AWS EMR Instructions

These instructions walk you through the process of creating an initial Amazon EMR (Elastic Map Reduce) cluster using **Quick Create** options in the AWS Management Console.

Note, the EMR cluster you set up using these instructions is not meant for a production (secure) environment, and do not cover configuration options in depth. It is meant to help you set up a cluster for class purposes as quickly as possible.

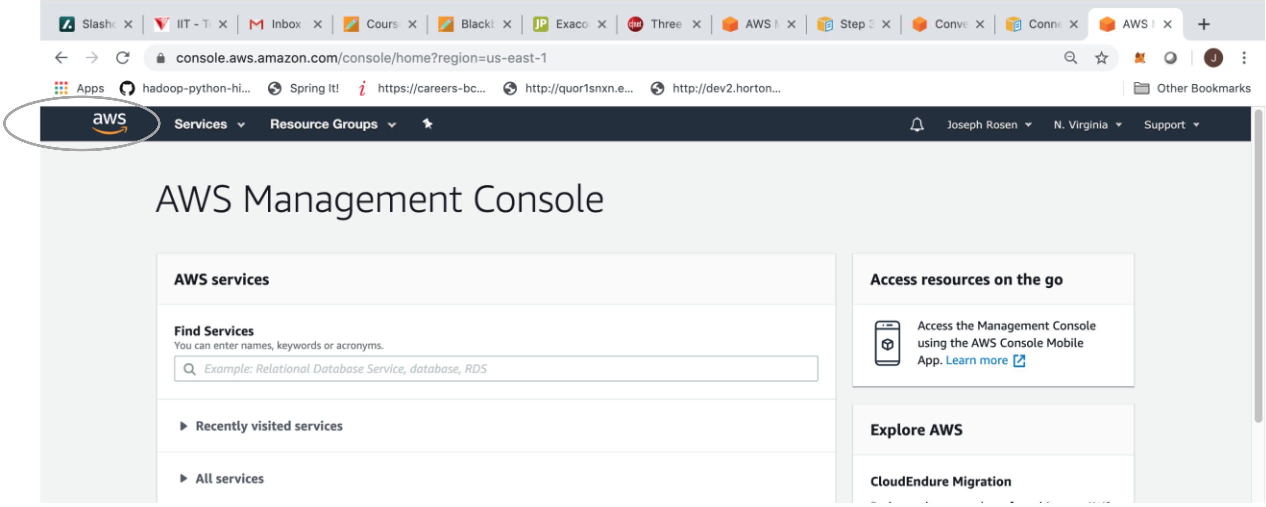
Charges accumulate for cluster you create at the per-second rate for Amazon EMR pricing. The cost will be minimal because the cluster should run for less than a couple of hours after the cluster is provisioned. So it is important that you decommission the cluster as instructed below after you are done with an assignment.

Step 1: Prerequisites

Before you begin setting up your Amazon EMR cluster, make sure that you have completed assignment #1, have an AWS account and understand the basics of working with S3 buckets and associated data objects.

Step 2: AWS Management Console

When you log in to AWS you are presented with the AWS Management Console page. Wherever you are on the site, you can always return to the management console page by clicking on the AWS logo at the top left.



console.aws.amazon.com/console/home?region=us-east-1
Apps
hadoop-python-hi...
Spring It!
https://careers-bc...
http://quor1snxn.e...
http://dev2.horton...
Other Bookmarks
aws
Services
Resource Groups
Joseph Rosen
N. Virginia
Support
AWS Management Console
AWS services
Find Services
You can enter names, keywords or acronyms.
Example: Relational Database Service, database, RDS
Recently visited services
All services
Access resources on the go
Access the Management Console using the AWS Console Mobile App. Learn more
Explore AWS
CloudEndure Migration

Step 3: Finding Services

We will be making use of several AWS services including

- EC2 – provides computing capability in the form of virtual machines (servers)
- S3 – for object storage
- EMR – Elastic Map Reduce, the Hadoop cluster as a service

When you are on the AWS Management Console page (which we can always get to by clicking the AWS logo), you can find the main page for a service by doing one of the following

1. Type the name of the service whose web page you want to reach into the “Find Services” text box and press Enter/Return
2. If you typed in the name of or used a service recently you might be able to find its name by clicking on “Recently visited services” and then clicking on the name of the desired service
3. If you don’t recall the name of the service, then click on “All Services” to get a list and click on the service of interest.
4. Or you can always click on the word “Services” in the upper left of the management console to get a list of services and also type in the one you are looking for.

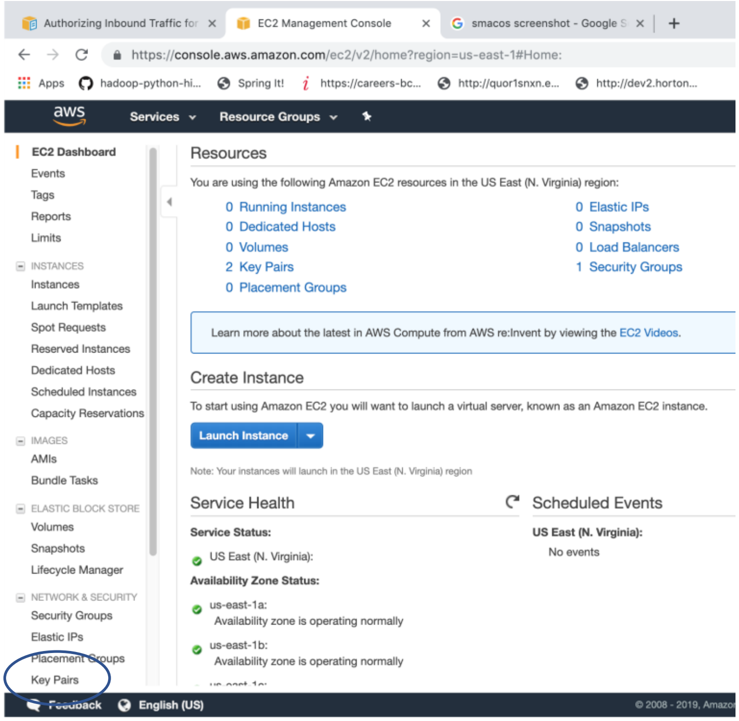
So in the following steps when you are requested to find some service, you can do the above.

Step 4: Create an Amazon EC2 Key Pair

You must have an Amazon Elastic Compute Cloud (Amazon EC2) key pair to connect to the nodes in your EMR cluster over a secure channel using the Secure Shell (SSH) protocol. We will understand more about SSH below.

1. Find the EC2 service page
2. In the navigation pane, under **NETWORK & SECURITY**, choose **Key Pairs**.

> **Note**
>
> The navigation pane is on the left side of the Amazon EC2 console. If you do not see the pane, it might be minimized; choose the arrow to expand the pane.



Resources

You are using the following Amazon EC2 resources in the US East (N. Virginia) region:

0 Running Instances	0 Elastic IPs
0 Dedicated Hosts	0 Snapshots
0 Volumes	0 Load Balancers
2 Key Pairs	1 Security Groups
0 Placement Groups	

Learn more about the latest in AWS Compute from AWS re:Invent by viewing the EC2 Videos.

Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

Launch Instance

Note: Your instances will launch in the US East (N. Virginia) region

Service Health

Service Status:

US East (N. Virginia):

Availability Zone Status:

us-east-1a:
Availability zone is operating normally

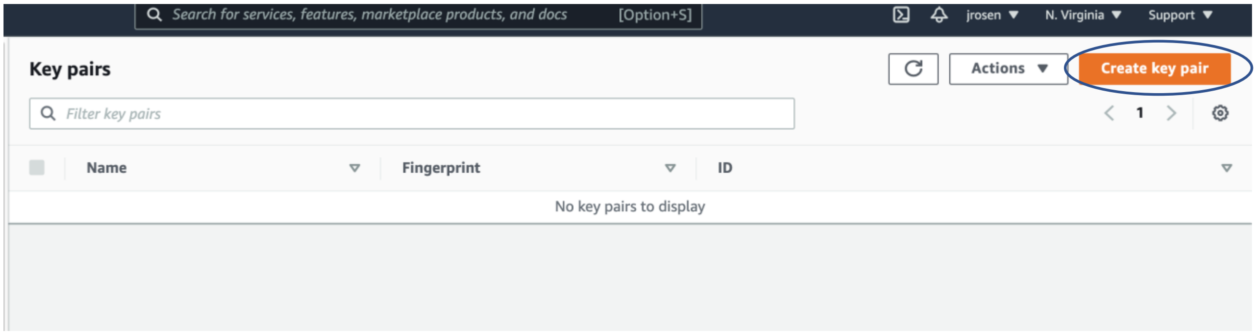
us-east-1b:
Availability zone is operating normally

us-east-1c:

Scheduled Events

US East (N. Virginia):
No events

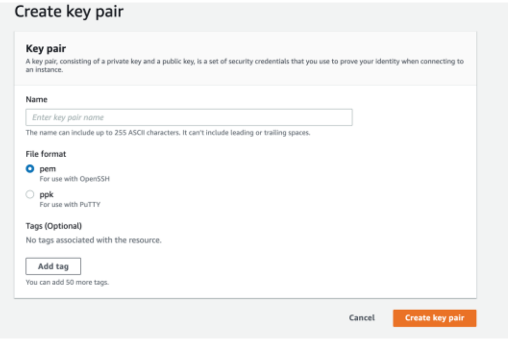
3. Choose **Create Key Pair**.



Key pairs

Name	Fingerprint	ID
No key pairs to display		

Then you should see the following form:



Create key pair

Key pair

A key pair, consisting of a private key and a public key, is a set of security credentials that you use to prove your identity when connecting to an instance.

Name

Enter key pair name

The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.

File format

● pem
For use with OpenSSH

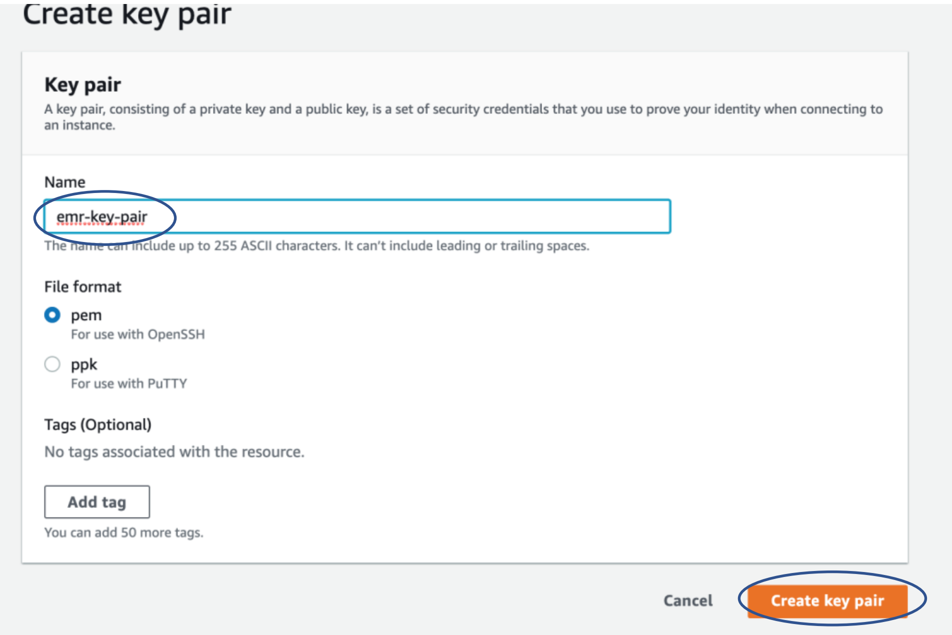
○ ppk
For use with PuTTY

Tags (Optional)

No tags associated with the resource.

You can add 50 more tags.

4. For the key pair name, enter a name for the new key pair (something like emr-key-pair), and then choose **Create key pair**. Leave other options as they are, unless you are using Putty, then check ‘ppk.’



Create key pair

Key pair

A key pair, consisting of a private key and a public key, is a set of security credentials that you use to prove your identity when connecting to an instance.

Name

emr-key-pair

The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.

File format

● pem
For use with OpenSSH

○ ppk
For use with PuTTY

Tags (Optional)

No tags associated with the resource.

You can add 50 more tags.

5. The private key file is automatically downloaded by your browser. The base file name is the name you specified as the name of your key pair, and the file name extension is .pem (or .ppk). Save the private key file in a safe place.

   In most cases on the MAC the file will download to the directory /Users/<username>/Downloads

   And on the PC the file will most likely download to

   /c/Users/<username>/Downloads.

   Note, the way I have written the path to the file is formatted for when using the git bash utility.

   > **Important**
   >
   > This is the only chance for you to save the private key file. You'll need to provide the name of your key pair when you launch an instance and the corresponding private key each time you connect to the instance. But if you can create another by repeating the above steps.

6. So find the directory into which your .pem file has been downloaded and either keep it there or move it to another directory of your choice. You will need to know the path to this file.
7. Using the “terminal” program on the MAC or the “bash” utility on the PC execute the following command to set the permissions of your private key file so that only you can read it. Note, use the appropriate path and file name for your situation.

```
chmod 400 <path-to-file>/emr-key-pair.pem
```

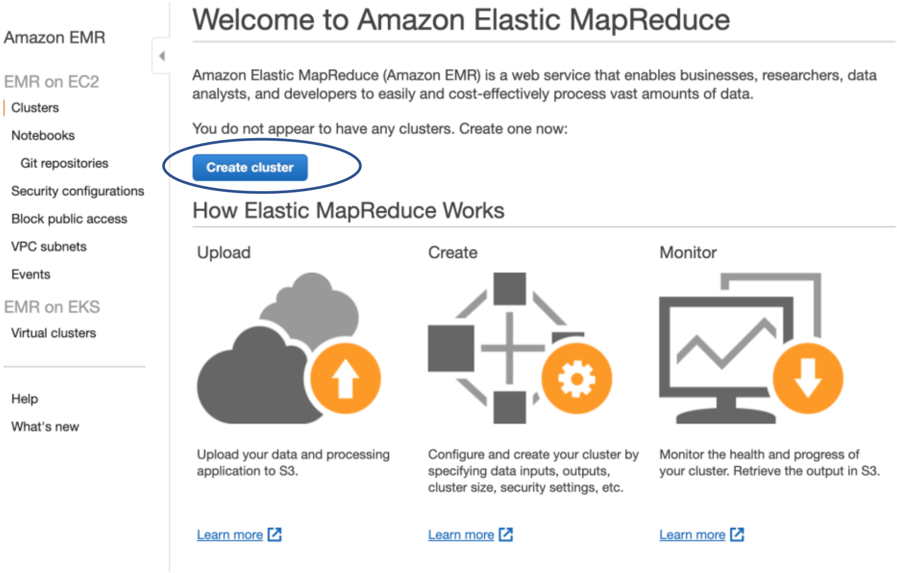
Note, depending on the operating system used for your personal computer, the above may not work. Things might still be ok, but if not reach out to me.

Step 5: Launch Your Initial Amazon EMR Cluster

In this step, you launch your initial cluster by using **Quick Options** in the Amazon EMR console and leaving most options to their default values.

To launch the sample Amazon EMR cluster

1. Find the EMR console page
2. Choose **Create cluster**.



Welcome to Amazon Elastic MapReduce

Amazon Elastic MapReduce (Amazon EMR) is a web service that enables businesses, researchers, data analysts, and developers to easily and cost-effectively process vast amounts of data.

