Automating a Multi-Tier Application on VMware with Ansible

Objective:

Using Ansible to fully automate the deployment, configuration, and orchestration of a multi-tier application (e.g., LAMP stack) across multiple CentOS VMs (master node, node1, and node2) in a VMware environment.

Steps:

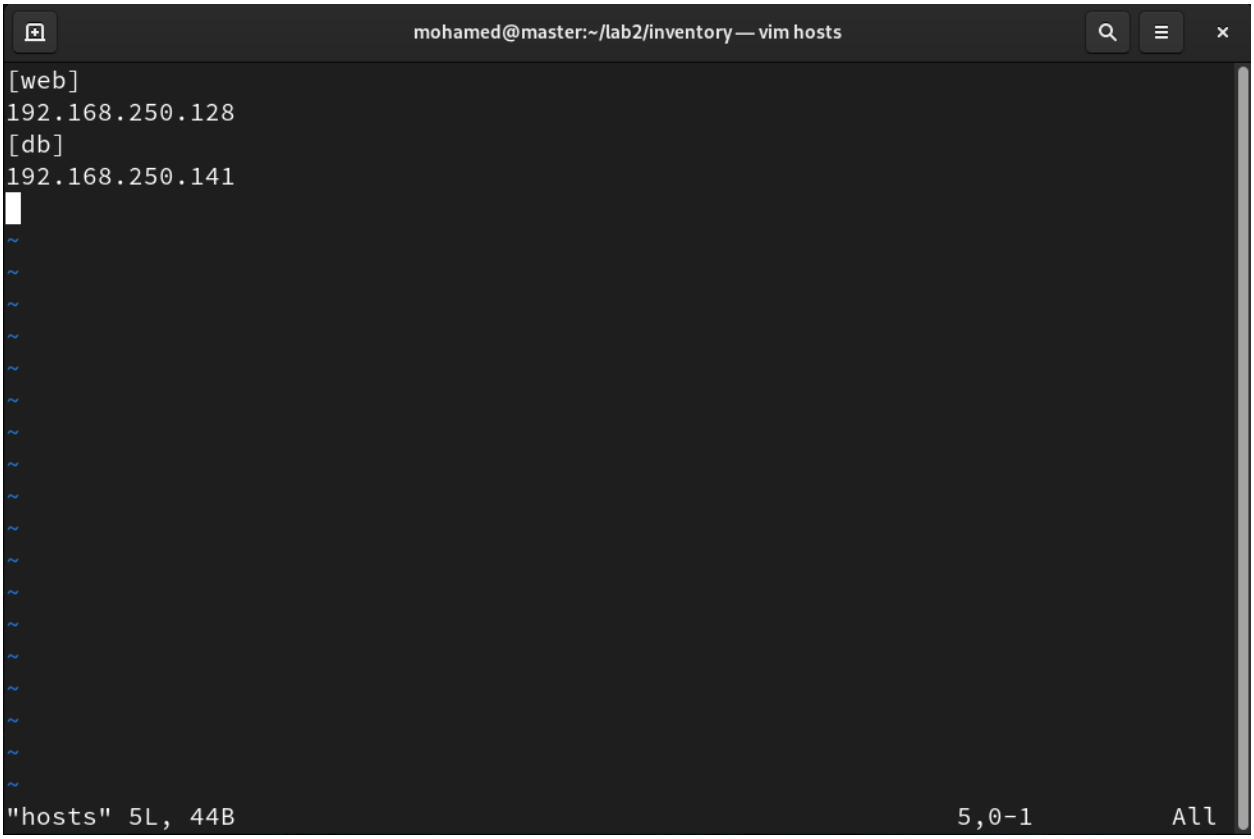
1. **Provisioning VMs**:
    - Use Ansible to deploy and configure two nodes (node1 and node2) on VMware.
    - Automate the installation of necessary dependencies like Apache on one node and MySQL on the other.
2. **Role-based Deployment**:
    - Use **Ansible roles** to separate the tasks:
        - **Web server role** (for node1 to host Apache/PHP).
        - **Database server role** (for node2 to host MySQL/MariaDB).
    - Deploy a simple PHP application on the web server node and configure it to communicate with the database on node2.
3. **Network Configuration & Load Balancing**:
    - Automate firewall rules, IP tables, and networking configurations between the nodes.
4. **Backup and Recovery Automation**:
    - Automate backups of the database on node2 using Ansible scheduled jobs.
    - Automate web content backup on node1.
5. **Security**:
    - Implement Ansible Vault to manage secrets such as database credentials.
    - Use Ansible to apply security updates and harden the systems.

