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

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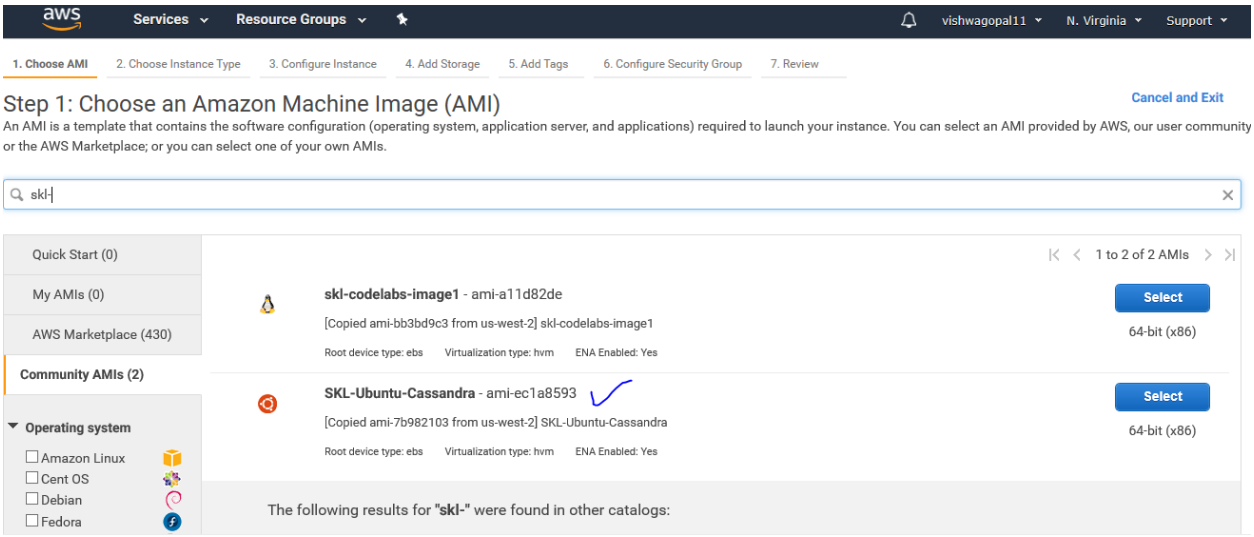
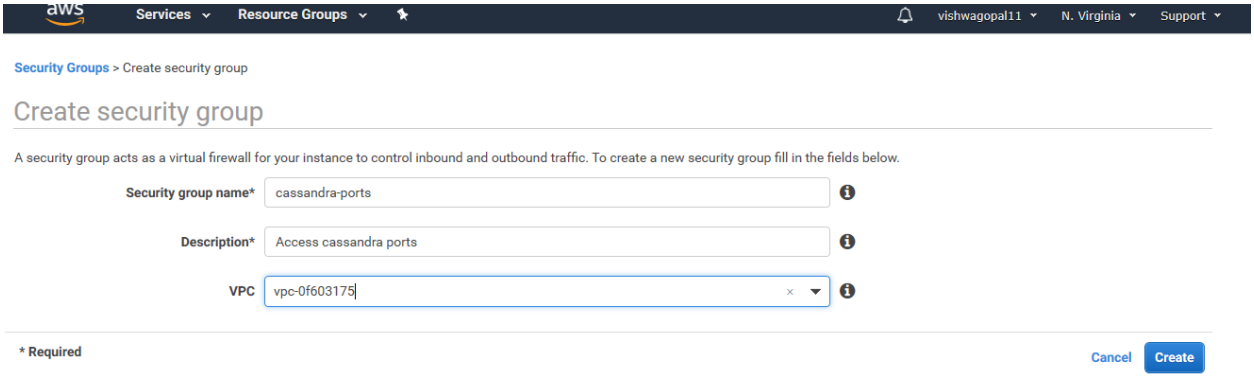
Batch: PGPCC_OCT19A

