## hdfs dfsadmin –report Screenshot :

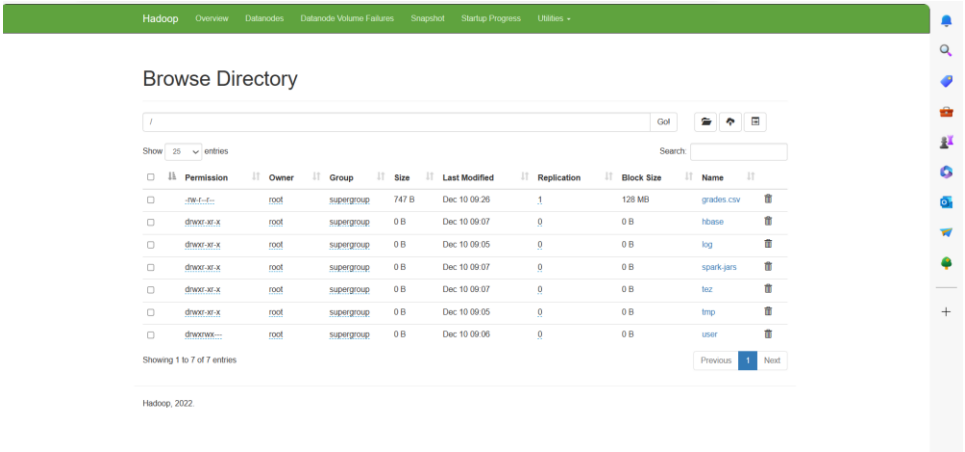
```
chitramoy@bigdata:~/dsc650-infra/bellevue-bigdata/hadoop-hive-spark-hbase$ sudo docker-compose exec master bash
bash-5.0# hdfs dfsadmin -report
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 15:49:56,282 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Configured Capacity: 103670202368 (96.55 GB)
Present Capacity: 81259583160 (75.68 GB)
DFS Remaining: 80877835960 (75.32 GB)
DFS Used: 381747200 (364.06 MB)
DFS Used%: 0.47%
Replicated Blocks:
        Under replicated blocks: 0
        Blocks with corrupt replicas: 0
        Missing blocks: 0
        Missing blocks (with replication factor 1): 0
        Low redundancy blocks with highest priority to recover: 0
        Pending deletion blocks: 0
Erasure Coded Block Groups:
        Low redundancy block groups: 0
        Block groups with corrupt internal blocks: 0
        Missing block groups: 0
        Low redundancy blocks with highest priority to recover: 0
        Pending deletion blocks: 0

-------------------------------------------------
Live datanodes (2):

Name: 172.28.1.2:9866 (worker1)
Hostname: worker1
Decommission Status : Normal
Configured Capacity: 51835101184 (48.28 GB)
DFS Used: 202510336 (193.13 MB)
Non DFS Used: 10908463104 (10.16 GB)
DFS Remaining: 40438920402 (37.66 GB)
DFS Used%: 0.39%
DFS Remaining%: 78.01%
Configured Cache Capacity: 0 (0 B)
Cache Used: 0 (0 B)
Cache Remaining: 0 (0 B)
Cache Used%: 100.00%
Cache Remaining%: 0.00%
Xceivers: 5
Last contact: Sun Dec 10 15:49:56 GMT 2023
Last Block Report: Sun Dec 10 15:04:26 GMT 2023
```

```
-------------------------------------------------
Live datanodes (2):

Name: 172.28.1.2:9866 (worker1)
Hostname: worker1
Decommission Status : Normal
Configured Capacity: 51835101184 (48.28 GB)
DFS Used: 202510336 (193.13 MB)
Non DFS Used: 10908463104 (10.16 GB)
DFS Remaining: 40438920402 (37.66 GB)
DFS Used%: 0.39%
DFS Remaining%: 78.01%
Configured Cache Capacity: 0 (0 B)
Cache Used: 0 (0 B)
Cache Remaining: 0 (0 B)
Cache Used%: 100.00%
Cache Remaining%: 0.00%
Xceivers: 5
Last contact: Sun Dec 10 15:49:56 GMT 2023
Last Block Report: Sun Dec 10 15:04:26 GMT 2023
Num of Blocks: 151


Name: 172.28.1.3:9866 (worker2)
Hostname: worker2
Decommission Status : Normal
Configured Capacity: 51835101184 (48.28 GB)
DFS Used: 179236864 (170.93 MB)
Non DFS Used: 10931736576 (10.18 GB)
DFS Remaining: 40438915558 (37.66 GB)
DFS Used%: 0.35%
DFS Remaining%: 78.01%
Configured Cache Capacity: 0 (0 B)
Cache Used: 0 (0 B)
Cache Remaining: 0 (0 B)
Cache Used%: 100.00%
Cache Remaining%: 0.00%
Xceivers: 5
Last contact: Sun Dec 10 15:49:55 GMT 2023
Last Block Report: Sun Dec 10 15:04:25 GMT 2023
Num of Blocks: 133


bash-5.0#
```

