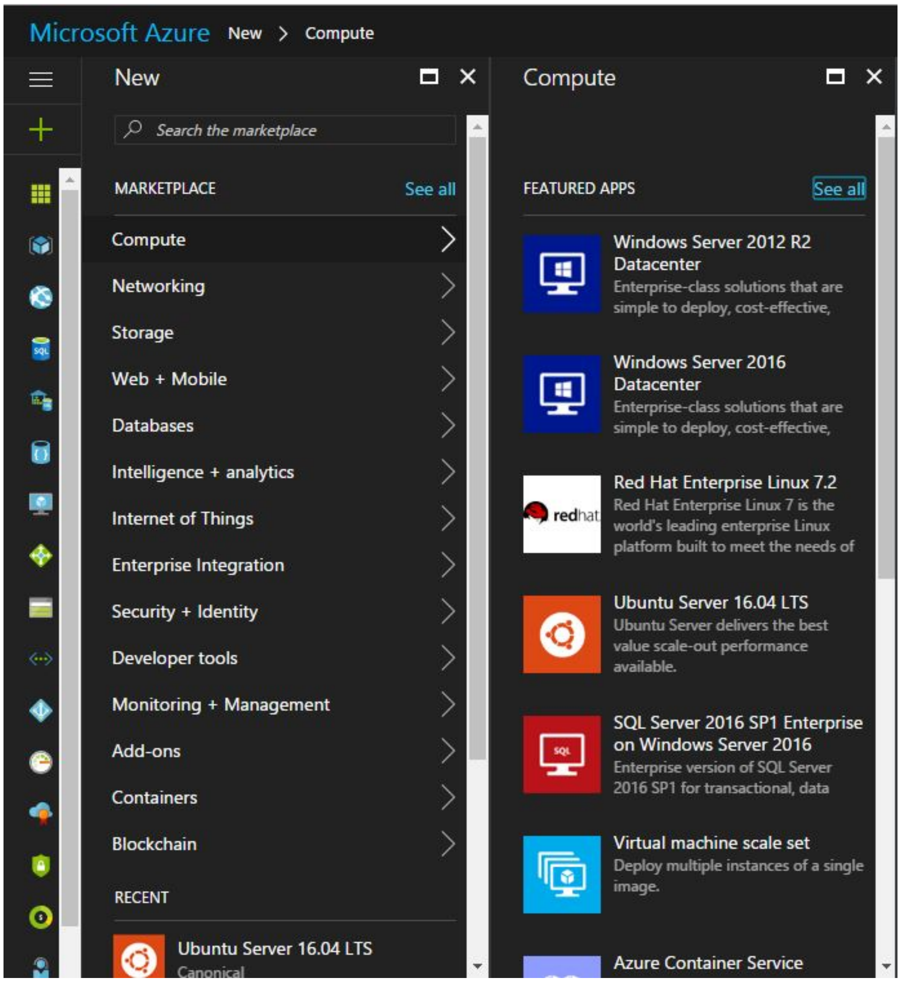
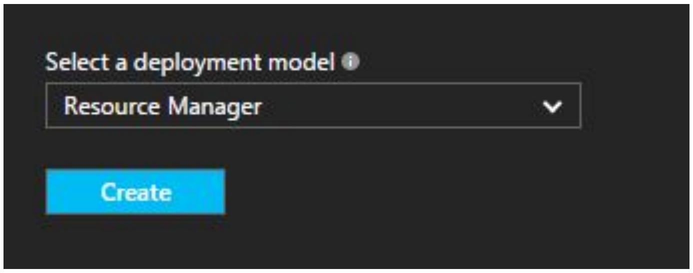
Deploying VM in Azure:

First Choose **Compute ->** Select a server type.


Microsoft Azure
New > Compute
New
Search the marketplace
MARKETPLACE
See all
Compute
Networking
Storage
Web + Mobile
Databases
Intelligence + analytics
Internet of Things
Enterprise Integration
Security + Identity
Developer tools
Monitoring + Management
Add-ons
Containers
Blockchain
RECENT
Ubuntu Server 16.04 LTS
Canonical
Compute
FEATURED APPS
See all
Windows Server 2012 R2 Datacenter
Enterprise-class solutions that are simple to deploy, cost-effective,
Windows Server 2016 Datacenter
Enterprise-class solutions that are simple to deploy, cost-effective,
Red Hat Enterprise Linux 7.2
Red Hat Enterprise Linux 7 is the world's leading enterprise Linux platform built to meet the needs of
Ubuntu Server 16.04 LTS
Ubuntu Server delivers the best value scale-out performance available.
SQL Server 2016 SP1 Enterprise on Windows Server 2016
Enterprise version of SQL Server 2016 SP1 for transactional, data
Virtual machine scale set
Deploy multiple instances of a single image.
Azure Container Service

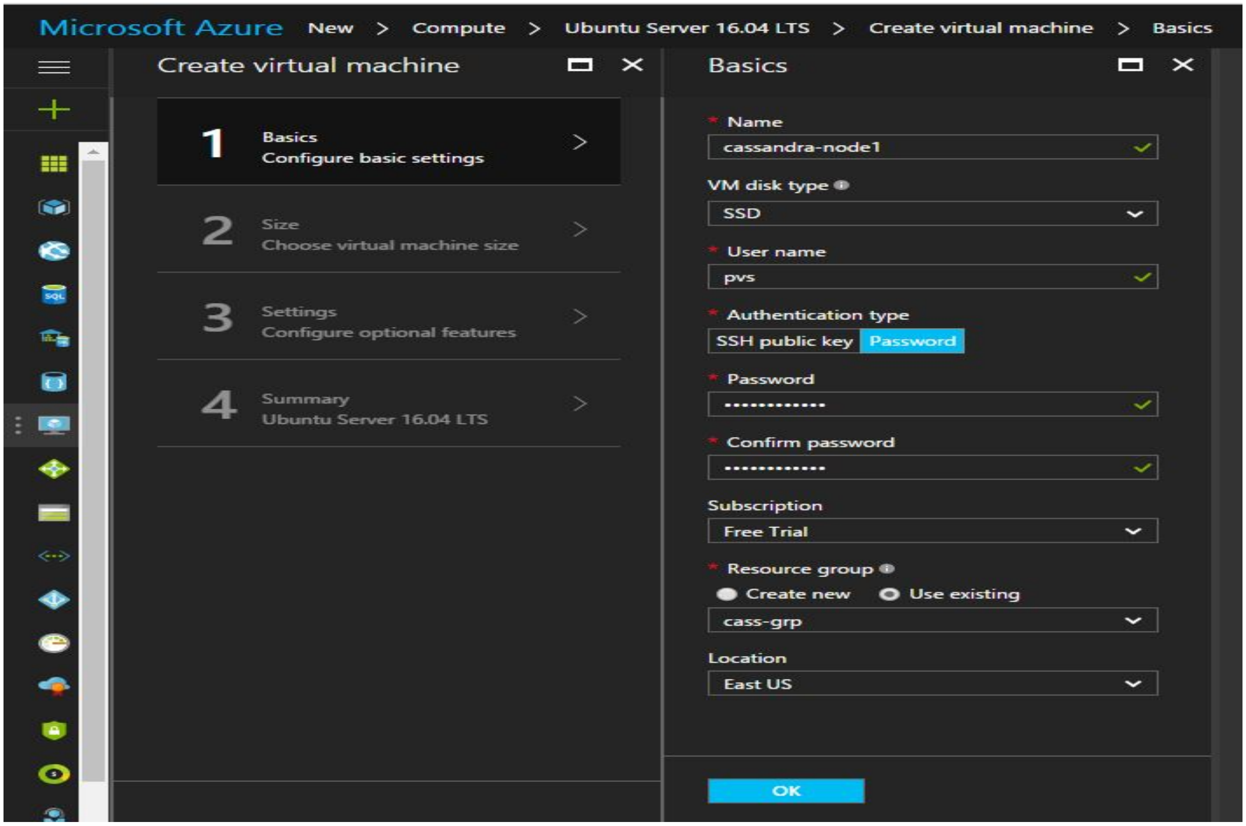
Then select the deployment model.


Select a deployment model: Resource Manager

Then configure the server details.

It has 4 steps.

Step-1:


Microsoft Azure
New > Compose > Ubuntu Server 16.04 LTS > Create virtual machine > Basics
OK

Create virtual machine

1 Basics
Configure basic settings

2 Size
Choose virtual machine size

3 Settings
Configure optional features

4 Summary
Ubuntu Server 16.04 LTS

Basics

* Name: cassandra-node1

VM disk type: SSD

* User name: pvs

* Authentication type: SSH public key [✓ Password]

* Password: ••••••••••••

* Confirm password: ••••••••••••

Subscription: Free Trial

* Resource group: ● Create new ○ Use existing

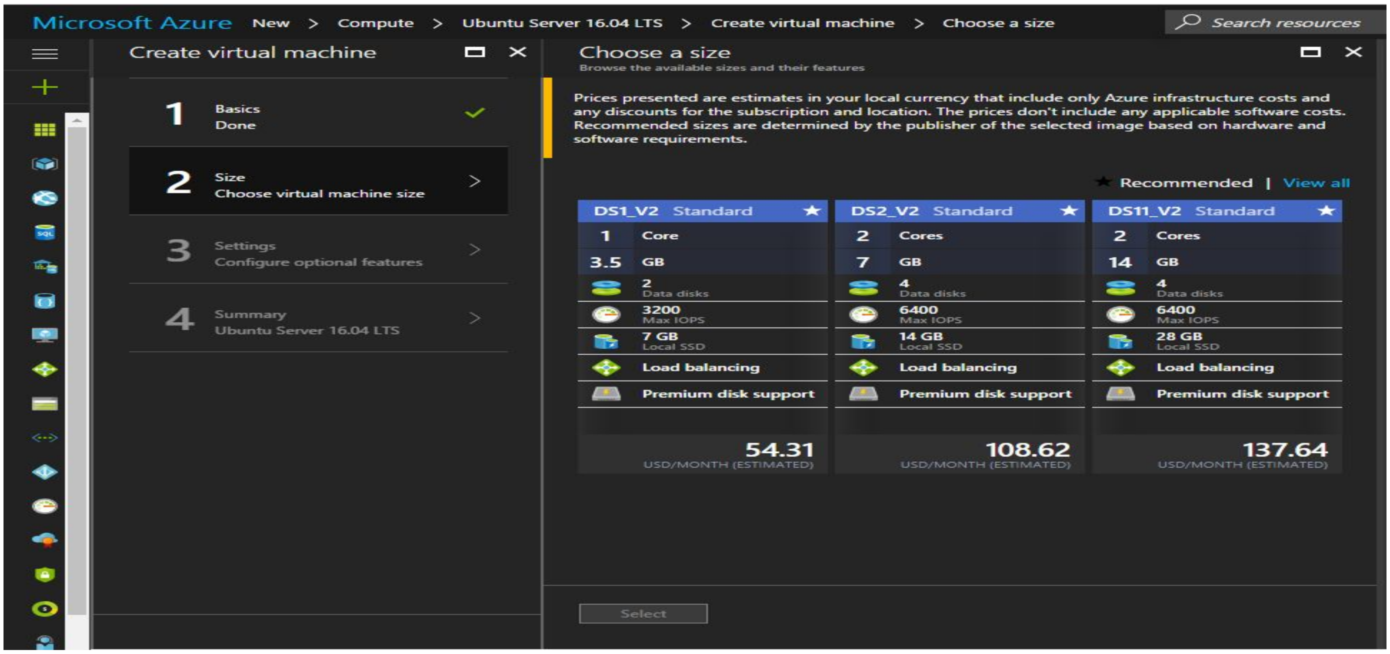
cass-grp

Location: East US

Fill out the details like name of the instance, Username for authentication

- For authentication, we can use either SSH Public key or setup a password.
- Choose a resource group if u have any, otherwise create one.
- Select the location of your Instance.

Step-2:


Microsoft Azure
New > Compute > Ubuntu Server 16.04 LTS > Create virtual machine > Choose a size
Search resources
Select

Create virtual machine

1 Basics
Done ✓

2 Size
Choose virtual machine size

3 Settings
Configure optional features

4 Summary
Ubuntu Server 16.04 LTS

Choose a size
Browse the available sizes and their features

Prices presented are estimates in your local currency that include only Azure infrastructure costs and any discounts for the subscription and location. The prices don't include any applicable software costs. Recommended sizes are determined by the publisher of the selected image based on hardware and software requirements.

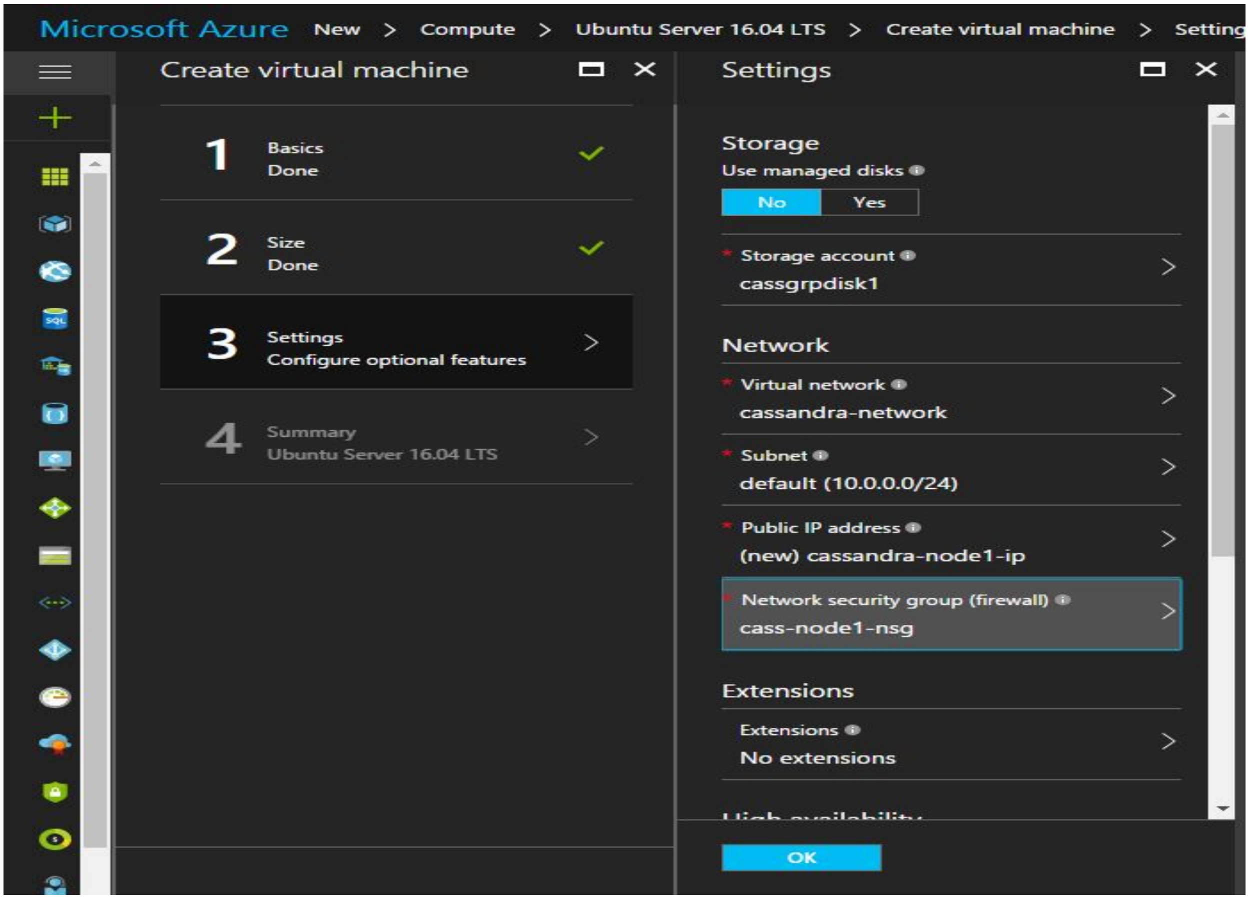
★ Recommended | View all

DS1_V2 Standard ★	DS2_V2 Standard ★	DS11_V2 Standard ★
1 Core	2 Cores	2 Cores
3.5 GB	7 GB	14 GB
2 Data disks	4 Data disks	4 Data disks
3200 Max IOPS	6400 Max IOPS	6400 Max IOPS
7 GB Local SSD	14 GB Local SSD	28 GB Local SSD
Load balancing	Load balancing	Load balancing
Premium disk support	Premium disk support	Premium disk support
54.31 USD/MONTH (ESTIMATED)	108.62 USD/MONTH (ESTIMATED)	137.64 USD/MONTH (ESTIMATED)

Choose an Instance type.

→ For a free version of Microsoft Azure we ca use only a total of 4 Cores in any region.

Step-3:



Microsoft Azure New > Compute > Ubuntu Server 16.04 LTS > Create virtual machine > Setting

Create virtual machine

1 Basics
Done ✓

2 Size
Done ✓

3 Settings
Configure optional features >

4 Summary
Ubuntu Server 16.04 LTS >

Settings

Storage

Use managed disks: [✓ No] Yes

* Storage account: cassgrpdisk1

Network

* Virtual network: cassandra-network

* Subnet: default (10.0.0.0/24)

* Public IP address: (new) cassandra-node1-ip

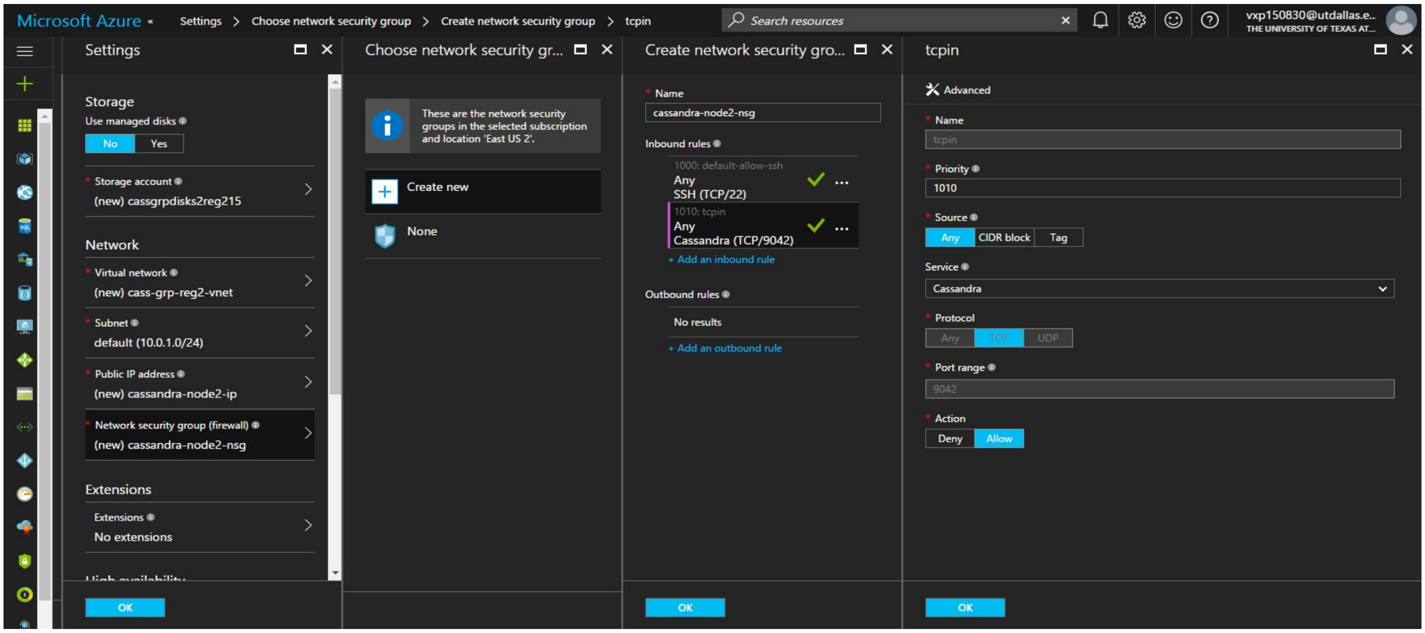
* Network security group (firewall): cass-node1-nsg

Extensions

Extensions: No extensions

Create a storage account -> it tells the details how data is stored and can be removed if necessary.

- Virtual network helps to create a network where we can assign static or dynamin ip’s to the VM.
- Subnet defines the range of the ip’s that can be assigned to the VM.
- Network security group is the place where we will add all the protocols related to that VM.
    - For a Cassandra VM we need the TCP port 9042 for communication.
    - We need to setup them in the network security group, for Inbound and Outbound rules.



Microsoft Azure « Settings > Choose network security group > Create network security group > tcpin
Search resources
vxp150830@utdallas.e...
THE UNIVERSITY OF TEXAS AT...

Settings

Storage

Use managed disks: No | Yes

Storage account: (new) cassgrpdisks2reg215

Network

Virtual network: (new) cass-grp-reg2-vnet

Subnet: default (10.0.1.0/24)

Public IP address: (new) cassandra-node2-ip

Network security group (firewall): (new) cassandra-node2-nsg

Extensions

Extensions: No extensions

High availability

OK

Choose network security gr...

These are the network security groups in the selected subscription and location 'East US 2'.

Create new

None

Create network security gro...

Name: cassandra-node2-nsg

Inbound rules

1000: default-allow-ssh Any SSH (TCP/22)

1010: tcpin Any Cassandra (TCP/9042)

+ Add an inbound rule

Outbound rules

No results

+ Add an outbound rule

OK

tcpin

Advanced

Name: tcpin

Priority: 1010

Source: Any | CIDR block | Tag

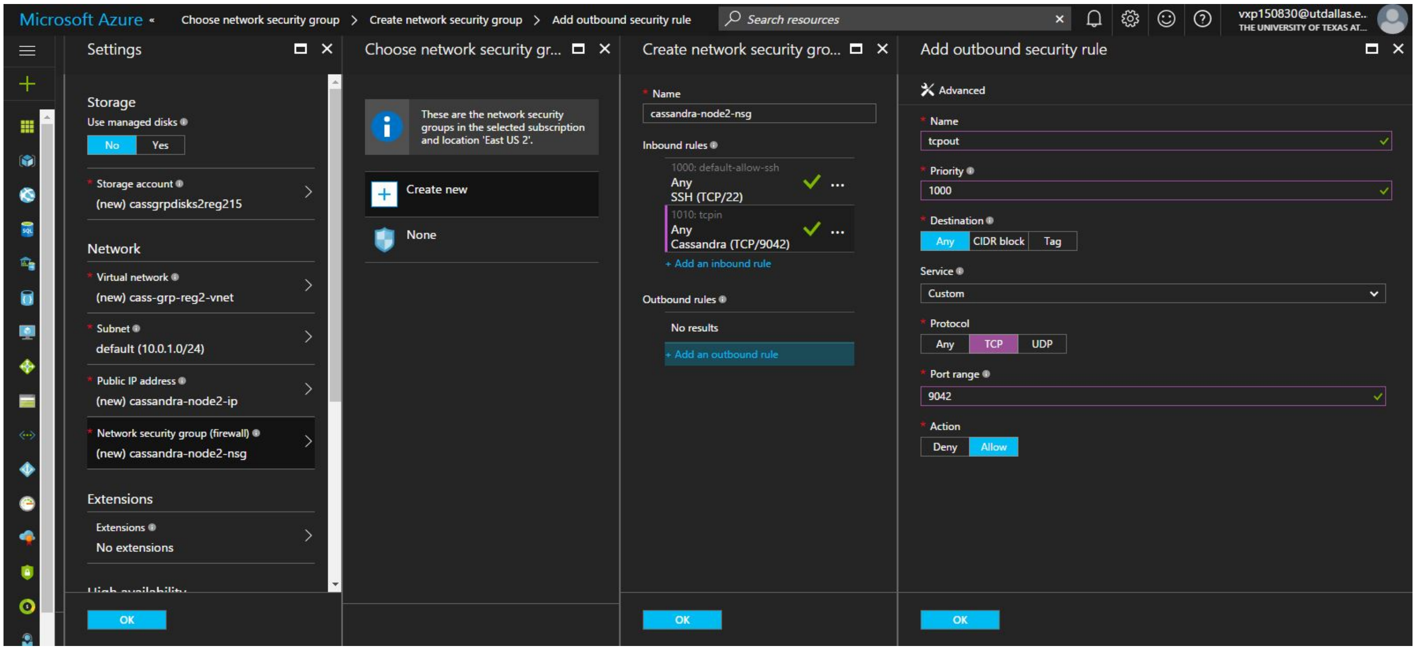
Service: Cassandra

Protocol: Any | TCP | UDP

Port range: 9042

Action: Deny | Allow

OK



Microsoft Azure « Choose network security group > Create network security group > Add outbound security rule
Search resources
vxp150830@utdallas.e...
THE UNIVERSITY OF TEXAS AT...

Settings

Storage

Use managed disks: No | Yes

Storage account: (new) cassgrpdisks2reg215

Network

Virtual network: (new) cass-grp-reg2-vnet

Subnet: default (10.0.1.0/24)

Public IP address: (new) cassandra-node2-ip

Network security group (firewall): (new) cassandra-node2-nsg

Extensions

Extensions: No extensions

High availability

OK

Choose network security gr...

These are the network security groups in the selected subscription and location 'East US 2'.

Create new

None

Create network security gro...

Name: cassandra-node2-nsg

Inbound rules

1000: default-allow-ssh Any SSH (TCP/22)

1010: tcpin Any Cassandra (TCP/9042)

+ Add an inbound rule

Outbound rules

No results

+ Add an outbound rule

OK

Add outbound security rule

Advanced

Name: tcpout

Priority: 1000

Destination: Any | CIDR block | Tag

Service: Custom

Protocol: Any | TCP | UDP

Port range: 9042

Action: Deny | Allow

OK

Step-4:

It is the review screen where all the details about the VM are displayed before deploying the server.

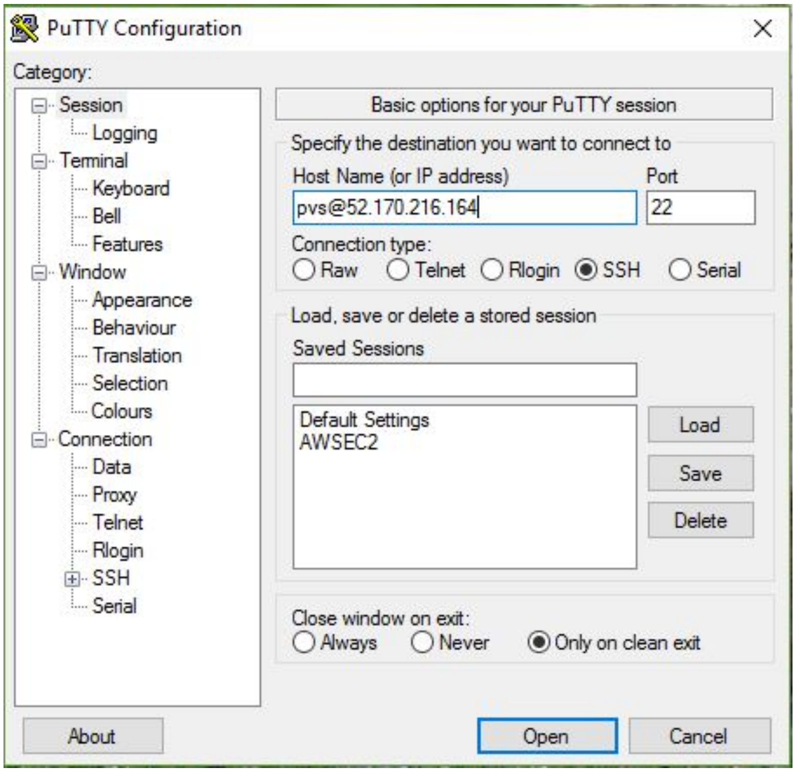
We can review the details and modify, if we need to do any changes before deploying the server.

Note: for my instance, I have chosen to setup a password for authentication.

Logging into the Server:

Open Putty.

Then enter the Ip address of the server.



Specify the destination you want to connect to

Host Name (or IP address): pvs@52.170.216.164

Port: 22

Connection type: ○ Raw ○ Telnet ○ Rlogin ● SSH ○ Serial

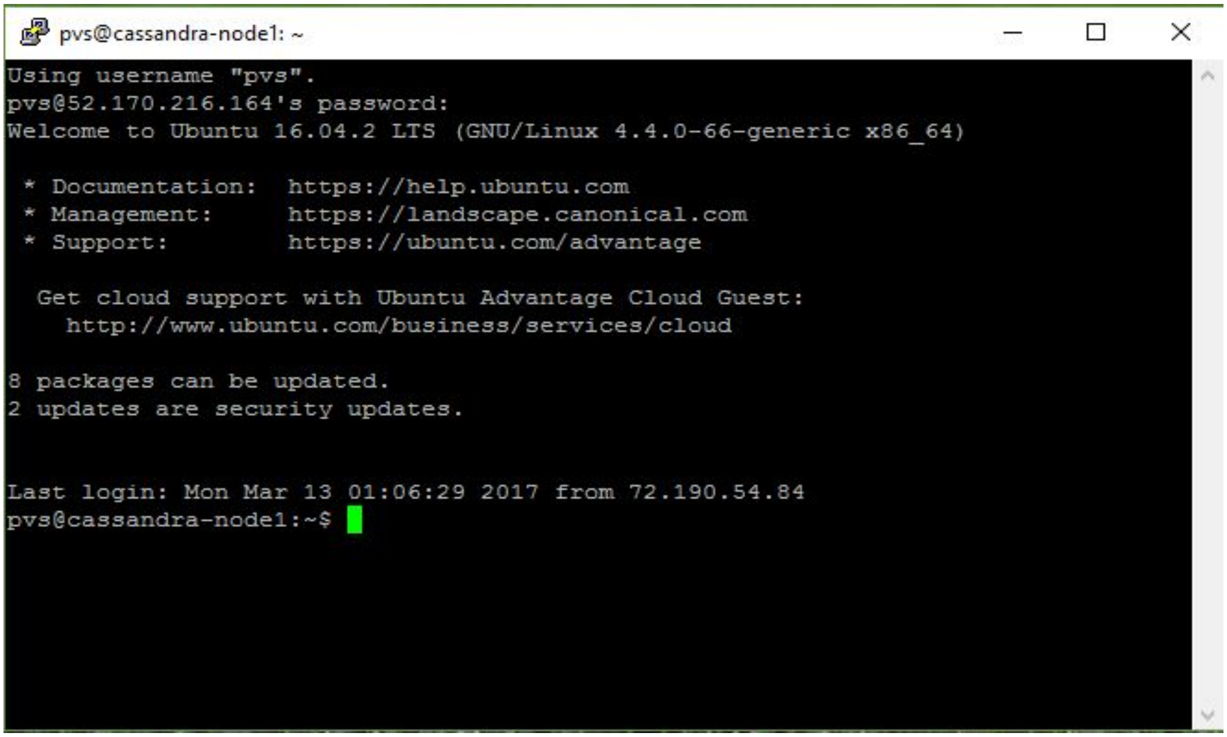
Load, save or delete a stored session

Saved Sessions

Default Settings
AWSEC2

Close window on exit: ○ Always ○ Never ● Only on clean exit

In the Login Screen Enter Username and Password:



```
Using username "pvs".
pvs@52.170.216.164's password:
Welcome to Ubuntu 16.04.2 LTS (GNU/Linux 4.4.0-66-generic 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

8 packages can be updated.
2 updates are security updates.


Last login: Mon Mar 13 01:06:29 2017 from 72.190.54.84
pvs@cassandra-node1:~$
```

<u>Setting Up Cassandra:</u>

Now we need to setup Cassandra in each VM, so that each instance can act like a node.

Oracle Java 8 and JNI are prerequisites for Cassandra v3.

- Install Oracle Java 8 using:

```
# To install java:

sudo apt-add-repository ppa:webupd8team/java

sudo apt-get update

sudo apt-get install oracle-java8-installer


# Check that java is properly installed:

java -version
```

- Install JNA using:

```
sudo apt-get install libjna-java -y
```

- Install Cassandra:

```
# This will set up the PPAs for Cassandra and the keys for verification.

echo "deb http://www.apache.org/dist/cassandra/debian 30x main" | sudo tee -a /etc/apt/sources.list.d/cassandra.sources.list

echo "deb-src http://www.apache.org/dist/cassandra/debian 30x main" | sudo tee -a /etc/apt/sources.list.d/cassandra.sources.list


gpg --keyserver pgp.mit.edu --recv-keys F758CE318D77295D

gpg --export --armor F758CE318D77295D | sudo apt-key add -


gpg --keyserver pgp.mit.edu --recv-keys 2B5C1B00

gpg --export --armor 2B5C1B00 | sudo apt-key add -


gpg --keyserver pgp.mit.edu --recv-keys 0353B12C

gpg --export --armor 0353B12C | sudo apt-key add –
```

Now Install Cassandra:

```
sudo apt-get update

sudo apt-get install Cassandra
```

# To check if cassandra is running:

sudo service cassandra status

# To check the nodes

sudo nodetool status

- configuring Cassandra for Multi-Node setup:
  - Stop Cassandra using: *sudo service cassandra stop.*
  - Find your ethernet card interface ID using *ifconfig*, it should be eth(x).
  - Edit Cassandra's configuration cassandra.yaml: *sudo vim /etc/cassandra/cassandra.yaml*
    - Change the cluster name.
    - Add the IP addresses of the seed nodes.
    - Comment out the listen_address.
    - Add the listen interface.
    - Start the RPC service.
    - Set the RPC interface.
    - Set the endpoint snitch.
    - By editing the file: sudo vim /etc/cassandra/cassandra.yaml (Shown Below)

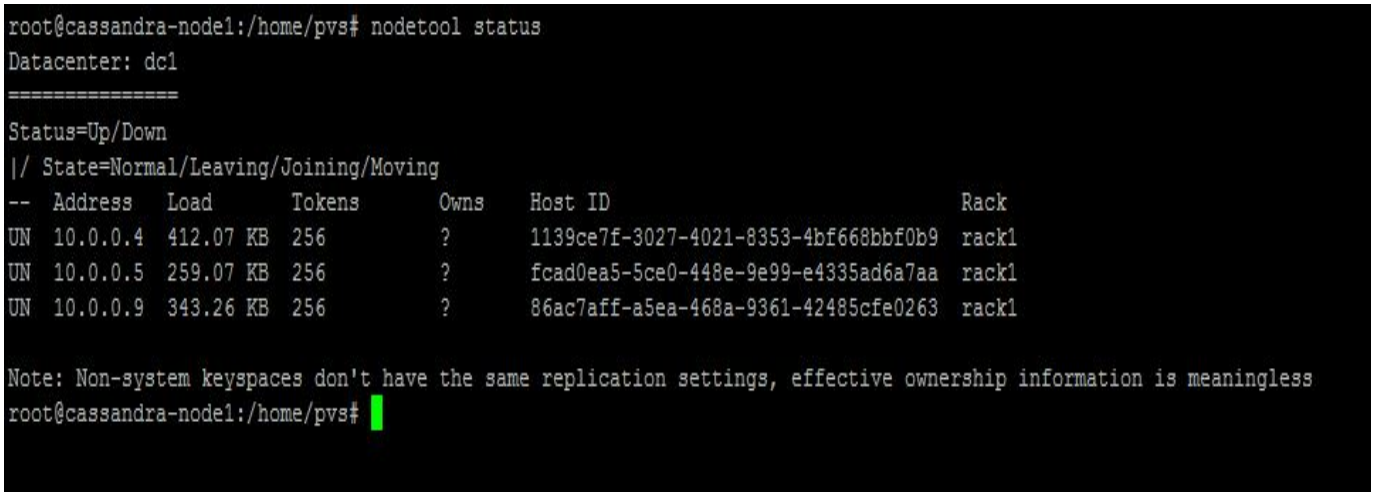
```
cluster_name: 'Pvs Cluster'
seeds: "10.0.0.4,10.0.0.5"

# listen_address:
listen_interface: eth0

start_rpc: true
# rpc_address:
rpc_interface: eth0

endpoint_snitch: GossipingPropertyFileSnitch
```

Delete all Cassandra system configurations: *sudo rm -rf /var/lib/cassandra/data/system/.*

Start Cassandra: *sudo service cassandra start*.

check the nodes using: *sudo nodetool status.*

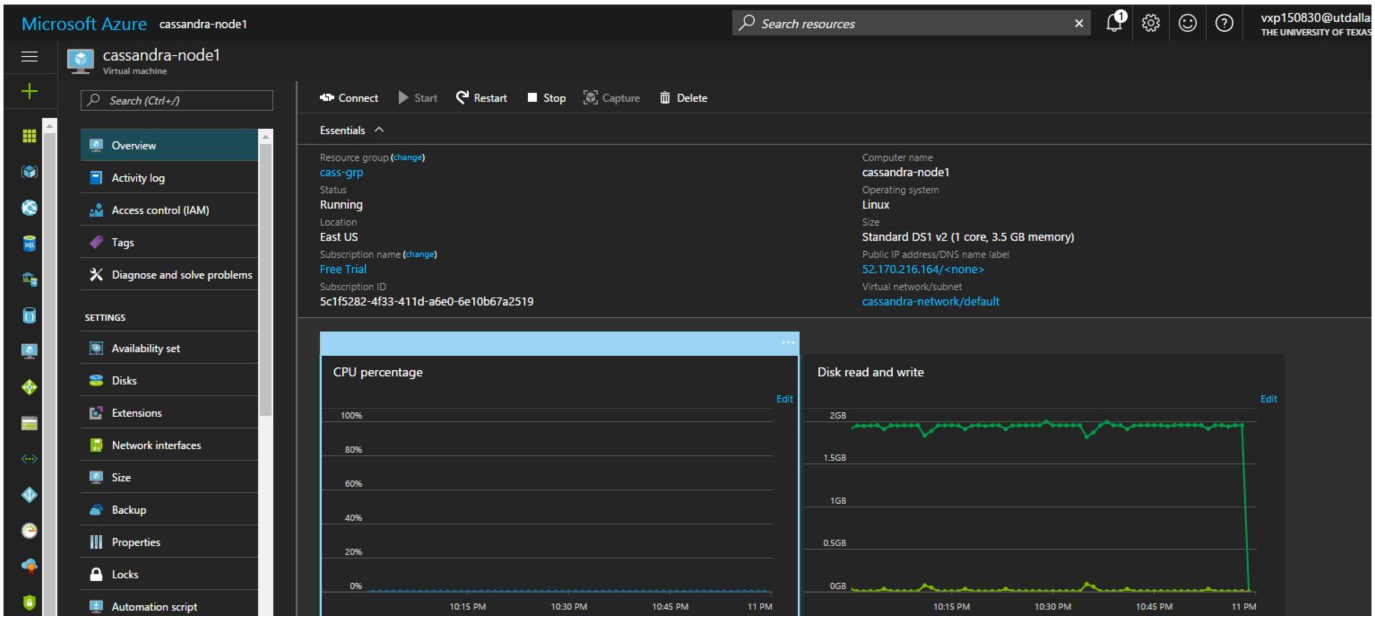
The output of the nodetool status gives the list of nodes present in the cluster.



```
root@cassandra-node1:/home/pvs# nodetool status
Datacenter: dc1
===============
Status=Up/Down
|/ State=Normal/Leaving/Joining/Moving
--  Address   Load       Tokens       Owns    Host ID                               Rack
UN  10.0.0.4  412.07 KB  256          ?       1139ce7f-3027-4021-8353-4bf668bbf0b9  rack1
UN  10.0.0.5  259.07 KB  256          ?       fcad0ea5-5ce0-448e-9e99-e4335ad6a7aa  rack1
UN  10.0.0.9  343.26 KB  256          ?       86ac7aff-a5ea-468a-9361-42485cfe0263  rack1

Note: Non-system keyspaces don't have the same replication settings, effective ownership information is meaningless
root@cassandra-node1:/home/pvs#
```

VM Instance specification:

Once the VM Instance is launched it looks like this.



Resource group (change)
cass-grp
Status
Running
Location
East US
Subscription name (change)
Free Trial
Subscription ID
5c1f5282-4f33-411d-a6e0-6e10b67a2519

Computer name
cassandra-node1
Operating system
Linux
Size
Standard DS1 v2 (1 core, 3.5 GB memory)
Public IP address/DNS name label
52.170.216.164/<none>
Virtual network/subnet
cassandra-network/default

Specifications:

- 1 core
- 3.5 GB RAM
- 2 Data Disks
- 3200 Max IOPS
- 7 GB Local SSD

Pricing: 54.31 USD/month

Issues Faced:

1) Microsoft Azure doesn’t provide much flexibility for free users.

The maximum number of cores that can be run in a region is 4. So, if we choose a 2-core instance, we can create more than two instances in one region. So, for a 3-node cluster we need to use 2 regions and for a 6-node cluster we need to use 3 regions. For benchmarking, we need an extra instance, which is going to be in another region. Setup communication between instances of different regions and the Interface is clumsy.

Solution: what we decided is that we choose VM’s with one core so that we can run 1-node and 3-node cluster.

2) Instance capacity:

Azure VM with 1-core and 2-core cannot run 640 concurrent users with a 1-node Cassandra configuration.

Solution: So, the maximum we can compare is up to 320 users for a single node Cassandra configuration.

3) The free tier of Azure has lot of restrictions which is very difficult to use even for the benchmarking purpose.