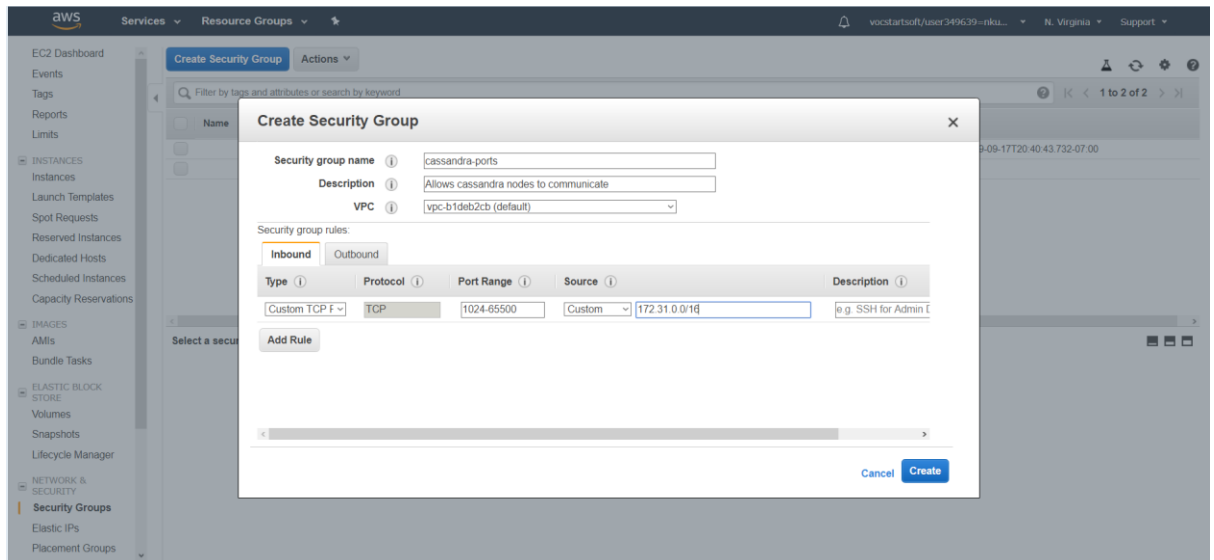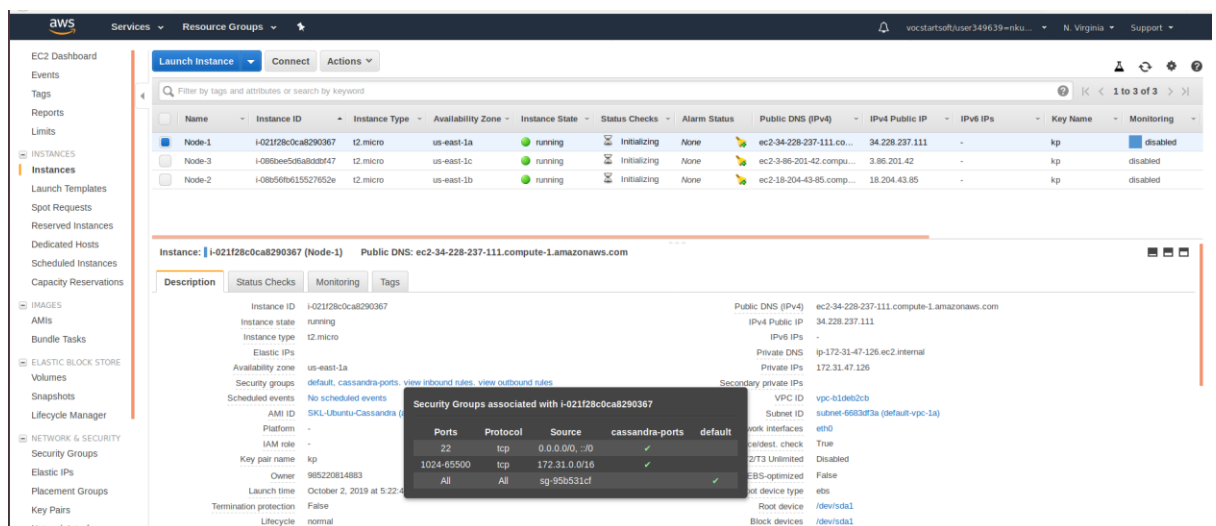**Lab: Cassandra setup | Master-less architecture**

1. Create a security group : 'cassandra-ports'

2. Launch 3 EC2 instance each one in different Availability zones using community AMI (SKL-Ubuntu-Cassandra)

3. Node-1 cassandra config setup in AZ-1a

```
ubuntu@ip-172-37-45: /opt/apache-cassandra-3.11.1/conf
File Edit View Search Terminal Tabs Help
ubuntu@ip-172-31-37-45: /opt/apache-cassandra-3.11.1/conf    ubuntu@ip-172-31-15-95: /opt/apache-cassandra-3.11.1/conf    ubuntu@ip-172-31-95-92: /opt/apache-cassandra-3.11.1/conf
kunar@ubuntu:~/Desktop$ ^C
kunar@ubuntu:~/Desktop$ ssh -i kp.pem ubuntu@18.206.218.44
The authenticity of host '18.206.218.44 (18.206.218.44)' can't be established.
ECDSA key fingerprint is SHA256:nosxtzewAJIYvVSkTTh3UMIZkE2x2EnG+FygxPcWhtc.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '18.206.218.44' (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

226 packages can be updated.
142 updates are security updates.


*** System restart required ***
Last login: Sun Jan 28 15:55:31 2018 from 106.200.196.203
ubuntu@ip-172-31-37-45:~$ cd /opt/
ubuntu@ip-172-31-37-45:/opt$ cd apache cassandra-3.11.1/
ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1$ cd conf/
ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_CLUSTER_NAME=GL-Cluster=g' cassandra.yaml
ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_IP_ADDRESS=172.31.37.45=g' cassandra.yaml
ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_SEED_LIST=172.31.15.95=g' cassandra.yaml
ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_DATACENTER=dc1=g' cassandra-rackdc.properties
ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_RACK=r1=g' cassandra-rackdc.properties
ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1/conf$ cassandra
ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1/conf$ Java HotSpot(TM) 64-Bit Server VM warning: Cannot open file /opt/apache-cassandra-3.11.1/logs/gc.log due to No such file or directory

CompilerOracle: dontinline org/apache/cassandra/db/Columns$Serializer.deserializeLargeSubset (Lorg/apache/cassandra/io/util/DataInputPlus;Lorg/apache/cassandra/db/Columns;I)Lorg/apache/cassandra/db/Column
s;
CompilerOracle: dontinline org/apache/cassandra/db/Columns$Serializer.serializeLargeSubset (Ljava/util/Collection;ILorg/apache/cassandra/db/Columns;ILorg/apache/cassandra/io/util/DataOutputPlus;)V
CompilerOracle: dontinline org/apache/cassandra/db/Columns$Serializer.serializeLargeSubsetSize (Ljava/util/Collection;ILorg/apache/cassandra/db/Columns;I)I
CompilerOracle: dontinline org/apache/cassandra/db/commitlog/AbstractCommitLogSegmentManager.advanceAllocatingFrom (Lorg/apache/cassandra/db/commitlog/CommitLogSegment;)V
CompilerOracle: dontinline org/apache/cassandra/db/transform/BaseIterator.tryGetMoreContents ()Z
CompilerOracle: dontinline org/apache/cassandra/db/transform/StoppingTransformation.stop ()V
CompilerOracle: dontinline org/apache/cassandra/db/transform/StoppingTransformation.stopInPartition ()V
CompilerOracle: dontinline org/apache/cassandra/io/util/BufferedDataOutputStreamPlus.doFlush (I)V
CompilerOracle: dontinline org/apache/cassandra/io/util/BufferedDataOutputStreamPlus.writeExcessSlow ()V
CompilerOracle: dontinline org/apache/cassandra/io/util/BufferedDataOutputStreamPlus.writeSlow (JI)V
CompilerOracle: dontinline org/apache/cassandra/io/util/RebufferingInputStream.readPrimitiveSlowly (I)J
CompilerOracle: inline org/apache/cassandra/db/rows/UnfilteredSerializer.serializeRowBody (Lorg/apache/cassandra/db/rows/Row;ILorg/apache/cassandra/db/SerializationHeader;Lorg/apache/cassandra/io/util/Dat
aOutputPlus;)V
ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1/conf$ nodetool status
Datacenter: dc1
===============
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
--  Address       Load       Tokens       Owns (effective)  Host ID                               Rack
UN  172.31.15.95  249.46 KiB  256          68.7%             d5ce0965-759e-45bd-8957-d58269dc4f75  r2
UN  172.31.37.45  89.43 KiB   256          64.1%             2e4911e5-60e7-4809-88f6-27d80bb48692  r1
UN  172.31.95.92  262.87 KiB  256          67.2%             3328fbcb-6217-4b4b-a294-ba82fdee1e56  r3

ubuntu@ip-172-31-37-45:/opt/apache-cassandra-3.11.1/conf$
```

4. Node-2 cassandra config setup in AZ-1b

```
ubuntu@ip-172-31-47-126: /opt/apache-cassandra-3.11.1/bin    ubuntu@ip-172-31-15-95: /opt/apache-cassandra-3.11.1/bin    ubuntu@ip-172-31-95-92: ~
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1$ cd conf/
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_CLUSTER_NAME=GL-Cluster=g' cassandra.yaml
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_IP_ADDRESS=172.31.15.95=g' cassandra.yaml
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_SEED_LIST=172.31.15.95=g' cassandra.yaml
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_DATACENTER=dc1=g' cassandra-rackdc.properties
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_RACK=r2=g' cassandra-rackdc.properties
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/conf$ cd ..
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1$ cd bin
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/bin$ cassandra
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/bin$ Java HotSpot(TM) 64-Bit Server VM warning: Cannot open file /opt/apache-cassandra-3.11.1/logs/gc.log due to No such file or directory

CompilerOracle: dontinline org/apache/cassandra/db/Columns$Serializer.deserializeLargeSubset (Lorg/apache/cassandra/io/util/DataInputPlus;Lorg/apache/cassandra/db/Columns;I)Lorg/apache/cassandra/db/Column
s;
CompilerOracle: dontinline org/apache/cassandra/db/Columns$Serializer.serializeLargeSubset (Ljava/util/Collection;ILorg/apache/cassandra/db/Columns;ILorg/apache/cassandra/io/util/DataOutputPlus;)V
CompilerOracle: dontinline org/apache/cassandra/db/Columns$Serializer.serializeLargeSubsetSize (Ljava/util/Collection;ILorg/apache/cassandra/db/Columns;I)I
CompilerOracle: dontinline org/apache/cassandra/db/commitlog/AbstractCommitLogSegmentManager.advanceAllocatingFrom (Lorg/apache/cassandra/db/commitlog/CommitLogSegment;)V
CompilerOracle: dontinline org/apache/cassandra/db/transform/BaseIterator.tryGetMoreContents ()Z
CompilerOracle: dontinline org/apache/cassandra/db/transform/StoppingTransformation.stop ()V
CompilerOracle: dontinline org/apache/cassandra/db/transform/StoppingTransformation.stopInPartition ()V
CompilerOracle: dontinline org/apache/cassandra/io/util/BufferedDataOutputStreamPlus.doFlush (I)V
CompilerOracle: dontinline org/apache/cassandra/io/util/BufferedDataOutputStreamPlus.writeExcessSlow ()V
CompilerOracle: dontinline org/apache/cassandra/io/util/BufferedDataOutputStreamPlus.writeSlow (JI)V
CompilerOracle: dontinline org/apache/cassandra/io/util/RebufferingInputStream.readPrimitiveSlowly (I)J
CompilerOracle: inline org/apache/cassandra/db/rows/UnfilteredSerializer.serializeRowBody (Lorg/apache/cassandra/db/rows/Row;ILorg/apache/cassandra/db/SerializationHeader;Lorg/apache/cassandra/io/util/Dat
aOutputPlus;)V
CompilerOracle: inline org/apache/cassandra/io/util/Memory.checkBounds (JJ)V
CompilerOracle: inline org/apache/cassandra/io/util/SafeMemory.checkBounds (JJ)V
CompilerOracle: inline org/apache/cassandra/utils/AsymmetricOrdering.selectBoundary (Lorg/apache/cassandra/utils/AsymmetricOrdering/Op;II)I
CompilerOracle: inline org/apache/cassandra/utils/AsymmetricOrdering.strictnessOfLessThan (Lorg/apache/cassandra/utils/AsymmetricOrdering/Op;)I
CompilerOracle: inline org/apache/cassandra/utils/BloomFilter.indexes (Lorg/apache/cassandra/utils/IFilter/FilterKey;)[J
CompilerOracle: inline org/apache/cassandra/utils/BloomFilter.setIndexes (JJI[J)V
CompilerOracle: inline org/apache/cassandra/utils/ByteBufferUtil.compare (Ljava/nio/ByteBuffer;[B)I
CompilerOracle: inline org/apache/cassandra/utils/ByteBufferUtil.compare ([BLjava/nio/ByteBuffer;)I
CompilerOracle: inline org/apache/cassandra/utils/ByteBufferUtil.compareUnsigned (Ljava/nio/ByteBuffer;Ljava/nio/ByteBuffer;)I
CompilerOracle: inline org/apache/cassandra/utils/FastByteOperations$UnsafeOperations.compareTo (Ljava/lang/Object;JILjava/lang/Object;JI)I
CompilerOracle: inline org/apache/cassandra/utils/FastByteOperations$UnsafeOperations.compareTo (Ljava/lang/Object;JILjava/nio/ByteBuffer;)I
CompilerOracle: inline org/apache/cassandra/utils/FastByteOperations$UnsafeOperations.compareTo (Ljava/nio/ByteBuffer;Ljava/nio/ByteBuffer;)I
CompilerOracle: inline org/apache/cassandra/utils/vint/VIntCoding.encodeVInt (JI)[B
INFO  [main] 2019-10-02 14:28:42,768 YamlConfigurationLoader.java:89 - Configuration location: file:/opt/apache-cassandra-3.11.1/conf/cassandra.yaml
INFO  [main] 2019-10-02 14:28:43,555 Config.java:481 - Node configuration:[allocate_tokens_for_keyspace=null; authenticator=PasswordAuthenticator; authorizer=CassandraAuthorizer; auto_bootstrap=true; auto
_snapshot=true; back_pressure_enabled=false; back_pressure_strategy=org.apache.cassandra.net.RateBasedBackPressure{high_ratio=0.9, factor=5, flow=FAST}; batch_size_fail_threshold_in_kb=50; batch_size_warn
_threshold_in_kb=5; batchlog_replay_throttle_in_kb=1024; broadcast_address=null; broadcast_rpc_address=null; buffer_pool_use_heap_if_exhausted=true; cas_contention_timeout_in_ms=1000; cdc_enabled=true; cd
c_free_space_check_interval_ms=250; cdc_raw_directory=/opt/cassandra-data/cdc_raw; cdc_total_space_in_mb=0; client_encryption_options=<REDACTED>; cluster_name=GL-Cluster; column_index_cache_size_in_kb=2;
column_index_size_in_kb=64; commit_failure_policy=stop; commitlog_compression=null; commitlog_directory=/opt/cassandra-data/commitlog; commitlog_max_compression_buffers_in_pool=3; commitlog_periodic_queue
_size=-1; commitlog_segment_size_in_mb=32; commitlog_sync=periodic; commitlog_sync_batch_window_in_ms=NaN; commitlog_sync_period_in_ms=10000; commitlog_total_space_in_mb=null; compaction_large_partition_w
arning_threshold_mb=100; compaction_throughput_mb_per_sec=16; concurrent_compactors=null; concurrent_counter_writes=32; concurrent_materialized_view_writes=32; concurrent_reads=32; concurrent_replicates=n
INFO  [main] 2019-10-02 14:28:37,719 Gossiper.java:1680 - No gossip backlog, proceeding
ubuntu@ip-172-31-15-95:/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  172.31.15.95  103.85 KiB  256          100.0%            d5ce0965-759e-45bd-8957-d58269dc4f75  r2

ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/bin$
```

5. Node-3 cassandra config setup in AZ-1c


```
         ubuntu@ip-172-31-47-126: /opt/apache-cassandra-3.11.1/bin          ×          ubuntu@172-31-15-95: /opt/apache-cassandra-3.11.1/bin          ×          ubuntu@ip-172-31-95-92: /opt/apache-cassandra-3.11.1/bin          ×

Last login: Sun Jan 28 15:55:31 2018 from 106.200.196.203
ubuntu@ip-172-31-95-92:~$ cd /opt/
ubuntu@ip-172-31-95-92:/opt$ cd apache-cassandra-3.11.1/
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1$ cd conf/
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_CLUSTER_NAME=GL-Cluster=g' cassandra.yaml
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_IP_ADDRESS=172.31.95.92=g' cassandra.yaml
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_SEED_LIST=172.31.15.95=g' cassandra.yaml
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_DATACENTER=dc1=g' cassandra-rackdc.properties
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/conf$ sed -i 's=MOD_RACK=r3=g' cassandra-rackdc.properties
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/conf$
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/conf$ cd ..
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1$ cd bin
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/bin$ cassandra
ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/bin$ Java HotSpot(TM) 64-Bit Server VM warning: Cannot open file /opt/apache-cassandra-3.11.1/logs/gc.log due to No such file or directory

CompilerOracle: dontinline org/apache/cassandra/db/Columns$Serializer.deserializeLargeSubset (Lorg/apache/cassandra/io/util/DataInputPlus;Lorg/apache/cassandra/db/Columns;I)Lorg/apache/cassandra/db/Column
s;
CompilerOracle: dontinline org/apache/cassandra/db/Columns$Serializer.serializeLargeSubset (Ljava/util/Collection;ILorg/apache/cassandra/db/Columns;ILorg/apache/cassandra/io/util/DataOutputPlus;)V
CompilerOracle: dontinline org/apache/cassandra/db/Columns$Serializer.serializeLargeSubsetSize (Ljava/util/Collection;ILorg/apache/cassandra/db/Columns;I)I
```

```
ubuntu@ip-172-31-95-92:/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  172.31.15.95   108.8 KiB  256          100.0%            d5ce0965-759e-45bd-8957-d58269dc4f75  r2
UN  172.31.95.92   108.4 KiB  256          100.0%            3328fbcb-6217-4b4b-a294-ba82fdee1e56  r3

ubuntu@ip-172-31-95-92:/opt/apache-cassandra-3.11.1/bin$
```

6. Login to cqlsh and create table with data


```
ubuntu@ip-172-31-15-95:/opt/apache-cassandra-3.11.1/conf$ cqlsh 172.31.37.45 -u cassandra -p cassandra
Connected to GL-Cluster at 172.31.37.45:9042.
[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> CREATE KEYSPACE IF NOT EXISTS starfleet WITH replication ={'class':'NetworkTopologyStrategy','dc1':3};
cassandra@cqlsh> CREATE TABLE starfleet.user(
           ... User_id VARCHAR,
           ... location VARCHAR,
           ... display_name VARCHAR,
           ... First_name VARCHAR,
           ... Last_name VARCHAR,
           ... PRIMARY KEY(user_id,location)
           ... );
cassandra@cqlsh> INSERT INTO starfleet.user(user_id,location,display_name,first_name,last_name)
           ... VALUES('u1','earth1','Kirk','William','Shatner');
cassandra@cqlsh> INSERT INTO starfleet.user(user_id,location,display_name,first_name,last_name)
           ... VALUES('u2','vulcan','Spock','Leonard','Nimoy');
cassandra@cqlsh> select * from starfleet.user
           ... ;

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

(2 rows)
cassandra@cqlsh>
```

7. Changing CONSISTENCY level


```
                                                          ubuntu@ip-172-31-15-95: /opt/apache-cassandra-3.11.1/conf
File  Edit  View  Search  Terminal  Tabs  Help
         ubuntu@ip-172-31-37-45: /opt/apache-cassandra-3.11.1/conf          ×          ubuntu@ip-172-31-15-95: /opt/apache-cassandra-3.11.1/conf          ×          ubuntu@ip-172-31-95-92: /opt/apache-cassandra-3.11.1/conf          ×
cassandra@cqlsh> CONSISTENCY
Current consistency level is ONE.
cassandra@cqlsh> CONSISTENCY ALL
Consistency level set to ALL.
cassandra@cqlsh> SELECT * FROM starfleet.user where userd_id='u2';
InvalidRequest: Error from server: code=2200 [Invalid query] message="Undefined column name userd_id"
cassandra@cqlsh> SELECT * FROM starfleet.user where user_id='u2';

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

(1 rows)
cassandra@cqlsh>
```

8. Shutting down the Node-3 in AZ-c

9. Observation after shutting down node-3, high consistency and lowest availability

10. Changing CONSISTENCY level to Quorum and firing same query gives output even after failure of one node as Quorum of all nodes all data centers