You do not appear to have any clusters. Create one now:

How Elastic MapReduce Works

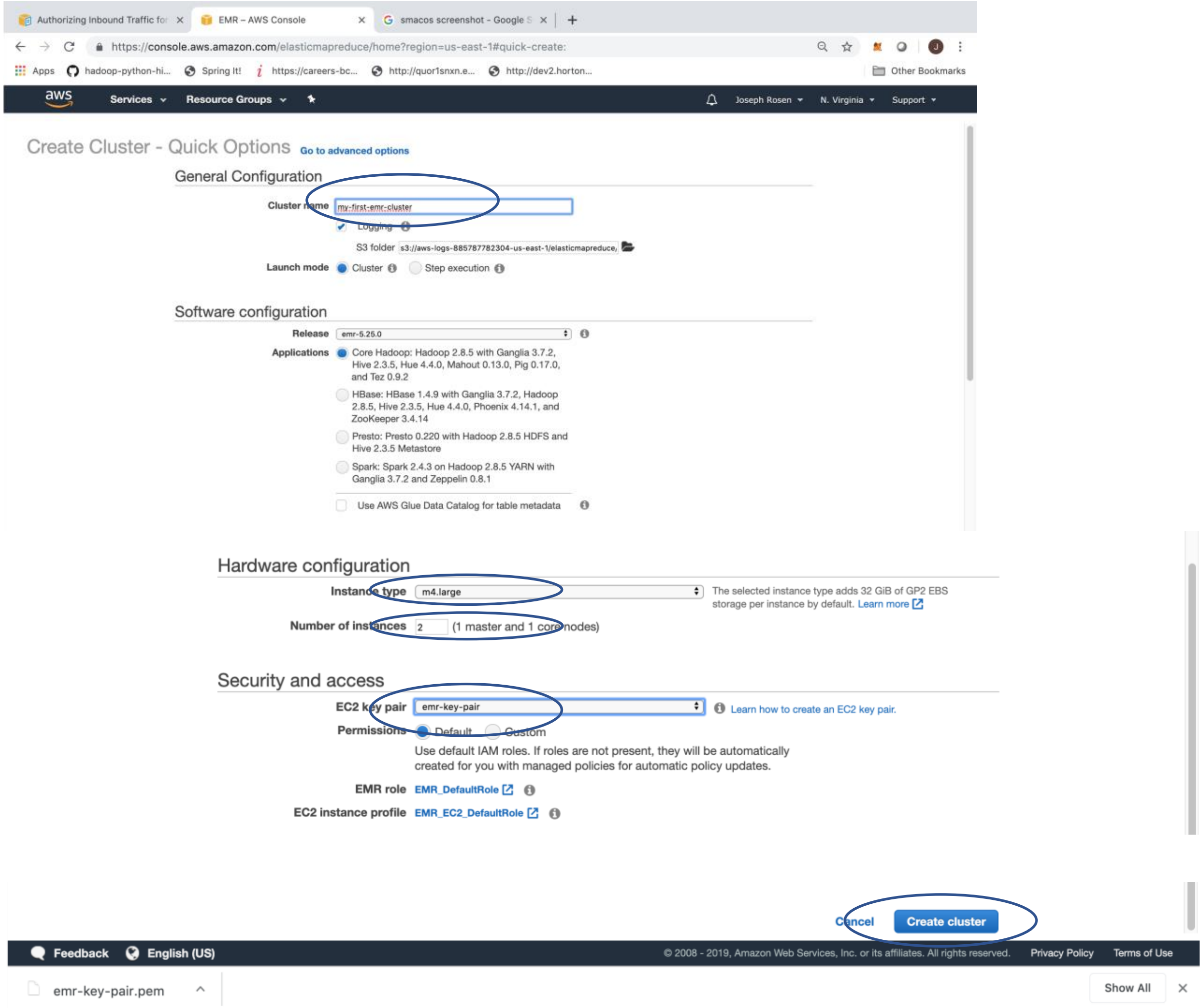
Upload your data and processing application to S3.

Configure and create your cluster by specifying data inputs, outputs, cluster size, security settings, etc.

Monitor the health and progress of your cluster. Retrieve the output in S3.

3. On the **Create Cluster - Quick Options** page, accept the default values except for the following fields (see figure on next page):
   - Enter a **Cluster name** that helps you identify the cluster, for example, *My First EMR Cluster*.

- Under **Hardware configuration** choose:
  - The Instance type as: m4.large
  - The Number of instances as: 2
- Under **Security and access**, choose the **EC2 key pair** that you created in Create an Amazon EC2 Key Pair
-



Create Cluster - Quick Options Go to advanced options

General Configuration

Cluster name: my-first-emr-cluster

☑ Logging

S3 folder: s3://aws-logs-885787782304-us-east-1/elasticmapreduce/

Launch mode: ● Cluster ○ Step execution

Software configuration

Release: emr-5.25.0

Applications:
- ● Core Hadoop: Hadoop 2.8.5 with Ganglia 3.7.2, Hive 2.3.5, Hue 4.4.0, Mahout 0.13.0, Pig 0.17.0, and Tez 0.9.2
- ○ HBase: HBase 1.4.9 with Ganglia 3.7.2, Hadoop 2.8.5, Hive 2.3.5, Hue 4.4.0, Phoenix 4.14.1, and ZooKeeper 3.4.14
- ○ Presto: Presto 0.220 with Hadoop 2.8.5 HDFS and Hive 2.3.5 Metastore
- ○ Spark: Spark 2.4.3 on Hadoop 2.8.5 YARN with Ganglia 3.7.2 and Zeppelin 0.8.1

☐ Use AWS Glue Data Catalog for table metadata

Hardware configuration

Instance type: m4.large

The selected instance type adds 32 GiB of GP2 EBS storage per instance by default. Learn more

Number of instances: 2 (1 master and 1 core nodes)

Security and access

EC2 key pair: emr-key-pair

Learn how to create an EC2 key pair.

Permissions: ● Default ○ Custom

Use default IAM roles. If roles are not present, they will be automatically created for you with managed policies for automatic policy updates.

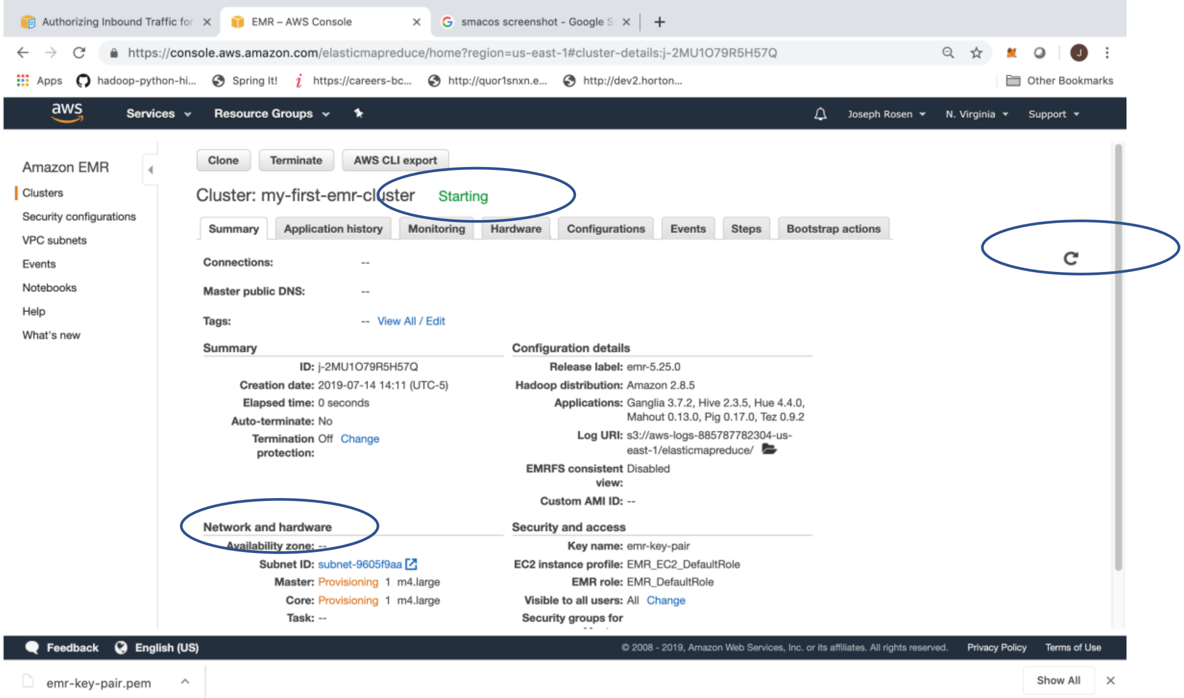
EMR role: EMR_DefaultRole

EC2 instance profile: EMR_EC2_DefaultRole

4. Choose **Create cluster**.

Note your cluster is ready for use when, instead of "Starting" it says "Waiting Cluster ready after last step completed." This could sometimes take 10+ minutes, so don't worry.

