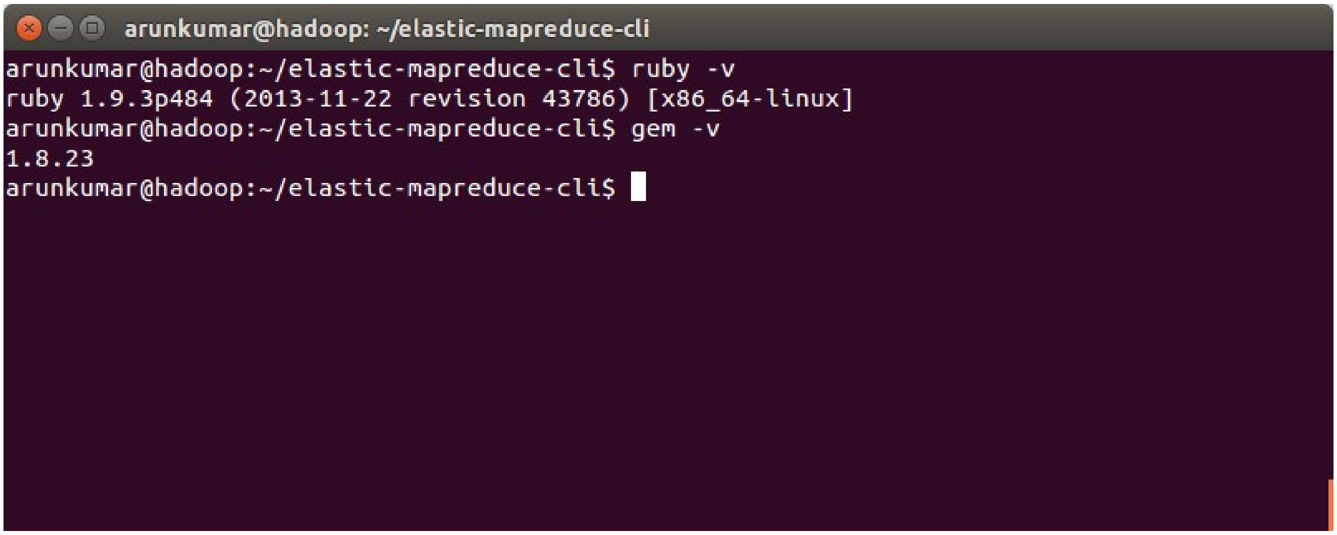
SPARK ON AWS

1. Install Amazon CLI using the below link:

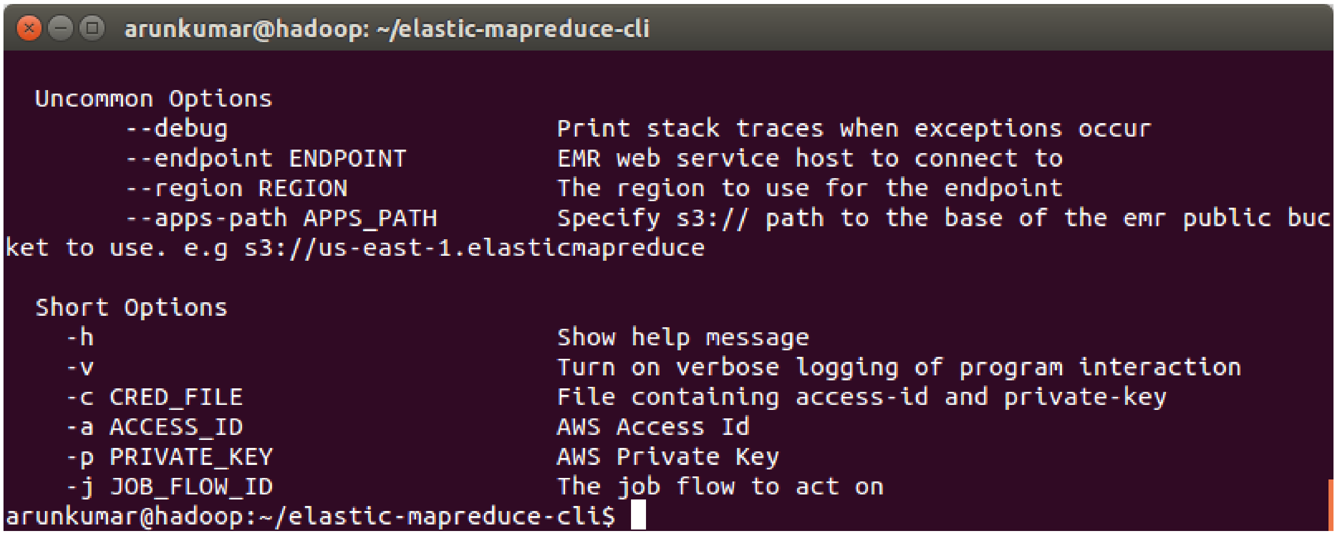
http://docs.aws.amazon.com/ElasticMapReduce/latest/DeveloperGuide/emr-cli-install.html

