main 1 branch 0 tags Go to file Code

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cluster	add aws configuration	2 minutes ago
single-node	add aws configuration	2 minutes ago
README.md	Update README.md	41 seconds ago
WordCount.java	update files	3 days ago
github-com-ChiaraFor96-hadoop...	Create github-com-ChiaraFor96-hadoop-on-aws-blob-main-REA...	3 days ago

README.md

hadoop-on-aws

In this repository I show you how to setup a plain Hadoop cluster, in particular using EC2 machines (that lives in the same subnet with ubuntu). But you con consider it for a plain cluster of on premis machines.

Single machine cluster set up

This part is expired from these tutorials:

- http://hadoop.apache.org/docs/current/hadoop-project-dist/hadoop-common/SingleCluster.html
- https://www.edureka.co/blog/install-hadoop-single-node-hadoop-cluster

Start.

- Download hadoop: `wget https://apache.osuosl.org/hadoop/common/stable/hadoop-3.3.1.tar.gz`
- unpack the tar: `tar -xvf hadoop-3.3.1.tar.gz`
- Install *java* `sudo apt-get -y install openjdk-8-jdk-headless`

From now assume that the upacked tar forlder name is HADOOP_FILES

- Change the `.bashrc` file adding these rows:

```
#set hadoop home
export HADOOP_HOME=$HOME/HADOOP_FILES
export HADOOP_CONF_DIR=$HOME/HADOOP_FILES/etc/hadoop
export HADOOP_MAPRED_HOME=$HOME/HADOOP_FILES
export HADOOP_COMMON_HOME=$HOME/HADOOP_FILES
export HADOOP_HDFS_HOME=$HOME/HADOOP_FILES
export YARN_HOME=$HOME/HADOOP_FILES
export PATH=$PATH:$HOME/HADOOP_FILES/bin

# set java home
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export PATH=/usr/lib/jvm/java-8-openjdk-amd64:$PATH
export PDSH_RCMD_TYPE=ssh
```

- Run `source .bashrc` for reload the file
- modify the configurations file that are in `HADOOP_FILES/etc/hadoop/`
  - for the file `core-site.xml` (it contains configuration settings of Hadoop core such as I/O settings that are common to HDFS & MapReduce)

```
<configuration>
<property>
<name>fs.default.name</name>
<value>hdfs://localhost:9000</value>
</property>
</configuration>
```

  - for the file `hdfs-site.xml` (which is the file with configuration settings of HDFS daemons (i.e. NameNode, DataNode, Secondary NameNode). It also includes the replication factor and block size of HDFS.)

About

In this repository I show you how to setup a plain Hadoop cluster, in particular using EC2 machines.

Readme

Releases

No releases published

Packages

No packages published

Languages

Java 100.0%

```
<configuration>
<property>
<name>dfs.replication</name>
<value>1</value>
</property>
<property>
<name>dfs.permission</name>
<value>false</value>
</property>
</configuration>
```

- for the file `yarn-site.xml` (it contains configuration settings of MapReduce application like number of JVM that can run in parallel, the size of the mapper and the reducer process, CPU cores available for a process, etc.)

```
<configuration>
<property>
<name>yarn.nodemanager.aux-services</name>
<value>mapreduce_shuffle</value>
</property>
<property>
<name>yarn.nodemanager.auxservices.mapreduce.shuffle.class</name>
<value>org.apache.hadoop.mapred.ShuffleHandler</value>
</property>
</configuration>
```

- for the file `mapred-site.xml` (it ontains configuration settings of ResourceManager and NodeManager like application memory management size, the operation needed on program & algorithm, etc.)

```
<configuration>
<property>
<name>mapreduce.framework.name</name>
<value>yarn</value>
</property>
<property>
<name>yarn.app.mapreduce.am.env</name>
<value>HADOOP_MAPRED_HOME=/home/ubuntu/HADOOP_FILES</value>
</property>
<property>
<name>mapreduce.map.env</name>
<value>HADOOP_MAPRED_HOME=/home/ubuntu/HADOOP_FILES</value>
</property>
<property>
<name>mapreduce.reduce.env</name>
<value>HADOOP_MAPRED_HOME=/home/ubuntu/HADOOP_FILES</value>
</property>
</configuration>
```