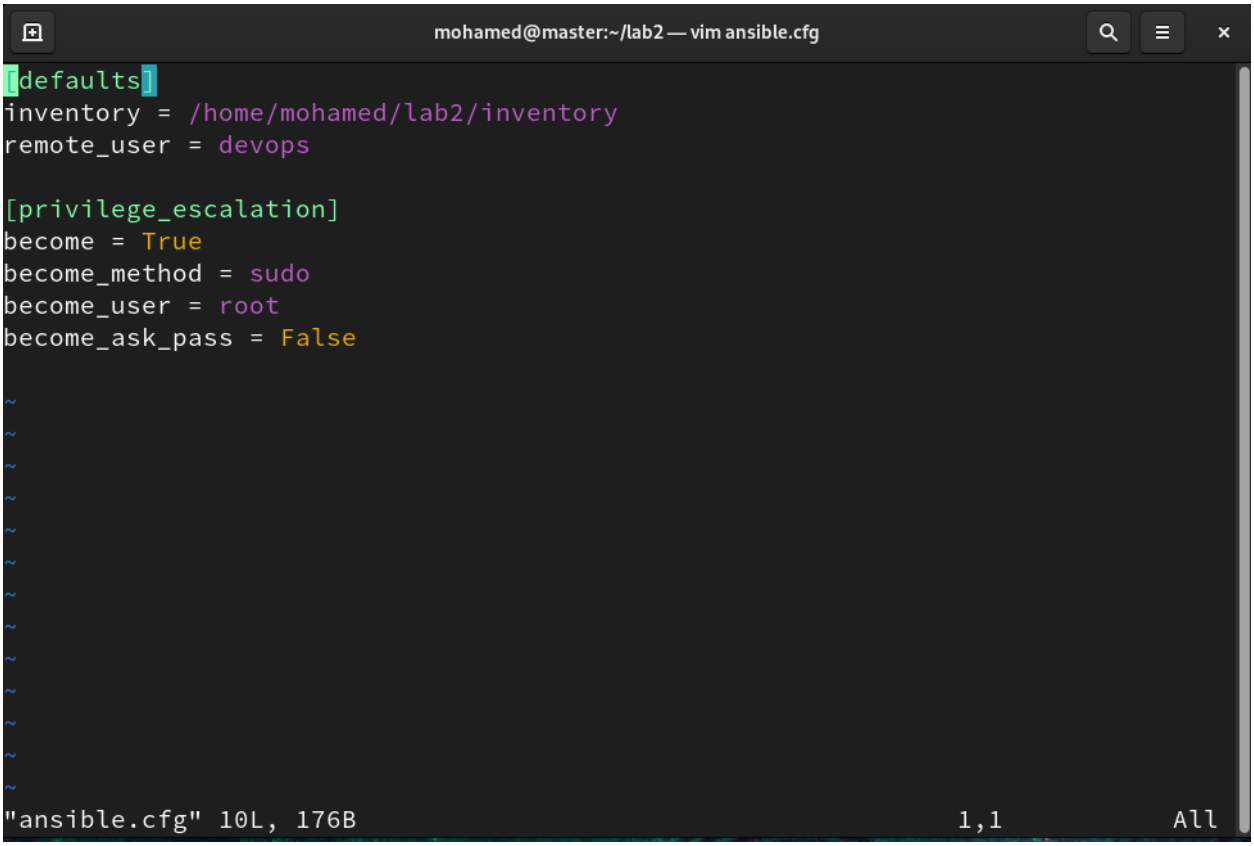
Outcome:

- A fully automated infrastructure with multiple VMs on VMware, deploying a multi-tier application.
- Centralized monitoring and logging for system health and performance.

- Secure and efficient infrastructure with automated backups and firewall configurations.

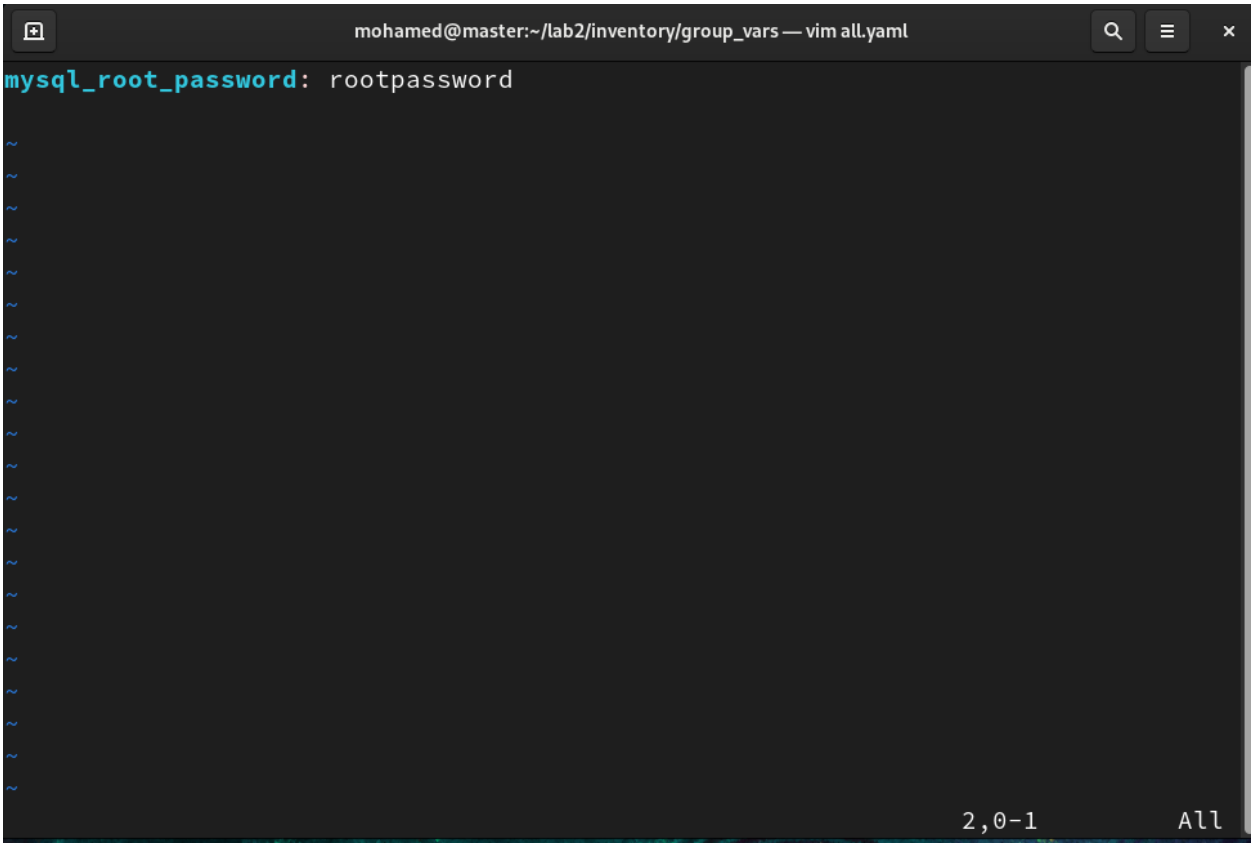
Define the Inventory, Setup and Provisioning VMs