2. Please execute the below commands to verify the installation

ruby -v
gem -v
./elastic-mapreduce - version



```
arunkumar@hadoop:~/elastic-mapreduce-cli$ ruby -v
ruby 1.9.3p484 (2013-11-22 revision 43786) [x86_64-linux]
arunkumar@hadoop:~/elastic-mapreduce-cli$ gem -v
1.8.23
arunkumar@hadoop:~/elastic-mapreduce-cli$ 
```



```

  Uncommon Options
        --debug                      Print stack traces when exceptions occur
        --endpoint ENDPOINT          EMR web service host to connect to
        --region REGION              The region to use for the endpoint
        --apps-path APPS_PATH        Specify s3:// path to the base of the emr public buc
ket to use. e.g s3://us-east-1.elasticmapreduce

  Short Options
    -h                               Show help message
    -v                               Turn on verbose logging of program interaction
    -c CRED_FILE                     File containing access-id and private-key
    -a ACCESS_ID                     AWS Access Id
    -p PRIVATE_KEY                   AWS Private Key
    -j JOB_FLOW_ID                   The job flow to act on
arunkumar@hadoop:~/elastic-mapreduce-cli$ 
```

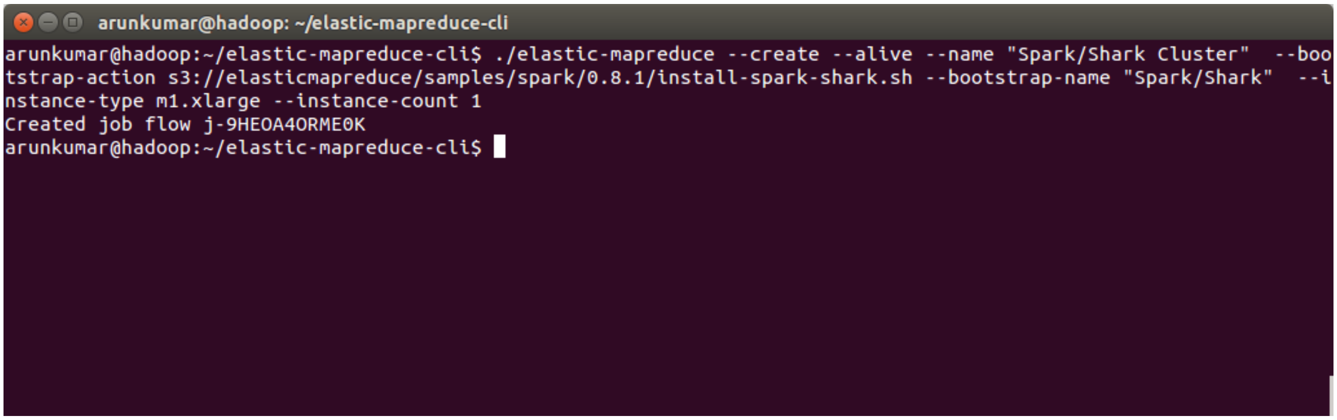
3. Run the below command to create a new spark cluster :

Note: The instance count determines the number of machines will be running in your cluster. Which can low as 1. Please use '1' initially as our sample programs will easily run in that. Also use 'expand all' option in bills to see your usage charges. If you are not using 'expand all' option, always it displays the bill as '0'.

```
elastic-mapreduce --create --alive --name "Spark/Shark Cluster"  --bootstrap-action
s3://elasticmapreduce/samples/spark/0.8.1/install-spark-shark.sh --bootstrap-name
"Spark/Shark"  --instance-type m1.xlarge --instance-count 1
```

