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Activity 5: Consolidating Playbook plays

1. **Objectives:**

1.1 Use **when** command in playbook for different OS distributions

1.2 Apply refactoring techniques in cleaning up the playbook codes

2. **Discussion**:

We are going to look at a way that we can differentiate a playbook by a host in terms of which distribution the host is running. It's very common in most Linux shops to run multiple distributions, for example, Ubuntu shop or Debian shop and you need a different distribution for a one off-case or perhaps you want to run plays only on certain distributions.

It is a best practice in ansible when you are working in a collaborative environment to use the command git pull. git pull is a Git command used to update the local version of a repository from a remote. By default, git pull does two things. Updates the current local working branch (currently checked out branch) and updates the remote-tracking branches for all other branches. git pull essentially pulls down any changes that may have happened since the last time you worked on the repository.

Requirement:

In this activity, you will need to create a CentOS VM. Likewise, you need to activate the second adapter to a host-only adapter after the installations. Take note of the IP address of the CentOS VM. Make sure to use the command *ssh-copy-id* to copy the public key to CentOS. Verify if you can successfully SSH to CentOS VM.

Task 1: Use when command for different distributions

1. In the local machine, make sure you are in the local repository directory (*CPE232_yourname*). Issue the command git pull. When prompted, enter the correct passphrase or password. Describe what happened when you issue this command. Did something happen? Why?

```
qadjuanson@workstation:~$ ls
CPE212_Aliya  Documents  Juanson_CPE212_4.1  Music     Public  Templates
Desktop       Downloads  Juanson_PrelimExam  Pictures  snap    Videos
qadjuanson@workstation:~$ cd Juanson_CPE212_4.1
qadjuanson@workstation:~/Juanson_CPE212_4.1$ git pull
Already up to date.
qadjuanson@workstation:~/Juanson_CPE212_4.1$
```

- **After I issue the command git pull, it says “already up to date.” which means that my local copy of the repository already has all the latest changes from github.**

2. Edit the inventory file and add the IP address of the Centos VM. Issue the command we used to execute the playbook (the one we used in the last activity): *ansible-playbook --ask-become-pass install_apache.yml*. After executing this command, you may notice that it did not become successful in the Centos VM. You can see that the Centos VM has failed=1. Only the two remote servers have been changed. The reason is that Centos VM does not support "apt" as the package manager. The default package manager for Centos is "yum."

```
qadjuanson@workstation:~/Juanson_CPE212_4.1$ ansible all -m ping
192.168.56.101 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
}
192.168.56.102 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python3"
    },
    "changed": false,
    "ping": "pong"
}
[DEPRECATION WARNING]: Distribution centos 9 on host 192.168.56.103 should use
/usr/libexec/platform-python, but is using /usr/bin/python for backward compatibility
with prior Ansible releases. A future Ansible release will default to using the
discovered platform python for this host. See
https://docs.ansible.com/ansible/2.10/reference_appendices/interpreter_discovery.html for
 more information. This feature will be removed in version 2.12. Deprecation warnings can
 be disabled by setting deprecation_warnings=False in ansible.cfg.
192.168.56.103 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "ping": "pong"
}
```

```
qadjuanson@workstation:~/Juanson_CPE212_4.1$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

PLAY [all] *********************************************************************

TASK [Gathering Facts] *********************************************************
ok: [192.168.56.101]
ok: [192.168.56.102]
[DEPRECATION WARNING]: Distribution centos 9 on host 192.168.56.103 should use
/usr/libexec/platform-python, but is using /usr/bin/python for backward compatibility
with prior Ansible releases. A future Ansible release will default to using the
discovered platform python for this host. See
https://docs.ansible.com/ansible/2.10/reference_appendices/interpreter_discovery.html for
 more information. This feature will be removed in version 2.12. Deprecation warnings can
 be disabled by setting deprecation_warnings=False in ansible.cfg.
ok: [192.168.56.103]

TASK [install apache2 package] *************************************************
[WARNING]: Updating cache and auto-installing missing dependency: python3-apt
fatal: [192.168.56.103]: FAILED! => {"changed": false, "cmd": "apt-get update", "msg": "[Errno 2] No such file
or directory: b'apt-get'", "rc": 2}
changed: [192.168.56.102]
changed: [192.168.56.101]

TASK [install apache2 package] *************************************************
ok: [192.168.56.102]
ok: [192.168.56.101]

TASK [add PHP support for apache] **********************************************
ok: [192.168.56.102]
ok: [192.168.56.101]

PLAY RECAP *********************************************************************
192.168.56.101             : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignore
d=0
192.168.56.102             : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignore
d=0
192.168.56.103             : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignore
```

3. Edit the *install_apache.yml* file and insert the lines shown below.

```
---
- hosts: all
  become: true
  tasks:

  - name: update repository index
    apt:
      update_cache: yes
    when: ansible_distribution == "Ubuntu"

  - name: install apache2 package
    apt:
      name: apache2
    when: ansible_distribution == "Ubuntu"

  - name: add PHP support for apache
    apt:
      name: libapache2-mod-php
    when: ansible_distribution == "Ubuntu"
```

Make sure to save the file and exit.

Run *ansible-playbook --ask-become-pass install_apache.yml* and describe the result.

If you have a mix of Debian and Ubuntu servers, you can change the configuration of your playbook like this.