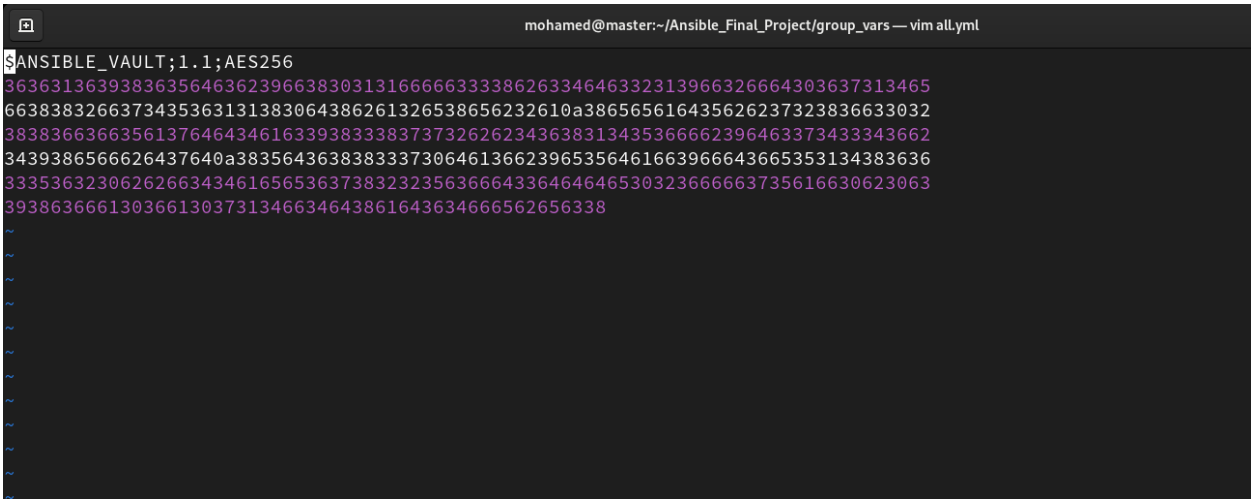





```
[mohamed@master lab2]$ ansible all -m ping
192.168.250.141 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
}
192.168.250.128 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
}
```

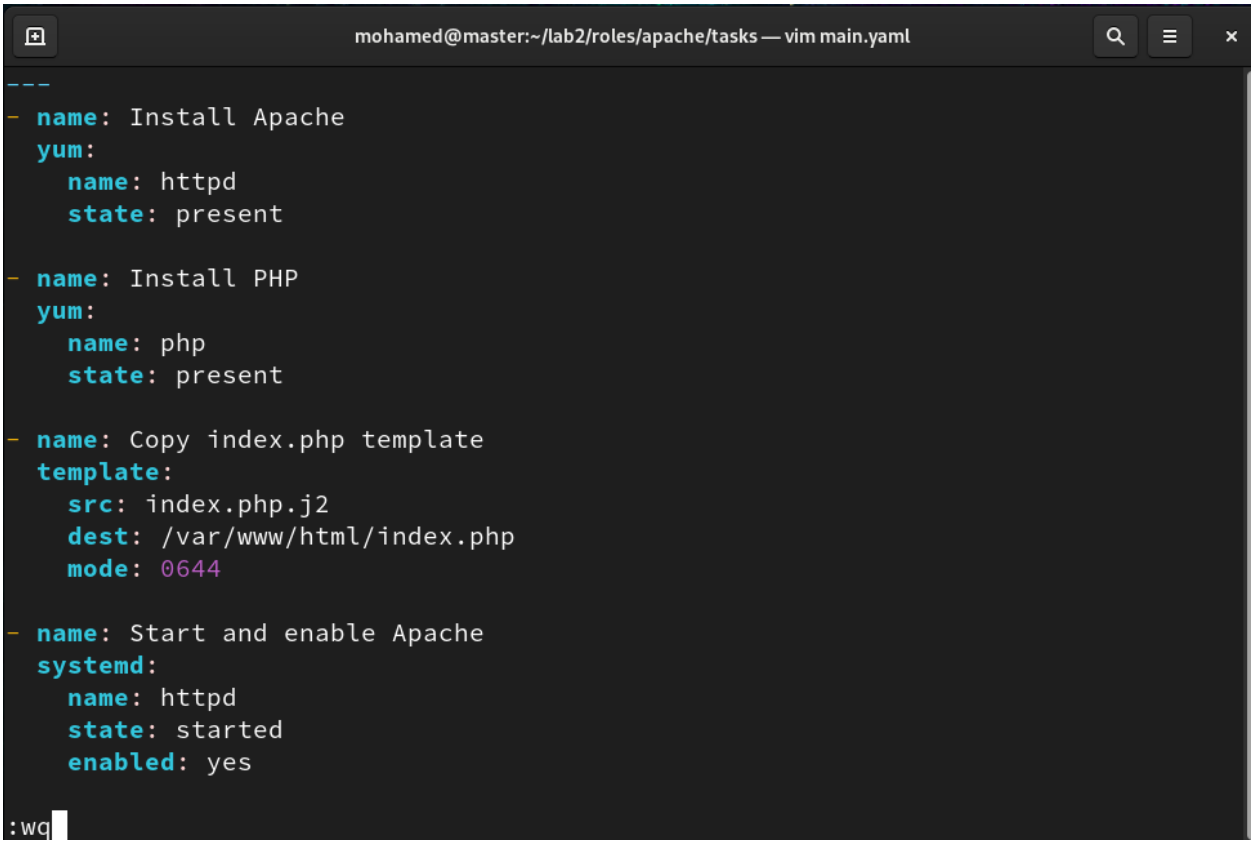
Set Global Variables and use Ansible Vault