The cluster status page with the cluster **Summary** appears (see below). You can use this page to monitor the progress of cluster creation and view details about cluster status. As cluster creation tasks finish, items on the status page update. You may need to choose the refresh icon (circular arrow) on the right or refresh your browser to receive updates.



Cluster: my-first-emr-cluster Starting

Connections: --

Master public DNS: --

Tags: -- View All / Edit

Summary

ID: j-2MU1O79R5H57Q
Creation date: 2019-07-14 14:11 (UTC-5)
Elapsed time: 0 seconds
Auto-terminate: No
Termination protection: Off Change

Configuration details

Release label: emr-5.25.0
Hadoop distribution: Amazon 2.8.5
Applications: Ganglia 3.7.2, Hive 2.3.5, Hue 4.4.0, Mahout 0.13.0, Pig 0.17.0, Tez 0.9.2
Log URI: s3://aws-logs-885787782304-us-east-1/elasticmapreduce/
EMRFS consistent view: Disabled
Custom AMI ID: --

Network and hardware

Availability zone: --
Subnet ID: subnet-9605f9aa
Master: Provisioning 1 m4.large
Core: Provisioning 1 m4.large
Task: --

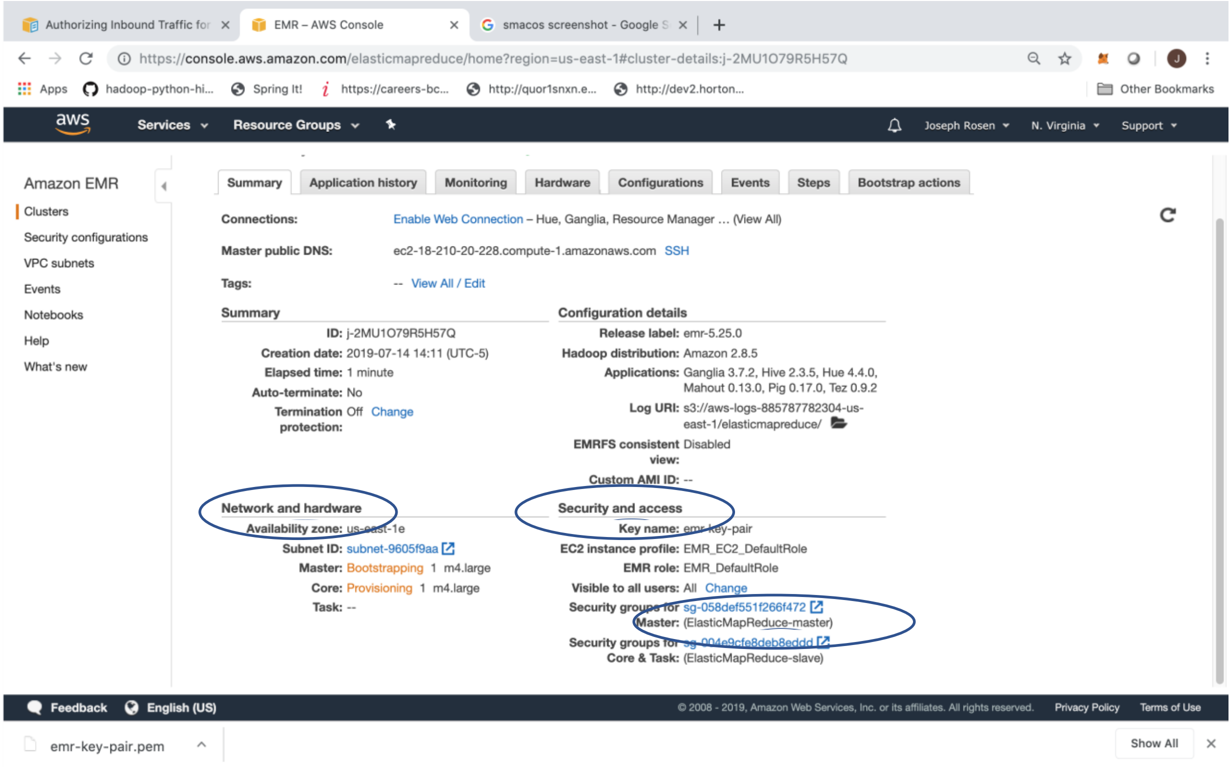
Security and access

Key name: emr-key-pair
EC2 instance profile: EMR_EC2_DefaultRole
EMR role: EMR_DefaultRole
Visible to all users: All Change
Security groups for

Under **Network and hardware**, find the **Master** and **Core** instance status. The status goes from **Provisioning** to **Bootstrapping** to **Waiting** during the cluster creation process. For more information, see Understanding the Cluster Lifecycle.

As soon as you see the links for **Security groups for Master** and **Security Groups for Core & Task (see below)**, you can move on to the next task, but you may want to wait until the cluster starts successfully and is in the **Waiting** state. The links are blue colored identifiers starting with “sg-“ in the Security and Access Area of the page.

Under **Security and access** choose the **Security groups for Master** link



Connections: Enable Web Connection – Hue, Ganglia, Resource Manager ... (View All)

Master public DNS: ec2-18-210-20-228.compute-1.amazonaws.com SSH

Tags: -- View All / Edit

Summary

ID: j-2MU1O79R5H57Q
Creation date: 2019-07-14 14:11 (UTC-5)
Elapsed time: 1 minute
Auto-terminate: No
Termination protection: Off Change

Configuration details

Release label: emr-5.25.0
Hadoop distribution: Amazon 2.8.5
Applications: Ganglia 3.7.2, Hive 2.3.5, Hue 4.4.0, Mahout 0.13.0, Pig 0.17.0, Tez 0.9.2
Log URI: s3://aws-logs-885787782304-us-east-1/elasticmapreduce/
EMRFS consistent view: Disabled
Custom AMI ID: --

Network and hardware

Availability zone: us-east-1e
Subnet ID: subnet-9605f9aa
Master: Bootstrapping 1 m4.large
Core: Provisioning 1 m4.large
Task: --

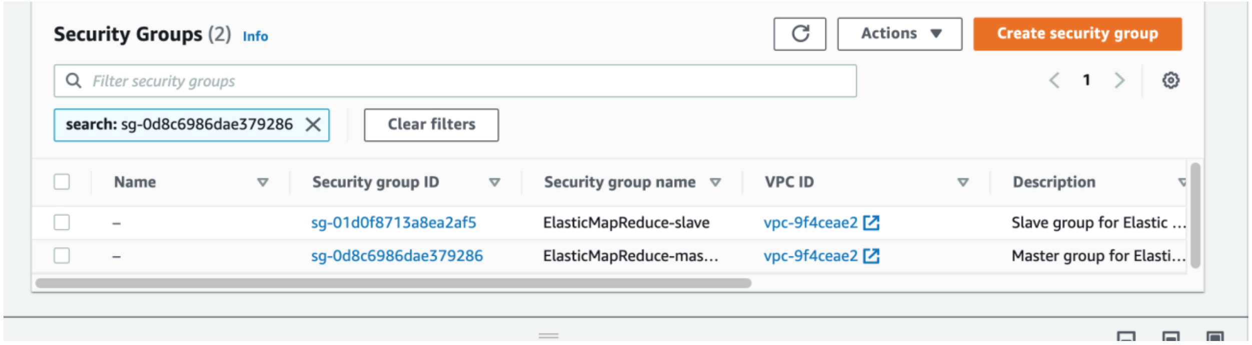
Security and access

Key name: emr-key-pair
EC2 instance profile: EMR_EC2_DefaultRole
EMR role: EMR_DefaultRole
Visible to all users: All Change
Security groups for Master: sg-058def551f266f472 (ElasticMapReduce-master)
Security groups for Core & Task: sg-004e9cfe8deb8eddd (ElasticMapReduce-slave)

For more information about reading the cluster summary, see View Cluster Status and Details.

