**Name : - Komal Mhetre**

**Role : DevOps Engineer**

**Task :- Deploy Tomcat Sample .War file On AWS using Ansible**

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1. **Ansible :-**
   **=======**
   **1) Take 3 instances in same region.**
   **2) 1 is Ansible master, 2 is worker nodes.**
   **3) Make master and worker node configuration as mention in step 2.**
   **4) create a Playbook for download and start tomcat in two worker nodes.**
   **5) Deploy a sample .war file and start the application using same playbook.**
   **6) check the application UI.**
   **7) share you output using gitlab repositary.**

- **Prerequisite :-**

- **Three AWS EC2 instance and Ansible installed in the server.**
- **SSH connection to all the instances.**
- **Mention the private IP address of worker nodes under Ansible Hosts.**

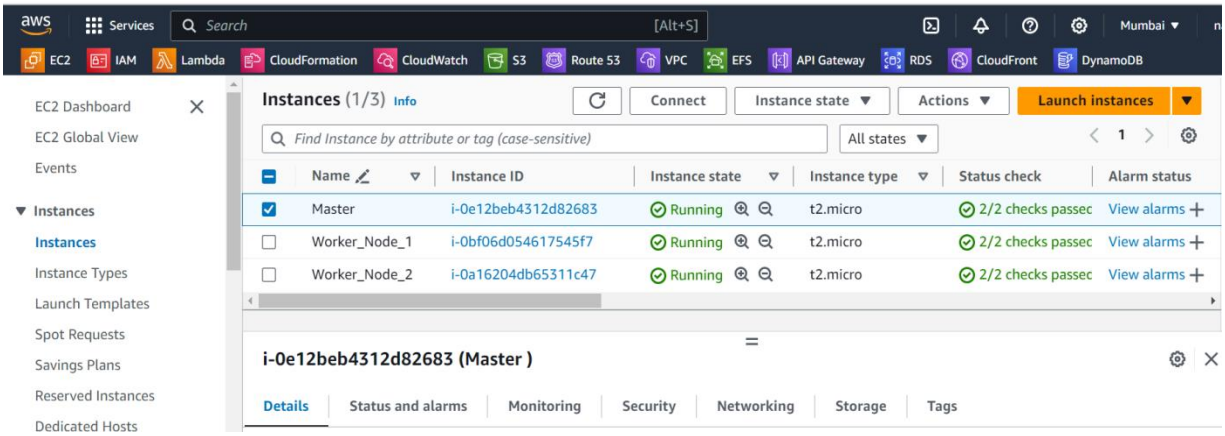
- **Objective :-**

- **Configure Ansible to manage three instances in the same region, with one as the Ansible master and two as worker nodes. Create a playbook to download, start Tomcat, deploy a sample .war file, and start the application on the worker nodes.**

- **Steps :-**

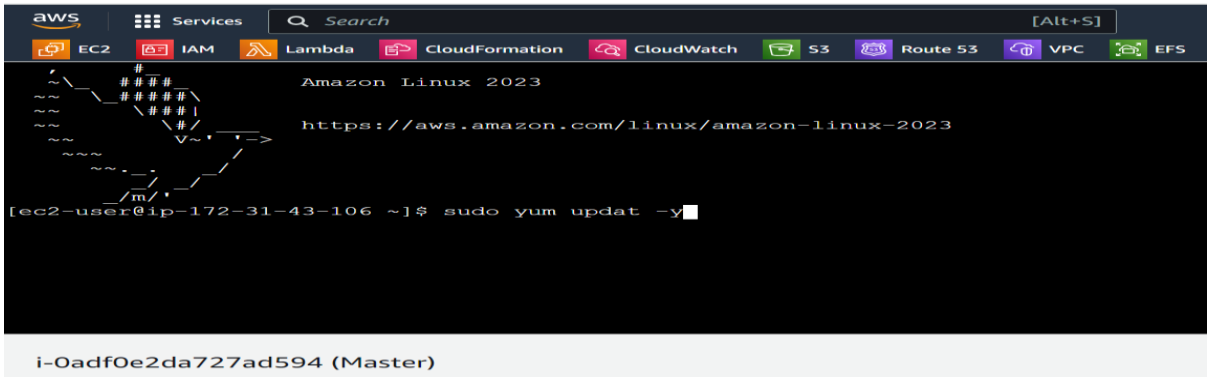
**Launch three instances in the same region.**