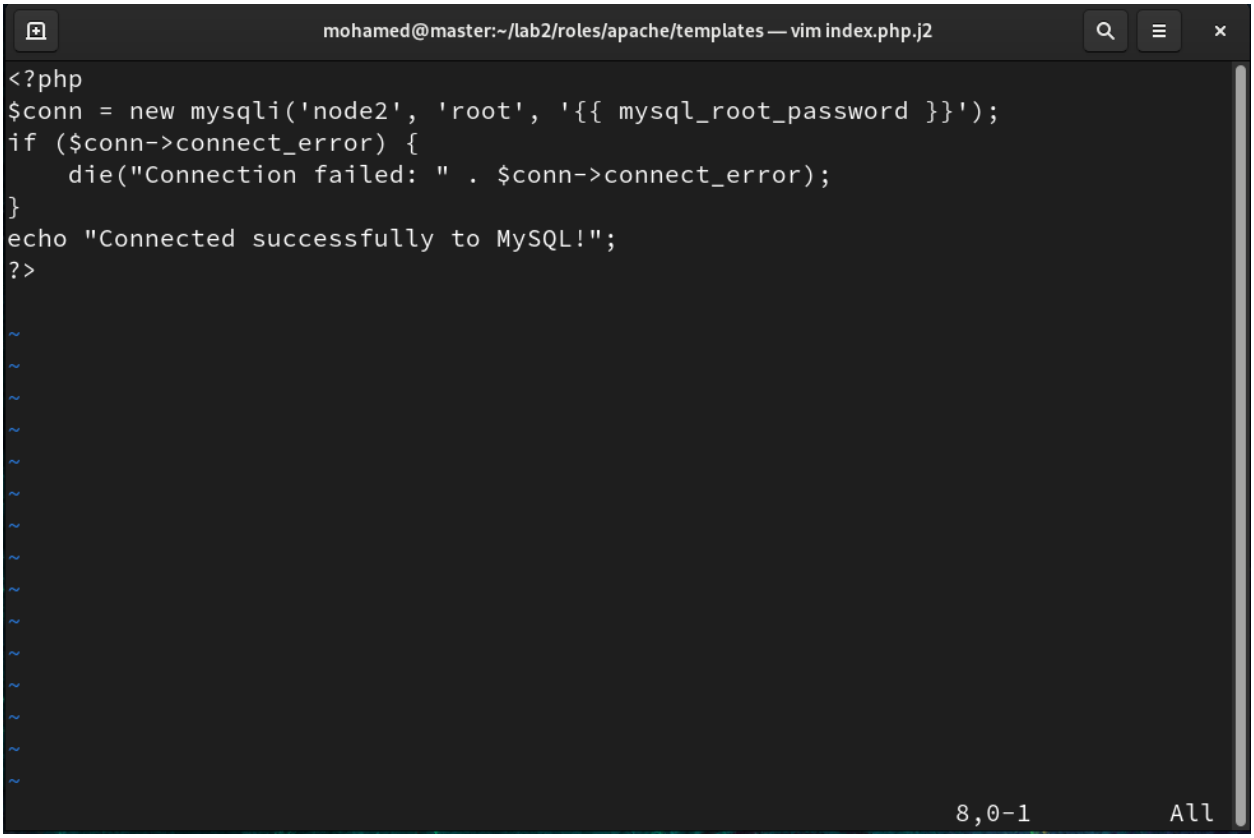


Create Roles

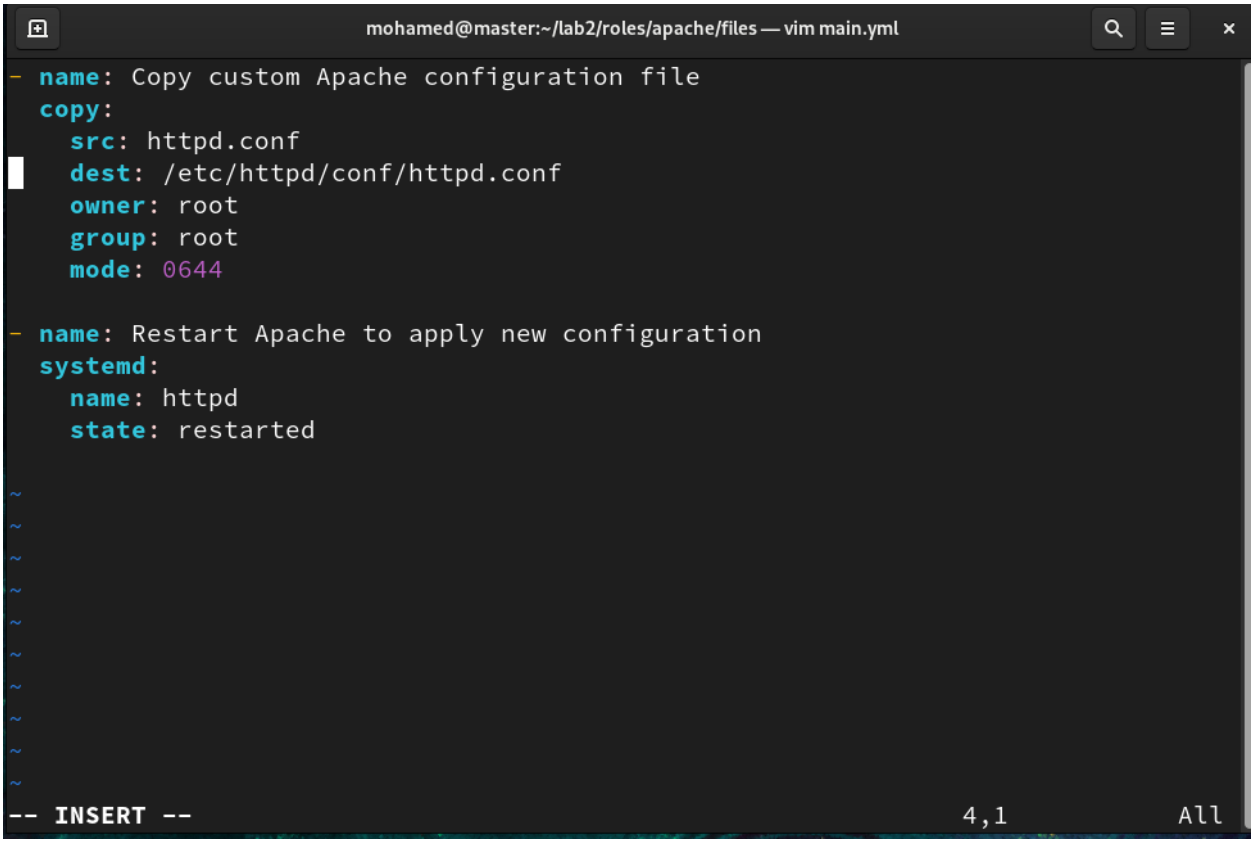
Apache Role (Web Server)



