

**Bansilal Ramnath Agarwal Charitable Trust's
VISHWAKARMA INSTITUTE OF INFORMATION
TECHNOLOGY,**

PUNE-48 Department of Information Technology

ITUA32202: CLOUD COMPUTING

Assignment-6

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C2 Batch

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PRN: 22010443

AIM: Write an ansible-playbook to install nginx on target servers.

THEORY:

1) What is YAML

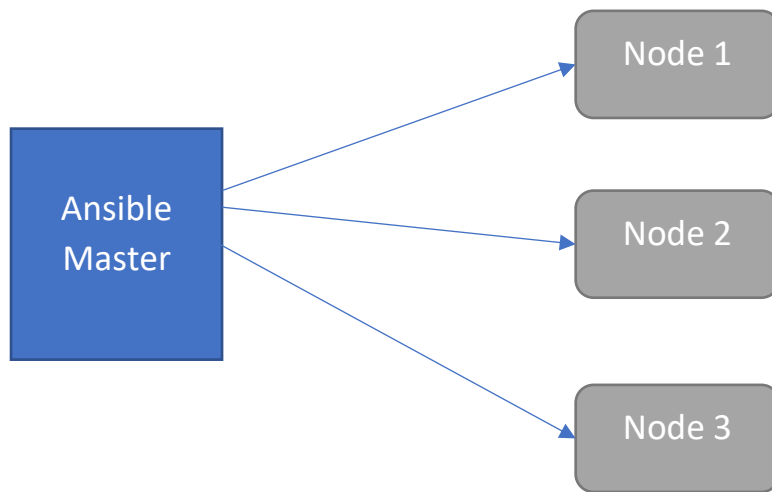
YAML stands for "YAML Ain't Markup Language". It is a human-readable data serialization format used for configuring applications, storing data, and exchanging information between systems. It is often used in configuration files and is used as a replacement for XML or JSON. YAML uses indentation to define the structure of data and uses a minimalistic syntax that makes it easy to read and write by humans.

2) What is Ansible

Ansible is an open-source automation tool used for configuration management, application deployment, and orchestration. It uses a declarative language called YAML to define the configuration of systems and applications, and it executes tasks in parallel on multiple systems over SSH. Ansible is designed to be simple, easy to use, and highly scalable, and it does not require any agents or additional software to be installed on the target systems. Ansible can be used to automate tasks such as server provisioning, software installation, system updates, and application deployment, among others.

STEPWISE IMPLEMENTATION:

1. Architecture:



Architecture Diagram

-> Create 4 EC2 Instances on AWS

The screenshot shows the AWS Management Console interface. The top navigation bar includes the AWS logo, a search bar, and the user's profile. The left sidebar contains various navigation options like 'EC2 Dashboard', 'Events', 'Limits', 'Instances', 'Instance Types', 'Launch Templates', 'Spot Requests', 'Savings Plans', 'Reserved Instances', 'Dedicated Hosts', 'Scheduled Instances', 'Capacity Reservations', 'Images', 'AMIs', 'AMI Catalog', 'Elastic Block Store', and 'Volumes'. The main content area displays a list of EC2 instances under the 'Instances (4) Info' header. The list includes columns for Name, Instance ID, Instance state, Instance type, Status check, Alarm status, Availability Zone, and Public IPv4 DNS. Below the list, the details for a specific instance (i-07bdf43e1ad90445) are shown, including tabs for Details, Security, Networking, Storage, Status checks, Monitoring, and Tags. The 'Details' tab is active, showing the instance summary with fields for Instance ID, Public IPv4 address, Private IPv4 addresses, IPv6 address, Instance state, Hostname type, Answer private resource DNS name, and Elastic IP addresses.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4 DNS
Ansible-Server1	i-020bf2f9adb11f21	Running	t2.micro	2/2 checks passed	No alarms	us-east-1d	ec2-107-20-32-2
Ansible-Server2	i-0e760ee713c7d812b	Running	t2.micro	2/2 checks passed	No alarms	us-east-1d	ec2-3-87-13-163
Ansible-Server3	i-096f9a6c21b1be6cb	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a	ec2-34-227-227-
Ansible-Master	i-02a27b3021029b10d	Running	t2.micro	2/2 checks passed	No alarms	us-east-1a	ec2-54-87-55-46

Here we have Created 1 Master & 3 Slaves Servers.

