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| Course/Section: CPE 232 - CPE31S4 | Date Submitted: 10-24-2023 |
| Instructor: Dr. Jonathan V. Taylar | Semester and SY: 1st Sem 2023-2024 |
| Activity 9: Install, Configure, and Manage Performance Monitoring tools | |
| 1. Objectives | |
| Create and design a workflow that installs, configure and manage enterprise performance tools using Ansible as an Infrastructure as Code (IaC) tool. | |
| 2. Discussion | |
| <p>Performance monitoring is a type of monitoring tool that identifies current resource consumption of the workload, in this page we will discuss multiple performance monitoring tool.</p> <p>Prometheus</p> <p>Prometheus fundamentally stores all data as timeseries: streams of timestamped values belonging to the same metric and the same set of labeled dimensions. Besides stored time series, Prometheus may generate temporary derived time series as the result of queries. Source: Prometheus - Monitoring system & time series database</p> <p>Cacti</p> <p>Cacti is a complete network graphing solution designed to harness the power of RRDTool's data storage and graphing functionality. Cacti provides a fast poller, advanced graph templating, multiple data acquisition methods, and user management features out of the box. All of this is wrapped in an intuitive, easy to use interface that makes sense for LAN-sized installations up to complex networks with thousands of devices. Source: Cacti® - The Complete RRDTool-based Graphing Solution</p> | |
| 3. Tasks | |
| <ol style="list-style-type: none"> 1. Create a playbook that installs Prometheus in both Ubuntu and CentOS. Apply the concept of creating roles. 2. Describe how you did step 1. (Provide screenshots and explanations in your report. Make your report detailed such that it will look like a manual.) 3. Show an output of the installed Prometheus for both Ubuntu and CentOS. 4. Make sure to create a new repository in GitHub for this activity. | |

4. Output (screenshots and explanations)

Task 1: Preparation

1. Create a github repository that will be used for the installation of Prometheus in Ubuntu and CentOS.

Create a new repository
A repository contains all project files, including the revision history. Already have a project repository elsewhere? [Import a repository.](#)

Required fields are marked with an asterisk ().*

Owner * **Repository name ***
TuRonnDraco / CPE232_Act9_Seruelas
CPE232_Act9_Seruelas is available.

Great repository names are short and memorable. Need inspiration? How about [legendary-adventure](#) ?

Description (optional)
Installation of Prometheus in Ubuntu and CentOS.

☒ **Public**
Anyone on the internet can see this repository. You choose who can commit.

☐ **Private**
You choose who can see and commit to this repository.

Initialize this repository with:
☒ **Add a README file**
This is where you can write a long description for your project. [Learn more about READMEs.](#)

Add .gitignore
.gitignore template: **None**
Choose which files not to track from a list of templates. [Learn more about ignoring files.](#)

Choose a license
License: **None**
A license tells others what they can and can't do with your code. [Learn more about licenses.](#)

This will set `main` as the default branch. Change the default name in your [settings](#).

🔒 You are creating a public repository in your personal account.

[Create repository](#)

Figure 1.1.1 - Creation of the CPE232_Act9_Seruelas repository.

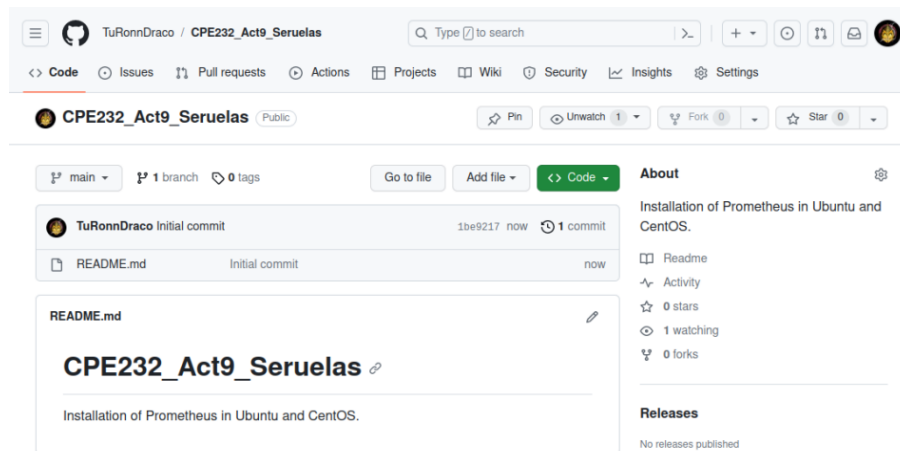


Figure 1.1.2 - Verification of the repository's creation.

2. Copy the ssh code provided for the repository, in order to clone the repository in your local machine or workstation using **git clone <address>**.

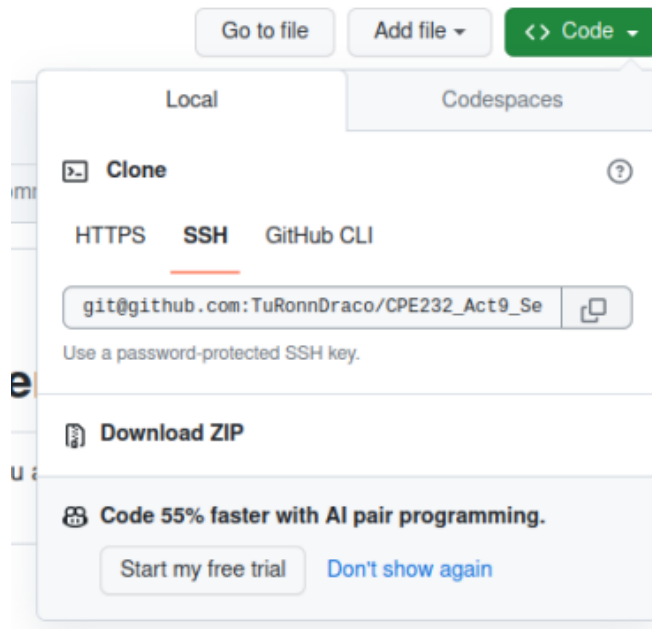


Figure 1.2.1 - Copying the ssh code of the repository.