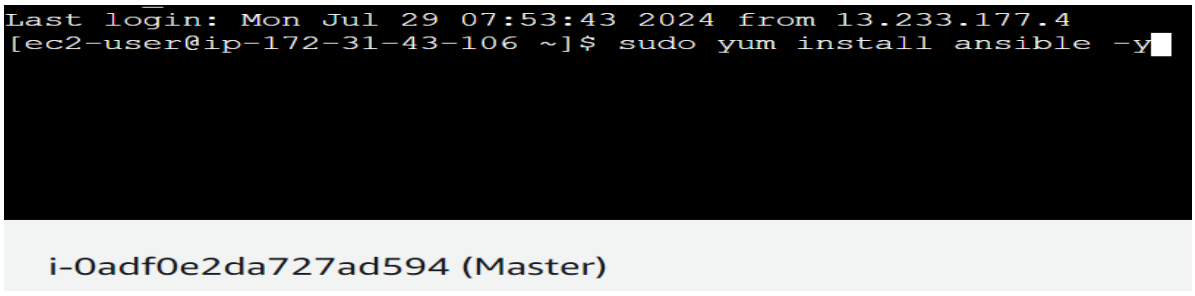
- **Instance 1: Ansible Master**
- **Instance 2: Worker Node 1**
- **Instance 3: Worker Node 2**

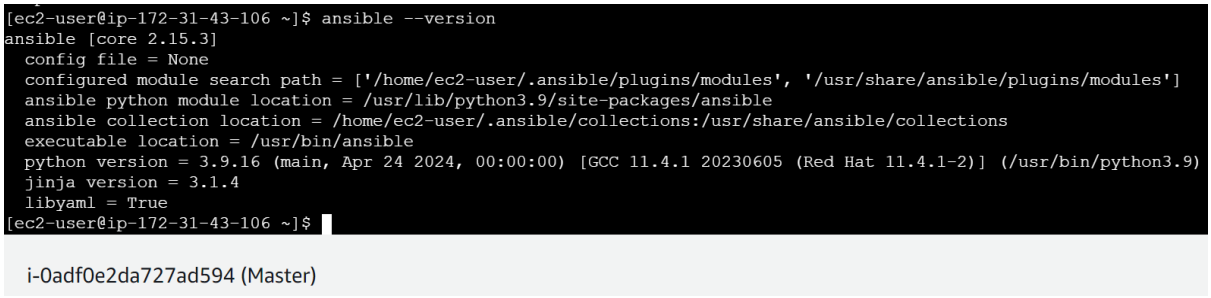



- **Configure the Ansible Master and Worker Nodes according to the instructions Given below.**
- **Install Ansible on master node and check the version of ansible**

**Sudo yum update –y**
**Sudo yum install ansible –y**
**Ansible --version**



- **Generate SSH key pair on master node using below command**
  **ssh-keygen**

```
[root@ip-172-31-43-106 ec2-user]# 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:bDovnSBeu3fZS0VudX+PRBoswh6ELqkXYZJLaXA8gW4 root@ip-172-31-43-106.ap-south-1.compute.internal
The key's randomart image is:
+---[RSA 3072]----+
|.+o+   ..        |
|..O o .o   .     |
|.o = +  + . o o o|
| E. + .o o . * .o|
|.  . o  S   . = o|
|  . o oo     + .o|
|   o oo+ . o. . .|
|    . oo+ o..    |
|      .+..  ..   |
+----[SHA256]-----+
[root@ip-172-31-43-106 ec2-user]#
```

```
[ec2-user@ip-172-31-46-199 ~]$ pwd
/home/ec2-user
[ec2-user@ip-172-31-46-199 ~]$ cd /home/ec2-user/.ssh/
[ec2-user@ip-172-31-46-199 .ssh]$ ls
authorized_keys  id_rsa  id_rsa.pub
[ec2-user@ip-172-31-46-199 .ssh]$ cat id_rsa.pub
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABgQDUjnQ6Pw8BP+WATSCNVczUIfRPRyv/+e4UiDVOZKiz3PF5aSuV/iij/Dudt8MUA/vN9/J6f9sOfuX9A4v7/wwIHJ3Jupn9UuhM
PX17nqxaVKmtIxx3AWTLdr1nKc9PydD1G9p8eW5v7GtkIXhE1Vz+9/1txKAf9voY6LXtUVC2NVqqLci1UBXrtQzKKYw/+6eDLjB6ZZSsheOTmX4CTYqs6VJ3EKAYd22YThyFgv9z
Rw6S/ARFvmzxNw3kFXlKdXQm9vHmqQJInStz85BEg04aySnBSj6Dj6R5Zw3jB/8XjPku3Q9H/K2NGIo+mCWx+JsrsmXebdQjjy+h80gBzbwtwpkB5R0Ewg5h5deftQK2/Q3zAQYC
xSHxycEhALSr2VuCGinrR2cEc5zbeT4P6TkvwRdSRQdJ5/N6frnuWXbgjexVAokMH+rg6OztvwlG4ecikZ6tr5Yo/VBFCLQ2OBNzAOGGRnXv8+cRV+7Cjw6jXkGK8kmaxR+HxAoX
JrwLSg8= ec2-user@ip-172-31-46-199.ap-south-1.compute.internal
[ec2-user@ip-172-31-46-199 .ssh]$
```

