Cloud Computing

Fault Recovery in HDFS

09.08.2017

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Submitted by: [GROUP 15]

Aditi (2014CS10205)
Aditi Singla (2014CS50277)
Aditi Gupta (2017BSY7508)

Installation

We followed the following steps to install and run Hadoop on all the VMs :

1. Install Java on all VMs using apt-get :
   a. $sudo apt-get install default-jdk
2. Add a user account to install and run Hadoop file system. It also needs to be added to the sudo group.
   a. $sudo addgroup hadoop
   b. $sudo adduser --ingroup hadoop hadoopuser
   c. $sudo usermod -aG sudo hadoopuser
3. Generate an SSH key for the new user so as to allow the new user to access the local machine via SSH, with this key.
   a. $su - hadoopuser (Logging into the new user)
   b. $ssh-keygen -t rsa -P ""
   c. $cat ~/.ssh/id_rsa.pub >> ~/.ssh/authorized_keys
4. Open the /etc/hosts file, to add the IP addresses corresponding to the master and the slaves of the Hadoop file system.
   a. $sudo vim /etc/hosts
   b. Add the following lines :
      i. 10.17.6.98 aditi-master
      ii. 10.17.5.73 aditi-slave1
      iii. 10.17.51.70 aditi-slave2
      iv. 10.17.5.62 aditi-slave3
5. Now, we need to allow the hadoop users on different VMs to be able to ssh into each other without entering a password. Hence, we will need to copy the SSH key we had created. This needs to be done only at the **master VM**.
   a. $ssh-copy-id -i ~/.ssh/id_rsa.pub hadoopuser@aditi-master
   b. $ssh-copy-id -i ~/.ssh/id_rsa.pub hadoopuser@aditi-slave1
   c. $ssh-copy-id -i ~/.ssh/id_rsa.pub hadoopuser@aditi-slave2
   d. $ssh-copy-id -i ~/.ssh/id_rsa.pub hadoopuser@aditi-slave3
6. Download Hadoop on master VM. It can be downloaded on master VM first, and then be scp'ed into the slave VMs, by the following steps :
   a. $sudo mkdir /opt/hadoop
   b. $cd /opt/hadoop
   c. $wget http://apache.mesi.com.ar/hadoop/common/hadoop-1.2.1/hadoop-1.2.0.tar.gz
   d. $tar -xzf hadoop-1.2.0.tar.gz
   e. $sudo mv hadoop-1.2.0 hadoop

     f. $scp -r /opt/hadoop/hadoop hadoopuser@aditi-slave1:/opt/hadoop

     g. $scp -r /opt/hadoop/hadoop hadoopuser@aditi-slave2:/opt/hadoop

     h. $scp -r /opt/hadoop/hadoop hadoopuser@aditi-slave3:/opt/hadoop

7. The ownership of the hadoop folder needs to be changed to hadoopuser in all the VMs.

     a. $sudo chown -R hadoopuser /opt/hadoop

8. Edit the hadoop configuration files in the /opt/hadoop/hadoop/conf folder directory as follows :

     a. Add the following to the core-site.xml file :

```
<configuration>
  <property>
    <name>fs.default.name</name>
    <value>hdfs://aditi-master:9000/</value>
  </property>
  <property>
    <name>dfs.permissions</name>
    <value>false</value>
  </property>
</configuration>
```

     b. Add the following to the hdfs-site.xml file :

```
<configuration>
  <property>
    <name>dfs.data.dir</name>
    <value>/opt/hadoop/hadoop/dfs/name/data</value>
    <final>true</final>
  </property>
  <property>
    <name>dfs.name.dir</name>
    <value>/opt/hadoop/hadoop/dfs/name</value>
    <final>true</final>
  </property>
  <property>
    <name>dfs.replication</name>
    <value>2</value>
  </property>
</configuration>
```

     c. Add the following to the mapred-site.xml file :

```
<configuration>
  <property>
    <name>mapred.job.tracker</name>
    <value>aditi-master:9001</value>
  </property>
</configuration>
```

      d. Add these lines to hadoop-env.sh :
   export JAVA_HOME=/usr/lib/jvm/java-7-openjdk-amd64
   export HADOOP_OPTS=-Djava.net.preferIPv4Stack=true
   export HADOOP_CONF_DIR=/opt/hadoop/hadoop/conf

