The Social Semantic Desktop

Siegfried Handschuh

Siegfried.Handschuh@deri.org

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http://nepomuk.semanticdesktop.org
Overview

• Motivation
• Vision
• Issues/Research Questions
• Collaboration
• Social Services
• Conclusion
Semantic Desktop
Motivation
Motivation

The PC is our universal information companion - How to use it most effectively?
Our computer is a universal information device

- Produce
- Consume
- Structure
- Organize
- Replicate
- Combine
- Note & Remember
- Store & Preserve
- Search & Retrieve
- Plan & Schedule
- Share & Exchange

- Leisure
- Work
- Office
- Home
- Mobile

- Text
- Data
- Image
- Video
- Music

- Consume
- Produce
- Communicate

- Office
- Home
- Mobile

- Text
- Data
- Image
- Video
- Music
How do you manage Information?
Information Growth

Figure 1

Digital Information Created, Captured, Replicated Worldwide

Tenfold Growth in Five Years!

Source: IDC, 2006
Information is tightly confined

• The computer desktop is our universal workspace
  • All kinds of information in different formats
  • Used for various purposes in different applications

But

- Not always suitable structured
- Data are trapped/imprisoned in applications → Data Silos

File System

Email Folders

Bookmarks
Semantic Desktop Vision
Vision: Networked Collaborative Knowledge

• Free the Silos - Bridge the Islands
• Interconnected Knowledge
• Ensure local and global Collaboration
History: On the shoulders of giants

Memex (Vannevar Bush) 1945
A memex is “a device in which an individual stores all his books, records, and communications.”

NLS oN-Line System (Doug Engelbart) 1962
NLS system was the first to employ the practical use of hypertext links, the mouse, information organized by relevance, screen windowing, presentation programs, and other modern computing concepts.

http://sloan.stanford.edu/MouseSite/1968Demo.html

WWW (Tim Berners-Lee) 1991
“There was a second part of the dream [...] we could then use computers to help us analyse it, make sense of what we’re doing, where we individually fit in, and how we can better work together.”
It wasn’t the time...
Today necessary technologies & communities exist:

- Standardised metadata: **Semantic Web**
- Scalable distributed infrastructure: **P2P Computing**
- Knowledge articulation and interaction: **Desktop/Wiki Technology**
- Processing of unstructured and legacy information: **NLP**
- Human centric information exchange: **Online Social Networks**
Issues, Methodologies
Research Questions
Goal: Overcome the problem of data overload and data silos

SD methodology:
• put the data into the centre of attention, not the applications
• SD is a infrastructure like the WWW -> needs Standardisation

• What to represent (scope)?
• How to represent (ontologies)?
• How to create data (applications)?
• How to utilise data (added-benefit for users)?
Question to You

• Think about scenarios you encounter every day, and where the SSD can make your work easier?
Architecture - background
## Functionalities

<table>
<thead>
<tr>
<th>Category</th>
<th>Functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop</td>
<td>Annotation, Offline Access, Desktop Sharing, Resource Management, Application Integration, Notification Management</td>
</tr>
<tr>
<td>Search</td>
<td>Search, Find Related Items</td>
</tr>
<tr>
<td>Social</td>
<td>Social Interaction, Resource Sharing, Access Rights Management, Publish/Subscribe, User Group Management</td>
</tr>
<tr>
<td>Profiling</td>
<td>Training, Tailor, Trust, Logging</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>Reasoning, Keyword Extraction, Sorting and Grouping</td>
</tr>
</tbody>
</table>
Requirements for the Semantic Desktop

- Knowledge Articulation and Visualization.
- Standard Desktop Classification Structures.
- Mapping and Aligning of Information Schemes.
- Wrapping of Legacy Information.
- Metadata Storage and Querying.
- Linking of Data Items and Relational Metadata.
- Social Aspects.
- Open Architecture.
Research Questions: Knowledge Representation

• How to establish a common knowledge representation with the required level of expressivity across multiple desktop systems?

• How to cope with the heterogeneity of knowledge models, especially multiple knowledge modules with potentially different interpretation schemes?

