AG Heterogene Informationssysteme
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Middleware for Heterogeneous and Distributed Information Systems – Exercise Sheet 7

Wednesday, December 10, 2008 – 10:00 to 11:30 – Room 48-379

Web Service Coordination (WS-Coordination)

Web services may tie together a large number of participants forming large distributed computational units referred to as *activities*[1]. The resulting activities are often complex in structure, with complex relationships between their participants. The Web Service Coordination (WS-Coordination) specification defines an extensible framework for coordinating activities using a *coordinator* and set of *coordination protocols*. The framework enables participants to reach consistent agreement on the outcome of distributed activities.

1. What component services are offered by a coordination service (also known as coordinator)? What are these services used for?
2. What is a *coordination context*? What information is contained in a coordination context?
3. How is a coordination context embedded in a SOAP message? Why is the `mustUnderstand` attribute of particular importance here?

Web Service Atomic Transaction (WS-AtomicTranscation) and Web Service Business Activity (WS-BusinessActivity)

WS-Coordination defines an extensible framework for defining coordination types. Web Service Atomic Transaction (WS-AtomicTransaction) and Web Service Business Activity (WS-BusinessActivity) extend WS-Coordination with the *atomic transaction coordination type* and the *business activity coordination type*, respectively.

As an example, consider an application to automatically book a trip. The required tasks are booking a flight, booking a hotel, and booking a rental car at the airport. For each of these tasks a web service is offered by the airline, the hotel, and the car rental agency, respectively.

1. Assume that the atomic transaction coordination type is used. What participants are involved in the distributed transactions? What coordination protocols are used by each of the participants? Use a sequence diagram to illustrate the interactions of the participants!

[1] see Web Services Coordination (WS-Coordination), July 12 2007, available at http://docs.oasis-open.org/ws-tx/wscoor/2006/06

2. Consider that the flight booking fails. What is the outcome of the atomic transaction?
3. Is the atomic transaction protocol suitable for this scenario? Do you see any problems?
4. Assume that the business activity coordination type is used instead of the atomic transaction coordination type. What coordination protocols are used by each of the participants? Use a sequence diagram to illustrate the interactions of the participants (assuming that all bookings are successful)!
5. Consider that the flight booking fails. How does the business activity proceed?
6. In response to the failed booking, the application decides to book a train instead of an airplane. Therefore it needs to hire a rental car at the station instead of the airport. How does the business activity proceed?
7. What are the key differences between atomic transactions and business activities?

Web-based Information Systems

Numerous techniques for the implementation of web-based information systems are available. One can distinguish client-side approaches such as Java Applets and server-side approaches such as CGI programs, Server APIs, Server-Side-Includes, Java Servlets, and Java Server Pages. The architecture of web-based information systems typically includes two or three tiers, namely a web server, a DBMS and possibly an application server.

Consider the following sample systems and choose an implementation technique and a system architecture that appears best suited! Give reasons for your choice!

1. An electronic guest book of a private web site
2. An online book store
3. An intranet web application with a rich user interface