9. Now, Hadoop needs to be configured on the master VM. This needs to be done only at the **master VM**.
   a. Add this line to the file /opt/hadoop/hadoop/conf/masters :
   aditi-master
   b. Add these lines to the file /opt/hadoop/hadoop/conf/slaves :
   aditi-slave1
   aditi-slave2
   aditi-slave3
   c. Format master node and start all nodes :
   $/opt/hadoop/hadoop/bin/hadoop namenode –format
   $/opt/hadoop/hadoop/bin start-all.sh

Block Report

We added 4 different files named, File1.mp4 , FIle2.mp4, File3.mp4 and File4.mp4 to the master VM. They got distributed in blocks of size 64 MB, and each block was replicated at 2 different VMs. Following steps were taken:

1. Copy the file from hadoopuser to hadoop. It might take some time, depending on the size of file.
   $bin/hadoop fs -copyFromLocal ~/File1.mp4 /
2. List out the contents of the filesystem, along with their details.
   $bin/hadoop fs -ls /

3. View the description of all the blocks being used to store a file, along with the number of replicas.
   $bin/hadoop fsck / -files -locations -blocks

```
drwxr-xr-x   - root supergroup          0 2017-09-08 21:17 /tmp
hadoopuser@baadalvm:/opt/hadoop/hadoop/bin$ sudo ./hadoop fsck / -files -locations -blocks
FSCK started by root from /127.0.0.1 for path / at Fri Sep 08 20:24:26 IST 2017
/ <dir>
/File1.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-4460018218118930179_1003 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
1. blk_-2008902122186153532_1003 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
2. blk_5572808684764298553_1003 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
3. blk_-8246435289944763159_1003 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
4. blk_-1073052820413340206_1003 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
5. blk_-1724632614252315195_1003 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
6. blk_-1369306124559324683_1003 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
7. blk_-8410634133017425999_1003 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
8. blk_-3181410419409773680_1003 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
9. blk_7987756567811023005_1003 len=49612763 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]

/File2.mp4 653592539 bytes, 10 block(s):  OK
0. blk_2638069195591168073_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
1. blk_7356450812104590627_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
2. blk_-8340145212350497359_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
3. blk_-8630885131759552039_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
4. blk_-5307575684064377671_1004 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
5. blk_7656149818116326886_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
6. blk_-294239726949597084_1004 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
7. blk_6134642412472572303_1004 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
8. blk_3318248062125288302_1004 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
9. blk_1535498645106185651_1004 len=49612763 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]

/File3.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-7335443388698332404_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.5.73:50010]
1. blk_3716143160242824524_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
2. blk_8028915581436625988_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.5.62:50010]
3. blk_8961631214898192856_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.5.62:50010]
4. blk_1456700771295654591_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.5.62:50010]
5. blk_-5749067967390748225_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.5.73:50010]
6. blk_-4742656527055610412_1005 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
7. blk_-6986016303814486091_1005 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
8. blk_-2638801027731460921_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.5.62:50010]
9. blk_6152758091192002059_1005 len=49612763 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]

/lessfunnynaam.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-4513880168992238033_1002 len=67108864 repl=1 [10.17.5.73:50010]
1. blk_-1439479909415341112_1002 len=67108864 repl=1 [10.17.5.73:50010]
2. blk_-8547066278268929881_1002 len=67108864 repl=1 [10.17.5.73:50010]
3. blk_-2943258476369970626_1002 len=67108864 repl=1 [10.17.5.73:50010]
4. blk_3988315196319571768_1002 len=67108864 repl=1 [10.17.5.73:50010]
5. blk_4640805430871516456_1002 len=67108864 repl=1 [10.17.5.73:50010]
6. blk_-8889418590241280054_1002 len=67108864 repl=1 [10.17.5.73:50010]
7. blk_-8889777304678674333_1002 len=67108864 repl=1 [10.17.5.73:50010]
8. blk_6990636028051852035_1002 len=67108864 repl=1 [10.17.5.73:50010]
9. blk_5299752871499925691_1002 len=49612763 repl=1 [10.17.5.73:50010]

/tmp <dir>
/tmp/hadoop-root <dir>
/tmp/hadoop-root/mapred <dir>
/tmp/hadoop-root/mapred/system <dir>
/tmp/hadoop-root/mapred/system/jobtracker.info 4 bytes, 1 block(s):  OK
0. blk_1416413134873527878_1001 len=4 repl=3 [10.17.5.73:50010, 10.17.51.70:50010, 10.17.5.62:50010]

Status: HEALTHY
 Total size:    2614370160 B
```

```
Status: HEALTHY
 Total size:       2614370160 B
 Total dirs:       5
 Total files:      5
 Total blocks (validated):      41 (avg. block size 63765125 B)
 Minimally replicated blocks:   41 (100.0 %)
 Over-replicated blocks:        0 (0.0 %)
 Under-replicated blocks:       0 (0.0 %)
 Mis-replicated blocks:         0 (0.0 %)
 Default replication factor:    3
 Average block replication:     1.7804878
 Corrupt blocks:                0
 Missing replicas:              0 (0.0 %)
 Number of data-nodes:          3
 Number of racks:               1
FSCK ended at Fri Sep 08 20:24:26 IST 2017 in 22 milliseconds


The filesystem under path '/' is HEALTHY
hadoopuser@baadalvm:/opt/hadoop/hadoop/bin$
```

