Distributed Storage & Node failure

↳ It means storing the data into multiple machines.

* It could be sharding or Replica or both.

Mostly real big tech companies use the both Sharding + Replica

CAP Theorem

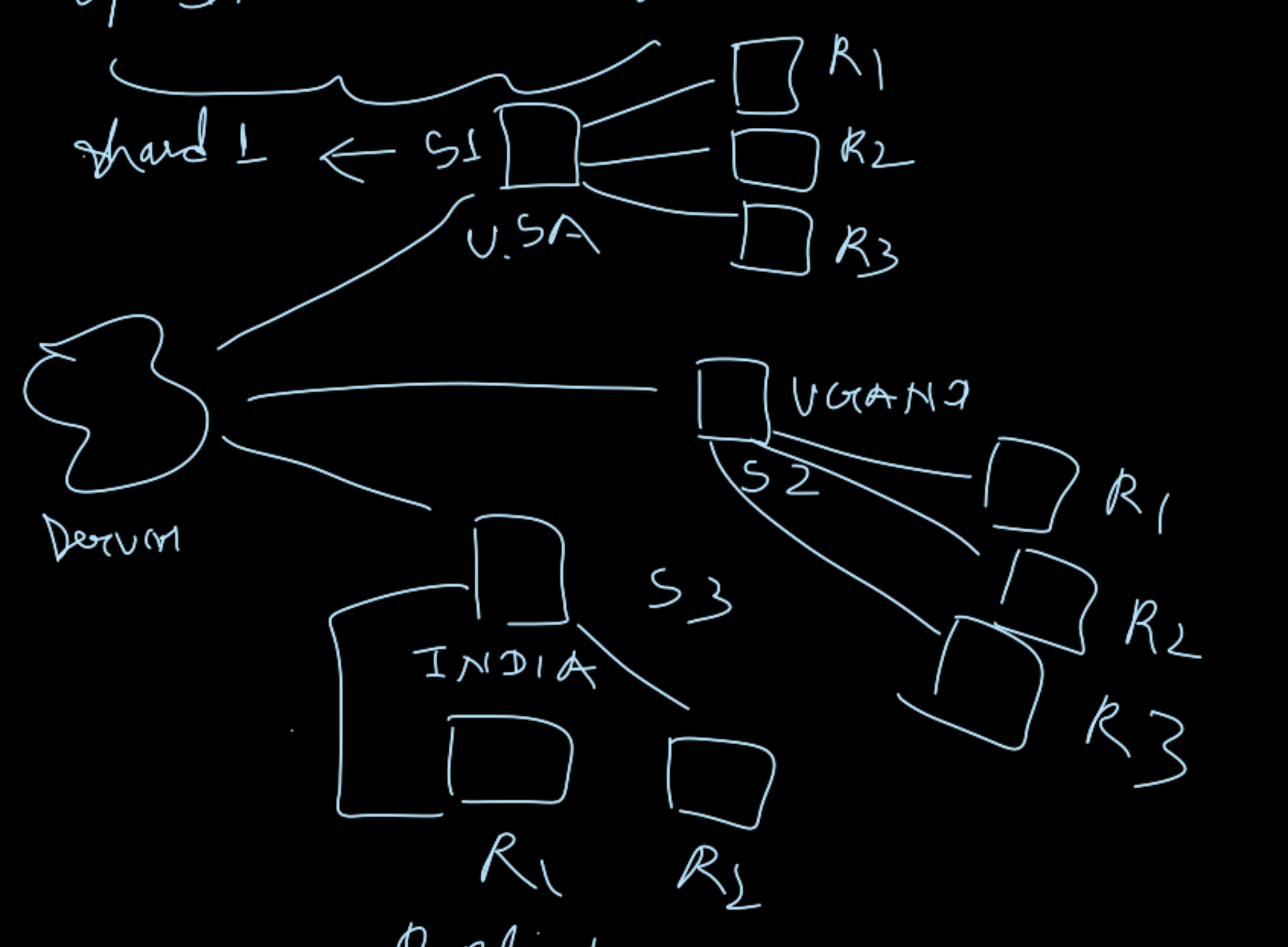
- Consistency
- Availability
- partition Tolerance { system still works even if network breaks between nodes }

→ A distributed system can only provide 2 out of 3

Ex: Banking : consistency + partition tolerance { slow availibility }

Social Media : Availibility + partion tolerance { Eventual consistency is allowed }

Hybrid Architecture of Distributed Storage



Node failures And Recovery machanism

A failure could be happen:

- power outage
- Network disconnection
- Hardware crash
- Software bug
- cloud zone failure

