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| <b>Activity 5: Consolidating Playbook plays</b>  |                                   |
| <b>1. Objectives:</b><br>1.1 Use <b>when</b> command in playbook for different OS distributions<br>1.2 Apply refactoring techniques in cleaning up the playbook codes  |                                   |
| <b>2. Discussion:</b><br><br><p>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.</p> <p>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.</p> <p><b>Requirement:</b><br/> 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 <b>ssh-copy-id</b> to copy the public key to CentOS. Verify if you can successfully SSH to CentOS VM.</p> |                                   |
| <b>Task 1: Use when command for different distributions</b><br>In the local machine, make sure you are in the local repository directory ( <b>CPE232_yourname</b> ). 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?   |                                   |

1. 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."

```
victor@workstation:~/CPE232_Ortega$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

PLAY [all] *****

TASK [Gathering Facts] *****
ok: [192.168.56.103]
ok: [192.168.56.102]
ok: [192.168.56.106]

TASK [update repository index] *****
fatal: [192.168.56.106]: FAILED! => {"changed": false, "msg": "Failed to lock apt for exclusive operation: Failed to lock directory /var/lib/apt/lists/: E:Could not get lock /var/lib/apt/lists/lock. It is held by process 24952 (python3)"}
fatal: [192.168.56.103]: FAILED! => {"changed": false, "msg": "Failed to lock apt for exclusive operation: Failed to lock directory /var/lib/apt/lists/: E:Could not get lock /var/lib/apt/lists/lock. It is held by process 24952 (python3)"}
changed: [192.168.56.102]

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

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

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

2. 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.

```
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"
```

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.

```
victor@workstation:~/CPE232_Ortega$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

PLAY [all] *****

TASK [Gathering Facts] *****
Fatal: [192.168.56.106]: FAILED! => ("msg": "Missing sudo password")
ok: [192.168.56.102]
ok: [192.168.56.103]

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

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

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

PLAY RECAP *****
192.168.56.102      : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.103      : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.106      : ok=0    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0

victor@workstation:~/CPE232_Ortega$
```

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
        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"
```

Make sure to save and exit.

```
---
- 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"

---
- 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"
```

Run *ansible-playbook --ask-become-pass install\_apache.yml* and describe the result.

```
ok: [192.168.56.103]
ok: [192.168.56.102]
ok: [192.168.56.110]

TASK [update repository index] *****
skipping: [192.168.56.110]
changed: [192.168.56.102]
changed: [192.168.56.103]

TASK [install apache2 package] *****
skipping: [192.168.56.110]
ok: [192.168.56.102]
ok: [192.168.56.103]

TASK [add PHP support for apache] *****
skipping: [192.168.56.110]
ok: [192.168.56.102]
ok: [192.168.56.103]

TASK [update repository index] *****
skipping: [192.168.56.103]
skipping: [192.168.56.102]
ok: [192.168.56.110]

TASK [install apache2 package] *****
skipping: [192.168.56.103]
skipping: [192.168.56.102]
ok: [192.168.56.110]

TASK [add PHP support for apache] *****
skipping: [192.168.56.103]
skipping: [192.168.56.102]
ok: [192.168.56.110]

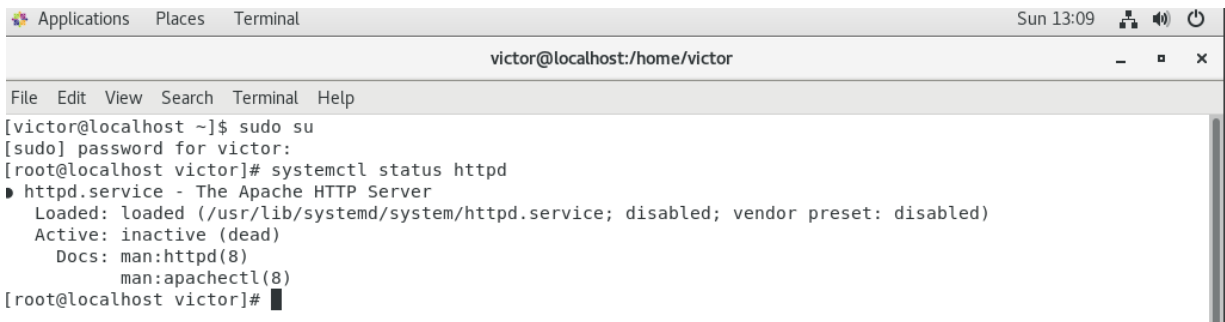
PLAY RECAP *****
192.168.56.102      : ok=4    changed=1    unreachable=0    failed=0    skipped=3    rescued=0    ignored=0
192.168.56.103      : ok=4    changed=1    unreachable=0    failed=0    skipped=3    rescued=0    ignored=0
192.168.56.110      : ok=4    changed=0    unreachable=0    failed=0    skipped=3    rescued=0    ignored=0
```

4. 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.