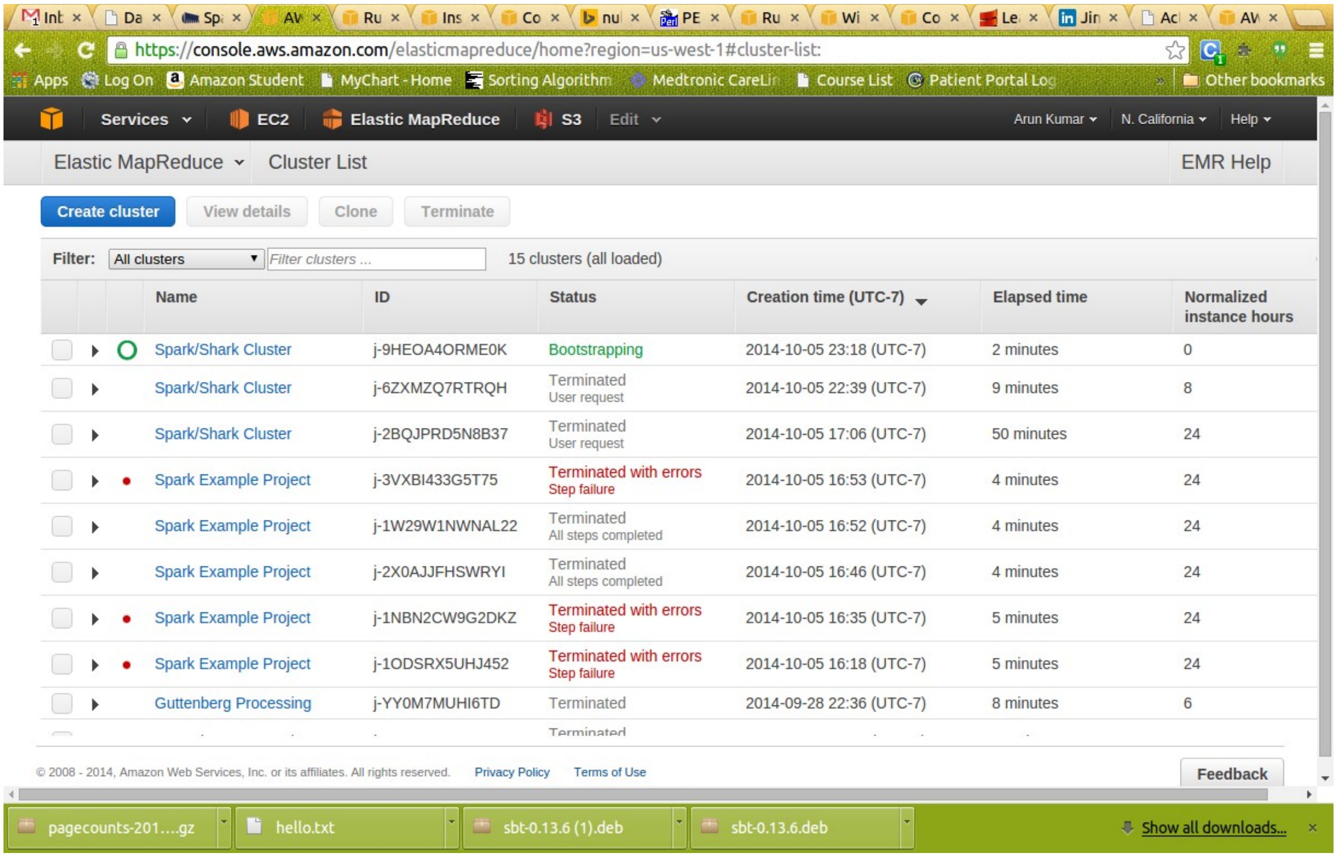
This command will initiate a new cluster and you will see a message like :

```
Created job flow j-9HEOA4ORME0K
```



```
arunkumar@hadoop:~/elastic-mapreduce-cli$ ./elastic-mapreduce --create --alive --name "Spark/Shark Cluster"  --boo
tstrap-action s3://elasticmapreduce/samples/spark/0.8.1/install-spark-shark.sh --bootstrap-name "Spark/Shark"  --i
nstance-type m1.xlarge --instance-count 1
Created job flow j-9HEOA4ORME0K
arunkumar@hadoop:~/elastic-mapreduce-cli$ 
```

4. You can see the same cluster in AWS



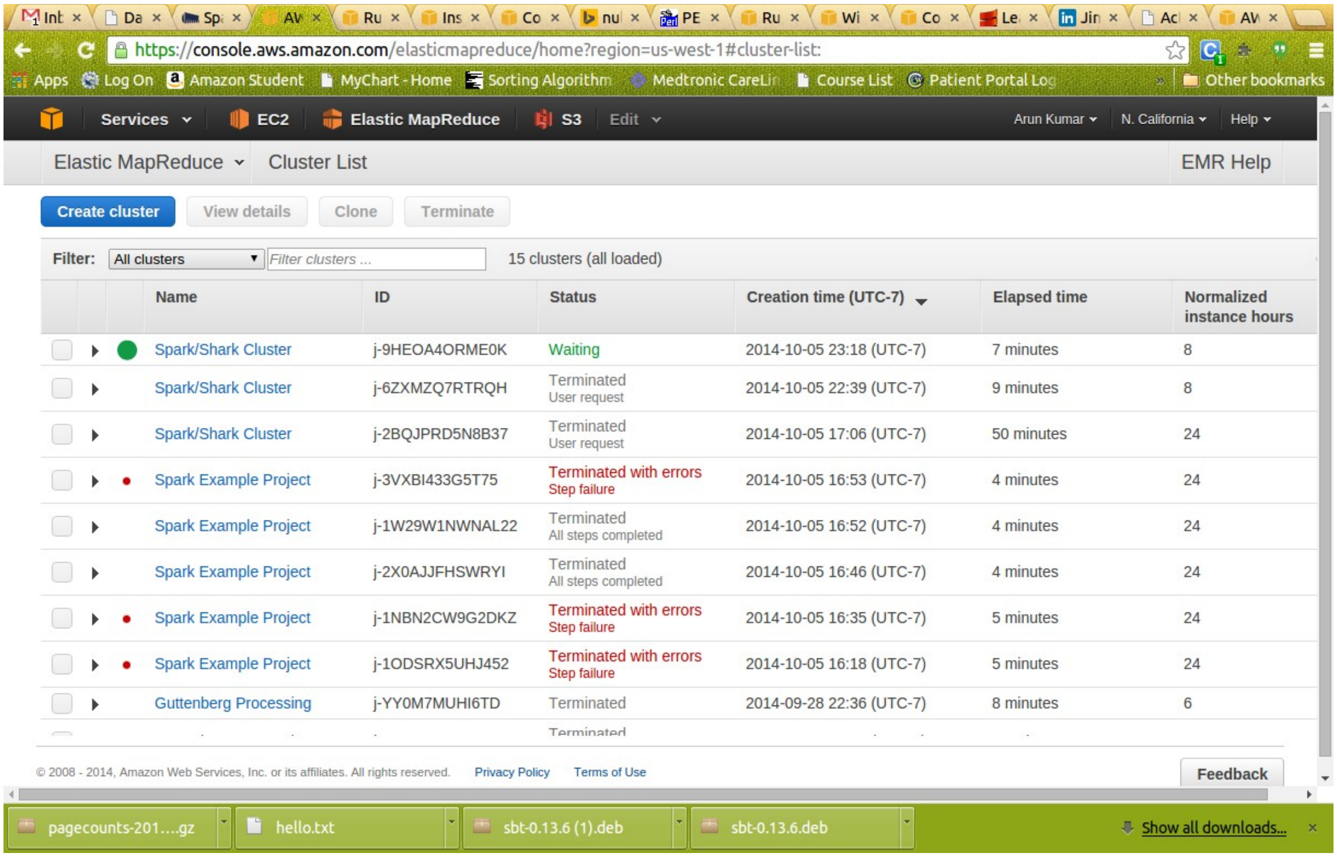
15 clusters (all loaded)