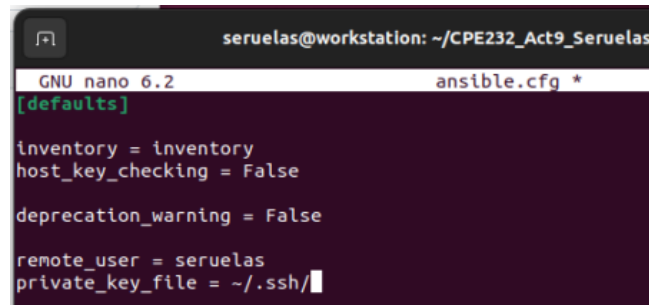
```
seruelas@workstation: ~/CPE232_Act9_Seruelas
seruelas@workstation:~$ git clone git@github.com:TuRonnDraco/CPE232_Act9_Seruelas.git
Cloning into 'CPE232_Act9_Seruelas'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (3/3), done.
seruelas@workstation:~$ ls
Ansible54          CPE232_Seruelas1    Music              Templates
CPE232_Act5_Seruelas CPE232_TESTREPOSITORY Pictures            Videos
CPE232_Act6_Seruelas Desktop             Public
CPE232_Act7_Seruelas Documents          Seruelas_PrelimExam
CPE232_Act9_Seruelas Downloads          snap
seruelas@workstation:~$ cd CPE232_Act9_Seruelas
seruelas@workstation:~/CPE232_Act9_Seruelas$ git status
On branch main
Your branch is up to date with 'origin/main'.

nothing to commit, working tree clean
```

Figure 1.2.2 - Cloning the github repository to the local machine or workstation.

Task 2: Preparation of the Local Repository

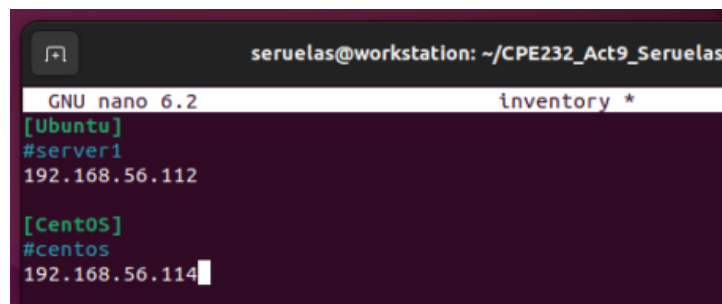
1. Setup the configuration for the repository by creating the **ansible.cfg** file.



```
seruelas@workstation: ~/CPE232_Act9_Seruelas
GNU nano 6.2 ansible.cfg *
[defaults]
inventory = inventory
host_key_checking = False
deprecation_warning = False
remote_user = seruelas
private_key_file = ~/.ssh/
```

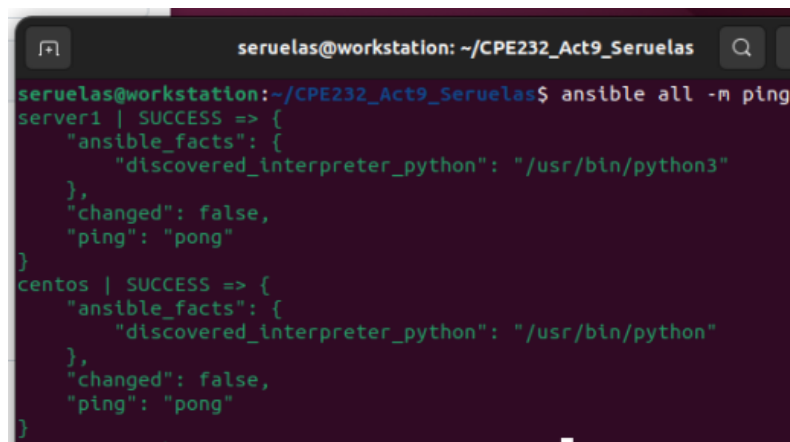
Figure 2.1.1 - Setting up ansible.cfg for the repository.

2. Setup the inventory file for the repository by using sudo nano, and specify the machines that will be used for the installation of prometheus. You can specify the machines via their hostnames or their ip addresses.



```
seruelas@workstation: ~/CPE232_Act9_Seruelas
GNU nano 6.2 inventory *
[Ubuntu]
#server1
192.168.56.112
[CentOS]
#centos
192.168.56.114
```