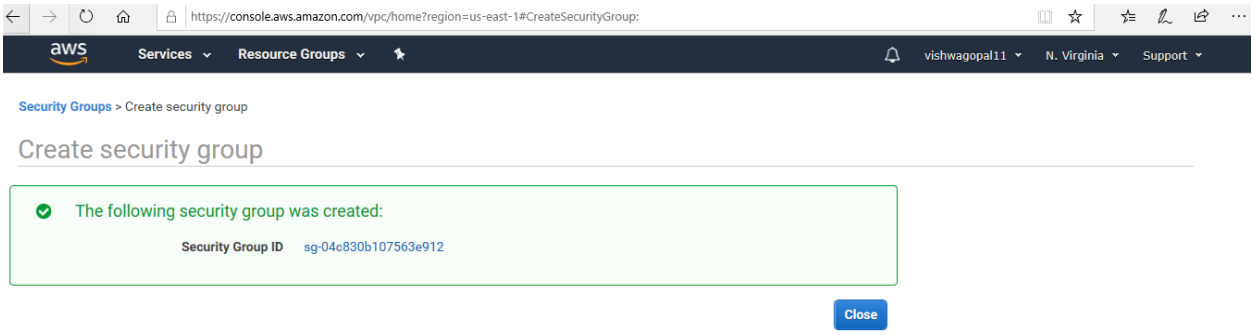
How to do it – 1

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



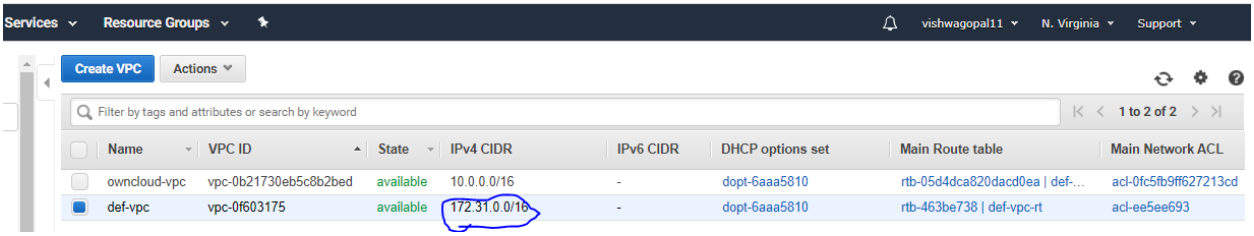
- Create a Security Group as Cassandra-ports and assign it to the default-vpc

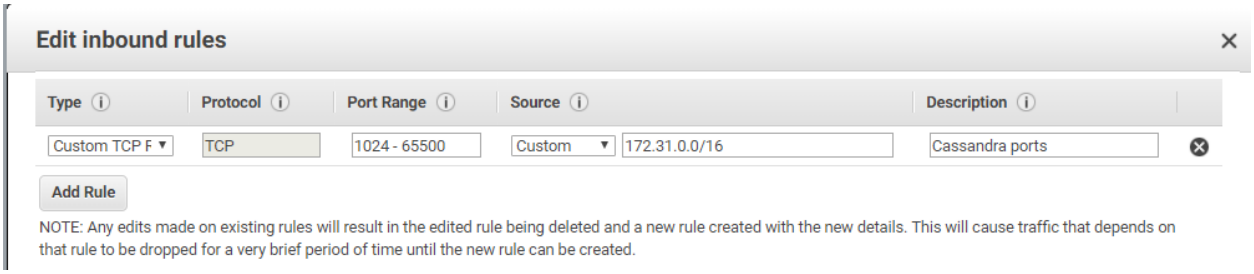


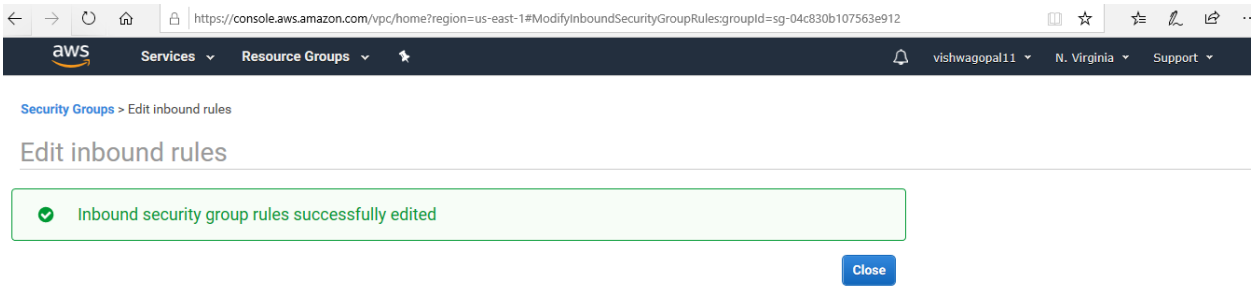


Edit the Inbound rules to allow Custom-TCP traffic with the port range of 1024-65500

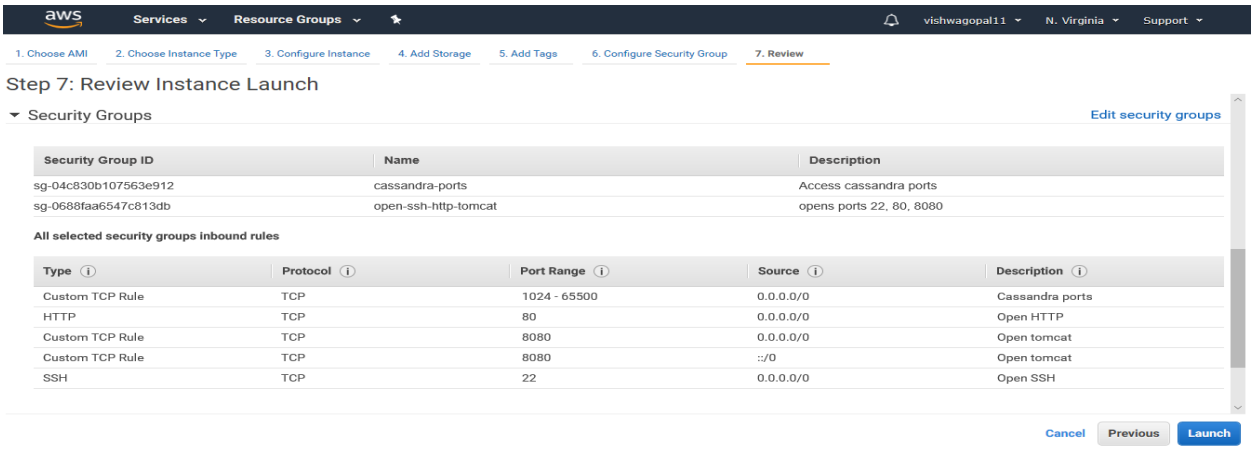
Take the CIDR Block of the Default VPC and assign it to the Cassandra-ports Security group created