- **Connect each worker node**
  **Ensure the nodes are updated and the python is installed on them (required by ansible)**

```
   ,     #_
   ~\_  ####_          Amazon Linux 2023
  ~~  \_#####\
  ~~     \###|
  ~~       \#/ ___     https://aws.amazon.com/linux/amazon-linux-2023
   ~~       V~' '->
    ~~~         /
      ~~._.   _/
         _/ _/
       _/m/'
[ec2-user@ip-172-31-37-4 ~]$ sudo su
[root@ip-172-31-37-4 ec2-user]# yum update -y
Last metadata expiration check: 0:08:18 ago on Mon Jul 29 07:36:09 2024.
Dependencies resolved.
Nothing to do.
Complete!
[root@ip-172-31-37-4 ec2-user]# ssh-keygen
```

i-0114cdb2d51f83b47 (Worker_Node_1)

```
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/ec2-user/.ssh/id_rsa
Your public key has been saved in /home/ec2-user/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:0fZLbaVSh+I7mz5WVWZxrWaONpentwHL5wAxR7elngk ec2-user@ip-172-31-37-4.ap-south-1.compute.internal
The key's randomart image is:
+---[RSA 3072]----+
|             . o=|
|          .  . .oO|
|         . ooE.+=+|
|          o o+*+*.|
|         S  .=*Bo |
|            .*=B .|
|            .+B = |
|             o+= o|
|            o+. +.|
+----[SHA256]-----+
[ec2-user@ip-172-31-37-4 ~]$
```

i-0114cdb2d51f83b47 (Worker_Node_1)

```
[ec2-user@ip-172-31-37-4 ~]$ pwd
/home/ec2-user
[ec2-user@ip-172-31-37-4 ~]$ cd /home/ec2-user/.ssh/
[ec2-user@ip-172-31-37-4 .ssh]$ ls
authorized_keys  id_rsa  id_rsa.pub
[ec2-user@ip-172-31-37-4 .ssh]$ vi authorized_keys
```

i-0114cdb2d51f83b47 (Worker_Node_1)

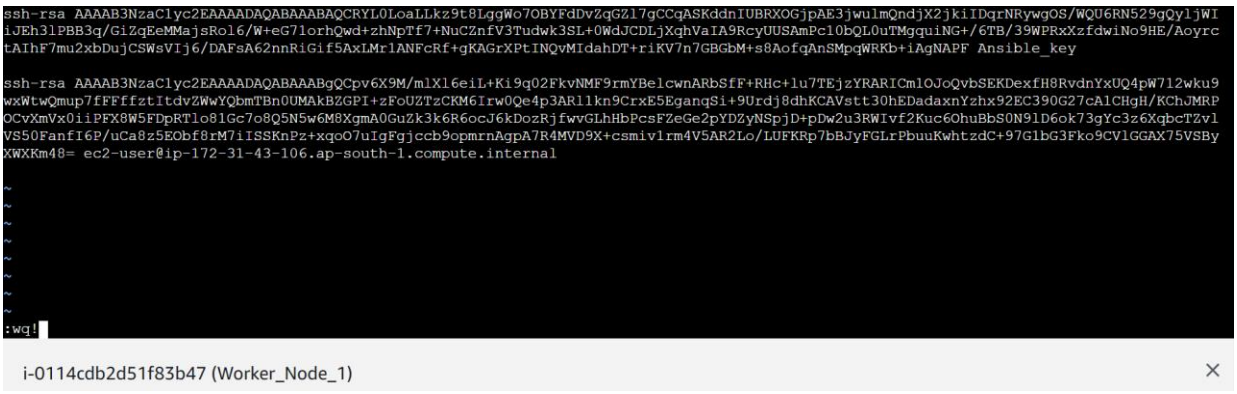
```
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/ec2-user/.ssh/id_rsa
Your public key has been saved in /home/ec2-user/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:WneLVp0h4Zdtx8fJYwEkmWlNX45MXQOuyo37xuvR7Yg ec2-user@ip-172-31-36-14.ap-south-1.compute.internal
The key's randomart image is:
+---[RSA 3072]----+
|           .O=+++|
|           *o=oB*|
|          . o.**O|
|            .+.++|
|        S ..o o  |
|       o..++...  |
|      .  ++o.. . |
|         ..oo o  |
|         .+E.. . |
+----[SHA256]-----+
[ec2-user@ip-172-31-36-14 ~]$
```

