Human Interactions in Dynamic Environments through Mobile Web Services

Daniel Schall, Robert Gombotz, Christoph Dorn, Schahram Dustdar

Distributed Systems Group
Institute of Information Systems
Vienna University of Technology
Austria

www.vitalab.tuwien.ac.at

Talk Overview

- Today's Collaboration and Challenges
- Problem Statement
- Activity-centric Collaboration
- Human-provided Services
- HpS Application
- HpS Implementation
- Conclusion and Outlook

Today's Collaboration

- **Often Email-based to coordinate activities and exchange artifacts**
  - Flexible but hard to manage

- **Flexible Team structure**
  - Increasingly medium/short lived to work on given task
  - Collaboration across organizational boundaries

- **On the move**
  - Using mobile devices
  - Spontaneous interactions
  - Situated resources

Challenges

- **Humans are key resources in collaboration**
    - How to structure collaboration more efficiently?
    - How to describe expertise?
    - How to incorporate human into collaboration?
- **Mobile / ad-hoc collaboration**
    - How to find available expert to solve problem?
    - How to select right collaboration partner if a number of candidates exist?
   - How to interact with human?

Problem Statement

- Information regarding human (profile, expertise) bound to centralized cooperate directory
  - Difficult to find expert in flexible collaboration scenarios
  - Difficult to establish other metrics for expert finding
- Interactions with human
  - Most tools do not account for spontaneous interactions
  - Support for mobile scenarios/interactions

→ Describe and provide **Human Services** in collaborative environments

Approach to Human Services

- **Representing work through activities**
  - Coordinate work among participants
  - Relate to people, tools, *services* carrying out activity
  - Define templates denoting activity patterns

- **Modeling Human-provided Services**
  - Describe human skills
  - Definition of interactions with human

- **Utilizing context information**
  - Physical and logical context sources

- **Supporting Human Services**
  - Platform and device independent, mobility support

Activities in Collaboration

- We define activities as:

  A set of one or more **related** action items **performed** by a human actor and **as perceived by** a human actor