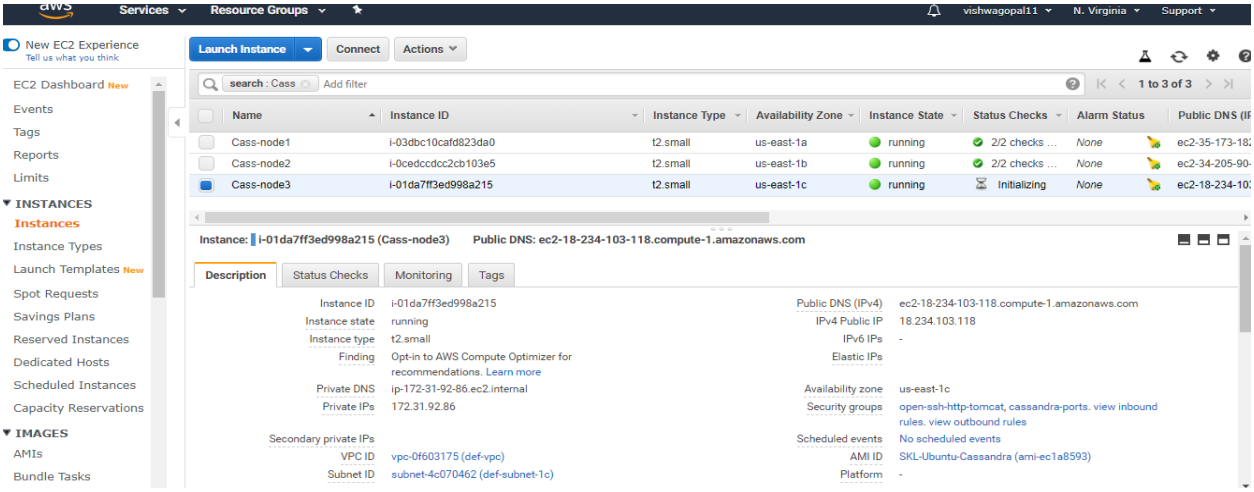




Assign the ssh and Cassandra security ports to the EC2 instance being created and launch the instance

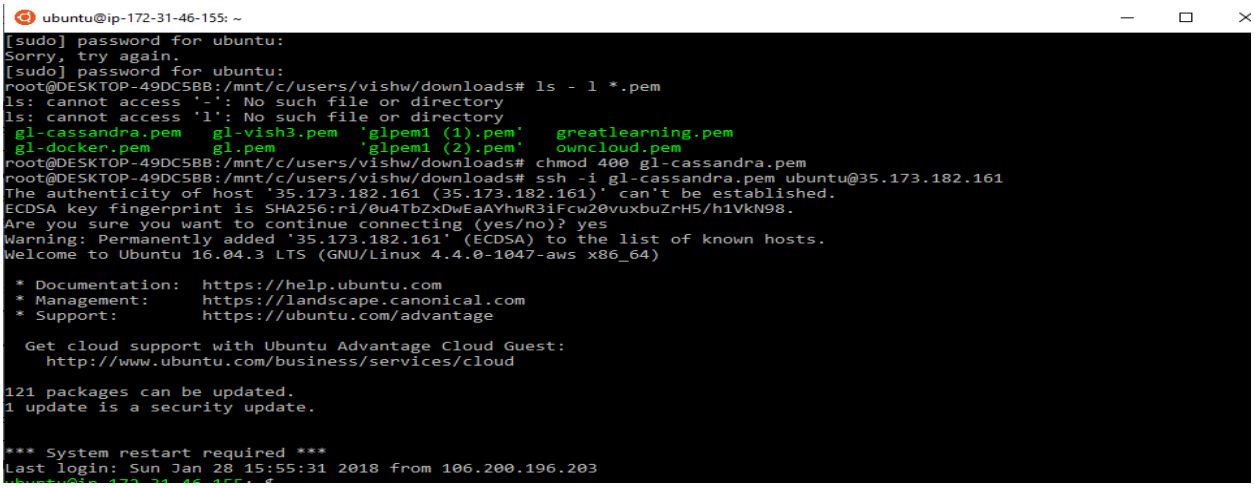


Download the keypair gl-cassandra.pem and launch the instance Cass-node1 in availability zone US-east-1a. Follow the same instructions to create two more EC2 instances Cass-node2 and Cass-node3 in availability zones US-east-1b and US-east-1c respectively

