

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION

SUMMER SEMESTER, 2015-2016

DURATION: 3 Hours

FULL MARKS: 150

CSE 4803: Parallel and Distributed Processing

Programmable calculators are not allowed. Do not write anything on the question paper.

There are 8 (eight) questions. Answer any 6 (six) of them.

Figures in the right margin indicate marks.

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| a) What is Openness in distribute systems? Mention the differences between Migration, Relocation and Replication transparency. | 2+6 |
| b) What are the differences between architecture and design pattern in software development? Describe what Fat Clients and Thin Clients are in a three-tiered architecture. If the clients' machines have low computational power, which type of clients you will choose in a distributed system. Explain why. | 4+6 |
| c) Define Distributed Pervasive Systems. Assume you have a task to design a distributed sensor network with many heterogeneous sensors. However, the sensors have very low storage capacity. Which kind of architectural style would you choose to best suite such system? Explain why. | 2+5 |
| a) What are the differences between Horizontal and Vertical Distribution? | 5 |
| b) Describe the architectural styles in a distributed system with proper examples. | 8 |
| c) What are the techniques to pass parameters in a RPC System? Describe with proper examples. | 12 |
| a) Design a system where you are supposed to design a distributed system where the resources of the system will be arranged in a horizontal manner. Moreover, the users of such system can have their personal preferences when discovering new resources based on different categories. The users would like to limit their search space inside such predefined categories. | 10 |
| b) With proper diagram describe the working principle of BitTorrent System. | 12 |
| c) Consider a procedure <i>incr</i> with two integer parameters. The procedure adds one to each parameter. Now suppose that it is called with the same variable twice, for example, <i>as incr (i, i)</i> . If <i>i</i> is initially 0, what value will it have afterwards if <i>call-by-reference</i> is used. What if <i>copy/restore</i> is used? | 3 |
| a) Describe the general mechanism of Distributed Hash Tables to resolve an identifier to the address of an associated entity. Your answer should include proper figures and examples. | 10 |
| b) How can you implement naming in a distributed system using a general purpose Hierarchical location scheme? As there are two different ways to add or delete a node in such scheme, namely top down and bottom up approaches, which one of them is suitable for an optimized naming service? | 6+4 |
| c) Define Names, Addresses and Identifiers. What are the differences between broadcasting and multicasting? | 3+2 |

- 348
5. a) An excerpt from the DNS database for the zone *cs.vu.nl* is given in Figure 1. Describe the significance of the entries and how can they be used to refer to individual resources in a distributed system.

Name	Record type	Record value
cs.vu.nl	SOA	star.cs.vu.nl. hostmaster.cs.vu.nl. 2005092900 7200 3600 2419200 3600
cs.vu.nl	TXT	"Vrije Universiteit - Math. & Comp. Sc."
cs.vu.nl	MX	1 mail.few.vu.nl.
cs.vu.nl	NS	ns.vu.nl.
cs.vu.nl	NS	top.cs.vu.nl.
cs.vu.nl	NS	solo.cs.vu.nl.
cs.vu.nl	NS	star.cs.vu.nl.
star.cs.vu.nl	A	130.37.24.6
star.cs.vu.nl	A	192.31.231.42
star.cs.vu.nl	MX	1 star.cs.vu.nl.
star.cs.vu.nl	MX	666 zephyr.cs.vu.nl.
star.cs.vu.nl	HINFO	"Sun" "Unix"
zephyr.cs.vu.nl	A	130.37.20.10
zephyr.cs.vu.nl	MX	1 zephyr.cs.vu.nl.
zephyr.cs.vu.nl	MX	2 tornado.cs.vu.nl.
zephyr.cs.vu.nl	HINFO	"Sun" "Unix"
ftp.cs.vu.nl	CNAME	soling.cs.vu.nl.
www.cs.vu.nl	CNAME	soling.cs.vu.nl.
soling.cs.vu.nl	A	130.37.20.20
soling.cs.vu.nl	MX	1 soling.cs.vu.nl.
soling.cs.vu.nl	MX	666 zephyr.cs.vu.nl.
soling.cs.vu.nl	HINFO	"Sun" "Unix"
vucs-das1.cs.vu.nl	PTR	0.198.37.130.in-addr.arpa.
vucs-das1.cs.vu.nl	A	130.37.198.0
inkt.cs.vu.nl	HINFO	"OCE" "Proprietary"
inkt.cs.vu.nl	A	192.168.4.3
pen.cs.vu.nl	HINFO	"OCE" "Proprietary"
pen.cs.vu.nl	A	192.168.4.2
localhost.cs.vu.nl	A	127.0.0.1

Figure 1: An excerpt from the DNS database for the zone *cs.vu.nl*

- b) What are the different primitives of Berkeley Sockets? Describe how these primitives are used to pass message in a distributed system. 4+2
- c) What is MOM? Why do we need MOM when we already have RPC in distributed systems? 2+2
6. a) How is Message Queuing Model different from Berkeley Sockets? Can you establish a message oriented persistent communication using Berkeley Sockets? Explain your answer. 2+3
- b) Mention the algorithms through which the name resolutions in a distributed system can be implemented. 10
- c) What are Mount and Mounting Points? If you have created a distributed system where clients consume services from a web server where the clients understand messages according to their individual preferences. That is, it would be inappropriate for your distributed system to assume that a generic message format can be created which would be understood by every client. If that is the case, how can you create a MOM which will provide all the clients with their messages in proper format? 2+8

- a) What are the differences between REST and SOAP? What are the basic principles of REST API? 2+4
- b) Suppose you are tasked to create a distributed file transfer system where users can upload and download files with large volumes. Mention your preferred Service Oriented Architecture to design such system. 8
- c) Describe the general architecture of standard Web Service protocol with proper diagrams. Suppose a distributed system passes messages with very small size among the components. What would be your choice of technology if you wanted to create a Service Oriented Architecture for that system? Will your preferred technology change if the communication should connect different protocols like HTTP, SMTP, FTP, etc.? Explain your answer. 6+3+2
- a) What are the underlying components of Google search engine? With proper diagram outline the architecture of the original Google search engine. 6+5
- b) Describe the interface of Bigtable. Why Google search engine uses Bigtable instead of traditional Relational Database to implement their services? 6+2
- c) With proper example, explain the MapReduce algorithm. 6