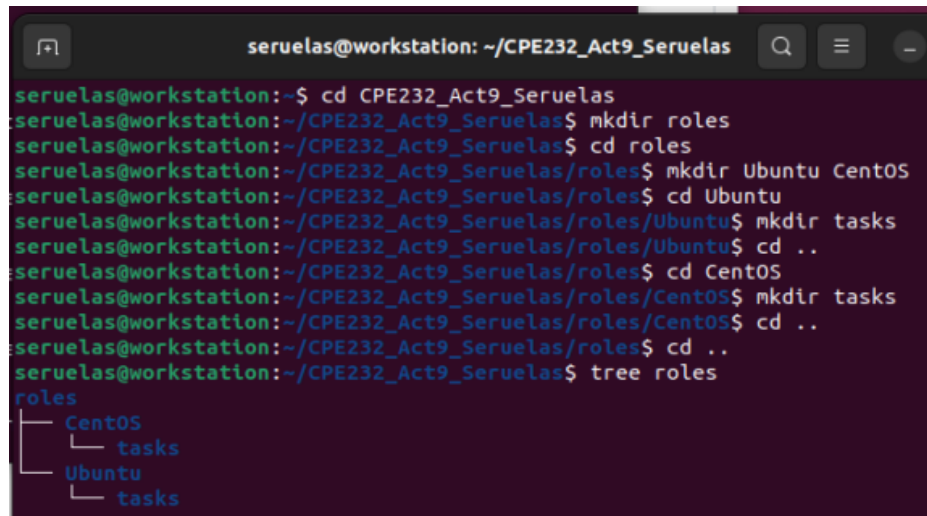
Figure 2.2.1 - Specification of machines used for playbook, either in their hostnames or ip addresses.



```
seruelas@workstation: ~/CPE232_Act9_Seruelas$ ansible all -m ping
server1 | SUCCESS => {
  "ansible_facts": {
    "discovered_interpreter_python": "/usr/bin/python3"
  },
  "changed": false,
  "ping": "pong"
}
centos | SUCCESS => {
  "ansible_facts": {
    "discovered_interpreter_python": "/usr/bin/python"
  },
  "changed": false,
  "ping": "pong"
}
```

Figure 2.2.2 - Verification of connection of machines via ansible.

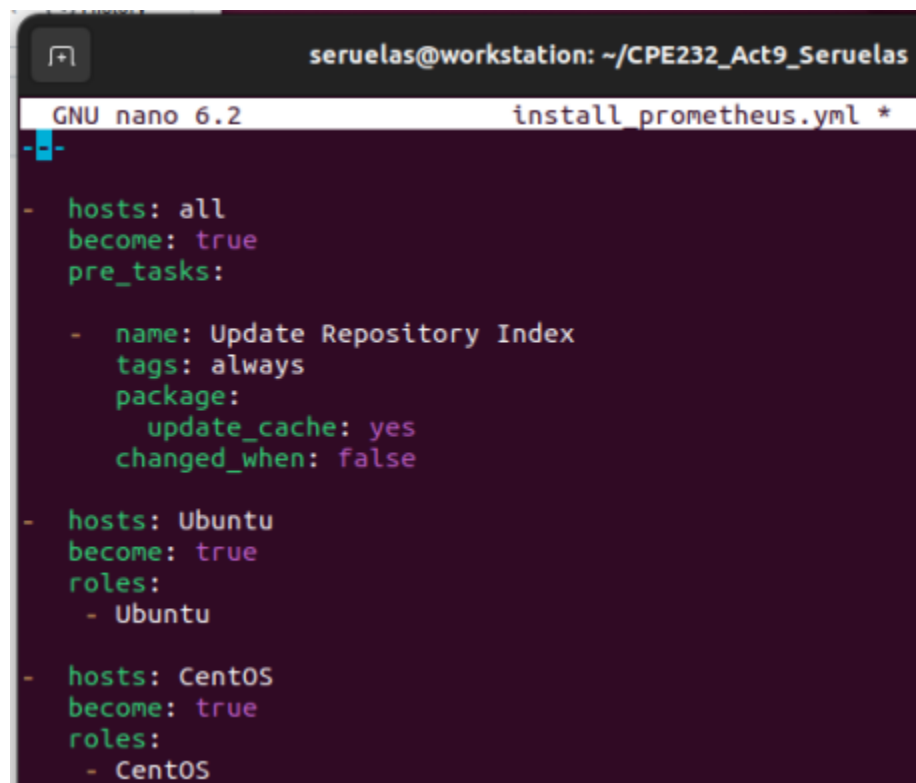
3. Create the roles for each ansible distribution by creating their own directories with their own task directory in the roles directory using **mkdir**.



```
seruelas@workstation: ~$ cd CPE232_Act9_Seruelas
seruelas@workstation:~/CPE232_Act9_Seruelas$ mkdir roles
seruelas@workstation:~/CPE232_Act9_Seruelas$ cd roles
seruelas@workstation:~/CPE232_Act9_Seruelas/roles$ mkdir Ubuntu CentOS
seruelas@workstation:~/CPE232_Act9_Seruelas/roles$ cd Ubuntu
seruelas@workstation:~/CPE232_Act9_Seruelas/roles/Ubuntu$ mkdir tasks
seruelas@workstation:~/CPE232_Act9_Seruelas/roles/Ubuntu$ cd ..
seruelas@workstation:~/CPE232_Act9_Seruelas/roles$ cd CentOS
seruelas@workstation:~/CPE232_Act9_Seruelas/roles/CentOS$ mkdir tasks
seruelas@workstation:~/CPE232_Act9_Seruelas/roles/CentOS$ cd ..
seruelas@workstation:~/CPE232_Act9_Seruelas/roles$ cd ..
seruelas@workstation:~/CPE232_Act9_Seruelas$ tree roles
roles
├── CentOS
│   └── tasks
└── Ubuntu
    └── tasks
```

Figure 2.3.1 - Creation of the roles for the repository.

4. Create the **install_prometheus.yml** that will contain the scripting that will install prometheus to the target hosts and configure it to target the Ubuntu and CentOS roles.



```
GNU nano 6.2      install_prometheus.yml *
-
- hosts: all
  become: true
  pre_tasks:
    - name: Update Repository Index
      tags: always
      package:
        update_cache: yes
        changed_when: false
- hosts: Ubuntu
  become: true
  roles:
    - Ubuntu
- hosts: CentOS
  become: true
  roles:
    - CentOS
```

Figure 2.4.1 - Creation and configuration of the install_prometheus.yml

Task 3: Installation of Prometheus in Ubuntu

1. Create the **main.yml** that will hold the script for the installation of Prometheus in Ubuntu.

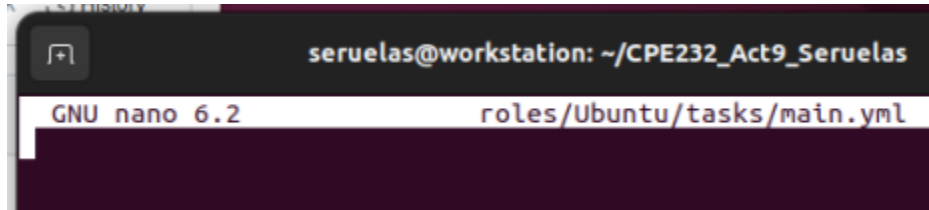


Figure 3.1.1 - Creation of the main.yml for the Ubuntu role.