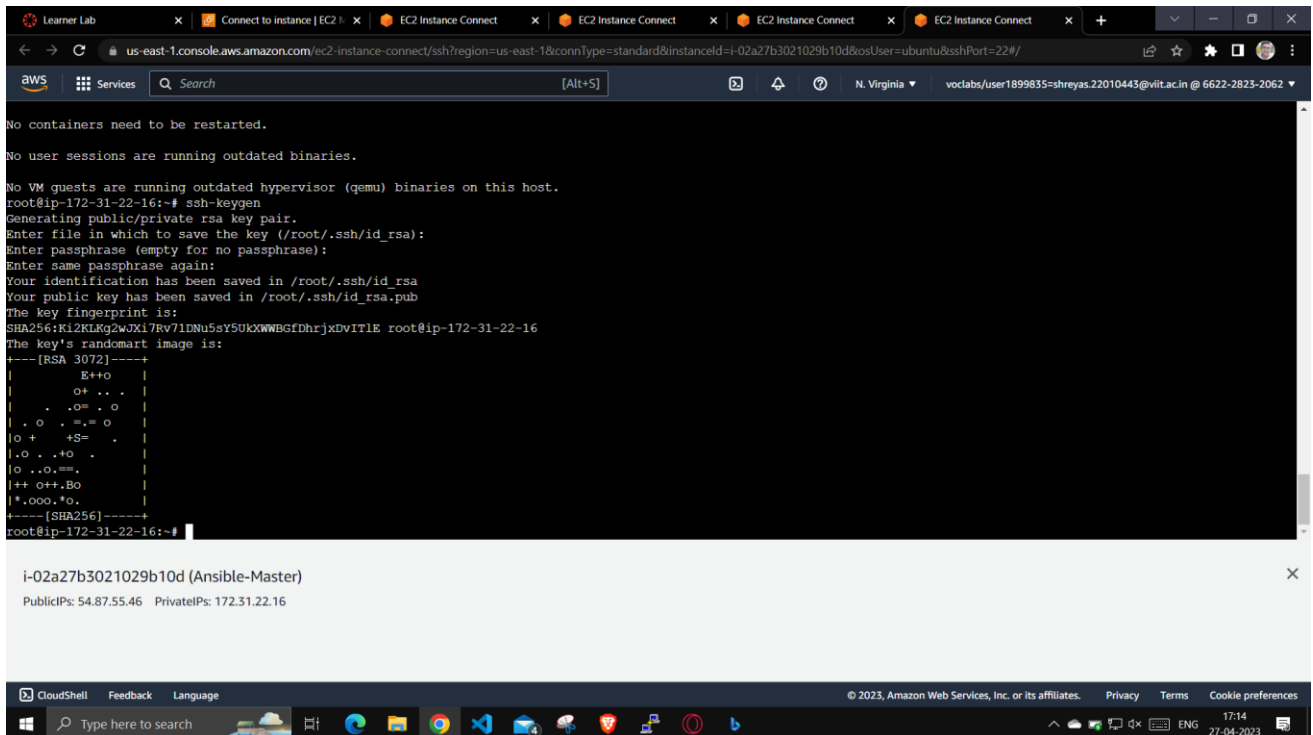
-> Run `sudo apt-get update` on all Instances