- name: update repository index
  apt:
    update_cache: yes
  when: ansible_distribution in [“Debian”, “Ubuntu]

Note: This will work also if you try. Notice the changes are highlighted.

```
 GNU nano 6.2                                    install_apache.yml
---
- hosts: all
  become: true
  tasks:

  - name: update repository index
    apt:
      update_cache: yes
    when: ansible_distribution == "Ubuntu"

  - name: install apache2 package
    apt:
      name: apache2
    when: ansible_distribution == "Ubuntu"

  - name: add PHP support for apache
    apt:
      name: libapache2-mod-php
    when: ansible_distribution == "Ubuntu"
```

```
qadjuanson@workstation:~/Juanson_CPE212_4.1$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

PLAY [all] *********************************************************************************************

TASK [Gathering Facts] *********************************************************************************
ok: [192.168.56.101]
ok: [192.168.56.102]
[DEPRECATION WARNING]: Distribution centos 9 on host 192.168.56.103 should use /usr/libexec/platform-python,
but is using /usr/bin/python for backward compatibility with prior Ansible releases. A future Ansible release
will default to using the discovered platform python for this host. See
https://docs.ansible.com/ansible/2.10/reference_appendices/interpreter_discovery.html for more information.
This feature will be removed in version 2.12. Deprecation warnings can be disabled by setting
deprecation_warnings=False in ansible.cfg.
ok: [192.168.56.103]

TASK [update repository index] *************************************************************************
skipping: [192.168.56.103]
changed: [192.168.56.101]
changed: [192.168.56.102]

TASK [install apache2 package] *************************************************************************
skipping: [192.168.56.103]
ok: [192.168.56.101]
ok: [192.168.56.102]

TASK [add PHP support for apache] **********************************************************************
skipping: [192.168.56.103]
ok: [192.168.56.102]
ok: [192.168.56.101]

PLAY RECAP *********************************************************************************************
192.168.56.101             : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignore
d=0
192.168.56.102             : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignore
d=0
192.168.56.103             : ok=1    changed=0    unreachable=0    failed=0    skipped=3    rescued=0    ignore
d=0
```

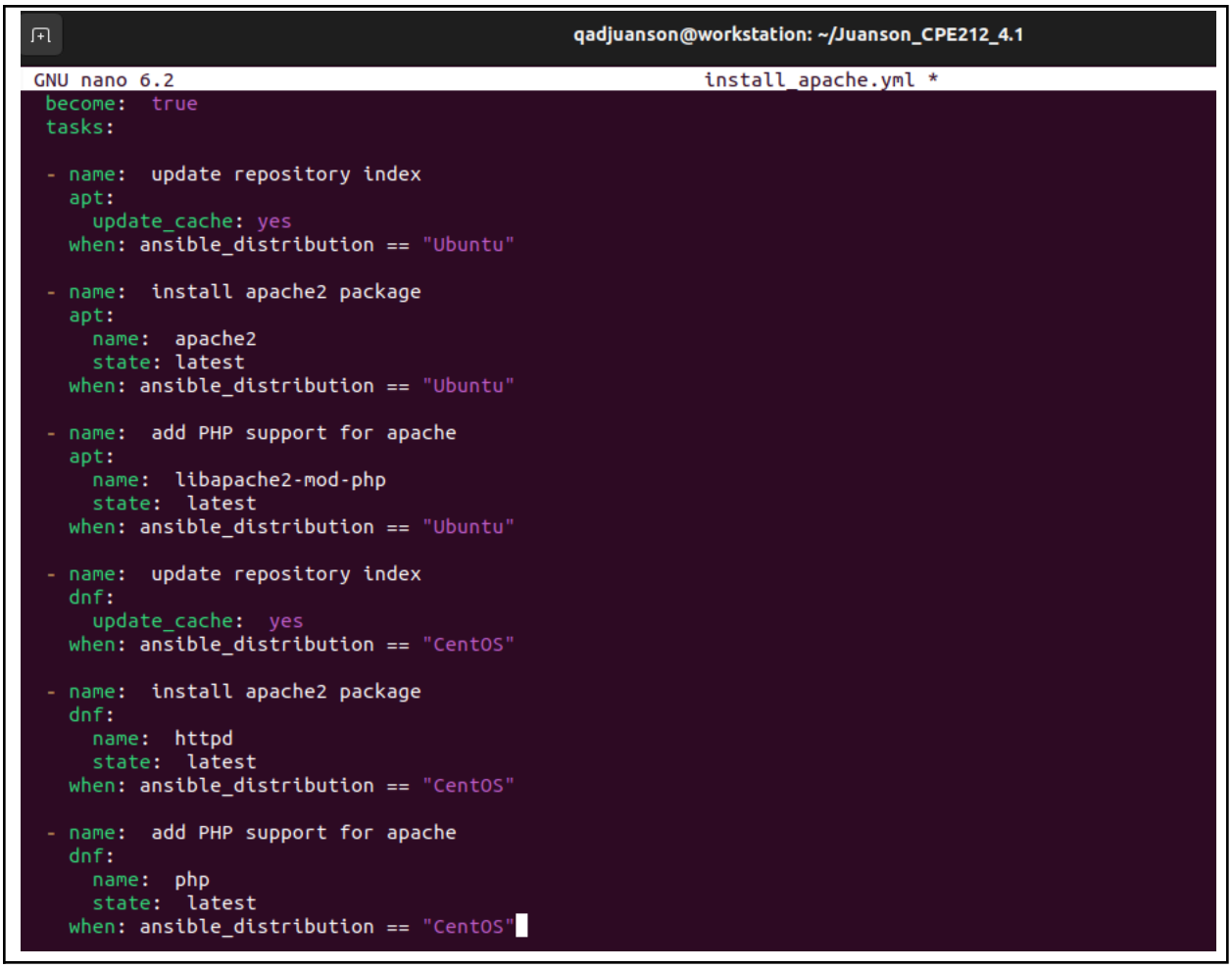
- **The blue text saying "skipping: [192.168.56.103] indicates that the tasks related to updating the repository index, installing Apache, and adding PHP support for Apache were skipped for that particular host/server.**

