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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 happens when you issue this command. Did something happen? Why?

```
jefferson@LocalMachine:~/CPE232_jefferson$ git pull
Already up to date.
```

**The command is successful and the git is up to date already.**

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."

```
jefferson@LocalMachine: ~/CPE232_jefferson
  GNU nano 6.2                          inventory
[remote_servers]

192.168.56.104
192.168.56.105
192.168.56.106
```

```
jefferson@LocalMachine: ~/CPE232_jefferson
api-with-mic,password).", "unreachable": true}
ok: [192.168.56.104]
ok: [192.168.56.105]

TASK [update repository index] ***********************************************
*
changed: [192.168.56.105]
changed: [192.168.56.104]

TASK [install apache2 package] ***********************************************
*
ok: [192.168.56.105]
ok: [192.168.56.104]

TASK [add PHP support for apache] ********************************************
*
ok: [192.168.56.105]
ok: [192.168.56.104]

PLAY RECAP *******************************************************************
*
192.168.56.104             : ok=4    changed=1    unreachable=0    failed=0
skipped=0    rescued=0    ignored=0
192.168.56.105             : ok=4    changed=1    unreachable=0    failed=0
skipped=0    rescued=0    ignored=0
192.168.56.106             : ok=0    changed=0    unreachable=1    failed=0
skipped=0    rescued=0    ignored=0
```

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.

```
jefferson@LocalMachine: ~/CPE232_jefferson

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"
```

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

```
jefferson@LocalMachine: ~/CPE232_jefferson
ok: [192.168.56.104]
ok: [192.168.56.106]

TASK [update repository index] ***********************************************
*
skipping: [192.168.56.106]
changed: [192.168.56.105]
changed: [192.168.56.104]

TASK [install apache2 package] ***********************************************
*
skipping: [192.168.56.106]
ok: [192.168.56.104]
ok: [192.168.56.105]

TASK [add PHP support for apache] ********************************************
*
skipping: [192.168.56.106]
ok: [192.168.56.105]
ok: [192.168.56.104]

PLAY RECAP *******************************************************************
*
192.168.56.104             : ok=4    changed=1    unreachable=0    failed=0
skipped=0    rescued=0    ignored=0
192.168.56.105             : ok=4    changed=1    unreachable=0    failed=0
skipped=0    rescued=0    ignored=0
192.168.56.106             : ok=1    changed=0    unreachable=0    failed=0
skipped=3    rescued=0    ignored=0
```

**It is now successful and it can now be able to reach the CentOs server.**

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.