-> Install ansible on the master server

-> Generate ssh key on Ansible-master using command

ssh-keygen

This will generate keys on the master server

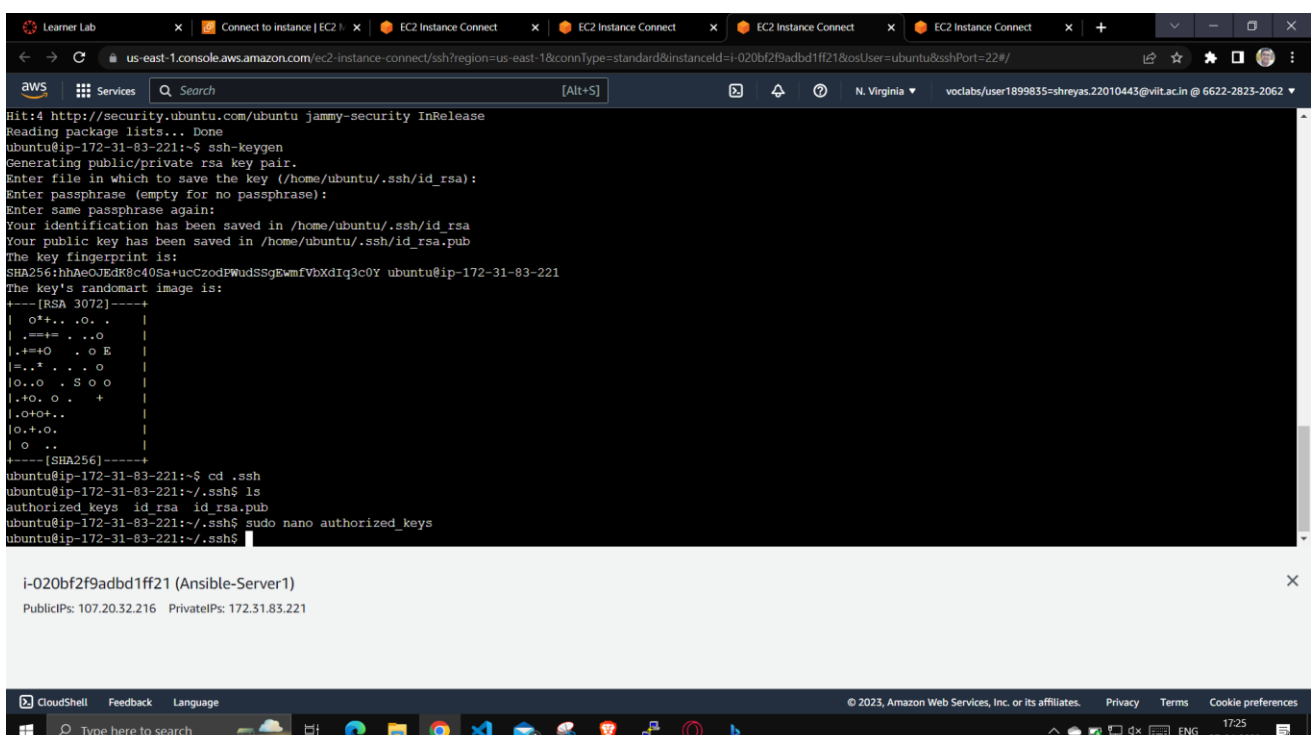


```
Learn Lab | Connect to instance | EC2 | EC2 Instance Connect | EC2 Instance Connect | EC2 Instance Connect | EC2 Instance Connect | EC2 Instance Connect | +
us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?region=us-east-1&connType=standard&instanceId=i-02a27b3021029b10d&osUser=ubuntu&sshPort=22#/
Services | Search | [Alt+S] | N. Virginia | voclabs/user1899835=shreyas.22010443@vilit.ac.in @ 6622-2823-2062
No containers need to be restarted.
No user sessions are running outdated binaries.
No VM guests are running outdated hypervisor (qemu) binaries on this host.
root@ip-172-31-22-16:~# ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /root/.ssh/id_rsa
Your public key has been saved in /root/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:Ki2KLG2wXJi7Rv71DNu5sY5UKXWBgfdHrjxDvIT1E root@ip-172-31-22-16
The key's randomart image is:
+---[RSA 3072]-----+
|      E+O      |
|      O+ ..   |
|      .O= .O   |
|      .O . =+  |
|      |O +  +S= |
|      |.O . +O  |
|      |O ..O==  |
|      |++ o++Bo |
|      |*.ooo.*o |
|      +-----+
+---[SHA256]-----+
root@ip-172-31-22-16:~#
```

i-02a27b3021029b10d (Ansible-Master)
PublicIPs: 54.87.55.46 PrivateIPs: 172.31.22.16

