

## Lab: Big data management on Cloud – Cassandra setup – Master less architecture

Name: Vishwanaath Gopalakrishnan

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Batch: PGPCC\_OCT19A

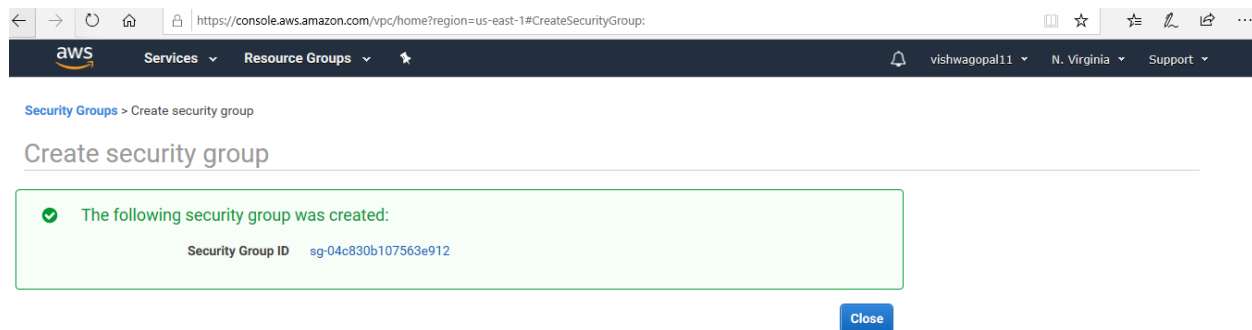
### How to do it – 1

- Create the EC2 instance using the SKL-Ubuntu-Cassandra Community AMI in Virginia using the 7 Step Workflow using a t2. Small machine

The screenshot shows the AWS Management Console interface for creating an EC2 instance. The 'Choose AMI' step is active, displaying a search bar with the filter 'skl-'. Below the search bar, a list of AMIs is shown. The 'SKL-Ubuntu-Cassandra' AMI (ami-ec1a8593) is highlighted with a blue checkmark, indicating it is the selected option. The interface also shows a sidebar with navigation options like 'Quick Start', 'My AMIs', and 'AWS Marketplace'. The top navigation bar includes the AWS logo, 'Services', 'Resource Groups', and user information.

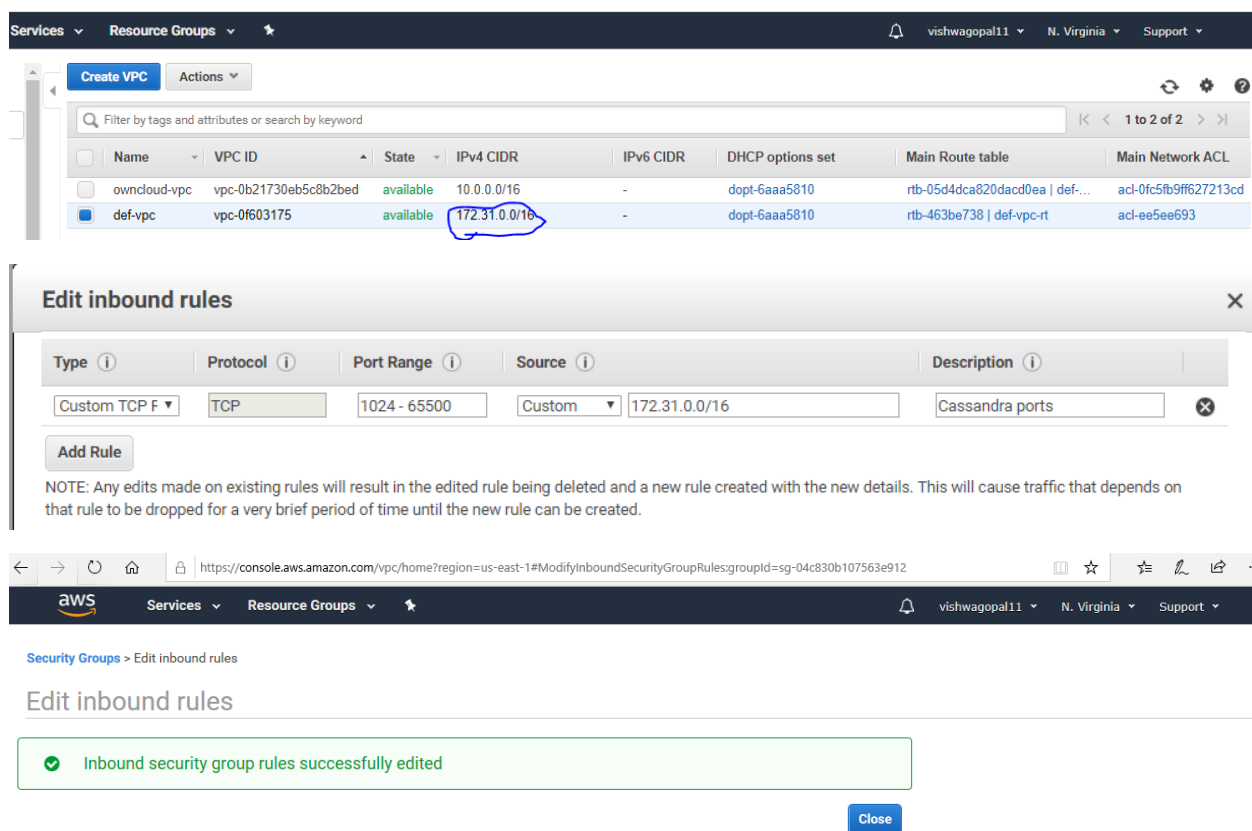
- Create a Security Group as Cassandra-ports and assign it to the default-vpc

The screenshot shows the 'Create security group' form in the AWS Management Console. The form has three main fields: 'Security group name\*' with the value 'cassandra-ports', 'Description\*' with the value 'Access cassandra ports', and 'VPC' with a dropdown menu showing 'vpc-0f603175'. There are information icons (i) next to each field. At the bottom, there is a '\* Required' label and two buttons: 'Cancel' and 'Create'.



Edit the Inbound rules to allow Custom-TCP traffic with the port range of 1024-65500

Take the CIDR Block of the Default VPC and assign it to the Cassandra-ports Security group created



Assign the ssh and Cassandra security ports to the EC2 instance being created and launch the instance

**Step 7: Review Instance Launch**

▼ Security Groups Edit security groups

Security Group ID	Name	Description
sg-04c830b107563e912	cassandra-ports	Access cassandra ports
sg-0688faa6547c813db	open-ssh-http-tomcat	opens ports 22, 80, 8080

All selected security groups inbound rules

Type	Protocol	Port Range	Source	Description
Custom TCP Rule	TCP	1024 - 65500	0.0.0.0/0	Cassandra ports
HTTP	TCP	80	0.0.0.0/0	Open HTTP
Custom TCP Rule	TCP	8080	0.0.0.0/0	Open tomcat
Custom TCP Rule	TCP	8080	:::0	Open tomcat
SSH	TCP	22	0.0.0.0/0	Open SSH

Cancel Previous Launch

Download the keypair `gl-cassandra.pem` and launch the instance `Cass-node1` in availability zone `US-east-1a`. Follow the same instructions to create two more EC2 instances `Cass-node2` and `Cass-node3` in availability zones `US-east-1b` and `US-east-1c` respectively

**Launch Instance** Connect Actions

Search: Cass Add filter

Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)
Cass-node1	i-03dbc10caf823da0	t2.small	us-east-1a	running	2/2 checks ...	None	ec2-35-173-182-161
Cass-node2	i-0cedccdc2cb103e5	t2.small	us-east-1b	running	2/2 checks ...	None	ec2-34-205-90-10
Cass-node3	i-01da7f3ed998a215	t2.small	us-east-1c	Initializing	Initializing	None	ec2-18-234-103-118

Instance: **i-01da7f3ed998a215 (Cass-node3)** Public DNS: `ec2-18-234-103-118.compute-1.amazonaws.com`

Description	Status Checks	Monitoring	Tags
Instance ID	i-01da7f3ed998a215		
Instance state	running		
Instance type	t2.small		
Finding	Opt-in to AWS Compute Optimizer for recommendations. <a href="#">Learn more</a>		
Private DNS	ip-172.31.92.86.ec2.internal		
Private IPs	172.31.92.86		
Secondary private IPs			
VPC ID	vpc-0f603175 (def-vpc)		
Subnet ID	subnet-4c070462 (def-subnet-1c)		
Public DNS (IPv4)	ec2-18-234-103-118.compute-1.amazonaws.com		
IPv4 Public IP	18.234.103.118		
IPv6 IPs	-		
Elastic IPs			
Availability zone	us-east-1c		
Security groups	open-ssh-http-tomcat, cassandra-ports. <a href="#">view inbound rules</a> . <a href="#">view outbound rules</a>		
Scheduled events	No scheduled events		
AMI ID	SKL-Ubuntu-Cassandra (ami-ec1a8593)		
Platform	-		