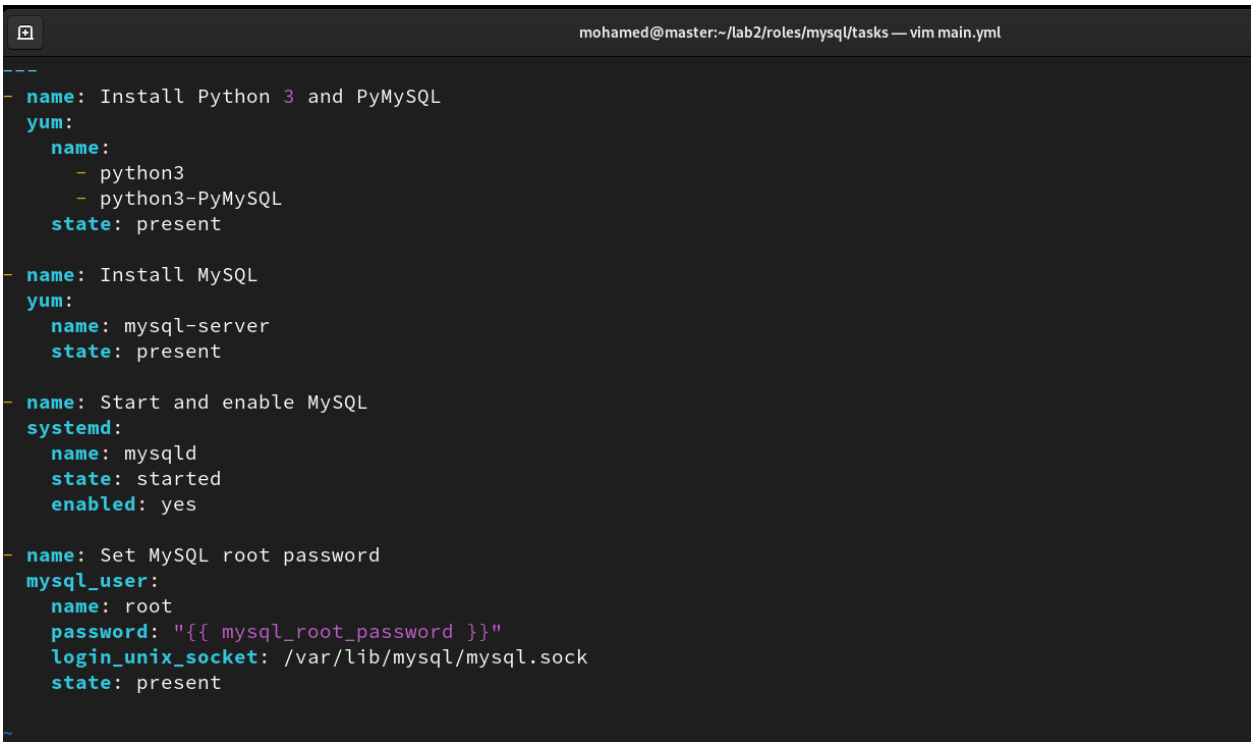
PHP application template



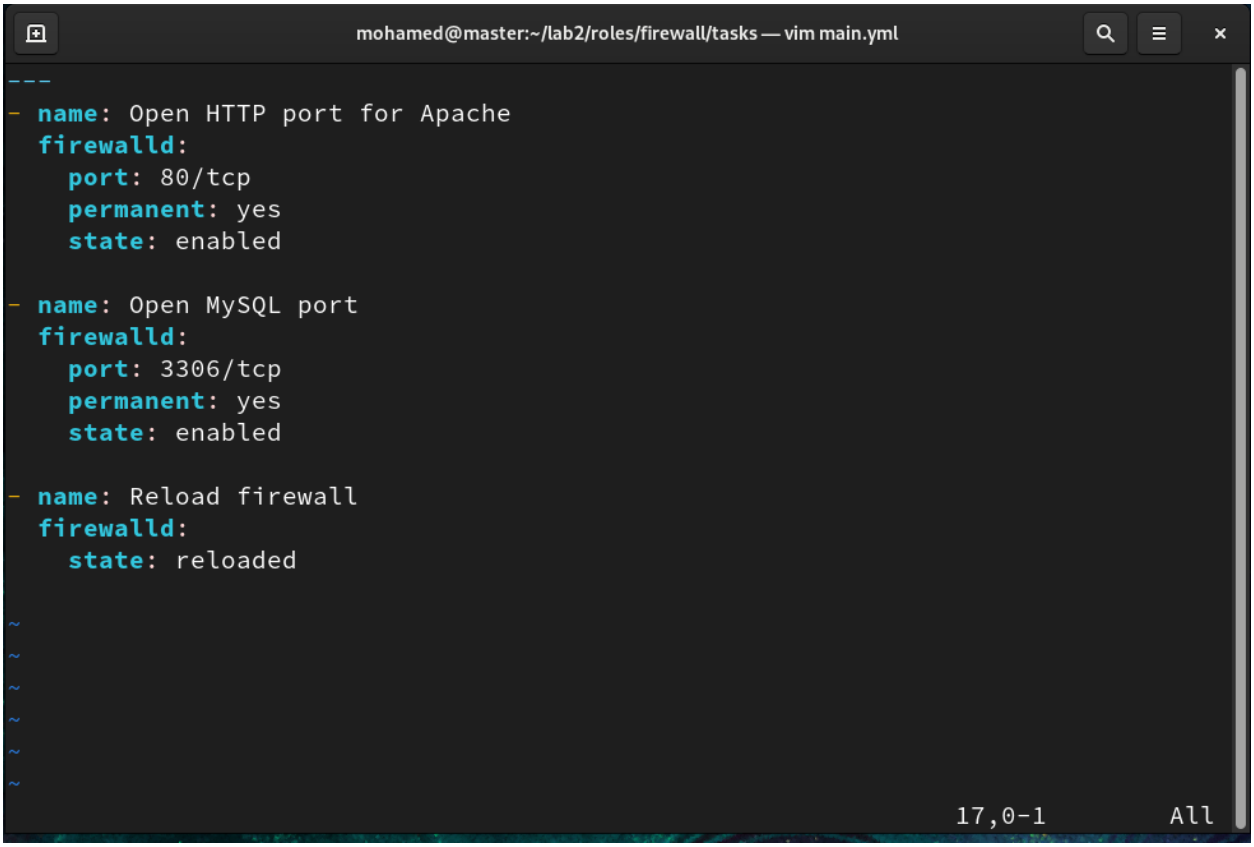