The screenshot shows a terminal window titled 'Applications Places Terminal' with the user 'victor@localhost:/home/victor'. The terminal output is as follows:

```
[victor@localhost ~]$ sudo su
[sudo] password for victor:
[root@localhost victor]# systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; vendor preset: disabled)
   Active: inactive (dead)
     Docs: man:httpd(8)
           man:apachectl(8)
[root@localhost victor]#
```

4.2 Issue the following command to start the service:

*sudo systemctl start httpd*

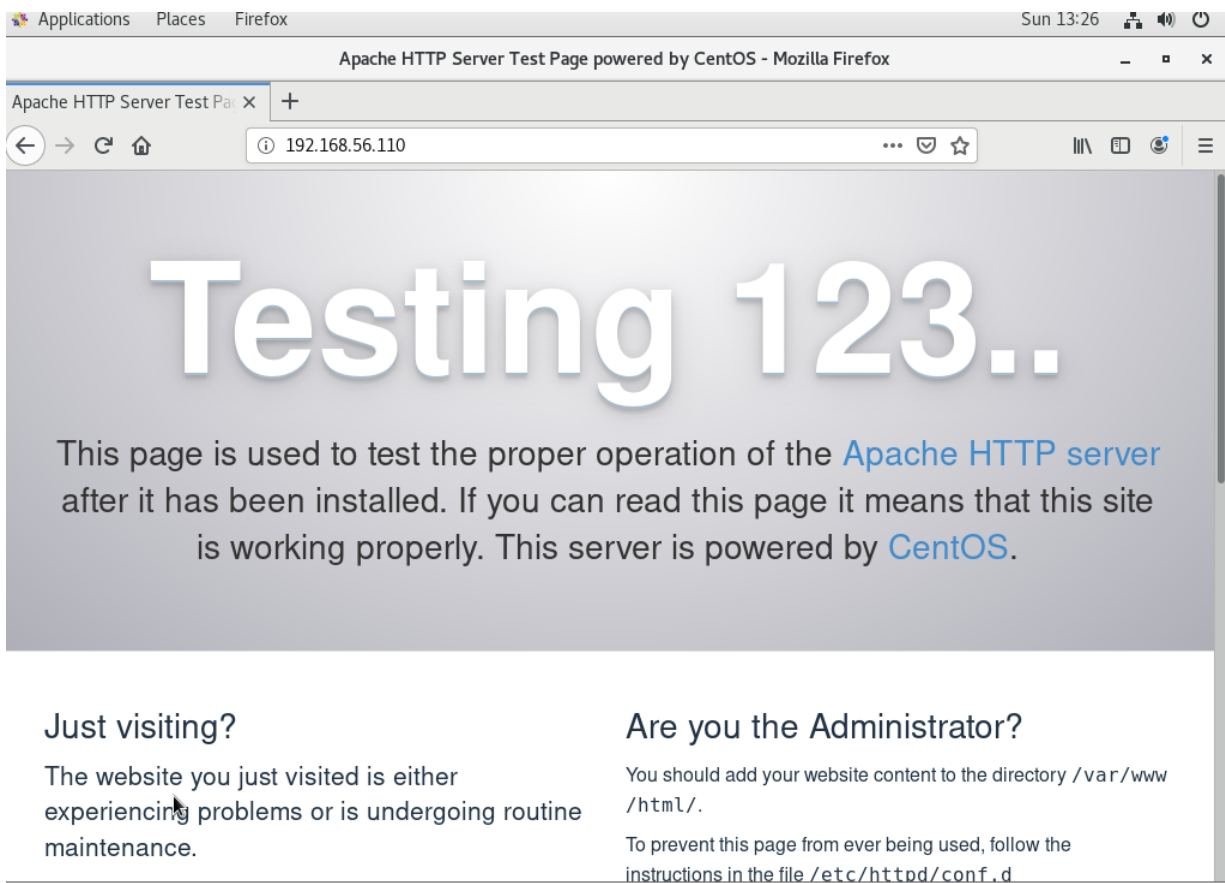
(When prompted, enter the sudo password)

*sudo firewall-cmd --add-port=80/tcp*

(The result should be a success)

```
[root@localhost victor]# sudo firewall-cmd --add-port=80/tcp
success
[root@localhost victor]#
```

4.3 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.