SShed into the three instances created and ensured that they are working fine

**Cass-node1:** ipV4 Public IP: 35.173.182.161

```
ubuntu@ip-172-31-46-155: ~
[sudo] password for ubuntu:
Sorry, try again.
[sudo] password for ubuntu:
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# ls -l *.pem
ls: cannot access '-': No such file or directory
ls: cannot access 'l': No such file or directory
-rw-r--r-- 1 root root 1679 Jan 28 15:55 gl-cassandra.pem
-rw-r--r-- 1 root root 1679 Jan 28 15:55 gl-docker.pem
-rw-r--r-- 1 root root 1679 Jan 28 15:55 gl-vish3.pem
-rw-r--r-- 1 root root 1679 Jan 28 15:55 glpem1 (1).pem
-rw-r--r-- 1 root root 1679 Jan 28 15:55 glpem1 (2).pem
-rw-r--r-- 1 root root 1679 Jan 28 15:55 greatlearning.pem
-rw-r--r-- 1 root root 1679 Jan 28 15:55 owncloud.pem
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# chmod 400 gl-cassandra.pem
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# ssh -i gl-cassandra.pem ubuntu@35.173.182.161
The authenticity of host '35.173.182.161 (35.173.182.161)' can't be established.
ECDSA key fingerprint is SHA256:ri/0u4TbZxDwEaAYhWR3iFw20vuxbuZrH5/h1Vkn98.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '35.173.182.161' (ECDSA) to the list of known hosts.
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-1047-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

Get cloud support with Ubuntu Advantage Cloud Guest:
http://www.ubuntu.com/business/services/cloud

121 packages can be updated.
1 update is a security update.

*** System restart required ***
Last login: Sun Jan 28 15:55:31 2018 from 106.200.196.203
ubuntu@35.173.182.161:~$
```

Cass-node2: IPv4 Public IP: 34.205.90.145

```
ubuntu@ip-172-31-11-94: ~  
-r-xr-xr-x 1 ubuntu ubuntu 1696 Jan 28 19:27 gl-cassandra.pem  
-r-xr-xr-x 1 ubuntu ubuntu 1692 Dec 25 11:26 gl-docker.pem  
-r-xr-xr-x 1 ubuntu ubuntu 1696 Dec 12 02:48 gl-vish3.pem  
-r-xr-xr-x 1 ubuntu ubuntu 1692 Nov 17 15:09 gl.pem  
-rwxrwxrwx 1 ubuntu ubuntu 1692 Nov 16 07:17 'glpem1 (1).pem'  
-rwxrwxrwx 1 ubuntu ubuntu 1692 Nov 16 07:23 'glpem1 (2).pem'  
-r-xr-xr-x 1 ubuntu ubuntu 1692 Nov 16 11:53 greatlearning.pem  
-r-xr-xr-x 1 ubuntu ubuntu 1696 Nov 17 21:13 owncloud.pem  
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# chmod 400 gl-cassandra.pem  
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# ssh -i gl-cassandra.pem ubuntu@34.205.90.145  
The authenticity of host '34.205.90.145 (34.205.90.145)' can't be established.  
ECDSA key fingerprint is SHA256:qPhKHtr+ndowkJuVuC0HKqXUVr5DQF9vbJT+q0kIkN4.  
Are you sure you want to continue connecting (yes/no)? yes  
Warning: Permanently added '34.205.90.145' (ECDSA) to the list of known hosts.  
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-1047-aws x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:       https://ubuntu.com/advantage  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud  
  
121 packages can be updated.  
1 update is a security update.  
  
*** System restart required ***  
Last login: Sun Jan 28 15:55:31 2018 from 106.200.196.203  
ubuntu@ip-172-31-11-94:~$
```

Cass-node3: IPv4 Public IP: 18.234.103.118

```
ubuntu@ip-172-31-92-86: ~  
gl-docker.pem  gl.pem  'glpem1 (2).pem'  owncloud.pem  
ubuntu@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads$ sudo su  
[sudo] password for ubuntu:  
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# ls -l *.pem  
ls: cannot access '-': No such file or directory  
ls: cannot access 'l': No such file or directory  
gl-cassandra.pem  gl-vish3.pem  'glpem1 (1).pem'  greatlearning.pem  
gl-docker.pem    gl.pem      'glpem1 (2).pem'  owncloud.pem  
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# chmod 400 gl-cassandra.pem  
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# ssh -i gl-cassandra.pem ubuntu@18.234.103.118  
The authenticity of host '18.234.103.118 (18.234.103.118)' can't be established.  
ECDSA key fingerprint is SHA256:MtY5uhZ47pmoKt24eo/7iouYMTzhKLi8v1JhN/Qn+fs.  
Are you sure you want to continue connecting (yes/no)? yes  
Warning: Permanently added '18.234.103.118' (ECDSA) to the list of known hosts.  
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-1047-aws x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:       https://ubuntu.com/advantage  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud  
  
21 packages can be updated.  
1 update is a security update.  
  
*** System restart required ***  
Last login: Sun Jan 28 15:55:31 2018 from 106.200.196.203  
ubuntu@ip-172-31-92-86:~$
```

All 3 terminal windows are now open parallelly

```

ubuntu@ip-172-31-46-155: ~
gl-docker.pem gl.pem 'glpem1 (2).pem' owncloud
d.pem
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# chmod 400
gl-cassandra.pem
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# ssh -i gl-
cassandra.pem ubuntu@35.173.182.161
The authenticity of host '35.173.182.161 (35.173.182.161)' c
an't be established.
ECDSA key fingerprint is SHA256:ri/0u4TbZxDwEaAYhWR3ifcw20v
xbuZRH5/hIVKN98.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '35.173.182.161' (ECDSA) to the l
ist of known hosts.
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-1047-aws x86
64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

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http://www.ubuntu.com/business/services/cloud

121 packages can be updated.
1 update is a security update.

*** System restart required ***
Last login: Sun Jan 28 15:55:31 2018 from 106.200.196.203
ubuntu@ip-172-31-46-155:~$

root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# ls -l *.pem
-r-xr-xr-x 1 ubuntu ubuntu 1696 Jan 28 19:27 gl-cassandra.pem
-r-xr-xr-x 1 ubuntu ubuntu 1692 Dec 25 11:26 gl-docker.pem
-r-xr-xr-x 1 ubuntu ubuntu 1696 Dec 12 02:48 gl-vish3.pem
-r-xr-xr-x 1 ubuntu ubuntu 1692 Nov 17 15:09 gl.pem
-rwxrwxrwx 1 ubuntu ubuntu 1692 Nov 16 07:17 'glpem1 (1).pem'
-r-xr-xr-x 1 ubuntu ubuntu 1692 Nov 16 07:23 'glpem1 (2).pem'
-r-xr-xr-x 1 ubuntu ubuntu 1692 Nov 16 11:53 greatlearning.pem
-r-xr-xr-x 1 ubuntu ubuntu 1696 Nov 17 21:13 owncloud.pem
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# chmod 400 gl-c
assandra.pem
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/downloads# ssh -i gl-cass
andra.pem ubuntu@34.205.90.145
The authenticity of host '34.205.90.145 (34.205.90.145)' can't be
established.
ECDSA key fingerprint is SHA256:qPhKHtr+ndowkJuVuc8HKqXUVr5DQF9vb
JTa9q8k1kM4.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '34.205.90.145' (ECDSA) to the list of
known hosts.
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-1047-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

Get cloud support with Ubuntu Advantage Cloud Guest:
http://www.ubuntu.com/business/services/cloud

121 packages can be updated.
1 update is a security update.

root@DESKTOP-49DC5BB:/mnt/c/users/vishw/down
gl-docker.pem gl.pem 'glpem1 (2)
em
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/down
-cassandra.pem
root@DESKTOP-49DC5BB:/mnt/c/users/vishw/down
ssandra.pem ubuntu@18.234.103.118
The authenticity of host '18.234.103.118 (18
t be established.
ECDSA key fingerprint is SHA256:MTY5uhz47pmo
8vIDHw/Qnfa.
Are you sure you want to continue connecting
Warning: Permanently added '18.234.103.118'
of known hosts.
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonic
 * Support:       https://ubuntu.com/advant

Get cloud support with Ubuntu Advantage Cl
http://www.ubuntu.com/business/services/

121 packages can be updated.
1 update is a security update.

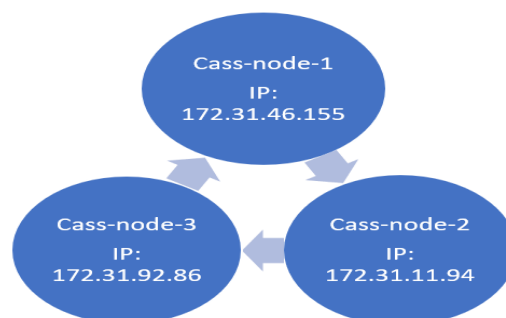
```

## Creating a Cassandra ring cluster:

- Create a Cassandra cluster using the Private IP of the EC instances and update the Seed IP with the heightened value as below

