Mobile Web Services
for Collaborative Learning

Master Thesis

Iliyana Ivanova
Matr. Nr. 262369

Supervisors: Prof. Dr. Matthias Jarke
Prof. Dr. Wolfgang Prinz

Advisors: Dipl.-Inform. Mohamed Amine Chatti
M. Sc. Satish Narayana Srirama
Outline

• Motivation
• State of Art
• Design
• Implementation
• Evaluation
• Demo
• Q & A
Social Aspect of Learning

• Evolution from traditional education through d-learning and e-learning to m-learning

• Transition from an isolated individual activity to a collaborative and conversational experience

• Web 2.0 & social software
  – User generated content
  – Participation and collaboration

• Drowning in data, but starving for knowledge
  → Necessity for expert finding and expertise retrieval
Mobile Web Service Provisioning

Collaborative learning as a learner-centered process

Resource Provisioning

Interoperability

Mobile learning

Mobility

Web Service Provisioning

Mobile Web Service Provisioning

Learning as a service
Thesis Goal and Research Domains

• Thesis goal
  To provide a novel approach to expertise finding within a truly collaborative mobile learning environment, including expert finding, literature resource retrieval and multimedia resource broadcasting, based on web service provisioning from mobile phones.

• Thesis research domains

  - Collaborative Learning
  - M-Learning
  - Mobile Social Software
  - Mobile Web Service Provisioning
## Existing Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Domains</th>
<th>Collaborative Learning</th>
<th>M-Learning</th>
<th>Mobile Social Software</th>
<th>Mobile Web Service Provisioning</th>
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<tr>
<td>University of Washington</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No*</td>
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<td>Plazes, Jambo Networks</td>
<td>Partly</td>
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<td>Trifonova and Ronchetti</td>
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<td>Yes</td>
<td>No</td>
<td>No*</td>
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<td>Our approach</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</table>

* Web Service provisioning from desktop servers
Design

- Scenario
- Requirements
- System Architecture
  - MobileHost CoLearn Modules
  - MobileHost CoLearn Web Services
Sample Scenario

I use it every day: Rating 9/10

I’ve got a UML problem 😞

Not much

Susan

Lazy to answer

Anna

Bob

No idea

Just a bit

Melanie

Brandon

Ben

No time

I think I know: Rating 7/10

Motivation

State of Art

Design

Implementation

Evaluation

Conclusion & Future Work

Demo / Q&A
Requirements:
Discovery and Management of Expert Data

• Find experts in a specific field within a truly collaborative mobile environment.

[Diagram of a network with roles: Requestor (0), Forwarder (1), Forwarder (n-1), Responder (n)]
Requirements:
Discovery and Management of Resources

• Literature resources:
  • Manage different types of literature resources (articles, inproceedings, proceedings, books, URLs, master and PhD theses, unpublished resources);
  • Tag resources with a particular level of relevance;
  • Retrieve the tagged literature resources of other learners.

• Multimedia resources:
  • Manage photocasting and podcasting channels and their episodes;
  • Leave/retrieve broadcast feedback.
MobileHost CoLearn Modules

MobileHost CoLearn System

Expertise Management Module
- Expert Management Module
- Resource Management Module

Broadcast Management Module
- Photocast Management Module
- Podcast Management Module

Photocasting Module
- Available PhotoCh Web Service
- Subscribe PhotoCh Web Service
- Receive Photocast Web Service
- Comment Photocast Web Service
- Retrieve PhotoComm Web Service
- Unsubscribe PhotoCh Web Service

Podcasting Module
- Available PodCh Web Service
- Subscribe PodCh Web Service
- Receive Podcast Web Service
- Comment Podcast Web Service
- Retrieve PodComm Web Service
- Unsubscribe PodCh Web Service
Use Case Diagram of the Expert Finder Module
System Architecture
Technologies and Tools Used

- **J2ME**
  - CLDC 1.1 / MIDP 2.0
  - Optional packages: JSR-75 FCOP and PIMOP, JSR-135 MMAPI, JSR-120 WMA

- Eclipse SDK 3.2 and EclipseME Plug-in

- NetBeans IDE 5.5 and NetBeans Mobility Pack

- Sun Java Wireless Toolkit 2.5 for CLDC and Sony Ericsson SDK 2.2.4

- kSOAP2 and kXML2
<request xsi:type="mh:request">
  <requestor xsi:type="mh:learner">
    <phone xsi:type="xsd:string">+4917623580216</phone>
    <ip xsi:type="xsd:string">134.130.122.57</ip>
    <name xsi:type="xsd:string">Iliyana Ivanova</name>
    <email xsi:type="xsd:string">iliyanai@yahoo.com</email>
    <other xsi:type="xsd:string">icq:12341234</other>
  </requestor>
  <title xsi:type="xsd:string">J2ME JSR-75 Permissions in Jad</title>
  <description xsi:type="xsd:string">Help me to configure JSR-75 permissions in my Jad file</description>
  <startDateTime xsi:type="xsd:dateTime">Thu May 31 10:25:22 UTC 2007</startDateTime>
  <expiryDateTime xsi:type="xsd:dateTime">Fri Jun 15 10:25:22 UTC 2007</expiryDateTime>
  <forwards xsi:type="SOAP-ENC:Array" SOAP-ENC:ArrayType="mh:forward[?]">
    <forward id="1" xsi:type="mh:forward">
      <forwarder xsi:type="mh:learner">
        <phone xsi:type="xsd:string">+4921102456201</phone>
        <ip xsi:type="xsd:string">137.226.232.12</ip>
        <name xsi:type="xsd:string">Liliya Sadikova</name>
      </forwarder>
      <date xsi:type="xsd:dateTime">Fri Jun 01 21:36:54 UTC 2007</date>
      <comment xsi:type="xsd:string">That's one of my best friends, please help</comment>
    </forward>
    <forward id="2" xsi:type="mh:forward">
      <forwarder xsi:type="mh:learner">
        <phone xsi:type="xsd:string">+4921102456202</phone>
        <ip xsi:type="xsd:string">137.226.232.22</ip>
        <name xsi:type="xsd:string">Dimlar Denev</name>
      </forwarder>
      <date xsi:type="xsd:dateTime">Sat Jun 02 15:22:41 UTC 2007</date>
      <comment xsi:type="xsd:string">A real needs help. You're better. Plz help</comment>
    </forward>
  </forwards>
</request>
Expert Rating SOAP Request Message

