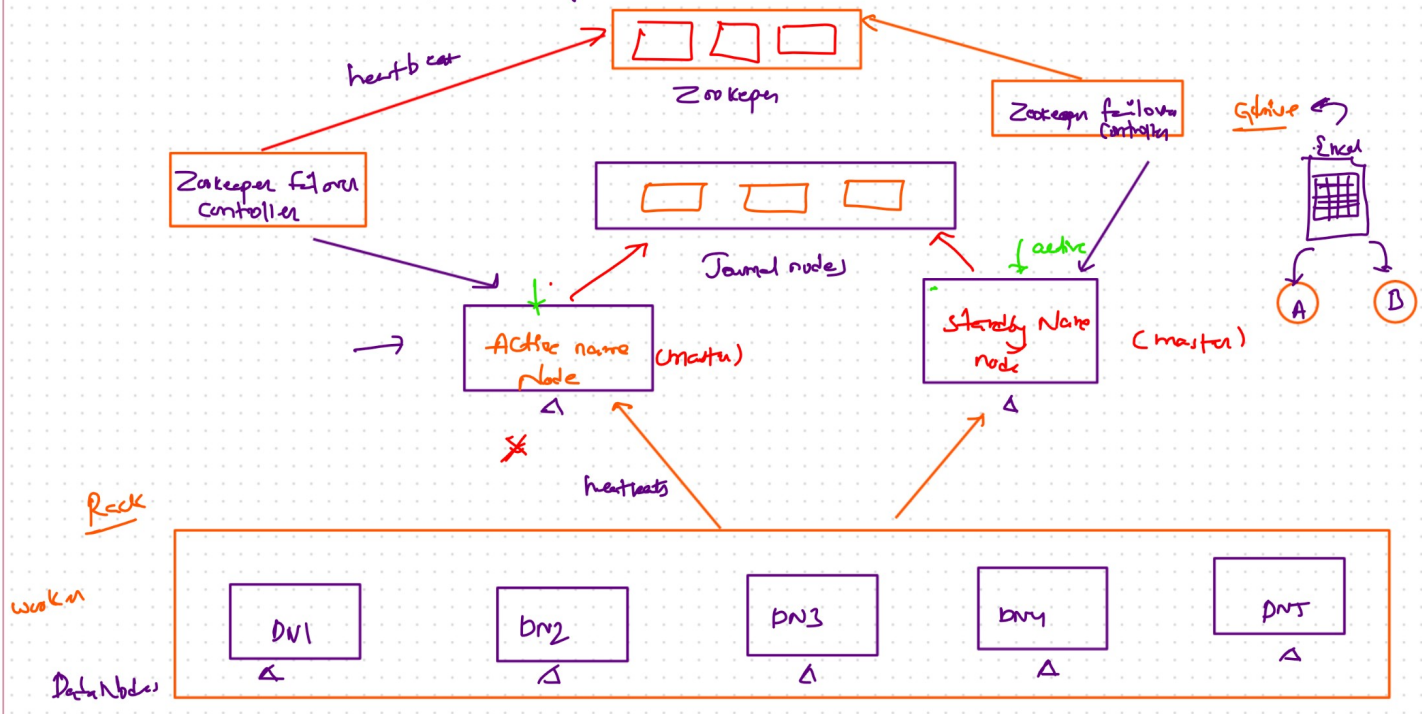
High Availability (HA) Architecture

* Standby Namenode

Keypoints

- Introduced in Hadoop 2.x
- act as a "hot backup" for the active namenode
- maintains a synchronized copy of the namespace image in memory
- allows seamless failover if the active namenode fails

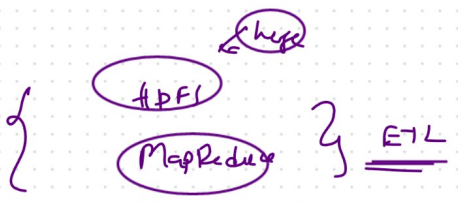


Note:

1. failover controller detects active Namenode failure
2. failure is reported to Zookeeper
3. Zookeeper coordinates transition of Standby Namenode to active role
4. Client operations continue without interruption

Benefits:

- Eliminates SPOF (Single point of failure)
- ensures continous cluster operations



* minimizes downtime
* Critical for production environments

SLA (99.999 %)
(9)

Components & their roles

HW

(1) Active Name node ⟶ HDFS
(Master)

(2) Standby Name node

(3) Data Nodes
(workers)