Apache Configuration



MySQL Role (Database Server)

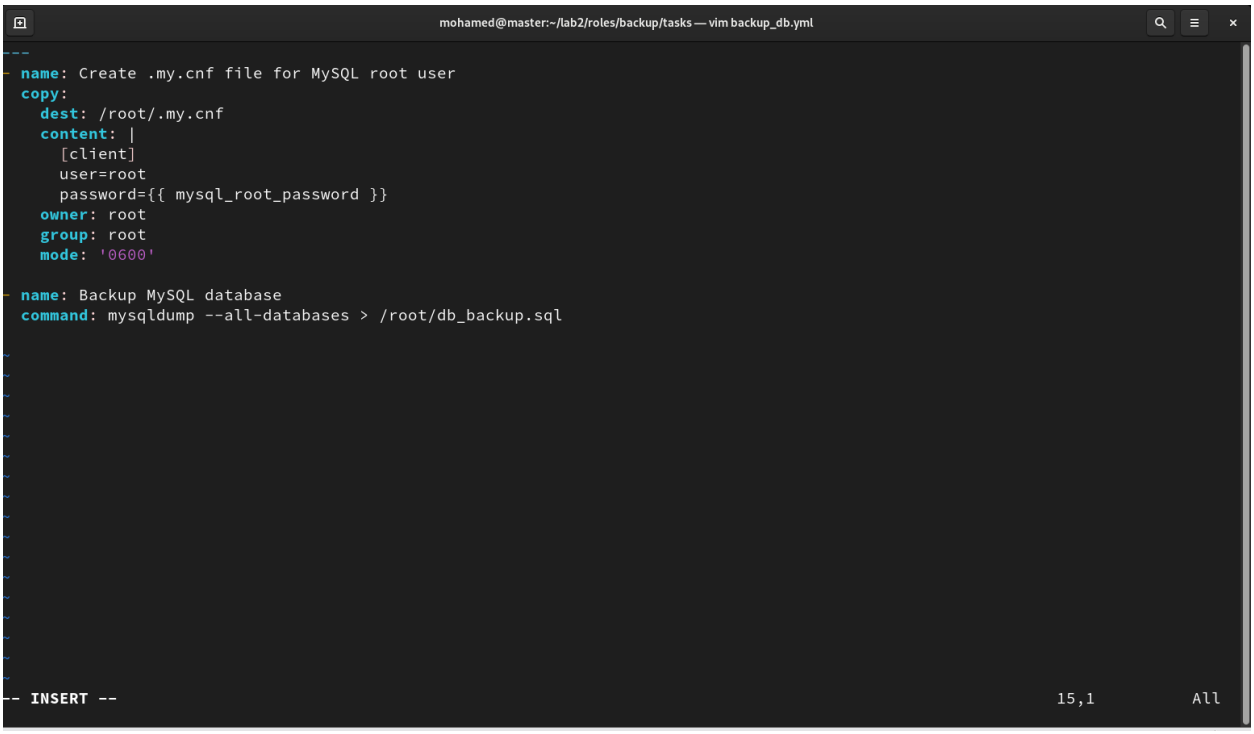


Firewall Role (For Both Nodes)

