**第 6 章 Hadoop HA 高可用**

# HA 概述

* + 1. 所谓 HA（High Availablity），即高可用（7\*24 小时不中断服务）。
    2. 实现高可用最关键的策略是消除单点故障。HA 严格来说应该分成各个组件的 HA

机制：HDFS 的 HA 和 YARN 的 HA。

* + 1. NameNode 主要在以下两个方面影响 HDFS 集群
* NameNode 机器发生意外，如宕机，集群将无法使用，直到管理员重启
* NameNode 机器需要升级，包括软件、硬件升级，此时集群也将无法使用

HDFS HA 功能通过配置多个 NameNodes(Active/Standby)实现在集群中对 NameNode 的热备来解决上述问题。如果出现故障，如机器崩溃或机器需要升级维护，这时可通过此种方式将NameNode 很快的切换到另外一台机器。

* 1. **HDFS-HA 集群搭建**

当前HDFS 集群的规划

|  |  |  |
| --- | --- | --- |
| hadoop102 | hadoop103 | hadoop104 |
| NameNode |  | Secondarynamenode |
| DataNode | DataNode | DataNode |

HA 的主要目的是消除 namenode 的单点故障,需要将hdfs 集群规划成以下模样

|  |  |  |
| --- | --- | --- |
| hadoop102 | hadoop103 | hadoop104 |
| NameNode | NameNode | NameNode |
| DataNode | DataNode | DataNode |

**6.2.1 HDFS-HA 核心问题**

1. **怎么保证三台 namenode 的数据一致**

a.Fsimage:让一台 nn 生成数据,让其他机器 nn 同步

b.Edits:需要引进新的模块 JournalNode 来保证 edtis 的文件的数据一致性

1. **怎么让同时只有一台 nn 是 active，其他所有是 standby 的**
   1. 手动分配
   2. 自动分配

**3）2nn 在 ha 架构中并不存在，定期合并 fsimage 和 edtis 的活谁来干**由 standby 的 nn 来干

1. **如果 nn 真的发生了问题，怎么让其他的 nn 上位干活**
   1. 手动故障转移b.自动故障转移
   2. **HDFS-HA 手动模式**
      1. **环境准备**
         1. 修改 IP
         2. 修改主机名及主机名和 IP 地址的映射
         3. 关闭防火墙
         4. ssh 免密登录
         5. 安装 JDK，配置环境变量等
      2. **规划集群**

|  |  |  |
| --- | --- | --- |
| hadoop102 | hadoop103 | hadoop104 |
| NameNode | NameNode | NameNode |
| JournalNode | JournalNode | JournalNode |
| DataNode | DataNode | DataNode |