2. The prometheus package is available to be easily installed in Ubuntu by simply checking **sudo apt install prometheus**. Create a module that will install the **prometheus** package at its latest state.

```
- name: Install Prometheus in Ubuntu
  tags: ubuntu, prometheus
  apt:
    name: prometheus
    state: latest
```

Figure 3.2.1 - Module that will be installing the latest state or version of prometheus in Ubuntu.

3. In order to make the prometheus service operable, create a module that will enable the prometheus services.

```
- name: Enabling Prometheus in Ubuntu
  tags: ubuntu, enable, prometheus
  service:
    name: prometheus
    state: restarted
    enabled: true
```

Figure 3.3.1 - Module that will enable the prometheus service in Ubuntu.

4. In order for prometheus to be accessed in Ubuntu, the user must enable to port 9090/tcp in their module. Create a module that will use the shell to enable to port 9090/tcp using ufw in Ubuntu.

```
- name: Allow port 9090 for Prometheus in Ubuntu
  tags: ubuntu, port, prometheus
  shell: |
    sudo ufw allow 9090/tcp
```

Figure 3.4.1 - Module that will allow or enable the port 9090/tcp in Ubuntu.

Task 4: Installation of Prometheus in CentOS.

1. Create a **main.yml** that will contain the script that will install prometheus in CentOS.

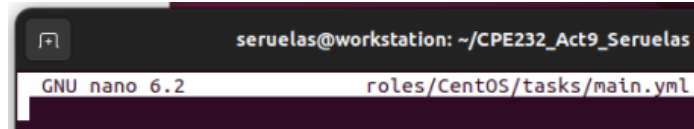


Figure 4.1.1 - Creation of main.yml for the CentOS role.

2. In the main.yml, create a module that creates a directory for the files of Prometheus.

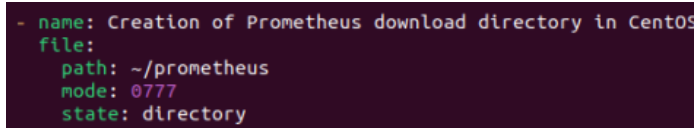


Figure 4.2.1 - Module that creates the download directory of Prometheus in CentOS.

3. Create a module that will create multiple directories that will be used by Prometheus as libraries and dependencies.

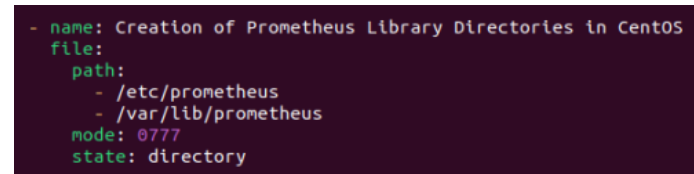


Figure 4.3.1 - Module that creates the necessary directories for Prometheus in CentOS.

4. Create a module that will download and unarchive the prometheus package to the download directory.

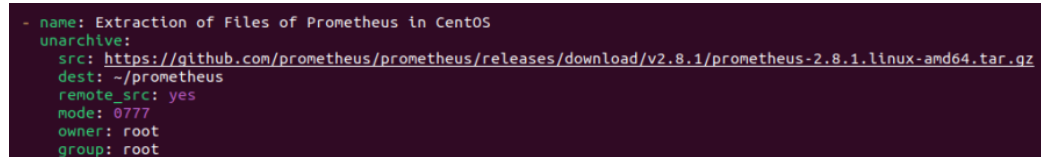


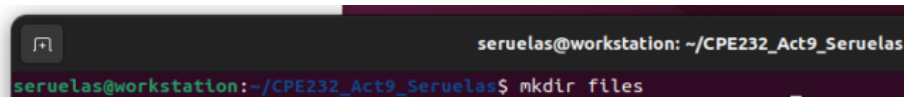
Figure 4.4.1 - Module that downloads and unarchives the prometheus package to its dedicated directory in CentOS.

5. After downloading and unarchiving the prometheus package, copy its files to the following directories using a shell in the module.

```
- name: Copying Files from Prometheus Directory to others in CentOS
shell: |
  cd ~/prometheus/prometheus*
  cp -r prometheus /usr/local/bin/
  cp -r promtool /usr/local/bin/
  cp -r consoles /etc/prometheus
  cp -r console_libraries /etc/prometheus
```

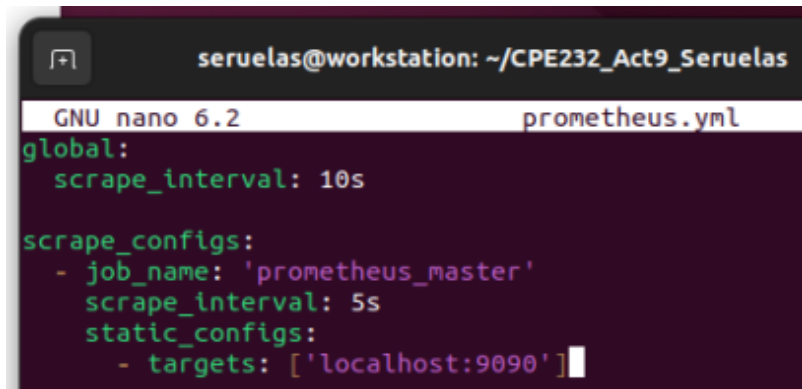
Figure 4.5.1 - Module that will copy the files from the download directory of prometheus unto the necessary directories in CentOS.

