

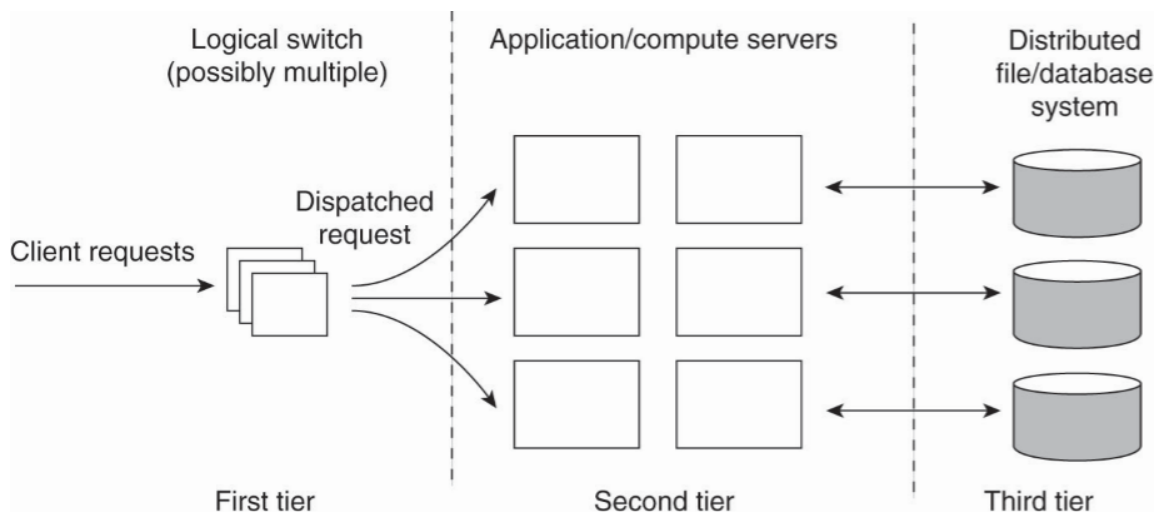
Sample of Questions for the Distributed Systems Course

It is expected the answers should be short and concise but correct. Spaces for answering questions will be given in the exam sheet.

1. Distributed systems
 - a. Give an example of a distributed system. (1 point)
 - b. Explain briefly its geographical distribution, communication, and naming in 3 sentences. (1 point)
2. Client-server architecture
 - a. Draw one possible three-tiered architecture. (1 point)
 - b. Explain the placement of components in the three-tiered architecture if you choose the vertical distribution style. (1 point)

3. Fundamental communication:

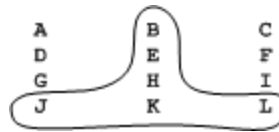
You are asked to explain the following architecture in which a service using several application/compute servers serves client requests



- a. How can this architecture help to improve the performance of the service? (1 point)
 - b. How can this architecture help to reduce the failure rate of the service? (1 point)
4. Communication programming: consider Message-oriented transient communications using Socket and using Message-Passing Interface
 - a. Which layers they are designed for? (1 point)
 - b. Which types of application styles/models they are suitable for? (1 point)
5. Naming:
 - a. List three mechanisms for name resolution. (1 point)
 - b. List two main advantages of recursive name resolution. (1 point)
6. Time synchronization:

Compare Cristian and Berkeley algorithms for time synchronization based on

- a. interactions between the time server and clients. (1 point)
 - b. the way to calculate and adjust the clock. (1 point)
7. Replication and Consistency: Quorum based Protocols
- a. Is the marked node set shown below a valid write quorum? (1 point)
 - i. [YES, because a write quorum of 6 and a read quorum of $9 > \#$ total replica servers]
 - ii. [YES, because a read quorum of (A, B, C, D, E, F, G) overlaps with the write quorum]
 - iii. [NO, because a write quorum of (A,D,G, J, K, L) would not include C, F, or I]
 - iv. [NO, but it would be valid when we remove C from the set of replica servers]
 - b. Explain very briefly (1 point)
 - i. If YES [i,ii]: draw an example of a valid read quorum size and read quorum set.
 - ii. If NO [iii,iv]: draw a quorum (read or write set) that might lead to a problem.



8. Distributed File Systems
- a. What is the main difference between NFS v3 and v4? (1 point)
 - b. What benefit does this difference provide? (1 point)
9. Security
- a. Explain the concept of strong collision resistance in the context of cryptographic hash functions. (1 point)
 - b. What is a reflection attack? Explain in two sentences. (1 point)
10. Fault Tolerance & Dependability
- a. Define the meaning of “failure” in one sentence. (1 point)
 - b. Define the meaning of “fault” in one sentence (1 point)