* + 1. **配置 HDFS-HA 集群**

1. **官方地址：<http://hadoop.apache.org/>**
2. **在 opt 目录下创建一个ha 文件夹**

[atguigu@hadoop102 ~]$ cd /opt [atguigu@hadoop102 opt]$ sudo mkdir ha

[atguigu@hadoop102 opt]$ sudo chown atguigu:atguigu /opt/ha

1. **将/opt/module/下的 hadoop-3.1.3 拷贝到/opt/ha 目录下（记得删除 data 和 log 目录）**

[atguigu@hadoop102 opt]$ cp -r /opt/module/hadoop-3.1.3 /opt/ha/

## 配置 core-site.xml

<configuration>

<!-- 把多个 NameNode 的地址组装成一个集群 mycluster -->

<property>

<name>fs.defaultFS</name>

<value>hdfs://mycluster</value>

</property>

<!-- 指定 hadoop 运行时产生文件的存储目录 -->

<property>

<name>hadoop.tmp.dir</name>

<value>/opt/ha/hadoop-3.1.3/data</value>

</property>

</configuration>

1. **配置 hdfs-site.xml**

<configuration>

<!-- NameNode 数据存储目录 -->

<property>

<name>dfs.namenode.name.dir</name>

<value>file://${hadoop.tmp.dir}/name</value>

</property>

<!-- DataNode 数据存储目录 -->

<property>

<name>dfs.datanode.data.dir</name>

<value>file://${hadoop.tmp.dir}/data</value>

</property>

<!-- JournalNode 数据存储目录 -->

<property>

<name>dfs.journalnode.edits.dir</name>

<value>${hadoop.tmp.dir}/jn</value>

</property>

<!-- 完全分布式集群名称 -->

<property>

<name>dfs.nameservices</name>

<value>mycluster</value>

</property>

<!-- 集群中 NameNode 节点都有哪些 -->

<property>

<name>dfs.ha.namenodes.mycluster</name>

<value>nn1,nn2,nn3</value>

</property>

<!-- NameNode 的 RPC 通信地址 -->

<property>

<name>dfs.namenode.rpc-address.mycluster.nn1</name>

<value>hadoop102:8020</value>

</property>

<property>

<name>dfs.namenode.rpc-address.mycluster.nn2</name>

<value>hadoop103:8020</value>

</property>

<property>

<name>dfs.namenode.rpc-address.mycluster.nn3</name>

<value>hadoop104:8020</value>

</property>

<!-- NameNode 的 http 通信地址 -->

<property>

<name>dfs.namenode.http-address.mycluster.nn1</name>

<value>hadoop102:9870</value>

</property>

<property>

<name>dfs.namenode.http-address.mycluster.nn2</name>

<value>hadoop103:9870</value>

</property>

<property>

<name>dfs.namenode.http-address.mycluster.nn3</name>

<value>hadoop104:9870</value>

</property>

<!-- 指定 NameNode 元数据在 JournalNode 上的存放位置 -->

<property>

<name>dfs.namenode.shared.edits.dir</name>

<value>qjournal://hadoop102:8485;hadoop103:8485;hadoop104:8485/myclus ter</value>

</property>

<!-- 访问代理类：client 用于确定哪个 NameNode 为 Active -->

<property>

<name>dfs.client.failover.proxy.provider.mycluster</name>

<value>org.apache.hadoop.hdfs.server.namenode.ha.ConfiguredFailoverProxyP rovider</value>

</property>

<!-- 配置隔离机制，即同一时刻只能有一台服务器对外响应 -->

<property>

<name>dfs.ha.fencing.methods</name>

<value>sshfence</value>

</property>

<!-- 使用隔离机制时需要 ssh 秘钥登录-->

<property>

<name>dfs.ha.fencing.ssh.private-key-files</name>

<value>/home/atguigu/.ssh/id\_rsa</value>

</property>

</configuration>

1. **分发配置好的 hadoop 环境到其他节点**
   * 1. **启动 HDFS-HA 集群**
2. **将 HADOOP\_HOME 环境变量更改到 HA 目录(三台机器)**

[atguigu@hadoop102 ~]$ sudo vim /etc/profile.d/my\_env.sh

将 HADOOP\_HOME 部分改为如下

#HADOOP\_HOME

export HADOOP\_HOME=/opt/ha/hadoop-3.1.3 export PATH=$PATH:$HADOOP\_HOME/bin export PATH=$PATH:$HADOOP\_HOME/sbin

**去三台机器上 source 环境变量**

[atguigu@hadoop102 ~]$source /etc/profile

## 在各个 JournalNode 节点上，输入以下命令启动 journalnode 服务

[atguigu@hadoop102 ~]$ hdfs --daemon start journalnode [atguigu@hadoop103 ~]$ hdfs --daemon start journalnode [atguigu@hadoop104 ~]$ hdfs --daemon start journalnode

1. **在[nn1]上，对其进行格式化，并启动**

[atguigu@hadoop102 ~]$ hdfs namenode -format [atguigu@hadoop102 ~]$ hdfs --daemon start namenode

1. **在[nn2]和[nn3]上，同步 nn1 的元数据信息**

[atguigu@hadoop103 ~]$ hdfs namenode -bootstrapStandby [atguigu@hadoop104 ~]$ hdfs namenode -bootstrapStandby