Allow SSH Connections to the Cluster from Your Client

Security groups act as virtual firewalls to control inbound and outbound traffic to your cluster. When you create your first cluster, Amazon EMR creates the default Amazon EMR-managed security group associated with the master instance, **ElasticMapReduce-master**, and the security group associated with core and task nodes, **ElasticMapReduce-slave**. To reach the security groups of interest just click on the blue link associated with the Security group for Master entry and you should then see something like the following.

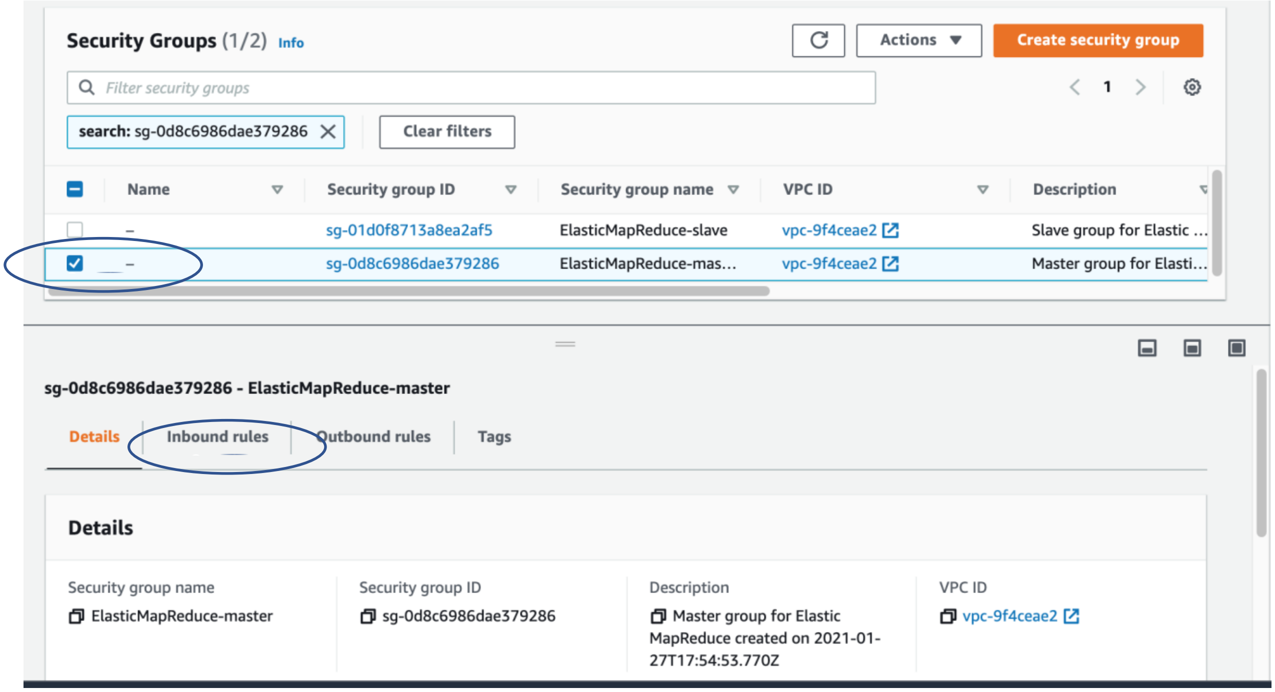


search: sg-0d8c6986dae379286

Name	Security group ID	Security group name	VPC ID	Description
–	sg-01d0f8713a8ea2af5	ElasticMapReduce-slave	vpc-9f4ceae2	Slave group for Elastic ...
–	sg-0d8c6986dae379286	ElasticMapReduce-mas...	vpc-9f4ceae2	Master group for Elasti...

For more information about security groups, see Control Network Traffic with Security Groups and Security Groups for Your VPC in the *Amazon VPC User Guide*..

1. Choose **ElasticMapReduce-master** from the list. Select the ElasticMapReduce-master by clicking on its row.
2. On the bottom of the screen will appear tabs for this security group. Select the “Inbound rules” tab.



☐	Name	Security group ID	Security group name	VPC ID	Description
☐	–	sg-01d0f8713a8ea2af5	ElasticMapReduce-slave	vpc-9f4ceae2	Slave group for Elastic …
☑	–	sg-0d8c6986dae379286	ElasticMapReduce-mas…	vpc-9f4ceae2	Master group for Elasti…

sg-0d8c6986dae379286 - ElasticMapReduce-master

Details

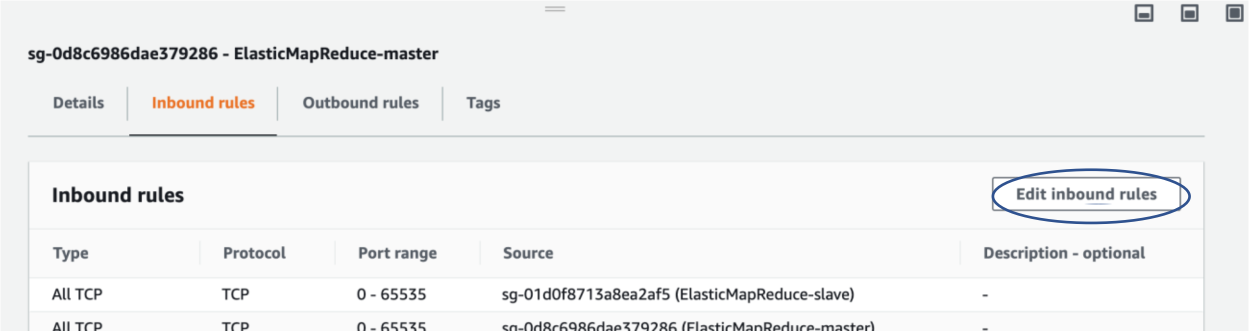
Security group name: ElasticMapReduce-master

Security group ID: sg-0d8c6986dae379286

Description: Master group for Elastic MapReduce created on 2021-01-27T17:54:53.770Z