Cassandra Node	Private IP	Seed IP	Commands
Cass-node-1 IPv4:35.173.182.161	172.31.46.155 (Node 1)	172.31.46.155 (Node 1)	sed -i 's=MOD_IP_ADDRESS=172.31.46.155=g' cassandra.yaml sed -i 's=MOD_CLUSTER_NAME=GL-Cluster=g' cassandra.yaml sed -i 's=MOD_SEED_LIST=172.31.46.155=g' cassandra.yaml sed -i 's=MOD_DATACENTER=dc1=g' cassandra-rackdc.properties sed -i 's=MOD_RACK=r1=g' cassandra-rackdc.properties
Cass-node-2 IPv4:34.205.90.145	172.31.11.94 (Node 2)	172.31.46.155 (Node 1)	sed -i 's=MOD_IP_ADDRESS=172.31.11.94=g' cassandra.yaml sed -i 's=MOD_CLUSTER_NAME=GL-Cluster=g' cassandra.yaml sed -i 's=MOD_SEED_LIST=172.31.46.155=g' cassandra.yaml sed -i 's=MOD_DATACENTER=dc1=g' cassandra-rackdc.properties sed -i 's=MOD_RACK=r2=g' cassandra-rackdc.properties
Cass-node-3 IPv4:18.234.103.110	172.31.92.86 (Node 3)	172.31.46.155 (Node 1)	sed -i 's=MOD_IP_ADDRESS=172.31.92.86=g' cassandra.yaml sed -i 's=MOD_CLUSTER_NAME=GL-Cluster=g' cassandra.yaml sed -i 's=MOD_SEED_LIST=172.31.46.155=g' cassandra.yaml sed -i 's=MOD_DATACENTER=dc1=g' cassandra-rackdc.properties sed -i 's=MOD_RACK=r3=g' cassandra-rackdc.properties

## Cluster: GL-Cluster



## Node 1 updates:

```
ubuntu@ip-172-31-46-155: /opt/apache-cassandra-3.11.1/conf$  
  
*** System restart required ***  
Last login: Sun Jan 28 15:55:31 2018 from 106.200.196.203  
ubuntu@ip-172-31-46-155:~$ pwd  
/home/ubuntu  
ubuntu@ip-172-31-46-155:~$ cd /opt/  
ubuntu@ip-172-31-46-155:/opt$ ls -al  
total 24  
drwxr-xr-x 6 ubuntu ubuntu 4096 Jan 28 2018 .  
drwxr-xr-x 23 root root 4096 Jan 29 00:43 ..  
drwxrwxr-x 10 ubuntu ubuntu 4096 Jan 28 2018 apache-cassandra-3.11.1  
drwxr-xr-x 8 ubuntu ubuntu 4096 Dec 20 2017 jdk1.8.0.161-CassHasIssuesWith161  
drwxr-xr-x 8 ubuntu ubuntu 4096 Apr 1 2016 jdk1.8.0.92  
drwxrwxr-x 2 ubuntu ubuntu 4096 Jan 28 2018 softwares  
ubuntu@ip-172-31-46-155:/opt$ cd apache-cassandra-3.11.1  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1$ cd conf  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$ nano cassandra.yaml  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_IP_ADDRESS=172.31.46.155=g' cassandra.yaml  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_CLUSTER_NAME=GL-Cluster=g' cassandra.yaml  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_SEED_LIST=172.31.11.94=g' cassandra.yaml  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$
```

Updated the file with the SEED IP as the same Private IP as the Node1 Ip as it was not correct

```
# Compression to apply to the commit log. If omitted, the commit log  
# will be written uncompressed. LZ4, Snappy, and Deflate compressors  
# are supported.  
# commitlog_compression:  
#   - class_name: LZ4Compressor  
#   parameters:  
#  
# any class that implements the SeedProvider interface and has a  
# constructor that takes a Map<String, String> of parameters will do.  
seed_provider:  
  # Addresses of hosts that are deemed contact points.  
  # Cassandra nodes use this list of hosts to find each other and learn  
  # the topology of the ring. You must change this if you are running  
  # multiple nodes!  
  - class_name: org.apache.cassandra.locator.SimpleSeedProvider  
    parameters:  
      # seeds is actually a comma-delimited list of addresses.  
      # Ex: "<ip1>,<ip2>,<ip3>"  
      - seeds: "172.31.46.155"  
  
# For workloads with more data than can fit in memory, Cassandra's  
# bottleneck will be reads that need to fetch data from  
# disk. "concurrent_reads" should be set to (16 * number_of_drives) in  
# order to allow the operations to enqueue low enough in the stack  
# that the OS and drives can reorder them. Same applies to  
# "concurrent_counter_writes", since counter writes read the current  
# values before incrementing and writing them back.
```

```
ubuntu@ip-172-31-46-155: /opt/apache-cassandra-3.11.1/conf$  
  
#  
# http://www.apache.org/licenses/LICENSE-2.0  
#  
# Unless required by applicable law or agreed to in writing, software  
# distributed under the license is distributed on an "AS IS" BASIS,  
# WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.  
# See the license for the specific language governing permissions and  
# limitations under the license.  
#  
# These properties are used with GossipingPropertyFileSnitch and will  
# indicate the rack and dc for this node  
dc=MOD_DATACENTER  
rack=MOD_RACK  
#  
# Add a suffix to a datacenter name. Used by the Ec2Snitch and Ec2MultiRegionSnitch  
# to append a string to the EC2 region name.  
#dc_suffix=  
#  
# Uncomment the following line to make this snitch prefer the internal ip when possible, as the Ec2MultiRegionSnitch does.  
# prefer_local=true  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_DATACENTER=dc1=g' cassandra-rackdc.properties  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_RACK=r1=g' cassandra-rackdc.properties  
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$ more cassandra-rackdc.properties  
# Licensed to the Apache Software Foundation (ASF) under one  
# or more contributor license agreements. See the NOTICE file  
# distributed with this work for additional information  
# regarding copyright ownership. The ASF licenses this file  
# to you under the Apache License, Version 2.0 (the  
# "License"); you may not use this file except in compliance  
# with the license. You may obtain a copy of the license at  
#  
# http://www.apache.org/licenses/LICENSE-2.0  
#  
# Unless required by applicable law or agreed to in writing, software  
# distributed under the license is distributed on an "AS IS" BASIS,  
# WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.  
# See the license for the specific language governing permissions and  
# limitations under the license.  
#  
# These properties are used with GossipingPropertyFileSnitch and will  
# indicate the rack and dc for this node  
dc=dc1  
rack=r1
```

- Use the below commands to startup all the 3 cassandra nodes using the below commands from the bin folder