GNU nano 6.2

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

- name: install apache2 package
  apt:
    name:
      - apache2
      - libapache2-mod-php
    state: latest
  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: httpd
    state: latest
  when: ansible_distribution == "CentOS"

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

^G Help

^O Write Out

^W Where Is

^K Cu

^Y Exit

^R Read File

^\_ Replace

^U Re

Run *ansible-playbook --ask-become-pass install\_apache.yml* and describe the result.

```
TASK [update repository index for CentOS] *****
skipping: [192.168.56.103]
ok: [192.168.56.110]

TASK [install apache and php packages for CentOS] *****
skipping: [192.168.56.103]
ok: [192.168.56.110]

PLAY RECAP *****
192.168.56.102      : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
192.168.56.103      : ok=3    changed=1    unreachable=0    failed=0    skipped=2    rescued=0    ignored=0
192.168.56.110      : ok=3    changed=0    unreachable=0    failed=0    skipped=2    rescued=0    ignored=0

victor@Workstation:~/CPE232_Ortega$
```

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.

```

TASK [Gathering Facts] *****
ok: [192.168.56.103]
ok: [192.168.56.102]
ok: [192.168.56.110]

TASK [update repository index Ubuntu] *****
skipping: [192.168.56.110]
fatal: [192.168.56.102]: FAILED! => {"changed": false, "msg": "Failed to lock apt for exclusive operation: Failed to lock directory
/var/lib/apt/lists/: E:Could not get lock /var/lib/apt/lists/lock. It is held by process 8999 (python3)"}
changed: [192.168.56.103]

TASK [install apache2 and php packages for Ubuntu] *****
skipping: [192.168.56.110]
ok: [192.168.56.103]

TASK [update repository index for CentOS] *****
skipping: [192.168.56.103]
ok: [192.168.56.110]

TASK [install apache and php packages for CentOS] *****
skipping: [192.168.56.103]
ok: [192.168.56.110]

PLAY RECAP *****
192.168.56.102 : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
192.168.56.103 : ok=3    changed=1    unreachable=0    failed=0    skipped=2    rescued=0    ignored=0
192.168.56.110 : ok=3    changed=0    unreachable=0    failed=0    skipped=2    rescued=0    ignored=0
victor@Workstation: ~/CFE332_0ctober$

```

- 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

```

Run *ansible-playbook --ask-become-pass install\_apache.yml* and describe the result.

- 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](https://docs.ansible.com/ansible/latest/builtin/packages.html)

Run *ansible-playbook --ask-become-pass install\_apache.yml* and describe the result.

```
victor@Workstation:~/CPE232_Ortega$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

PLAY [all] *****

TASK [Gathering Facts] *****
ok: [192.168.56.103]
ok: [192.168.56.102]
ok: [192.168.56.110]

TASK [Install apache and php] *****
ok: [192.168.56.102]
ok: [192.168.56.103]
ok: [192.168.56.110]

PLAY RECAP *****
192.168.56.102      : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.103      : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.110      : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0

victor@Workstation:~/CPE232_Ortega$
```

Then git push:

```
victor@Workstation:~/CPE232_Ortega$ git push origin main
Enumerating objects: 13, done.
Counting objects: 100% (13/13), done.
Delta compression using up to 2 threads
Compressing objects: 100% (7/7), done.
Writing objects: 100% (8/8), 1.07 KiB | 1.07 MiB/s, done.
Total 8 (delta 1), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (1/1), done.
To github.com:qvbTor/CPE232_Ortega.git
   b363abe..93100a6  main -> main
victor@Workstation:~/CPE232_Ortega$
```

**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?
  - Refactoring playbook code is important for making it easier to read, maintain, and use effectively. It also helps to improve the overall quality and consistency of the code, which makes it more reliable and less likely to contain errors. Additionally, refactoring can help to make playbook code more future-proof, meaning that it will be easier to update and adapt to new requirements in the future.
2. When do we use the “when” command in playbook?
  - Ansible playbooks use the when statement to control whether tasks run based on specific conditions. This lets you define criteria under which a task should or should not run. This is especially useful for making playbooks more adaptable to different scenarios. For example, you could use when to check the operating system of target hosts and only run a task if it matches a specific OS version. Or you could use when to handle idempotent tasks, which means they only run when necessary. This minimizes unnecessary workload and prevents unintended changes.