(4) Journal Nodes —— Shared edit logs

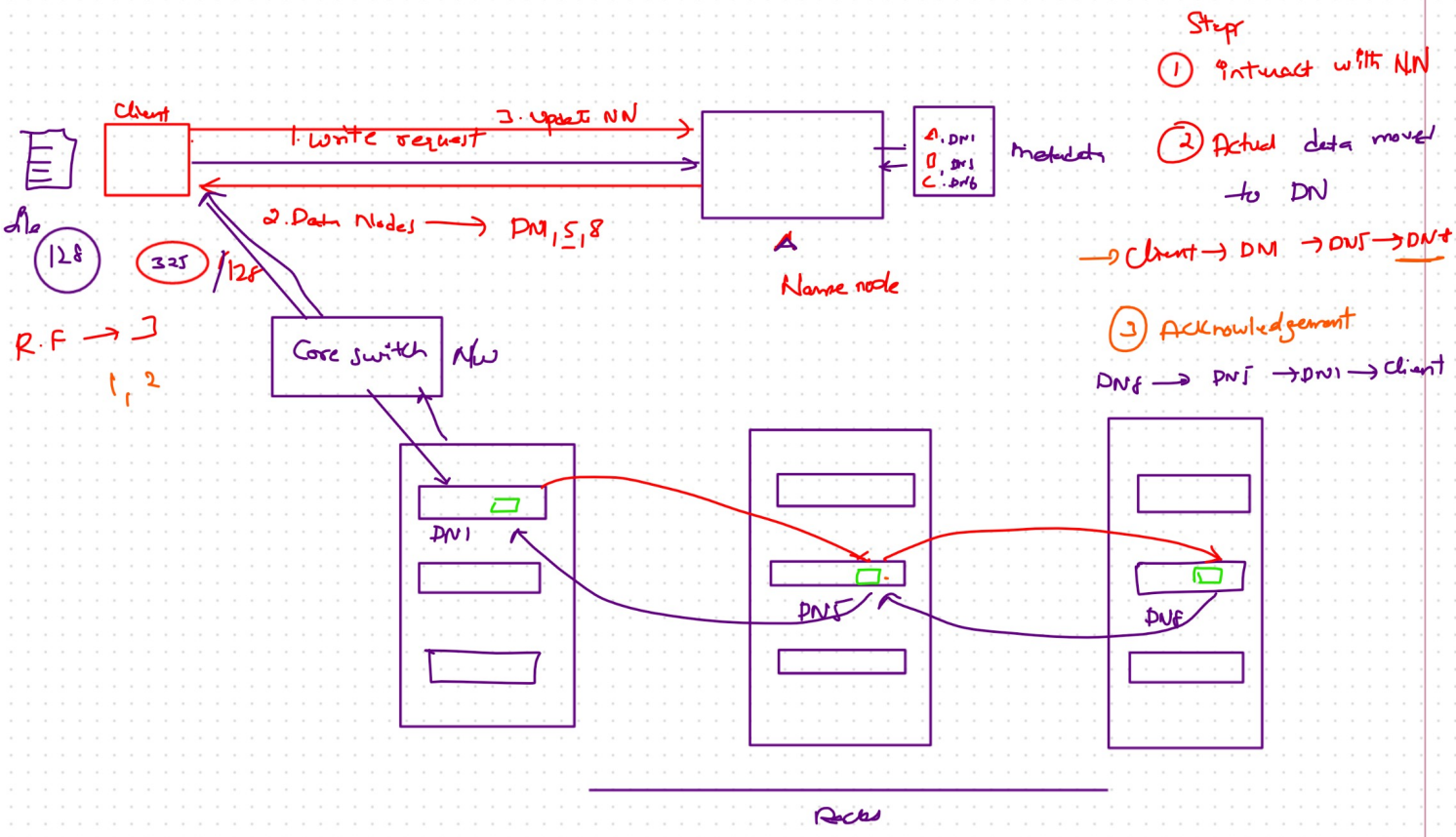
active — standby
pri — geo
pri — redundant

(5) Zookeeper

(6) Fail Over Controller

(7) Client —— Interacts Hadoop cluster

Write Operation in HDFS — 3 step process



3 - step Write Process

Step 1: Interact with Name node

- client sends a write request to NN
- NN performs internal checks
  - available space
  - namespace permissions
  - block size requirements
  - rack awareness (data nodes)
- NN provide client with a list of Data nodes where blocks should be stored (replication factor)

Step2: Write Data to Data Node

- Client streams data directly to first DN (bypassing the name node)
- First Data Node:
  - writes data to its local storage
  - forwards data to the second Data Node in the pipeline
- Second Data Node:
  - writes data to its local storage
  - forward data to Third Data Node
- Third Data Node:
  - write data to its local storage

Note: Name node is not involved in actual data transfer

Step3: Acknowledgement Process

- acknowledgement flow in reverse order
  - last data node confirms succesful write to second data node
  - second data node confirms to first Data Node
  - first data node confirms to client
- Client informs name node that write was Succesfully
- name node updates its metadata to reflect the new block location

Linux Commands