4. One of the VM was shut down. In this case, it was aditi-slave1 (10.17.5.73). It took a few minutes to remove the datanode from the hdfs cluster.

    a. As soon as the datanode is removed, we see the number of datanodes to be 2. At this point, the files which were initially added and were just on that node, were found to be missing (and hence, corrupted). And others with one copy on that node, were found to be under replicated.

```
The filesystem under path '/' is HEALTHY
hadoopuser@baadalvm:/opt/hadoop/hadoop/bin$ sudo ./hadoop fsck / -files -locations -blocks
FSCK started by root from /127.0.0.1 for path / at Fri Sep 08 20:43:56 IST 2017
/ <dir>
/File1.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-4460018218118930179_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
1. blk_-2008902122186153532_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
2. blk_5572808684764298553_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
3. blk_-8246435289944763159_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
4. blk_-10730528204133340206_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
5. blk_-1724632614252315195_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
6. blk_-1369306124559324683_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
7. blk_-8410634133017425999_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
8. blk_-3181410419409773680_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
9. blk_7987756567811023005_1003 len=49612763 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]

/File2.mp4 653592539 bytes, 10 block(s):  Under replicated blk_2638069195591168073_1004. Target Replicas is 2 but found 1 replica(s).
 Under replicated blk_7356450812104590627_1004. Target Replicas is 2 but found 1 replica(s).
 Under replicated blk_7656149818116326886_1004. Target Replicas is 2 but found 1 replica(s).
 Under replicated blk_3318248062125288382_1004. Target Replicas is 2 but found 1 replica(s).
0. blk_2638069195591168073_1004 len=67108864 repl=1 [10.17.51.70:50010]
1. blk_7356450812104590627_1004 len=67108864 repl=1 [10.17.51.70:50010]
2. blk_-8340145212350497359_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
3. blk_-8630851317595252039_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
4. blk_-5307575684064377671_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
5. blk_7656149818116326886_1004 len=67108864 repl=1 [10.17.51.70:50010]
6. blk_-2942397269449597084_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
7. blk_613464241247257303_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
8. blk_3318248062125288382_1004 len=67108864 repl=1 [10.17.51.70:50010]
9. blk_1535498645106185651_1004 len=49612763 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]

/File3.mp4 653592539 bytes, 10 block(s):  Under replicated blk_-7335443388698332404_1005. Target Replicas is 2 but found 1 replica(s).
 Under replicated blk_8028915581436625988_1005. Target Replicas is 2 but found 1 replica(s).
 Under replicated blk_8961631214898192856_1005. Target Replicas is 2 but found 1 replica(s).
 Under replicated blk_1456700771295654591_1005. Target Replicas is 2 but found 1 replica(s).
 Under replicated blk_-2638801027731460921_1005. Target Replicas is 2 but found 1 replica(s).