VPC ID: vpc-9f4ceae2

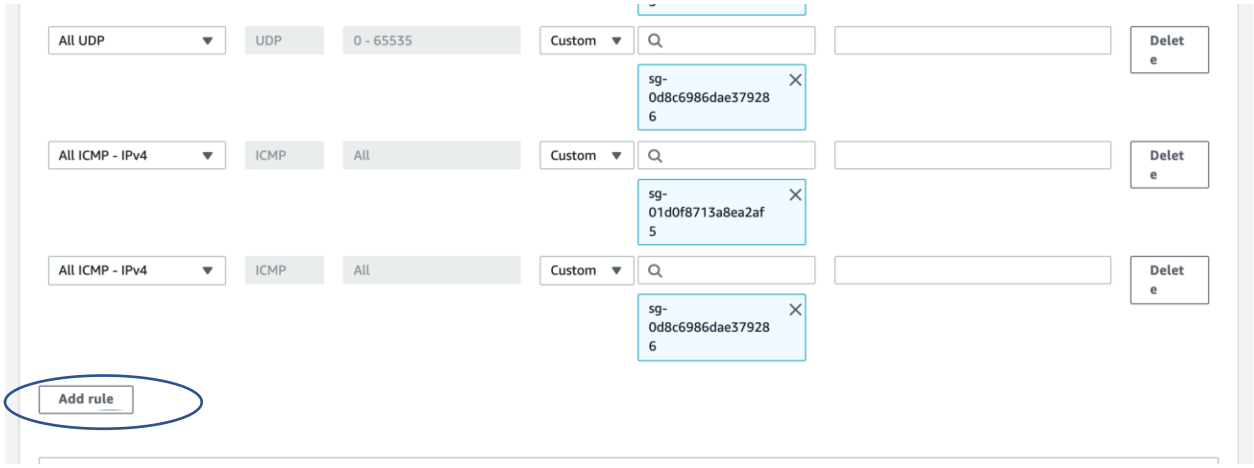
When you see the “Edit inbound rules” button. Click on it.


sg-0d8c6986dae379286 - ElasticMapReduce-master

Inbound rules

Type	Protocol	Port range	Source	Description - optional
All TCP	TCP	0 - 65535	sg-01d0f8713a8ea2af5 (ElasticMapReduce-slave)	-
All TCP	TCP	0 - 65535	sg-0d8c6986dae379286 (ElasticMapReduce-master)	-

A new pane will appear allowing you to modify access rules. Scroll down to the bottom of the list where you will see the “Add rule” button. Select it.

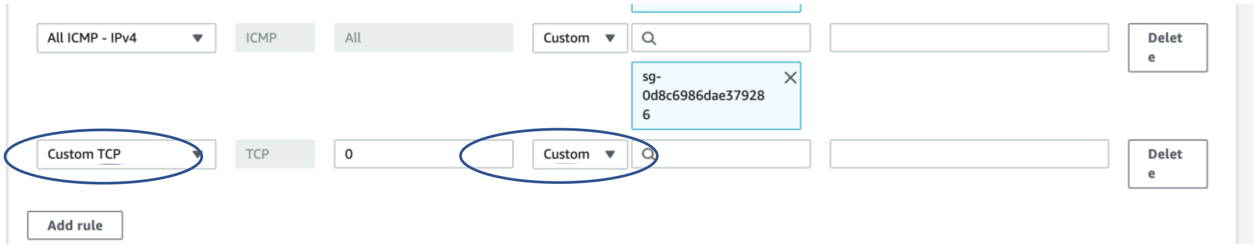


All UDP | UDP | 0 - 65535 | Custom | sg-0d8c6986dae379286

All ICMP - IPv4 | ICMP | All | Custom | sg-01d0f8713a8ea2af5

All ICMP - IPv4 | ICMP | All | Custom | sg-0d8c6986dae379286

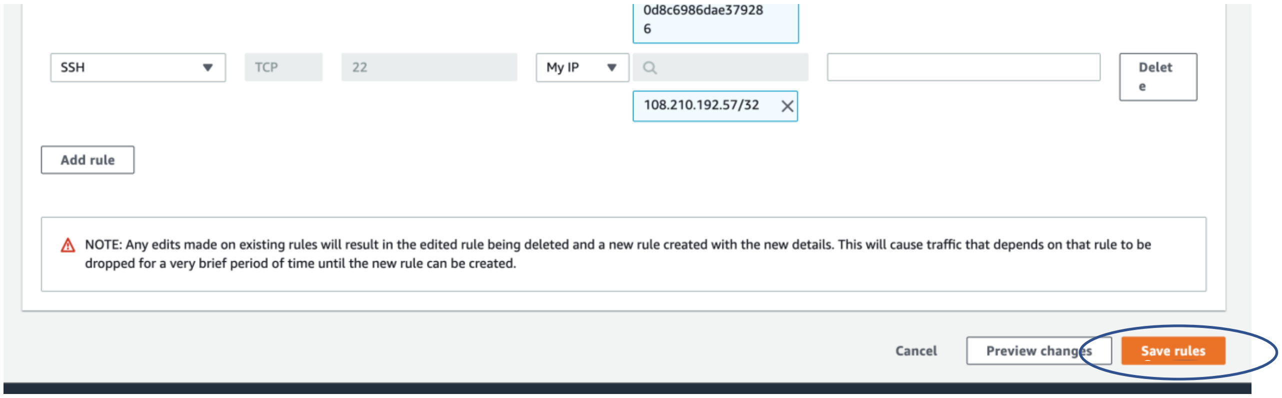
A line for you to enter a new access rule will appear:



All ICMP - IPv4 | ICMP | All | Custom | sg-0d8c6986dae379286

Custom TCP | TCP | 0 | Custom

1. Select the field with label “Custom TCP” which pops up a list of options, select “SSH”. When you do the next field to its left will display the value “TCP” and the next field to the left of that will show “22”.
2. Now select the next field showing the value “Custom” which pops up a list from which you should select “My IP” which causes your IP to be the only one allowed to access your EMR cluster via SSH (or SCP). Scroll down a bit more, if needed, and click on the “Save rules” button.



0d8c6986dae379286

SSH | TCP | 22 | My IP | 108.210.192.57/32

NOTE: Any edits made on existing rules will result in the edited rule being deleted and a new rule created with the new details. This will cause traffic that depends on that rule to be dropped for a very brief period of time until the new rule can be created.

Note, once you have set up this rule, in most cases when you create a new cluster, it will use the same security group, so you likely will not need to set up this rule again. But it always is good to check.

Step 6: Connect to the Master Node Using SSH

Secure Shell (SSH) is a network protocol you can use to create a secure connection to a remote computer. After you make a connection, the terminal on your local computer behaves as if it is running on the remote computer. Commands you issue locally run on the remote computer, and the command output from the remote computer appears in your terminal window.

When you use SSH with AWS, you are connecting to an EC2 instance, which is a virtual server running in the cloud. When working with Amazon EMR, the most common use of SSH is to connect to the EC2 instance that is acting as the master node of the cluster.

Using SSH to connect to the master node gives you the ability to monitor and interact with the cluster. You can issue Linux commands on the master node, run applications such as Hive and Pig interactively, browse directories, read log files, and so on.

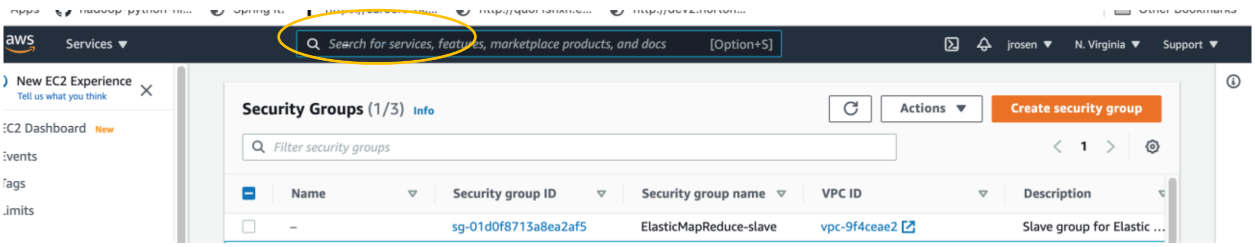
To connect to the master node using SSH, you need the public DNS name of the master node. In addition, the security group associated with the master node must have an inbound rule that allows SSH (TCP port 22) traffic from a source that includes the client where the SSH connection originates (something you did above).

Retrieve the Public DNS Name of the Master Node

You can retrieve the master public DNS name using the Amazon EMR console and the AWS CLI.

