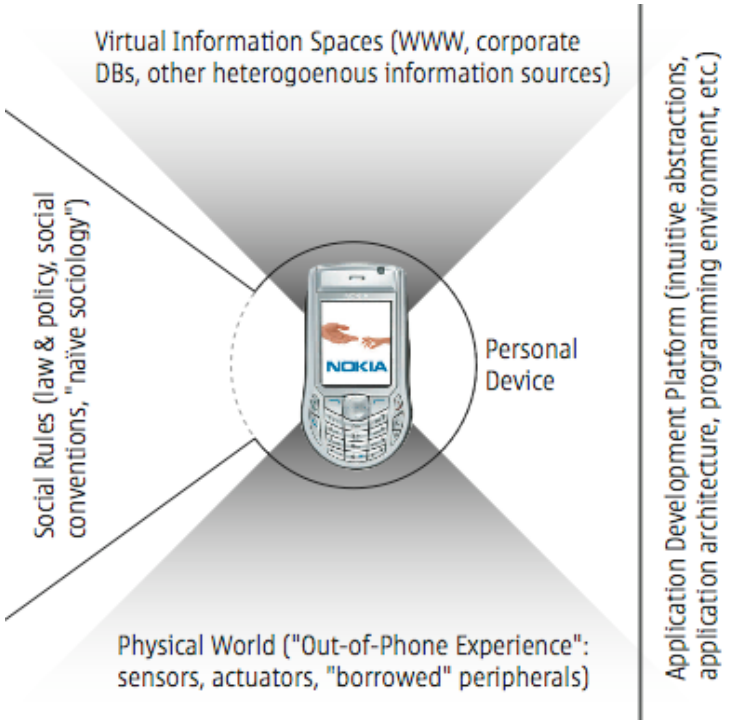
Project Goals (1)

- **Build systems that offer users flexible, context- and policy-aware means to**
  - access any information (local and remote)
  - manipulate (and interact with) data and environments
- **Build systems that do more <u>on behalf of</u> users**
- **We target – but are not limited to – mobile devices**



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Project Goals (2)

- **Platform for building "Semantic Web applications"**
  - ubiquitous support for Semantic Web data (acquisition, transformation, storage, querying, reasoning, etc.)
  - support for context- and policy-awareness (using Semantic Web technologies)
  - MacOS "Dashboard" -like framework for small applications
- **Ontology-based approach to application construction**
  - functionality and services fully represented
  - automatically built workflows, goal-oriented operation

Context- and Policy-Awareness

- **Rich models of usage contexts**
  - using reasoning & rules to infer context(s)
    - current location & “task” are important dimensions of context
  - context information is used to adapt application behavior
- **Rich models of various policies**
  - privacy, access, security, etc.
  - more generally, a “policy” is a representation about how the system should behave in some future situation
    - this is a key to autonomy
  - using reasoning/rules to provide compliance/enforcement

Issues with Current Applications

- **Current applications "imprison" data they "own"**
  - data formats do not offer accessible semantics
  - formats are typically proprietary
  - semantics not declarative
- **Ensuring interoperation introduces a high cost**
  - any interaction has to be specifically designed/engineered
  - heavy emphasis on application-specific standardization
- ***Ad hoc* interoperation is impossible**

“Brave New Applications”

- **Operate autonomously in “unanticipated” situations**
- **Exhibit robustness in the face of**
  - changing, inconsistent and unexpected data
  - variations in reliability, trust
- **Capable of serendipitous behavior, opportunism**

“Smart Data”

- **New approach: separate data from applications**
  - data carries declarative descriptions of its semantics
  - manipulate any data with (almost) any application
    - e.g., browse photos using your calendar
- **All data available in Semantic Web formalisms**
  - shared local and distributed repositories (“triple stores”)
  - legacy data sources “exposed” as RDF (e.g., via XSLT)
  - query data via SPARQL, WilburQL, etc.

Research Questions

- **What happens when data is "decoupled" from applications?**
  - will traditional applications disappear?
  - will this enable ubiquitous computing?
- **What is the efficient separation of concerns between the small applications, the middleware/platform and the data store(s)?**
- **Will "smart data" enable smarter applications?**
- **What is the "browser" for the Semantic Web?**
  - David's "Haystack", Tim's "Tabulator", Ora's "OINK"?

Game Plan

- **Specify compelling use cases**
  - exploiting mobility, contextuality
  - e.g., supporting meetings and collaboration (with Nokia/ES)
  - e.g., personal media organization (with Nokia/M)
- **Build infrastructure**
  - “Dashboard” -like rapid-development framework
  - application demos
- **Collaborate with other projects**
  - (even others could eat our dog food)
- **Capture insight about mobility and context-awareness**

Existing Assets (1)

- **cwm**, **Wilbur**, **SWRP**
  - generic Semantic Web toolkits (reasoning, querying, etc.)
- **Alloy**
  - constraint solver
- **Haystack**
  - “universal” information client
- **Piggy-Bank**
  - tool for collecting and querying Semantic Web data
- **Tabulator**, **OINK**
  - Semantic Web “browsers”

Existing Assets (2)

- **SAMA-SE**
  - ontology-enabled dynamic user-interface generator
- **XML2RDF**
  - proxy for transforming legacy data into RDF & OWL
- **Zakim-bot**, **RRSAgent**
  - automated support for meetings and teleconferences
- **CALI**
  - context engine (DL, temporal reasoning and rules)
- **Rei**
  - policy engine/reasoner