Name	ID	Status	Creation time (UTC-7)	Elapsed time	Normalized instance hours
○ Spark/Shark Cluster	j-9HEOA4ORME0K	Bootstrapping	2014-10-05 23:18 (UTC-7)	2 minutes	0
Spark/Shark Cluster	j-6ZXMZQ7RTRQH	Terminated User request	2014-10-05 22:39 (UTC-7)	9 minutes	8
Spark/Shark Cluster	j-2BQJPRD5N8B37	Terminated User request	2014-10-05 17:06 (UTC-7)	50 minutes	24
● Spark Example Project	j-3VXBI433G5T75	Terminated with errors Step failure	2014-10-05 16:53 (UTC-7)	4 minutes	24
Spark Example Project	j-1W29W1NWNAL22	Terminated All steps completed	2014-10-05 16:52 (UTC-7)	4 minutes	24
Spark Example Project	j-2X0AJJFHSWRYI	Terminated All steps completed	2014-10-05 16:46 (UTC-7)	4 minutes	24
● Spark Example Project	j-1NBN2CW9G2DKZ	Terminated with errors Step failure	2014-10-05 16:35 (UTC-7)	5 minutes	24
● Spark Example Project	j-1ODSRX5UHJ452	Terminated with errors Step failure	2014-10-05 16:18 (UTC-7)	5 minutes	24
Guttenberg Processing	j-YY0M7MUHI6TD	Terminated	2014-09-28 22:36 (UTC-7)	8 minutes	6
		Terminated			

5. When your cluster is in the WAITING status, we will be using the sample data in one of the public S3 bucket located at the below link. We can directly use this data in our spark shell. So you dont have to download it.

https://s3.amazonaws.com/bigdatademo/sample/wiki/pagecounts-20100212-050000.gz.

6. Check the status of cluster. It should be in waiting state.



https://console.aws.amazon.com/elasticmapreduce/home?region=us-west-1#cluster-list:

Filter: All clusters | Filter clusters ... | 15 clusters (all loaded)

			Name	ID	Status	Creation time (UTC-7)	Elapsed time	Normalized instance hours
□	▸	●	Spark/Shark Cluster	j-9HEOA4ORME0K	Waiting	2014-10-05 23:18 (UTC-7)	7 minutes	8
□	▸		Spark/Shark Cluster	j-6ZXMZQ7RTRQH	Terminated User request	2014-10-05 22:39 (UTC-7)	9 minutes	8
□	▸		Spark/Shark Cluster	j-2BQJPRD5N8B37	Terminated User request	2014-10-05 17:06 (UTC-7)	50 minutes	24
□	▸	●	Spark Example Project	j-3VXBI433G5T75	Terminated with errors Step failure	2014-10-05 16:53 (UTC-7)	4 minutes	24
□	▸		Spark Example Project	j-1W29W1NWNAL22	Terminated All steps completed	2014-10-05 16:52 (UTC-7)	4 minutes	24
□	▸		Spark Example Project	j-2X0AJJFHSWRYI	Terminated All steps completed	2014-10-05 16:46 (UTC-7)	4 minutes	24
□	▸	●	Spark Example Project	j-1NBN2CW9G2DKZ	Terminated with errors Step failure	2014-10-05 16:35 (UTC-7)	5 minutes	24
□	▸	●	Spark Example Project	j-1ODSRX5UHJ452	Terminated with errors Step failure	2014-10-05 16:18 (UTC-7)	5 minutes	24
□	▸		Guttenberg Processing	j-YY0M7MUHI6TD	Terminated	2014-09-28 22:36 (UTC-7)	8 minutes	6
□					Terminated			