1. **启动[nn2]和[nn3]**

[atguigu@hadoop103 ~]$ hdfs --daemon start namenode [atguigu@hadoop104 ~]$ hdfs --daemon start namenode

1. **查看 web 页面显示**

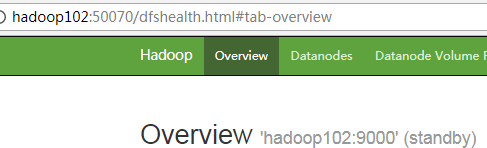


图 hadoop102(standby)

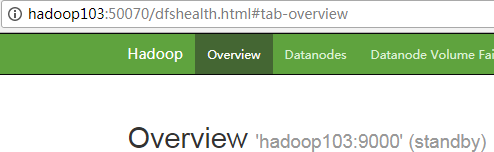


图 hadoop103(standby)



图 hadoop104(standby)

## 在所有节点上，启动 datanode

[atguigu@hadoop102 ~]$ hdfs --daemon start datanode [atguigu@hadoop103 ~]$ hdfs --daemon start datanode [atguigu@hadoop104 ~]$ hdfs --daemon start datanode

1. **将[nn1]切换为 Active**

[atguigu@hadoop102 ~]$ hdfs haadmin -transitionToActive nn1

## 查看是否 Active

[atguigu@hadoop102 ~]$ hdfs haadmin -getServiceState nn1

# HDFS-HA 自动模式

* + 1. **HDFS-HA 自动故障转移工作机制**

自动故障转移为 HDFS 部署增加了两个新组件：ZooKeeper 和 ZKFailoverController

（ZKFC）进程，如图所示。ZooKeeper 是维护少量协调数据，通知客户端这些数据的改变和监视客户端故障的高可用服务。



HDFS-HA故障转移机制

Zookeeper服务端

zk1 zk2 zk3

Edits文件管理系统：qjournal

edits edits edits

写 读

Name node

内存中的元数据

1 假死

edits

active

Name node standby

内存中的元数据

4 强行杀死namenode,防止脑裂

ssh kill -9 namenode进程号

edits

fsimage fsimage

2 检测到假死

Zkfc

3 通知另一台NameNode的zkfc

7 激活本台namenode，切换为Active Zkfc

Failover Failover

controller controller

Zookeeper客户端

5 如果ssh补刀失败则调用用户自定义脚本程序

Zookeeper客户端

6 获取命令运行结果

/home/atguigu/kill/ poweroff.sh

同时出现两个Active状态namenode的术语叫脑裂brain split。

防 止 脑 裂 的 两 种 方 式 ： 1）ssh 发 送 kill 指 令 2）调用用户自定义脚本程序

* + 1. **HDFS-HA 自动故障转移的集群规划**

|  |  |  |
| --- | --- | --- |
| hadoop102 | hadoop103 | hadoop104 |
| NameNode | NameNode | NameNode |
| JournalNode | JournalNode | JournalNode |
| DataNode | DataNode | DataNode |
| Zookeeper | Zookeeper | Zookeeper |
| ZKFC | ZKFC | ZKFC |

* + 1. **配置 HDFS-HA 自动故障转移**

1. **具体配置**
   1. 在 hdfs-site.xml 中增加

<!-- 启用 nn 故障自动转移 -->

<property>

<name>dfs.ha.automatic-failover.enabled</name>

<value>true</value>

</property>

* 1. 在 core-site.xml 文件中增加

<!-- 指定 zkfc 要连接的 zkServer 地址 -->

<property>

<name>ha.zookeeper.quorum</name>

<value>hadoop102:2181,hadoop103:2181,hadoop104:2181</value>

</property>

* 1. 修改后分发配置文件

[atguigu@hadoop102 etc]$ pwd

/opt/ha/hadoop-3.1.3/etc [atguigu@hadoop102 etc]$ xsync hadoop/

1. **启动**
2. 关闭所有 HDFS 服务：

[atguigu@hadoop102 ~]$ stop-dfs.sh

1. 启动Zookeeper 集群：

[atguigu@hadoop102 ~]$ zkServer.sh start [atguigu@hadoop103 ~]$ zkServer.sh start [atguigu@hadoop104 ~]$ zkServer.sh start