0. blk_-7335443388698332404_1005 len=67108864 repl=1 [10.17.5.62:50010]
1. blk_3716143160242824524_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
2. blk_8028915581436625988_1005 len=67108864 repl=1 [10.17.5.62:50010]
3. blk_8961631214898192856_1005 len=67108864 repl=1 [10.17.5.62:50010]
4. blk_1456700771295654591_1005 len=67108864 repl=1 [10.17.5.62:50010]
5. blk_-5749067967390748225_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
6. blk_4742656527055610412_1005 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
7. blk_-6906016303814486091_1005 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
8. blk_-2638801027731460921_1005 len=67108864 repl=1 [10.17.5.62:50010]
9. blk_6152758091192002059_1005 len=49612763 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
```

```
/lessfunnynaam.mp4 653592539 bytes, 10 block(s):
/lessfunnynaam.mp4: CORRUPT block blk_-4513880168992238033

/lessfunnynaam.mp4: CORRUPT block blk_-1439479909415341112

/lessfunnynaam.mp4: CORRUPT block blk_-8547066278268929881

/lessfunnynaam.mp4: CORRUPT block blk_-2943258476369970626

/lessfunnynaam.mp4: CORRUPT block blk_3988315196319571768

/lessfunnynaam.mp4: CORRUPT block blk_4640805430871516456

/lessfunnynaam.mp4: CORRUPT block blk_-888941859024128054

/lessfunnynaam.mp4: CORRUPT block blk_-8889777304678674333

/lessfunnynaam.mp4: CORRUPT block blk_6990636028051852035

/lessfunnynaam.mp4: CORRUPT block blk_5299752871499925691
 MISSING 10 blocks of total size 653592539 B
0. blk_-4513880168992238033_1002 len=67108864 MISSING!
1. blk_-1439479909415341112_1002 len=67108864 MISSING!
2. blk_-8547066278268929881_1002 len=67108864 MISSING!
3. blk_-2943258476369970626_1002 len=67108864 MISSING!
4. blk_3988315196319571768_1002 len=67108864 MISSING!
5. blk_4640805430871516456_1002 len=67108864 MISSING!
6. blk_-888941859024128054_1002 len=67108864 MISSING!
7. blk_-8889777304678674333_1002 len=67108864 MISSING!
8. blk_6990636028051852035_1002 len=67108864 MISSING!
9. blk_5299752871499925691_1002 len=49612763 MISSING!
```

```
/tmp <dir>
/tmp/hadoop-root <dir>
/tmp/hadoop-root/mapred <dir>
/tmp/hadoop-root/mapred/system <dir>
/tmp/hadoop-root/mapred/system/jobtracker.info 4 bytes, 1 block(s):  Under replicated blk_1416413134873527878_1001. Target Replicas is 3 but found 2 replica(s).
0. blk_1416413134873527878_1001 len=4 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]

Status: CORRUPT
 Total size:    2614370160 B
 Total dirs:    5
 Total files:   5
 Total blocks (validated):      41 (avg. block size 63765125 B)
  ********************************
  CORRUPT FILES:        1
  MISSING BLOCKS:       10
  MISSING SIZE:         653592539 B
  CORRUPT BLOCKS:       10
  ********************************
 Minimally replicated blocks:   31 (75.60976 %)
 Over-replicated blocks:        0 (0.0 %)
 Under-replicated blocks:       10 (24.390244 %)
 Mis-replicated blocks:         0 (0.0 %)
 Default replication factor:    3
 Average block replication:     1.2926829
 Corrupt blocks:                10
 Missing replicas:              10 (18.867924 %)
 Number of data-nodes:          2
 Number of racks:               1
FSCK ended at Fri Sep 08 20:43:56 IST 2017 in 4 milliseconds
```