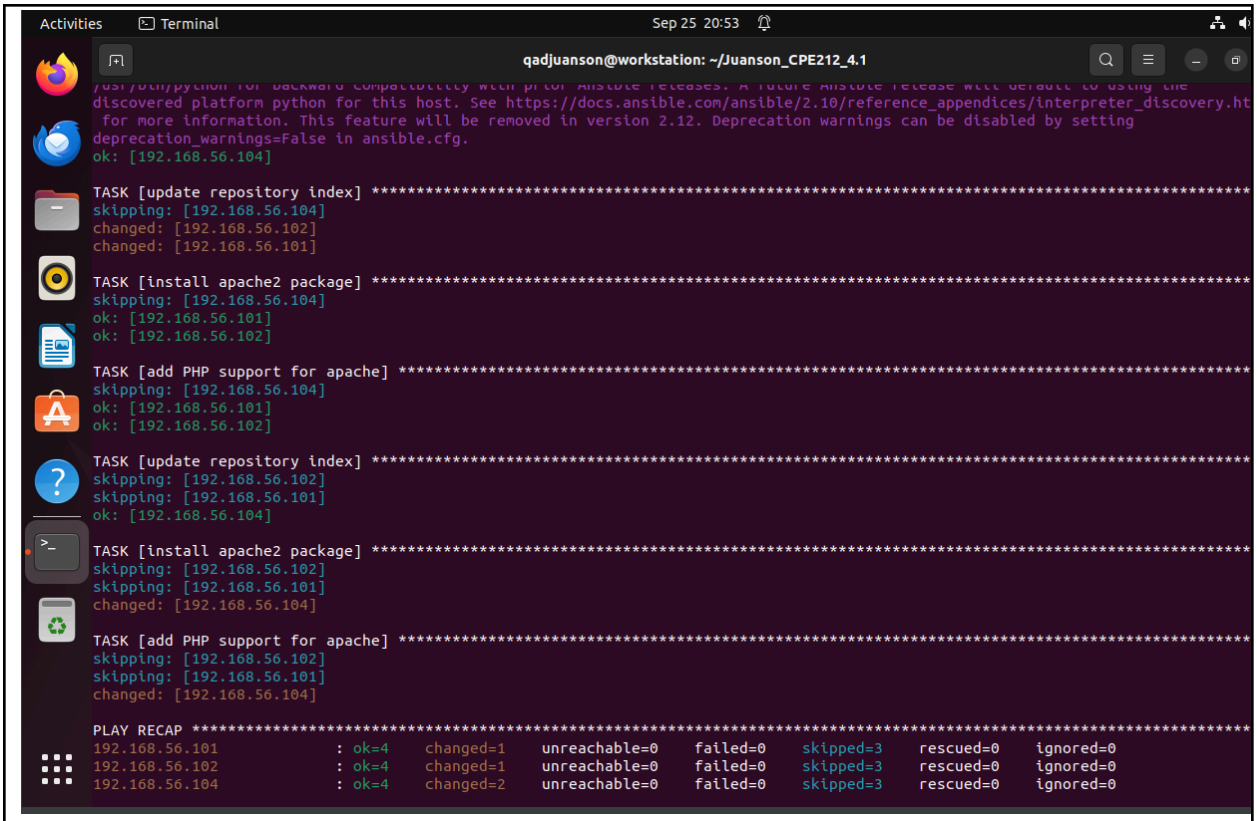
4. Edit the *install_apache.yml* file and insert the lines shown below.

```
---
- hosts: all
  become: true
  tasks:

  - name: update repository index
    apt:
      update_cache: yes
    when: ansible_distribution == "Ubuntu"

  - name: install apache2 package
    apt:
      name: apache2
      stae: latest
    when: ansible_distribution == "Ubuntu"

  - name: add PHP support for apache
    apt:
      name: libapache2-mod-php
      state: latest
    when: ansible_distribution == "Ubuntu"

  - name: update repository index
    dnf:
      update_cache: yes
    when: ansible_distribution == "CentOS"

  - name: install apache2 package
    dnf:
      name: httpd
      state: latest
    when: ansible_distribution == "CentOS"

  - name: add PHP support for apache
    dnf:
      name: php
      state: latest
    when: ansible_distribution == "CentOS"
```

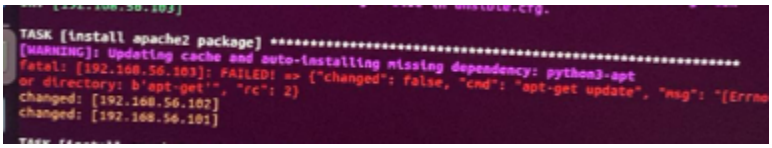
Make sure to save and exit.