- for `hadoop-env.sh` add `export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64`

Open ports 9870 and 8088 to the IPs that you want to see web UIs of hadoop

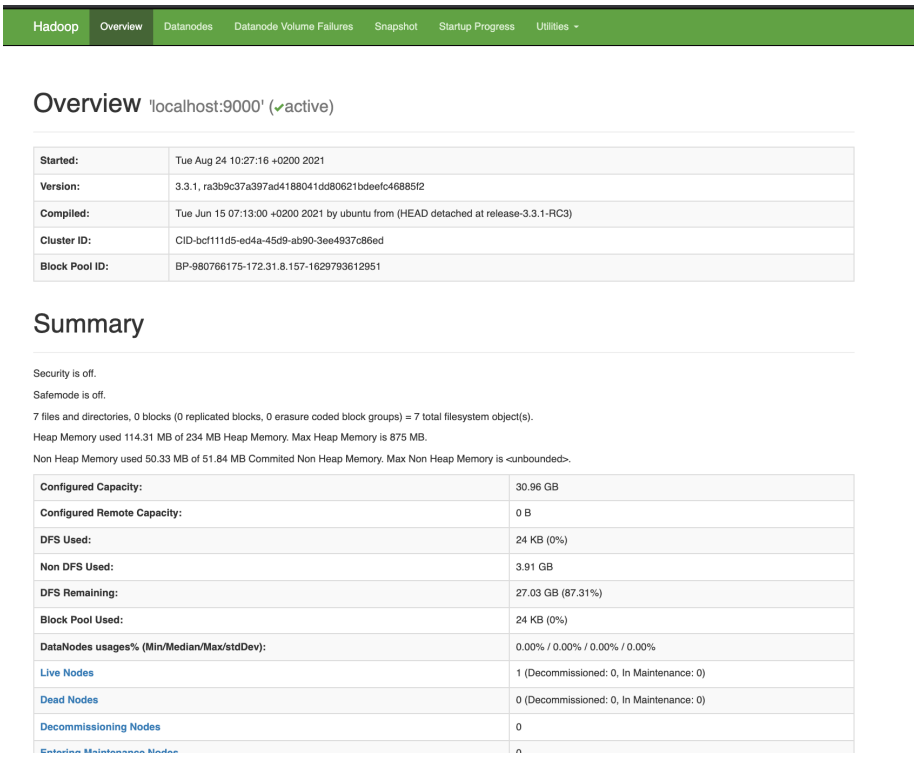
Run the single machine cluster

From the HADOOPFILE FOLDER

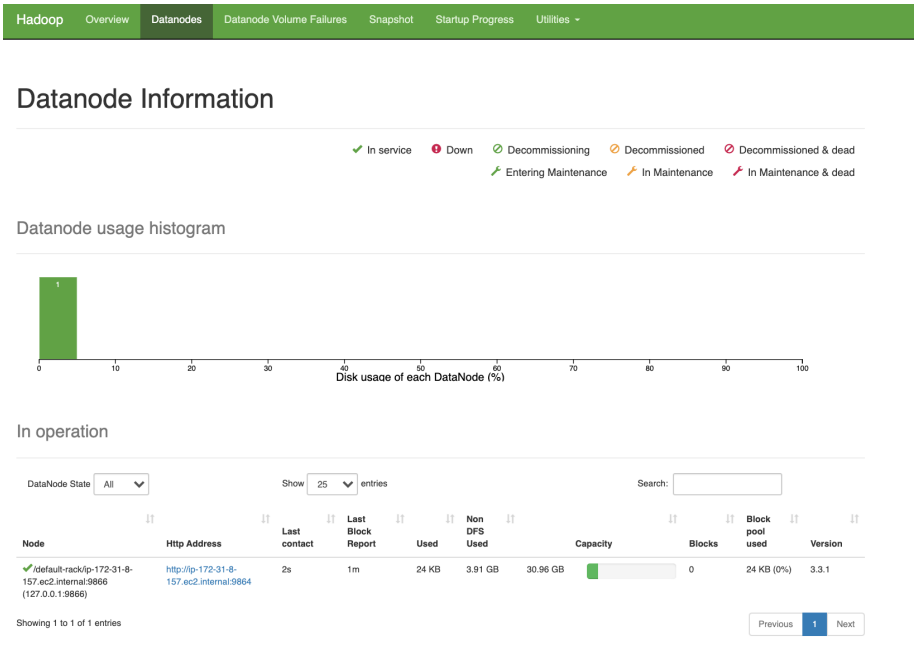
- `./hadoop-daemon.sh start namenode` for start name node
- `/hadoop-daemon.sh start datanode` for start the data node
- `./yarn-daemon.sh start resourcemanager` for start the resource manager
- `./yarn-daemon.sh start nodemanager` for start the node manager
- `./mr-jobhistory-daemon.sh start historyserver` for start the history server

