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Activity 5: Consolidating Playbook plays

Objectives:

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

1.2 Apply refactoring techniques in cleaning up the playbook codes

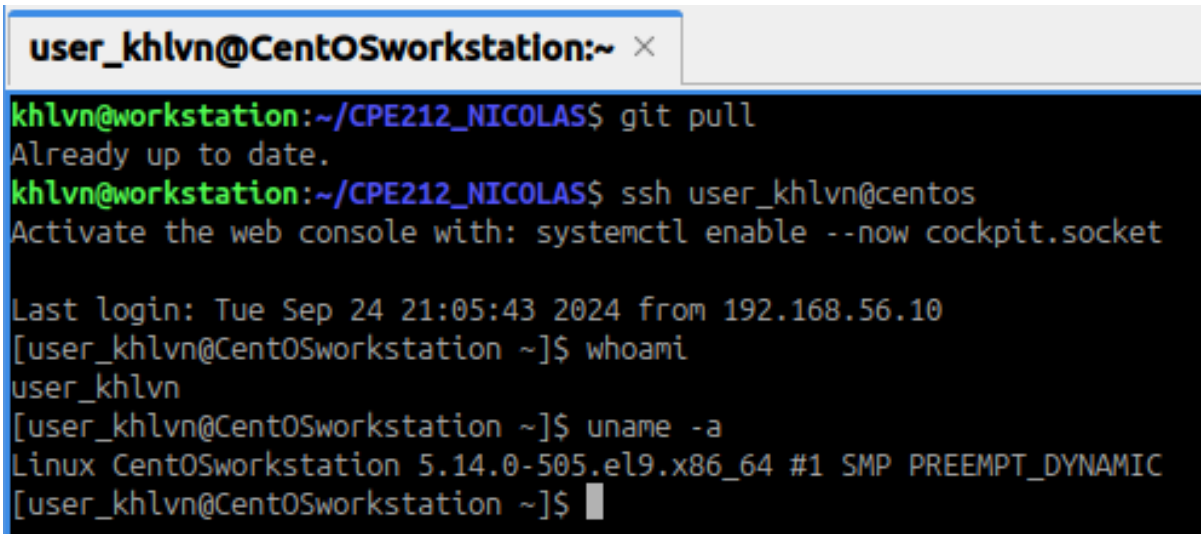
2. Discussion:

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.

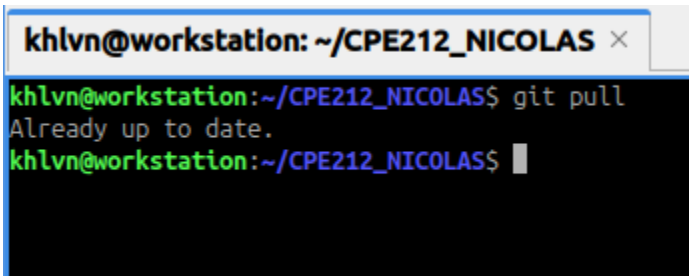
It is a best practice in ansible when you are working in a collaborative environment to use the command git pull. git pull is a Git command used to update the local version of a repository from a remote. By default, git pull does two things. Updates the current local working branch (currently checked 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 installation. 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?
    - **git pull fetches the remote repository in github and updates the content in the local repository. In my case, the remote repository doesn't contain any files that is why it is already up to date.**
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."

```
khlvn@workstation:~/CPE212_NICOLAS$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

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

TASK [update repository index] *************************************************************************************************************
[WARNING]: Updating cache and auto-installing missing dependency: python3-apt
fatal: [centos]: FAILED! => {"changed": false, "cmd": "apt-get update", "msg": "[Errno 2] No such file or directory: b'apt-get'", "rc":
2, "stderr": "", "stderr_lines": [], "stdout": "", "stdout_lines": []}

PLAY RECAP *********************************************************************************************************************************
centos                     : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
```

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

```
khlvn@workstation:~/CPE212_NICOLAS$ cat 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"
khlvn@workstation:~/CPE212_NICOLAS$
```

```
---
- 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.

```
khlvn@workstation:~/CPE212_NICOLAS$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

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

TASK [update repository index] *************************************************************************************
skipping: [centos]

TASK [install apache2 package] *************************************************************************************
skipping: [centos]

TASK [add PHP support for apache] **********************************************************************************
skipping: [centos]

PLAY RECAP *********************************************************************************************************
centos                     : ok=1    changed=0    unreachable=0    failed=0    skipped=3    rescued=0    ignored=0
```

The ansible scanned the type of operating system running on the remote server and will only proceed if the servers are running Ubuntu, otherwise, not.

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.

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

```
khlvn@workstation:~/CPE212_NICOLAS$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

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

TASK [update repository index] ************************************************************************************
skipping: [centos]

TASK [install apache2 package] ************************************************************************************
skipping: [centos]

TASK [add PHP support for apache] *********************************************************************************
skipping: [centos]

TASK [update repository index] ************************************************************************************
ok: [centos]

TASK [install apache2 package] ************************************************************************************
changed: [centos]

TASK [add PHP support for apache] *********************************************************************************
changed: [centos]