b. After about a minute, the under replicated files were restored to normal state again through rebalancing, when there replicas were created and distributed on the other nodes.

```
user@baadalvm:/opt/hadoop/hadoop/bin
hadoopuser@baadalvm:/opt/hadoop/hadoop/bin$ sudo ./hadoop fsck / -files -locations -blocks
FSCK started by root from /127.0.0.1 for path / at Fri Sep 08 20:45:39 IST 2017
/ <dir>
/File1.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-4460018218118930179_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
1. blk_-2008902122186153532_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
2. blk_5572808684764298553_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
3. blk_-8246435289944763159_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
4. blk_-1073052820413340206_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
5. blk_-1724632614252315195_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
6. blk_-1369306124559324683_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
7. blk_-8410634133017425999_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
8. blk_-3181410419409773680_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
9. blk_7987756567811023005_1003 len=49612763 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]

/File2.mp4 653592539 bytes, 10 block(s):  OK
0. blk_2638069195591168073_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
1. blk_7356450812104590627_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
2. blk_-8340145212350497359_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
3. blk_-863085131759552039_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
4. blk_-5307575684064377671_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
5. blk_7656149818116326886_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
6. blk_-2942397269945597084_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
7. blk_613464241247257303_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
8. blk_3318248062125288382_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
9. blk_1535498645106185651_1004 len=49612763 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]

/File3.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-7335443388698332404_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
1. blk_3716143160242824524_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
2. blk_8028915581436625988_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
3. blk_8961631214898192856_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
4. blk_1456700771295654591_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
5. blk_-5749067967390748225_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
6. blk_4742656527055610412_1005 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
7. blk_-6906016303814486091_1005 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
8. blk_-2638801027731460921_1005 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.62:50010]
9. blk_6152758091192002059_1005 len=49612763 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]

/lessfunnynaam.mp4 653592539 bytes, 10 block(s):
```

```
/lessfunnynaam.mp4 653592539 bytes, 10 block(s):
/lessfunnynaam.mp4: CORRUPT block blk_-4513880168992238033

/lessfunnynaam.mp4: CORRUPT block blk_-1439479909415341112

/lessfunnynaam.mp4: CORRUPT block blk_-8547066278268929881

/lessfunnynaam.mp4: CORRUPT block blk_-2943258476369970626

/lessfunnynaam.mp4: CORRUPT block blk_3988315196319571768

/lessfunnynaam.mp4: CORRUPT block blk_4640805430871516456

/lessfunnynaam.mp4: CORRUPT block blk_-888941859024128054

/lessfunnynaam.mp4: CORRUPT block blk_-8889777304678674333

/lessfunnynaam.mp4: CORRUPT block blk_6990636028051852035

/lessfunnynaam.mp4: CORRUPT block blk_5299752871499925691
```

```
MISSING 10 blocks of total size 653592539 B
0. blk_-4513880168992238033_1002 len=67108864 MISSING!
1. blk_-1439479909415341112_1002 len=67108864 MISSING!
2. blk_-8547066278268929881_1002 len=67108864 MISSING!
3. blk_-2943258476369970626_1002 len=67108864 MISSING!
4. blk_3988315196319571768_1002 len=67108864 MISSING!
5. blk_4640805430871516456_1002 len=67108864 MISSING!
6. blk_-888941859024128054_1002 len=67108864 MISSING!
7. blk_-8889777304678674333_1002 len=67108864 MISSING!
8. blk_6990636028051852035_1002 len=67108864 MISSING!
9. blk_5299752871499925691_1002 len=49612763 MISSING!

/tmp <dir>
/tmp/hadoop-root <dir>
/tmp/hadoop-root/mapred <dir>
/tmp/hadoop-root/mapred/system <dir>
/tmp/hadoop-root/mapred/system/jobtracker.info 4 bytes, 1 block(s):  Under replicated blk_1416413134873527878_1001. Target Replicas is 3 but found 2 replica(s).
0. blk_1416413134873527878_1001 len=4 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]

Status: CORRUPT
 Total size:    2614370160 B
 Total dirs:    5
 Total files:   5
 Total blocks (validated):      41 (avg. block size 63765125 B)
 ********************************
  CORRUPT FILES:        1
  MISSING BLOCKS:       10
  MISSING SIZE:         653592539 B
  CORRUPT BLOCKS:       10
 ********************************
 Minimally replicated blocks:   31 (75.60976 %)
 Over-replicated blocks:        0 (0.0 %)
 Under-replicated blocks:       1 (2.4390244 %)
 Mis-replicated blocks:         0 (0.0 %)
 Default replication factor:    3
 Average block replication:     1.5121951
 Corrupt blocks:                10
 Missing replicas:              1 (1.6129032 %)
 Number of data-nodes:          2
 Number of racks:               1
FSCK ended at Fri Sep 08 20:45:39 IST 2017 in 8 milliseconds
```