• How to support the tailoring of knowledge models towards different needs in various exploiting applications?

• How to represent existing legacy data on the desktop and express both complex application-level annotations and simple end-user oriented annotations in one coherent model?
Collaborative Semantic: Technical Research Issues

• To achieve the overall vision of “semantic collaborative information management” a number of technological issues need to be addressed:

  • Knowledge Representation, Standards
  • Lifting, and Information Extraction & Annotation
  • Visual Interfaces for the Social Semantic Space
  • Collaboration and knowledge exchange
  • Collected intelligence (Web 2.0) → Collective Intelligence (Social Semantic Space)

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Doug Engelbart, 1968:

"The grand challenge is to boost the collective IQ of organizations and of society."
Semantic Collaboration on the Desktop
Motivation - How do you...?

• How do you manage and structure your *personal information*?

• How do you *share and exchange data & knowledge with your colleagues*?

• How do you *find an expert in your organization*?
Organising a project showcase at a conference:
involved Documents, contacts, time-schedule
The approach:

Enhance available information by formal semantic annotation to build explicit personal information models and facilitate automated services
Personal Information Management

- folders ≈ email ≈ bookmarks
- Projects, Meetings, People, Topics, etc.
- representing "mental models" explicitly.

Claudia

PIMO Personal Information Model

Claudia Stern
Dirk Hagemann
Klaus Nord

Projects:
- completed
- industrial

folders:
- deri
- fzi
- repository
- personal
- project

organizations:
- 2006
- KWeb

Local:
- 2006
- inactive
- Nepomuk (Project)
- Nepomuk_lists
- Partners

Event

Person

Topic

Document

Image

Email

Project

Person
How can we achieve that?

Claudia

PIMO

Personal Information Model

Topic

Event

Project

Person

NIE

Nepomuk Information Elements

Contact

Document

Email

Peter Dyke

Tim Ruthen

Keith

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Realising the Social Semantic Desktop

**Desktop**: Help individuals in managing information on the Web/their PC

**Semantic**: Make content available to automated processing

**Social**: Enable exchange across individual boundaries

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**Personal Semantic Web**: a semantically enlarged intimate supplement to memory

**Social protocols and distributed search**

**Social semantic peers**

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Project: SOKS: Self-Organising Knowledge Systems

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Flexible Information processing is at the heart of all knowledge work

- Knowledge work comprises
  - Collecting, structuring, connecting information
  - Articulation of new ideas, observations, insights, thus generating information
  - Sharing, exchange, and communication

according to multiple, individual goals, perspectives, and processes

- Modern work requirements ask for flexibility and collaboration within networks across traditional boundaries
Personal Information Model

E-Emails

Model

PIM

Time Schedule

Meeting

Presentations

Travel Website

Conference Website

Interconnect disperse Information
Example: PIMO about SKOS

http://www.deri.ie/outlook/contact/0019E1773D6A56
http://people.csail.mit.edu/pcm/
http://chavalias.com/tiki-index.php
has-address
http://en.wikipedia.org/wiki/Amsterdam
has-location
http://www.kth.se/Claudia
has-speaker
http://www.cs.vu.nl/~schut/
has-speaker
http://www.few.vu.nl/~cgueret/
has-speaker
http://www.few.vu.nl/soks/symposium
is-hosted-by
Calender (…)
takes-place-on
is-hosted-by
A hierarchy of models and ontologies facilitates the handling of global and personal views.

