COMP90015 DS 2020s1 Final

Distributed Systems (University of Melbourne)

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

2. Discuss any two architectural models for construction of distributed systems.

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

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. 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.

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.

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

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

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

10. Describe the types of navigation schemes that can be used for name resolution in Domain Name Systems.

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

12. 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.