## Cassandra

### Nodetool status

At the end of the setup, we should expect a distributed Cassandra ring formed with Peer to Peer (P2P) system same status of the nodes from the racks r1, r2 and r3 in the data center dc1

```
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/conf$ cd ..
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1$ cd bin
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ ls -al
total 232
drwxr-xr-x  2 ubuntu ubuntu  4096 Jan 28  2018 .
drwxrwxr-x 10 ubuntu ubuntu  4096 Jan 28  2018 ..
-rwxr-xr-x  1 ubuntu ubuntu 10096 Oct  2  2017 cassandra
-rwxr-xr-x  1 ubuntu ubuntu  7110 Oct  2  2017 cassandra.bat
-rwxr-xr-x  1 ubuntu ubuntu  3093 Oct  2  2017 cassandra.in.bat
-rw-r--r--  1 ubuntu ubuntu  3035 Oct  2  2017 cassandra.in.sh
-rwxr-xr-x  1 ubuntu ubuntu 12431 Oct  2  2017 cassandra.ps1
-rwxr-xr-x  1 ubuntu ubuntu  1353 Oct  2  2017 cqlsh
-rwxr-xr-x  1 ubuntu ubuntu  1061 Oct  2  2017 cqlsh.bat
-rwxr-xr-x  1 ubuntu ubuntu  98142 Oct  2  2017 cqlsh.py
-rwxr-xr-x  1 ubuntu ubuntu  2163 Oct  2  2017 debug-cql
-rwxr-xr-x  1 ubuntu ubuntu  1392 Oct  2  2017 debug-cql.bat
-rwxr-xr-x  1 ubuntu ubuntu  3359 Oct  2  2017 nodetool
-rwxr-xr-x  1 ubuntu ubuntu  1513 Oct  2  2017 nodetool.bat
-rwxr-xr-x  1 ubuntu ubuntu  1957 Oct  2  2017 source-conf.ps1
-rwxr-xr-x  1 ubuntu ubuntu  2034 Oct  2  2017 sstableloader
-rwxr-xr-x  1 ubuntu ubuntu  1396 Oct  2  2017 sstableloader.bat
-rwxr-xr-x  1 ubuntu ubuntu  2042 Oct  2  2017 sstablescrib
-rwxr-xr-x  1 ubuntu ubuntu  1404 Oct  2  2017 sstablescrib.bat
-rwxr-xr-x  1 ubuntu ubuntu  2042 Oct  2  2017 sstableupgrade
-rwxr-xr-x  1 ubuntu ubuntu  1404 Oct  2  2017 sstableupgrade.bat
-rwxr-xr-x  1 ubuntu ubuntu  2045 Oct  2  2017 sstableutil
-rwxr-xr-x  1 ubuntu ubuntu  1407 Oct  2  2017 sstableutil.bat
-rwxr-xr-x  1 ubuntu ubuntu  2042 Oct  2  2017 sstableverify
-rwxr-xr-x  1 ubuntu ubuntu  1535 Oct  2  2017 sstableverify.bat
-rwxr-xr-x  1 ubuntu ubuntu  1175 Oct  2  2017 stop-server
-rwxr-xr-x  1 ubuntu ubuntu  2467 Oct  2  2017 stop-server.bat
-rwxr-xr-x  1 ubuntu ubuntu  6614 Oct  2  2017 stop-server.ps1
```



```

ubuntu@ip-172-31-46-155: /opt/apache-cassandra-3.11.1/bin
INFO [main] 2020-01-29 03:15:46,306 Gossiper.java:1655 - Waiting for gossip to settle...
INFO [main] 2020-01-29 03:15:54,309 Gossiper.java:1686 - No gossip backlog; proceeding ✓

ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ Nodetool status
Nodetool: command not found
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ ls -al
total 232
drwxr-xr-x 2 ubuntu ubuntu 4096 Jan 28 2018 .
drwxrwxr-x 11 ubuntu ubuntu 4096 Jan 29 02:51 ..
-rwxr-xr-x 1 ubuntu ubuntu 10096 Oct 2 2017 cassandra
-rwxr-xr-x 1 ubuntu ubuntu 7110 Oct 2 2017 cassandra.bat
-rwxr-xr-x 1 ubuntu ubuntu 3093 Oct 2 2017 cassandra.in.bat
-rw-r--r-- 1 ubuntu ubuntu 3035 Oct 2 2017 cassandra.in.sh
-rwxr-xr-x 1 ubuntu ubuntu 12431 Oct 2 2017 cassandra.ps1
-rwxr-xr-x 1 ubuntu ubuntu 1353 Oct 2 2017 cqlsh
-rwxr-xr-x 1 ubuntu ubuntu 1061 Oct 2 2017 cqlsh.bat
-rwxr-xr-x 1 ubuntu ubuntu 98142 Oct 2 2017 cqlsh.py
-rwxr-xr-x 1 ubuntu ubuntu 2163 Oct 2 2017 debug-cql
-rwxr-xr-x 1 ubuntu ubuntu 1392 Oct 2 2017 debug-cql.bat
-rwxr-xr-x 1 ubuntu ubuntu 3359 Oct 2 2017 nodetool
-rwxr-xr-x 1 ubuntu ubuntu 1513 Oct 2 2017 nodetool.bat
-rwxr-xr-x 1 ubuntu ubuntu 1957 Oct 2 2017 source-conf.ps1
-rwxr-xr-x 1 ubuntu ubuntu 2034 Oct 2 2017 sstableloader
-rwxr-xr-x 1 ubuntu ubuntu 1396 Oct 2 2017 sstableloader.bat
-rwxr-xr-x 1 ubuntu ubuntu 2042 Oct 2 2017 sstablescrib
-rwxr-xr-x 1 ubuntu ubuntu 1404 Oct 2 2017 sstablescrib.bat
-rwxr-xr-x 1 ubuntu ubuntu 2042 Oct 2 2017 sstableupgrade
-rwxr-xr-x 1 ubuntu ubuntu 1404 Oct 2 2017 sstableupgrade.bat
-rwxr-xr-x 1 ubuntu ubuntu 2045 Oct 2 2017 sstableutil
-rwxr-xr-x 1 ubuntu ubuntu 1407 Oct 2 2017 sstableutil.bat
-rwxr-xr-x 1 ubuntu ubuntu 2042 Oct 2 2017 sstableverify
-rwxr-xr-x 1 ubuntu ubuntu 1535 Oct 2 2017 sstableverify.bat
-rwxr-xr-x 1 ubuntu ubuntu 1175 Oct 2 2017 stop-server
-rwxr-xr-x 1 ubuntu ubuntu 2467 Oct 2 2017 stop-server.bat
-rwxr-xr-x 1 ubuntu ubuntu 6614 Oct 2 2017 stop-server.ps1
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ nodetool status
Datacenter: dc1
=====
Status=Up/Down
-- State=Normal/Leaving/Joining/Moving
-- Address Load Tokens Owns (effective) Host ID Rack
UN 172.31.46.155 176.42 KiB 256 100.0% 55c65c1a-dbb1-4a77-81f9-c1ca909f11dc r1 ✓

```

Follow the similar steps with the IP address updates in the nodes 2 and 3 according to the generated commands

### Node 2 Updates:

```

*** System restart required ***
Last login: Sun Jan 28 15:55:31 2018 from 106.200.196.203
ubuntu@ip-172-31-11-94:~$ cd /opt/
ubuntu@ip-172-31-11-94:/opt$ ls -al
total 24
drwxr-xr-x 6 ubuntu ubuntu 4096 Jan 28 2018 .
drwxr-xr-x 23 root root 4096 Jan 29 00:58 ..
drwxrwxr-x 10 ubuntu ubuntu 4096 Jan 28 2018 apache-cassandra-3.11.1
drwxr-xr-x 8 ubuntu ubuntu 4096 Dec 20 2017 jdk1.8.0_161-CassHasIssuesWith161
drwxr-xr-x 8 ubuntu ubuntu 4096 Apr 1 2016 jdk1.8.0_92
drwxrwxr-x 2 ubuntu ubuntu 4096 Jan 28 2018 softwares
ubuntu@ip-172-31-11-94:/opt$ cd apache-cassandra-3.11.1/conf/
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$ nano cassandra.yaml
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_IP_ADDRESS=172.31.11.94=g' cassandra.yaml
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_CLUSTER_NAME=GL-Cluster=g' cassandra.yaml
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_SEED_LIST=172.31.92.86=g' cassandra.yaml
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_DATACENTER=dc1=g' cassandra-rackdc.properties
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_RACK=r2=g' cassandra-rackdc.properties
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/conf$

```

Updated the seed node information in the Cassandra.yaml file manually



ubuntu@ip-172-31-11-94: /opt/apache-cassandra-3.11.1/conf

```
GNU nano 2.5.3 File: cassandra.yaml

- class_name: org.apache.cassandra.locator.SimpleSeedProvider
  parameters:
    # seeds is actually a comma-delimited list of addresses.
    # Ex: "<ip1>,<ip2>,<ip3>"
    - seeds: "172.31.46.155"

# For workloads with more data than can fit in memory, Cassandra's
# bottleneck will be reads that need to fetch data from
# disk. "concurrent_reads" should be set to (16 * number_of_drives) in
# order to allow the operations to enqueue low enough in the stack
# that the OS and drives can reorder them. Same applies to
# "concurrent_counter_writes", since counter writes read the current
# values before incrementing and writing them back.
#
```