- Example of an activity: an entry in a person's calendar or to-do list

- Our goal:
  - Integrate tools and resources (services)
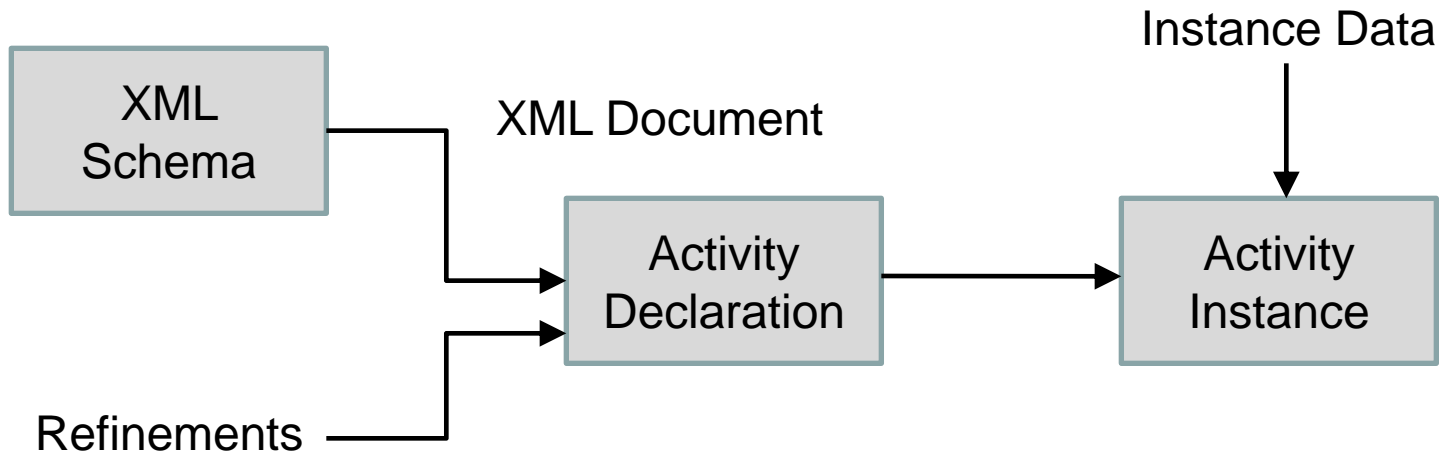 - Best practices
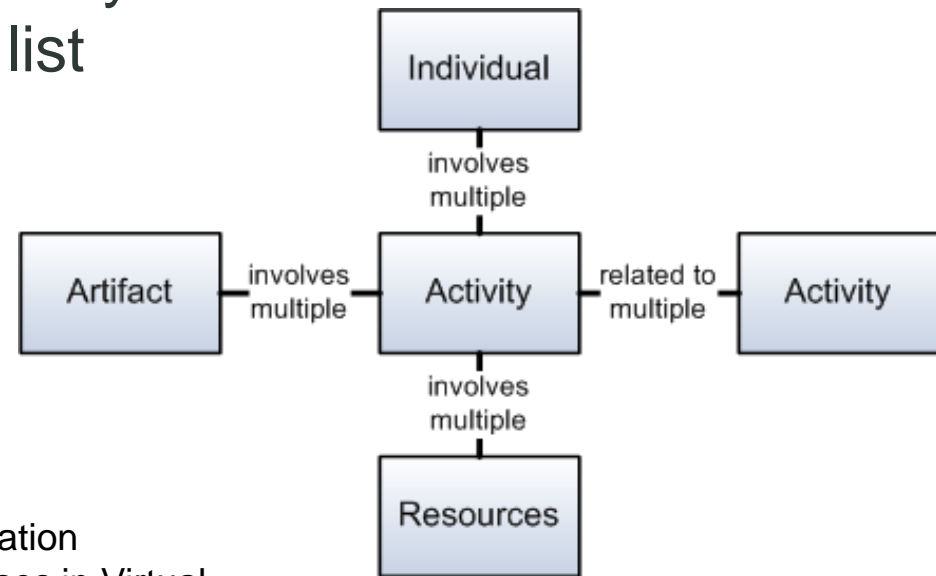
Activities mentioned in collaboration:
[Dustdar2004] "Caramba - A Process-Aware Collaboration System Supporting Ad Hoc and Collaborative Processes in Virtual Teams"
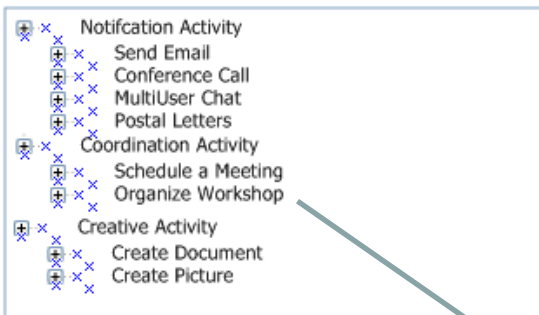[Hill2006] Beyond predictable workflows: Enhancing productivity in artful business processes, IBM SJ 45-4

Representation of Activities

- Our framework supports:
  - XML Schema: defining data model for activities
  - Activity Declaration: abstract template
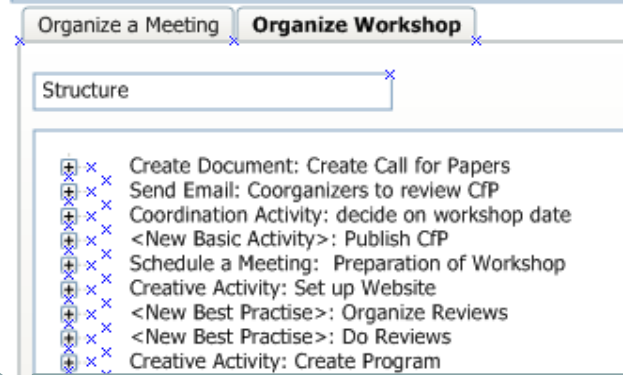 - Activity Instance: representation activities in progress
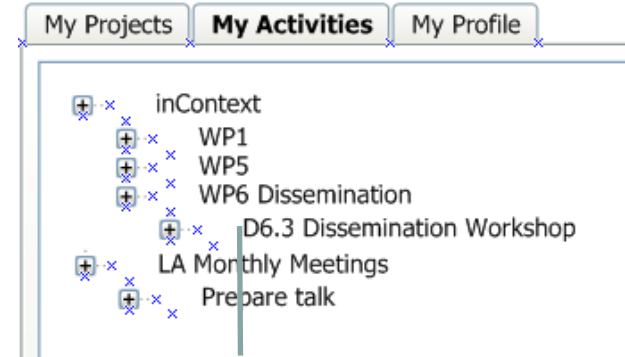
Example of Activities