Run *ansible-playbook --ask-become-pass install_apache.yml* and describe the result.


qadjuanson@workstation: ~/Juanson_CPE212_4.1
GNU nano 6.2
install_apache.yml *
become: true
tasks:
- name: update repository index
apt:
update_cache: yes
when: ansible_distribution == "Ubuntu"
- name: install apache2 package
apt:
name: apache2
state: latest
when: ansible_distribution == "Ubuntu"
- name: add PHP support for apache
apt:
name: libapache2-mod-php
state: latest
when: ansible_distribution == "Ubuntu"
- name: update repository index
dnf:
update_cache: yes
when: ansible_distribution == "CentOS"
- name: install apache2 package
dnf:
name: httpd
state: latest
when: ansible_distribution == "CentOS"
- name: add PHP support for apache
dnf:
name: php
state: latest
when: ansible_distribution == "CentOS"

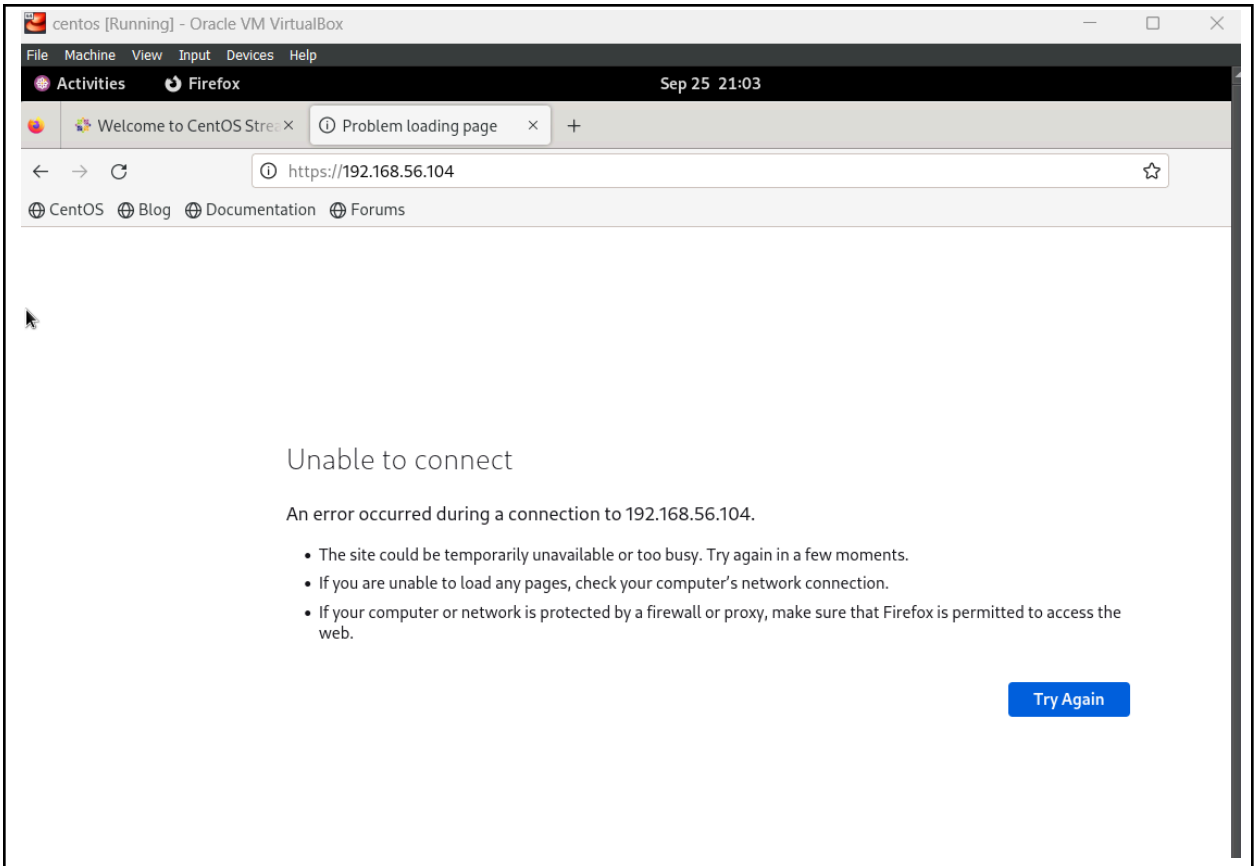


- **As you can see my IP address in CentOS VM has been changed. It is because I've encountered some errors in this task so I change the network settings of my CentOS VM.**

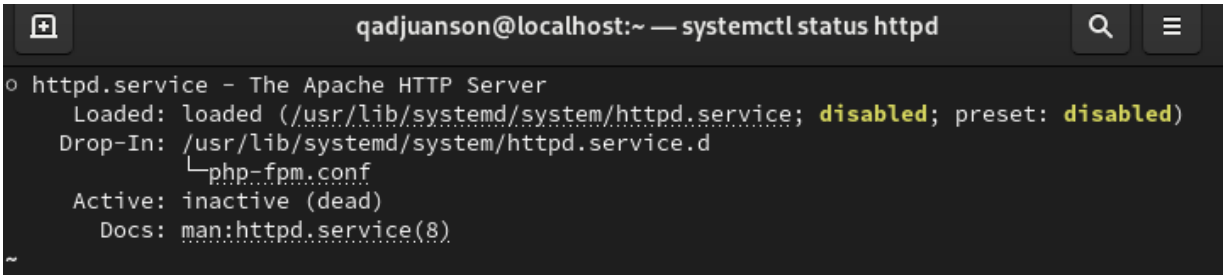


(this is the error)

5. To verify the installations, go to CentOS VM and type its IP address on the browser. Was it successful? The answer is no. It's because the httpd service or the Apache HTTP server in the CentOS is not yet active. Thus, you need to activate it first.



