

Exam Practice Quiz #1

Due: TBA

1 Fill-in The Blanks

Consider the following scenario with a distributed storage system with the following node IDs: 121, 492, 982, 1832, 92, and 384. Note: you may need to use Mod operator to get the node IDs to fit within the ID-space discussed below.

a. Consider a system only using Consistent hashing with an 8 bit-ID space.

- At which server, will the following keys be stored:

key-ID	server-ID
12	1832
352	121
500	1832
892	384
9831	121

- if a new server is added with ID 182, which keys will get moved to this server?

KeyID = None!

- When the new server with ID 182 is added, where will the keys come from? (i.e., from which servers will the keys be moved.)

keys will come from 982.

b. Consider a system running Tapestry with the same server-IDs as above. Tapestry is setup with Base 4 and 10 bit-ID space.

(a) How many rows are in each node's Tapestry routing table?

of Rows = 5.

(b) How many columns are in each node's Tapestry routing table?

of Columns = 4.

(c) Which nodes are in the first row of Node 121.

01321 (i.e., 121)	13230 (i.e., 492)	—	33112 (i.e., 982)	—
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- (d) If a new server with ID 294 is added to this network, which servers are the need to know nodes?

13230 (i.e.,492	12000 (i.e.,384
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2 Open-Ended Questions

- a. “Causal order implies FIFO order”. *True or False? Why?*

True. From the point of view of the application (which is where the causal ordering is enforced), any messages from the same channel will be delivered in FIFO order especially when ordered according to Vector clock based causality.

- b. Given the following set of snapshots from each process:

- P1: (1,0,0); (3,4,0)
- P2: (0,1,0); (0,3,0); (0,6,4)
- P3: (0,0,1); (0,2,3); (4,4,6)

Recall, vector clocks get incremented when a process either (1) receives a msg, (2) sends a msg, or (3) processes an independent event.

If you select the latest snapshot of each process – (3,4,0), (0,6,4), and (4,4,6) – *do you have a globally consistent snapshot? Why or why not?*

You don’t. Justifications should include that snapshots 3,4,0 and 4,4,6 are not concurrent, or, equivalently, that there is a causal path between them. Also, a valid justification is that the three snapshots are not mutually concurrent, but a full answer should mention which pair is not.

- c. DNS maps domain names to IP addresses on the Internet. *Explain how hierarchies allow DNS to scale.*

The DNS namespace is organized according to a hierarchy (in a tree). Different nodes in the tree are maintained by different administrative organizations (and also on different servers). Each level in the hierarchy only has to store information about the immediate children and not the entire tree (or sub-tree) which reduces the amount of information stored at each server. Given this requirement, the entire domain-name list can be partitioned across different servers based on their location in the hierarchy.

- d. If you are designing an RPC system and you know that all RPCs will be idempotent, *how does that make your design simpler?*

The design of the server can be simpler, as you don't have to worry about executing calls multiple times: thus no need for a cache of responses, for example.