Some screens

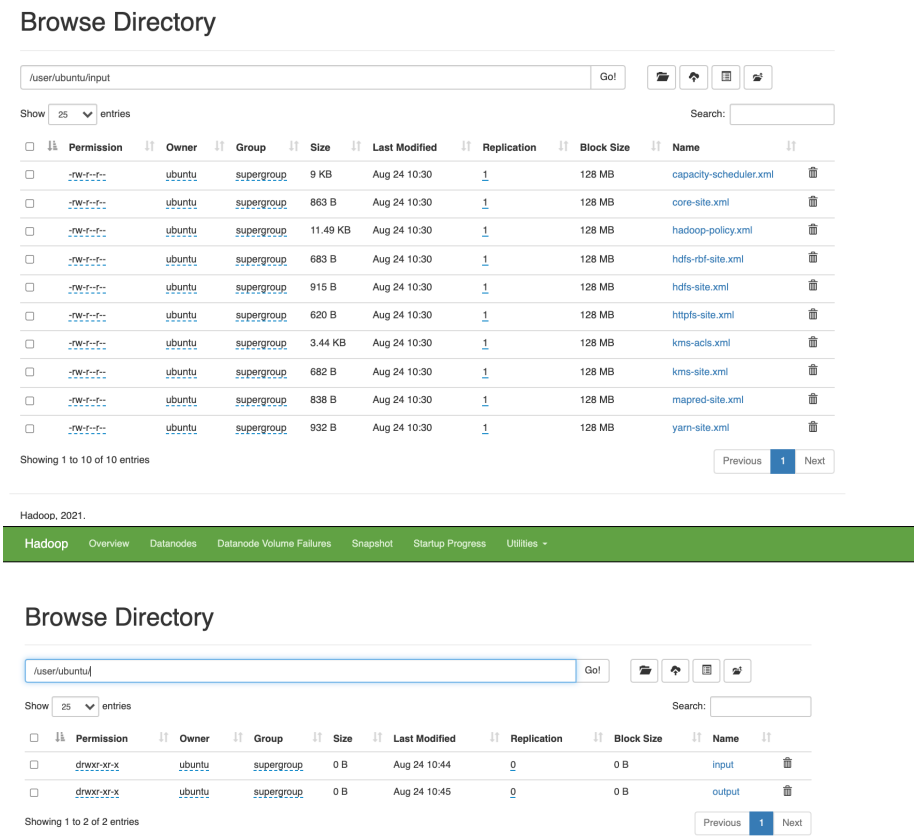
Overview:



Cluster Datanode:



HDFS interface (http://machineIP:9870/dfshealth.html):



Cluster with more than a node set up

For this part I follow this two tutorials and some stackoverflow questions:

- https://www.edureka.co/blog/setting-up-a-multi-node-cluster-in-hadoop-2.X
- http://hadoop.apache.org/docs/current/hadoop-project-dist/hadoop-common/ClusterSetup.html

Start.