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-> Now copy the public key from the master server and paste it into the authorized_keys of the slave servers.



```
Learn Lab | Connect to instance | EC2 | EC2 Instance Connect | EC2 Instance Connect | EC2 Instance Connect | EC2 Instance Connect | EC2 Instance Connect | +
us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?region=us-east-1&connType=standard&instanceId=i-020bf2f9adbd1ff21&osUser=ubuntu&sshPort=22#/
Services | Search | [Alt+S] | N. Virginia | voclabs/user1899835=shreyas.22010443@vilit.ac.in @ 6622-2823-2062
Hit:4 http://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
ubuntu@ip-172-31-83-221:~$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/ubuntu/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/ubuntu/.ssh/id_rsa
Your public key has been saved in /home/ubuntu/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:hhAeQJEd8c40Sa+ucCzodFWudsSgEwmfVbXdiQ3c0Y ubuntu@ip-172-31-83-221
The key's randomart image is:
+---[RSA 3072]-----+
|  O+.. .O. .  |
|  .==+ . .O   |
|  .+=+ . .O E |
|  =.* . .O    |
|  |O.. .S O O |
|  |.O. O. +   |
|  |.O+O+..    |
|  |.O+.O.     |
|  | O ..      |
|  +-----+
+---[SHA256]-----+
ubuntu@ip-172-31-83-221:~$ cd .ssh
ubuntu@ip-172-31-83-221:~/.ssh$ ls
authorized_keys  id_rsa  id_rsa.pub
ubuntu@ip-172-31-83-221:~/.ssh$ sudo nano authorized_keys
ubuntu@ip-172-31-83-221:~/.ssh$
```

i-020bf2f9adbd1ff21 (Ansible-Server1)
PublicIPs: 107.20.32.216 PrivateIPs: 172.31.83.221

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```
Learner Lab x Connect to instance | EC2 | x EC2 Instance Connect x EC2 Instance Connect x EC2 Instance Connect x EC2 Instance Connect x +
us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?region=us-east-1&connType=standard&instanceId=i-0e760ee713c7d812b&osUser=ubuntu&sshPort=22#/
aws Services Search [Alt+S] N. Virginia voclabs/user1899835=shreyas.22010443@vlt.ac.in @ 6622-2823-2062
Get:31 http://security.ubuntu.com/ubuntu jammy-security/main amd64 Packages [796 kB]
Get:32 http://security.ubuntu.com/ubuntu jammy-security/main Translation-en [156 kB]
Get:33 http://security.ubuntu.com/ubuntu jammy-security/main amd64 c-n-f Metadata [9024 B]
Get:34 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 Packages [830 kB]
Get:35 http://security.ubuntu.com/ubuntu jammy-security/restricted Translation-en [131 kB]
Get:36 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 c-n-f Metadata [604 B]
Get:37 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 Packages [727 kB]
Get:38 http://security.ubuntu.com/ubuntu jammy-security/universe Translation-en [120 kB]
Get:39 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 c-n-f Metadata [14.2 kB]
Get:40 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 Packages [34.3 kB]
Get:41 http://security.ubuntu.com/ubuntu jammy-security/multiverse Translation-en [6464 B]
Get:42 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 c-n-f Metadata [252 B]
Fetched 27.1 MB in 5s (5695 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
35 packages can be upgraded. Run 'apt list --upgradable' to see them.
ubuntu@ip-172-31-81-106:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
ubuntu@ip-172-31-81-106:~$ cd .ssh
ubuntu@ip-172-31-81-106:~/.ssh$ ls
authorized_keys
ubuntu@ip-172-31-81-106:~/.ssh$ sudo nano authorized_keys
ubuntu@ip-172-31-81-106:~/.ssh$
```

i-0e760ee713c7d812b (Ansible-Server2)
PublicIPs: 3.87.13.163 PrivateIPs: 172.31.81.106

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-> To check for ssh authentication:

ssh ubuntu@PrivateIP

i-020bf2f9adbd1ff21 (Ansible-Server1)
PublicIPs: 107.20.32.216 PrivateIPs: 172.31.83.221

i-0e760ee713c7d812b (Ansible-Server2)
PublicIPs: 3.87.13.163 PrivateIPs: 172.31.81.106