5. After this, the shut down VM was turned on again, using the following commands :
   a. cd /opt/hadoop/hadoop/conf
   b. ./hadoop-daemon.sh start tasktracker
   c. ./hadoop-daemon.sh start datanode

   1. As soon as the datanode is added back, we see the number of datanodes to be 3. At this point, a few files have replication factor 3, for which a replica already existed in the VM that was shut down.

```
/tmp <dir>
/tmp/hadoop-root <dir>
/tmp/hadoop-root/mapred <dir>
/tmp/hadoop-root/mapred/system <dir>
/tmp/hadoop-root/mapred/system/jobtracker.info 4 bytes, 1 block(s):  OK
0. blk_1416413134873527878_1001 len=4 repl=3 [10.17.5.62:50010, 10.17.51.70:5001
0, 10.17.5.73:50010]

Status: HEALTHY
 Total size:    2614370160 B
 Total dirs:    5
 Total files:   5
 Total blocks (validated):      41 (avg. block size 63765125 B)
 Minimally replicated blocks:   41 (100.0 %)
 Over-replicated blocks:        28 (68.29269 %)
 Under-replicated blocks:       0 (0.0 %)
 Mis-replicated blocks:         0 (0.0 %)
 Default replication factor:    3
 Average block replication:     2.4634147
 Corrupt blocks:                0
 Missing replicas:              0 (0.0 %)
 Number of data-nodes:          3
 Number of racks:               1
FSCK ended at Fri Sep 08 20:49:49 IST 2017 in 19 milliseconds


The filesystem under path '/' is HEALTHY
hadoopuser@baadalvm:/opt/hadoop/hadoop/bin$
```

```
hadoopuser@baadalvm:/opt/hadoop/hadoop/bin$ sudo ./hadoop fsck / -files -locations -blocks
FSCK started by root from /127.0.0.1 for path / at Fri Sep 08 20:49:49 IST 2017
/ <dir>
/File1.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-4460018218118930179_1003 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
1. blk_-2008902122186153532_1003 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
2. blk_5572808684764298553_1003 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
3. blk_-8246435289944763159_1003 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
4. blk_-1073052820413340206_1003 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
5. blk_-1724632614252315195_1003 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
6. blk_-1369306124559324683_1003 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
7. blk_-8410634133017425999_1003 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
8. blk_-3181410419409773680_1003 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
9. blk_7987756567811023005_1003 len=49612763 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]

/File2.mp4 653592539 bytes, 10 block(s):  OK
0. blk_2638069195591168073_1004 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
1. blk_7356450812104590627_1004 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
2. blk_-8340145212350497359_1004 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
