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Course/Section: CPE 232 - CPE31S5	**Date Submitted:** September 23, 2023
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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**:

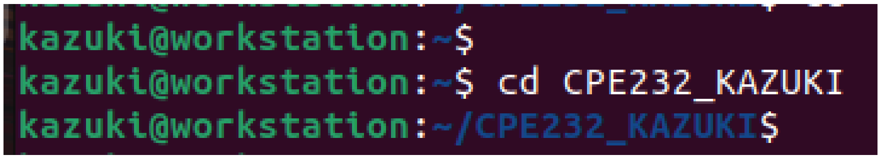
We are going to look at a way that we can differentiate a playbook by a host in terms of which distribution the host is running. It's very common in most Linux shops to run multiple distributions, for example, Ubuntu shop or Debian shop and you need a different distribution for a one off-case or perhaps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

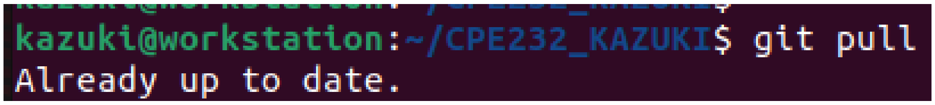
Task 1: Use when command for different distributions

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



```
kazuki@workstation:~$
kazuki@workstation:~$ cd CPE232_KAZUKI
kazuki@workstation:~/CPE232_KAZUKI$
```

Figure 1.1.1 - Navigating the Repository Directory

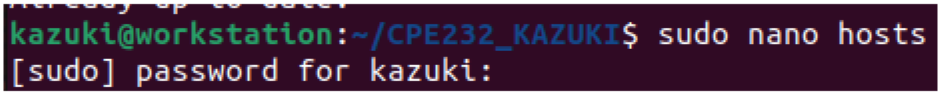


```
kazuki@workstation:~/CPE232_KAZUKI$ git pull
Already up to date.
```

Figure 1.1.2 - Git Pull Command

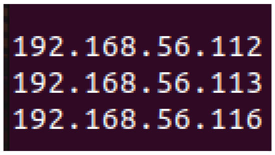
After executing the “git pull” command, the output shows “Already up to date”. This means that my local repository directory is already synchronized with the remote repository.

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."



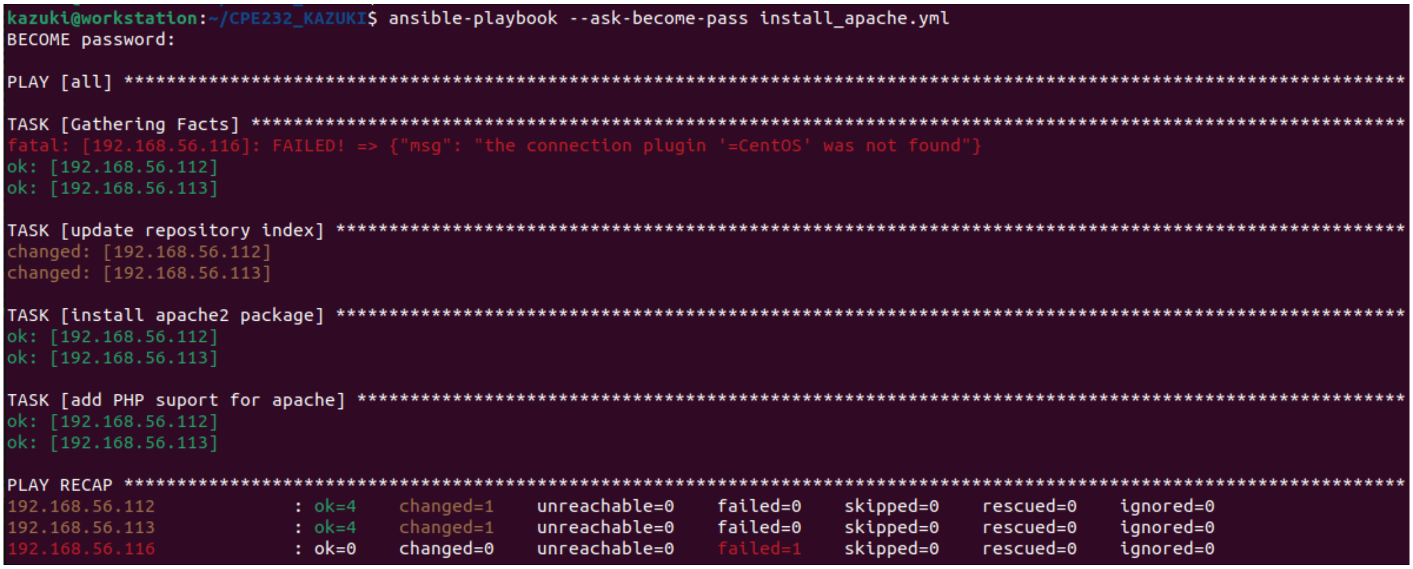
```
Already up to date.
kazuki@workstation:~/CPE232_KAZUKI$ sudo nano hosts
[sudo] password for kazuki:
```

