**HBase HA Cluster Setup and Documentation**

**1. Cluster Architecture Overview**

**Components:**

* **2 HBase Master Nodes (Active/Standby)**
* **3 ZooKeeper Quorum Nodes (Deployed inside Hadoop Master nodes)**
* **2 RegionServers (scalable)**
* **Hadoop HA Cluster (already operational)**

**Network Topology:**

* Docker bridge network: hadoop-net
* All containers communicate through static hostnames

**2. Dockerization and Container Setup**

**Base Image:**

Custom-built from hadoop\_cluster4:latest, not from public registry.

**Dockerfiles:**

* **HBase Dockerfile** includes:
  + HBase binary installation
  + Custom config copy (hbase-site.xml, hbase-env.sh, regionservers)
  + hbase-entrypoint.sh script for role-based daemon launch

**Containers:**

* hbase-master1, hbase-master2
* regionserver1, regionserver2
* Integrated with existing master1, master2, master3, slave1, slave2 containers from Hadoop HA

**3. Configuration Files**

**hbase-site.xml**

* hbase.rootdir pointing to hdfs://mycluster/hbase
* ZooKeeper quorum set to: hadoopmaster, hadoopmaster1, hadoopmaster2
* RegionServer and Master ports defined
* HA configurations enabled

**hbase-env.sh**

* Java home
* HBASE\_MANAGES\_ZK=false
* Custom heap and GC settings

**RegionServers**

regionserver1

regionserver2

**4. High Availability & Failover**

**Master HA:**

* ZooKeeper elects an Active Master
* Standby observes state

**RegionServer HA:**

* If a RegionServer dies, ZooKeeper notifies Master
* Master reassigns regions to active RegionServers

**Failover Simulation:**

* Manual Docker container kill:
* docker stop hbase-master1
* docker stop regionserver2
* Validate:
* hbase shell
* status
* Recovery time ~10-15s

**5. Testing & Validation**

**Functional Tests:**

* Create tables (test\_table, employees, logs)
* TTL & versioning validated in logs



**Integrity Tests:**

* Data remains accessible post-failover
* status 'detailed' shows reassigned regions

**6. Deployment Automation**

**Script: deploy\_cluster.sh**

* Builds images if not exist
* docker-compose up -d
* Health checks included
* Starts containers in sequence

**Validation:**

* Logs tailing with docker logs
* jps verification inside containers

**7. Scaling Instructions**

**Add RegionServer:**

docker-compose up -d regionserver3

* Add hostname to regionservers config

**Add Master:**

docker-compose up -d hbase-master3