6. For Prometheus in CentOS, it requires two configuration files that allows the prometheus service to be functional and operational. Create a new directory named **files**, and create the two configurations, **prometheus.yml** and **prometheus.service** with the following scripts.



```
seruelas@workstation: ~/CPE232_Act9_Seruelas
seruelas@workstation:~/CPE232_Act9_Seruelas$ mkdir files
```

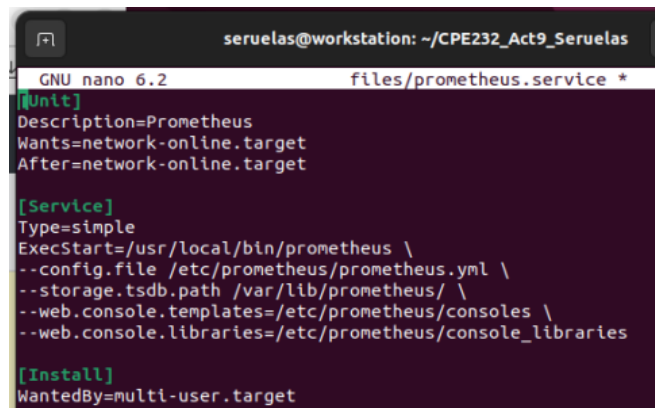
Figure 4.6.1 - Creation of the files directory in the repository.



```
seruelas@workstation: ~/CPE232_Act9_Seruelas
GNU nano 6.2 prometheus.yml
global:
  scrape_interval: 10s

scrape_configs:
  - job_name: 'prometheus_master'
    scrape_interval: 5s
    static_configs:
      - targets: ['localhost:9090']
```

Figure 4.6.2 - **prometheus.yml** script of configuration.



```
seruelas@workstation: ~/CPE232_Act9_Seruelas
GNU nano 6.2 files/prometheus.service *
[Unit]
Description=Prometheus
Wants=network-online.target
After=network-online.target

[Service]
Type=simple
ExecStart=/usr/local/bin/prometheus \
--config.file /etc/prometheus/prometheus.yml \
--storage.tsdb.path /var/lib/prometheus/ \
--web.console.templates=/etc/prometheus/consoles \
--web.console.libraries=/etc/prometheus/console_libraries

[Install]
WantedBy=multi-user.target
```

Figure 4.6.3 - **prometheus.service** script of configuration.

7. After the creation of the two configuration files, copy the configuration files unto its dedicated directories in a module.

```
- name: Copy Configuration of Prometheus to etc/prometheus/ in CentOS
copy:
  src: prometheus.yml
  dest: /etc/prometheus
  mode: 7777
  owner: root
  group: root

- name: Copy Configuration of Prometheus Service to /etc/systemd/system/ in CentOS
copy:
  src: prometheus.service
  dest: /etc/systemd/system
  mode: 7777
  owner: root
```

Figure 4.7.1 - Module that copies the configurations to their dedicated directories in CentOS.

8. After configuring and compiling all the files necessary for Prometheus, reload the systemd service to save changes in a module.

```
- name: Reload systemd service in CentOS
shell: |
  systemctl daemon-reload
```

Figure 4.8.1 - Module that will reload the systemd service via shell commands in CentOS.

9. Create a module that enables and restarts the HTTPD service, along side enabling and restarting the Prometheus service.

```
- name: Enable HTTPD in CentOS
service:
  name: httpd
  state: restarted
  enabled: true

- name: Enable Prometheus Service in CentOS
service:
  name: prometheus
  state: restarted
  enabled: true
```

Figure 4.9.1 - Module that enables and restarts the HTTPD and Prometheus service in CentOS.

10. In order for the Prometheus service to be fully functional, allow the port 9090/tcp in CentOS, and reload the firewalld to save changes and allow the Prometheus service to be operational.