1) Browse activity declarations
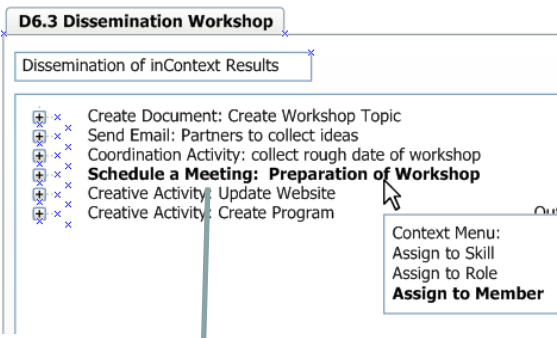- Best practises
- How-To / guidelines

Notifcation Activity
- Send Email
- Conference Call
- MultiUser Chat
- Postal Letters

Coordination Activity
- Schedule a Meeting
- Organize Workshop

Creative Activity
- Create Document
- Create Picture

2) Expand composite activity
- Atomic activities
- Composable activitites - hierarchical

Organize a Meeting | **Organize Workshop**

Structure

- Create Document: Create Call for Papers
- Send Email: Coorganizers to review CfP
- Coordination Activity: decide on workshop date
- <New Basic Activity>: Publish CfP
- Schedule a Meeting: Preparation of Workshop
- Creative Activity: Set up Website
- <New Best Practise>: Organize Reviews
- <New Best Practise>: Do Reviews
- Creative Activity: Create Program
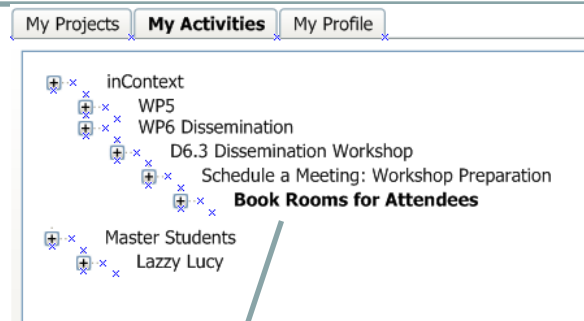
3) Create activity instance
- Customizable
- Add/remove sub-activities

My Projects | **My Activities** | My Profile

- inContext
  - WP1
  - WP5
  - WP6 Dissemination
    - D6.3 Dissemination Workshop
  - LA Monthly Meetings
    - Prepare talk
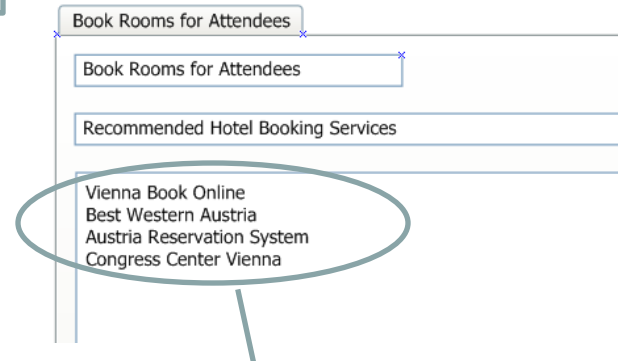
4) Costumize sub-activity
- Assign to team member
- Assign role

D6.3 Dissemination Workshop

Dissemination of inContext Results

- Create Document: Create Workshop Topic
- Send Email: Partners to collect ideas
- Coordination Activity: collect rough date of workshop
- **Schedule a Meeting: Preparation of Workshop**
- Creative Activity: Update Website
- Creative Activity: Create Program

Context Menu:
Assign to Skill
Assign to Role
Assign to Member

5) Atomic activity
- Executed by team member
- Atomic element of complex activity

My Projects | **My Activities** | My Profile

- inContext
  - WP5
  - WP6 Dissemination
    - D6.3 Dissemination Workshop
      - Schedule a Meeting: Workshop Preparation
        - **Book Rooms for Attendees**
- Master Students
  - Lazzy Lucy

6) Mapping to services
- Mapping to a class of services
- Recommendations / service ranking

Book Rooms for Attendees

Book Rooms for Attendees

Recommended Hotel Booking Services

Vienna Book Online
Best Western Austria
Austria Reservation System
Congress Center Vienna

Example of Activities (contd.)