Figure 1.2.1 - Navigating the Inventory File



```
192.168.56.112
192.168.56.113
192.168.56.116
```

Figure 1.2.2 - Editing the Inventory File

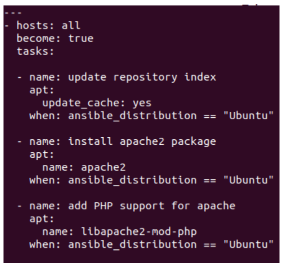


```
kazuki@workstation:~/CPE232_KAZUKI$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

TASK [Gathering Facts] *******************************************************************************************
fatal: [192.168.56.116]: FAILED! => {"msg": "the connection plugin '=CentOS' was not found"}
ok: [192.168.56.112]
ok: [192.168.56.113]

TASK [update repository index] ***********************************************************************************
changed: [192.168.56.112]
changed: [192.168.56.113]

TASK [install apache2 package] ***********************************************************************************
ok: [192.168.56.112]
ok: [192.168.56.113]

TASK [add PHP suport for apache] *********************************************************************************
ok: [192.168.56.112]
ok: [192.168.56.113]

PLAY RECAP *******************************************************************************************************
192.168.56.112             : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.113             : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.116             : ok=0    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
```

Figure 1.2.2 - Executing the Playbook

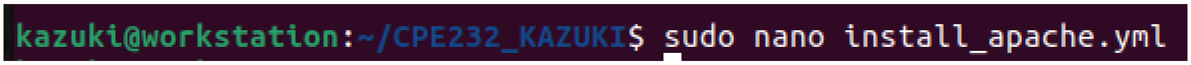
The output shows an error in CentOS’ IP Address since, CentOs does not use “apt” package manager.

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



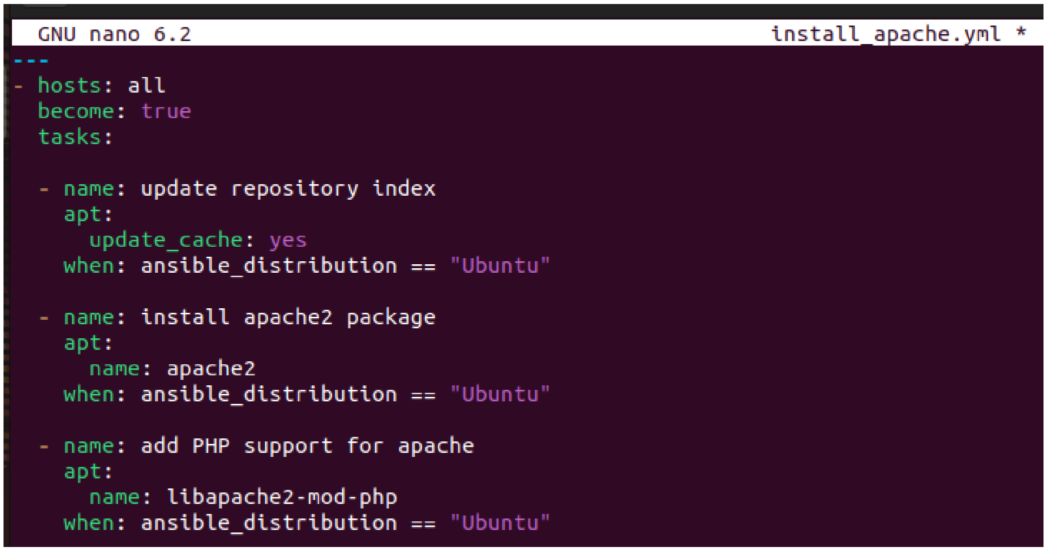
```
---
- hosts: all
  become: true
  tasks:

  - 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.



```
kazuki@workstation:~/CPE232_KAZUKI$ sudo nano install_apache.yml
```

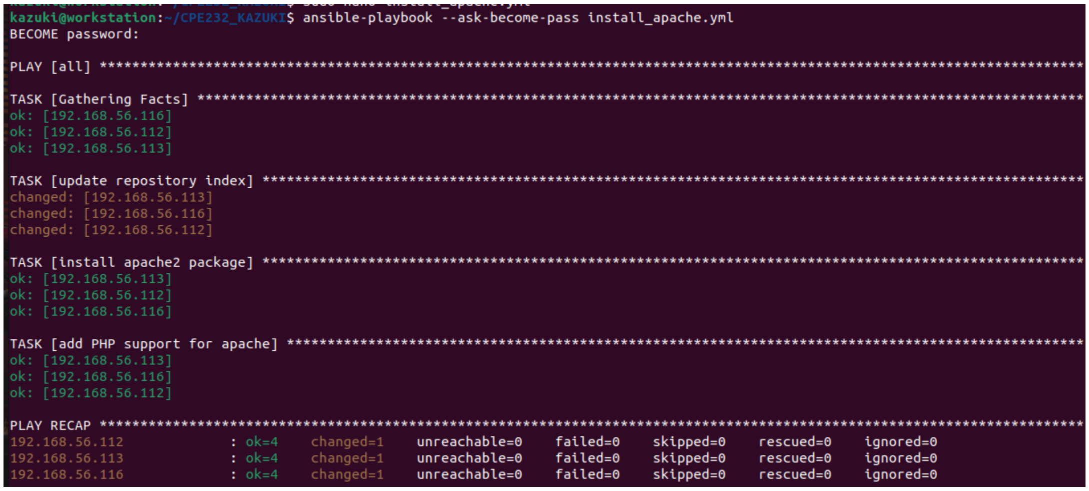
Figure 1.3.1 - Navigating the install_apache.yml File