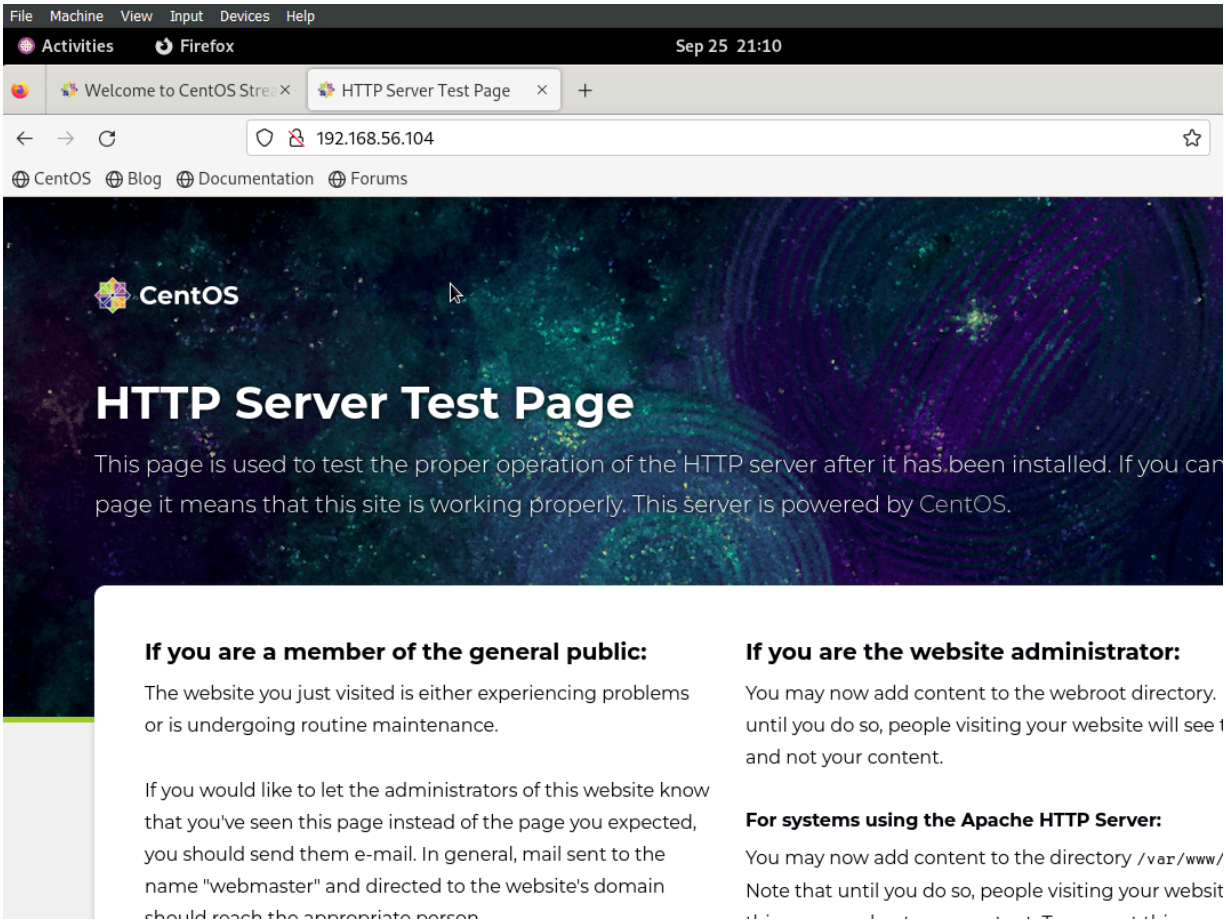
5.1 To activate, go to the CentOS VM terminal and enter the following:
systemctl status httpd
The result of this command tells you that the service is inactive.



5.2 Issue the following command to start the service:
sudo systemctl start httpd
(When prompted, enter the sudo password)
sudo firewall-cmd --add-port=80/tcp
(The result should be a success)

```
qadjuanson@localhost:~
[qadjuanson@localhost ~]$ sudo systemctl start httpd
[sudo] password for qadjuanson:
[qadjuanson@localhost ~]$ sudo firewall-cmd --add-port=80/tcp
success
[qadjuanson@localhost ~]$
```

5.3 To verify the service is already running, go to CentOS VM and type its IP address on the browser. Was it successful? (Screenshot the browser)



Task 2: Refactoring playbook

This time, we want to make sure that our playbook is efficient and that the codes are easier to read. This will also makes run ansible more quickly if it has to execute fewer tasks to do the same thing.