Download and upack the tar file in each machine, and install some programs:

- Download hadoop: `wget https://apache.osuosl.org/hadoop/common/stable/hadoop-3.3.1.tar.gz`
- unpack the tar: `tar -xvf hadoop-3.3.1.tar.gz`
- Install *java* `sudo apt-get -y install openjdk-8-jdk-headless`
- `sudo apt install firewalld`
- `sudo apt install net-tools`

Disable firewall:

- `sudo systemctl stop firewalld`
- `sudo systemctl disable firewalld`
- `sudo service firewalld stop`
- `sudo ufw disable`

Change `/etc/hosts` file adding private IPs of all cluster machines like follow (in AWS the private ip not changes and the machines are in the same subnet)

```
172.31.4.195 master
172.31.11.53 slave1
172.31.5.5 slave2
```

and other slaves that you have.

From now assume that the upacked tar folder name is HADOOP_FILES

Restart host service: `service sshd restart`

- Change the `.bashrc` file adding these rows:

```
export HADOOP_HOME=$HOME/server/hadoop-3.3.1
export HADOOP_CONF_DIR=$HOME/HADOOP_FILES/etc/hadoop
export HADOOP_MAPRED_HOME=$HOME/HADOOP_FILES
```

```
export HADOOP_COMMON_HOME=$HOME/HADOOP_FILES
export HADOOP_HDFS_HOME=$HOME/HADOOP_FILES
export HADOOP_YARN_HOME=$HOME/HADOOP_FILES
export PATH=$PATH:$HOME/HADOOP_FILES/bin

export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64
export PATH=/usr/lib/jvm/java-8-openjdk-amd64:$PATH
```

- Run `source .bashrc` for reload the file

Open ports:

- 9870 and 8088 of the master to the IPs that you want to see web UIs of hadoop
- 0 - 65535 between hosts for communicate each other
- modify the configurations file that are in `HADOOP_FILES/etc/hadoop/` - for the file `core-site.xml` (it contains configuration settings of Hadoop core such as I/O settings that are common to HDFS & MapReduce) for both *master* and *slaves* `<configuration> <property> <name>fs.default.name</name> <value>hdfs://master:9000</value> </property> </configuration>`
    - for the file `hdfs-site.xml` (which is the file with configuration settings of HDFS daemons (i.e. NameNode, DataNode, Secondary NameNode). It also includes the replication factor and block size of HDFS.)

      for *master*

      ```
      <configuration>
      <property>
      <name>dfs.replication</name>
      <value>2</value>
      </property>
      <property>
      <name>dfs.permissions</name>
      <value>false</value>
      </property>
      <property>
      <name>dfs.namenode.name.dir</name>
      <value>/home/ubuntu/server/hadoop-3.3.1/namenode</value>
      </property>
      <property>
      <name>dfs.datanode.data.dir</name>
      <value>/home/ubuntu/server/hadoop-3.3.1/datanode</value>
      </property>
      </configuration>
      ```

      for *slaves*

      ```
      <configuration>
      <property>
      <name>dfs.replication</name>
      <value>2</value>
      </property>
      <property>
      <name>dfs.permissions</name>
      <value>false</value>
      </property>
      <property>
      <name>dfs.datanode.data.dir</name>
      <value>/home/ubuntu/server/HADOOP_FILES/datanode</value>
      </property>
      </configuration>
      ```

      Remember to mkdir of the datanode folder on slaves (if not preset on them) and chmod 700

    - for the file `yarn-site.xml` (it contains configuration settings of MapReduce application like number of JVM that can run in parallel, the size of the mapper and the reducer process, CPU cores available for a process, etc.) for both *master* and *slaves*

      ```
      <configuration>
      <property>
      <name>yarn.nodemanager.aux-services</name>
      <value>mapreduce_shuffle</value>
      </property>
      <property>
      <name>yarn.nodemanager.auxservices.mapreduce.shuffle.class</name>
      <value>org.apache.hadoop.mapred.ShuffleHandler</value>
      </property>
      </configuration>
      ```