Restart Cassandra from node 2 as the Security group is already defined for Cassandra port

```
ubuntu@ip-172-31-11-94: /opt/apache-cassandra-3.11.1/bin
[main] 2020-01-29 03:39:32,600 StorageService.java:606 - Token metadata:
[main] 2020-01-29 03:39:32,873 QueryProcessor.java:163 - Preloaded 0 prepared statements
[main] 2020-01-29 03:39:32,874 StorageService.java:617 - Cassandra version: 3.11.1
[main] 2020-01-29 03:39:32,879 StorageService.java:618 - Thrift API version: 20.1.0
[main] 2020-01-29 03:39:32,879 StorageService.java:619 - CQL supported versions: 3.4.4 (default: 3.4.4)
[main] 2020-01-29 03:39:32,880 StorageService.java:621 - Native protocol supported versions: 3/v3, 4/v4, 5/v5-beta (default: 4/v4)
[main] 2020-01-29 03:39:32,909 TokenMetadata.java:408 - Updating topology for all endpoints that have changed
[main] 2020-01-29 03:39:32,947 IndexSummaryManager.java:85 - Initializing index summary manager with a memory pool size of 49 MB and a resize interval of 60 minutes
[main] 2020-01-29 03:39:33,057 MessagingService.java:753 - Starting Messaging Service on /172.31.11.94:7000 (eth0)
WARN [main] 2020-01-29 03:39:33,068 SystemKeyspace.java:1089 - No host ID found, created 66bf846f-d0a8-4355-b87a-29413e1718a9 (Note: This should happen exactly once per node).
[main] 2020-01-29 03:39:33,119 OutboundTcpConnection.java:108 - OutboundTcpConnection using coalescing strategy DISABLED
[HANDSHAKE-/172.31.46.155] 2020-01-29 03:39:33,160 OutboundTcpConnection.java:560 - Handshaking version with /172.31.46.155
[main] 2020-01-29 03:39:34,187 StorageService.java:706 - Loading persisted ring state
[main] 2020-01-29 03:39:34,189 StorageService.java:819 - Starting up server gossip
[main] 2020-01-29 03:39:34,350 StorageService.java:1442 - JOINING: waiting for ring information
[HANDSHAKE-/172.31.46.155] 2020-01-29 03:39:35,247 OutboundTcpConnection.java:560 - Handshaking version with /172.31.46.155
[main] 2020-01-29 03:39:35,381 Gossiper.java:1067 - Node /172.31.46.155 is now part of the cluster
[RequestResponseStage:1] 2020-01-29 03:39:35,407 Gossiper.java:1031 - InetAddress /172.31.46.155 is now UP
[main] 2020-01-29 03:39:35,510 TokenMetadata.java:470 - Updating topology for /172.31.46.155
[main] 2020-01-29 03:39:35,511 TokenMetadata.java:470 - Updating topology for /172.31.46.155
[InternalResponseStage:1] 2020-01-29 03:39:36,021 ViewManager.java:137 - Not submitting build tasks for views in keyspace system_traces as storage service is not initialized
[InternalResponseStage:1] 2020-01-29 03:39:36,033 ColumnFamilyStore.java:408 - Initializing system_traces.events
[InternalResponseStage:1] 2020-01-29 03:39:36,042 ColumnFamilyStore.java:408 - Initializing system_traces.sessions
[InternalResponseStage:1] 2020-01-29 03:39:36,050 ViewManager.java:137 - Not submitting build tasks for views in keyspace system_distributed as storage service is not initialized
[InternalResponseStage:1] 2020-01-29 03:39:36,061 ColumnFamilyStore.java:408 - Initializing system_distributed.parent_repair_history
[InternalResponseStage:1] 2020-01-29 03:39:36,067 ColumnFamilyStore.java:408 - Initializing system_distributed.repair_history
[InternalResponseStage:1] 2020-01-29 03:39:36,075 ColumnFamilyStore.java:408 - Initializing system_distributed.view_build_status
[InternalResponseStage:1] 2020-01-29 03:39:36,082 ViewManager.java:137 - Not submitting build tasks for views in keyspace system_auth as storage service is not initialized
[InternalResponseStage:1] 2020-01-29 03:39:36,089 ColumnFamilyStore.java:408 - Initializing system_auth.resource_role_permissions_index
[InternalResponseStage:1] 2020-01-29 03:39:36,099 ColumnFamilyStore.java:408 - Initializing system_auth.role_members
[InternalResponseStage:1] 2020-01-29 03:39:36,103 ColumnFamilyStore.java:408 - Initializing system_auth.role_permissions
[InternalResponseStage:1] 2020-01-29 03:39:36,116 ColumnFamilyStore.java:408 - Initializing system_auth.roles
[main] 2020-01-29 03:39:36,351 StorageService.java:1442 - JOINING: waiting for schema information to complete
[main] 2020-01-29 03:39:36,392 StorageService.java:1442 - JOINING: schema complete, ready to bootstrap
[main] 2020-01-29 03:39:36,393 StorageService.java:1442 - JOINING: waiting for pending range calculation
[main] 2020-01-29 03:39:36,393 StorageService.java:1442 - JOINING: calculation complete, ready to bootstrap
[main] 2020-01-29 03:39:36,393 StorageService.java:1442 - JOINING: getting bootstrap token
[main] 2020-01-29 03:39:36,506 StorageService.java:1442 - JOINING: sleeping 30000 ms for pending range setup
```

```

INFO [StreamConnectionEstablisher:1] 2020-01-29 03:40:06.908 StreamCoordinator.java:264 - [Stream #0a8a19d0-4249-11ea-9feb-e9cf0f3fe5, ID#0] Beginning stream session with /172.31.46.155
INFO [STREAM-1N-/172.31.46.155:7000] 2020-01-29 03:40:07.071 StreamResultFuture.java:187 - [Stream #0a8a19d0-4249-11ea-9feb-e9cf0f3fe5] Session with /172.31.46.155 is complete
INFO [STREAM-1N-/172.31.46.155:7000] 2020-01-29 03:40:07.110 StreamResultFuture.java:219 - [Stream #0a8a19d0-4249-11ea-9feb-e9cf0f3fe5] All sessions completed
INFO [main] 2020-01-29 03:40:07.126 StorageService.java:1442 - JOINING: Finish joining ring
INFO [STREAM-1N-/172.31.46.155:7000] 2020-01-29 03:40:07.136 StorageService.java:1498 - Bootstrap completed! for the tokens [-1968436798599823741, -59108641193062485, -276592993918674607, 346608310630774477, -466431649087069008, 7324163818067972291, 258549451549212883, 912944117779921487, -255271217882893713, 33549595108881215, 93, -39981862058384258, 594504043203743935, 4179067321685470922, -472515867088038084, 93393722832668195539, -452609619841955319, 737871176664833527, 363719451088848323, 172621643, 218698410586640231, 3546029232324693906, 3954972732726998435, 9254244511787299018, 7140880686723857625, 278149178114339898, -47502636957563454, -5598917678, 6456579849, -2836311410656876343, 4114774698596169604, 6875780562216957, 6179363786551054052, -6629828470689880870, -896703569449186025, 382746888483793129, -5145876, 517788790428, -1905870389276716689, -6175254125526737382, -864319465538270933, -604376631604732566, -7888818590321658350, 366275905448871264, -432198053877344257, 41, 583170007127800462, -345573627435667798, 198866364023868994, -661130954027420826, -903028860674999313, 5248130773487767319, 600910185755525267, -4986357915906920397, 61551674809944236949, -52069931265103821, 3163629629552674007, -127691075090729609, 316530012178592323, 7942244974299173487, -678806806697174641, -6392769698734600, 9104, -8809427233236350821, -8923194645925172028, 6510024512566071696, 1645229036300877253, 1071908434269592897, 2018413459309904071, -3500655997763623, 62443487775500, 708128, 55079992685912718044, 325243129908960801, -8881739410694585863, 6189414177662921719, 96708341155647435, 533869636246406774, 331140785822230381, 361565516041, 8160983, -5999676895493748352, -378219212217171959, 384699179700831521, -454779805979457257, 21366831584088969, 103735765745833351, 800729635775623, 8057742424, 3721554793741053, -370901710582261232, 20935604784037784, 403472663654237388, 41324828059246354, 9150198768298213959, 4789315901404923680, -83051116738844267, 202525668077691908, 865226623749886260, 635015639808383671, 850512755847301761, -664028057419857388, -161233161330272724, -83627604158248264, 26177836984525932, 7, 2068629065563892743, -5226219827252214804, 1959044732705457059, -519736136598506864, -63202057551766260, 5429377907138886674, -376430911000613145, 9502889855801, 69538, -843758932426015311, -6971848632764002045, -6942689468624725811, -6708426013181857568, -790815318518049341, -264570595794192474, -40001354474759874, -8280051, 728804829299, 357122464794590380, 32019652391961984407, 132548513988530600, -116974917864313421, 1604309918061258106, -101681881064123430, -2659516342488295904, 25368, 328303540181262, 6080613157460412709, 1923389758180349695, 872095198749885766, -1169761796146309061, 76001518445135597, -731253305841913959, 891299394171239036, 75214, 34301864181896, 902364939786956212, 645171720798875474, -38217314214241785, 630359157866152346, -8213456430027846210, -16044825397328713, 8300401358424915, 32, 9719253118562831, 1443535085675456369, -4996953943273686185, 897764029349712140, -1318181159263479415, -846394190256211883, -4388536740081745640, 2862044197135038272, 317537258348710635, -520285120636202122, -465685764753160253, 7460802816008345051, 1587717758092126468, -783825645675807448, -800139506793542142, -17279535857312, 16208246716, -38519517089727400932, 1724160653702556134, 452446369800079681, -49045820829560586, 78178569494879371, 593081282033600961, -3201666674721817635, 170, 2724818042685508, -766242323848656431, -3875867686030098412, 8394158174405580297, 521081851946093971, -2874387354269604088, -3074963165421614033, 5801603575855679465, -34419761016590298969, -5886584524784226646, -673791103058371391, -2267435126058886215, 693438037190286324, 188417381875925543, 354072085491399311, -4524746825723000, 2698, -84616780847141147, -367797493726787008, -7581381066480018091, -728235514385363521, 
```

Checking the status from node 1, we see that 2 nodes are now linked to the cluster

```

ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ nodetool status
Datacenter: dc1
=====
Status=Up/Down
--/ State=Normal/Leaving/Joining/Moving
-- Address            Load           Tokens         Owns (effective)  Host ID                               Rack
UN 172.31.11.94        103.32 KiB    256            100.0%            66bf846f-d0a8-4355-b87a-29413e1718a9  r2
UN 172.31.46.155      181.37 KiB    256            100.0%            55c65c1a-dbb1-4a77-81f9-c1ca909f11dc  r1