```
  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"
```

Figure 1.3.2 - Editing the install_apache.yml File

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



```
kazuki@workstation:~/CPE232_KAZUKI$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

TASK [Gathering Facts] *********************************************************************************
ok: [192.168.56.116]
ok: [192.168.56.112]
ok: [192.168.56.113]

TASK [update repository index] *************************************************************************
changed: [192.168.56.113]
changed: [192.168.56.116]
changed: [192.168.56.112]

TASK [install apache2 package] *************************************************************************
ok: [192.168.56.113]
ok: [192.168.56.112]
ok: [192.168.56.116]

TASK [add PHP support for apache] **********************************************************************
ok: [192.168.56.113]
ok: [192.168.56.116]
ok: [192.168.56.112]

PLAY RECAP *********************************************************************************************
192.168.56.112             : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.113             : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.116             : ok=4    changed=1    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

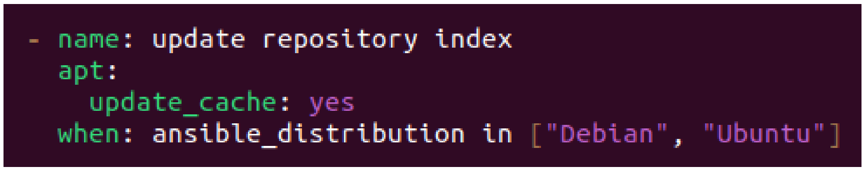
Figure 1.3.3 - Executing the install_apache.yml File

I am actually expecting an error in this part, but seeing the command "when" makes sense that this will not have an error. Since it indicates that those will only run for Ubuntu Ansible distribution.

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

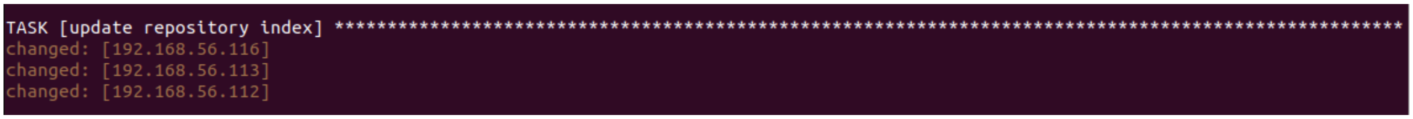
```
-   name: update repository index
    apt:
       update_cache: yes
    when: ansible_distribution in ["Debian", "Ubuntu]
```

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



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

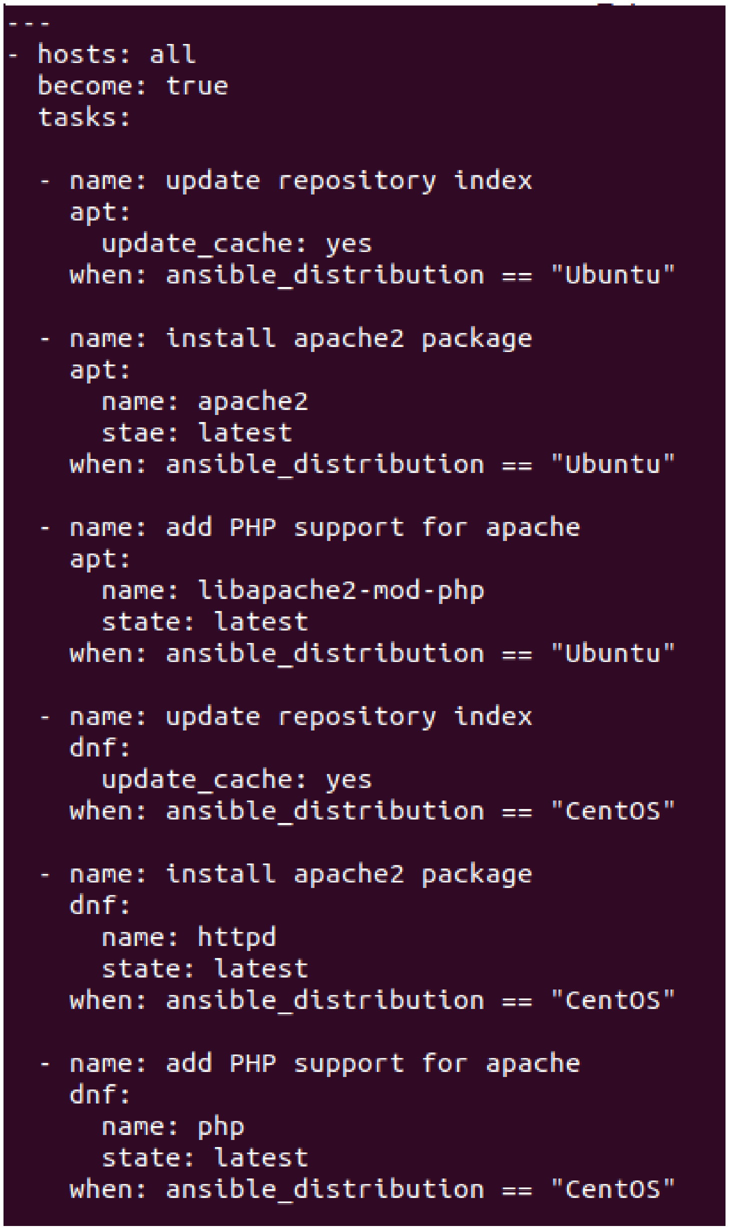
Figure 1.3.4 - Experimenting Playbook



```
TASK [update repository index] *****************************************************************************************************
changed: [192.168.56.116]
changed: [192.168.56.113]
changed: [192.168.56.112]
```