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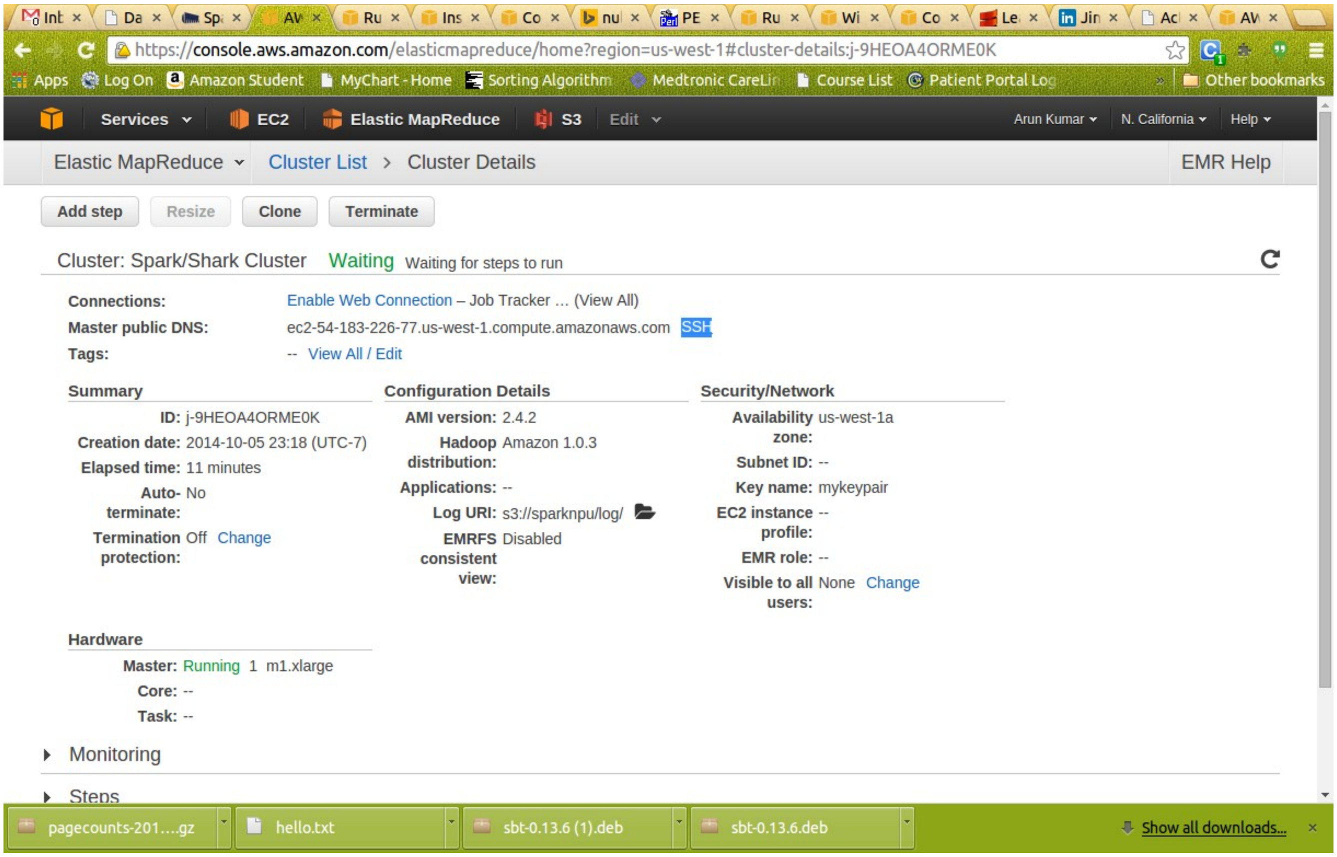
pagecounts-201....gz | hello.txt | sbt-0.13.6 (1).deb | sbt-0.13.6.deb | Show all downloads...

7.. Now we should ssh to master node to initialize spark shell. We will be running our scrips in master node. To get the ssh command, click on cluster, then 'cluster details' in Elastic Map reduce console page. Then click on SSH as shown below



Cluster: Spark/Shark Cluster Waiting Waiting for steps to run

Connections: Enable Web Connection – Job Tracker ... (View All)
Master public DNS: ec2-54-183-226-77.us-west-1.compute.amazonaws.com SSH
Tags: -- View All / Edit

Summary
ID: j-9HEOA4ORME0K
Creation date: 2014-10-05 23:18 (UTC-7)
Elapsed time: 11 minutes
Auto-terminate: No
Termination protection: Off Change