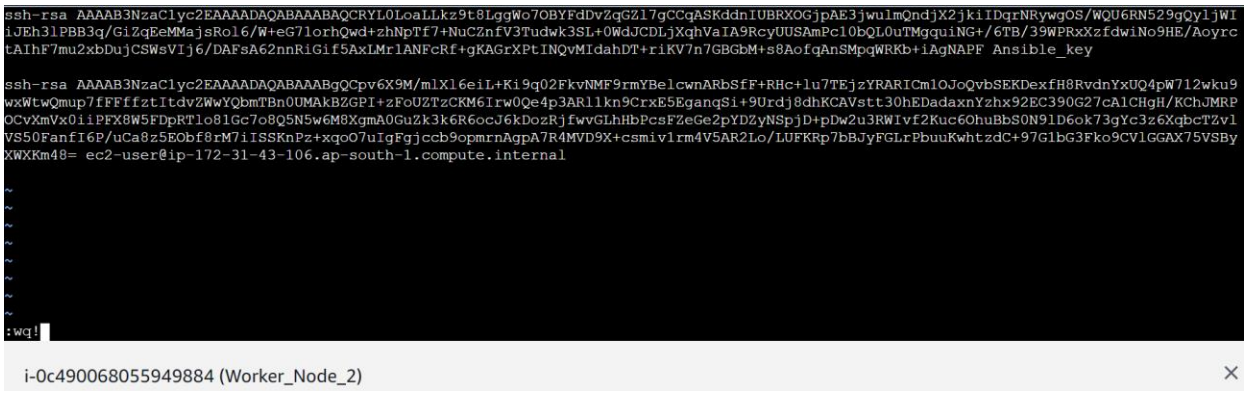
i-0c490068055949884 (Worker_Node_2)

```
[ec2-user@ip-172-31-36-14 ~]$ pwd
/home/ec2-user
[ec2-user@ip-172-31-36-14 ~]$ cd /home/ec2-user/.ssh/
[ec2-user@ip-172-31-36-14 .ssh]$ ls
authorized_keys  id_rsa  id_rsa.pub
[ec2-user@ip-172-31-36-14 .ssh]$ vi authorized_keys
```

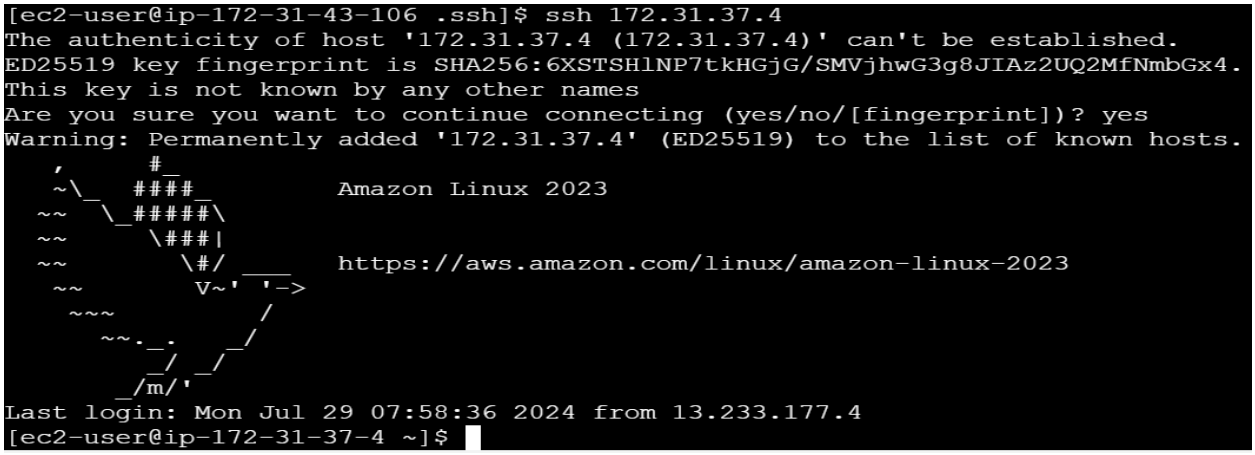
i-0c490068055949884 (Worker_Node_2)