- Activity implemented by Human Service
  - Example: "Book Rooms for Attendees" implemented by Human Service

| My Projects | **My Activities** | My Profile |

- inContext
  - WP5
  - WP6 Dissemination
    - D6.3 Dissemination Workshop
      - Schedule a Meeting: Workshop Preparation
      - **Book Rooms for Attendees**
- Master Students
  - Lazzy Lucy

Human Actor

Service
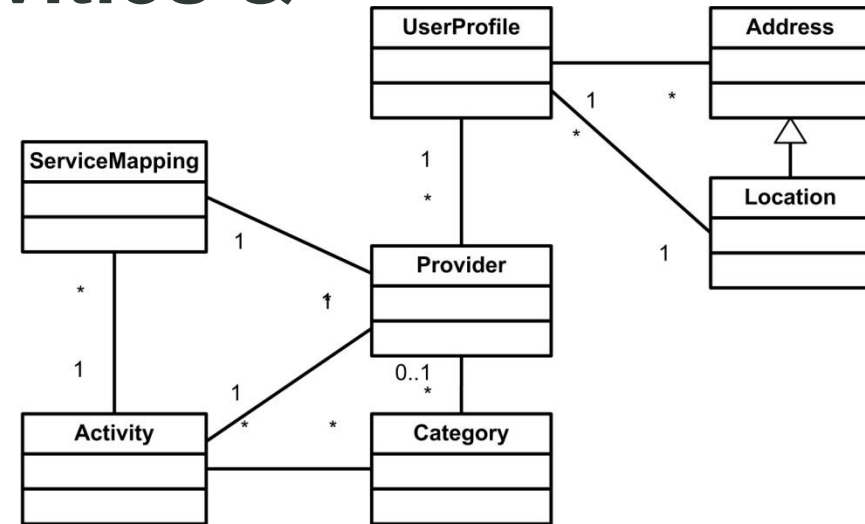
View of Service Consumer
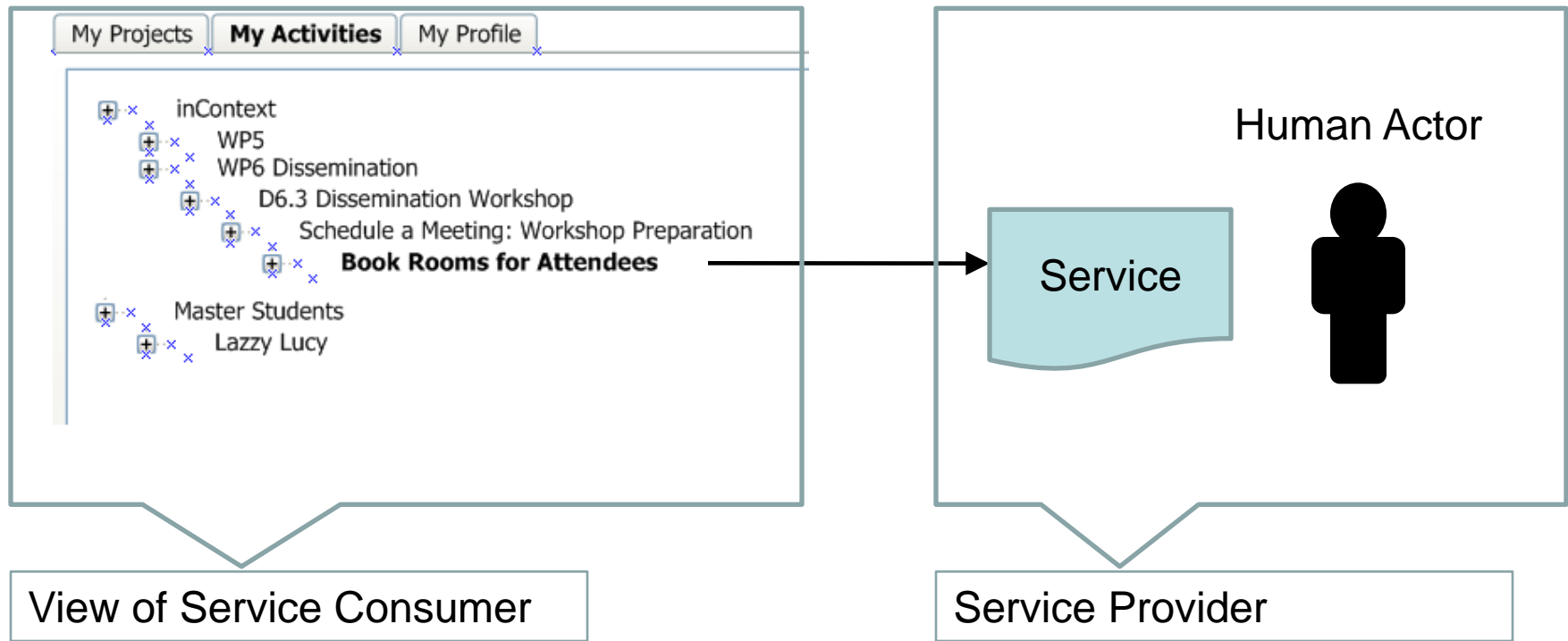
Service Provider