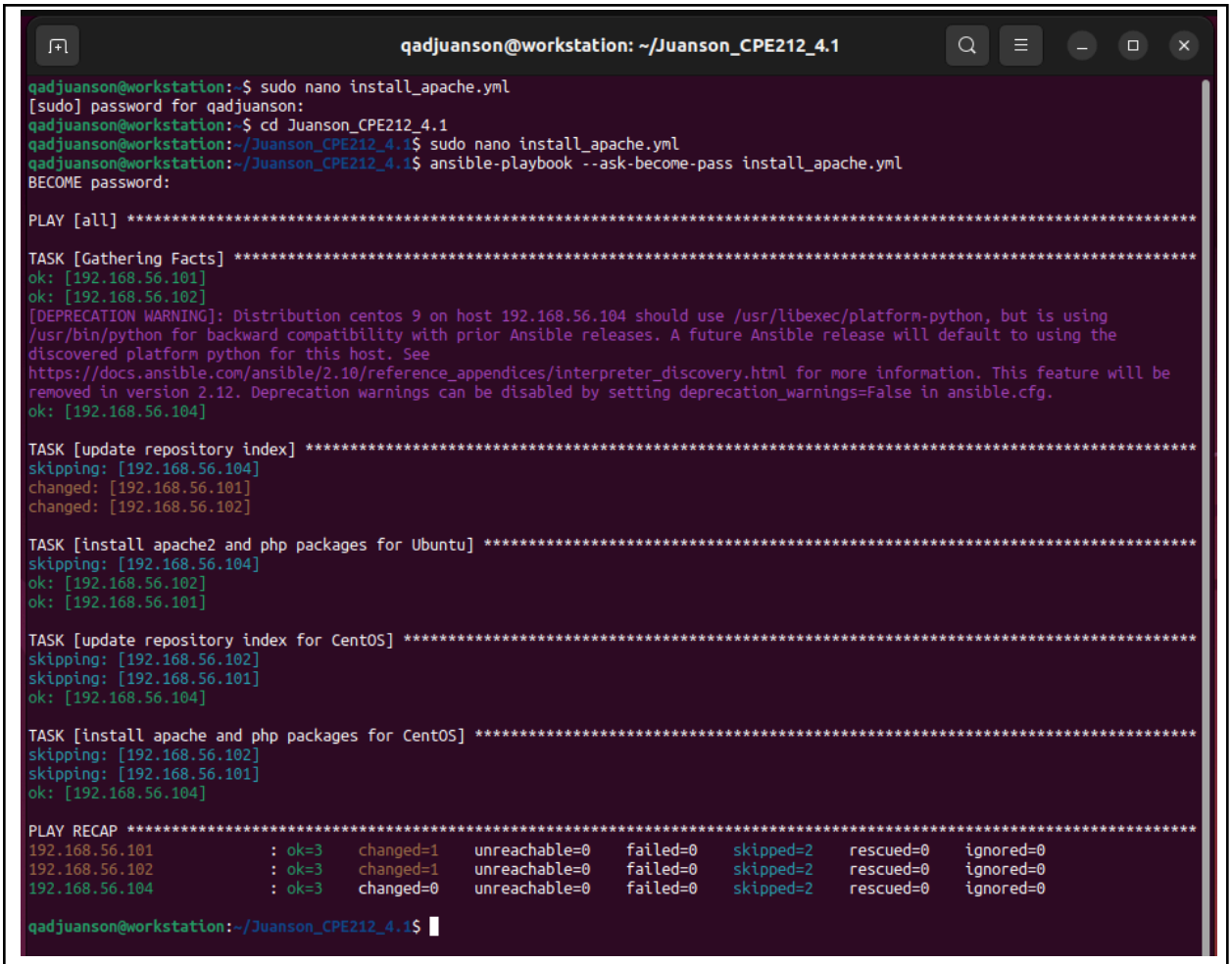
1. Edit the playbook *install_apache.yml*. Currently, we have three tasks targeting our Ubuntu machines and 3 tasks targeting our CentOS machine. Right now, we try to consolidate some tasks that are typically the same. For example, we can consolidate two plays that install packages. We can do that by creating a list of installation packages as shown below:

```
---
- hosts: all
  become: true
  tasks:

  - name: update repository index Ubuntu
    apt:
      update_cache: yes
    when: ansible_distribution == "Ubuntu"

  - name: install apache2 and php packages for Ubuntu
    apt:
      name:
        - apache2
        - libapache2-mod-php
      state: latest
    when: ansible_distribution == "Ubuntu"

  - name: update repository index for CentOS
    dnf:
      update_cache: yes
    when: ansible_distribution == "CentOS"

  - name: install apache and php packages for CentOS
    dnf:
      name:
        - httpd
        - php
      state: latest
    when: ansible_distribution == "CentOS"
```

   Make sure to save the file and exit.

   Run *ansible-playbook --ask-become-pass install_apache.yml* and describe the result.

```
 GNU nano 6.2                                          install_apache.yml *
---
-  hosts:  all
   become:  true
   tasks:

   - name:  update repository index
     apt:
       update_cache: yes
     when: ansible_distribution == "Ubuntu"

   - name:  install apache2 and php packages for Ubuntu
     apt:
       name:
         - apache2
         - libapache2-mod-php
       state: latest
     when: ansible_distribution == "Ubuntu"

   - name: update repository index for CentOS
     dnf:
       update_cache: yes
     when: ansible_distribution == "CentOS"

   - name: install apache and php packages for CentOS
     dnf:
       name:
         - httpd
         - php
       state: latest
     when: ansible_distribution == "CentOS"
```



- **In the previous screenshot you will see the green text which is “ok=4” and the blue text “skipped=1”, but in this screenshot the green text becomes “ok=3” and the blue text becomes “skipped=2” because I modify the install_apache.yml by combining the tasks in shortcut manner.**

2. Edit the playbook *install_apache.yml* again. In task 2.1, we consolidated the plays into one play. This time we can actually consolidated everything in just 2 plays. This can be done by removing the update repository play and putting the command *update_cache: yes* below the command *state: latest*. See below for reference:

```
---
- hosts: all
  become: true
  tasks:

   - name: install apache2 and php packages for Ubuntu
     apt:
      name:
        - apache2
        - libapache2-mod-php
      state: latest
      update_cache: yes
     when: ansible_distribution == "Ubuntu"

   - name: install apache and php packages for CentOS
     dnf:
       name:
         - httpd
         - php
       state: latest
       update_cache: yes
     when: ansible_distribution == "CentOS"
```

Make sure to save the file and exit.