1. 启动 Zookeeper 以后，然后再初始化 HA 在 Zookeeper 中状态：

[atguigu@hadoop102 ~]$ hdfs zkfc -formatZK

1. 启动HDFS 服务：

[atguigu@hadoop102 ~]$ start-dfs.sh

1. 可以去 zkCli.sh 客户端查看 Namenode 选举锁节点内容：

[zk: localhost:2181(CONNECTED) 7] get -s

/hadoop-ha/mycluster/ActiveStandbyElectorLock

myclusternn2 hadoop103 �>(�> cZxid = 0x10000000b

ctime = Tue Jul 14 17:00:13 CST 2020 mZxid = 0x10000000b

mtime = Tue Jul 14 17:00:13 CST 2020 pZxid = 0x10000000b

cversion = 0

dataVersion = 0

aclVersion = 0

ephemeralOwner = 0x40000da2eb70000 dataLength = 33

numChildren = 0

1. **验证**

（1）将 Active NameNode 进程 kill，查看网页端三台 Namenode 的状态变化

[atguigu@hadoop102 ~]$ kill -9 namenode 的进程 id

**6.4.3 解决 NN 连接不上 JN 的问题**

自动故障转移配置好以后，然后使用 start-dfs.sh 群起脚本启动 hdfs 集群，有可能会遇到 NameNode 起来一会后，进程自动关闭的问题。查看 NameNode 日志，报错信息如下：

2020-08-17 10:11:40,658 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 0 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:40,659 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop102/192.168.6.102:8485. Already tried 0 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:40,659 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 0 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:41,660 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 1 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:41,660 INFO org.apache.hadoop.ipc.Client: Retrying connect

to server: hadoop102/192.168.6.102:8485. Already tried 1 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:41,665 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 1 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:42,661 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 2 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:42,661 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop102/192.168.6.102:8485. Already tried 2 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:42,667 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 2 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:43,662 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 3 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:43,662 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop102/192.168.6.102:8485. Already tried 3 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:43,668 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 3 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:44,663 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 4 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:44,663 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop102/192.168.6.102:8485. Already tried 4 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:44,670 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 4 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:45,467 INFO

org.apache.hadoop.hdfs.qjournal.client.QuorumJournalManager: Waited 6001

ms (timeout=20000 ms) for a response for selectStreamingInputStreams. No responses yet.

2020-08-17 10:11:45,664 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop102/192.168.6.102:8485. Already tried 5 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:45,664 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 5 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:45,672 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 5 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:46,469 INFO

org.apache.hadoop.hdfs.qjournal.client.QuorumJournalManager: Waited 7003 ms (timeout=20000 ms) for a response for selectStreamingInputStreams. No responses yet.

2020-08-17 10:11:46,665 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop102/192.168.6.102:8485. Already tried 6 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:46,665 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 6 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:46,673 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 6 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:47,470 INFO

org.apache.hadoop.hdfs.qjournal.client.QuorumJournalManager: Waited 8004 ms (timeout=20000 ms) for a response for selectStreamingInputStreams. No responses yet.

2020-08-17 10:11:47,666 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop102/192.168.6.102:8485. Already tried 7 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:47,667 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 7 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:47,674 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 7 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10,

sleepTime=1000 MILLISECONDS) 2020-08-17 10:11:48,471 INFO

org.apache.hadoop.hdfs.qjournal.client.QuorumJournalManager: Waited 9005 ms (timeout=20000 ms) for a response for selectStreamingInputStreams. No responses yet.

