### Tentative schedule ...

<table>
<thead>
<tr>
<th>Dates</th>
<th>TOPICS / LECTURES NOTES</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>March 15,</td>
<td>Web services fundamentals (part II)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Web services based architectures</td>
<td></td>
</tr>
<tr>
<td>March 22</td>
<td>Mobile agent based architectures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course evaluation</td>
<td></td>
</tr>
<tr>
<td>March 29,</td>
<td>Quiz #2</td>
<td></td>
</tr>
<tr>
<td>April 5</td>
<td>Quiz corrections</td>
<td></td>
</tr>
<tr>
<td>Same week</td>
<td>Deadline for project report submissions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project demos</td>
<td></td>
</tr>
</tbody>
</table>
Web Services Based Architectures

INSE 7110 – Winter 2005
Value Added Services Engineering in Next Generation Networks
Week #11
Application areas

Any area that requires program to program interactions over a network

Examples
- Value added service engineering in NGN
- Digital imagery
- Geographical information systems
Outline

• Web services for value added service engineering in NGN

• A digression on digital imagery
Applying Web services to value added service engineering in NGN

1. Parlay-X
2. OMA
Two issues

1. Define Web services for making telecommunications capabilities available to applications in same or foreign domain
   - Call control
   - Presence
   - Location
   - Messaging
Two issues ...

2 - Enable the use of Web services in telecommunications by providing common / supporting functions such as:

Billing
Security -
  - Authentication
  - Authorization
  - Non repudiation
  - Others
Service management
  - registration
  - Discovery
  - Others
1. Introduction
2. Architecture
3. The services
Introduction

1. Specifications
   Parlay forum
   - White paper + actual specifications
   - Released as part of Parlay 4.0 specifications
   3GPP forum
   - Parlay-X Web services for multimedia conference

2. Application interfaces
   - Focus: First issue
   - Aim at covering all telecommunication capabilities
     - Stand alone capabilities (e.g. presence, call control)
     - Combined capabilities (presence + call control)

3. Use the reference Web service principles (e.g. coarse grained) technologies (e.g. WSDL)
Architecture

Parlay Gateway
- Parlay X Web Services
  - Parlay X APIs
    - Parlay Applications

Increasing abstraction

Network Elements
- Network Protocols (e.g. SIP, INAP etc)

Parlay Applications
The services

1. Call control
2. Conferencing
3. Messaging
   - SMS
   - MMS
3. Payment (e.g. volume charging)
4. Account management (e.g. account credit expiration date query)
5. User status (online / offline)
6. Terminal location
Parlay-X Call Control …

Make a call
Get call information
End call
Cancel call request
Parlay-X Call Control ...

- Handle busy
- Handle Not reachable
- Handle No answer
- Handle off Hook
Parlay-X Conferencing - Basics

- Allows the creation of a multimedia conference call
- Allows the dynamic management of:
  - Conference
  - Participants
  - Media

- Service model entities
  - Conference: a “context” to which participants can be added
  - Participant: parties involved in the conference
  - Media: audio/video/chat
Parlay-X - Conference management

“createConference”:
  • Create a multimedia conference with initially no participant

“getConferenceInfo”
  • Gets information concerning the current status (initial, active, terminated) of the conference

“endConference”
  • Three possibilities:
    • Maximum duration of the conference expired
    • All participants have left the conference
    • The conference owner has left the conference
Parlay-X - Participant management

“inviteParticipant”:
  • Add a new participant to the conference
  • The operation fails if the maximum participants number has been reached

“disconnectParticipant”:
  • Disconnects the participant

“getParticipantInfo”
  • Gets information concerning the current status (invited, connected, disconnected) of the participant

“getParticipants”
  • Gets information concerning the current status of each participant
Parlay-X - Media management

“addMediaForParticipant”:
• Executed on a single participant
• Add a media stream to the media set used by participant
• The new media has to be compatible with:
  • The conference type
  • The media supported by the participant terminal

“deleteMediaForParticipant”:
• Executed on a single participant
• Add a media stream to the media set used by participant
Parlay-X – Sequence diagrams ...

