

Exam **Service-oriented architecture with Seb services** **Master CSc/BIT**

Module/course code: 192652150
Date: 05-04-2016
Tijd: 8:45-11:45 (+25% voor studenten met recht op extra tijd)
Teacher: L. Ferreira Pires

Type of exam: open book

Attachments: Questions sheet

Allowed resources: book Papazoglou, M.P. Web services: principles and technology, a copy of the WSDL and WS-BPEL standards and a copy of the lecture sheets of 2014-2015 (without annotations)

Instructions:

- Exam contains 8 questions, with a total of 9 points (mark ranging from 1 to 10). You get already 1.0 point for showing up today.
- Place your name and student number on each sheet (or file) with answers to the questions.
- The points assigned of each question are indicated in the questions sheet.

Final exam
192652150
Service-oriented architecture with Web services

5 April 2016

During this exam the students are allowed to use the book Papazoglou, M.P. Web services: principles and technology, a copy of the WS-BPEL standard and a copy of the lecture sheets (without annotations).

Answer the questions below in your own words. Text literally copied from the book or the sheets will be ignored for marking.

Consider the scenario of a business process for making travelling arrangements for employees of a company. The client of the process invokes the business process, specifying the name of the employee, the employee id, the destination, the departure date, and the return date. The BPEL business process first checks the employee travel rights and preferences through a Web service that supplies general information about employees. Then the BPEL process checks the price of the flight ticket with two airlines: KLM and Lufthansa. Both airline companies are supposed to provide a Web service through which such checks can be made. Finally, the BPEL process selects the flight ticket with the lowest price that fits the rights and preferences of the employee, and returns a travel plan to the client.

Assume that the BPEL process is asynchronous and that the Web service for checking the employee travel rights and preferences is synchronous. This is reasonable because these data can be obtained immediately and returned to the caller. To acquire the plane ticket prices, asynchronous invocations are used, i.e., the airlines web services are asynchronous. Again, this is a reasonable approach, because it might take longer to confirm the plane travel schedule. To simplify the exercise, assume that the airlines offer functionally identical Web services, i.e., they provide the same port types and operations.

Question 1 (1.0 points)

- a. Draw a diagram that shows the relations between the parts involved in this scenario. This diagram should represent the parts, the interfaces (ports) supported by these parts and the operations invoked on each interface.
- b. Explain and justify your diagram.

Question 2 (1.5 points)

- a. Define generic WSDL interfaces for the airline service based on the operations and parameters that you defined in your answer to Question 2. Don't forget that this service is asynchronous!
- b. Discuss and justify the elements you have defined in your interfaces, including the data types.

Hint:

A valid and complete WSDL specification for this service can become quite verbose. There is no need to write all the WSDL tags if you clearly indicate the port types (interfaces), operations, messages and data types in your answer, as well as the binding and ports.

Question 3 (1.0 point)

- a. For one of the operations you defined in Question 2, give an example of a SOAP request message.
- b. Explain which inputs are represented in the example.

Don't forget to make sure the encoding of your SOAP message matches the encoding indicated in the WSDL specification in Question 2.

Question 4 (1.0 point)

- a. Identify and explain one benefit of defining web services choreographies.
- b. Give one example related to the business process of Questions 1 to 4 that illustrates this benefit.

Question 5 (1.5 points)

- a. Define an abstract BPEL process for the business process for employee travel arrangements of Questions 1 to 4. This BPEL process can be defined without all the details and can be simplified to perform only the most essential activities, but make sure you indicate which simple activities are necessary.
- b. Explain and justify your BPEL process.

Question 6 (1.0 point)

- a. Why are correlations necessary to make your process of Question 6 more realistic?
- b. How would you define your correlation set(s) in this process?

Question 7 (1.0 point)

Consider the following example of a `tModelInstanceDetails` definition found in a `bindingTemplate` for a web service.

```
<tModel tModelKey="...">
  <name>http://www.getquote.com/StockQuoteService-interface</name>
  <description xml:lang="en">
    Standard service interface definition for a stock quote service.
  </description>
  <overviewDoc>
    <description xml:lang="en">
      WSDL Service Interface Document
    </description>
    <overviewURL>
      http://www.getquote.com/services/SQS-
      interface.wsdl#SingleSymbolBinding
    </overviewURL>
  </overviewDoc>

  <categoryBag>
    <keyedReference tModelKey="UUID:C1ACF26D-9672-4404-9D70-
    39B756E62AB4"
                    keyName="uddi-org:types" keyValue="wsdlSpec"/>
    <keyedReference tModelKey="UUID:DB77450D-9FA8-45D4-A7BC-
    04411D14E384"
                    keyName="Stock market trading services"
                    keyValue="84121801"/>
  </categoryBag>
</tModel>
```

- a. What is the purpose of the `<overviewURL>` element?
- b. What do you think the references to the `tModels` in the `<categoryBag>` are telling us about this binding template and its related business service?

Question 8 (1.0 point)

In the preparation of Workshop 5 you should have learned that RESTful services are designed according to the following principles: (i) stateless client-server interactions, (ii) resources identified via URLs and (iii) CRUD actions that naturally match HTTP.

Explain how this works with the example of a service that manages a set of students in terms of their unique id, name and address. Make sure each principle (and each one of the CRUD actions) is illustrated in your example.

Good luck!