2020-08-17 10:11:48,668 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop102/192.168.6.102:8485. Already tried 8 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:48,668 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 8 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:48,675 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 8 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:49,669 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop102/192.168.6.102:8485. Already tried 9 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:49,673 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop104/192.168.6.104:8485. Already tried 9 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:49,676 INFO org.apache.hadoop.ipc.Client: Retrying connect to server: hadoop103/192.168.6.103:8485. Already tried 9 time(s); retry policy is RetryUpToMaximumCountWithFixedSleep(maxRetries=10, sleepTime=1000 MILLISECONDS)

2020-08-17 10:11:49,678 WARN

org.apache.hadoop.hdfs.server.namenode.FSEditLog: Unable to determine input streams from QJM to [192.168.6.102:8485, 192.168.6.103:8485,

192.168.6.104:8485]. Skipping.

org.apache.hadoop.hdfs.qjournal.client.QuorumException: Got too many exceptions to achieve quorum size 2/3. 3 exceptions thrown: 192.168.6.103:8485: Call From hadoop102/192.168.6.102 to hadoop103:8485 failed on connection exception: java.net.ConnectException: 拒绝连接; For more details see: <http://wiki.apache.org/hadoop/ConnectionRefused> 192.168.6.102:8485: Call From hadoop102/192.168.6.102 to hadoop102:8485 failed on connection exception: java.net.ConnectException: 拒绝连接; For more details see: <http://wiki.apache.org/hadoop/ConnectionRefused> 192.168.6.104:8485: Call From hadoop102/192.168.6.102 to hadoop104:8485 failed on connection exception: java.net.ConnectException: 拒绝连接; For more details see: <http://wiki.apache.org/hadoop/ConnectionRefused>

查看报错日志，可分析出报错原因是因为 NameNode 连接不上 JournalNode，而利用 jps 命令查看到三台 JN 都已经正常启动，为什么 NN 还是无法正常连接到 JN 呢？这是因为 start-dfs.sh 群起脚本默认的启动顺序是先启动NN，再启动 DN，然后再启动 JN，并且默认的 rpc 连接参数是重试次数为 10，每次重试的间隔是 1s，也就是说启动完 NN 以后的 10s 中内，JN 还启动不起来，NN 就会报错了。

core-default.xml 里面有两个参数如下：

<!-- NN 连接 JN 重试次数，默认是 10 次 -->

<property>

<name>ipc.client.connect.max.retries</name>

<value>10</value>

</property>

<!-- 重试时间间隔，默认 1s -->

<property>

<name>ipc.client.connect.retry.interval</name>

<value>1000</value>

</property>

解决方案：遇到上述问题后，可以稍等片刻，等 JN 成功启动后，手动启动下三台

NN：

[atguigu@hadoop102 ~]$ hdfs --daemon start namenode [atguigu@hadoop103 ~]$ hdfs --daemon start namenode [atguigu@hadoop104 ~]$ hdfs --daemon start namenode

也可以在 core-site.xml 里面适当调大上面的两个参数：

<!-- NN 连接 JN 重试次数，默认是 10 次 -->

<property>

<name>ipc.client.connect.max.retries</name>

<value>20</value>

</property>

<!-- 重试时间间隔，默认 1s -->

<property>

<name>ipc.client.connect.retry.interval</name>

<value>5000</value>

</property>

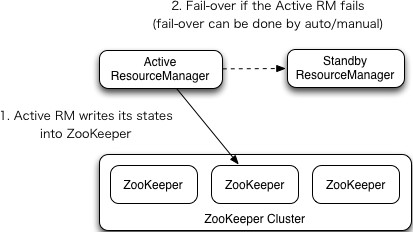
* 1. **YARN-HA 配置**
     1. **YARN-HA 工作机制**

1. **官方文档：**

[http://hadoop.apache.org/docs/r3.1.3/hadoop-yarn/hadoop-yarn-site/ResourceManagerHA.htm](http://hadoop.apache.org/docs/r2.7.2/hadoop-yarn/hadoop-yarn-site/ResourceManagerHA.html)

[l](http://hadoop.apache.org/docs/r2.7.2/hadoop-yarn/hadoop-yarn-site/ResourceManagerHA.html)