**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.

jefferson@LocalMachine: ~/CPE232_jefferson

GNU nano 6.2 install_apache.yml *

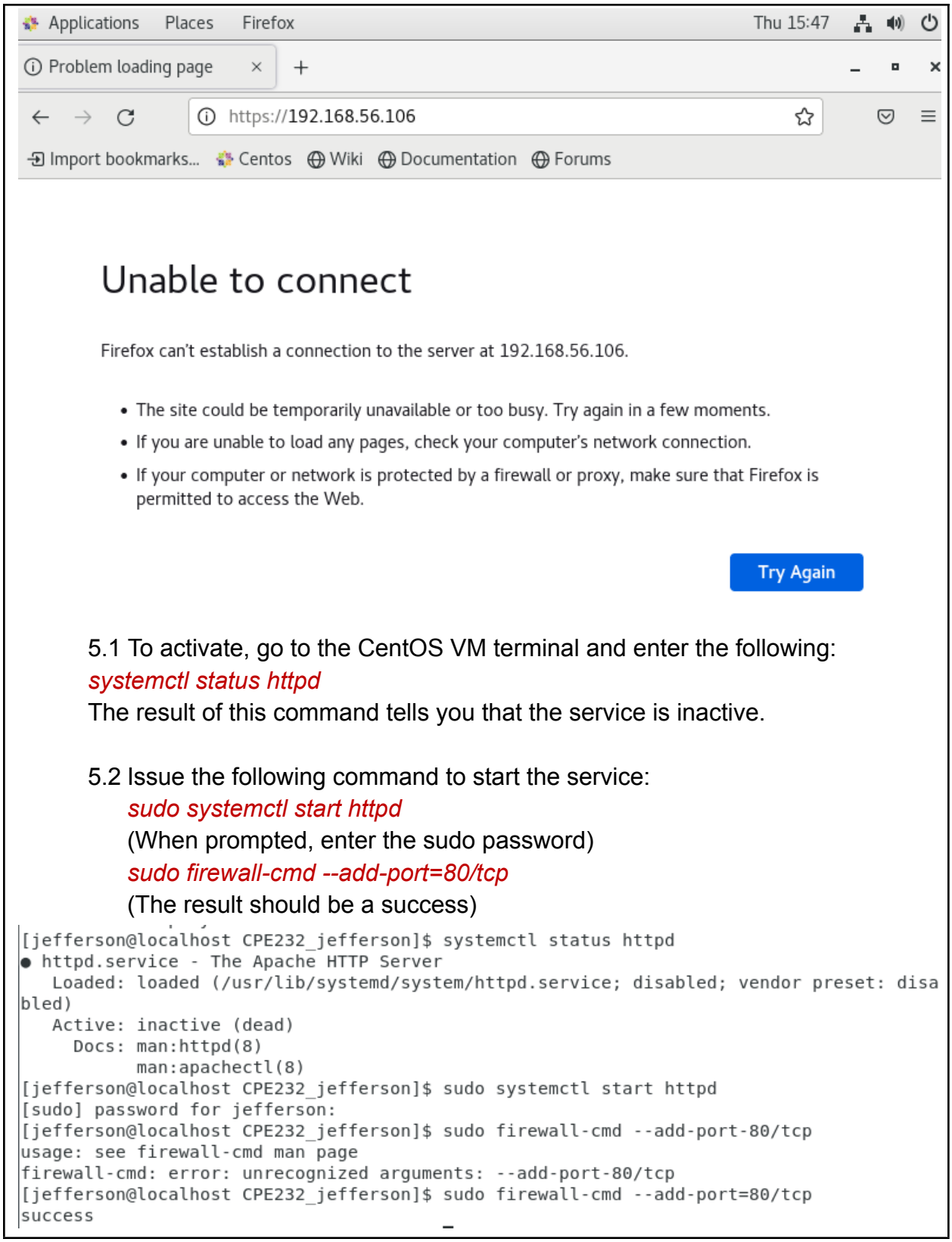
```
    name: apache2
  when: ansible_distribution == "Ubuntu"

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

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

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

- name: add PHP support for apache
  dnf:
    name: libapache2-mod-php
    state: latest
  when: ansible_distribution == "CentOS"
```

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

```
jefferson@LocalMachine: ~/CPE232_jefferson

TASK [update repository index] ***********************************************
*
skipping: [192.168.56.104]
skipping: [192.168.56.105]
ok: [192.168.56.106]

TASK [install apache2 package] ***********************************************
*
skipping: [192.168.56.104]
skipping: [192.168.56.105]
changed: [192.168.56.106]

TASK [add PHP support for apache] ********************************************
*
skipping: [192.168.56.104]
skipping: [192.168.56.105]
changed: [192.168.56.106]

PLAY RECAP *******************************************************************
*
192.168.56.104             : ok=4    changed=1    unreachable=0    failed=0
skipped=3    rescued=0    ignored=0
192.168.56.105             : ok=4    changed=1    unreachable=0    failed=0
skipped=3    rescued=0    ignored=0
192.168.56.106             : ok=4    changed=2    unreachable=0    failed=0
skipped=3    rescued=0    ignored=0
```

**The CentOs connection is now successful and was able to connect.**

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.

