

Semester 1 Exam-Distributed Systems
(COMP90015_2022_SM1) - MAIN EXAM - June24 - 10:00 AM -
1:45 PM

● **UNGRADED**

25 MINUTES LATE

STUDENT

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TOTAL POINTS

- / 60 pts

QUESTION 1

Discuss the key challenges that one needs to address in the design and development of distributed systems or applications. 5 pts

QUESTION 2

Discuss any two architectural models for construction of distributed systems. Explain the 5 pts

suitable application scenarios for each.

QUESTION 3

Describe five types of attacks (on processes, communication channels, services) that might occur in the Internet. 5 pts

QUESTION 4

What are the advantages of using multiple threads over multiple processes? Explain the difference between a worker pool thread model and a thread-per-object model, including details concerning what concurrency control and queueing is required in each case. 5 pts

QUESTION 5

Consider a server process that has a single TCP server socket, bound and listening on port 4444. For this scenario answer the following: (A.) While listening for an incoming TCP connection on port 4444, can the process also receive UDP packets on port 4444? Explain your answer. (B.) While the server is using the TCP connection on port 4444 for sending command messages to the client, can the same server process use another TCP connection on port 2000 for sending control messages to the client? Explain your answer. (C.) Is it possible for the server process to receive 5 concurrent TCP connections from clients on the same port? Explain your answer. (D.) Is it possible for a client to connect from TCP port 4444 to the server process? Explain your answer. (E.) To reduce the load of a server process, can another server process be added to the same host with a TCP socket bound on port 4444? Explain your answer. 5 pts

QUESTION 6

What is an idempotent operation? Some of the primitive operations for a typical flat file service interface for a Distributed File System are shown below (UFID stands for Unique File Identifier). Which of the following primitives of the interface are not idempotent? Explain your answer. (A.) Read(UFID, i, n): Reads up to n items from position i in the file. (B.) Write(UFID, i, Data): Writes the data starting at position i in the file. The file is extended if necessary. (C.) Create(): Creates a new file of length 0 and returns a UFID for it. (D.) Delete(UFID): Removes the file from the file store/system. 5 pts

QUESTION 7

Discuss the architecture of a microkernel-based operating system. Comment on how well this architectural model supports the creation of extensible operating systems. 5 pts

QUESTION 8

Why is symmetric encryption used for session encryption, rather than asymmetric encryption? Explain how asymmetric keys are used in digital signatures. 5 pts

QUESTION 9

Discuss the secure socket layer (SSL) with Transport Level Security (TLS) protocol stack architecture and its components. 5 pts

QUESTION 10

Discuss the model architecture of a distributed file system. Illustrate how comprehensive it is by comparing it to the NFS implementation. 5 pts

QUESTION 11

Write a simple Java RMI program that demonstrates the invocation of remote object services. Implement a service which offers dictionary services. It should support 3 operations/services (a) "ADD" which adds a new word and its meaning to the dictionary; (b) "SEARCH" which returns the meaning of a word passed as an argument. (c) DELETE which deletes word passed as an argument from the dictionary. Write both server and client programs. 5 pts

QUESTION 12

Multiple Choice Questions. Each sub-question carries 0.5 mark. 5 pts

- 12.1 — The "Openness" challenge of Distributed System means the following: 0.5 pts
- 12.2 — Which of the following creates a TCP/IP socket listening on port 123 in Java? 0.5 pts
- 12.3 — In Java Threads, which of the following methods execute threads without blocking? 0.5 pts
- 12.4 — Which of the following is NOT a fundamental model to formally describe common properties of distributed systems? 0.5 pts
- 12.5 — The kernel design philosophy followed in the Linux Operating System is: 0.5 pts
- 12.6 — Which of the following is not true? 0.5 pts
- 12.7 — Which one of the following is the best definition of "network latency"? 0.5 pts
- 12.8 — Which of the following technology supports dynamic negotiation of encryption and authentication algorithms? 0.5 pts
- 12.9 — Domain Name System is organised as a: 0.5 pts
- 12.10 — Which of the following does not provide an overlay network? 0.5 pts