Run *ansible-playbook --ask-become-pass install_apache.yml* and describe the result.

```
 GNU nano 6.2                                  install_apache.yml *
---
- hosts:  all
  become:  true
  tasks:

  - name:  install apache2 and php packages for Ubuntu
    apt:
      name:
        - apache2
        - libapache2-mod-php
      state: latest
      update_cache: yes
    when: ansible_distribution == "Ubuntu"

  - name: install apache and php packages for CentOS
    dnf:
      name:
        - httpd
        - php
      state: latest
      update_cache: yes
    when: ansible_distribution == "CentOS"
```

```
qadjuanson@workstation:~/Juanson_CPE212_4.1$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

PLAY [all] *****************************************************************************************************************

TASK [Gathering Facts] *****************************************************************************************************
ok: [192.168.56.102]
ok: [192.168.56.101]
[DEPRECATION WARNING]: Distribution centos 9 on host 192.168.56.104 should use /usr/libexec/platform-python, but is using
/usr/bin/python for backward compatibility with prior Ansible releases. A future Ansible release will default to using the
discovered platform python for this host. See
https://docs.ansible.com/ansible/2.10/reference_appendices/interpreter_discovery.html for more information. This feature will be
removed in version 2.12. Deprecation warnings can be disabled by setting deprecation_warnings=False in ansible.cfg.
ok: [192.168.56.104]

TASK [install apache2 and php packages for Ubuntu] *************************************************************************
skipping: [192.168.56.104]
ok: [192.168.56.101]
ok: [192.168.56.102]

TASK [install apache and php packages for CentOS] **************************************************************************
skipping: [192.168.56.102]
skipping: [192.168.56.101]
ok: [192.168.56.104]

PLAY RECAP *****************************************************************************************************************
192.168.56.101             : ok=2    changed=0    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
192.168.56.102             : ok=2    changed=0    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
192.168.56.104             : ok=2    changed=0    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0

qadjuanson@workstation:~/Juanson_CPE212_4.1$
```

- **compared to the previous recap the 'changed' becomes 0 and the 'ok' becomes 2 and the 'skipped' becomes 1.**

3. Finally, we can consolidate these 2 plays in just 1 play. This can be done by declaring variables that will represent the packages that we want to install. Basically, the apache_package and php_package are variables. The names are arbitrary, which means we can choose different names. We also take out the line when: ansible_distribution. Edit the playbook *install_apache.yml* again and make sure to follow the below image. Make sure to save the file and exit.

```
---
- hosts: all
  become: true
  tasks:

  - name: install apache and php
    apt:
      name:
        - "{{ apache_package }}"
        - "{{ php_package }}"
      state: latest
      update_cache: yes
```

```
qadjuanson@workstation: ~/Juanson_CPE212_4.1
GNU nano 6.2                                    install_apache.yml *
---
- hosts:  all
  become:  true
  tasks:

  - name:  install apache2 and php
    apt:
      name:
        - "{{ apache_package }}"
        - "{{ php_package }}"
      state: latest
      update_cache: yes
```

Run *ansible-playbook --ask-become-pass install_apache.yml* and describe the result.