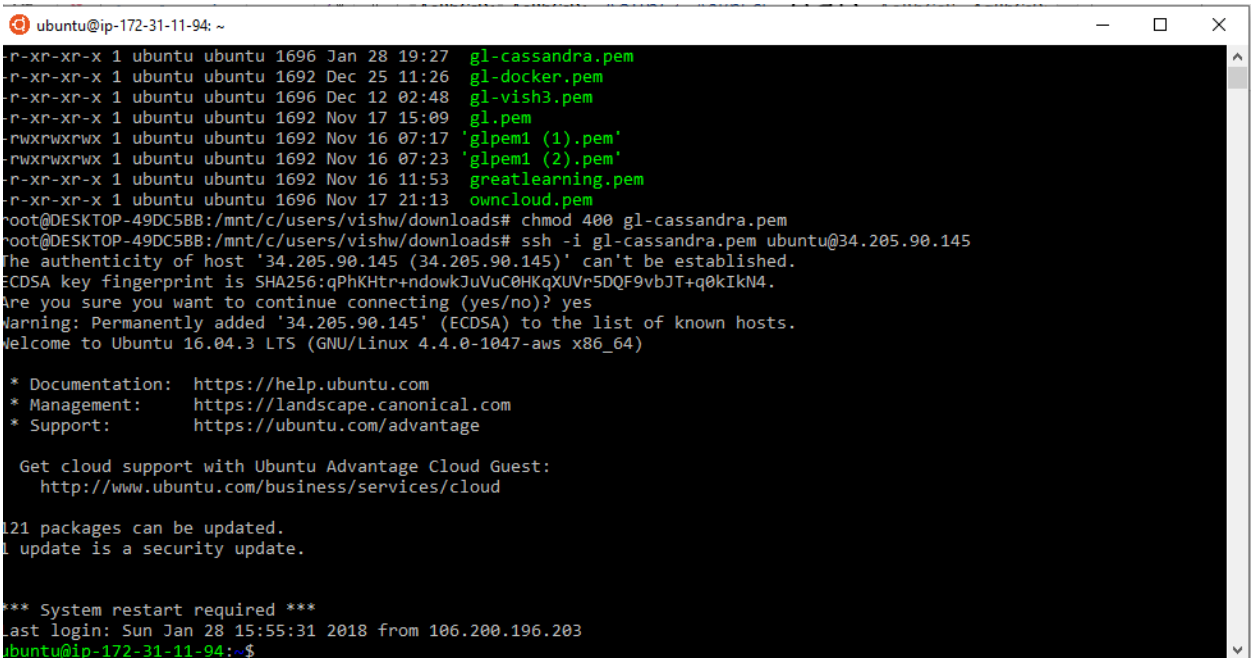


SSHed into the three instances created and ensured that they are working fine

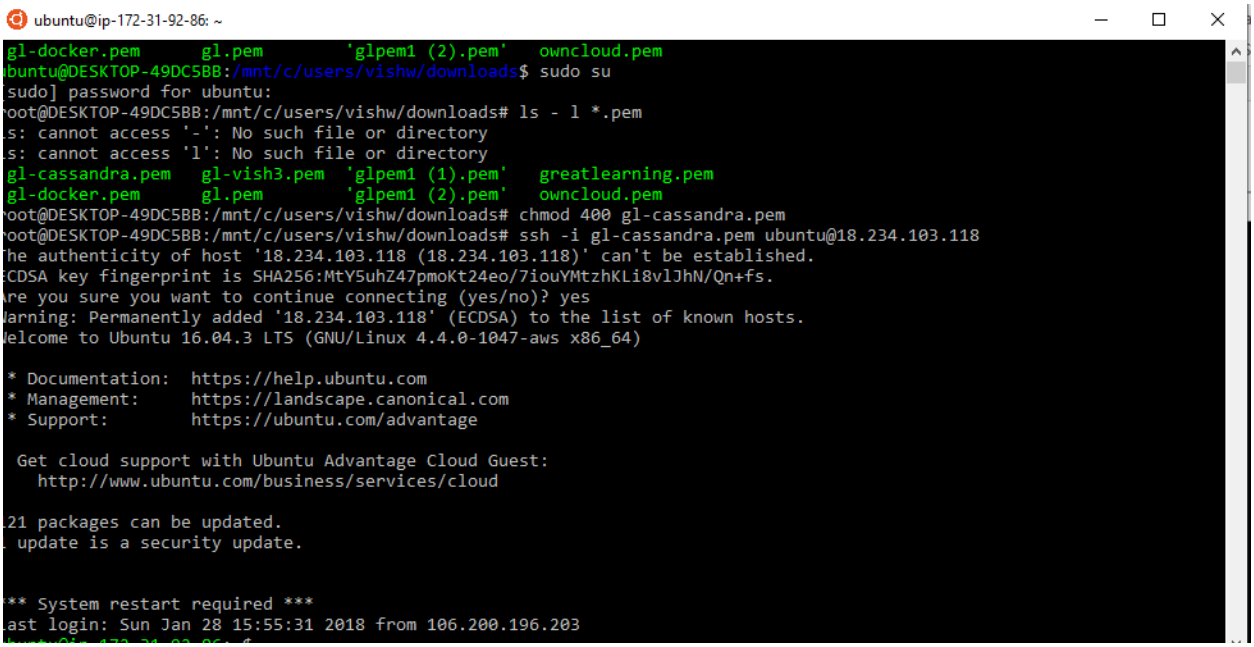
Cass-node1: ipV4 Public IP: 35.173.182.161