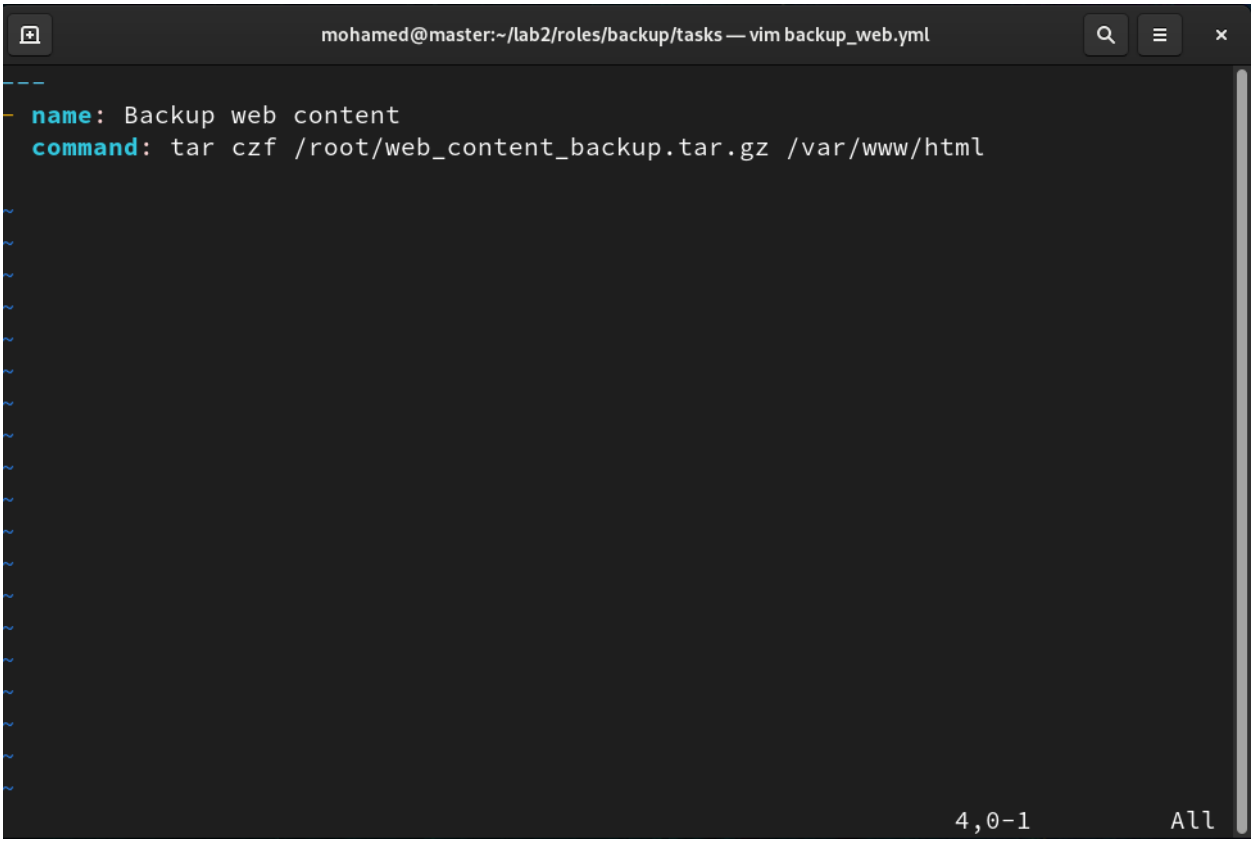


Backup Role

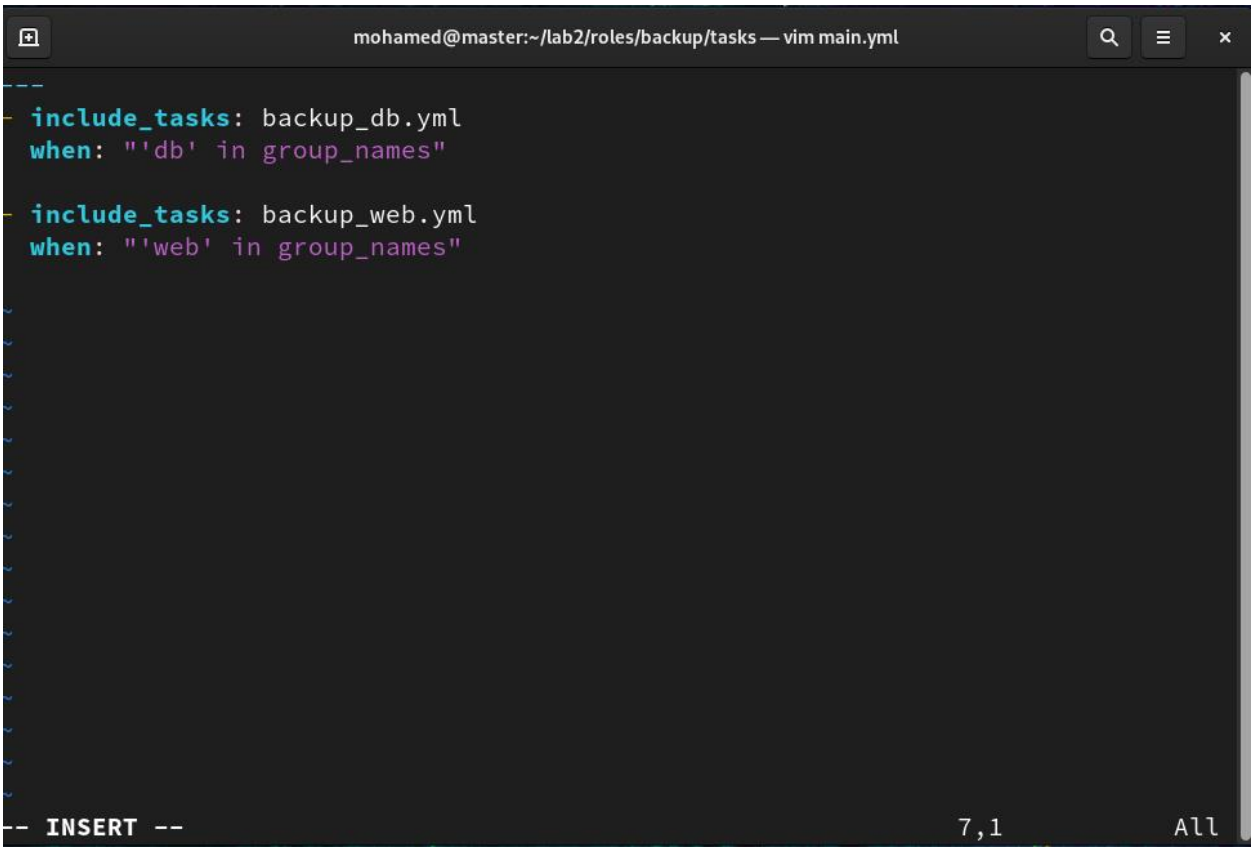
- **For MySQL Database**



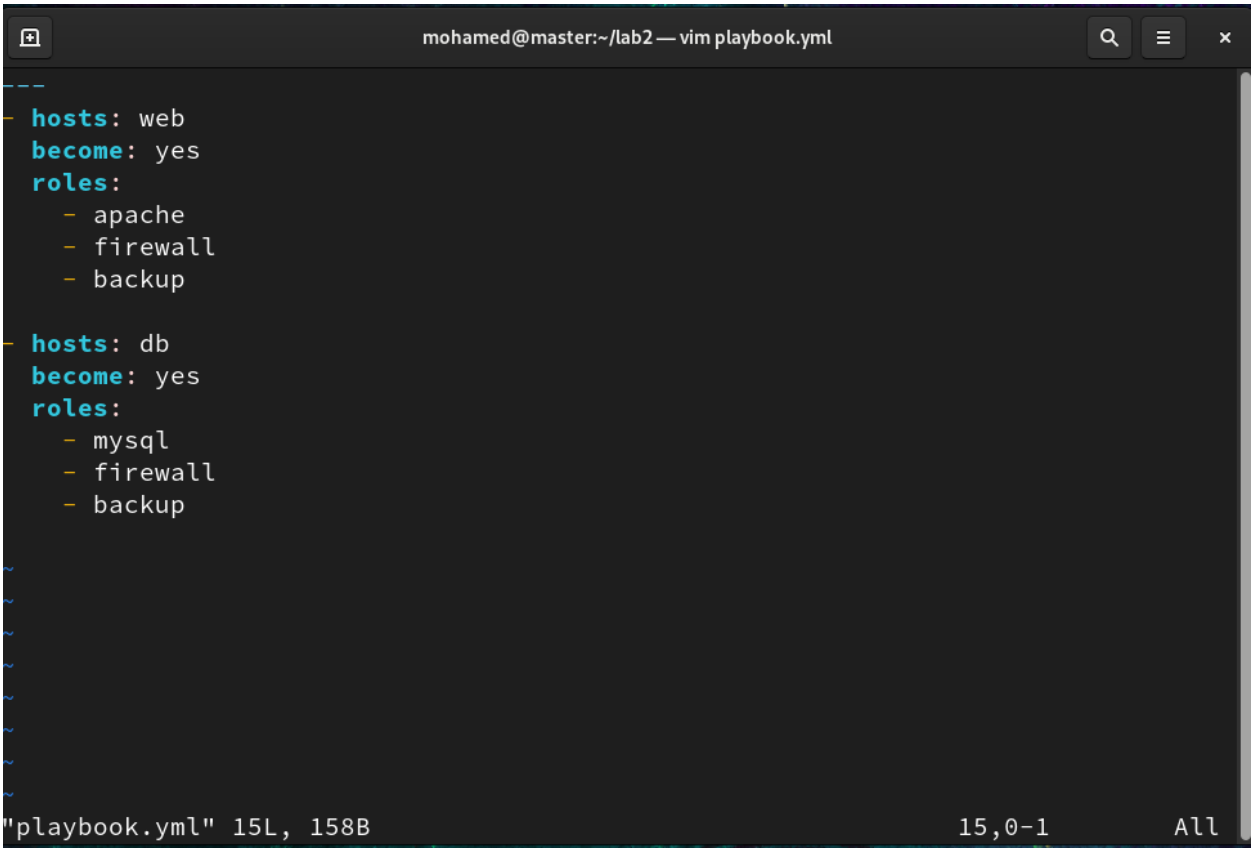
- **For Apache Web Content**



- **Backup Main Role**



Create the Playbook



Use Ansible Vault

```
[mohamed@master lab2]$ ansible-vault encrypt group_vars/all.yml
New Vault password:
Confirm New Vault password:
Encryption successful
```

Apply The Playbook

```
[mohamed@master lab2]$ ansible-playbook -i inventory/hosts playbook.yml --ask-vault-pass
Vault password:

PLAY [web] *********************************************************************************************************************

TASK [Gathering Facts] *********************************************************************************************************
ok: [192.168.250.128]

TASK [apache : Install Apache] *************************************************************************************************
ok: [192.168.250.128]

TASK [apache : Install PHP] ****************************************************************************************************
ok: [192.168.250.128]

TASK [apache : Copy index.php template] ****************************************************************************************
ok: [192.168.250.128]

TASK [apache : Start and enable Apache] ****************************************************************************************
ok: [192.168.250.128]

TASK [firewall : Open HTTP port for Apache] ************************************************************************************
ok: [192.168.250.128]

TASK [firewall : Open MySQL port] **********************************************************************************************
ok: [192.168.250.128]

TASK [firewall : Reload firewalld service] *************************************************************************************
changed: [192.168.250.128]

TASK [backup : include_tasks] **************************************************************************************************
skipping: [192.168.250.128]

TASK [backup : include_tasks] **************************************************************************************************
included: /home/mohamed/lab2/roles/backup/tasks/backup_web.yml for 192.168.250.128

TASK [backup : Backup web content] *********************************************************************************************
changed: [192.168.250.128]
```

```