```

### Node 3 Updates:

Node 3 has the Node 1 as the seed node updated in the Cassandra.yaml file and the P2P system gets created

```

*** System restart required ***
last login: Sun Jan 28 15:55:31 2018 from 106.200.196.203
ubuntu@ip-172-31-92-86:~$ cd /opt/
ubuntu@ip-172-31-92-86:/opt$ ls -al
total 24
drwxr-xr-x 6 ubuntu ubuntu 4096 Jan 28 2018 .
drwxr-xr-x 23 root root 4096 Jan 29 00:59 ..
drwxrwxr-x 10 ubuntu ubuntu 4096 Jan 28 2018 apache-cassandra-3.11.1
drwxr-xr-x 8 ubuntu ubuntu 4096 Dec 20 2017 jdk1.8.0_161-CassHasIssuesWith161
drwxr-xr-x 8 ubuntu ubuntu 4096 Apr 1 2016 jdk1.8.0_92
drwxrwxr-x 2 ubuntu ubuntu 4096 Jan 28 2018 softwares
ubuntu@ip-172-31-92-86:/opt$ cd apache-cassandra-3.11.1/conf
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_IP_ADDRESS=172.31.92.86=g' cassandra.yaml
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_CLUSTER_NAME=GL-Cluster=g' cassandra.yaml
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_SEED_LIST=172.31.46.155=g' cassandra.yaml
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_DATACENTER=dc1=g' cassandra-rackdc.properties
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_RACK=r3=g' cassandra-rackdc.properties
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/conf$ more cassandra-rackdc.properties
*** Licensed to the Apache Software Foundation (ASF) under one

```

## Start Cassandra and check the status from the bin folder

```
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/bin
INFO [main] 2020-01-29 03:46:48,975 IndexSummaryManager.java:85 - Initializing index summary manager with a memory pool size of 49 MB and a resize interval of 60 minutes
INFO [main] 2020-01-29 03:46:49,001 MessagingService.java:753 - Starting Messaging Service on /172.31.92.86:7000 (eth0)
WARN [main] 2020-01-29 03:46:49,010 SystemKeyspace.java:1089 - No host ID found, created 98c16c3f-abea-4997-9ee5-76f73771d6ec (Note: This should happen exactly once per node).
INFO [main] 2020-01-29 03:46:49,069 OutboundTcpConnection.java:108 - OutboundTcpConnection using coalescing strategy DISABLED
INFO [HANDSHAKE-/172.31.46.155] 2020-01-29 03:46:49,099 OutboundTcpConnection.java:560 - Handshaking version with /172.31.46.155
INFO [ScheduledTasks:1] 2020-01-29 03:46:49,275 TokenMetadata.java:498 - Updating topology for all endpoints that have changed
INFO [main] 2020-01-29 03:46:50,129 StorageService.java:706 - Loading persisted ring state
INFO [main] 2020-01-29 03:46:50,137 StorageService.java:819 - Starting up server gossip
INFO [main] 2020-01-29 03:46:50,301 StorageService.java:1442 - JOINING: waiting for ring information
INFO [HANDSHAKE-/172.31.46.155] 2020-01-29 03:46:51,195 OutboundTcpConnection.java:560 - Handshaking version with /172.31.46.155
INFO [GossipStage:1] 2020-01-29 03:46:51,404 Gossiper.java:1067 - Node /172.31.46.155 is now part of the cluster
INFO [RequestResponseStage:1] 2020-01-29 03:46:51,516 Gossiper.java:1031 - InetAddress /172.31.46.155 is now UP
INFO [GossipStage:1] 2020-01-29 03:46:51,621 TokenMetadata.java:479 - Updating topology for /172.31.46.155
INFO [GossipStage:1] 2020-01-29 03:46:51,622 TokenMetadata.java:479 - Updating topology for /172.31.46.155
INFO [GossipStage:1] 2020-01-29 03:46:51,628 Gossiper.java:1067 - Node /172.31.11.94 is now part of the cluster
INFO [HANDSHAKE-/172.31.11.94] 2020-01-29 03:46:51,650 OutboundTcpConnection.java:560 - Handshaking version with /172.31.11.94
INFO [RequestResponseStage:1] 2020-01-29 03:46:51,708 Gossiper.java:1031 - InetAddress /172.31.11.94 is now UP
INFO [GossipStage:1] 2020-01-29 03:46:51,746 TokenMetadata.java:479 - Updating topology for /172.31.11.94
INFO [GossipStage:1] 2020-01-29 03:46:51,747 TokenMetadata.java:479 - Updating topology for /172.31.11.94
INFO [HANDSHAKE-/172.31.11.94] 2020-01-29 03:46:51,754 OutboundTcpConnection.java:560 - Handshaking version with /172.31.11.94
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,142 ViewManager.java:137 - Not submitting build tasks for views in keyspace system_traces as storage service is not initialized
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,160 ColumnFamilyStore.java:408 - Initializing system_traces.events
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,167 ColumnFamilyStore.java:408 - Initializing system_traces.sessions
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,176 ViewManager.java:137 - Not submitting build tasks for views in keyspace system_distributed as storage service is not initialized
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,184 ColumnFamilyStore.java:408 - Initializing system_distributed.parent_repair_history
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,190 ColumnFamilyStore.java:408 - Initializing system_distributed.repair_history
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,202 ColumnFamilyStore.java:408 - Initializing system_distributed.view_build_status
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,206 ViewManager.java:137 - Not submitting build tasks for views in keyspace system_auth as storage service is not initialized
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,216 ColumnFamilyStore.java:408 - Initializing system_auth.resource_role_permissions_index
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,222 ColumnFamilyStore.java:408 - Initializing system_auth.role_members
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,229 ColumnFamilyStore.java:408 - Initializing system_auth.role_permissions
INFO [InternalResponseStage:1] 2020-01-29 03:46:52,283 ColumnFamilyStore.java:408 - Initializing system_auth.roles
INFO [main] 2020-01-29 03:46:53,302 StorageService.java:1442 - JOINING: waiting for schema information to complete
INFO [main] 2020-01-29 03:46:53,302 StorageService.java:1442 - JOINING: schema complete, ready to bootstrap
INFO [main] 2020-01-29 03:46:53,302 StorageService.java:1442 - JOINING: waiting for pending range calculation
INFO [main] 2020-01-29 03:46:53,302 StorageService.java:1442 - JOINING: calculation complete, ready to bootstrap
INFO [main] 2020-01-29 03:46:53,303 StorageService.java:1442 - JOINING: getting bootstrap token
INFO [main] 2020-01-29 03:46:53,364 StorageService.java:1442 - JOINING: sleeping 30000 ms for pending range setup
```

```
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/bin
with /172.31.46.155
INFO [STREAM-IN-/172.31.46.155:7000] 2020-01-29 03:47:23,875 StreamResultFuture.java:173 - [Stream #0eed5770-424a-11ea-b58d-692dd57b0279 ID#0] Prepare completed. Receiving 1 files(0.100KiB), sending 0 files(0.000KiB)
INFO [StreamReceiveTask:1] 2020-01-29 03:47:23,943 StreamResultFuture.java:187 - [Stream #0eed5770-424a-11ea-b58d-692dd57b0279] Session with /172.31.46.155 is complete
INFO [StreamReceiveTask:1] 2020-01-29 03:47:23,961 StreamResultFuture.java:219 - [Stream #0eed5770-424a-11ea-b58d-692dd57b0279] All sessions completed
INFO [main] 2020-01-29 03:47:23,969 StorageService.java:1442 - JOINING: Finish joining ring
INFO [StreamReceiveTask:1] 2020-01-29 03:47:23,972 StorageService.java:1498 - Bootstrap completed! for the tokens [3400496997940832059, -5339556328624742901, -43047086301009396736, -3687773552638765750, 98071407354333917, -1476218909718786349, 6075790640134309313, -8520570519962368912, -7049876577559738742, 3434320559786536219, 1260789391292877246, -6547299383300077438, -3815762253380195705, -4273037653157053963, -222655082689008901, 7289601654680234100, -4102042695452540163, -3757546325307454789, 5389093137987937052, -4595666290279980446, 2443904611351016762, 2777693912565570634, -5488086125635724186, 5838479602581066588, -2248114893927223112, -5427347359863951762, 5940923606794553737, -757719871495780675, 524012087953915669, 323652409145524149, -7436581422262768944, -5567748232588561070, 8421086269370457468, 427404804678017373, -8002347486461437991, 9218783135191439291, 8916496381842776332, -873769955727442881, -3274940553943864941, 2924143582878678481, 5053309475639549403, 7876580865149965914, 4622723134798974703, 7628027517988022669, -8222535399470958253, 5355031103420919540, 5006840986227722887, -3385686696690960314, 7545605284023828316, -5911968270429255110, 2891564994190718719, 1947815498443428916, -5420709286661006636, 5361017722847080425, -8584551565776130431, -3520343324556600429, -877721287411744305, -8415724919325367895, 7597420093445250933, 1659008047767616122, -5366726650728751157, -4062356740956712539, -4866900529254887598, 2239908984454822803, -8085165386888631961, -520331938336199092, -6823829141691922496, -8506758566944358676, -6746861913731475610, -7364621173223789208, 7879948294243183663, 6544206681886611854, -79732202567905593, 04, -8735420130745058036, -3874253630310980048, 5489480146617392398, 763073721761247853, -7595945968675595907, -4058561562606763007, -1233219720856544492, -159190684747576411, -7122310550759795702, -4517218152853271081, 8000491876879419031, 5339150491111717566, 4707759730627622461, -4836357309642911937, 52110710228179537, -2008066221092684128, -1223497892305125571, -3601732653572085635, -6240463949483112516, -2958085236759259943, -6949643203692134705, -7548125093887781588, 2015863252498994510, -3682406542204398652, -452550503304676576, 6848227662455955144, 3955204189681483010, -325026090325466802, -3911087935090797915, -4854973655021408357, -7913014138699581143, -32180390923245213, -3334416350698160231, -6843989334537932799, -2812125046612825762, -937890173181929267, 7322211913635888591, 4722759958197472628, 2301182289643244964, 7, 7078582540145366275, -19298121891512148054, -4205390361000346517, -1875046732925626510, -3329399304521564307, -6636975624021952034, 8873618395446672284, 8522403760865896798, -3342270990804850956, -2382093887374935693, 2786994992313567408, -6286928218156748187, 5577939396563270442, 6623484935621560734, 673145247685592331, -2857687122434574831, -6437387565467713512, 5033504281372389578, 8587245387123298672, 701994808296007110, -1074106820734458058, -3022738118857116884, 748958396795996317, 1641269703582311570, 6984649003744891484, -2891106465902169857, -6048792533115723684, -40491404527576117276, -3573115863771713010, 1330451675135163249, -7667990137856441560, 713947801540146256, -1873697962332670570, -9139357746967950234, -3343565072587855065, 4734841530864389384, -1903615177980232223, 8558549610053340572, -500391364726245617, -1529305509511963875, 4555440569089966868, 4142838330223474954, -2639788057811884275, 5134844946149946840, -2548889760036090718, 7796998848807654252, 1990926346768193905, -2739531669302486275, 4453697441757735878, 8850331827315232001, -2397491420593471296, -6121790432093069323, 1578754902270008597, 6394116249709841831, -1413345801477998015, -589189375638044513, 1657829601102285654, 3462499234408939504, 5981240970466129431, -9044147307539392759, 5150271884306147445, -7106883889457853893, 103572794890436382, -5306195647076969089, 1856365254447539816, -6120154883440646699, 8131761130700901345, -3779370952152643457, 3330958590466023452, 3909917677968472350, 7371462237422797831, 8433632771663950622, 2940830362877613659, -8756727211156284958, -6279679940260931459, -5550552297010625294, 1748844866407908237, 5051035796707241741, -434607694429699329, 5713616179206131459, -1445564379500680799, 8855987116832208017, -7136805862194497849, -5444994264265935896, 6088475499337837708, 1924030193055145566, 6772593996536324007, 7589025813632376890, -7766166698608939202, 171113223545746588, 4552475520384282203, 8955581362458574962, -5496103546119056095, -592177639835656584, -2068641881934927832, 549578653115057632, -9139215825125736226, -504206567840752076, -4066742924951828038, -8228732479253832857, 6821543771536071887, -21432121010360190368, -708978384805291474, 7173981691167333920, -3490871199537870337, 3146027044481501195, -1225475251495536619, 6987961162043628343, 555953368881824075, -7167610125191316975, 2883572977688370840, -1943259560829881554, 6380551653296790380, 60518814718572713, 1016305098130474683, 1968892375582543912, -8354977678632834288, 291218047914128530, 836864005703296110, -549437382778871286, -6917657046982723289, 1893390901037150459, 1286237596559137773, 2499071485522788489, 5968491426651283167, 6962120017493692509, 8635440390995943334, 4672264528011890219, -1745224569156273785, 6778021673036392448, -8515658095685620780, 145251157327935067, 1718147533965042180, 3950930844333504938, 8658490695940515361, -8584251373172189565, -6617857704204580243, -73778334116289046, -2448393690972061100, 2875396956003972230, -1720203763492891733, 6847739873704266171, 2795805778366558520, -5211000238390325007]
INFO [main] 2020-01-29 03:47:24,090 AuthCache.java:172 - (Re)initializing credentialsCache (validity period/update interval/max entries) (2000/2000/1000)
INFO [main] 2020-01-29 03:47:24,094 Gossiper.java:1655 - Waiting for gossip to settle...
INFO [main] 2020-01-29 03:47:32,100 Gossiper.java:1686 - No gossip backlog; proceeding
```