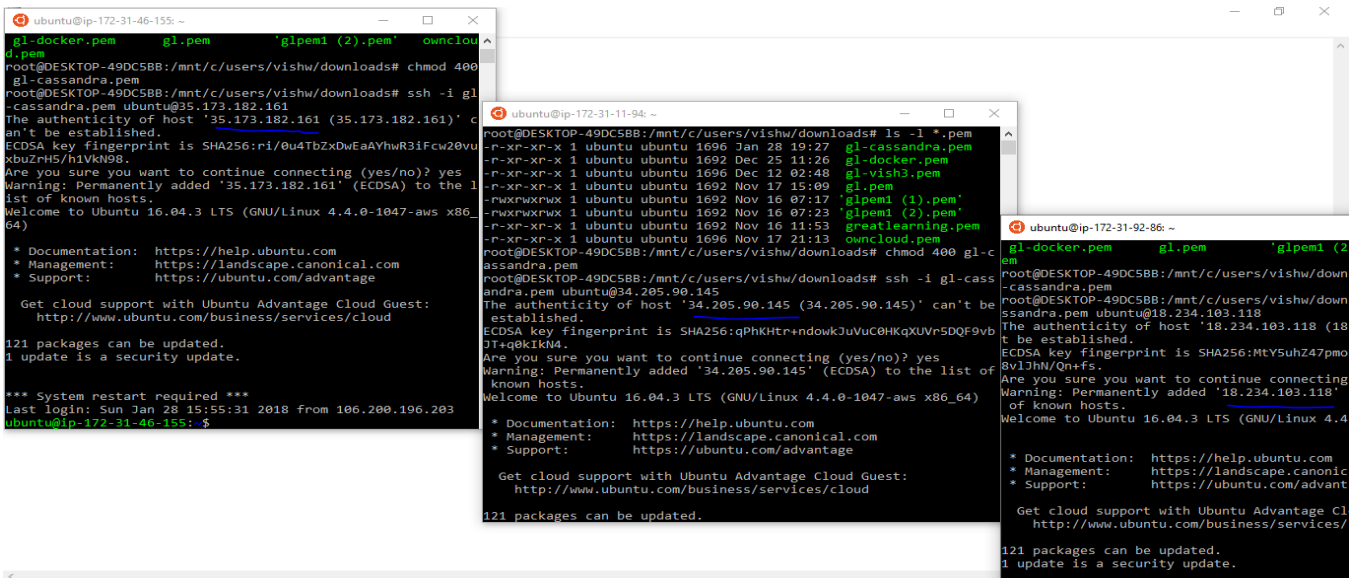
Cass-node2: ipV4 Public IP: 34.205. 90.145



Cass-node3: ipV4 Public IP: 18.234.103.118



All 3 terminal windows are now open parallelly

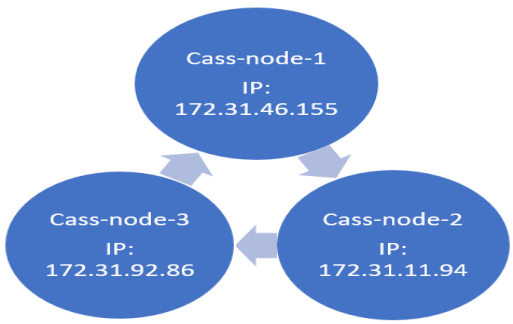


Creating a Cassandra ring cluster:

- Create a Cassandra cluster using the Private IP of the EC instances and update the Seed IP with the heighted 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
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# 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
#
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# 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
```
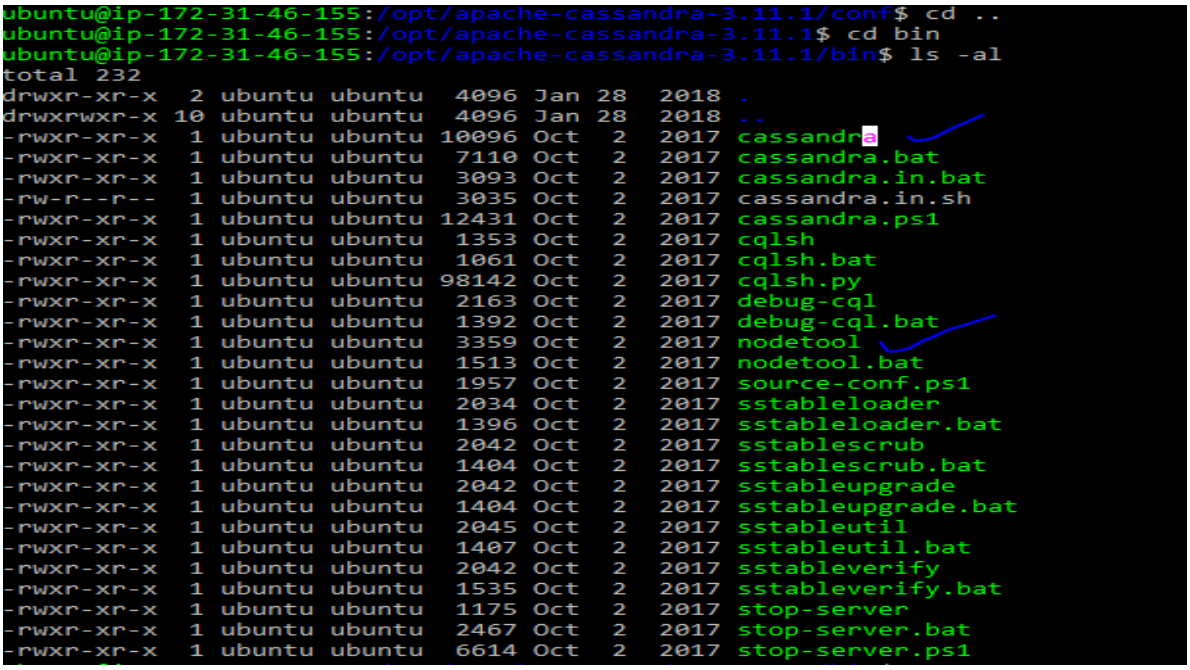

- Use the below commands to startup all the 3 cassandra nodes using the below commands from the bin folder

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/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 sstablescrub
-rwxr-xr-x  1 ubuntu ubuntu  1404 Oct  2  2017 sstablescrub.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

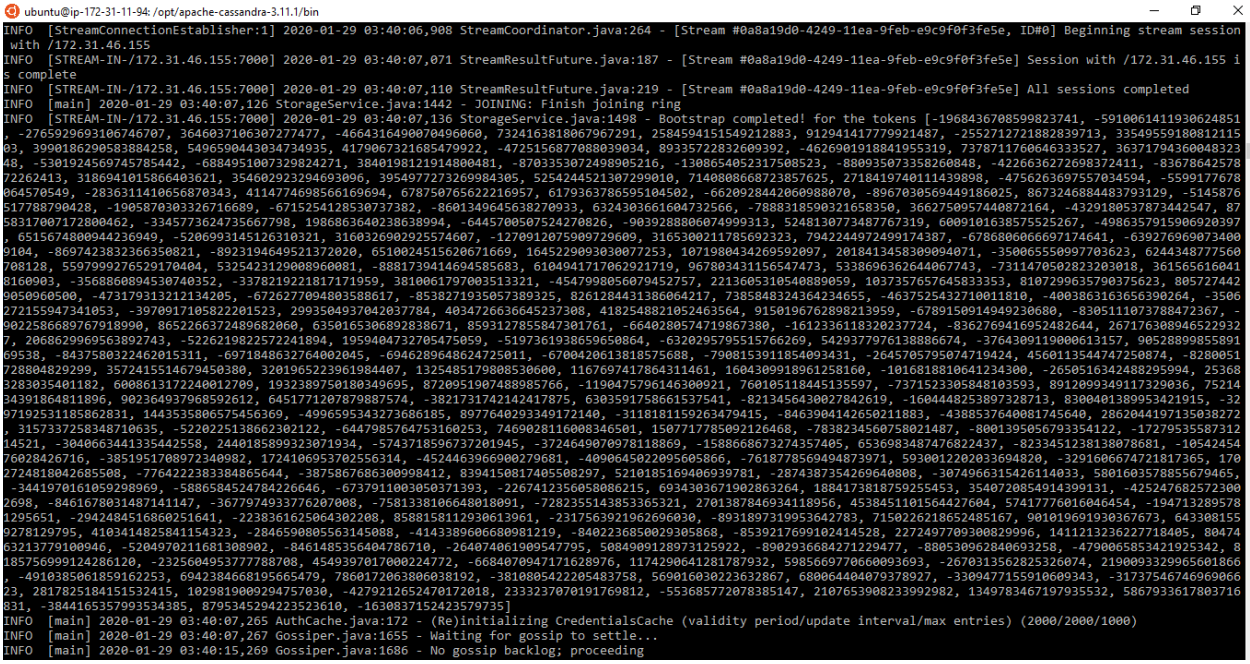
ubuntu@ip-172-31-11-94: /opt/apache-cassandra-3.11.1/conf

