Discussion Section 6

Spring 2014

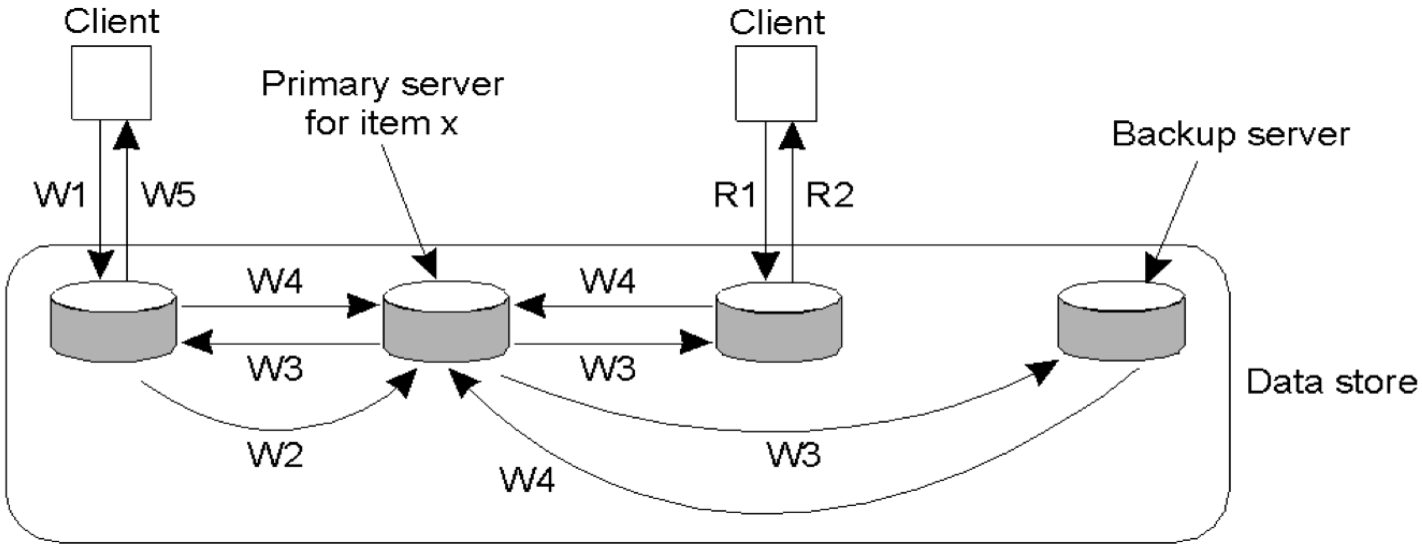
Chapter 7

Consistency Protocols

Q: Consider a non-blocking primary backup protocol used to guarantee sequential consistency in a distributed data store. Does such a data store always provide read-your-writes consistency?

Ans : No. In non-blocking primary backup, the primary performs the update and tells the backup servers to perform the update. There's no guarantee that the updated value was propagated to all the replicas

Primary Backup Protocol



- **Primary Server** is responsible for all write operations
- Read operations can be performed locally at the **backup servers**

Chapter 7

Quorum-based Protocols

Q: A file is replicated on 10 servers. List all the combinations of read quorum and write quorum that are permitted by the voting algorithm.

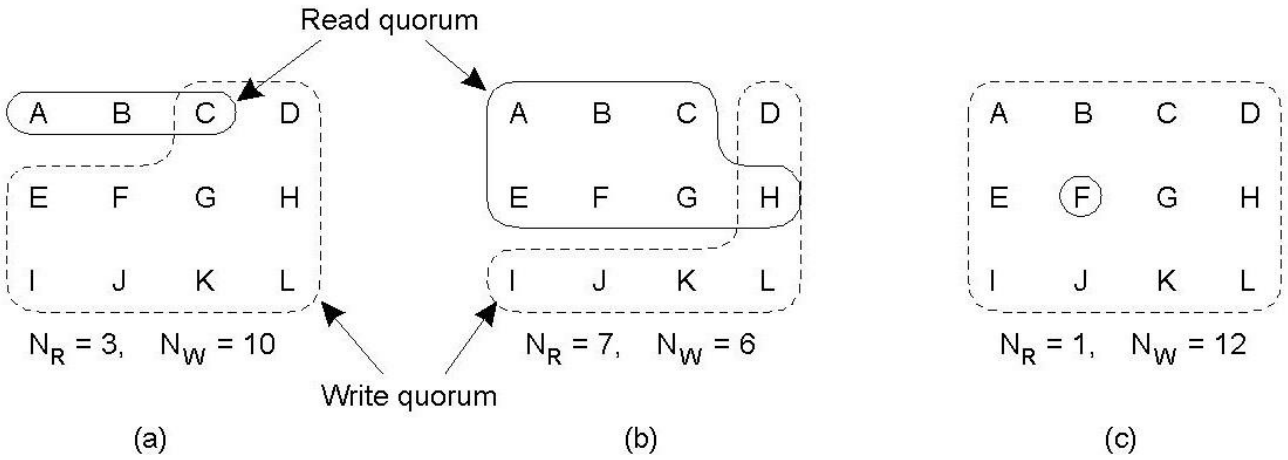
Quorum means the smallest number of servers needed to arrive at a decision