1. **YARN-HA 工作机制**



* + 1. **配置 YARN-HA 集群**

1. **环境准备**
   1. 修改 IP
   2. 修改主机名及主机名和 IP 地址的映射
   3. 关闭防火墙
   4. ssh 免密登录
   5. 安装 JDK，配置环境变量等
   6. 配置Zookeeper 集群
2. **规划集群**

|  |  |  |
| --- | --- | --- |
| hadoop102 | hadoop103 | hadoop104 |
| ResourceManager | ResourceManager | ResourceManager |
| NodeManager | NodeManager | NodeManager |
| Zookeeper | Zookeeper | Zookeeper |

1. **核心问题**

**a .如果当前 active rm 挂了，其他 rm 怎么将其他 standby rm 上位**核心原理跟 hdfs 一样，利用了 zk 的临时节点

* 1. **当前 rm 上有很多的计算程序在等待运行,其他的 rm 怎么将这些程序接手过来接着跑**

rm 会将当前的所有计算程序的状态存储在 zk 中,其他 rm 上位后会去读取，然后接

着跑

1. **具体配置**
2. yarn-site.xml

<configuration>

<property>

<name>yarn.nodemanager.aux-services</name>

<value>mapreduce\_shuffle</value>

</property>

<!-- 启用 resourcemanager ha -->

<property>

<name>yarn.resourcemanager.ha.enabled</name>

<value>true</value>

</property>

<!-- 声明两台 resourcemanager 的地址 -->

<property>

<name>yarn.resourcemanager.cluster-id</name>

<value>cluster-yarn1</value>

</property>

<!--指定 resourcemanager 的逻辑列表-->

<property>

<name>yarn.resourcemanager.ha.rm-ids</name>

<value>rm1,rm2,rm3</value>

</property>

<!-- ========== rm1 的配置 ========== -->

<!-- 指定 rm1 的主机名 -->

<property>

<name>yarn.resourcemanager.hostname.rm1</name>

<value>hadoop102</value>

</property>

<!-- 指定 rm1 的 web 端地址 -->

<property>

<name>yarn.resourcemanager.webapp.address.rm1</name>

<value>hadoop102:8088</value>

</property>

<!-- 指定 rm1 的内部通信地址 -->

<property>

<name>yarn.resourcemanager.address.rm1</name>

<value>hadoop102:8032</value>

</property>

<!-- 指定 AM 向 rm1 申请资源的地址 -->

<property>

<name>yarn.resourcemanager.scheduler.address.rm1</name>

<value>hadoop102:8030</value>

</property>

<!-- 指定供 NM 连接的地址 -->

<property>

<name>yarn.resourcemanager.resource-tracker.address.rm1</name>

<value>hadoop102:8031</value>

</property>

<!-- ========== rm2 的配置 ========== -->

<!-- 指定 rm2 的主机名 -->

<property>

<name>yarn.resourcemanager.hostname.rm2</name>

<value>hadoop103</value>

</property>

<property>

<name>yarn.resourcemanager.webapp.address.rm2</name>

<value>hadoop103:8088</value>

</property>

<property>

<name>yarn.resourcemanager.address.rm2</name>

<value>hadoop103:8032</value>

</property>

<property>

<name>yarn.resourcemanager.scheduler.address.rm2</name>

<value>hadoop103:8030</value>

</property>

<property>

<name>yarn.resourcemanager.resource-tracker.address.rm2</name>

<value>hadoop103:8031</value>

</property>

<!-- ========== rm3 的配置 ========== -->

<!-- 指定 rm1 的主机名 -->

<property>

<name>yarn.resourcemanager.hostname.rm3</name>