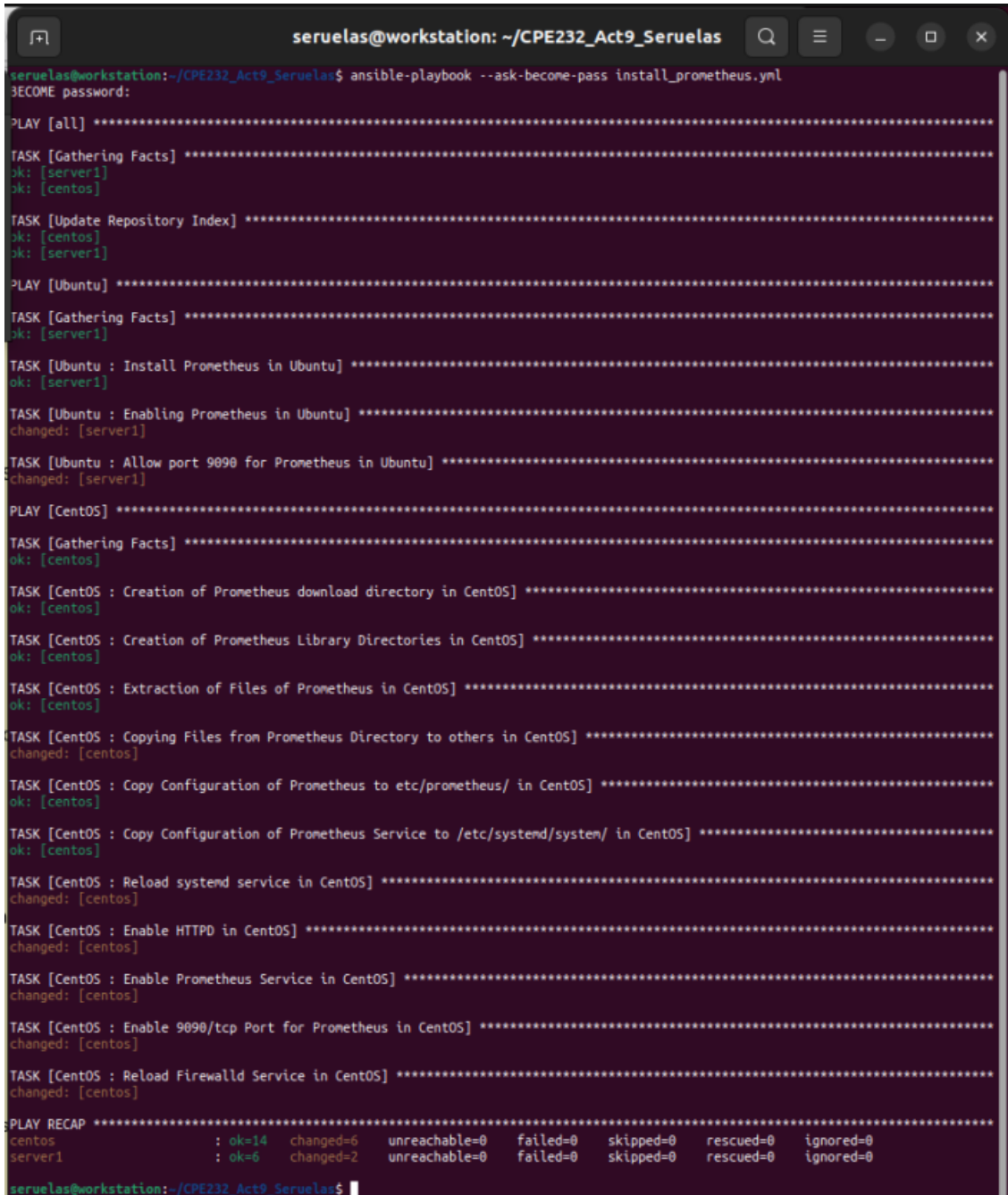
```
- name: Enable 9090/tcp Port for Prometheus in CentOS
  shell: |
    firewall-cmd --zone=public --add-port=9090/tcp --permanent

- name: Reload Firewalld Service in CentOS
  service:
    name: firewalld
    state: restarted
    enabled: true
```

Figure 4.10.1 - Module/s that will enable the 9090/tcp port, and reloads the firewalld service in CentOS.

Task 5: Verification of Playbook

1. Execute the `install_prometheus.yml` playbook with the command `ansible-playbook --ask-become-pass install_prometheus.yml`, and show its full output.



```
seruelas@workstation: ~/CPE232_Act9_Seruelas
seruelas@workstation:~/CPE232_Act9_Seruelas$ ansible-playbook --ask-become-pass install_prometheus.yml
BECOME password:

PLAY [all] *****

TASK [Gathering Facts] *****
ok: [server1]
ok: [centos]

TASK [Update Repository Index] *****
ok: [centos]
ok: [server1]

PLAY [Ubuntu] *****

TASK [Gathering Facts] *****
ok: [server1]

TASK [Ubuntu : Install Prometheus in Ubuntu] *****
ok: [server1]

TASK [Ubuntu : Enabling Prometheus in Ubuntu] *****
changed: [server1]

TASK [Ubuntu : Allow port 9090 for Prometheus in Ubuntu] *****
changed: [server1]

PLAY [CentOS] *****

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

TASK [CentOS : Creation of Prometheus download directory in CentOS] *****
ok: [centos]

TASK [CentOS : Creation of Prometheus Library Directories in CentOS] *****
ok: [centos]

TASK [CentOS : Extraction of Files of Prometheus in CentOS] *****
ok: [centos]

TASK [CentOS : Copying Files from Prometheus Directory to others in CentOS] *****
changed: [centos]

TASK [CentOS : Copy Configuration of Prometheus to etc/prometheus/ in CentOS] *****
ok: [centos]

TASK [CentOS : Copy Configuration of Prometheus Service to /etc/systemd/system/ in CentOS] *****
ok: [centos]

TASK [CentOS : Reload systemd service in CentOS] *****
changed: [centos]

TASK [CentOS : Enable HTTPD in CentOS] *****
changed: [centos]

TASK [CentOS : Enable Prometheus Service in CentOS] *****
changed: [centos]

TASK [CentOS : Enable 9090/tcp Port for Prometheus in CentOS] *****
changed: [centos]

TASK [CentOS : Reload Firewall Service in CentOS] *****
changed: [centos]

PLAY RECAP *****
centos      : ok=14   changed=6   unreachable=0   failed=0   skipped=0   rescued=0   ignored=0
server1    : ok=6    changed=2   unreachable=0   failed=0   skipped=0   rescued=0   ignored=0

seruelas@workstation:~/CPE232_Act9_Seruelas$
```

Figure 5.1.1 - Execution of `install_prometheus.yml` playbook with its play recap or summary.