PLAY RECAP ********************************************************************************************************
centos                     : ok=4    changed=2    unreachable=0    failed=0    skipped=3    rescued=0    ignored=0

khlvn@workstation:~/CPE212_NICOLAS$
```

The Playbook ran successfully after adding the lines above in the YML config file. The prior lines in the file was skipped by Ansible because the remote servers are not running Ubuntu, however in the last 3 tasks, the when keyword checks again if the type of OS runs similar to the OS that was in the value, this time the servers are running CentOS and it matched the OS in the value of the when syntax.

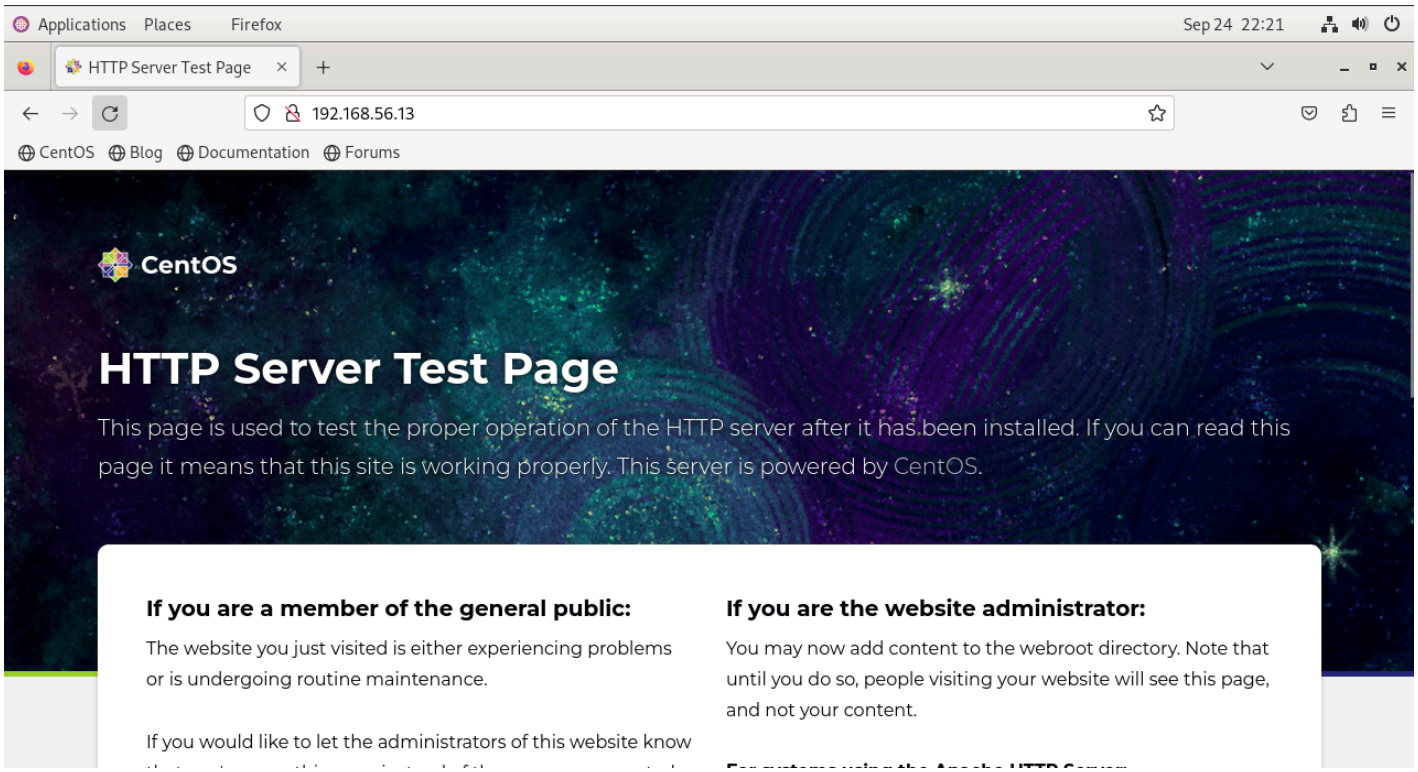
5. To verify the installations, go to CentOS VM and type its IP address on the browser. Was it successful? The answer is no. It's because the httpd service or the Apache HTTP server in CentOS is not yet active. Thus, you need to activate it first.

   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)

```
[user_khlvn@CentOSworkstation ~]$ systemctl status httpd
○ httpd.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; preset: d>
    Drop-In: /usr/lib/systemd/system/httpd.service.d
             └─php-fpm.conf
     Active: inactive (dead)
       Docs: man:httpd.service(8)
[user_khlvn@CentOSworkstation ~]$ sudo systemctl start httpd
[sudo] password for user_khlvn:
[user_khlvn@CentOSworkstation ~]$ sudo firewall-cmd --add-port=80/tcp
success
[user_khlvn@CentOSworkstation ~]$ systemctl status httpd
● httpd.service - The Apache HTTP Server
     Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; preset: d>
    Drop-In: /usr/lib/systemd/system/httpd.service.d
             └─php-fpm.conf
     Active: active (running) since Tue 2024-09-24 22:19:50 PST; 36s ago
       Docs: man:httpd.service(8)
   Main PID: 41837 (httpd)
     Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes>
      Tasks: 177 (limit: 48785)
     Memory: 32.3M
```

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.