- **Copy the public key and paste it on each node worker.**




- **Check the connection to ensure each node can connect to the master using SSH and the public IP**



```
[ec2-user@ip-172-31-43-106 .ssh]$ ssh 172.31.36.14
The authenticity of host '172.31.36.14 (172.31.36.14)' can't be established.
ED25519 key fingerprint is SHA256:mO1KKaCSbP/AcdPRPTBJARMBQUmascGNfPIt+GGf3PU.
This key is not known by any other names
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '172.31.36.14' (ED25519) to the list of known hosts.
   ,     #_
   ~\_  ####_        Amazon Linux 2023
  ~~  \_#####\
  ~~     \###|
  ~~       \#/ ___   https://aws.amazon.com/linux/amazon-linux-2023
   ~~       V~' '->
    ~~~         /
      ~~._.   _/
         _/ _/
       _/m/'
Last login: Mon Jul 29 07:39:33 2024 from 13.233.177.3
[ec2-user@ip-172-31-36-14 ~]$
```

```
[ec2-user@ip-172-31-43-106 ~]$ ansible localhost -m ping
[WARNING]: No inventory was parsed, only implicit localhost is available
localhost | SUCCESS => {
    "changed": false,
    "ping": "pong"
}
[ec2-user@ip-172-31-43-106 ~]$ sudo mkdir -p /etc/ansible
[ec2-user@ip-172-31-43-106 ~]$ sudo vi /etc/ansible/ansible.cfg
```

- **Update the Ansible inventory file on the master node :-**
  **Edit the /etc/ansible/hosts file.**

```
[defaults]
inventory = /etc/ansible/hosts
sudo_user = root
~
~
~
~
~
~
~
~
~
~
~
-- INSERT --
```

i-0adf0e2da727ad594 (Master)

```
[ec2-user@ip-172-31-43-106 ~]$ sudo vi /etc/ansible/hosts
```

- **In this /etc/ansible/hosts file to include the worker nodes.**

```
[webservers]

172.31.37.4
172.31.36.14

~
~
~
~
~
~
~
~
~
~
~
:wq!
```

i-0adf0e2da727ad594 (Master)

- **To verify connectivity between the Ansible control node (master) and the managed nodes (workers), use the command below to check if the connectivity is successful.**
  **ansible all -m ping**

```
core/2.15/reference_appendices/interpreter_discovery.html for more information.
172.31.37.4 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3.9"
    },
    "changed": false,
    "ping": "pong"
}
[WARNING]: Platform linux on host 172.31.36.14 is using the discovered Python interpreter at /usr/bin/python3.9, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.15/reference_appendices/interpreter_discovery.html for more information.
172.31.36.14 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3.9"
    },
    "changed": false,
    "ping": "pong"
}
[ec2-user@ip-172-31-43-106 ~]$
```

i-0adf0e2da727ad594 (Master)

- **Write Playbook to Install and Start Tomcat.**
  **Create playbook file named tomcat.yml**

```
[ec2-user@ip-172-31-43-106 ~]$ cd /etc/ansible
[ec2-user@ip-172-31-43-106 ansible]$ ls
ansible.cfg  hosts  roles
[ec2-user@ip-172-31-43-106 ansible]$ sudo mkdir playbooks
[ec2-user@ip-172-31-43-106 ansible]$ ls
ansible.cfg  hosts  playbooks  roles
[ec2-user@ip-172-31-43-106 ansible]$ cd playbooks/
[ec2-user@ip-172-31-43-106 playbooks]$ vi tomcat.yml
```