```
 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

```
INFO  [main] 2020-01-29 03:39:32,600 StorageService.java:606 - Token metadata:
INFO  [main] 2020-01-29 03:39:32,873 QueryProcessor.java:163 - Preloaded 0 prepared statements
INFO  [main] 2020-01-29 03:39:32,874 StorageService.java:617 - Cassandra version: 3.11.1
INFO  [main] 2020-01-29 03:39:32,879 StorageService.java:618 - Thrift API version: 20.1.0
INFO  [main] 2020-01-29 03:39:32,879 StorageService.java:619 - CQL supported versions: 3.4.4 (default: 3.4.4)
INFO  [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)
INFO  [ScheduledTasks:1] 2020-01-29 03:39:32,909 TokenMetadata.java:498 - Updating topology for all endpoints that have changed
INFO  [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 minut
es
INFO  [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 pe
r node).
INFO  [main] 2020-01-29 03:39:33,119 OutboundTcpConnection.java:108 - OutboundTcpConnection using coalescing strategy DISABLED
INFO  [HANDSHAKE-/172.31.46.155] 2020-01-29 03:39:33,160 OutboundTcpConnection.java:560 - Handshaking version with /172.31.46.155
INFO  [main] 2020-01-29 03:39:34,187 StorageService.java:706 - Loading persisted ring state
INFO  [main] 2020-01-29 03:39:34,189 StorageService.java:819 - Starting up server gossip
INFO  [main] 2020-01-29 03:39:34,350 StorageService.java:1442 - JOINING: waiting for ring information
INFO  [HANDSHAKE-/172.31.46.155] 2020-01-29 03:39:35,247 OutboundTcpConnection.java:560 - Handshaking version with /172.31.46.155
INFO  [GossipStage:1] 2020-01-29 03:39:35,381 Gossiper.java:1067 - Node /172.31.46.155 is now part of the cluster
INFO  [RequestResponseStage-1] 2020-01-29 03:39:35,407 Gossiper.java:1031 - InetAddress /172.31.46.155 is now UP
INFO  [GossipStage:1] 2020-01-29 03:39:35,510 TokenMetadata.java:479 - Updating topology for /172.31.46.155
INFO  [GossipStage:1] 2020-01-29 03:39:35,511 TokenMetadata.java:479 - Updating topology for /172.31.46.155
INFO  [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
INFO  [InternalResponseStage:1] 2020-01-29 03:39:36,033 ColumnFamilyStore.java:408 - Initializing system_traces.events
INFO  [InternalResponseStage:1] 2020-01-29 03:39:36,042 ColumnFamilyStore.java:408 - Initializing system_traces.sessions
INFO  [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
INFO  [InternalResponseStage:1] 2020-01-29 03:39:36,061 ColumnFamilyStore.java:408 - Initializing system_distributed.parent_repair_history
INFO  [InternalResponseStage:1] 2020-01-29 03:39:36,067 ColumnFamilyStore.java:408 - Initializing system_distributed.repair_history
INFO  [InternalResponseStage:1] 2020-01-29 03:39:36,075 ColumnFamilyStore.java:408 - Initializing system_distributed.view_build_status
INFO  [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 in
itialized
INFO  [InternalResponseStage:1] 2020-01-29 03:39:36,089 ColumnFamilyStore.java:408 - Initializing system_auth.resource_role_permissons_index
INFO  [InternalResponseStage:1] 2020-01-29 03:39:36,099 ColumnFamilyStore.java:408 - Initializing system_auth.role_members
INFO  [InternalResponseStage:1] 2020-01-29 03:39:36,103 ColumnFamilyStore.java:408 - Initializing system_auth.role_permissions
INFO  [InternalResponseStage:1] 2020-01-29 03:39:36,116 ColumnFamilyStore.java:408 - Initializing system_auth.roles
INFO  [main] 2020-01-29 03:39:36,351 StorageService.java:1442 - JOINING: waiting for schema information to complete
INFO  [main] 2020-01-29 03:39:36,392 StorageService.java:1442 - JOINING: schema complete, ready to bootstrap
INFO  [main] 2020-01-29 03:39:36,393 StorageService.java:1442 - JOINING: waiting for pending range calculation
INFO  [main] 2020-01-29 03:39:36,393 StorageService.java:1442 - JOINING: calculation complete, ready to bootstrap
INFO  [main] 2020-01-29 03:39:36,393 StorageService.java:1442 - JOINING: getting bootstrap token
INFO  [main] 2020-01-29 03:39:36,506 StorageService.java:1442 - JOINING: sleeping 30000 ms for pending range setup
```



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

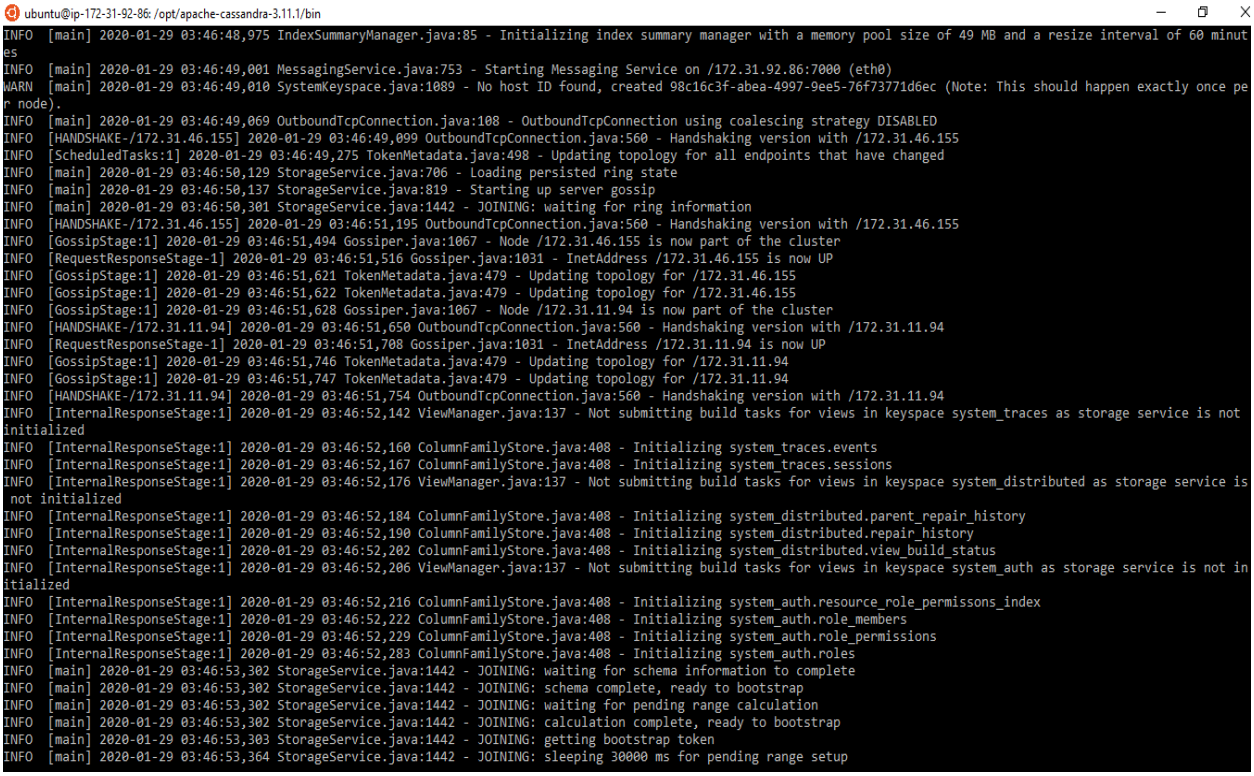
```
ubuntu@ip-172-31-46-155:/opt/apache-cassandra-3.11.1/bin$ nodetool status
Datacenter: dc1
===============
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
--  Address        Load       Tokens       Owns (effective)  Host ID                               Rack
UN  172.31.11.94   103.32 KiB  256          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
```

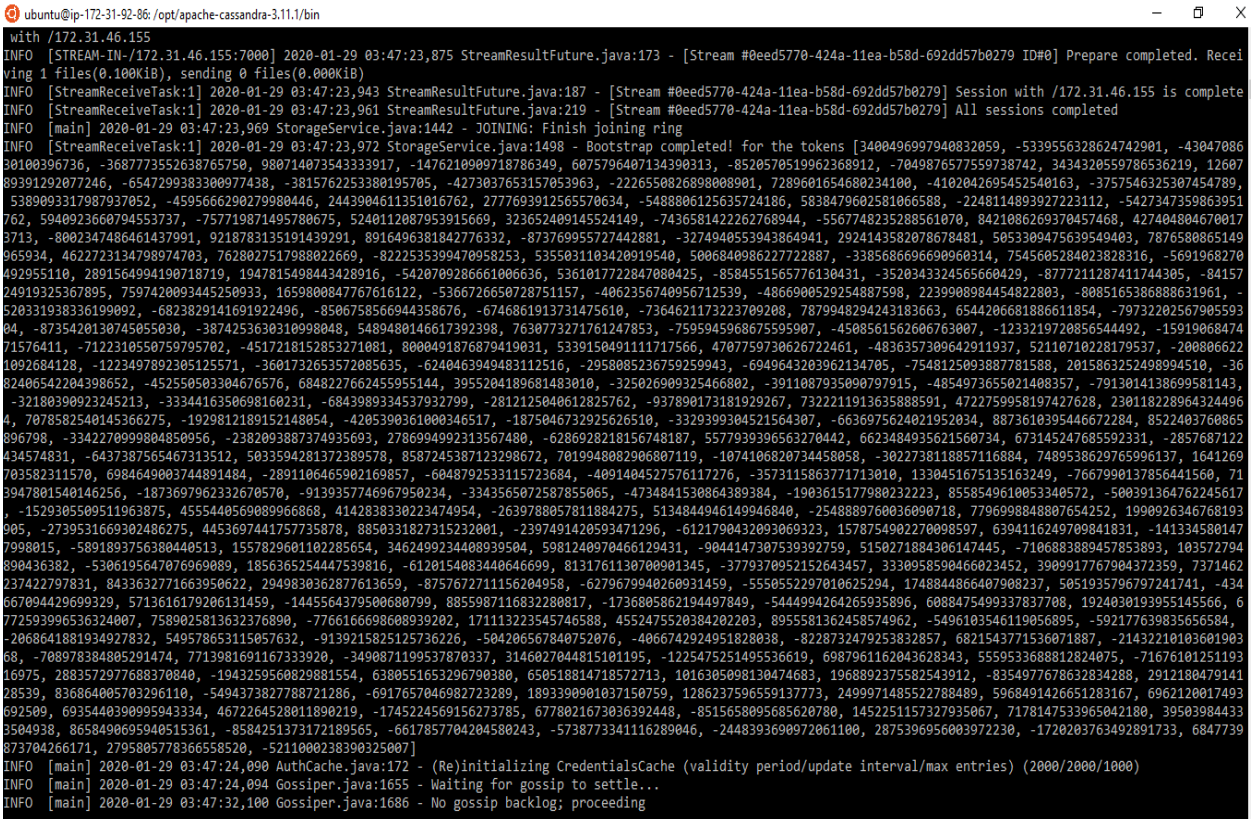
Node 3 Updates:

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





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 1st 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-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$ 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>
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
===============
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
--  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.ya
ml
WARN  06:07:35,144 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

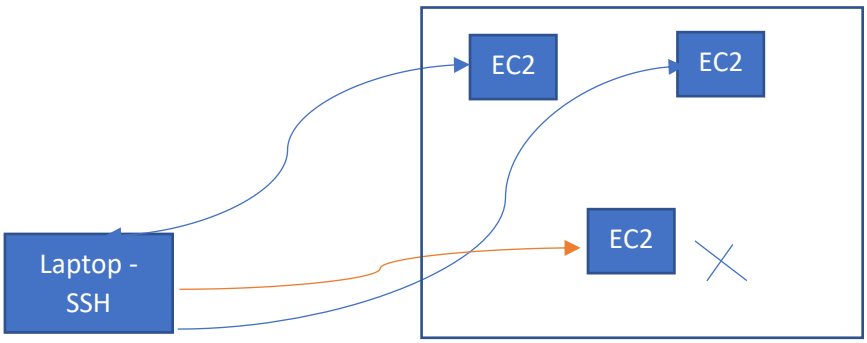
13. Run the select query on user_id ‘u2’ again

```
(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 with 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

Horizantal 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. Murmer3 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