## Screenshot of uploading grades.csv file :

```
bash-5.0# hdfs dfs -put /data/grades.csv /
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 15:58:02,826 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
put: `/grades.csv': File exists
bash-5.0# hdfs dfs -ls /
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 15:58:14,326 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 7 items
-rw-r--r--   1 root supergroup        747 2023-12-10 15:26 /grades.csv
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /hbase
drwxr-xr-x   - root supergroup          0 2023-12-10 15:05 /log
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /spark-jars
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /tez
drwxr-xr-x   - root supergroup          0 2023-12-10 15:05 /tmp
drwxrwx---   - root supergroup          0 2023-12-10 15:06 /user
bash-5.0# exit
exit
```

```
chitramoy@bigdata:~/dsc650-infra/bellevue-bigdata/hadoop-hive-spark-hbase$ docker-compose exec worker1 bash
ERROR: Couldn't connect to Docker daemon at http+docker://localhost - is it running?

If it's at a non-standard location, specify the URL with the DOCKER_HOST environment variable.
chitramoy@bigdata:~/dsc650-infra/bellevue-bigdata/hadoop-hive-spark-hbase$ sudo docker-compose exec worker1 bash
bash-5.0# hdfs dfs -ls /
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 15:59:11,284 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 7 items
-rw-r--r--   1 root supergroup        747 2023-12-10 15:26 /grades.csv
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /hbase
drwxr-xr-x   - root supergroup          0 2023-12-10 15:05 /log
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /spark-jars
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /tez
drwxr-xr-x   - root supergroup          0 2023-12-10 15:05 /tmp
drwxrwx---   - root supergroup          0 2023-12-10 15:06 /user
bash-5.0# exit
exit
chitramoy@bigdata:~/dsc650-infra/bellevue-bigdata/hadoop-hive-spark-hbase$ sudo docker-compose exec worker2 bash
bash-5.0# hdfs dfs -ls /
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 15:59:38,394 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 7 items
-rw-r--r--   1 root supergroup        747 2023-12-10 15:26 /grades.csv
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /hbase
drwxr-xr-x   - root supergroup          0 2023-12-10 15:05 /log
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /spark-jars
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /tez
drwxr-xr-x   - root supergroup          0 2023-12-10 15:05 /tmp
drwxrwx---   - root supergroup          0 2023-12-10 15:06 /user
bash-5.0# exit
exit
chitramoy@bigdata:~/dsc650-infra/bellevue-bigdata/hadoop-hive-spark-hbase$
```