```
khlvn@workstation:~/CPE212_NICOLAS$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:
[WARNING]: While constructing a mapping from /home/khlvn/CPE212_NICOLAS/install_apache.yml, line 13, c
key (name). Using last defined value only.
[WARNING]: While constructing a mapping from /home/khlvn/CPE212_NICOLAS/install_apache.yml, line 25, c
key (name). Using last defined value only.

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

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

TASK [update repository index] *************************************************************************
skipping: [centos]

TASK [install apache2 package and php support] *********************************************************
skipping: [centos]

TASK [update repository index] *************************************************************************
ok: [centos]

TASK [install apache2 package and php support] *********************************************************
ok: [centos]

PLAY RECAP *********************************************************************************************
centos                     : ok=3    changed=0    unreachable=0    failed=0    skipped=2    rescued=0
```

2. Edit the playbook *install_apache.yml* again. In task 2.1, we consolidated the plays into one play. This time we can actually consolidate 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.

```
khlvn@workstation:~/CPE212_NICOLAS$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:
[WARNING]: While constructing a mapping from /home/khlvn/CPE212_NICOLAS/install_apache.yml, line 8, co
key (name). Using last defined value only.
[WARNING]: While constructing a mapping from /home/khlvn/CPE212_NICOLAS/install_apache.yml, line 16, c
key (name). Using last defined value only.

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

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

TASK [install apache2 package and php support] *********************************************************
skipping: [centos]

TASK [install apache2 package and php support] *********************************************************
ok: [centos]

PLAY RECAP *********************************************************************************************
centos                     : ok=2    changed=0    unreachable=0    failed=0    skipped=1    rescued=0
```

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
```

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

```
khlvn@workstation:~/CPE212_NICOLAS$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

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

TASK [install apache and php] **********************************************************************************
fatal: [centos]: FAILED! => {"msg": "The task includes an option with an undefined variable. The error was: 'ap
d. 'apache_package' is undefined\n\nThe error appears to be in '/home/khlvn/CPE212_NICOLAS/install_apache.yml':
y\nbe elsewhere in the file depending on the exact syntax problem.\n\nThe offending line appears to be:\n\n\n
nd php\n     ^ here\n"}

PLAY RECAP *****************************************************************************************************
centos                     : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignore
```

The ansible playbook throwed an error because the two variables apache_package and the php_package were not still defined, similar to programming languages, a variable needs a value for it to be used somewhere in the program. The value must be an existing package.

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.

```
khlvn@workstation:~/CPE212_NICOLAS$ cat inventory
centos apache_package=httpd php_package=php
khlvn@workstation:~/CPE212_NICOLAS$
```

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 assigned 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.

```
khlvn@workstation:~/CPE212_NICOLAS$ nano inventory
khlvn@workstation:~/CPE212_NICOLAS$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

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

TASK [install apache and php] **************************************************************************
ok: [centos]

PLAY RECAP *********************************************************************************************
centos                     : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0
```

By following the steps above, we have incorporated the package for php and apache for remote servers inside the inventory file, by defining a variable inside the inventory, the playbook checks the value of the variable and installs the package.

Supplementary Activity:

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

```
khlvn@workstation:~/CPE212_NICOLAS$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

TASK [Gathering Facts] *********************************************************************************
fatal: [server2]: UNREACHABLE! => {"changed": false, "msg": "Failed to connect to the host via ssh: ssh
: No route to host", "unreachable": true}
fatal: [server1]: UNREACHABLE! => {"changed": false, "msg": "Failed to connect to the host via ssh: ssh
: No route to host", "unreachable": true}
ok: [centos]

TASK [install apache and php] **************************************************************************
skipping: [centos]

PLAY RECAP *********************************************************************************************
centos                     : ok=1    changed=0    unreachable=0    failed=0    skipped=1    rescued=0
server1                    : ok=0    changed=0    unreachable=1    failed=0    skipped=0    rescued=0
server2                    : ok=0    changed=0    unreachable=1    failed=0    skipped=0    rescued=0
```

```
khlvn@workstation:~/CPE212_NICOLAS$ cat install_apache.yml
---
 - hosts: all
   become: true
   tasks:

   - name: install apache and php
     package:
       name:
         - "{{ apache_package }}"
         - "{{ php_package }}"
       state: latest
       update_cache: yes
     when: ansible_distribution == "RedHat"
khlvn@workstation:~/CPE212_NICOLAS$
```

Reflections:

Answer the following:

1. **Why do you think refactoring of playbook codes is important?**
   - To reduce the plays and lines required to execute a specific task into only one task as possible.
2. **When do we use the “when” command in the playbook?**
   - It is situational, whenever we are configuring remote servers with different linux distributions, we can conditionally execute a task based on the result of an expression or variable. We use it when you want a task to run only if a specific condition is met.