- **Add the following content to the file.**

```yaml
---
- name: Install Apache Tomcat10 using Ansible
  hosts: webservers
  remote_user: ec2-user
  become: true
  tasks:
    - name: Update the System Packages
      yum:
        name: "*"
        state: latest

    - name: Create a Tomcat User
      user:
        name: tomcat
        shell: /bin/false

    - name: Create a Tomcat Group
      group:
```

```yaml
    - name: Create a Tomcat Group
      group:
        name: tomcat

    - name: Install JAVA
      yum:
        name: java-11-amazon-corretto-headless
        state: present

    - name: Create a Tomcat Directory
      file:
        path: /opt/tomcat10
        owner: tomcat
        group: tomcat
        mode: 0755
        state: directory
        recurse: yes
```

```yaml
- name: Download and unarchive Tomcat10
  unarchive:
    src: https://dlcdn.apache.org/tomcat/tomcat-9/v9.0.91/bin/apache-tomcat-9.0.91.tar.gz
    dest: /opt/tomcat10
    remote_src: yes
    extra_opts: [--strip-components=1]

- name: Change ownership of Tomcat directory
  file:
    path: /opt/tomcat10
    owner: tomcat
    group: tomcat
    mode: "u+rwx,g+rx,o=rx"
    recurse: yes
    state: directory
```

```yaml
- name: Create a systemd service file for Tomcat
  copy:
    content: |
      [Unit]
      Description=Apache Tomcat 10
      After=network.target

      [Service]
      Type=forking
      User=tomcat
      Group=tomcat
      Environment="JAVA_HOME=/usr/lib/jvm/java-11-amazon-corretto"
      Environment="CATALINA_PID=/opt/tomcat10/temp/tomcat.pid"
      Environment="CATALINA_HOME=/opt/tomcat10"
      Environment="CATALINA_BASE=/opt/tomcat10"
      ExecStart=/opt/tomcat10/bin/startup.sh
      ExecStop=/opt/tomcat10/bin/shutdown.sh
      Restart=on-failure
```

```
        Restart=on-failure

        [Install]
        WantedBy=multi-user.target
    dest: /etc/systemd/system/tomcat.service
    owner: root
    group: root
    mode: 0644

- name: Reload systemd to apply new service
  systemd:
    daemon_reload: yes

- name: Start and enable Tomcat service
  systemd:
    name: tomcat
    state: started
    enabled: yes
```

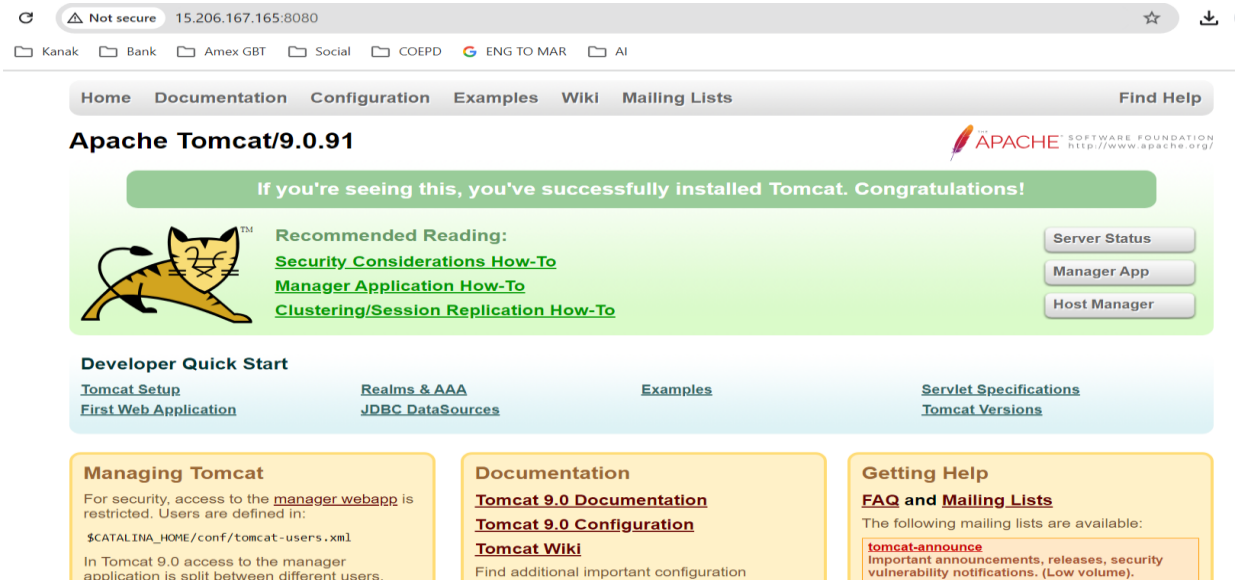
- **Execute the playbook from the Ansible master.**

```
[ec2-user@ip-172-31-43-106 ansible-playbooks]$ ansible-playbook install_tomcat.yml

PLAY [Install Apache Tomcat10 using Ansible] ***********************************************************************************

TASK [Gathering Facts] *********************************************************************************************************
[WARNING]: Platform linux on host 172.31.36.14 is using the discovered Python interpreter at /usr/bin/python3.9, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.15/reference_appendices/interpreter_discovery.html for more information.
ok: [172.31.36.14]
[WARNING]: Platform linux on host 172.31.37.4 is using the discovered Python interpreter at /usr/bin/python3.9, but future installation
of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.15/reference_appendices/interpreter_discovery.html for more information.
ok: [172.31.37.4]

TASK [Update the System Packages] **********************************************************************************************
ok: [172.31.36.14]
ok: [172.31.37.4]

TASK [Create a Tomcat User] ****************************************************************************************************
ok: [172.31.36.14]
ok: [172.31.37.4]

TASK [Create a Tomcat Group] ***************************************************************************************************
ok: [172.31.36.14]
ok: [172.31.37.4]
```