To retrieve the public DNS name of the master node using the Amazon EMR console

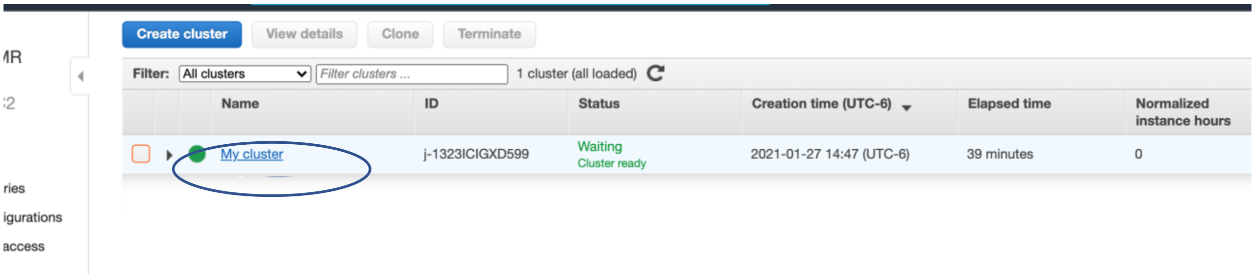
1. Find the EMR service page by typing EMR into the “Search for services.” Box and selecting EMR



Security Groups (1/3) Info

	Name	Security group ID	Security group name	VPC ID	Description
□	–	sg-01d0f8713a8ea2af5	ElasticMapReduce-slave	vpc-9f4ceae2	Slave group for Elastic ...

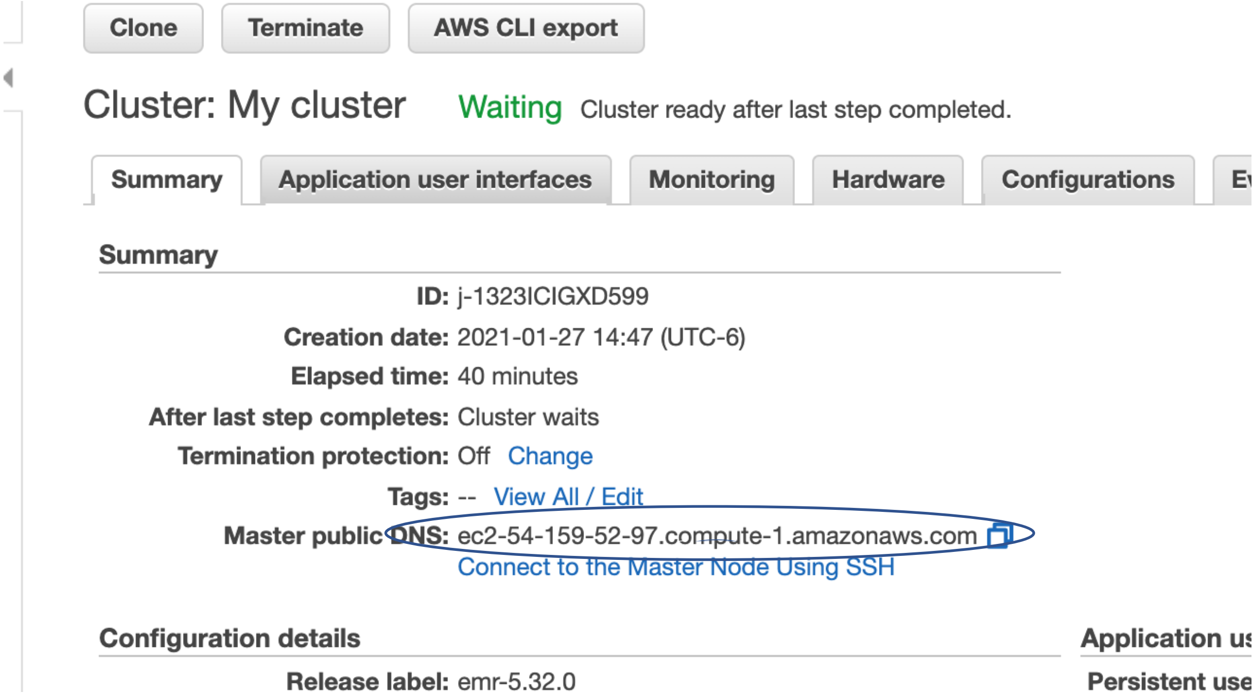
2. On the **Cluster List** page, select the link for your cluster.



Filter: All clusters | Filter clusters ... | 1 cluster (all loaded)

	Name	ID	Status	Creation time (UTC-6)	Elapsed time	Normalized instance hours
□	My cluster	j-1323ICIGXD599	Waiting Cluster ready	2021-01-27 14:47 (UTC-6)	39 minutes	0

3. Note the **Master public DNS** value that appears at the top of the **Cluster Details** page.



Cluster: My cluster Waiting Cluster ready after last step completed.

Summary

ID: j-1323ICIGXD599
Creation date: 2021-01-27 14:47 (UTC-6)
Elapsed time: 40 minutes
After last step completes: Cluster waits
Termination protection: Off Change
Tags: -- View All / Edit
Master public DNS: ec2-54-159-52-97.compute-1.amazonaws.com
Connect to the Master Node Using SSH

Configuration details

Release label: emr-5.32.0

Application us

Persistent use

To connect to the Master Node Using SSH and an Amazon EC2 Private Key

Open a terminal window the MAC or use the bash utility on the PC.

1. To establish a connection to the master node, type the following command.
   a. Replace *ec2-###-##-##-###.compute-1.amazonaws.com* with the master public DNS name of your cluster
   b. Replace */<path-to-file>/mykeypair.pem* with the path (on your PC/Mac) and file name of your .pem file.

For MACOS or Linux, something like:

ssh -i /path/to/emr-key-pair.pem hadoop@ *ec2-###-##-##-###.compute-1.amazonaws.com*

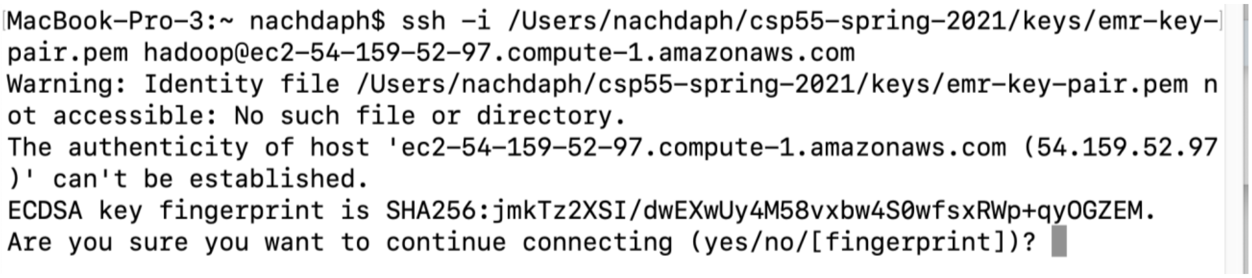
For Windows, something like;

ssh -i c:/path/to/emr-key-pair.pem hadoop@ *ec2-###-##-##-###.compute-1.amazonaws.com*

Important

You must use the login name hadoop when you connect to the Amazon EMR master node; otherwise, you may see an error similar to Server refused our key.