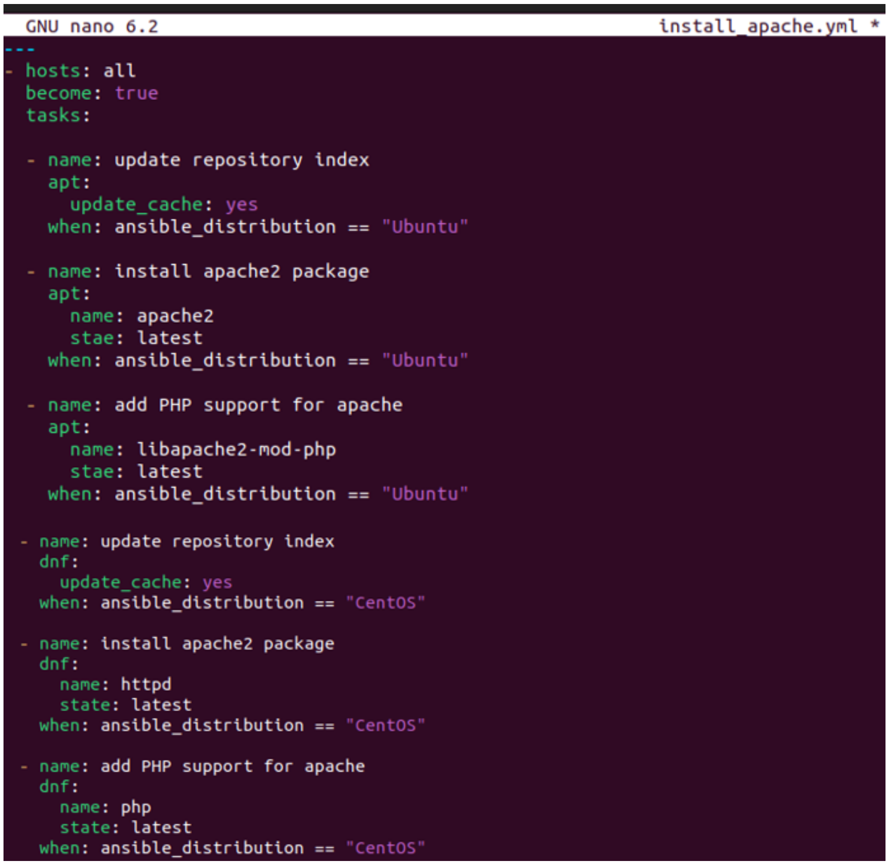
Figure 1.3.5 - Executing the Experimented Playbook