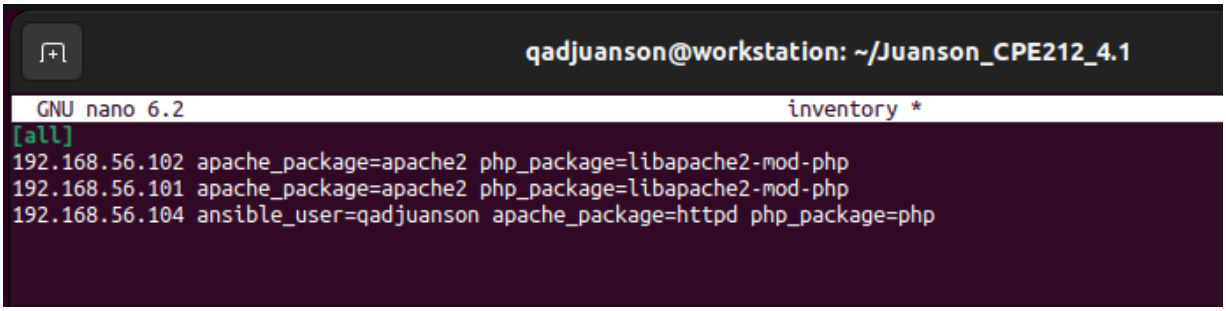
```
qadjuanson@workstation:~/Juanson_CPE212_4.1$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

PLAY [all] *********************************************************************************************************

TASK [Gathering Facts] *********************************************************************************************
ok: [192.168.56.102]
ok: [192.168.56.101]
[DEPRECATION WARNING]: Distribution centos 9 on host 192.168.56.104 should use /usr/libexec/platform-python, but is using
/usr/bin/python for backward compatibility with prior Ansible releases. A future Ansible release will default to using the
discovered platform python for this host. See
https://docs.ansible.com/ansible/2.10/reference_appendices/interpreter_discovery.html for more information. This feature will be
removed in version 2.12. Deprecation warnings can be disabled by setting deprecation_warnings=False in ansible.cfg.
ok: [192.168.56.104]

TASK [install apache2 and php] *************************************************************************************
fatal: [192.168.56.102]: FAILED! => {"msg": "The task includes an option with an undefined variable. The error was: 'apache_package
' is undefined\n\nThe error appears to be in '/home/qadjuanson/Juanson_CPE212_4.1/install_apache.yml': line 6, column 6, but may\nb
e elsewhere in the file depending on the exact syntax problem.\n\nThe offending line appears to be:\n\n\n    - name:  install apache
2 and php\n      ^ here\n"}
fatal: [192.168.56.101]: FAILED! => {"msg": "The task includes an option with an undefined variable. The error was: 'apache_package
' is undefined\n\nThe error appears to be in '/home/qadjuanson/Juanson_CPE212_4.1/install_apache.yml': line 6, column 6, but may\nb
e elsewhere in the file depending on the exact syntax problem.\n\nThe offending line appears to be:\n\n\n    - name:  install apache
2 and php\n      ^ here\n"}
fatal: [192.168.56.104]: FAILED! => {"msg": "The task includes an option with an undefined variable. The error was: 'apache_package
' is undefined\n\nThe error appears to be in '/home/qadjuanson/Juanson_CPE212_4.1/install_apache.yml': line 6, column 6, but may\nb
e elsewhere in the file depending on the exact syntax problem.\n\nThe offending line appears to be:\n\n\n    - name:  install apache
2 and php\n      ^ here\n"}

PLAY RECAP *********************************************************************************************************
192.168.56.101             : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
192.168.56.102             : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
192.168.56.104             : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
```

- **it shows that the 'apache_package' is undefined.**

4. Unfortunately, task 2.3 was not successful. It's because we need to change something in the inventory file so that the variables we declared will be in place. Edit the *inventory* file and follow the below configuration:

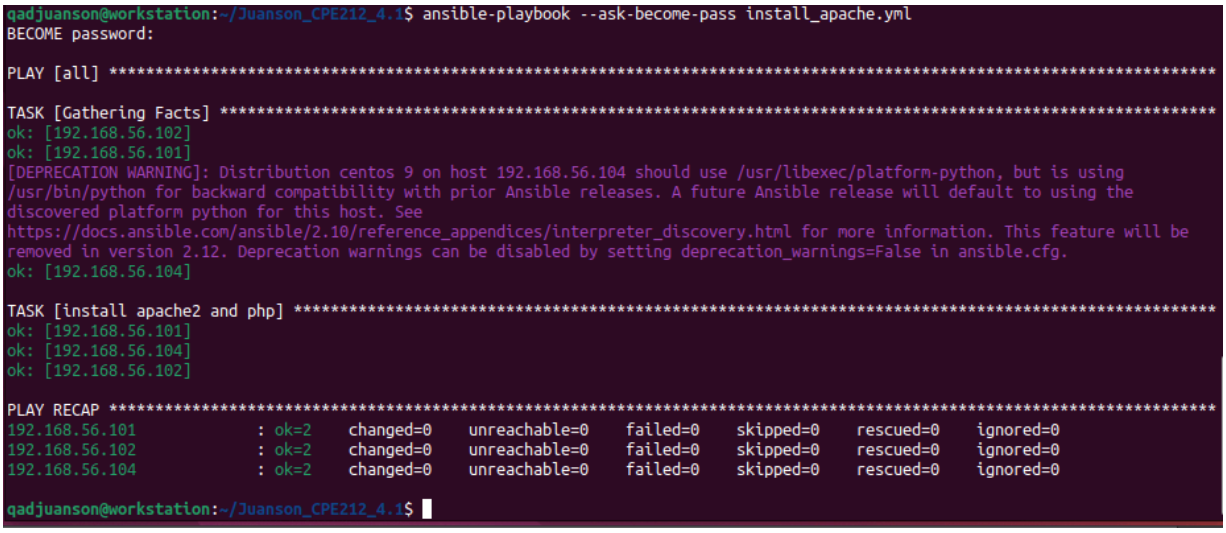
```
192.168.56.120 apache_package=apache2 php_package=libapache2-mod-php
192.168.56.121 apache_package=apache2 php_package=libapache2-mod-php
192.168.56.122 apache_package=httpd php_package=php
```

Make sure to save the *inventory* file and exit.



Finally, we still have one more thing to change in our *install_apache.yml* file. In task 2.3, you may notice that the package is assign as apt, which will not run in CentOS. Replace the *apt* with *package*. Package is a module in ansible that is generic, which is going to use whatever package manager the underlying host or the target server uses. For Ubuntu it will automatically use *apt*, and for CentOS it will automatically use *dnf*. Make sure to save the file and exit. For more details about the ansible package, you may refer to this documentation: ansible.builtin.package – Generic OS package manager — Ansible Documentation

Run *ansible-playbook --ask-become-pass install_apache.yml* and describe the result.



- **This indicates that the playbook was run on all hosts specified in the inventory file.**

Supplementary Activity:

1. Create a playbook that could do the previous tasks in Red Hat OS.

Reflections:

Answer the following:

1. Why do you think refactoring of playbook codes is important?
2. When do we use the “when” command in playbook?