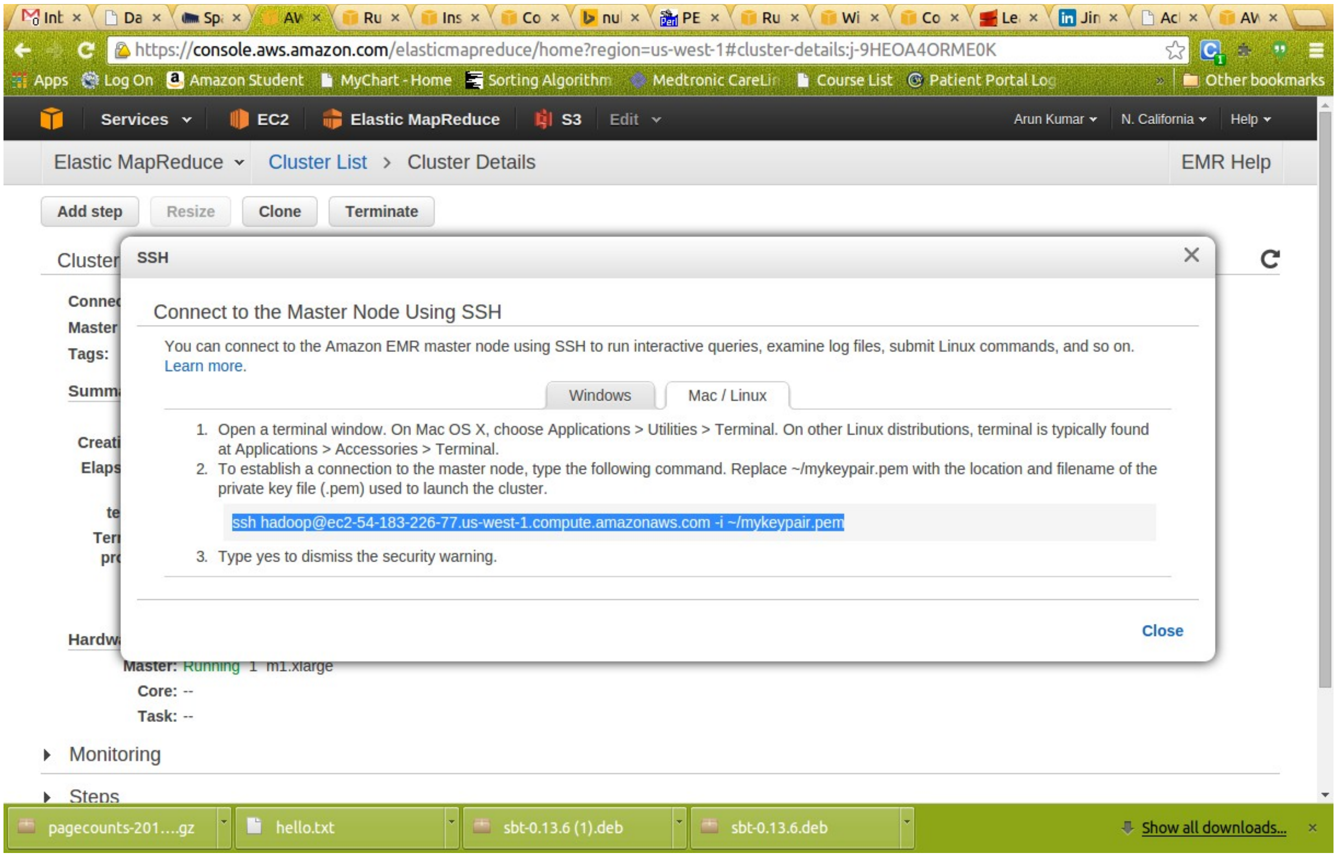
Configuration Details
AMI version: 2.4.2
Hadoop distribution: Amazon 1.0.3
Applications: --
Log URI: s3://sparknpu/log/
EMRFS consistent view: Disabled

Security/Network
Availability zone: us-west-1a
Subnet ID: --
Key name: mykeypair
EC2 instance profile: --
EMR role: --
Visible to all users: None Change

Hardware
Master: Running 1 m1.xlarge
Core: --
Task: --

Monitoring

Steps



Connect to the Master Node Using SSH

You can connect to the Amazon EMR master node using SSH to run interactive queries, examine log files, submit Linux commands, and so on. Learn more.

1. Open a terminal window. On Mac OS X, choose Applications > Utilities > Terminal. On other Linux distributions, terminal is typically found at Applications > Accessories > Terminal.
2. To establish a connection to the master node, type the following command. Replace ~/mykeypair.pem with the location and filename of the private key file (.pem) used to launch the cluster.

```
ssh hadoop@ec2-54-183-226-77.us-west-1.compute.amazonaws.com -i ~/mykeypair.pem
```

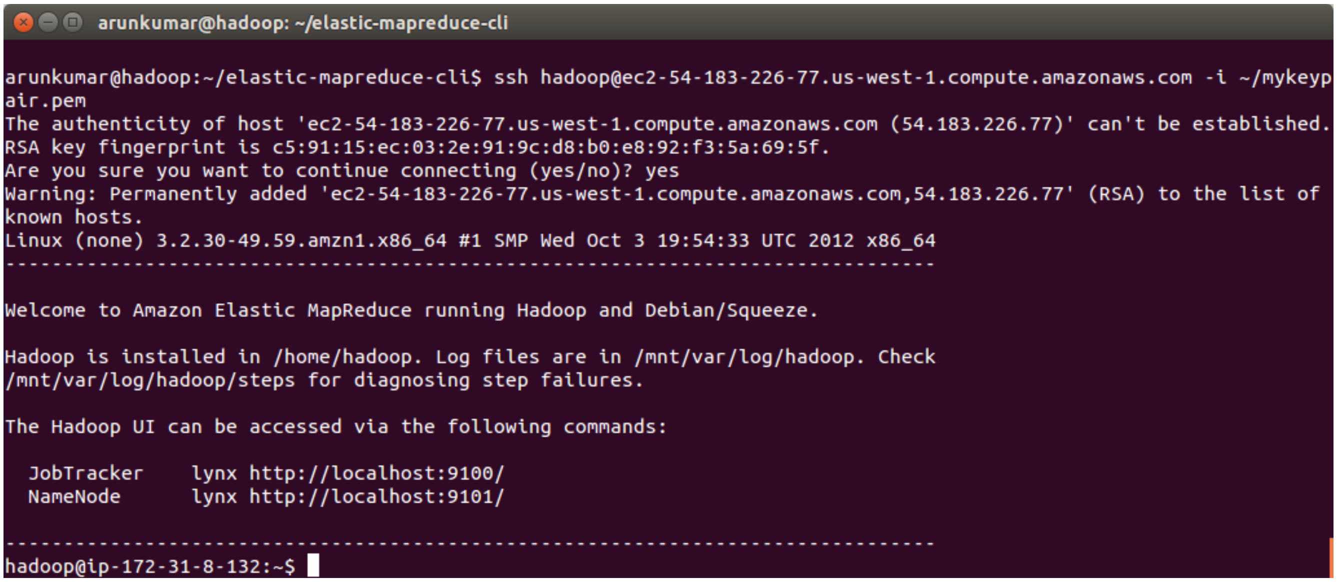
3. Type yes to dismiss the security warning.