    - for the file `mapred-site.xml` (cit ontains configuration settings of ResourceManager and NodeManager like application memory management size, the operation needed on program & algorithm, etc.) for both *master* and *slaves*

```
<configuration>
<property>
<name>mapreduce.framework.name</name>
<value>yarn</value>
</property>
<property>
<name>yarn.app.mapreduce.am.env</name>
<value>HADOOP_MAPRED_HOME=/home/ubuntu/HADOOP_FILES</value>
</property>
<property>
<name>mapreduce.map.env</name>
<value>HADOOP_MAPRED_HOME=/home/ubuntu/HADOOP_FILES</value>
</property>
<property>
<name>mapreduce.reduce.env</name>
<value>HADOOP_MAPRED_HOME=/home/ubuntu/HADOOP_FILES</value>
</property>
</configuration>
```

- for `hadoop-env.sh` for both *master* and *slaves* add `export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64`
- create the `masters` file (contains address of master nodes) for both *master* and *slaves* as

```
master
```

- create the `workers` file (contains address of worker nodes, in hadoop 2 this file is named `slaves`) as for *master*

```
master
slave1
slave2
```

for *slaves*

```
slave1
slave2
```

also remember to add the other slaves that are in `/etc/hosts`

Start the cluster

- the first time run `hadoop namenode -format`
- `HADOOP_FILES/sbin/start-all.sh`

Stop the cluster

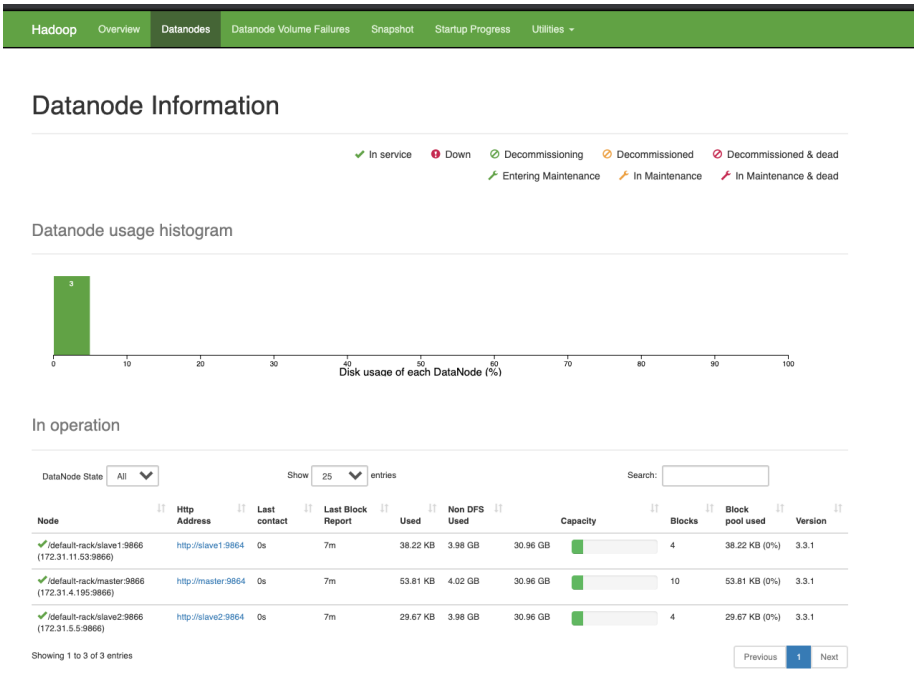
- `HADOOP_FILES/sbin/stop-all.sh`

Before restart (ONLY if there are problems)

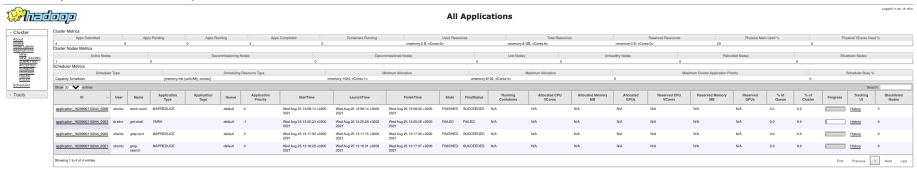
- remember to use `jps` command in the nodes for see the active services
- `rm -r /tmp/` (consider to delete only the hadoop folders inside /tmp)
- `rm -r datanode/current` in each datanode and in the name node
- `rm -r namenode/current` in the name node