2. Verify the successful installation of prometheus in the Ubuntu Server.

```
seruelas@server1: ~  
seruelas@server1:~$ systemctl status prometheus  
● prometheus.service - Monitoring system and time series database  
   Loaded: loaded (/lib/systemd/system/prometheus.service; enabled; vendor pre  
   Active: active (running) since Mon 2023-10-23 13:09:16 PST; 2min 13s ago  
     Docs: https://prometheus.io/docs/introduction/overview/  
    ManPage: man:prometheus(1)  
   Main PID: 17981 (prometheus)  
      Tasks: 8 (limit: 2261)  
     Memory: 33.4M  
        CPU: 316ms  
    CGroup: /system.slice/prometheus.service  
            └─17981 /usr/bin/prometheus  
  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.546Z caller=ha  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.546Z caller=ha  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.592Z caller=ha  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.592Z caller=ha  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.592Z caller=ha  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.594Z caller=ha  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.594Z caller=ha  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.594Z caller=ha  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.595Z caller=ha  
Oct 23 13:09:16 server1 prometheus[17981]: ts=2023-10-23T05:09:16.595Z caller=ha  
lines 1-22/22 (END)
```

Figure 5.2.1 - Verification of Prometheus service through **systemctl status**.

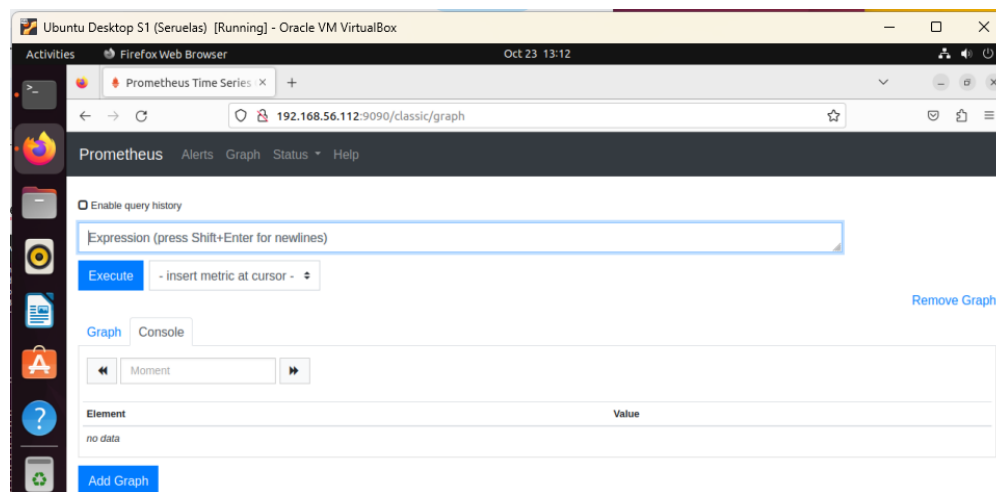


Figure 5.2.2 - Verification of Prometheus Service through browser by searching **<ip address>:9090**.

3. Verify the successful installation of prometheus in the CentOS Server.

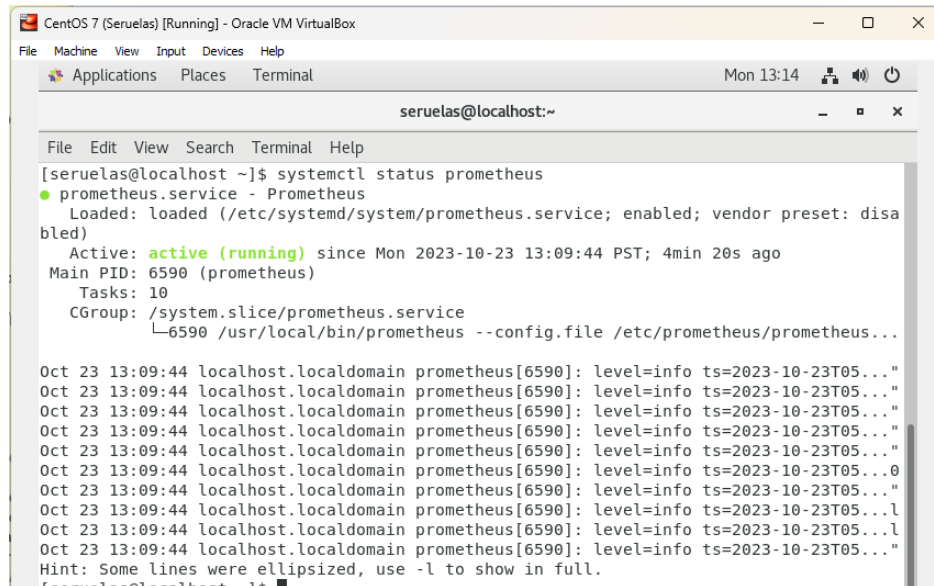


Figure 5.3.1 - Verification of Prometheus Service using **systemctl status**.