```
Learner Lab x Connect to instance | EC2 | x EC2 Instance Connect x EC2 Instance Connect x EC2 Instance Connect x EC2 Instance Connect x +
us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?region=us-east-1&connType=standard&instanceId=i-02a27b3021029b10d&osUser=ubuntu&sshPort=22#/
aws Services Search [Alt+S] N. Virginia voclabs/user1899835=shreyas.22010443@vlt.ac.in @ 6622-2823-2062
* Documentation: https://help.ubuntu.com
* Management: https://landscape.canonical.com
* Support: https://ubuntu.com/advantage

System information as of Thu Apr 27 11:55:29 UTC 2023

System load: 0.0 Processes: 100
Usage of /: 22.8% of 7.57GB Users logged in: 1
Memory usage: 25% IPv4 address for eth0: 172.31.81.106
Swap usage: 0%

Expanded Security Maintenance for Applications is not enabled.

39 updates can be applied immediately.
21 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

Last login: Thu Apr 27 11:41:16 2023 from 18.206.107.29
ubuntu@ip-172-31-81-106:~$ exit
logout
Connection to 172.31.81.106 closed.
root@ip-172-31-22-16:~$
```

i-02a27b3021029b10d (Ansible-Master)
PublicIPs: 54.87.55.46 PrivateIPs: 172.31.22.16

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Here we have cross verified the ssh-authentication for server-2

Use the `exit` command to close the ssh connection