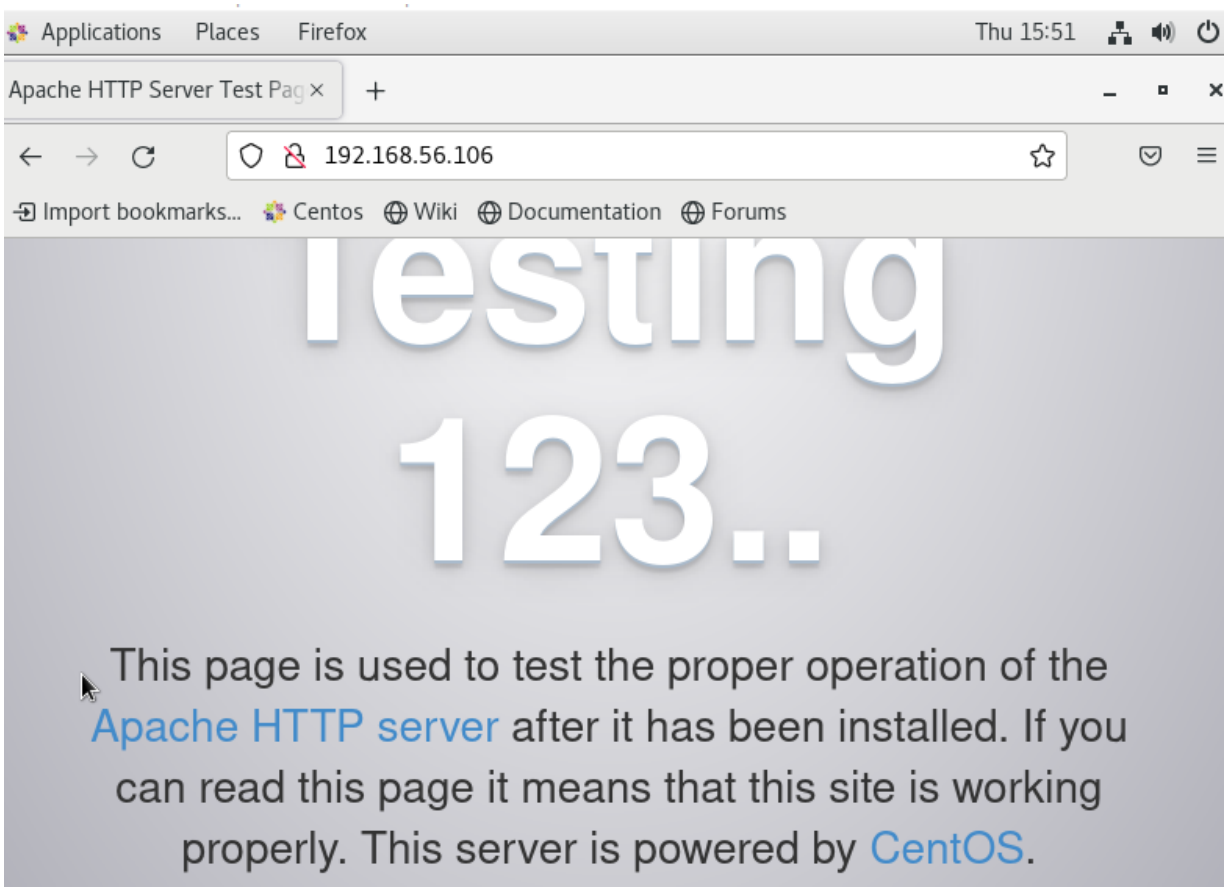



5.1 To activate, go to the CentOS VM terminal and enter the following:
*systemctl status httpd*
The result of this command tells you that the service is inactive.

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)

```
[jefferson@localhost CPE232_jefferson]$ systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; vendor preset: disa
bled)
   Active: inactive (dead)
     Docs: man:httpd(8)
           man:apachectl(8)
[jefferson@localhost CPE232_jefferson]$ sudo systemctl start httpd
[sudo] password for jefferson:
[jefferson@localhost CPE232_jefferson]$ sudo firewall-cmd --add-port-80/tcp
usage: see firewall-cmd man page
firewall-cmd: error: unrecognized arguments: --add-port-80/tcp
[jefferson@localhost CPE232_jefferson]$ sudo firewall-cmd --add-port=80/tcp
success
```

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 make 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.

```
jefferson@LocalMachine: ~/CPE232_jefferson
GNU nano 6.2                    install_apache.yml
---
- 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:
```

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

```
jefferson@LocalMachine: ~/CPE232_jefferson

TASK [install apache2 and php packages for Ubuntu] ****************************
*
skipping: [192.168.56.106]
ok: [192.168.56.105]
ok: [192.168.56.104]

TASK [update repository index for CentOS] *************************************
*
skipping: [192.168.56.104]
skipping: [192.168.56.105]
ok: [192.168.56.106]

TASK [install apache and php packages for CentOS] *****************************
*
skipping: [192.168.56.104]
skipping: [192.168.56.105]
ok: [192.168.56.106]

PLAY RECAP ********************************************************************
*
192.168.56.104             : ok=3    changed=1    unreachable=0    failed=0
skipped=2    rescued=0    ignored=0
192.168.56.105             : ok=3    changed=1    unreachable=0    failed=0
skipped=2    rescued=0    ignored=0
192.168.56.106             : ok=3    changed=0    unreachable=0    failed=0
skipped=2    rescued=0    ignored=0
```

**The command is successful and both servers of Ubuntu have changed while the CentOs don't have changed at all.**

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.

```
jefferson@LocalMachine: ~/CPE232_jefferson

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 apache2 and php packages for CentOS
    dnf:
      name:
        - httpd
        - php
      state: latest
      update_cache: yes
    when: ansible_distribution == "CentOS"
```