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"
```

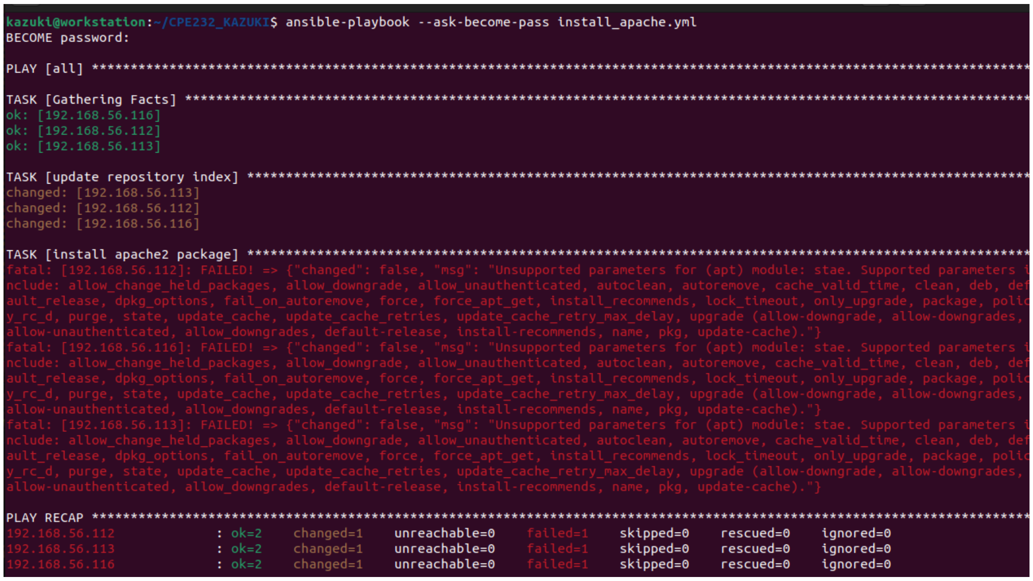
Make sure to save and exit.



```
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
      stae: latest
    when: ansible_distribution == "Ubuntu"

  - name: add PHP support for apache
    apt:
      name: libapache2-mod-php
      stae: 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"
```

Figure 1.4.1 - Editing Playbook

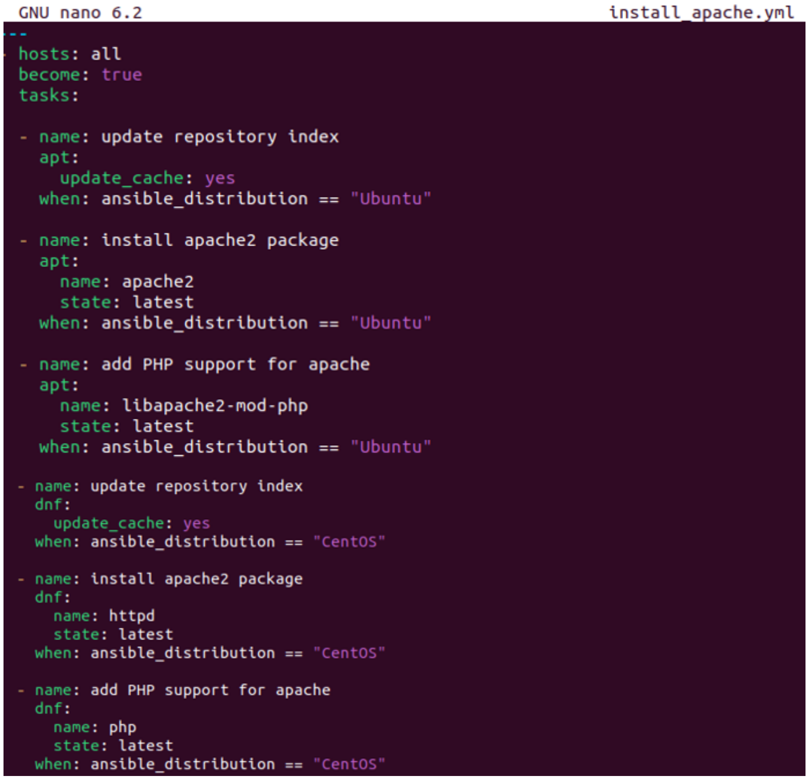
Run *ansible-playbook --ask-become-pass install_apache.yml* and describe the result.



```
kazuki@workstation:~/CPE232_KAZUKI$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

TASK [Gathering Facts] *************************************************************************************************
ok: [192.168.56.116]
ok: [192.168.56.112]
ok: [192.168.56.113]

TASK [update repository index] *****************************************************************************************
changed: [192.168.56.113]
changed: [192.168.56.112]
changed: [192.168.56.116]