2. When you enter this properly you should see



```
MacBook-Pro-3:~ nachdaph$ ssh -i /Users/nachdaph/csp55-spring-2021/keys/emr-key-
pair.pem hadoop@ec2-54-159-52-97.compute-1.amazonaws.com
Warning: Identity file /Users/nachdaph/csp55-spring-2021/keys/emr-key-pair.pem n
ot accessible: No such file or directory.
The authenticity of host 'ec2-54-159-52-97.compute-1.amazonaws.com (54.159.52.97
)' can't be established.
ECDSA key fingerprint is SHA256:jmkTz2XSI/dwEXwUy4M58vxbw4S0wfsxRWp+qyOGZEM.
Are you sure you want to continue connecting (yes/no/[fingerprint])?
```

3. You might see a waring. The warning states that the authenticity of the host you are connecting to cannot be verified. If needed, type yes to continue.
4. When you are done working on the master node (as you might be at the end of an assignment), type the following command to close the SSH connection.

```
exit
```

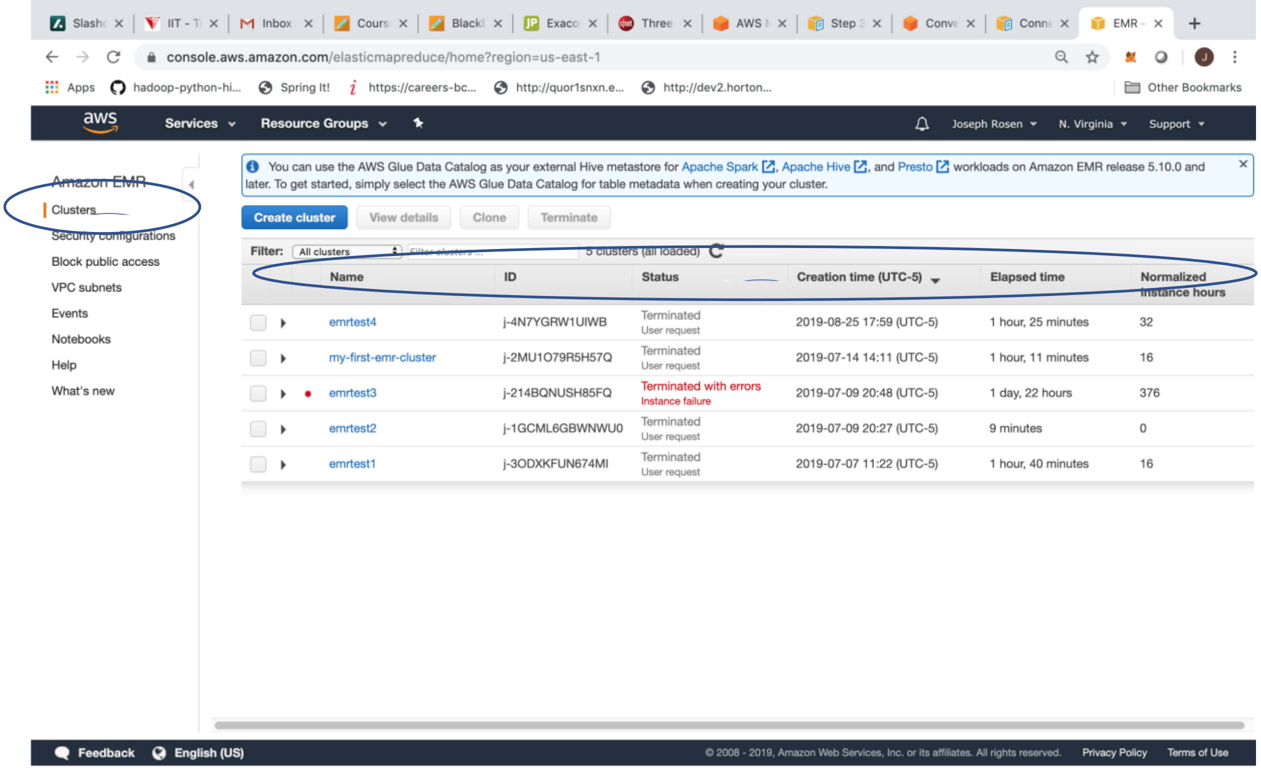
Step 7: Terminate the Cluster and Delete the Bucket

After you complete your homework assignment or other project work, you may want to terminate your cluster and delete your Amazon S3 bucket to avoid additional charges.

Terminating your cluster terminates the associated Amazon EC2 instances and stops the accrual of Amazon EMR charges. Amazon EMR preserves metadata information about completed clusters for your reference, at no charge, for two months. The console does not provide a way to delete terminated clusters so that they aren't viewable in the console. Terminated clusters are removed from the cluster when the metadata is removed.

To terminate the cluster

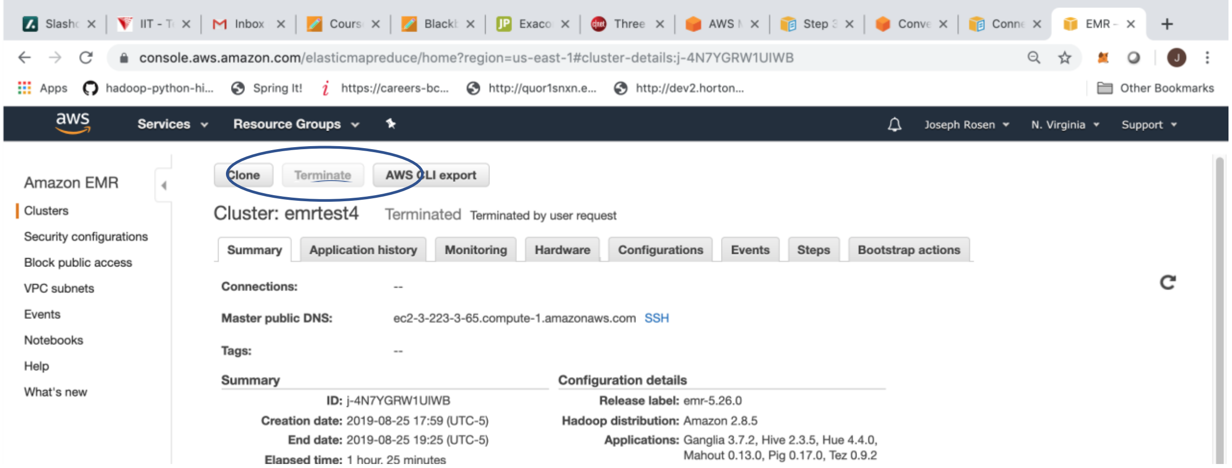
1. Find the EMR service
2. Choose **Clusters**, then choose your cluster.



You can use the AWS Glue Data Catalog as your external Hive metastore for Apache Spark, Apache Hive, and Presto workloads on Amazon EMR release 5.10.0 and later. To get started, simply select the AWS Glue Data Catalog for table metadata when creating your cluster.

Name	ID	Status	Creation time (UTC-5)	Elapsed time	Normalized instance hours
emrtest4	j-4N7YGRW1UIWB	Terminated User request	2019-08-25 17:59 (UTC-5)	1 hour, 25 minutes	32
my-first-emr-cluster	j-2MU1O79R5H57Q	Terminated User request	2019-07-14 14:11 (UTC-5)	1 hour, 11 minutes	16
emrtest3	j-214BQNUSH85FQ	Terminated with errors Instance failure	2019-07-09 20:48 (UTC-5)	1 day, 22 hours	376
emrtest2	j-1GCML6GBWNWU0	Terminated User request	2019-07-09 20:27 (UTC-5)	9 minutes	0
emrtest1	j-3ODXKFUN674MI	Terminated User request	2019-07-07 11:22 (UTC-5)	1 hour, 40 minutes	16

3. Choose Terminate:



Cluster: emrtest4 Terminated Terminated by user request

Connections: --

Master public DNS: ec2-3-223-3-65.compute-1.amazonaws.com SSH

Tags: --

Summary

ID: j-4N7YGRW1UIWB
Creation date: 2019-08-25 17:59 (UTC-5)
End date: 2019-08-25 19:25 (UTC-5)
Elapsed time: 1 hour, 25 minutes

Configuration details

Release label: emr-5.26.0
Hadoop distribution: Amazon 2.8.5
Applications: Ganglia 3.7.2, Hive 2.3.5, Hue 4.4.0, Mahout 0.13.0, Pig 0.17.0, Tez 0.9.2

To delete the cluster logging output bucket

1. Find the S3 service
2. Choose the EMR bucket from the list, so that the whole bucket row is selected.
3. Choose delete bucket, type the name of the bucket, and then click **Confirm**.

For more information about deleting folders and buckets, go to How Do I Delete an S3 Bucket in the *Amazon Simple Storage Service Getting Started Guide*.