Human-provided Services

- **HpS → Services "implemented" by human actors**
  - Features which cannot be implemented through software only
  - Human actors provide their abilities and work force
- **Example services**
  - Document review service, document translation services
- **Human-provided Services integrated into activities**
  - "Send for review", "Get expert opinion"
- **HpS as a conventional service in SOA model**
  - Describe HpS
    - Human charactertistics
    - Functional → WSDL
    - Non-functional → Meta information (human profile, skills, …)
  - Find HpS
  - Bind/interact with HpS

Combining Activities & HpS

- Orthogonal cases
- Activity declaration created along with mapping to service class
    - **Service consumer**: executes atomic activity
    - Service lookup and selection → execute HpS
    - HpS mapped to an activity without any concern about how and in which scenario the activity is used
- User-driven integration
    - HpS aware of pending tasks and creates explicitly service mapping

HpS Interactions
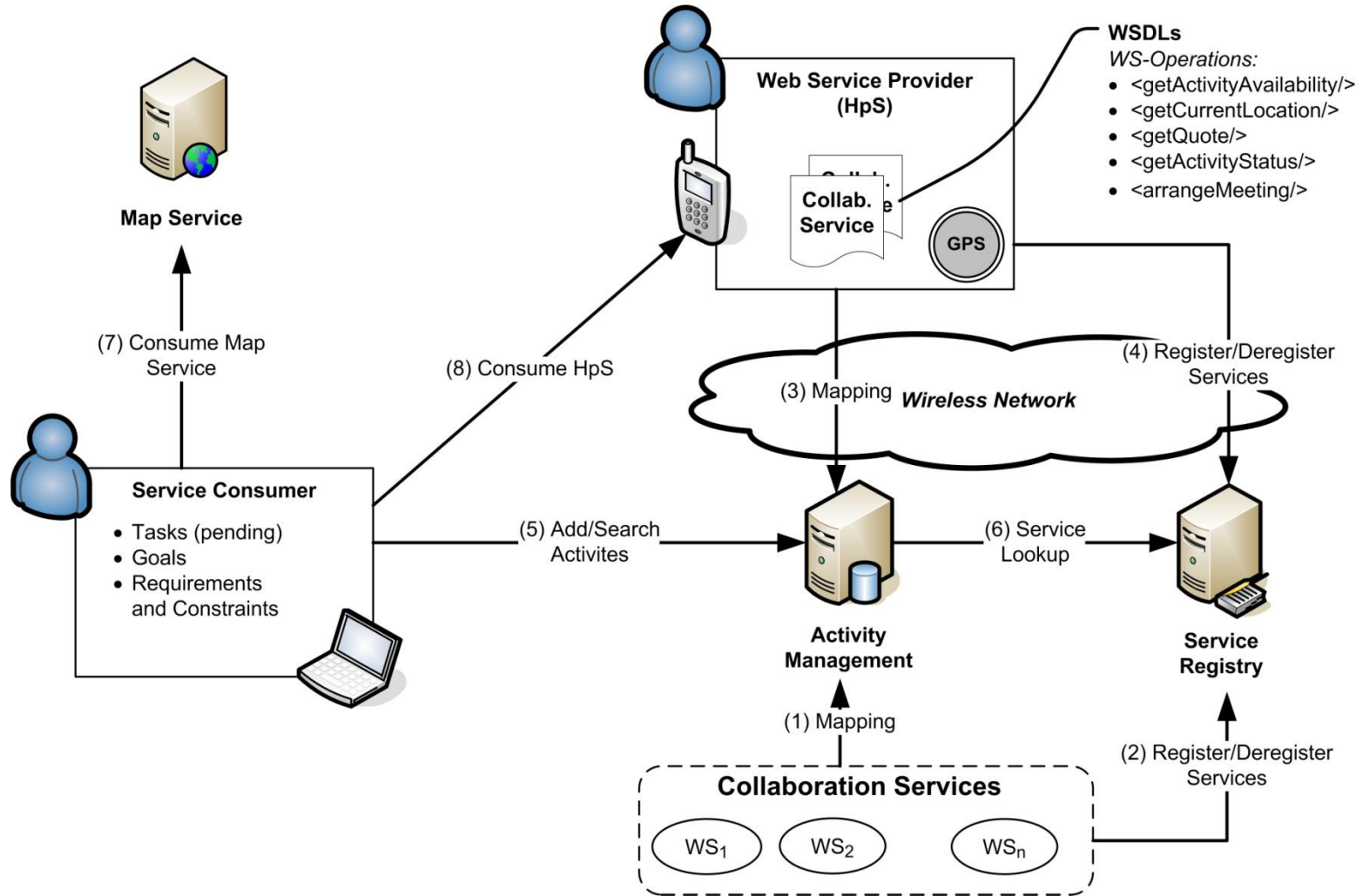
HpS Application – Service Consumer