## Screenshots of the three chosen HDFS command outputs :

```
bash-5.0# hdfs dfs -cat /grades.csv
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 16:32:34,842 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Last name,First name,SSN,Test1,Test2,Test3,Test4,Final,Grade
Alfalfa,Aloysius,123-45-6789,40,90,100,83,49,D-
Alfred,University,123-12-1234,41,97,96,97,48,D+
Berty,Gramma,567-89-0123,41,80,60,40,44,C
Android,Electric,087-65-4321,42,23,36,45,47,B-
Bumpkin,Fred,456-78-9012,43,78,88,77,45,A-
Rubble,Betty,234-56-7890,44,90,80,90,46,C-
Noshow,Cecil,345-67-8901,45,11,-1,4,43,F
Buff,Bif,632-79-9939,46,20,30,40,50,B+
Airpump,Andrew,223-45-6789,49,1,90,100,83,A
Backus,Jim,143-12-1234,48,1,97,96,97,A+
Carnivore,Art,565-89-0123,44,1,80,60,40,D+
Dandy,Jim,087-75-4321,47,1,23,36,45,C+
Elephant,Ima,456-71-9012,45,1,78,88,77,B-
Franklin,Benny,234-56-2890,50,1,90,80,90,B-
George,Boy,345-67-3901,40,1,11,-1,4,B
Heffalump,Harvey,632-79-9439,30,1,20,30,40,C
bash-5.0#
```

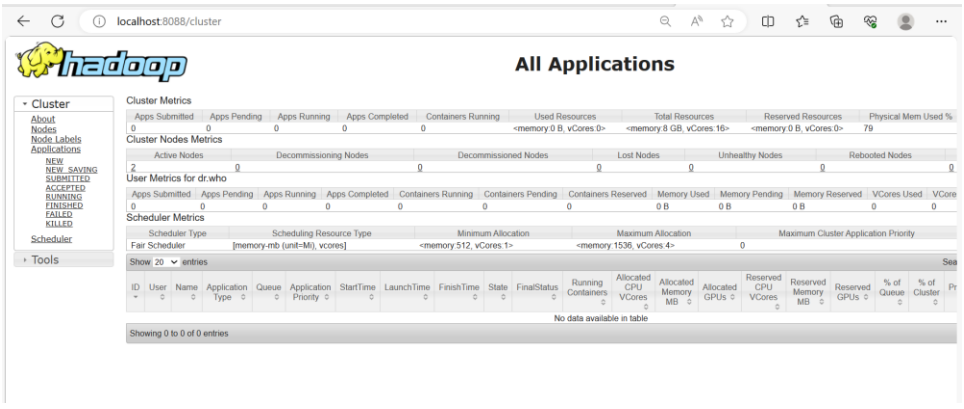
```
bash-5.0# hdfs dfs -ls /
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 17:43:25,299 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 7 items
-rw-r--r--   1 root supergroup        747 2023-12-10 15:26 /grades.csv
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /hbase
drwxr-xr-x   - root supergroup          0 2023-12-10 15:05 /log
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /spark-jars
drwxr-xr-x   - root supergroup          0 2023-12-10 15:07 /tez
drwxr-xr-x   - root supergroup          0 2023-12-10 15:05 /tmp
drwxrwx---   - root supergroup          0 2023-12-10 15:06 /user
bash-5.0# hdfs dfs -head /grades.csv
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 17:45:20,897 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Last name,First name,SSN,Test1,Test2,Test3,Test4,Final,Grade
Alfalfa,Aloysius,123-45-6789,40,90,100,83,49,D-
Alfred,University,123-12-1234,41,97,96,97,48,D+
Gerty,Gramma,567-89-0123,41,80,60,40,44,C
Android,Electric,087-65-4321,42,23,36,45,47,B-
Bumpkin,Fred,456-78-9012,43,78,88,77,45,A-
Rubble,Betty,234-56-7890,44,90,80,90,46,C-
Noshow,Cecil,345-67-8901,45,11,-1,4,43,F
Buff,Bif,632-79-9939,46,20,30,40,50,B+
Airpump,Andrew,223-45-6789,49,1,90,100,83,A
Backus,Jim,143-12-1234,48,1,97,96,97,A+
Carnivore,Art,565-89-0123,44,1,80,60,40,D+
Dandy,Jim,087-75-4321,47,1,23,36,45,C+
Elephant,Ima,456-71-9012,45,1,78,88,77,B-
Franklin,Benny,234-56-2890,50,1,90,80,90,B-
George,Boy,345-67-3901,40,1,11,-1,4,B
Heffalump,Harvey,632-79-9439,30,1,20,30,40,C
bash-5.0#
```

```
bash-5.0# hdfs dfs -touch abc.txt
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 18:04:06,376 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
bash-5.0# hdfs dfs -ls
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 18:04:23,370 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Found 2 items
drwxr-xr-x   - root supergroup          0 2023-12-10 15:06 .hiveJars
-rw-r--r--   1 root supergroup          0 2023-12-10 18:04 abc.txt
bash-5.0# hdfs dfs -rm abc.txt
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 18:04:39,678 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
Deleted abc.txt
bash-5.0#
```

