

Architecture of Information Systems (232011): First exam 2008/2009

July 1, 2009 13:30-15:30h, SP 1

Please pay attention to the following:

- **This exam has to be completed in 2 hours.**
- It is **NOT** allowed to use the book or any other material.
- You can answer in either Dutch or English.
- The exam consists of 6 questions.

Distribution of points:

- 10 points for showing up;
- Other questions as indicated.

1 Question 1 (15 points; 5 points for a, b and c each)

There are many acronyms in the architecture field. Describe the relationship between each of the following pairs of acronyms:

- a) **SOAP** (Simple Object Access Protocol) and **SOA** (Service-Oriented Architecture)
- b) **WSDL** (Web Services Definition Language) and **XML** (eXtensible Markup Language)
- c) **RPC** (Remote Procedure Call) and **DTP** (Distributed Transaction Processing)

2 Question 2 (10 points; 2 points each for a, b, c, d, e)

Imagine a business process for declaring expenses. It contains two steps: sending in the declaration by the user using a web-application, and a check by somebody from the financial department using a Windows application which results in either acceptance or rejection. The web-application can also give an overview of all declarations of a user (pending, accepted and rejected). We leave out everything related to payment.

Both the web-application and the Windows application need access to the declarations. Two possible solutions: (A) shared database storing the declarations, or (B) both have a local database and a declaration to be checked is sent to the other database in a message, and an acceptance or rejection message is sent back.

For each aspect, evaluate both solutions and give an advice which solution is best according to only that aspect. Explain your answer:

- a) Resiliency
- b) Extensibility
- c) Information accuracy
- d) Scalability
- e) Security

3 Question 3 (20 points; 10 for a, 10 for b)

Suppose we have a database server which is attached to a 1GB (one gigabit/sec) network. It processes queries where the message carrying the query is on average 1kB (one kilobyte) and the message carrying the result is on average 10kB (ten kilobyte). Each query takes on average 0.25 μ sec. There is a bit of low-level protocol overhead: to send one byte of data, you need 10 bits. Calculate how fast in terms of queries per second this database server can process if:

- a) you **do not** include the communication cost;
- b) if you **do** include the communication cost.

4 Question 4 (15 points)

Imagine we have two applications A and B which communicate using Message Queuing. A sends a request to B and B sends one response back for each request. Because processing the requests is computationally expensive, there are three servers running the B-application and only one running the A-application. There are no databases involved in the applications.

Draw a picture with both applications, all servers and all queues needed in this setup. Mark all arrows with "request", "response" or "both".

5 Question 5 (15 points; 5 points each for a, b, c)

The three most-often named security concerns are *confidentiality*, *integrity*, and *availability* (CIA), which we define as follows:

- Confidentiality: protection against disclosure;
- Integrity: protection against tampering;
- Availability: timely and reliable access to data.

The book discusses shared data and controlled duplication and compares and contrasts from the perspective of information accuracy. Do the same, but now from the perspective of:

- a) confidentiality: describe the implication of shared data on confidentiality, and describe the implications of controlled duplication on confidentiality;

- b) same for integrity;
- c) same for availability.

6 Question 6 (15 points; 5 points for a and 10 points for b)

In Figure 1 you see the picture of a middleware hub.

- a) Can both sides of the middleware connection be different kinds of middleware, e.g., in the middleware connection between Application A and the hub, that the white box on A's side is messaging and on the hub's side is RPC?
- b) The hub may contain more than one kind of middleware. Let's assume that the connection with application A is based on message queuing and the connection with application C is based on RPC. A expects that a message is (i) guaranteed to arrive at C and (ii) arrive only once. Explain what the hub has to do to make this happen.

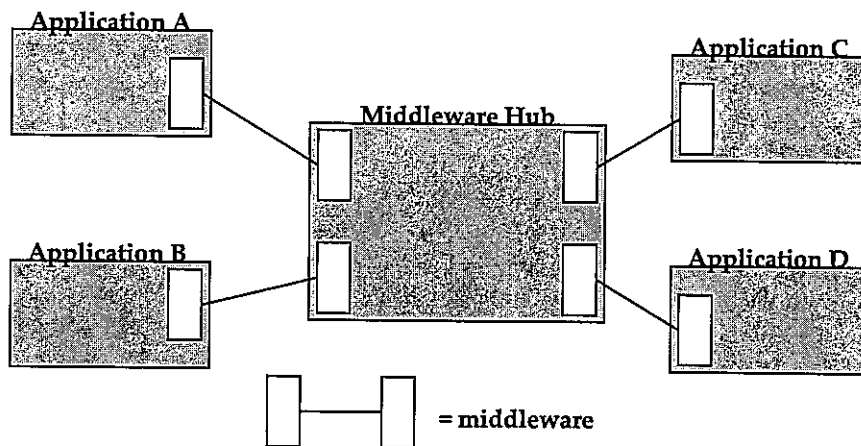


Figure 1: Middleware hub architecture.