The nodetool status will now show the same status across all three nodes

## Summary of the Cassandra ring cluster:

### From Node 3:

```
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/bin$ nodetool status
Datacenter: dc1
=====
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
-- Address      Load          Tokens       Owns (effective)  Host ID                               Rack
UN 172.31.11.94  103.32 KiB    256          63.5%             66bf846f-d0a8-4355-b87a-29413e1718a9  r2
UN 172.31.46.155 181.37 KiB    256          70.0%             55c65c1a-dbb1-4a77-81f9-c1ca909f11dc  r1
UN 172.31.92.86   89.35 KiB     256          66.4%             98c16c3f-abea-4997-9ee5-76f73771d6ec  r3
```

### From Node 2:

```
ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/bin$ nodetool status
Datacenter: dc1
=====
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
-- Address      Load          Tokens       Owns (effective)  Host ID                               Rack
UN 172.31.11.94  103.32 KiB    256          63.5%             66bf846f-d0a8-4355-b87a-29413e1718a9  r2
UN 172.31.46.155 181.37 KiB    256          70.0%             55c65c1a-dbb1-4a77-81f9-c1ca909f11dc  r1
UN 172.31.92.86   89.35 KiB     256          66.4%             98c16c3f-abea-4997-9ee5-76f73771d6ec  r3

ubuntu@ip-172-31-11-94:/opt/apache-cassandra-3.11.1/bin$
```

### From Node 1:

```
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ nodetool status
Datacenter: dc1
=====
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
-- Address      Load          Tokens       Owns (effective)  Host ID                               Rack
UN 172.31.11.94  103.32 KiB    256          63.5%             66bf846f-d0a8-4355-b87a-29413e1718a9  r2
UN 172.31.46.155 181.37 KiB    256          70.0%             55c65c1a-dbb1-4a77-81f9-c1ca909f11dc  r1
UN 172.31.92.86   89.35 KiB     256          66.4%             98c16c3f-abea-4997-9ee5-76f73771d6ec  r3

ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$
```

-----End of How to do it – 1-----



## How to do it - Steps 1 to 11:

### 1. Login to cqlsh in the 1<sup>st</sup> terminal window

Got a successful output of the GL-Cluster from terminal 1 as below

```
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ nodetool status
Datacenter: dc1
=====
Status=Up/Down
-- State=Normal/Leaving/Joining/Moving
-- Address      Load      Tokens     Owns (effective)  Host ID                               Rack
UN 172.31.11.94  103.32 KiB  256        63.5%             66bf846f-d0a8-4355-b87a-29413e1718a0  r2
UN 172.31.46.155 181.37 KiB  256        70.0%             55c65c1a-dbb1-4a77-81f9-c1ca080f11dc  r1
UN 172.31.92.86  89.35 KiB  256        66.4%             98c16c3f-abea-4997-9ee5-76f73771d6ec  r3

ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ cqlsh
Connection error: ('Unable to connect to any servers', {'127.0.0.1': error(111, "Tried connecting to [('127.0.0.1', 9042)]. Last error: Connection refused")})
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ hostname -I
172.31.46.155
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ cqlsh 'hostname-I' -u cassandra -p cassandra
Traceback (most recent call last):
  File "/opt/apache-cassandra-3.11.1/bin/cqlsh.py", line 2434, in <module>
    main(*read_options(sys.argv[1:], os.environ))
  File "/opt/apache-cassandra-3.11.1/bin/cqlsh.py", line 2413, in main
    encoding=options.encoding)
  File "/opt/apache-cassandra-3.11.1/bin/cqlsh.py", line 479, in __init__
    load_balancing_policy=WhitelistRoundRobinPolicy([self.hostname])),
  File "/opt/apache-cassandra-3.11.1/bin/./lib/cassandra-driver-internal-only-3.10.zip/cassandra-driver-3.10/cassandra/policies.py", line 417, in __init__
    socket.gaierror: [Errno -2] Name or service not known
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ cqlsh 172.31.46.155 -u cassandra -p cassandra
Connected to GL-Cluster at 172.31.46.155:9042.
[cqlsh 5.0.1 | Cassandra 3.11.1 | CQL spec 3.4.4 | Native protocol v4]
Use HELP for help.
cassandra@cqlsh>
```