TASK [backup : Backup web content] *********************************************************************************************
changed: [192.168.250.128]

PLAY [db] **********************************************************************************************************************

TASK [Gathering Facts] *********************************************************************************************************
ok: [192.168.250.141]

TASK [mysql : Install Python 3 and PyMySQL] ************************************************************************************
ok: [192.168.250.141]

TASK [mysql : Install MySQL] ***************************************************************************************************
ok: [192.168.250.141]

TASK [mysql : Start and enable MySQL] ******************************************************************************************
ok: [192.168.250.141]

TASK [mysql : Set MySQL root password] *****************************************************************************************
ok: [192.168.250.141]

TASK [firewall : Open HTTP port for Apache] ************************************************************************************
ok: [192.168.250.141]

TASK [firewall : Open MySQL port] **********************************************************************************************
ok: [192.168.250.141]

TASK [firewall : Reload firewalld service] *************************************************************************************
changed: [192.168.250.141]

TASK [backup : include_tasks] **************************************************************************************************
included: /home/mohamed/lab2/roles/backup/tasks/backup_db.yml for 192.168.250.141

TASK [backup : Create .my.cnf file for MySQL root user] ************************************************************************
ok: [192.168.250.141]

TASK [backup : Backup MySQL database] ******************************************************************************************
changed: [192.168.250.141]

TASK [backup : include_tasks] **************************************************************************************************
skipping: [192.168.250.141]

PLAY RECAP *********************************************************************************************************************
192.168.250.128            : ok=10   changed=2    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
192.168.250.141            : ok=11   changed=2    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
```