UNIVERSITY of TECHNOLOGY, MAURITIUS

MSc. Software Engineering

Cohorts: MSE/07/PT - MSE/08/PT

Examinations for 2007 – 2008 / Semester 1

MODULE: Service Oriented Architecture

MODULE CODE: WAT 5101

Duration: 2 Hours

Instructions to Candidates:

1. Answer **all** questions.
2. Questions may be answered in any order but your answers must show the question number clearly.
3. Always start a new question on a fresh page.
4. All questions carry equal marks.
5. Total marks 100

This question paper contains 4 questions and 6 pages.

QUESTION 1: (25 MARKS)

"A Service-Oriented Architecture (SOA) is a software architecture that is based on the key concepts of an application frontend, a service, a service repository and a service bus".

a) Explain the term 'software architecture' in the above definition.

(3 marks)

b) Describe the above four key concepts that constitute an SOA.

(12 marks)

c) Is it possible for a company to implement an SOA and achieve many of its benefits without establishing a service repository?

(4 marks)

d) Binding is referred to as the way in which service definitions and service instances are located, incorporated into the application frontend. Distinguish between ***development time binding*** and ***runtime binding*** of services.

(6 marks)

QUESTION 2: (25 MARKS)

We identified three expansion stages that signify the different levels of maturity of an SOA in the enterprise: the fundamental SOA, the networked SOA and the process-enabled SOA.

a) Imagine an airline web site that utilises four services - Flight Service, Customer Service, Booking Service, Payment Service - that encapsulate the major business entities and their behaviours that are relevant to the business processes that are exposed to their customers.

   i. Describe, using the layering approach to SOA, how the above could be arranged in order to meet the requirements of the fundamental SOA.

   (5 marks)

   ii. Discuss one advantage and one disadvantage of the fundamental SOA.

   (2 marks)

b) Consider the following situation where a booking application and a CRM application can operate in parallel:

The booking application can regard any person that has registered at the booking/airline website as a customer, whereas the CRM (Customer Relationship Management) system requires that a person has purchased at least one ticket in the last two years to be considered as a customer. Figure 1, below is one possible scenario in which the enterprise can operate the booking and CRM application in parallel: Two distinct applications with two distinct databases (DB1 and DB2), with redundant data, that are synchronised over nightly batch runs.

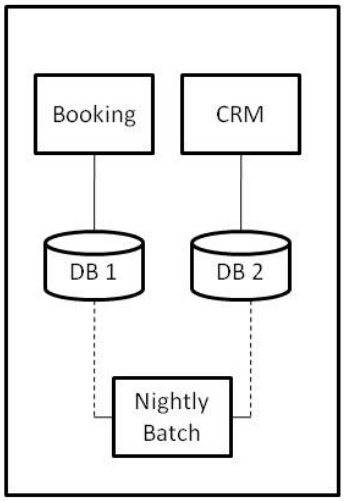

Figure 1: Two Separate Applications and Database

i. What are the possible disadvantages of the approach presented in Figure 1?

(3 marks)

ii. Explain how the networked SOA, which usually includes a layer of intermediary services, can provide a much simpler structure that will solve all the problems you identified in part i.(Support your answer with a diagram)

(15 marks)

QUESTION 3: (25 MARKS)

The combination of different functionalities offered by different Web Services, to create a new functionality offered as a service, is known as composition. Two important aspects of Web Services composition are orchestration and choreography.

a) Differentiate between orchestration and choreography in the context of Web Service Compositions. (Use UML sequence or activity diagrams to support your explanation)

(10 marks)

b) Describe two languages that are used for modelling Web Service composition.

(5 marks)

c) Message Exchange Patterns (MEPs) represent a set of templates that provide a group of already mapped out sequences for the exchange of messages. Describe the simple and the complex message exchange patterns.

(10 marks)

QUESTION 4: (25 MARKS)

The Simple Object Access Protocol (SOAP) is based on document-centric message passing to provide a means of communication between applications running on different operating systems, with different technologies and programming languages.

a) Describe the three main building blocks of a SOAP message.

(9 marks)

b) Below is a SOAP Request for the prices of apples, write down the generated SOAP response.

(6 marks)

```
<?xml version="1.0"?>
<soap:Envelope
xmlns:soap="http://www.w3.org/2001/12/soap-envelope"
soap:encodingStyle="http://www.w3.org/2001/12/soap-
encoding">

<soap:Body>

   <m:GetPrice xmlns:m="http://www.exmaple.com/prices">
      <m:Item>Apples</m:Item>
   </m:GetPrice>

</soap:Body>

</soap:Envelope>
```

c) What do you understand by the term: ‘SOAP HTTP binding’?

(4 marks)

d) What is the role of a SOAP engine, such as the Axis Apache SOAP engine?

(6 marks)

******END OF QUESTION PAPER******