<value>hadoop104</value>

</property>

<!-- 指定 rm1 的 web 端地址 -->

<property>

<name>yarn.resourcemanager.webapp.address.rm3</name>

<value>hadoop104:8088</value>

</property>

<!-- 指定 rm1 的内部通信地址 -->

<property>

<name>yarn.resourcemanager.address.rm3</name>

<value>hadoop104:8032</value>

</property>

<!-- 指定 AM 向 rm1 申请资源的地址 -->

<property>

<name>yarn.resourcemanager.scheduler.address.rm3</name>

<value>hadoop104:8030</value>

</property>

<!-- 指定供 NM 连接的地址 -->

<property>

<name>yarn.resourcemanager.resource-tracker.address.rm3</name>

<value>hadoop104:8031</value>

</property>

<!-- 指定 zookeeper 集群的地址 -->

<property>

<name>yarn.resourcemanager.zk-address</name>

<value>hadoop102:2181,hadoop103:2181,hadoop104:2181</value>

</property>

<!-- 启用自动恢复 -->

<property>

<name>yarn.resourcemanager.recovery.enabled</name>

<value>true</value>

</property>

<!-- 指定 resourcemanager 的状态信息存储在 zookeeper 集群 -->

<property>

<name>yarn.resourcemanager.store.class</name>

<value>org.apache.hadoop.yarn.server.resourcemanager.recovery.ZKRMStateSt ore</value>

</property>

<!-- 环境变量的继承 -->

<property>

<name>yarn.nodemanager.env-whitelist</name>

<value>JAVA\_HOME,HADOOP\_COMMON\_HOME,HADOOP\_HDFS\_HOME,HADOOP\_CONF\_DIR,CLAS SPATH\_PREPEND\_DISTCACHE,HADOOP\_YARN\_HOME,HADOOP\_MAPRED\_HOME</value>

</property>

</configuration>

1. 同步更新其他节点的配置信息，分发配置文件

[atguigu@hadoop102 etc]$ xsync hadoop/

## 启动 YARN

* 1. 在 hadoop102 或者 hadoop103 中执行：

[atguigu@hadoop102 ~]$ start-yarn.sh

* 1. 查看服务状态

[atguigu@hadoop102 ~]$ yarn rmadmin -getServiceState rm1

* 1. 可以去 zkCli.sh 客户端查看 ResourceManager 选举锁节点内容：

[atguigu@hadoop102 ~]$ zkCli.sh

[zk: localhost:2181(CONNECTED) 16] get -s

/yarn-leader-election/cluster-yarn1/ActiveStandbyElectorLock

cluster-yarn1rm1 cZxid = 0x100000022

ctime = Tue Jul 14 17:06:44 CST 2020 mZxid = 0x100000022

mtime = Tue Jul 14 17:06:44 CST 2020 pZxid = 0x100000022

cversion = 0

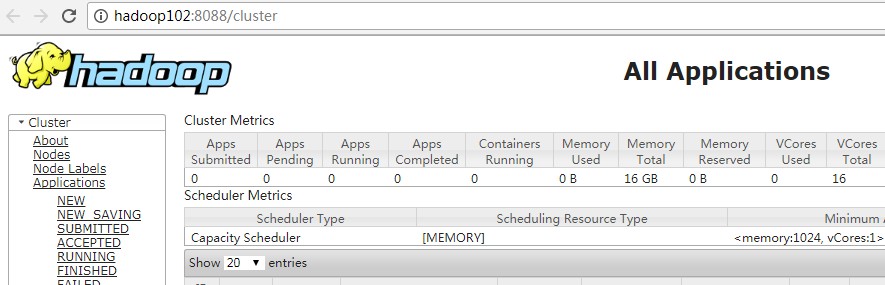
dataVersion = 0

aclVersion = 0

ephemeralOwner = 0x30000da33080005 dataLength = 20

numChildren = 0

* 1. web 端查看 hadoop102:8088 和hadoop103:8088 的 YARN 的状态



* 1. **HADOOP HA 的最终规划**

将整个 ha 搭建完成后,集群将形成以下模样

|  |  |  |
| --- | --- | --- |
| hadoop102 | hadoop103 | hadoop104 |
| NameNode | NameNode | NameNode |
| JournalNode | JournalNode | JournalNode |
| DataNode | DataNode | DataNode |
| Zookeeper | Zookeeper | Zookeeper |
| ZKFC | ZKFC | ZKFC |

|  |  |  |
| --- | --- | --- |
| ResourceManager | ResourceManager | ResourceManager |
| NodeManager | NodeManager | NodeManager |