### 2. Ensure the 'System\_Auth' keyspace replication is changed

```
Connected to GL-Cluster at 172.31.46.155:9042.
[cqlsh 5.0.1 | Cassandra 3.11.1 | CQL spec 3.4.4 | Native protocol v4]
Use HELP for help.
cassandra@cqlsh> ALTER KEYSPACE "system_auth" WITH REPLICATION = {'class':'NetworkTopologyStrategy', 'dc1':3};
cassandra@cqlsh>
```

### 3, 4, 5. Create a KEYSPACE and a sample table and insert two records into the table

```
Connected to GL-Cluster at 172.31.46.155:9042.
[cqlsh 5.0.1 | Cassandra 3.11.1 | CQL spec 3.4.4 | Native protocol v4]
Use HELP for help.
cassandra@cqlsh> ALTER KEYSPACE "system_auth" WITH REPLICATION = {'class':'NetworkTopologyStrategy', 'dc1':3};
cassandra@cqlsh>
cassandra@cqlsh> CREATE KEYSPACE IF NOT EXISTS startfleet WITH replication = {'class':'NetworkTopologyStrategy', 'dc1':3};
cassandra@cqlsh>
cassandra@cqlsh> describe keyspace startfleet;

CREATE KEYSPACE startfleet WITH replication = {'class': 'NetworkTopologyStrategy', 'dc1': '3'} AND durable_writes = true;
cassandra@cqlsh>
```

```
cassandra@cqlsh> CREATE TABLE startfleet.user (
... user_id VARCHAR,
... location VARCHAR,
... display_name VARCHAR,
... first_name VARCHAR,
... last_name VARCHAR,
... PRIMARY KEY (user_id, location)
... );
cassandra@cqlsh>
cassandra@cqlsh> INSERT INTO startfleet.user(user_id,location,display_name,first_name,last_name)
... VALUES('u1','earth1','Kirk','William','Shatner');
cassandra@cqlsh> INSERT INTO startfleet.user(user_id,location,display_name,first_name,last_name)
... VALUES('u2','vulcan','Spock','Leonard','Nimoy');
cassandra@cqlsh>
cassandra@cqlsh> select * from startfleet.user;

 user_id | location | display_name | first_name | last_name
-----|-----|-----|-----|-----
      u2 |  vulcan |      Spock |  Leonard |  Nimoy
      u1 |  earth1 |      Kirk |  William |  Shatner

(2 rows)
cassandra@cqlsh>
```

6. Check the consistency level
7. Update the Consistency level to ALL
8. Run a select query for the user\_id = 'u2' in AZ1

```

user_id | location | display_name | first_name | last_name
-----+-----+-----+-----+-----
      u2 |  vulcan |      Spock |   Leonard |   Nimoy
      u1 |  earth1 |      Kirk |   William |   Shatner
(2 rows)
cassandra@cqlsh> CONSISTENCY;
Current consistency level is ONE.
cassandra@cqlsh> CONSISTENCY ALL;
Consistency level set to ALL.

```

```

cassandra@cqlsh> select * from startfleet.user where user_id='u2';

user_id | location | display_name | first_name | last_name
-----+-----+-----+-----+-----
      u2 |  vulcan |      Spock |   Leonard |   Nimoy
(1 rows)
cassandra@cqlsh>

```

9. Shut down a node in AZ3 using Nodetool

Execute the below command in Node 3

Nodetool stopdaemon

```

ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/bin$ nodetool status
Datacenter: dc1
=====
|/ State=Up/Down|
-- Address      Load      Tokens     Owns (effective)  Host ID                               Rack
UN 172.31.11.94  285.65 KiB  256        100.0%            66bf846f-d0a8-4355-b87a-29413e1718a9  r2
UN 172.31.46.155 321.1 KiB  256        100.0%            55c65c1a-dbb1-4a77-81f9-c1ca909f11dc  r1
UN 172.31.92.86  265.99 KiB  256        100.0%            98c16c3f-abea-4997-9ee5-76f73771d6ec  r3

ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/bin$ nodetool stopdaemon
WARN 06:07:35,141 Small commitlog volume detected at /opt/cassandra-data/commitlog; setting commitlog_total_space_in_mb to 1969. You can override this in cassandra.yaml
WARN 06:07:35,145 Small cdc volume detected at /opt/cassandra-data/cdc_raw; setting cdc_total_space_in_mb to 984. You can override this in cassandra.yaml
WARN 06:07:35,145 Only 5.206GiB free across all data volumes. Consider adding more capacity to your cluster or removing obsolete snapshots
Cassandra has shutdown.
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/bin$ nodetool status
nodetool: Failed to connect to '127.0.0.1:7199' - ConnectException: 'Connection refused'.
ubuntu@ip-172-31-92-86:/opt/apache-cassandra-3.11.1/bin$

```

10. Run a select query again for the user\_id = 'u2' in AZ1

```

user_id | location | display_name | first_name | last_name
-----+-----+-----+-----+-----
      u2 |  vulcan |      Spock |   Leonard |   Nimoy
(1 rows)
cassandra@cqlsh> select * from startfleet.user where user_id='u2';
NoHostAvailable:
cassandra@cqlsh>

```

11. We get an output that NoHostAvailable after shutting down AZ3 (Observation)

12. Change the Consistency to QUORUM

13. Run the select query on user\_id 'u2' again

```
(1 rows)
cassandra@cqlsh> select * from startfleet.user where user_id='u2';
NoHostAvailable:
cassandra@cqlsh> CONSISTENCY QUORUM;
Consistency level set to QUORUM.
cassandra@cqlsh> select * from startfleet.user where user_id='u2';

user_id | location | display_name | first_name | last_name
-----+-----+-----+-----+-----
u2      | vulcan   | Spock       | Leonard    | Nimoy

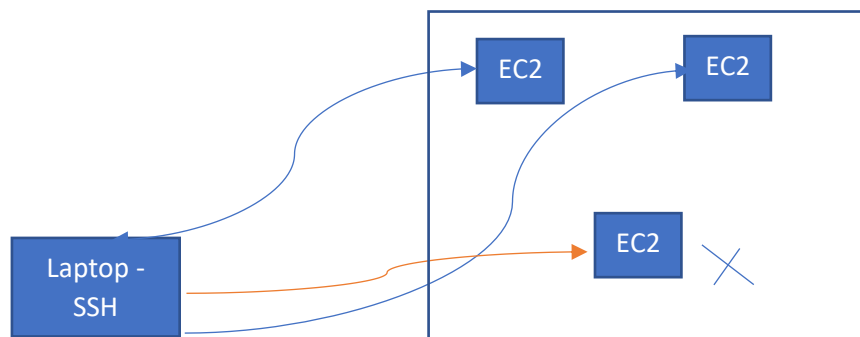
(1 rows)
cassandra@cqlsh>
```

14. Observation: Now the output becomes available that incidents QUORUM consistency is more reliable for availability than ALL even if one of the nodes goes down

```
user_id | location | display_name | first_name | last_name
-----+-----+-----+-----+-----
u2      | vulcan   | Spock       | Leonard    | Nimoy

(1 rows)
cassandra@cqlsh> nodetool status
...
[1]+  Stopped                  cqlsh 172.31.46.155 -u cassandra -p cassandra
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ nodetool status
Datacenter: dc1
=====
Status=Up/Down
--/ State=Normal/Leaving/Joining/Moving
-- Address          Load        Tokens      Owns (effective)  Host ID                               Rack
UN 172.31.11.94      343.38 KiB  256         100.0%            66bf846f-d0a8-4355-b87a-29413e1718a9  r2 ✓
UN 172.31.46.155    385.27 KiB  256         100.0%            55c65c1a-dbb1-4a77-81f9-c1ca909f11dc  r1 ✓
DN 172.31.92.86     265.99 KiB  256         100.0%            98c16c3f-abea-4997-9ee5-76f73771d6ec  r3 ✗
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$
```

The Final goal as per the below diagram is met





### **How to do it – 3 (Advanced)**

Q1 : Which of the following will give a wide row and its justification

Primary Key ((event type, date), created\_hh, created\_min, created\_nn)) – This combination will give a wide row where

- Event type, date acts as the Partition / Row key
- Created\_hh, created\_min and created\_nn together forms the clustering columns
- All these columns together forms the primary key and it will give value at a second level

Wide row:

Data grows per partition key which has a combination of both event type and date. Transmission can happen based on the clustering columns of 24 hrs, 60 mins and 60 seconds (24x60x60)

Larger the partition, wider the row format

Q2: Topology justification

Horizontal scalability is better than the vertical scalability with the distributed systems. N3 is the best performing node here as there is a lot of partitions that can be included in the node out of the list in the diagram assuming Y axis is memory and x axis is CPU

Q3: Can the Partitioner be changed in Cassandra cluster with no impact?

No, there will be impact if the partitioner changes in Cassandra cluster. Murmur3 hashing algorithm can be used as partitioners in Cassandra clusters which receives both Key and Value. The status of the cluster will not be easy to retrieve if the partitioner gets changed and hence the replication factor cannot be met. Hence there will be a major impact if this gets changed