Representational Level

Upper Level
Domain independent

Mid Level
Adopted to Organization
(i.e. IBM, Cisco, DERI, University)

Personal Level
Personal concepts and Data,
e.g. from Claudia

Person
Role
Time
Document
Organization

Person
Role
Time
Document
Organization

Conference
Manager
Project
Offer
Message
Company

Syposium
Claudia
SOKS
IBM
Data Lifting to RDF

Claudia's files and emails

- analyse text
- describe in RDF
- lift structure

PIMO

Desktop Database

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Example of document data distribution on Claudia's Desktop for Topic: “Information Retrieval”
Manual tagging

- manual tagging of files, folders, emails, etc.
- Representation of tags within PIMO
Application: Contextual Info

Contact Context

Dirk Hageman
SAP Karlsruhe
Kaiserstrasse 14 79631
Karlsruhe, Germany Tel:
+49 7351 9896714
Email: dirk-1@csc.kth.se

Related Persons
• Marie Trembleau
• Martin Williams

Documents written by Dirk Hageman

• Conceptualising Smart Spaces for Learning
• The Personal Reader: Personalizing and Enriching Learning Resources using Semantic Web

Files received from Dirk Hageman
• Nepomuk D6.2.pdf
• Finance.xls
Application: Mashup Web+ Desktop Data

- Situational Programming for the Power-User
- Mashup of Desktop + Web data
- Semantic-Pipes on the Desktop
- No need to remember a script syntax.
- Stored SPARQL procedures
- Ready-made building blocks
- Re-usable blocks of Dataflows
Impact: KDE Semantic Desktop

- **Open Source**
  - Involvement of KDE developers – Early Adopters
  - Semantic OS

- **Core Technology of the Semantic Desktop:**
  - PIMO, RDF Data store, Wrapper

- **Part of the official KDE 4**
  - Millions of installations
  - Semantic Web Technology on every KDE computer
  - Virulent effect
  - Creation of a market

Demo
Beyond the single platform: Social Services
Services across desktops cover distributed search, community building, and semantic exchange

• **Sharing & exchange of knowledge (= annotated data)**
  • Example: Delegation of a task invokes reminder service at the receiver’s side

• **Semantic search across individual desktops**
  • P2P network with distributed hash tables as index structure
  • Security model & access control
  • Mapping and merging of ontology concepts

• **Community building in networks**
  • Network & communication analysis
  • Easy location of experts
Example: Distributed Expert Finding

Task: Claudia has to write a work package deliverable,

- Query expansion and refinement
- Contextual Information

Claudia

Karen

Martin

Keith
Example: Expert Finding

Task: Claudia needs to find an expert for Information retrieval

Community of practice

Karen

Martin

Keith

Dirk

Search Topic is: Information Extraction

Karen Kiersted: karen-1@csc.kth.se, Skype: k.kiersted
Relevance: 80%

Keith Morgan: karen-1@csc.kth.se, Skype: keith
Relevance: 45%
Conclusion

- The Social Semantic Desktop is a universal platform for
  - Personal Information Management
  - Distributed Information Management
  - Social Network and Community Services

- Impact - dramatic time savings:
  - filtering out **marginal information** and
  - **discovering vital** information.
  - Easy **information integration**.
  - Build and participate in **communities** of practice
Solutions - You can ...

• How do you manage and structure your personal information?
  ⇒ ”mental model”, PIMO
  ⇒ free data from their silos

• How do you share and exchange data with your colleagues?
  ⇒ P2P network, Content-based routing
  ⇒ ”Link Routing” based on social connections

• How do you find an expert in your organization?
  ⇒ using the PIMO topics to detect and classify experts and communities
Summary

• **Personal information models:**
  • Knowledge articulation, visualisation and utilisation

• **Semantic authoring, annotation and publishing environments:**
  • Articulation of new ideas

• **Collaboration and knowledge exchange:**
  • Collecting, structuring, connecting information
  • Link to, comment on, annotate and exploit other people’s knowledge and articulations

• **Knowledge worker process support:**
  • Integrated task management support
  • Ad-hoc task planning
  • Collaborate on knowledge-intensive tasks
Open Issues / Open Research Questions

• Trust and Privacy
• Policies, User, group, and rights management.
• Semantic Desktop & Linked Open Data
• Ontology Expressivity vs. simplicity
  • Performance / scalability / development effort
• Ontology Mapping
  • i.e. mapping of PIMOs

• Ontologies and Intelligent Services
  • Ontology versioning, ontology evolution, import
  • Rules, Inferencing
• Context
• User Evaluation
• User Interaction, UI
• Non technical
  • psychological and sociological research