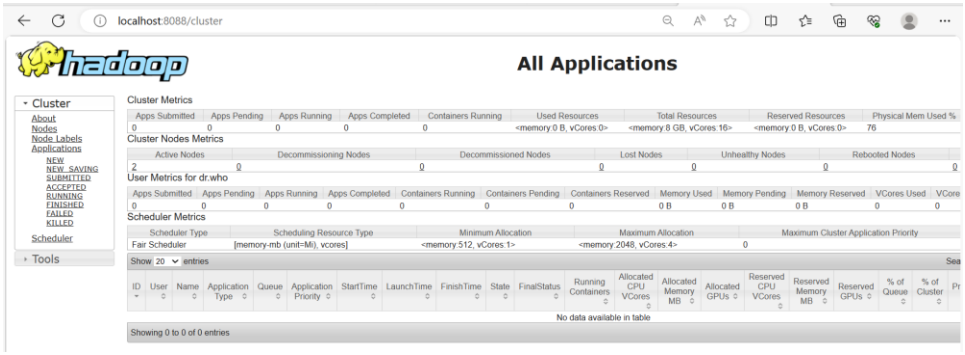
## Screenshot of the results YARN :

```
bash-5.0# yarn node -list
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 18:06:46,132 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
2023-12-10 18:06:46,373 INFO client.RMProxy: Connecting to ResourceManager at master/172.28.1.1:8032
Total Nodes:2
         Node-Id             Node-State Node-Http-Address       Number-of-Running-Containers
   worker2:38799                RUNNING       worker2:8042                          0
   worker1:33103                RUNNING       worker1:8042                          0
bash-5.0#
```

## Screenshot from the YARN UI showing the updated maximum memory (2048 MB) :



```
        <name>yarn.nodemanager.pmem-check-enabled</name>
        <value>false</value>
    </property>
    <property>
        <description>To enable RM web ui2 application.</description>
        <name>yarn.webapp.ui2.enable</name>
        <value>true</value>
    </property>
        <property>
        <name>yarn.nodemanager.pmem-check-enabled</name>
        <value>false</value>
    </property>

    <!--  -->
    <property>
        <name>yarn.log-aggregation-enable</name>
        <value>true</value>
    </property>
    <!--  -->
    <property>
        <name>yarn.log-aggregation.retain-seconds</name>
        <value>604800</value>
    </property>


</configuration>
bash-5.0# sed -i "/<name>yarn.scheduler.maximum-allocation-mb<\/name>/,/<\/proper
> ty>/s/<value>.*<\/value>/<value>2048<\/value>/" /usr/program/hadoop/etc
sed: unmatched '/'
bash-5.0# /hadoop/yarn-site.xml
bash: /hadoop/yarn-site.xml: No such file or directory
bash-5.0# yarn node -list
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/program/hadoop/share/hadoop/common/lib/slf4j-log4j12-1.7.25.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/tez/lib/slf4j-log4j12-1.7.10.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/program/hive/lib/log4j-slf4j-impl-2.10.0.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
2023-12-10 18:24:46,641 WARN util.NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable
2023-12-10 18:24:46,794 INFO client.RMProxy: Connecting to ResourceManager at master/172.28.1.1:8032
Total Nodes:2
         Node-Id             Node-State Node-Http-Address       Number-of-Running-Containers
   worker2:38799                RUNNING      worker2:8042                          0
   worker1:33103                RUNNING      worker1:8042                          0
bash-5.0# sed -i "/<name>yarn.scheduler.maximum-allocation-mb<\/name>/,/<\/property>/s/<value>.*<\/value>/<value>2048<\/value>/" /usr/program/hadoop/etc/hado
op/yarn-site.xml
bash-5.0# yarn --daemon stop resourcemanager
bash-5.0# yarn --daemon start resourcemanager
bash-5.0#
```