3. blk_-863085131759552039_1004 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
4. blk_-5307575684064377671_1004 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
5. blk_7656149818116326886_1004 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
6. blk_-294239726949597084_1004 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
7. blk_613464241247257303_1004 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
8. blk_3318248062125288382_1004 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
9. blk_1535498645106185651_1004 len=49612763 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]

/File3.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-7335443388698332404_1005 len=67108864 repl=3 [10.17.5.62:50010, 10.17.51.70:50010, 10.17.5.73:50010]
1. blk_3716143160242824524_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
2. blk_8028915581436625988_1005 len=67108864 repl=3 [10.17.5.62:50010, 10.17.51.70:50010, 10.17.5.73:50010]
3. blk_8961631214898192856_1005 len=67108864 repl=3 [10.17.5.62:50010, 10.17.51.70:50010, 10.17.5.73:50010]
4. blk_1456700771295654591_1005 len=67108864 repl=3 [10.17.5.62:50010, 10.17.51.70:50010, 10.17.5.73:50010]
5. blk_-5749067967390748225_1005 len=67108864 repl=3 [10.17.5.62:50010, 10.17.51.70:50010, 10.17.5.73:50010]
6. blk_4742656527055610412_1005 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
7. blk_-6906016303814486091_1005 len=67108864 repl=3 [10.17.51.70:50010, 10.17.5.62:50010, 10.17.5.73:50010]
8. blk_-2638801027731460921_1005 len=67108864 repl=3 [10.17.5.62:50010, 10.17.51.70:50010, 10.17.5.73:50010]
9. blk_6152758091192002059_1005 len=49612763 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]

/lessfunnynaam.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-4513880168992238033_1002 len=67108864 repl=1 [10.17.5.73:50010]
1. blk_-1439479909415341112_1002 len=67108864 repl=1 [10.17.5.73:50010]
2. blk_-8547066278268929881_1002 len=67108864 repl=1 [10.17.5.73:50010]
3. blk_-2943258476369970626_1002 len=67108864 repl=1 [10.17.5.73:50010]
4. blk_3988315196319571768_1002 len=67108864 repl=1 [10.17.5.73:50010]
5. blk_4640805430871516456_1002 len=67108864 repl=1 [10.17.5.73:50010]
6. blk_-888941859024128054_1002 len=67108864 repl=1 [10.17.5.73:50010]
7. blk_-8889777304678674333_1002 len=67108864 repl=1 [10.17.5.73:50010]
8. blk_6990636028051852035_1002 len=67108864 repl=1 [10.17.5.73:50010]
9. blk_5299752871499925691_1002 len=49612763 repl=1 [10.17.5.73:50010]

/tmp <dir>
/tmp/hadoop-root <dir>
/tmp/hadoop-root/mapred <dir>
/tmp/hadoop-root/mapred/system <dir>
/tmp/hadoop-root/mapred/system/jobtracker.info 4 bytes, 1 block(s):  OK
0. blk_1416413134873527878_1001 len=4 repl=3 [10.17.5.62:50010, 10.17.51.70:50010, 10.17.5.73:50010]
```