TASK [install apache2 package] *****************************************************************************************
fatal: [192.168.56.112]: FAILED! => {"changed": false, "msg": "Unsupported parameters for (apt) module: stae. Supported parameters i
nclude: allow_change_held_packages, allow_downgrade, allow_unauthenticated, autoclean, autoremove, cache_valid_time, clean, deb, def
ault_release, dpkg_options, fail_on_autoremove, force, force_apt_get, install_recommends, lock_timeout, only_upgrade, package, polic
y_rc_d, purge, state, update_cache, update_cache_retries, update_cache_retry_max_delay, upgrade (allow-downgrade, allow-downgrades,
allow-unauthenticated, allow_downgrades, default-release, install-recommends, name, pkg, update-cache)."}
fatal: [192.168.56.116]: FAILED! => {"changed": false, "msg": "Unsupported parameters for (apt) module: stae. Supported parameters i
nclude: allow_change_held_packages, allow_downgrade, allow_unauthenticated, autoclean, autoremove, cache_valid_time, clean, deb, def
ault_release, dpkg_options, fail_on_autoremove, force, force_apt_get, install_recommends, lock_timeout, only_upgrade, package, polic
y_rc_d, purge, state, update_cache, update_cache_retries, update_cache_retry_max_delay, upgrade (allow-downgrade, allow-downgrades,
allow-unauthenticated, allow_downgrades, default-release, install-recommends, name, pkg, update-cache)."}
fatal: [192.168.56.113]: FAILED! => {"changed": false, "msg": "Unsupported parameters for (apt) module: stae. Supported parameters i
nclude: allow_change_held_packages, allow_downgrade, allow_unauthenticated, autoclean, autoremove, cache_valid_time, clean, deb, def
ault_release, dpkg_options, fail_on_autoremove, force, force_apt_get, install_recommends, lock_timeout, only_upgrade, package, polic
y_rc_d, purge, state, update_cache, update_cache_retries, update_cache_retry_max_delay, upgrade (allow-downgrade, allow-downgrades,
allow-unauthenticated, allow_downgrades, default-release, install-recommends, name, pkg, update-cache)."}

PLAY RECAP *************************************************************************************************************
192.168.56.112             : ok=2    changed=1    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
192.168.56.113             : ok=2    changed=1    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
192.168.56.116             : ok=2    changed=1    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
```

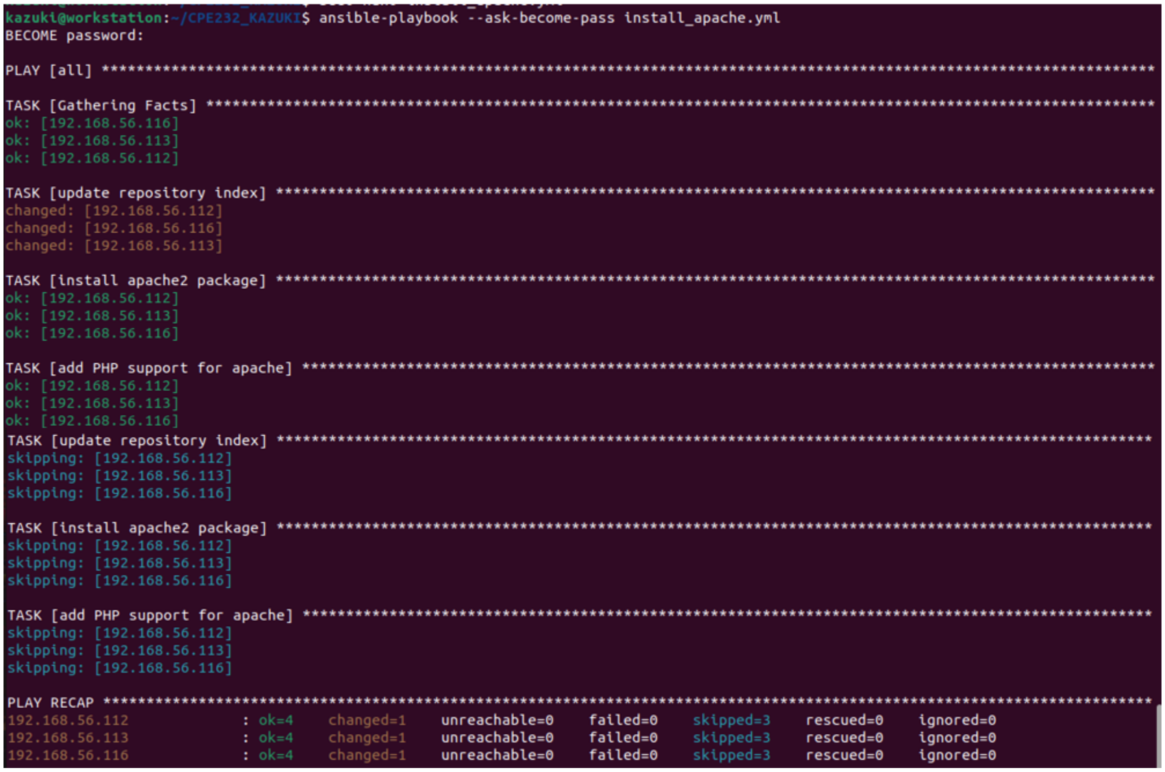
Figure 1.4.2 - Executing the Playbook

There is an error in the tasks, this is because the word “state” is misspelled as “stae” in both “install apache2 package” and “add PHP support for apache” tasks.