Daniel Jackson

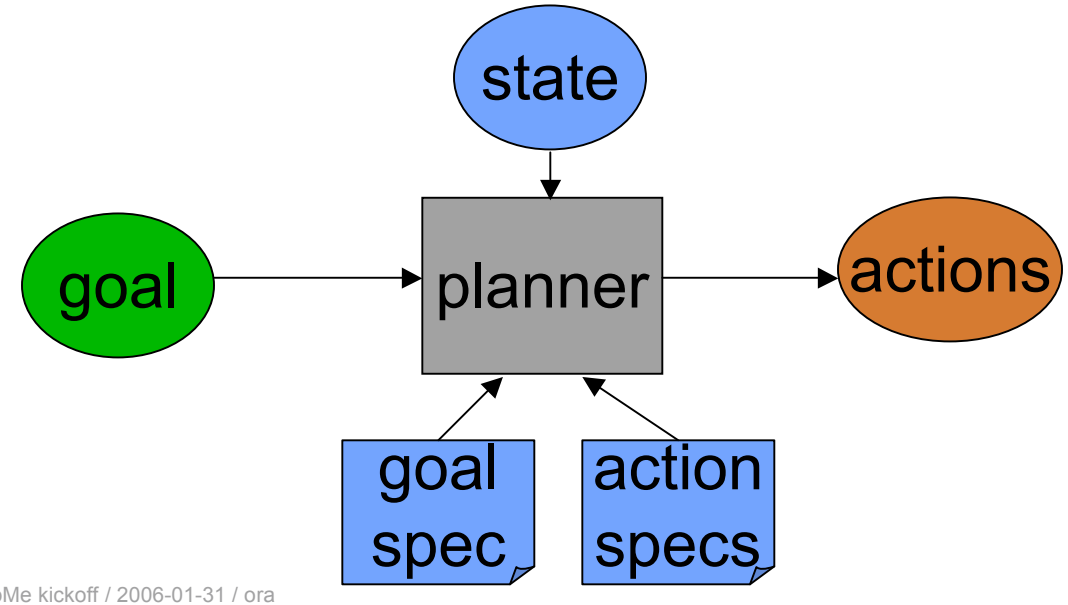
Getting Context-Aware

Attacking context

- standard approach: eliminate, by replicating context
- our approach: tolerate variation

Declarative assembly

- user indicates task: end-goal to achieve
- system suggests plan: sequence of actions to perform



Example: email

Based on discussion with Alex Ran and work by Felix Chang

Inputs

- task: ReplyToLastMsgFrom (name)
- actions: NameLookup, SortMsgsByDate, FilterMsgByAddr, Del, Reply, Send, …
- state: ...

Plan generated

- addr := NameLookup (name)
- SortMsgsByDate ()
- msgs := FilterMsgByAddr (addr)
- Reply (msgs.last)

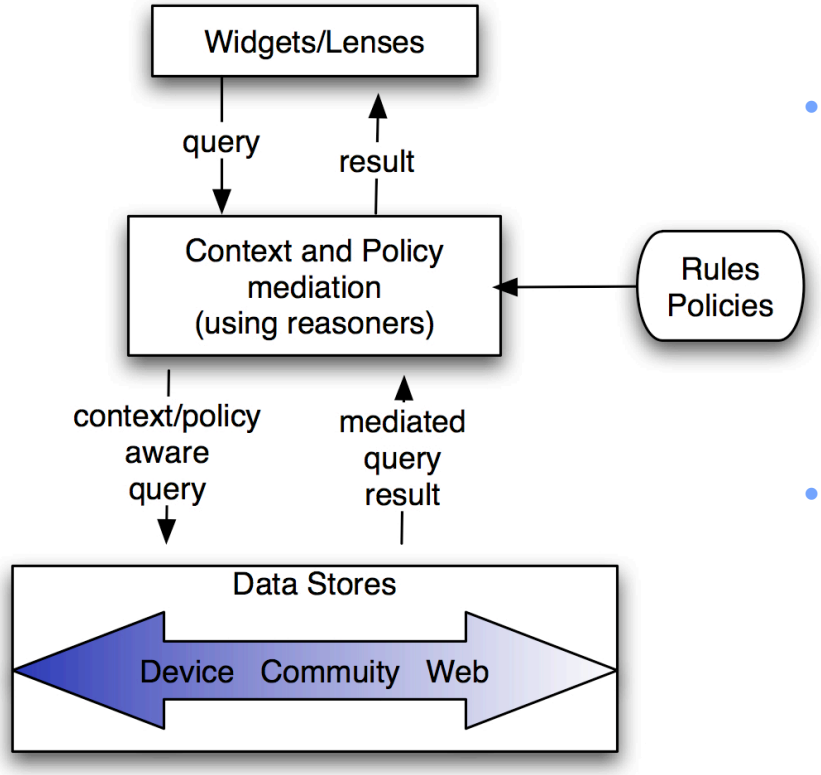
Next steps

Challenges

- can actions & tasks be easily specified?
- is a general ontology of tasks sufficient across apps?
- can we accommodate imperfect plans?
- can planner exploit smallness of change for large states?
- can context limit search space?

Danny Weitzner

Approach to Policy-Awareness



- **Departure from traditional approach to security, privacy, ownership**
- **Enable flexible, decentralized approach to policy management**
  - local control (vs. centralized authorities)
  - rule-based permissions (vs. token-based)
- **Evaluate policies with reference to:**
  - user preferences
  - user data
  - web data
  - operating context

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Questions? Comments?