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Original Request

<request xsi:type="mh:request">
  <repositor xsi:type="mh:learner">
    <phone xsi:type="xsd:string">+4917623589216</phone>
    <ip xsi:type="xsd:string">134.130.122.37</ip>
    <name xsi:type="xsd:string">Iliyana Ivanova</name>
    <email xsi:type="xsd:string">iliyana@yahoo.com</email>
    <other xsi:type="xsd:string">icq:12341234</other>
  </repositor>
  <title xsi:type="xsd:string">J2ME JSR-75 Permissions in JAD</title>
  <description xsi:type="xsd:string">Help me to configure JSR-75 permissions in my JAD file</description>
  <startDateTime xsi:type="xsd:dateTime">Thu May 31 10:25:22 UTC 2007</startDateTime>
  <expiryDateTime xsi:type="xsd:dateTime">Fri Jun 15 10:25:22 UTC 2007</expiryDateTime>
  <forwards xsi:type="SOAP-ENC:Array" SOAP-ENC:ArrayType="mh:forward[2]">
    <forward id='1' xsi:type="mh:forward">
      ...<forward id='2' xsi:type="mh:forward">
      ...<forwards>

Current Path

Expert Response

<response xsi:type="mh:response">
  <responder xsi:type="mh:learner">
    <phone xsi:type="xsd:string">+4924102156203</phone>
    <ip xsi:type="xsd:string">137.226.232.31</ip>
    <name xsi:type="xsd:string">Anna Nov</name>
    <email xsi:type="xsd:string">ann.nov@rwth-aachen.de</email>
    <other xsi:type="xsd:string">none</other>
  </responder>
  <date xsi:type="xsd:dateTime">Sun Jun 03 09:12:44 UTC 2007</date>
  <rating xsi:type="xsd:int">9</rating>
  <comment xsi:type="xsd:string">You need to add the javax.microedition.io.Connector. file.read/write permissions. If you need further help, do not hesitate to contact me.</comment>
</response>
</request>
Class Diagram of the Expert Finder Module
Screen Flow of the Expert Finder Module

(requests of the current user)
The presence of one more forward on the path increases the total client time (forwarder at level $n-1$) with 0.276 seconds, and the total server time (forwarder/responder at level $n$) with 0.265 seconds on average.
Granular Performance Analysis of the Expert Search Web Service

- Total server processing time: 7%
- Total client processing time: 7%
- Transmission time: 86%
User Evaluation

• 7 users in 2 sessions; 14 steps for evaluating the system framework and system modules

• Overall system evaluation
  • Questionnaire of 25 questions- a subset of the Software Usability Measurement Inventory (SUMI) [UCCI07]
  • Result- 86.87 points (out of 100 points), according to the System Usability Scale [Broo07]
User Evaluation

**Motivation**

**State of Art**

**Design**

**Implementation**

**Evaluation**

**Conclusion & Future Work**

**Demo / Q&A**

**Expert Finder and Expert Management Modules:**
- + collaborative environment
- + expertise fields with various levels of expertise
- + request path and forwarder comments

**Expert Answer Module:**
- + search possibilities
- - graphical representation of the request path (requestor, forwarder and responder photos)
- - pop-up request notification
- - automatic discovery of experts

**Resource Finder and Resource Management Modules:**
- + variety of literature resource types
- + tags with 3 levels of relevance
- + search possibilities
- - resource abstracts
- - wizard for related tags
- - latest resources added and latest tags used

**Broadcast Management and Broadcasting Modules:**
- + possibilities for broadcast creation
- + user preferences
- + comments
- - tags for particular areas of an image
- - vodcast management and vodcasting modules
Conclusion

The developed MobileHost CoLearn system:

- Provides a collaborative mobile learning environment by combining the mobile web service provisioning domain with the collaborative learning domain.

- Supports learners in finding exactly the valuable up-to-date information that they need within the constantly increasing information overflow:
  - Find experts in specific fields;
  - Retrieve tagged literature resources;
  - Receive broadcast content.

The user evaluation and performance analysis have clearly shown that the system is realistic and can scale to the demands of large collaborative learning groups in mobile networks.
Future Work

• Enhancements from the user evaluation:
  • Graphical representation of the request path;
  • Wizard for expertise fields and tags.

• Extendability of the system with further collaborative learning modules.

• MobileHost support of the full HTTP 1.1 specification.
Demo / Questions & Answers

Demo

Q & A