2. After sometime, we observe that all the files are balanced with replication factor 3. Note that, since file1, i.e. lessfunnynaam.mp4 was added when there was only one slave (aditi-slave1) with the master. This is the reason why there is just one copy now, which went missing when the VM was down.

```
/tmp <dir>
/tmp/hadoop-root <dir>
/tmp/hadoop-root/mapred <dir>
/tmp/hadoop-root/mapred/system <dir>
/tmp/hadoop-root/mapred/system/jobtracker.info 4 bytes, 1 block(s):  OK
0. blk_1416413134873527878_1001 len=4 repl=3 [10.17.5.62:50010, 10.17.51.70:5001
0, 10.17.5.73:50010]

Status: HEALTHY
 Total size:       2614370160 B
 Total dirs:       5
 Total files:      5
 Total blocks (validated):        41 (avg. block size 63765125 B)
 Minimally replicated blocks:     41 (100.0 %)
 Over-replicated blocks:          0 (0.0 %)
 Under-replicated blocks:         0 (0.0 %)
 Mis-replicated blocks:           0 (0.0 %)
 Default replication factor:      3
 Average block replication:       1.7804878
 Corrupt blocks:                  0
 Missing replicas:                0 (0.0 %)
 Number of data-nodes:            3
 Number of racks:                 1
FSCK ended at Fri Sep 08 21:57:44 IST 2017 in 29 milliseconds


The filesystem under path '/' is HEALTHY
hadoopuser@baadalvm:/opt/hadoop/hadoop/bin$
```

```
hadoopuser@baadalvm:/opt/hadoop/hadoop/bin$ sudo ./hadoop fsck / -files -locations -blocks
[sudo] password for hadoopuser:
FSCK started by root from /127.0.0.1 for path / at Fri Sep 08 21:57:44 IST 2017
/ <dir>
/File1.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-4460018218118930179_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
1. blk_-2008902122186153532_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
2. blk_5572808684764298553_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
3. blk_-8246435289944763159_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
4. blk_-1073052820413340206_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
5. blk_-1724632614252315195_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
6. blk_-1369306124559324683_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
7. blk_-8410634133017425999_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
8. blk_-3181410419409773680_1003 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
9. blk_7987756567811023005_1003 len=49612763 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]

/File2.mp4 653592539 bytes, 10 block(s):  OK
0. blk_2638069195591168073_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
1. blk_7356450812104590627_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
2. blk_-8340145212350497359_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
3. blk_-863085131759552039_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
4. blk_-5307575684064377671_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
5. blk_7656149818116326886_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
6. blk_-294239726949597084_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
7. blk_6134642412472573031_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
8. blk_3318248062125288382_1004 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
9. blk_1535498645106185651_1004 len=49612763 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]

/File3.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-7335443388698332404_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
1. blk_3716143160242824524_1005 len=67108864 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]
2. blk_8028915581436625988_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
3. blk_8961631214898192856_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
4. blk_1456700771295654591_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
5. blk_-5749067967390748225_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
6. blk_4742656527055610412_1005 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
7. blk_-6906016303814486091_1005 len=67108864 repl=2 [10.17.51.70:50010, 10.17.5.73:50010]
8. blk_-2638801027731460921_1005 len=67108864 repl=2 [10.17.5.73:50010, 10.17.51.70:50010]
9. blk_6152758091192002059_1005 len=49612763 repl=2 [10.17.5.62:50010, 10.17.51.70:50010]

/lessfunnynaam.mp4 653592539 bytes, 10 block(s):  OK
0. blk_-4513880168992238033_1002 len=67108864 repl=1 [10.17.5.73:50010]
1. blk_-1439479909415341112_1002 len=67108864 repl=1 [10.17.5.73:50010]
2. blk_-8547066278268929881_1002 len=67108864 repl=1 [10.17.5.73:50010]
3. blk_-2943258476369970626_1002 len=67108864 repl=1 [10.17.5.73:50010]
4. blk_3988315196319571768_1002 len=67108864 repl=1 [10.17.5.73:50010]
5. blk_4640805430871516456_1002 len=67108864 repl=1 [10.17.5.73:50010]
6. blk_-888941859024128054_1002 len=67108864 repl=1 [10.17.5.73:50010]
7. blk_-8889777304678674333_1002 len=67108864 repl=1 [10.17.5.73:50010]
8. blk_6990636028051852035_1002 len=67108864 repl=1 [10.17.5.73:50010]
9. blk_5299752871499925691_1002 len=49612763 repl=1 [10.17.5.73:50010]

/tmp <dir>
/tmp/hadoop-root <dir>
/tmp/hadoop-root/mapred <dir>
/tmp/hadoop-root/mapred/system <dir>
/tmp/hadoop-root/mapred/system/jobtracker.info 4 bytes, 1 block(s):  OK
0. blk_1416413134873527878_1001 len=4 repl=3 [10.17.5.62:50010, 10.17.51.70:50010, 10.17.5.73:50010]

Status: HEALTHY
 Total size:    2614370160 B
 Total dirs:    5
```

References

1. https://chawlasumit.wordpress.com/2015/03/09/install-a-multi-node-hadoop-cluster-on-ubuntu-14-04/
2. https://www.tutorialspoint.com/hadoop/hadoop_multi_node_cluster.htm