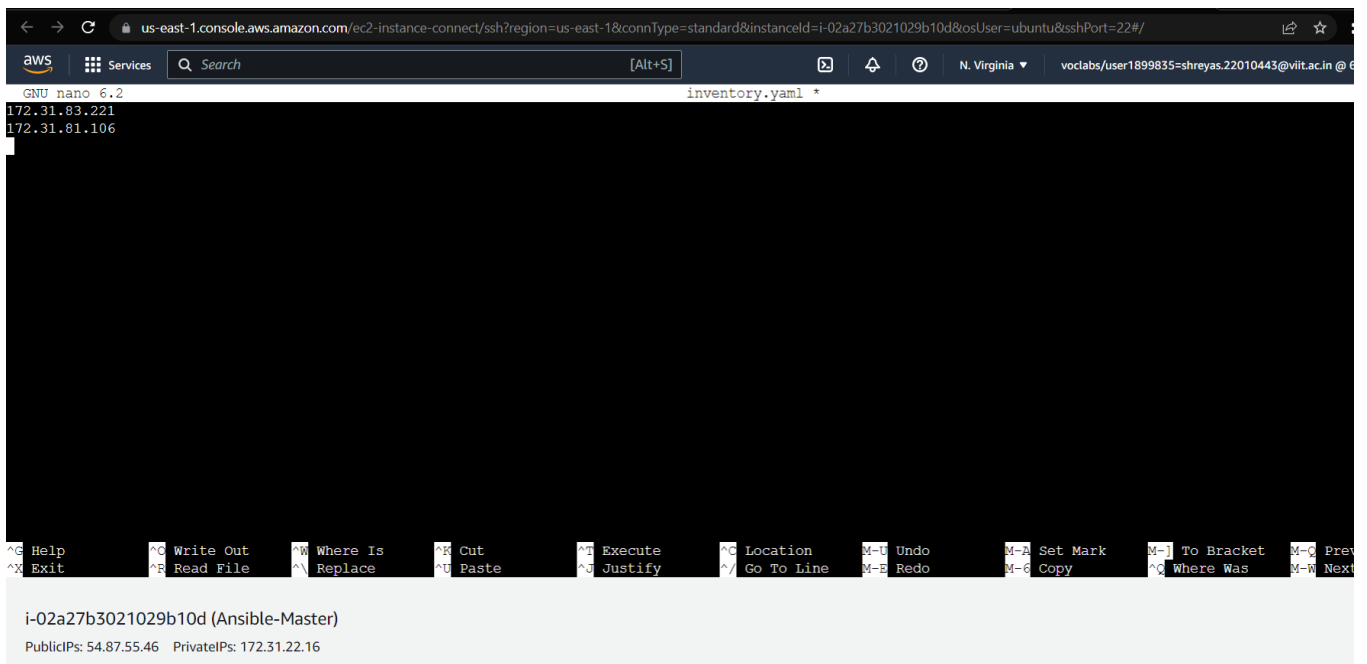
-> make a directory named ansible using the `mkdir ansible`

-> Create two yaml files namely

1. `inventory.yaml`

2. `playbook.yaml`

-> The `inventory.yaml` file must consist of the the private IP addresses of the slave servers

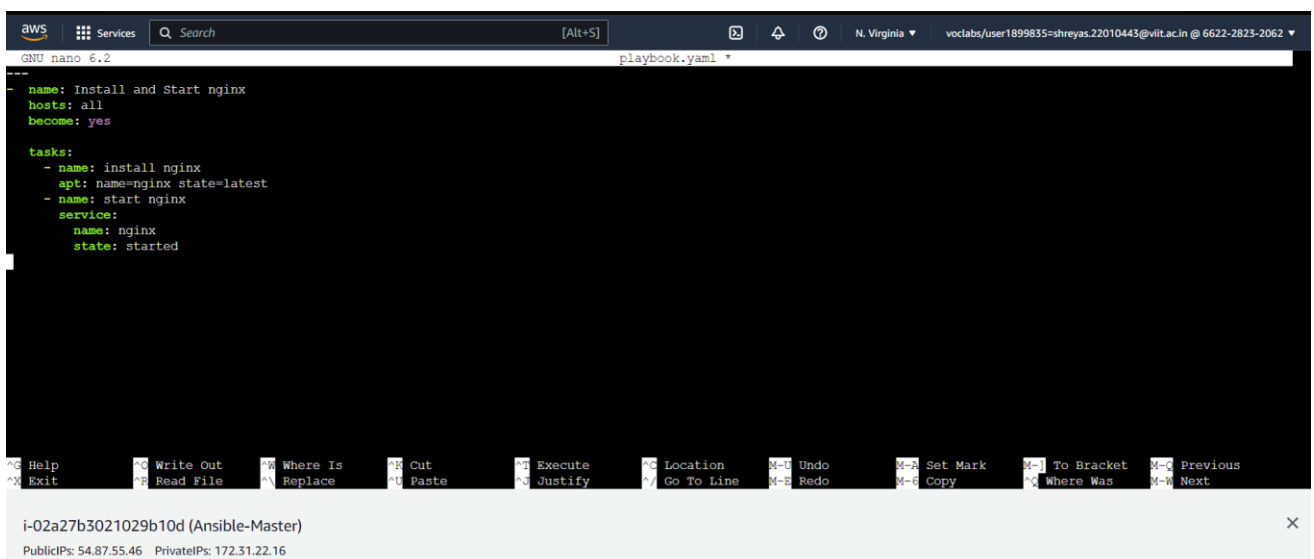


The screenshot shows an AWS console terminal window with the title "us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?region=us-east-1&connType=standard&instanceId=i-02a27b3021029b10d&osUser=ubuntu&sshPort=22#/" and a search bar. The terminal is running GNU nano 6.2 and editing a file named "inventory.yaml". The content of the file is:

```
172.31.83.221
172.31.81.106
```

The terminal also shows a command prompt "i-02a27b3021029b10d (Ansible-Master)" and the public and private IP addresses: "PublicIPs: 54.87.55.46 PrivateIPs: 172.31.22.16".

-> The `playbook.yaml` file must contain the ansible script which is to be executed.



The screenshot shows an AWS console terminal window with the title "us-east-1.console.aws.amazon.com/ec2-instance-connect/ssh?region=us-east-1&connType=standard&instanceId=i-02a27b3021029b10d&osUser=ubuntu&sshPort=22#/" and a search bar. The terminal is running GNU nano 6.2 and editing a file named "playbook.yaml". The content of the file is:

```
--
- name: Install and Start nginx
  hosts: all
  become: yes

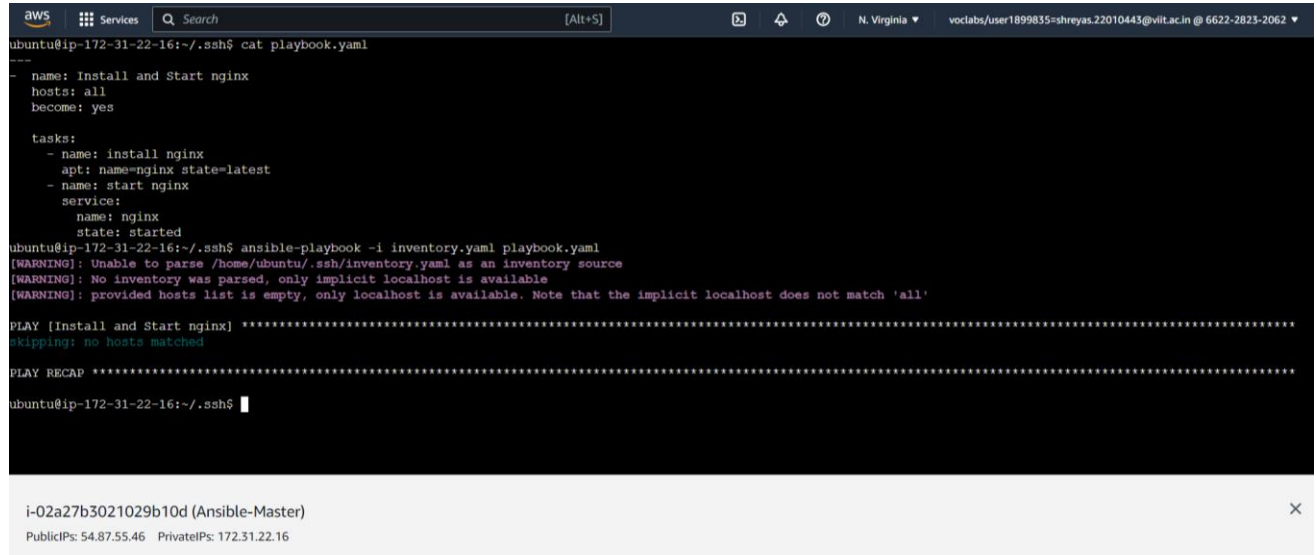
  tasks:
    - name: install nginx
      apt: name=nginx state=latest
    - name: start nginx
      service:
        name: nginx
        state: started
```

The terminal also shows a command prompt "i-02a27b3021029b10d (Ansible-Master)" and the public and private IP addresses: "PublicIPs: 54.87.55.46 PrivateIPs: 172.31.22.16".

-> Run the playbook.yaml & inventory.yaml files

```
ubuntu@ip-172-31-22-16:~/.ssh$ ansible-playbook -i inventory.yaml playbook.yaml
```

OUTPUT:



```
aws
Services
Search
[Alt+S]
N. Virginia
voclabs/user1899835=shreyas.22010443@vllt.ac.in @ 6622-2823-2062
ubuntu@ip-172-31-22-16:~/.ssh$ cat playbook.yaml
---
- name: Install and Start nginx
  hosts: all
  become: yes

  tasks:
    - name: install nginx
      apt: name=nginx state=latest
    - name: start nginx
      service:
        name: nginx
        state: started
ubuntu@ip-172-31-22-16:~/.ssh$ ansible-playbook -i inventory.yaml playbook.yaml
[WARNING]: Unable to parse /home/ubuntu/.ssh/inventory.yaml as an inventory source
[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 [Install and Start nginx] *****
skipping: no hosts matched

PLAY RECAP *****
ubuntu@ip-172-31-22-16:~/.ssh$
```

i-02a27b3021029b10d (Ansible-Master)
PublicIPs: 54.87.55.46 PrivateIPs: 172.31.22.16

Conclusion: We have successfully written an ansible-playbook to install nginx on target servers. We have also explored domains like ansible and yaml.