- **Expert finding based on contextual constraints**
  - Looking for HpS to review document
- **Service consumer**
  - Formulate query:
    (&(category=document.reviews)(|(postalCode=1040)(postalCode=1050))(skill=symbian))
- **Service lookup**
  - If suitable service available, rank and select
  - Otherwise, set activity to pending until fitting service becomes available
- **Suitable services available**
  - Person has become available
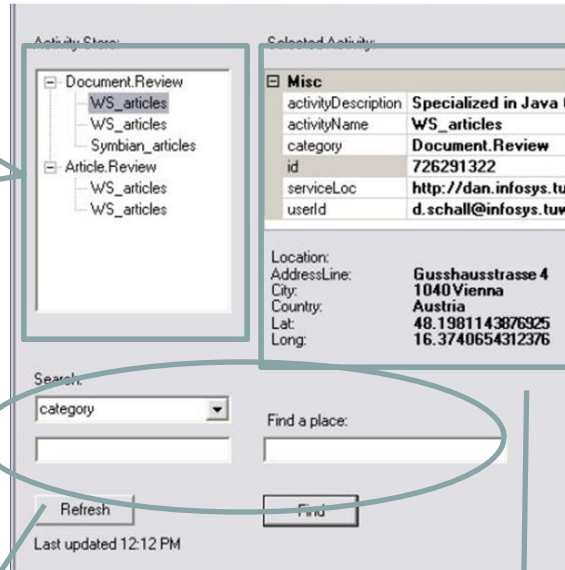 - Context dependent selection

Activity
- Expert opinion wanted
- Field: Web services, Symbian platform
- Required: Availabilty, Proximity

Spatial area

HpS Application – Service Consumer

2) Service tree view
•Service classes
•Specific service instances

Activity Store:
- Document.Review
  - WS_articles
  - WS_articles
  - Symbian_articles
- Article.Review
  - WS_articles
  - WS_articles

Selected Activity:

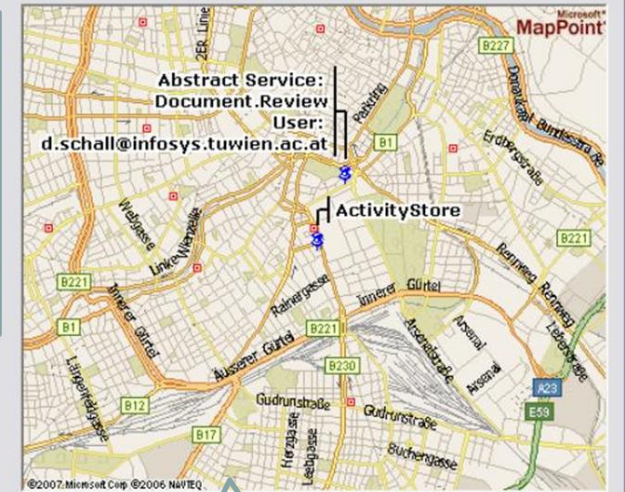| Misc	
activityDescription	Specialized in Java t...
activityName	WS_articles
category	Document.Review
id	726291322
serviceLoc	http://dan.infosys.tuw...
userId	d.schall@infosys.tuwi...

Location:
AddressLine: Gusshausstrasse 4
City: 1040 Vienna
Country: Austria
Lat: 48.1981143876925
Long: 16.3740654312376

Search:
category

Find a place:

Refresh   Find

Last updated 12:12 PM

Abstract Service: Document.Review
User: d.schall@infosys.tuwien.ac.at

ActivityStore

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1) Search services
•Lookup by service class (e.g. doc review)
•Location-based lookup (specify place → services in proximity)

Detailed info view
•Service (class)
•GPS (long/lat)
•Semantic location

Location enhanced service explorer
•Overlay available HpS on map
•GPS coordinates on MapPoint
•Meta information (service class)

HpS Application – Service Provider

- **Service provider (HpS)**
- GUI for management
- HpS ad-hoc service registration / discovery
- Manage incoming requests
- Context sensors → GPS traces from external Bluetooth sensor

SE M600i

- Possibly service composition on mobile device → Mashup
  - Compose locally deployed services
  - Create composite service from services on devices nearby (remote applications)

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HpS Implementation

- **HpS implemented as mobile Web service**
  - gSOAP, kSOAP, JSR-172 (consumer only), …
- **Deployment in OSGi container**
  - OSGi designed for resource constraint devices
  - Platform independent (PCs, mobile phones, sensor platforms)
  - Knopflerfish (~288kB) / Concierge (80kB)
- **Discovery**
  - Based on jSLP implementation (http://jslp.sourceforge.net/)
  - HpS described by string (ServiceURL)
  - Key/value pairs describe HpS attributes

Related Work

- [Dustdar2004] "Caramba - A Process-Aware Collaboration System Supporting Ad Hoc and Collaborative Processes in Virtual Teams", *Distributed and Parallel Databases*, Kluwer Academic Publishers, vol. 15(1), Jan. 2004, pp. 45-66.

- Business Collaboration, IBM Systems Journal Volume 45, Number 4, 2006, http://www.research.ibm.com/journal/sj45-4.html

- [Rellermeyer2007] "Services Everywhere: OSGi in Distributed Environments", *EclipseCon 2007, Santa Clara, CA, USA, Mar. 5-8, 2007.*

- [Hackmann2006] "Sliver: A BPEL Workflow Process Execution Engine for Mobile Devices", *International Conference on Service Oriented Computing (ICSOC), Springer, LNCS vol. 4294, Dec. 2006, pp. 503-508.*

- WS-BPEL Extension for People, WS-HumanTask specification v1.0 http://www.ibm.com/developerworks/webservices/library/specification/ws-bpel4people/

- [Schall2006] „Web Services on Embedded Devices", International Journal of Web Information Systems (IJWIS), Troubador Publisher.

Conclusion and Future Work

- Our framework comprises
    - Activities to structure collaboration
    - Utilizing resources to execute activity
    - Humans expressed as services (HpS)
    - Application of HpS and Implementation
- Future work
    - User profile expressing skills, expertise
    - Ranking of HpS based on social metrics
    - Interactions between HpS & BPEL4People

Thanks for your attention – Questions?

Contact: mailto://d.schall@infosys.tuwien.ac.at
Work: http://www.infosys.tuwien.ac.at/staff/dschall/
Lab: http://www.vitalab.tuwien.ac.at
Project: http://www.in-context.eu