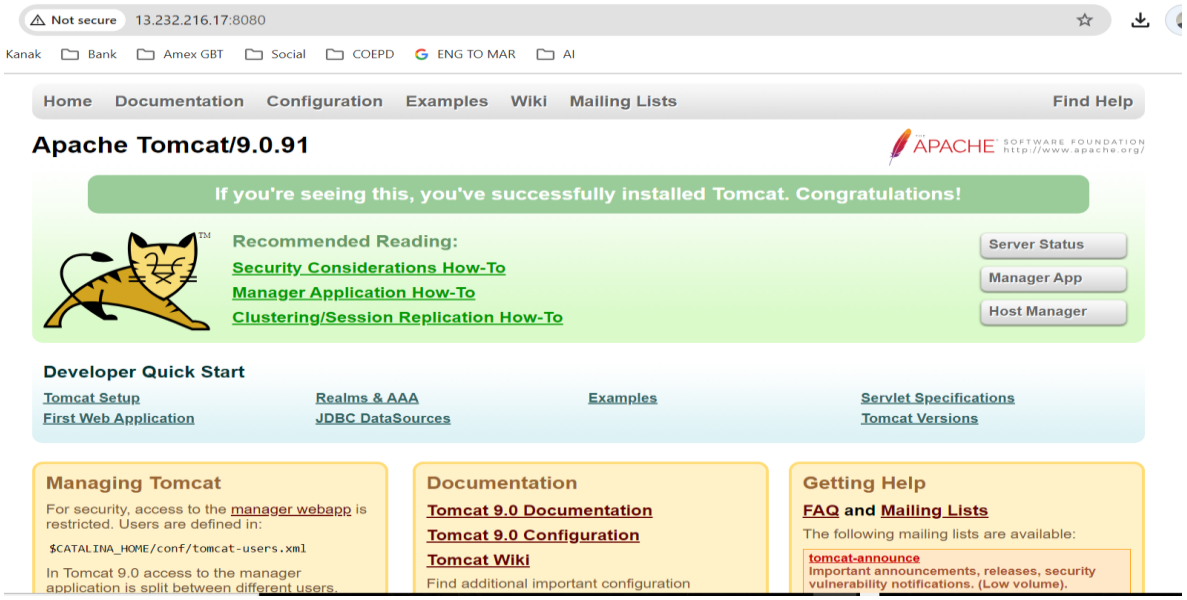
```
TASK [Create a Tomcat Group] ***************************************************************************************************
ok: [172.31.36.14]
ok: [172.31.37.4]

TASK [Install JAVA] ************************************************************************************************************
ok: [172.31.37.4]
ok: [172.31.36.14]

TASK [Create a Tomcat Directory] ***********************************************************************************************
ok: [172.31.37.4]
ok: [172.31.36.14]

TASK [Download and unarchive Tomcat10] *****************************************************************************************
changed: [172.31.37.4]
changed: [172.31.36.14]

TASK [Change ownership of Tomcat directory] ************************************************************************************
changed: [172.31.36.14]
changed: [172.31.37.4]

TASK [Create a systemd service file for Tomcat] ********************************************************************************
changed: [172.31.36.14]
changed: [172.31.37.4]
```

```
TASK [Create a systemd service file for Tomcat] ********************************************************************************
changed: [172.31.36.14]
changed: [172.31.37.4]

TASK [Reload systemd to apply new service] *************************************************************************************
ok: [172.31.36.14]
ok: [172.31.37.4]

TASK [Start and enable Tomcat service] *****************************************************************************************
changed: [172.31.36.14]
changed: [172.31.37.4]
```