How It is going to handle

* There are 4 ways

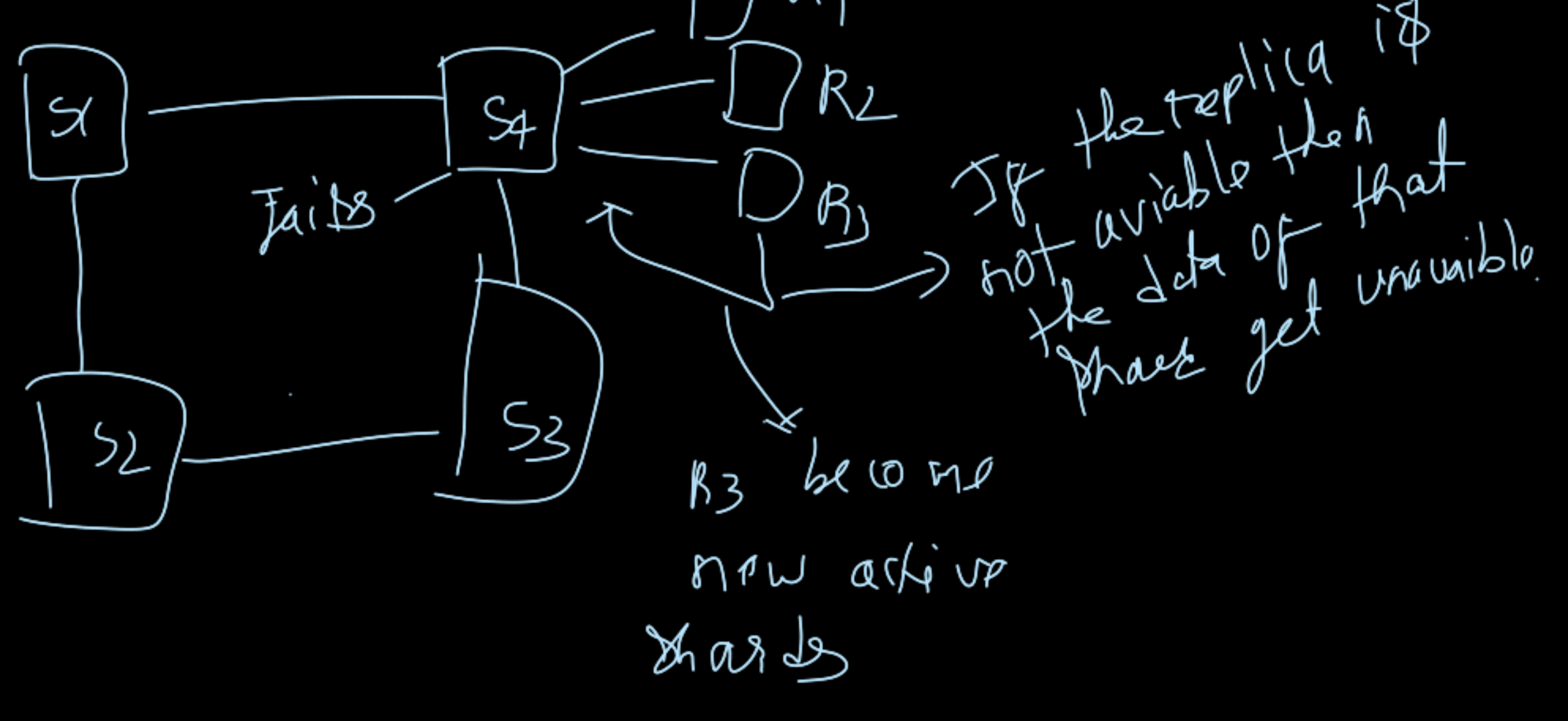
1. Replica Automatically takeover
   How it works ?
   - → nodes sends heartbeat signals
   - → If heartbeat stops → cluster assumes the node is dead
   - → Election happens
   - → Best replica becomes the new leader

2. Redirect traffic to healthy nodes
   ↳ client will automatic route requests to a working node.

   * If a node-A fails the load balancer sends the traffic to node B

   done By :
   - → load balancers
   - → service discovery tools { consul, zookeeper }

3. Data Rebalancing
   ↳ when shard nodes fail { simply the replica of that shard become the active shard. }



4. write-Ahead logs
   - → if nodes fails in mid-write
   - → logs are used to recover partial data

Chaos Monkey { made by netflix }

Breaking

Designed by netflix it randomly pick the any node and kill that node, to ensure that how our system recover automatically

* Its the part of "chaos Engineering".

→ Injecting controlled failures (kill server, slowing network) to observe how system behaves and fix weakness before they cause real outages.

Netflix have a Army called Simian_Army

Tool	purpose
chaos monkey	randomly kills servers
latency monkey	adds network delays
chaos Gorrila	simulate entire zone outage
chaos kong	simulate Entire region outage
Doctor monkey	detects unhealthy instances