Ans : N = 10

Required Combinations : (N_R, N_W)

Permitted Combinations : (1,10), (2,9), (3,8), (4,7) and (5,6)

Quorum-Based Protocols



Read Quorum : A collection of N_R servers to read a file with N replicas

Write Quorum : A collection of N_W servers to write to a file with N replicas

Constraints : $N_R+N_W > N$

$N_W > N/2$

Chapter 8

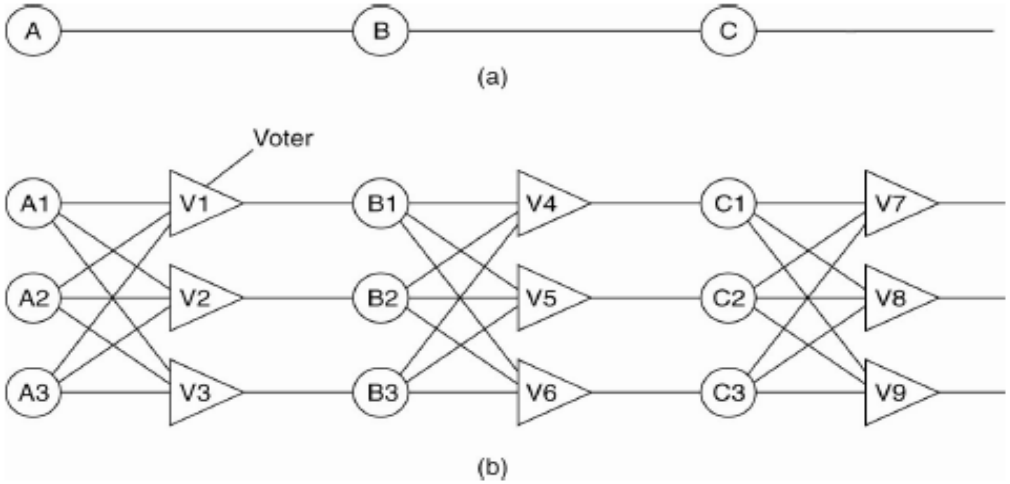
Q: Consider a Web browser that returns an outdated cached page instead of a more recent one that had been updated at the server. Is this a failure? What kind of failure?

***Definition of failure*:** When a component if not living up to its specifications, a failure occurs.
***Types of failure*:** Crash, omission, timing, response, arbitrary.
Answer: It depends on the promise it was made to the user: If an application promises to give the latest version within T units and does not provide so, a type of response failure occurs.

Chapter 8

Fault Tolerance

Q: In the figure below, how many failed elements can be handled? Given an example of the worst case that can be masked.

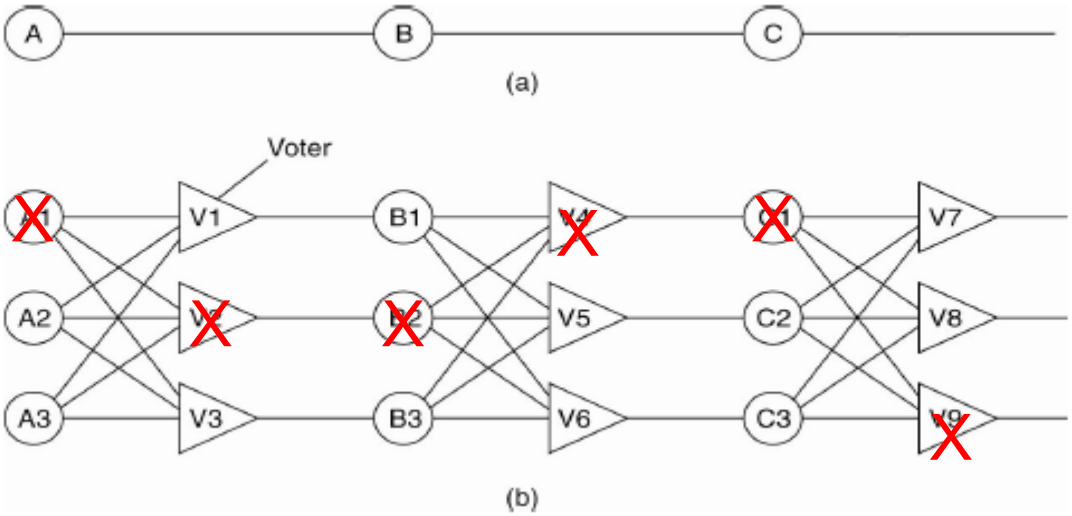


For devices, at most one in each column

For voters, 0 if at least one device is faulty in the next level and it is not feeding to that device (worst case), and 1 if it is feeding to that device (best of worst case)

So, it can handle 3 failed elements.

Triple Modular Redundancy



- Each device is triplicated
- Each voter has three inputs and one output
- If two or more inputs are the same, the output is equal to that input, else undefined