```
  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
      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"
```

Figure 1.4.3 - Fixing the Error

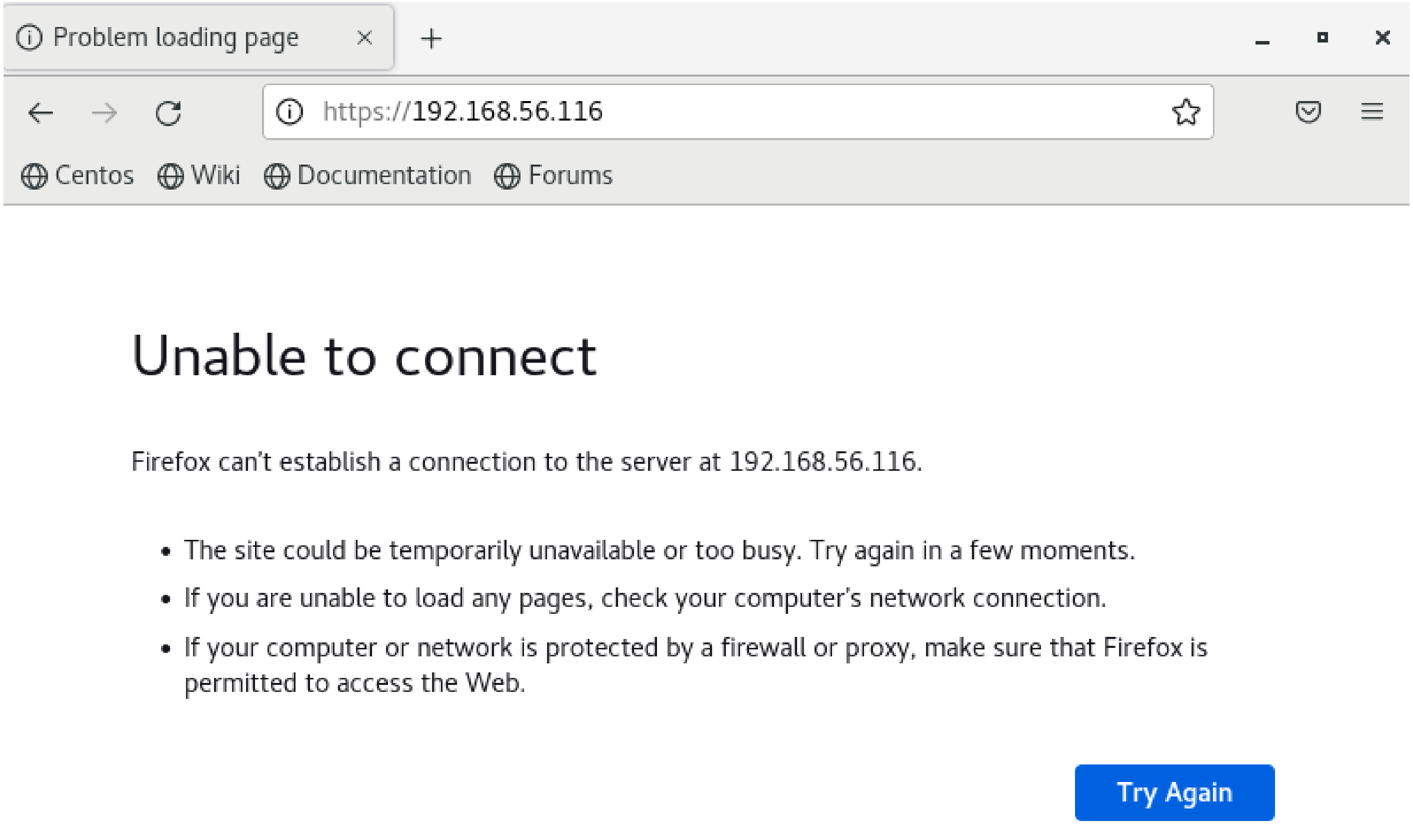


```
kazuki@workstation:~/CPE232_KAZUKI$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

TASK [Gathering Facts] *****************************************************************************************
ok: [192.168.56.116]
ok: [192.168.56.113]
ok: [192.168.56.112]

TASK [update repository index] *********************************************************************************
changed: [192.168.56.112]
changed: [192.168.56.116]
changed: [192.168.56.113]

TASK [install apache2 package] *********************************************************************************
ok: [192.168.56.112]
ok: [192.168.56.113]
ok: [192.168.56.116]

TASK [add PHP support for apache] ******************************************************************************
ok: [192.168.56.112]
ok: [192.168.56.113]
ok: [192.168.56.116]
TASK [update repository index] *********************************************************************************
skipping: [192.168.56.112]
skipping: [192.168.56.113]
skipping: [192.168.56.116]

TASK [install apache2 package] *********************************************************************************
skipping: [192.168.56.112]
skipping: [192.168.56.113]
skipping: [192.168.56.116]

TASK [add PHP support for apache] ******************************************************************************
skipping: [192.168.56.112]
skipping: [192.168.56.113]
skipping: [192.168.56.116]

