**Hadoop High Availability with HBase Deployment Documentation**

**Overview**

This document describes the deployment of a highly available Hadoop cluster with 3 NameNodes and HBase with 2 HMaster nodes and 3 RegionServers. The architecture provides fault tolerance for both Hadoop and HBase components.

**System Architecture**

**Hadoop Cluster Components**

3 NameNodes (master11, master22, master33) in HA configuration

Using ZooKeeper for failover coordination

JournalNodes for shared edit logs

ZKFC (ZKFailoverController) for automatic failover

3 DataNodes (colocated with RegionServers)

ResourceManager on each NameNode for YARN

**HBase Components**

2 HMaster nodes (hmaster1, hmaster2) in HA configuration

3 RegionServer nodes (regionserver1, regionserver2, regionserver3)

Each RegionServer also runs a DataNode and NodeManager for Data Locality

**Deployment Steps**

**1. Hadoop HA Configuration**

NameNode HA Setup

Configured ZooKeeper ensemble across master11, master22, master33

Each node has unique myid (1, 2, 3 respectively)

ZooKeeper service starts automatically on each master

JournalNodes run on all three masters for shared edits

Initialized shared edits on master11

Other NameNodes bootstrapped as standby

Automatic failover configured using ZKFC

Zookeeper formatted on master11

ZKFC starts on all NameNodes

ResourceManager HA

ResourceManager runs on all three masters

Uses ZooKeeper for state storage and automatic failover

**2. HBase HA Configuration**

**HMaster Setup**

Two HMaster nodes configured (hmaster1, hmaster2)

HBase configured to use:

HDFS HA namespace (hdfs://hacluster/hbase)

ZooKeeper quorum (master11,master22,master33)

Cluster mode (distributed=true)

RegionServer Setup

Three RegionServer nodes configured

Each RegionServer also runs:

HDFS DataNode

YARN NodeManager

HBase configured with:

Minimum 1 RegionServer required to start

60 second timeout for RegionServer startup

Replication enabled

**Core Components in Your HA Setup**

**Component HA Enabled?**

Role in HA

HMaster -> Yes

RegionServer -> No Not HA by itself, but can auto-recover if one fails

HDFS - > Yes Used by HBase to store all data

ZooKeeper -> Yes Coordinates master election, keeps cluster metadata

What’s configured:

2 HMasters: hmaster1 (Active) and hmaster2 (Standby)

ZooKeeper ensemble: master11, master22, master33

Failover Behavior:

ZooKeeper maintains a special ephemeral znode (e.g., /hbase/master) that is claimed by only one HMaster at a time (the active master).

If the active HMaster crashes or goes down:

ZooKeeper notices

The standby HMaster competes to become the new active master.

**RegionServer Recovery (Partial HA)**

If one RegionServer fails:

ZooKeeper detects it (RegionServers also register with ZK).

The active HMaster:

Marks the server as dead

Reassigns the regions hosted by the failed server to other active RegionServers.