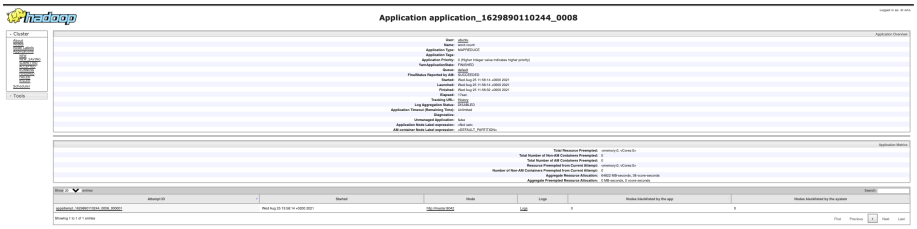
Some screens

Cluster Datanodes:

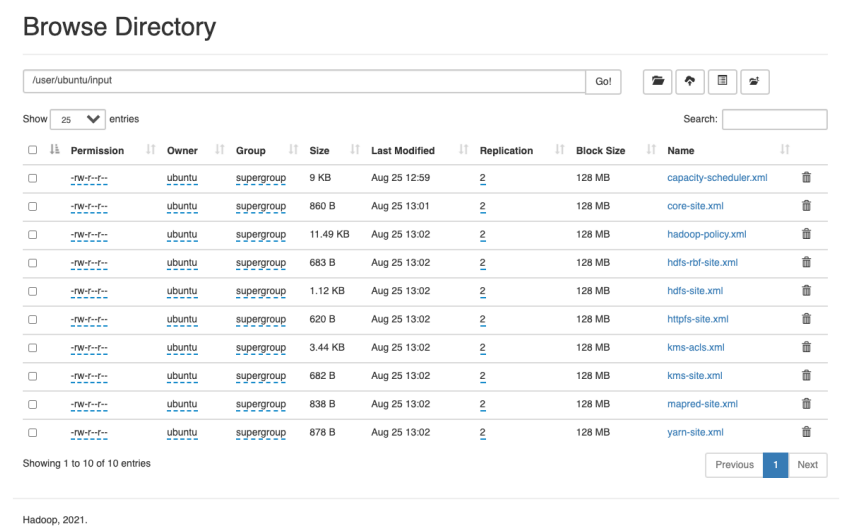


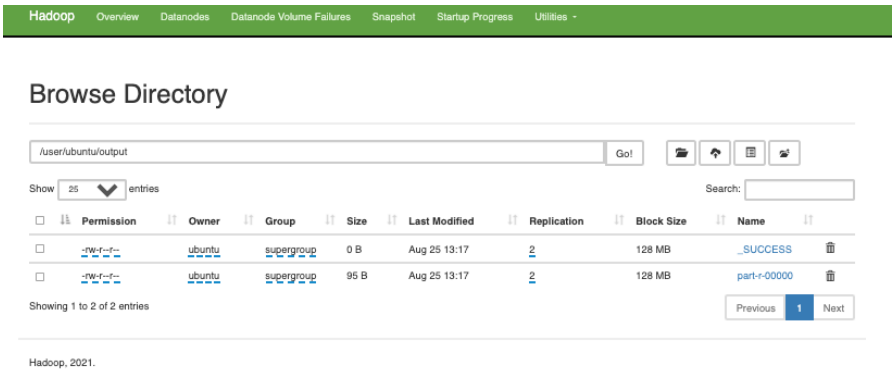
Hadoop interface (http://master:8088):





HDFS interface (http://master:9870/dfshealth.html):





Example of a job execution and HDFS interaction

An example of a job is in `WordCount.java`, it counts for each word in a hdfs folder the number of occurrences.