Master: Running 1 m1.xlarge
Core: --
Task: --

8. Copy the command as shown above. It should look like :

```
ssh hadoop@ec2-54-183-226-77.us-west-1.compute.amazonaws.com -i ~/mykeypair.pem
```

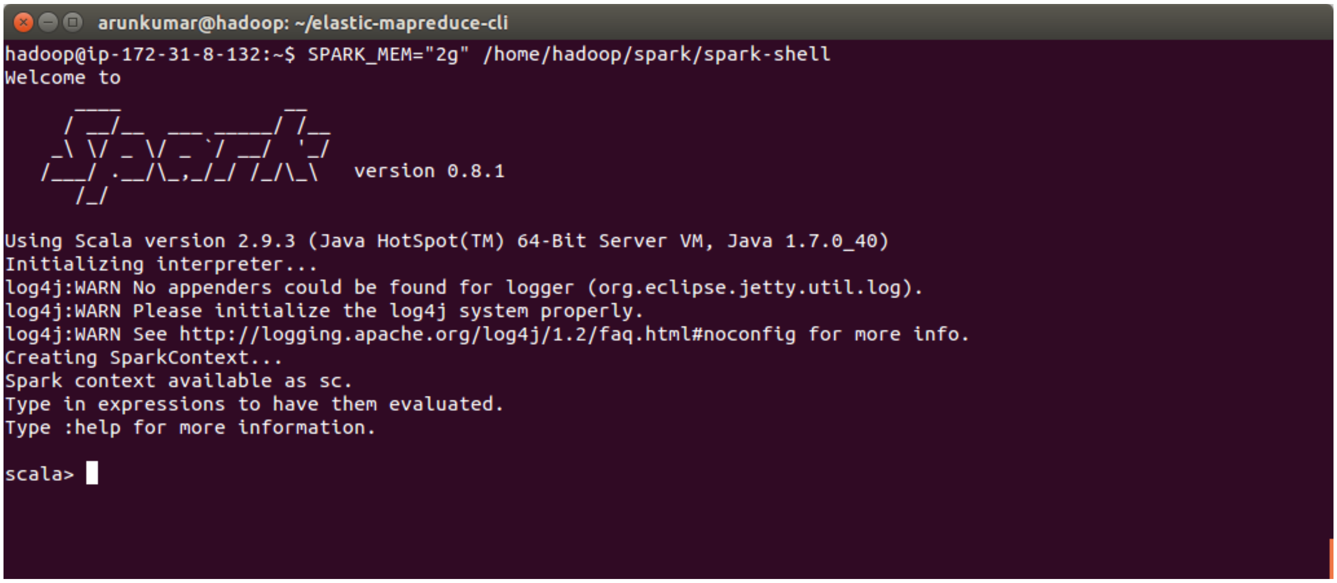
I hope your keypair is present in your home directory and the permission of the keypair file should be '600'. Other wise ssh will refuse to connect.



```
arunkumar@hadoop:~/elastic-mapreduce-cli$ ssh hadoop@ec2-54-183-226-77.us-west-1.compute.amazonaws.com -i ~/mykeyp
air.pem
The authenticity of host 'ec2-54-183-226-77.us-west-1.compute.amazonaws.com (54.183.226.77)' can't be established.
RSA key fingerprint is c5:91:15:ec:03:2e:91:9c:d8:b0:e8:92:f3:5a:69:5f.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ec2-54-183-226-77.us-west-1.compute.amazonaws.com,54.183.226.77' (RSA) to the list of
known hosts.
Linux (none) 3.2.30-49.59.amzn1.x86_64 #1 SMP Wed Oct 3 19:54:33 UTC 2012 x86_64
--------------------------------------------------------------------------------

Welcome to Amazon Elastic MapReduce running Hadoop and Debian/Squeeze.

Hadoop is installed in /home/hadoop. Log files are in /mnt/var/log/hadoop. Check
/mnt/var/log/hadoop/steps for diagnosing step failures.

The Hadoop UI can be accessed via the following commands:

  JobTracker    lynx http://localhost:9100/
  NameNode      lynx http://localhost:9101/

--------------------------------------------------------------------------------
hadoop@ip-172-31-8-132:~$ 
```

9. Open the spark shell

```
SPARK_MEM="2g" /home/hadoop/spark/spark-shell
```



```
hadoop@ip-172-31-8-132:~$ SPARK_MEM="2g" /home/hadoop/spark/spark-shell
Welcome to
      ____              __
     / __/__  ___ _____/ /__
    _\ \/ _ \/ _ `/ __/  '_/
   /___/ .__/\_,_/_/ /_/\_\   version 0.8.1
      /_/

Using Scala version 2.9.3 (Java HotSpot(TM) 64-Bit Server VM, Java 1.7.0_40)
Initializing interpreter...
log4j:WARN No appenders could be found for logger (org.eclipse.jetty.util.log).
log4j:WARN Please initialize the log4j system properly.
log4j:WARN See http://logging.apache.org/log4j/1.2/faq.html#noconfig for more info.
Creating SparkContext...
Spark context available as sc.
Type in expressions to have them evaluated.
Type :help for more information.

scala> 
```

You will be treated with the scala prompt.