Repeat previous steps to invite and connect many participants to the conference.
Parlay-X – Sequence diagrams ...
Parlay-X – Sequence diagrams …
Parlay-X MMS …

- Send Message
- Get Message Delivery Status
- Get Received messages
- Get messages URIs
- Notify message reception
1. Introduction
2. Architecture (ARCH)
3. OMA Web Service Enabler (OWSER)
Introduction

OMA
- Industry association created in 2002
- Focus on mobile services
- Aims at:
  - Consolidating standards for wireless services (e.g. 3GPP/PP2, IETF, W3C)
  - Producing new standards if needed-
  - Tackling the two issues
Architecture

Aim at providing a general architecture for mobile services

- Requirements
- Principles
- Functional entities
- Common framework
- Service adaptability
Principles

- Signalling protocol neutrality and independence from programming languages, operating systems and so on
- Leverage existing standards
- Interoperability, scalability
- Service adaptability
- Consistency with Internet models
OMA Web service enabler (OWSER)

Aim at providing solutions to common problems faced by designers when using Web services in an OMA environment

- Practical deployment patterns
- Common functions (e.g. charging, security)
- Network Identity specifications (i.e. specific aspects of security – Based on Liberty alliance specifications)
- WSDL Style guidelines
- Test requirements
Examples of deployment patterns

The adapter pattern

Requestor \[ \rightarrow \] Adapter \[ \rightarrow \] Legacy

1 \[ \rightarrow \] 2 \[ \rightarrow \] 3 \[ \rightarrow \] 4
Examples of deployment patterns

The gateway pattern
Examples of deployment patterns

The proxy pattern

Diagram showing the flow between Legacy, Proxy (Requestor), and Web service.
Examples of deployment patterns

The delegate pattern

- Requestor
- Web service
- Delegate (WS1)

1. Requestor communicates with Web service.
2. Web service forwards request to Delegate (WS1).
3. Delegate (WS1) processes request and returns response.
Examples of deployment patterns

The orchestrator pattern

Requestor 1 2 3 4 5
Orchestrator
Web Service 1
Web Service 2
Web Service 3
Examples of deployment patterns

The filter pattern

- Requestor
- Filter
- Web Service 1

1 2 3 1 2 3
Examples of deployment patterns

The workflow pattern

Requestor 1/ Web service 4

Requestor 2/ Web service 1

Requestor 3/ Web service 2

Requestor 4/ Web service 3
Common functions

Common functions are key to interoperability

Common supporting technologies

- XML 1.0
- SOAP 1.0
- WSDL 1.1
- HTTP 1.1
- UDDI 2.0X
- Use of WS-I profile
Common functions

Common functions are key to interoperability

Security (Identification of relevant standards and normative security technologies)

- Authentication
- Data integrity
- Confidentiality
- Key management
- Access control / authorization
- Non repudiation
Common functions

Common functions are key to interoperability

Service management (Identification of specific versions of UDDI)
- Registration
- Publication
- Discovery
A quick assessment

1. **Parlay-X Web services**
   - True Web services
     - Coarse grained approach (unlike WSDL version of Parlay specifications)
   - Work done “independently” of OMA
     - Situation is evolving (e.g. joint meetings are planned)

2. **OMA**
   - Tackle critical issues such as common functions
   - Integration of existing standards may take longer than planned
A Digression on Digital Imagery   ...

1. Introduction
2. Business model
3. Examples of interactions
Introduction

Common Picture Exchange (CPXe)

Purpose
- Automation of manipulation, printing and sharing digital images
  - Printing options (in-store pick up, postal delivery)

Involved companies
- Most companies active in the digital imaging industry (e.g. Kodak, HP, Konica, Olympus and others)
Business model ...

Changes to the original Web service model

- Motivation:
  - UDDI does not provide the level of fine granularity required by the industry
    - Where to get poster size glossy print in a given city
    - Located at a given distance from an hotel
    - With given opening hours

- Changes
  - Possibility to give much lower level granularity about services
  - Possibility for searching such type of information
Business model

Broker
(Human + Agent)
Two types of broker:
- UDDI
- Service locator

Requestor
(Human + agent)

Provider
(Human + agent)
Note: Provider keeps Information accessible
By service locator
Business model ...

Service locators
- Interact (on behalf of service requestor with UDDI and/or catalogues to find service(s) meeting specific criteria
- May be deployed by providers to direct to her/his services
- May be deployed by an independent party
- Accessible via a standardized API

- Catalogues
  - Standardized way for service providers to provide more details about their services (e.g. closing hours of an outlet)
  - Kept in service provider domain
  - Accessible via a standardized API by:
    - Service requestors
    - Service locators
Business model ...

Catalogues (Examples of info)
- Service property list
- Store list
  - Street address
  - Hours of operations
- Product list
- Price list
- Category list
Examples of interactions ...
Examples of interactions ...

Requestor  UDDI  Provider 1  Provider 2

Search

Bind
Examples of interactions ...

Requestor  Provider 1

Search

Bind
To probe further ...

- **Parlay-X**

- **OMA**
  - [OMA](http://www.openmobilealliance.org/)

  Digital imagery
  
  T. Thomson et al., CPXe: Web services for Internet Imaging, IEEE Computer Magazine, October 2003