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

```
jefferson@LocalMachine: ~/CPE232_jefferson

TASK [Gathering Facts] ***********************************************************
*
ok: [192.168.56.105]
ok: [192.168.56.104]
ok: [192.168.56.106]

TASK [install apache2 and php packages for Ubuntu] ***************************
*
skipping: [192.168.56.106]
ok: [192.168.56.104]
ok: [192.168.56.105]

TASK [install apache2 and php packages for CentOS] ***************************
*
skipping: [192.168.56.104]
skipping: [192.168.56.105]
ok: [192.168.56.106]

PLAY RECAP ***********************************************************************
*
192.168.56.104             : ok=2    changed=0    unreachable=0    failed=0
skipped=1    rescued=0    ignored=0
192.168.56.105             : ok=2    changed=0    unreachable=0    failed=0
skipped=1    rescued=0    ignored=0
192.168.56.106             : ok=2    changed=0    unreachable=0    failed=0
skipped=1    rescued=0    ignored=0
```

**The command is successful and there is no error.**

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
```

```
jefferson@LocalMachine: ~/CPE232_jefferson

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

  - name: install apache 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.

```
jefferson@LocalMachine: ~/CPE232_jefferson
fatal: [192.168.56.104]: FAILED! => {"msg": "The task includes an option with a
n undefined variable. The error was: 'apache_package' is undefined\n\nThe error
 appears to be in '/home/jefferson/CPE232_jefferson/install_apache.yml': line 6
, column 5, but may\nbe elsewhere in the file depending on the exact syntax pro
blem.\n\nThe offending line appears to be:\n\n\n  - name: install apache and ph
p\n    ^ here\n"}
fatal: [192.168.56.105]: FAILED! => {"msg": "The task includes an option with a
n undefined variable. The error was: 'apache_package' is undefined\n\nThe error
 appears to be in '/home/jefferson/CPE232_jefferson/install_apache.yml': line 6
, column 5, but may\nbe elsewhere in the file depending on the exact syntax pro
blem.\n\nThe offending line appears to be:\n\n\n  - name: install apache and ph
p\n    ^ here\n"}
fatal: [192.168.56.106]: FAILED! => {"msg": "The task includes an option with a
n undefined variable. The error was: 'apache_package' is undefined\n\nThe error
 appears to be in '/home/jefferson/CPE232_jefferson/install_apache.yml': line 6
, column 5, but may\nbe elsewhere in the file depending on the exact syntax pro
blem.\n\nThe offending line appears to be:\n\n\n  - name: install apache and ph
p\n    ^ here\n"}

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

**The inputted command is unsuccessful.**

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.

```
jefferson@LocalMachine: ~/CPE232_jefferson
  GNU nano 6.2                    inventory *
[remote_servers]

192.168.56.104 apache_package=apache2 php_package=libapache2-mod-php
192.168.56.105 apache_package=apache2 php_package=libapache2-mod-php
192.168.56.106 apache_package=httpd php_package=php
```

**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.

```
jefferson@LocalMachine: ~/CPE232_jefferson
jefferson@LocalMachine:~/CPE232_jefferson$ nano inventory
jefferson@LocalMachine:~/CPE232_jefferson$ nano install_apache.yml
jefferson@LocalMachine:~/CPE232_jefferson$ ansible-playbook --ask-become-pass i
nstall_apache.yml
BECOME password:

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

TASK [Gathering Facts] *********************************************************
*
ok: [192.168.56.104]
ok: [192.168.56.105]
ok: [192.168.56.106]

TASK [install apache and php] **************************************************
*
ok: [192.168.56.104]
ok: [192.168.56.106]
ok: [192.168.56.105]

PLAY RECAP *********************************************************************
*
192.168.56.104             : ok=2    changed=0    unreachable=0    failed=0
skipped=0    rescued=0    ignored=0
192.168.56.105             : ok=2    changed=0    unreachable=0    failed=0
skipped=0    rescued=0    ignored=0
192.168.56.106             : ok=2    changed=0    unreachable=0    failed=0
skipped=0    rescued=0    ignored=0
```

**After editing the input it showed that it has become successful and able to connect with ansible.**

**Reflections:**

Answer the following:

1. Why do you think refactoring of playbook codes is important?

   The reason why refactoring of playbook codes is important is because it makes it easier to the programmer because it was shortened and easier to memorize. It also helps the speed up of the development of the code.

2. When do we use the “when” command in the playbook?

   The “when” command in the playbook is used to determine the outcome of a variable. Also, it is used to be able to connect with any ansible host and its type of OS.

“I affirm that I shall not give or receive any unauthorized help on this assignment and that all work is my own.”