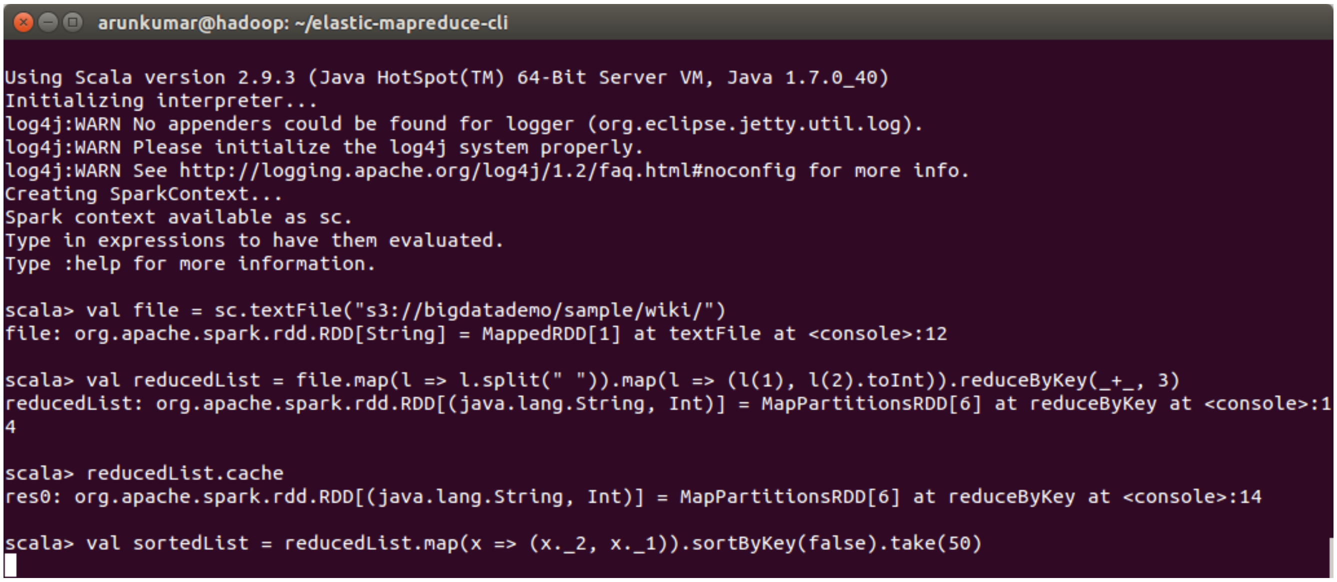
10. Run the below commands one by one.

val file = sc.textFile("s3://bigdatademo/sample/wiki/")

val reducedList = file.map(l => l.split(" ")).map(l => (l(1), l(2).toInt)).reduceByKey(_+_, 3)

reducedList.cache

val sortedList = reducedList.map(x => (x._2, x._1)).sortByKey(false).take(50)



```
Using Scala version 2.9.3 (Java HotSpot(TM) 64-Bit Server VM, Java 1.7.0_40)
Initializing interpreter...
log4j:WARN No appenders could be found for logger (org.eclipse.jetty.util.log).
log4j:WARN Please initialize the log4j system properly.
log4j:WARN See http://logging.apache.org/log4j/1.2/faq.html#noconfig for more info.
Creating SparkContext...
Spark context available as sc.
Type in expressions to have them evaluated.
Type :help for more information.

scala> val file = sc.textFile("s3://bigdatademo/sample/wiki/")
file: org.apache.spark.rdd.RDD[String] = MappedRDD[1] at textFile at <console>:12

scala> val reducedList = file.map(l => l.split(" ")).map(l => (l(1), l(2).toInt)).reduceByKey(_+_, 3)
reducedList: org.apache.spark.rdd.RDD[(java.lang.String, Int)] = MapPartitionsRDD[6] at reduceByKey at <console>:1
4

scala> reducedList.cache
res0: org.apache.spark.rdd.RDD[(java.lang.String, Int)] = MapPartitionsRDD[6] at reduceByKey at <console>:14

scala> val sortedList = reducedList.map(x => (x._2, x._1)).sortByKey(false).take(50)
```

The first line tells Spark which file to process. In the second line we split each line of the dataset into multiple fields, taking the first and the second fields (page title and pageview count) and perform a groupBy based on the key (pagetitle). The third line caches the data in memory in case we need to re-run this job. This eliminates the need to read our dataset from Amazon S3 again. The last line sorts the list and provides the result.

As the cluster contains only 1 machine, it may take a while to process the input. The output should look like :

sortedList: Array[(Int, java.lang.String)] = Array((328476,Special:Search), (217924,Main_Page), (73900,Special:Random), (65047,404_error/), (55814,%E3%83%A1%E3%82%A4%E3%83%B3%E3%83%9A%E3%83%BC%E3%82%B8), (21521,Special:Export/Where_Is_My_Mind), (19722,Wikipedia:Portada), (18312,%E7%89%B9%E5%88%A5:%E6%A4%9C%E7%B4%A2), (17080,Pagina_principale)

Note: For faster processing, please create cluster with minimum 3 machines.

11.Clean up.

a. Disconnect from the master node by terminating your SSH session.

b. Then execute the below command with your job id.

```
elastic-mapreduce --terminate -j j-367J67T8QGKAD
                  (Job id of your job)
```

or

clicking 'terminate' in the cluster.

Very important : Please terminate the cluster. Otherwise AWS charges can go high as 100$ in a week time!