## Summary of the result and its significance :

```
                Data-local map tasks=1
                Rack-local map tasks=1
                Total time spent by all maps in occupied slots (ms)=26136
                Total time spent by all reduces in occupied slots (ms)=14824
                Total time spent by all map tasks (ms)=13068
                Total time spent by all reduce tasks (ms)=3706
                Total vcore-milliseconds taken by all map tasks=13068
                Total vcore-milliseconds taken by all reduce tasks=3706
                Total megabyte-milliseconds taken by all map tasks=13381632
                Total megabyte-milliseconds taken by all reduce tasks=7589888
        Map-Reduce Framework
                Map input records=2
                Map output records=4
                Map output bytes=36
                Map output materialized bytes=56
                Input split bytes=286
                Combine input records=0
                Combine output records=0
                Reduce input groups=2
                Reduce shuffle bytes=56
                Reduce input records=4
                Reduce output records=0
                Spilled Records=8
                Shuffled Maps =2
                Failed Shuffles=0
                Merged Map outputs=2
                GC time elapsed (ms)=251
                CPU time spent (ms)=2150
                Physical memory (bytes) snapshot=751288320
                Virtual memory (bytes) snapshot=7062700032
                Total committed heap usage (bytes)=705691648
                Peak Map Physical memory (bytes)=285573120
                Peak Map Virtual memory (bytes)=2356228096
                Peak Reduce Physical memory (bytes)=181129216
                Peak Reduce Virtual memory (bytes)=2355253248
        Shuffle Errors
                BAD_ID=0
                CONNECTION=0
                IO_ERROR=0
                WRONG_LENGTH=0
                WRONG_MAP=0
                WRONG_REDUCE=0
        File Input Format Counters
                Bytes Read=236
        File Output Format Counters
                Bytes Written=97
Job Finished in 32.579 seconds
Estimated value of Pi is 3.80000000000000000000
bash-5.0#
```

**Analysis :**

The number of maps and the number of samples per map are parameters that affect the accuracy and efficiency of the Monte Carlo simulation used to approximate the value of Pi.

**Number of Maps (2 in the example):**

- The number of maps determines how many parallel tasks Hadoop will use to distribute the work.
- In the Pi example, each map performs a certain number of random samples using the Monte Carlo method to estimate the value of Pi independently.
- A higher number of maps can potentially lead to better parallelism and faster computation, especially when dealing with large datasets. However, it also depends on the size of your dataset and the nature of your computation.

**Number of Samples per Map (10 in the example):**

- Each map task generates a certain number of random samples to contribute to the Pi approximation.
- A higher number of samples per map generally leads to a more accurate Pi approximation, as it increases the precision of the Monte Carlo simulation.
- However, increasing the number of samples per map also increases the computational load on each map task, potentially affecting performance and parallelism.

In summary, the values **2** and **10** in the command represent the number of maps and the number of samples per map, respectively. Adjusting these values allows to balance the trade-off between accuracy and computational efficiency based on your specific requirements, available resources, and the characteristics of your data.

Optimal values for these parameters can depend on the size of your dataset, the computing resources available in Hadoop cluster, and the desired level of precision in the Pi approximation. Below are the pi values based on the change of parameters.

| Iteration | Number of Maps | Number of Samples per MAP | pi value |
|---|---|---|---|
| 1 | 2 | 10 | 3.80 |
| 2 | 3 | 10 | 3.60 |
| 3 | 4 | 10 | 3.40 |
| 4 | 5 | 10 | 3.28 |
| 5 | 6 | 10 | 3.33 |
| 6 | 2 | 30 | 3.33 |
| 7 | 2 | 45 | 3.24 |