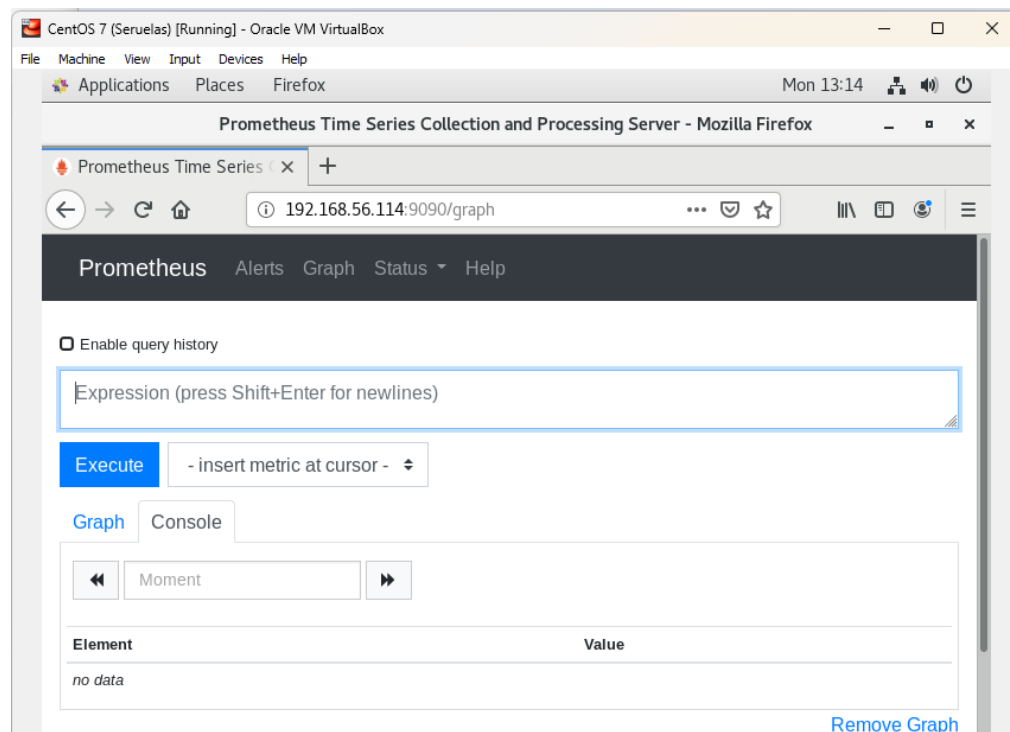


Figure 5.3.2 - Verification of Prometheus Service using the browser by searching the **<ip address>:9090**.

4. Push, Commit and Save all changes done in the local repository to the Github repository.

```
seruelas@workstation: ~/CPE232_Act9_Seruelas
seruelas@workstation:~/CPE232_Act9_Seruelas$ git add *
seruelas@workstation:~/CPE232_Act9_Seruelas$ git commit -m "Done at 1:17pm at 10-23-2023"
[main 0a6df37] Done at 1:17pm at 10-23-2023
10 files changed, 254 insertions(+)
create mode 160000 CPE232_Act8_Seruelas
create mode 100644 ansible.cfg
create mode 100644 centos.yml
create mode 100644 files/prometheus.service
create mode 100644 files/prometheus.yml
create mode 100644 install_prometheus.yml
create mode 100644 inventory
create mode 100644 roles/CentOS/tasks/main.yml
create mode 100644 roles/Ubuntu/tasks/main.yml
create mode 100644 ubuntu.yml
seruelas@workstation:~/CPE232_Act9_Seruelas$ git push origin
Enumerating objects: 18, done.
Counting objects: 100% (18/18), done.
Delta compression using up to 2 threads
Compressing objects: 100% (12/12), done.
Writing objects: 100% (17/17), 2.40 KiB | 2.40 MiB/s, done.
Total 17 (delta 2), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (2/2), done.
To github.com:TuRonnDraco/CPE232_Act9_Seruelas.git
1be9217..0a6df37  main -> main
```

Figure 5.4.1 - Saving all changes made in the local repository to the Github Repository.

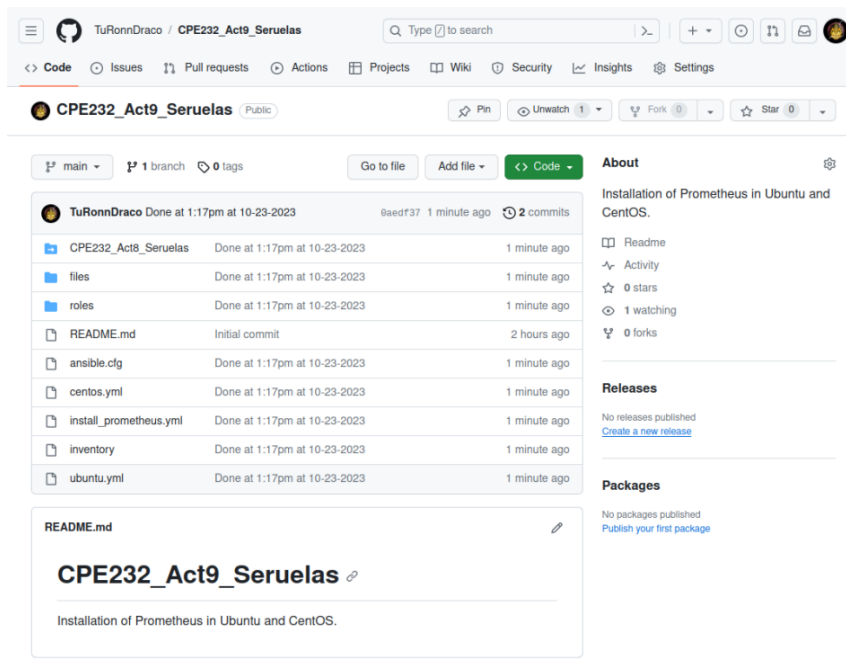


Figure 5.4.2 - Github Updated after Saving all changes.

Accessible at:

https://github.com/TuRonnDraco/CPE232_Act9_Seruelas

Reflections:

Answer the following:

1. What are the benefits of having a performance monitoring tool?
 - The benefits of having a performance monitoring tool is that it allows us to track the performance of the services via local network as to see if the services are working consistently or if there is any possible problems or slowdowns they are experiencing, affecting their efficiency. Having a performance monitoring tool also allows us to see a graph in which we can compare the performances of the services at different periods.

Conclusions:

In this activity, we were able to discuss the importance of Performance Monitoring Tools for our devices. Performance Monitoring Tools are tools that are necessary and helpful to the administrators or users as it allows them to track the performance and the graphical curve of how a service runs or how consistent it is. In this activity, we were able to install and configure **Prometheus** in our servers (Ubuntu and CentOS) using different modules, using the ansible playbook method. We were able to configure prometheus by using different configurations that allows prometheus service to run, and included them in our playbook. We are able to conclude that with what we have learned in our previous lessons and modules, we are able to create a playbook that will automatically install and configure the performance monitoring tool, prometheus in our Ubuntu and CentOS servers.