- **Open the web browser and navigate to…**
  **http://<worker_node_1_public_IP>:8080**




- **Open the web browser and navigate to…**
  **http://<worker_node_2_public_IP>:8080**




- **Copy the sample .war file to the Ansible master:**
  **Scp –i /path/to/key.pem /path/to/sample.war ec2-user@<Ansible_Master_public_IP>:/path/to/sample.war**

```
user7@DESKTOP-OUBTO94 MINGW64 /c/users/user7/Downloads (main)
$ scp -i /c/users/user7/downloads/ansible_tomcat_key.pem sample.war ec2-user@13.232.184.164:/home/ec2-user
sample.war                                                                    100% 4606   346.1KB/s   00:00

user7@DESKTOP-OUBTO94 MINGW64 /c/users/user7/Downloads (main)
$ scp -i /c/users/user7/downloads/ansible_tomcat_key.pem /c/users/user7/downloads/sample.war ec2-user@13.232.184.164:/home/ec2-user
sample.war                                                                    100% 4606   330.1KB/s   00:00

user7@DESKTOP-OUBTO94 MINGW64 /c/users/user7/Downloads (main)
$
```

```
user7@DESKTOP-OUBTO94 MINGW64 /
$ cd c:/users/user7/downloads/

user7@DESKTOP-OUBTO94 MINGW64 /c/users/user7/downloads (main)
$ ssh -i "ansible_tomcat_key.pem" ec2-user@ec2-13-232-184-164.ap-south-1.compute.amazonaws.com
   ,     #_
   ~\_  ####_        Amazon Linux 2023
  ~~  \_#####\
  ~~     \###|
  ~~       \#/ ___   https://aws.amazon.com/linux/amazon-linux-2023
   ~~       V~' '->
    ~~~         /
      ~~._.   _/
         _/ _/
       _/m/'
Last login: Wed Jul 31 14:48:24 2024 from 103.164.241.221
[ec2-user@ip-172-31-46-199 ~]$ cd /home/ec2-user/
[ec2-user@ip-172-31-46-199 ~]$ ls
sample.war
[ec2-user@ip-172-31-46-199 ~]$
```

- **Deploy a sample .war file and start the application.**
  **Write a playbook to deploy .war file**
  **Create a playbook file named deploy.war_file**

deploy_war.yml

```
- name: Deploy sample .war file to Tomcat
  hosts: webservers
  become: yes
  tasks:
    - name: copy sample .war file to Tomcat webapps directory
      copy:
        src: /home/ec2-user/sample.war
        dest: /opt/tomcat10/webapps/sample.war

      notify:
        - Restart Tomcat

  handlers:
    - name: Restart Tomcat
      systemd:
        name: tomcat
        state: restarted
```

```
[ec2-user@ip-172-31-46-199 ansible-playbooks]$ ansible-playbook deploy.war_file

PLAY [Deploy sample .war file to Tomcat] ***************************************************************************************

TASK [Gathering Facts] *********************************************************************************************************
[WARNING]: Platform linux on host 65.2.182.20 is using the discovered Python interpreter at /usr/bin/python3.9, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.15/reference_appendices/interpreter_discovery.html for more information.
ok: [65.2.182.20]
[WARNING]: Platform linux on host 172.31.35.135 is using the discovered Python interpreter at /usr/bin/python3.9, but future
installation of another Python interpreter could change the meaning of that path. See https://docs.ansible.com/ansible-
core/2.15/reference_appendices/interpreter_discovery.html for more information.
ok: [172.31.35.135]

TASK [Copy sample .war file to Tomcat webapps directory] ***********************************************************************
changed: [65.2.182.20]
changed: [172.31.35.135]

RUNNING HANDLER [Restart Tomcat] ***********************************************************************************************
changed: [65.2.182.20]
changed: [172.31.35.135]

PLAY RECAP *********************************************************************************************************************
172.31.35.135              : ok=3    changed=2    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
65.2.182.20                : ok=3    changed=2    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

- **Check the application UI.**
  **Access the Tomcat server on the worker nodes:**

  **Open the web browser and navigate to public_IP:8080/sample/ of the both nodes**