We interact with hdfs with the command `hdfs dfs`, for example:

```
# Explore HDFS directories with –ls
hdfs dfs -ls /
# Create a bigdata folder in your HDFS home
hdfs dfs -mkdir bigdata
# Create a dummy file in your folder in the local file system
echo 'This is a dummy file' > dummy.txt
# Put the dummy file to your bigdata folder in HDFS
hdfs dfs -put bigdata/dummy.txt
# Get the job file from the virtual cluster's HDFS
hdfs dfs –get /path/WordCount.java
# Print hdfs file
hdfs dfs -cat mapreduce/output/* | head -n 30
```

After obtain the jar with gradle we run it with: `hadoop jar jarName.jar WordCount inputHDFSFoder outputHDFSFolder`

The result of the running:

```
ubuntu@MASTER:~/201-mapreduce-ChiaraFor96/build/libs$ hdfs dfs -cat mapreduce/wordcount/output/* | head -n 30
Bye     1
Goodbye 1
Hadoop  2
Hello   2
World   2
```

The source code of `WordCount.java`

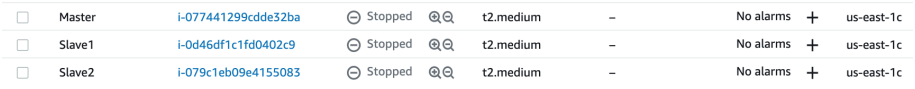
```
package exercise1;
import java.io.IOException;
import java.util.StringTokenizer;

import org.apache.hadoop.conf.Configuration;
import org.apache.hadoop.fs.FileSystem;
import org.apache.hadoop.fs.Path;
import org.apache.hadoop.io.IntWritable;
import org.apache.hadoop.io.Text;
import org.apache.hadoop.mapreduce.Job;
import org.apache.hadoop.mapreduce.Mapper;
import org.apache.hadoop.mapreduce.Reducer;
import org.apache.hadoop.mapreduce.lib.input.FileInputFormat;
import org.apache.hadoop.mapreduce.lib.output.FileOutputFormat;

public class WordCount {

        public static class TokenizerMapper
        extends Mapper<Object, Text, Text, IntWritable>{

                private final static IntWritable one = new IntWritable(1);
                private Text word = new Text();

                public void map(Object key, Text value, Context context
                                ) throws IOException, InterruptedException {
                        StringTokenizer itr = new StringTokenizer(value.toString());
                        while (itr.hasMoreTokens()) {
                                word.set(itr.nextToken());
                                context.write(word, one);
                        }
                }
        }

        public static class IntSumReducer
        extends Reducer<Text,IntWritable,Text,IntWritable> {
```

```
                private IntWritable result = new IntWritable();

                public void reduce(Text key, Iterable<IntWritable> values,
                                Context context
                                ) throws IOException, InterruptedException {
                        int sum = 0;
                        for (IntWritable val : values) {
                                sum += val.get();
                        }
                        result.set(sum);
                        context.write(key, result);
                }
        }

        public static void main(String[] args) throws Exception {
                Configuration conf = new Configuration();
                Job job = Job.getInstance(conf, "word count");

                Path inputPath = new Path(args[0]), outputPath = new Path(args[1]);
                FileSystem fs = FileSystem.get(new Configuration());

                if (fs.exists(outputPath)) {
                        fs.delete(outputPath, true);
                }

                job.setJarByClass(WordCount.class);
                job.setMapperClass(TokenizerMapper.class);

                if(args.length>2){
                        if(Integer.parseInt(args[2])>=0){
                                job.setNumReduceTasks(Integer.parseInt(args[2]));
                        }
                }

                job.setReducerClass(IntSumReducer.class);
                job.setOutputKeyClass(Text.class);
                job.setOutputValueClass(IntWritable.class);

                FileInputFormat.addInputPath(job, inputPath);
                FileOutputFormat.setOutputPath(job, outputPath);

                System.exit(job.waitForCompletion(true) ? 0 : 1);
        }
}
```

AWS configuration

AWS EC2 instance for single node cluster:

AWS EC2 instances for 3 node cluster:



AWS EC2 instances security group: