



Configure Management tool: Ansible:

PREPARED BY:

Abhilash Hasankar

Objective:

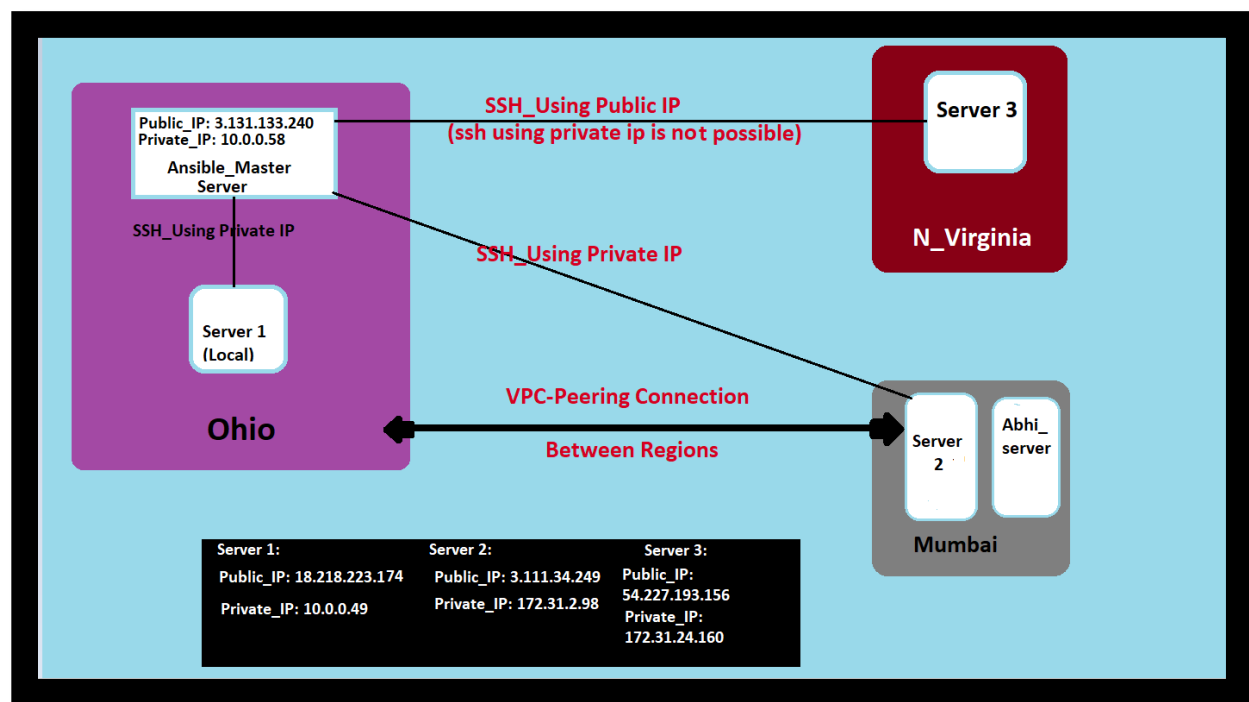
This project aims to establish a robust and secure connection between an Ansible master and its slave nodes in different AWS regions and deploys new EC2 instance using ansible playbook.

What is Ansible:

Ansible is an open-source automation tool used for IT tasks such as configuration management, application deployment, and orchestration. Developed by Red Hat, Ansible allows for the automation of repetitive IT processes, thereby improving efficiency and reducing errors. Ansible does not require any agents or additional software for client machines.

Ansible uses a push configuration model, where there is a central control node which pushes configurations and tasks to the managed nodes (target nodes/servers) over SSH for Linux or WinRM for Windows.

Flow Diagram:



Explanation:

In this project we have servers located in Ohio, North Virginia and in Mumbai. We have Ansible Master node in Ohio region with a server1 node inside a private VPC called Abi_VPC, we have one more server2 node in Mumbai and these two VPC's are peered. We have one server3 in North Virginia and this VPC is ideal (i-e there is no peering between any VPC's).

Note: all instances are running on Ubuntu machine

Now in the Ansible master Node we would update all packages and install ansible. Once installed create a ssh public and private key using the command **ssh-keygen**, which is stored in **/root/.ssh** similarly use the same command and run it in all the other servers. Copy the public key of master node and paste it in the authorized keys of all the servers to form a ssh connections.

Since Ansible master node with a private Ip is 10.0.0.58 and server1 are in the same region we can ssh using server1 private Ip (i-e ssh 10.0.0.49), also since there is VPC peering connection between Ohio and Mumbai VPC we can also form a secure shell (ssh) connection from master node to server2 using private IP of server2 (i-e ssh 172.31.2.98). But since master node and server3 are neither in same region nor there is any VPC peering between the regions, so we cannot ssh using private ip of server3, but we can ssh using public ip of server3 (i-e ssh 54.227.193.156).

Create an inventory file in the **/.ansible** directory where in all the servers private ip's are listed.

Once all setup is configured, we can test the ansible's push configurations by running an ansible adhoc shell commands to create a file abi.txt in the nodes/servers from master server. In this since we have used private IP of server 3 due to this there is no file created in the server3.

Here we also launched an EC2 instance in Mumbai region using Ansible playbook.

For this I have written the yaml code and pushed the configuration from Master node of Ohio region. For this first, we need to create an IAM role and attach it to the Master node with admin permission to EC2 service. Then install python3-pip, python3-boto, python3-boto3 and python3-botcore in the master node since these packages help in launching ec2 instances. After this run the yaml code for launching ec2 instances, run the playbook syntax-check command to check if there are any errors, once there are no errors run the ansible playbook and a new instance would be launched in the Mumbai region. Refer Configuration page for yaml code and IP address configuration.

Note: Public IP addresses are dynamically assigned by AWS.

Results:

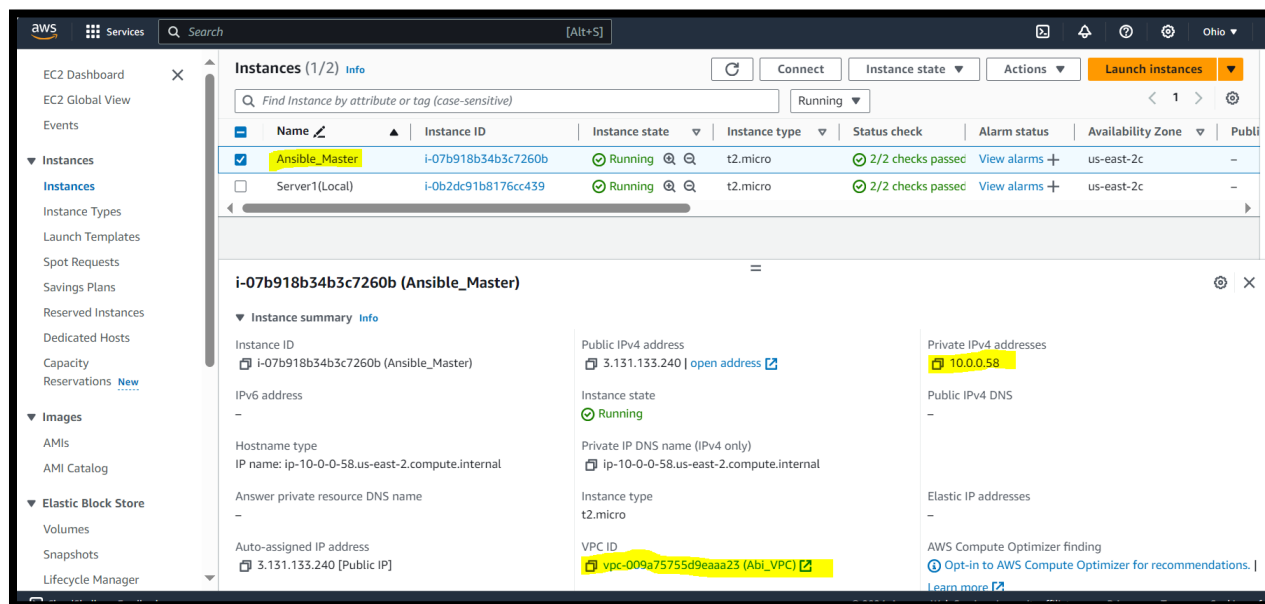


Fig 1: Ansible_Master instance created in Abi_VPC of Ohio region.

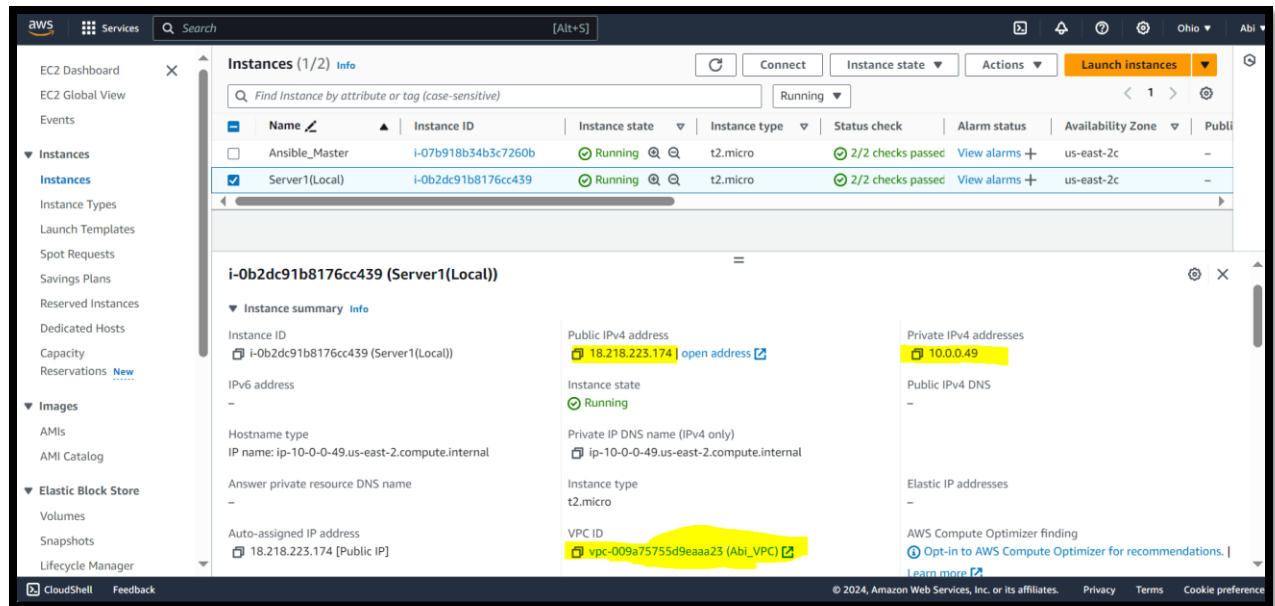


Fig 2: Server1(Local) created in Abi_VPC of Ohio region.

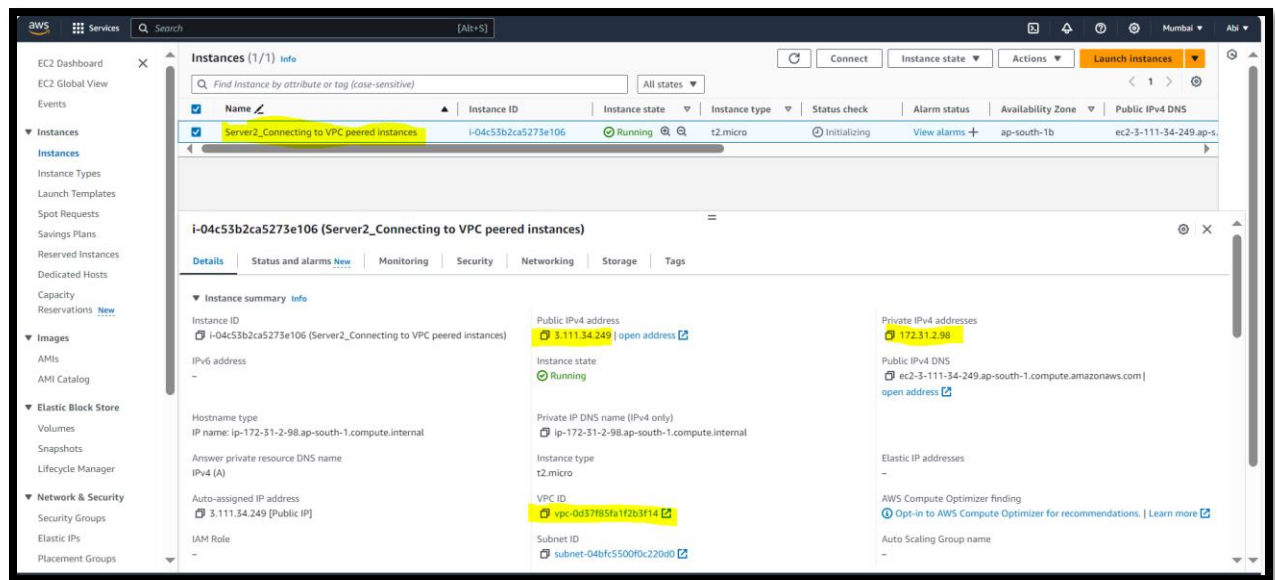


Fig 3: Server2 instance created in Destination_VPC of Mumbai Region.

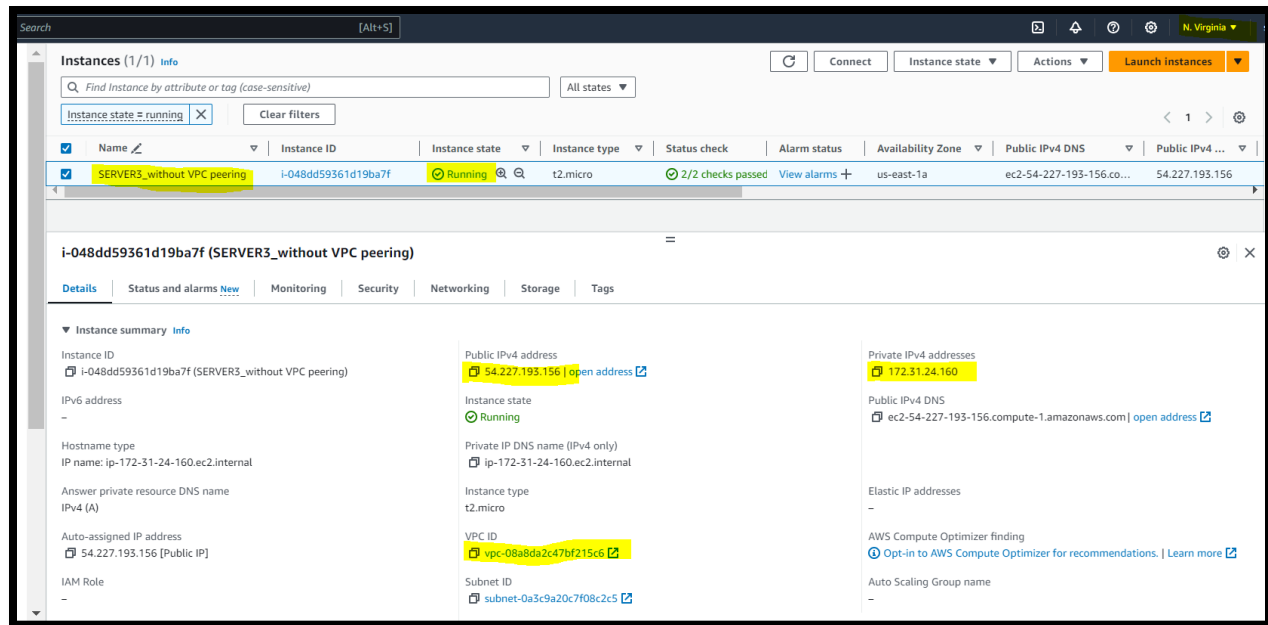


Fig 4: Server3 instance created in N.Virginia Region.

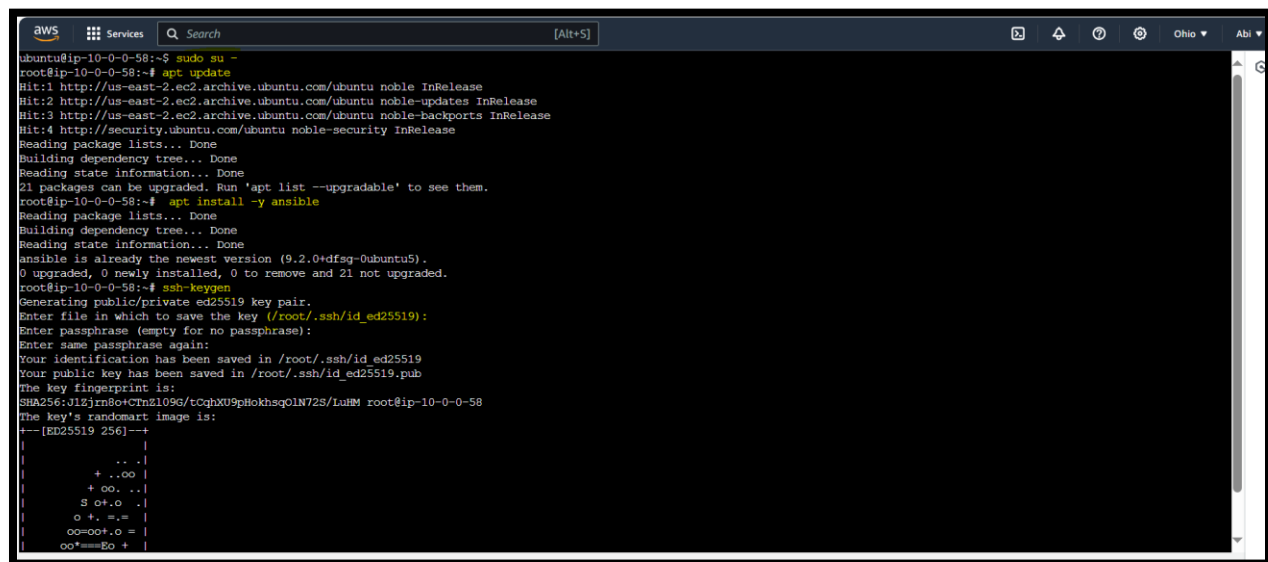


Fig 4: Packages installed in Ansible_master.

```
aws Services Search [Alt+S]
root@ip-10-0-0-58:~# cd .ssh/
root@ip-10-0-0-58:~/.ssh# ls
authorized_keys id_ed25519 id_ed25519.pub
root@ip-10-0-0-58:~/.ssh# cat id_ed25519.pub
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAICnStV4BGJvEj2iGYADtSTo00TrSP1lNVBZvndLwjmt0 root@ip-10-0-0-58
root@ip-10-0-0-58:~/.ssh#
```

Fig 5: extracting public key from Ansible_Master.

```
aws Services Search [Alt+S]
root@ip-10-0-0-49:~# apt update
Warning: The unit file, source configuration file or drop-ins of apt-news.service changed on disk. Run 'systemctl daemon-reload' to reload units.
Warning: The unit file, source configuration file or drop-ins of esm-cache.service changed on disk. Run 'systemctl daemon-reload' to reload units.
Hit:1 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://us-east-2.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
21 packages can be upgraded. Run 'apt list --upgradable' to see them.
root@ip-10-0-0-49:~# ssh-keygen
Generating public/private ed25519 key pair.
Enter file in which to save the key (/root/.ssh/id_ed25519):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /root/.ssh/id_ed25519
Your public key has been saved in /root/.ssh/id_ed25519.pub
The key fingerprint is:
SHA256:Y9dNFvCRD0TJ3609n9xWpgT7xPLTj5b26PxG32qB8qI root@ip-10-0-0-49
The key's randomart image is:
+--[ED25519 256]--+
|      +++++      |
|      ooo        |
|      ..B        |
|      ..o  *     |
|      S .  .o    |
|      . o. + B.+ |
|      o B.BB     |
|      . .@=B     |
|      E. . =*B=  |
+----[SHA256]-----+
root@ip-10-0-0-49:~# cd .ssh/
root@ip-10-0-0-49:~/.ssh# ls
```

Fig 6: Updating packages in Server1.

```
aws Services Search [Alt+S]
root@ip-10-0-0-49:~/.ssh# ls
authorized_keys id_ed25519 id_ed25519.pub
root@ip-10-0-0-49:~/.ssh# vi authorized_keys
root@ip-10-0-0-49:~/.ssh# cat authorized_keys
ssh-ed25519 AAAAC3NzaC1lZDI1NTE5AAAAICnStV4BGJvEj2iGYADtSTo00TrSP1iNVB2vndLwjmt0 root@ip-10-0-0-58
root@ip-10-0-0-49:~/.ssh#
```

Fig 7: Updating Ansible_Master's public key in the authorized key of Server1.

```
aws Services Search [Alt+S]
root@ip-10-0-0-58:~/.ssh# ssh 10.0.0.49
The authenticity of host '10.0.0.49 (10.0.0.49)' can't be established.
ED25519 key fingerprint is SHA256:xoEX+a2TWEooQ0TxySN1Bs6BP+3IYsEvO0chWcS8w/o.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.0.0.49' (ED25519) to the list of known hosts.
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-1008-aws x86_64)

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

System information as of Thu May  9 20:16:46 UTC 2024

System load:  0.0          Processes:            114
Usage of /:   27.1% of 6.71GB Users logged in:           1
Memory usage: 22%         IPv4 address for enX0: 10.0.0.49
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

17 updates can be applied immediately.
17 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

root@ip-10-0-0-49:~#
```

Fig 8: Results of SSH connection from Ansible_Master to server1.


```

ubuntu@ip-10-0-0-58:~$ sudo su -
root@ip-10-0-0-58:~# ping 3.111.34.249
PING 3.111.34.249 (3.111.34.249) 56(84) bytes of data.
64 bytes from 3.111.34.249: icmp_seq=1 ttl=49 time=222 ms
64 bytes from 3.111.34.249: icmp_seq=2 ttl=49 time=222 ms
^Z
[1]+  Stopped                  ping 3.111.34.249
root@ip-10-0-0-58:~# ping 172.31.2.98
PING 172.31.2.98 (172.31.2.98) 56(84) bytes of data.
64 bytes from 172.31.2.98: icmp_seq=1 ttl=64 time=219 ms
64 bytes from 172.31.2.98: icmp_seq=2 ttl=64 time=219 ms
64 bytes from 172.31.2.98: icmp_seq=3 ttl=64 time=219 ms
64 bytes from 172.31.2.98: icmp_seq=4 ttl=64 time=219 ms
^Z
[2]+  Stopped                  ping 172.31.2.98
root@ip-10-0-0-58:~# ssh 172.31.2.98
The authenticity of host '172.31.2.98 (172.31.2.98)' can't be established.
ED25519 key fingerprint is SHA256:DW9Fq+89qDyP8d6nPzBGydkIhyaCyh+3oD9DNcSNcQ4.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '172.31.2.98' (ED25519) to the list of known hosts.
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-1008-aws x86_64)

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

System information as of Mon May 13 18:04:46 UTC 2024

System load:  0.0              Processes:    115
Usage of /:   23.4% of 6.71GB  Users logged in: 1
Memory usage: 20%             IPv4 address for enX0: 172.31.2.98
Swap usage:   0%

```

```

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

System information as of Mon May 13 18:04:46 UTC 2024

System load:  0.0              Processes:    115
Usage of /:   23.4% of 6.71GB  Users logged in: 1
Memory usage: 20%             IPv4 address for enX0: 172.31.2.98
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

root@ip-172-31-2-98:~#
root@ip-172-31-2-98:~#
root@ip-172-31-2-98:~#

```

Fig 9: Results of SSH connection from Ansible_Master to server2.

```

ubuntu@ip-10-0-0-58:~$ sudo su -
root@ip-10-0-0-58:~# ping 172.31.24.160
PING 172.31.24.160 (172.31.24.160) 56(84) bytes of data.
^Z
[1]+  Stopped                  ping 172.31.24.160
root@ip-10-0-0-58:~# ping 54.227.193.156
PING 54.227.193.156 (54.227.193.156) 56(84) bytes of data.
64 bytes from 54.227.193.156: icmp_seq=1 ttl=42 time=10.0 ms
64 bytes from 54.227.193.156: icmp_seq=2 ttl=42 time=9.94 ms
64 bytes from 54.227.193.156: icmp_seq=3 ttl=42 time=9.91 ms
^Z
[2]+  Stopped                  ping 54.227.193.156
root@ip-10-0-0-58:~# ssh 172.31.24.160
^Z
[3]+  Stopped                  ssh 172.31.24.160
root@ip-10-0-0-58:~# ssh 54.227.193.156
The authenticity of host '54.227.193.156 (54.227.193.156)' can't be established.
ED25519 key fingerprint is SHA256:Maz5MgjX3DtF8xmLhXoog/WNQpzTmp9rZ+aaWGBHLDC.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '54.227.193.156' (ED25519) to the list of known hosts.
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-1008-aws x86_64)

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

System information as of Mon May 13 16:40:08 UTC 2024

System load:  0.0           Processes:           106
Usage of /:   23.3% of 6.71GB Users logged in:       0
Memory usage: 19%          IPv4 address for enX0: 172.31.24.160
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The list of available updates is more than a week old.

```

```
The list of available updates is more than a week old.  
To check for new updates run: sudo apt update  
  
The programs included with the Ubuntu system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*/copyright.  
  
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.  
  
root@ip-172-31-24-160:~#  
root@ip-172-31-24-160:~#  
root@ip-172-31-24-160:~#  
root@ip-172-31-24-160:~#
```

Fig 10: Results of SSH connection from Ansible_Master to server3's public IP.

```
aws Services Search [Alt+S]
root@ip-10-0-0-58:~/.ansible# vi inventory
root@ip-10-0-0-58:~/.ansible# cat inventory
[local_Machine]
10.0.0.49

[Mumbai]
172.31.2.98

[N.Virginia]
172.31.24.160

root@ip-10-0-0-58:~/.ansible# ansible -i inventory all -m "shell" -a "touch abi.txt" ^C
root@ip-10-0-0-58:~/.ansible# ansible -i inventory all -m "shell" -a "touch abi.txt"
[WARNING]: Invalid characters were found in group names but not replaced, use -vvvv to see details
10.0.0.49 | CHANGED | rc=0 >>

172.31.2.98 | CHANGED | rc=0 >>

172.31.24.160 | UNREACHABLE! => {
  "changed": false,
  "msg": "Failed to connect to the host via ssh: ssh: connect to host 172.31.24.160 port 22: Connection timed out",
  "unreachable": true
}
root@ip-10-0-0-58:~/.ansible#
```

Fig 11: Results of running ansible adhoc command from Ansible_Master to create file in server1, 2 and server3.

```
aws Services Search
root@ip-10-0-0-49:~# ls
abi.txt  snap
root@ip-10-0-0-49:~#

aws Services Search
root@ip-172-31-2-98:~# ls
abi.txt  snap
root@ip-172-31-2-98:~#

ubuntu@ip-172-31-24-160:~$ sudo su -
root@ip-172-31-24-160:~# ls
snap
root@ip-172-31-24-160:~#
```

Fig 12: Results of file creation in server1,2 and 3.

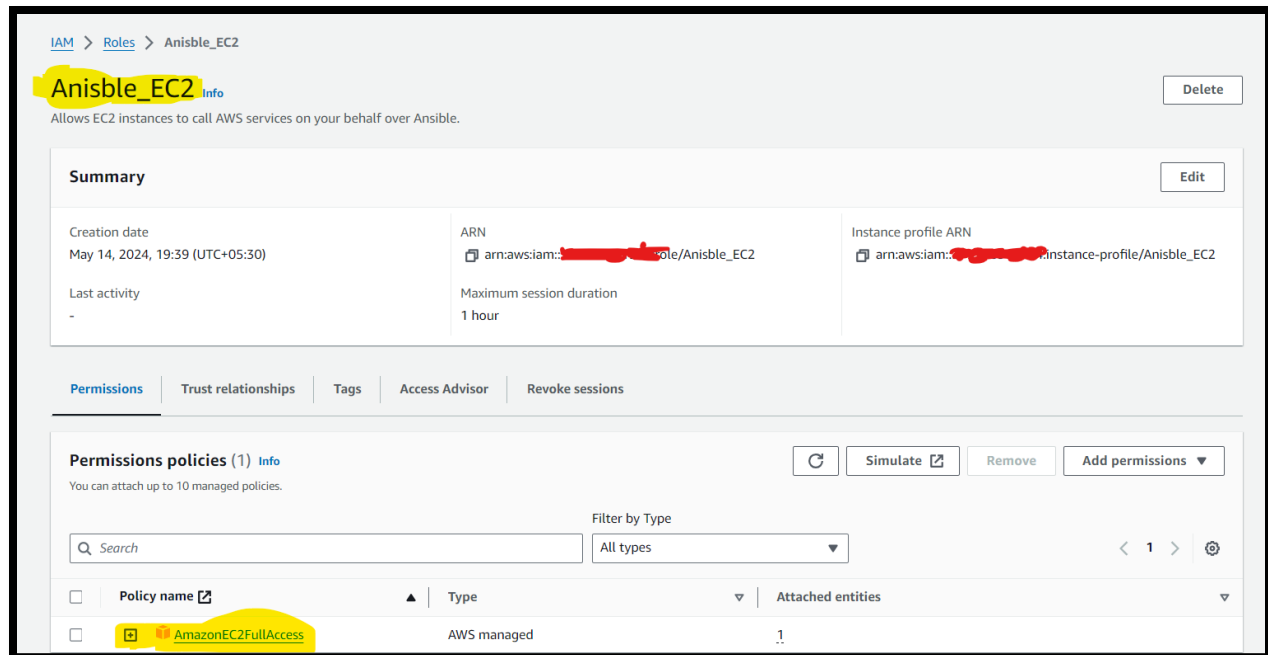


Fig 13: Creation of IAM role for EC2 full Admin Access.

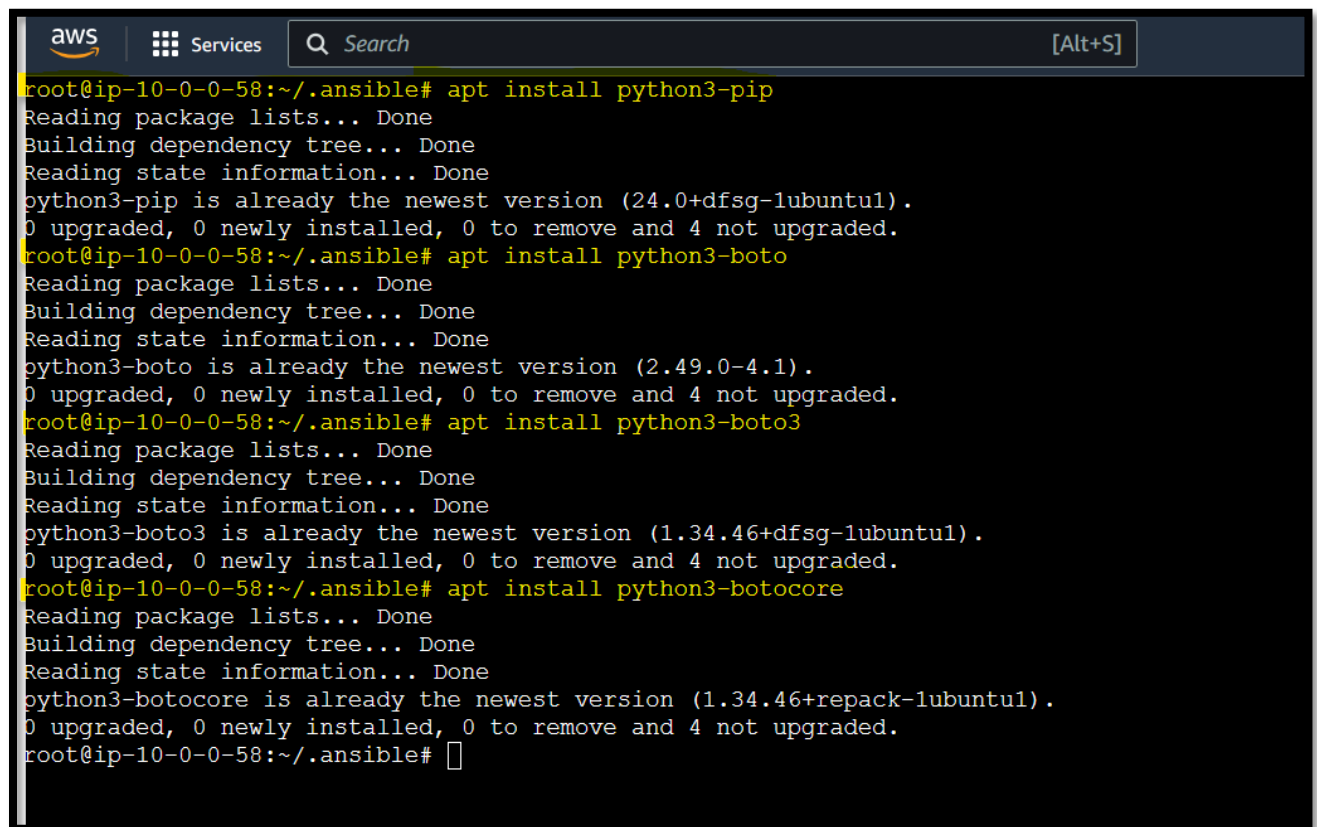


Fig 14: Installing packages in Ansible_Master.

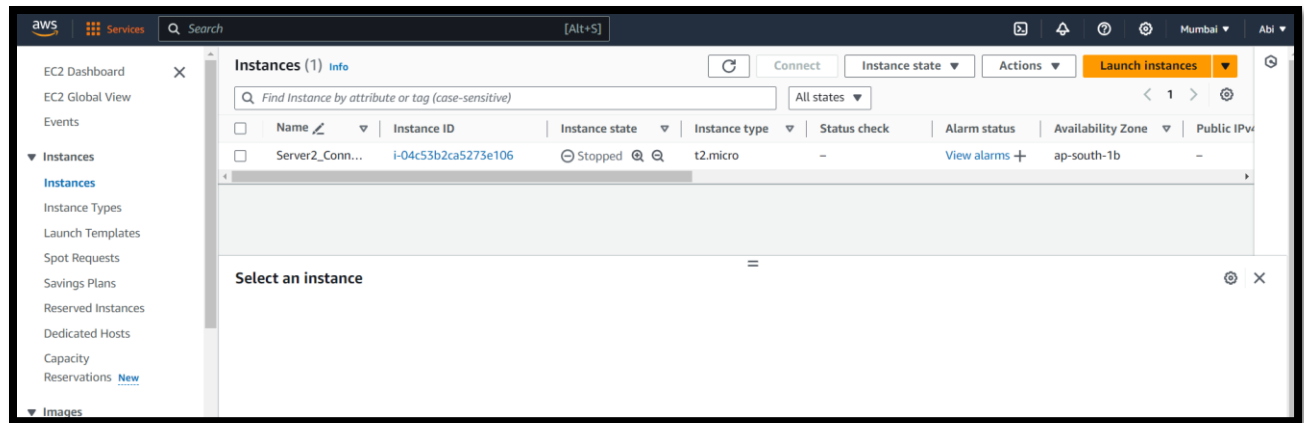


Fig 15: Instance status in Mumbai region before running ansible-playbook command.

```
aws Services Search [Alt+S]
root@ip-10-0-0-58:~/.ansible# cat ec_instance.yml
- name: EC2 instance launch
  hosts: localhost
  tasks:
    - ec2_instance:
        key_name: Mumbai_key
        region: ap-south-1
        instance_type: t2.micro
        image_id: ami-0cc9838aa7ab1dce7
        count: 1
        wait: yes
        security_group: sg-04e7fd8bbc15e0cf5
        network:
            assigning_public_ip: true
        tags:
            name: Abhi_server

root@ip-10-0-0-58:~/.ansible# ansible-playbook --syntax-check ec_instance.yml
[WARNING]: No inventory was parsed, only implicit localhost is available
[WARNING]: provided hosts list is empty, only localhost is available. Note that the implicit localhost does not match 'all'

playbook: ec_instance.yml
```

Fig 16: output of ansible-playbook syntax-check command.

```
root@ip-10-0-0-58:~/.ansible# ansible-playbook ec_instance.yml
[WARNING]: No inventory was parsed, only implicit localhost is available
[WARNING]: provided hosts list is empty, only localhost is available. Note that the implicit localhost does not match 'all'

PLAY [EC2 instance launch] *****

TASK [Gathering Facts] *****
ok: [localhost]

TASK [ec2_instance] *****
changed: [localhost]

PLAY RECAP *****
localhost                : ok=2    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

root@ip-10-0-0-58:~/.ansible#
```

Fig 17: Results of running ansible-playbook from Ansible_Master.

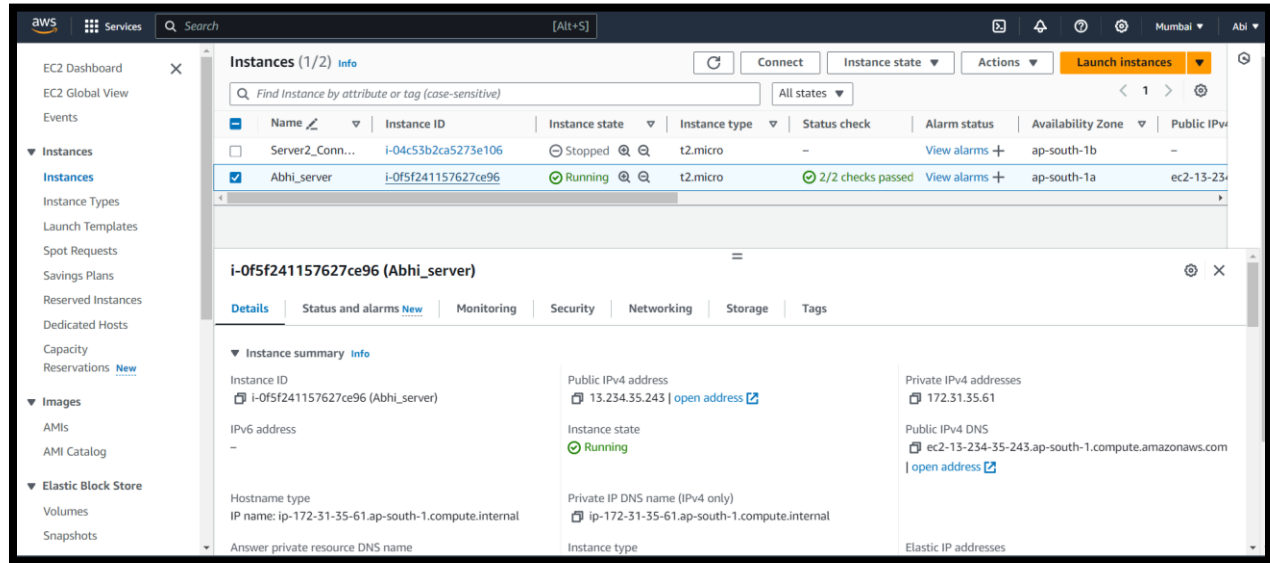


Fig 18: Instance created in Mumbai region after running ansible-playbook command.

Project learnings and observations:

- Cannot ssh using private ip if both the systems are not in the same region, could be achieved by VPC peering.
- Keep updated all the packages in the instances before running any new packages.
- Always run ansible syntax-check command before running any playbook, if there are any errors or packages which should installed will be listed, install them accordingly.
- Always use space while writing yaml code, do not use tab.
- Use the correct module name or correct playbooks while working with ansible, use ansible [documentation](#) for reference.
- If we are working on the same AWS account, then creating an IAM policy and attaching it to Ansible_Master node will help in launching Instances. But if not in the same AWS account, then we need to add access keys and secret key in the yaml code of destination account.