PLAY RECAP *****************************************************************************************************
192.168.56.112             : ok=4    changed=1    unreachable=0    failed=0    skipped=3    rescued=0    ignored=0
192.168.56.113             : ok=4    changed=1    unreachable=0    failed=0    skipped=3    rescued=0    ignored=0
192.168.56.116             : ok=4    changed=1    unreachable=0    failed=0    skipped=3    rescued=0    ignored=0
```

Figure 1.4.4 - Executing the Modified Playbook

After fixing the misspelled command, it is not successfully executed. I observe that the play for Centos has color blue texts, it serves as indicators from different systems/servers.

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.



Unable to connect

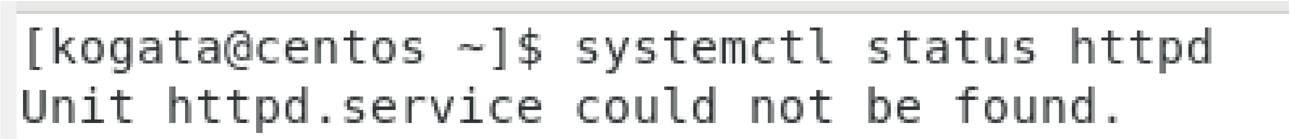
Firefox can't establish a connection to the server at 192.168.56.116.

- The site could be temporarily unavailable or too busy. Try again in a few moments.
- If you are unable to load any pages, check your computer's network connection.
- If your computer or network is protected by a firewall or proxy, make sure that Firefox is permitted to access the Web.

Figure 1.5.1 - Installation Verification

It is unable to connect, since CentOS's httpd is inactive.

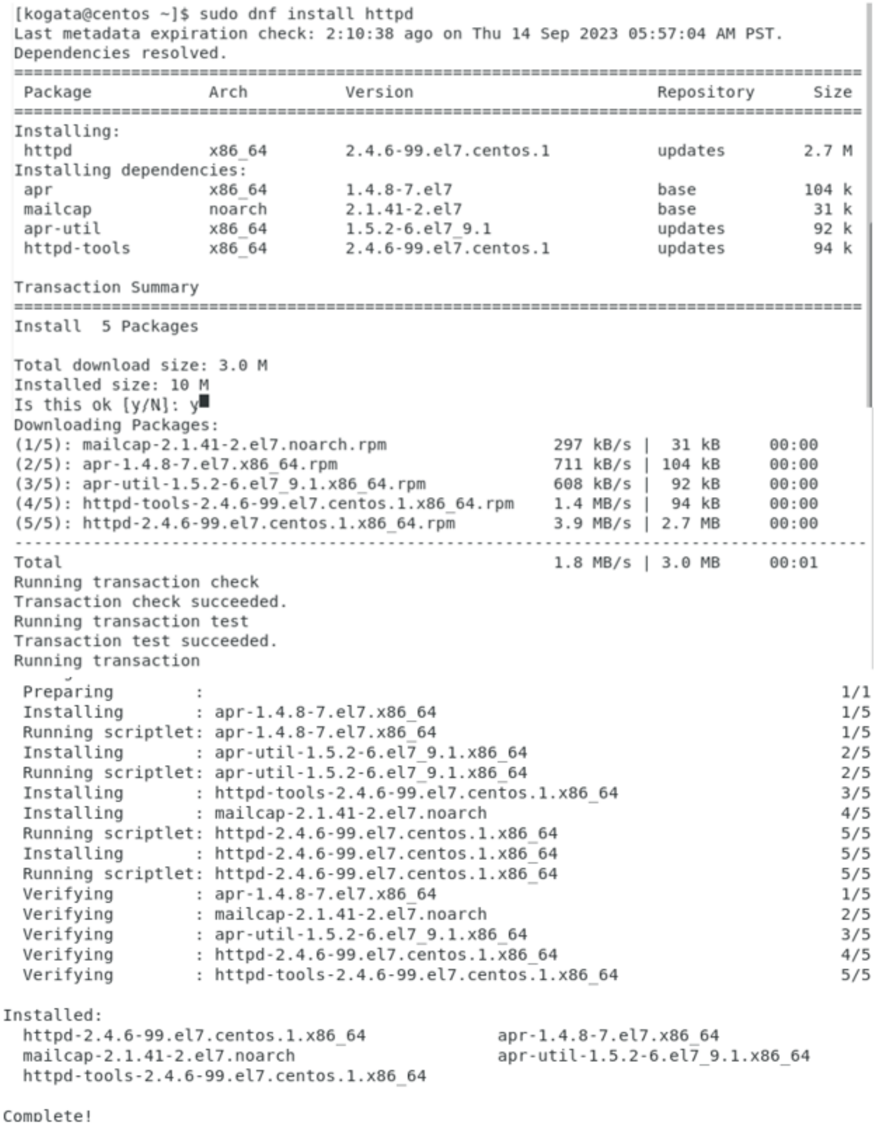
5.1 To activate, go to the CentOS VM terminal and enter the following:
systemctl status httpd
The result of this command tells you that the service is inactive.



```
[kogata@centos ~]$ systemctl status httpd
Unit httpd.service could not be found.
```

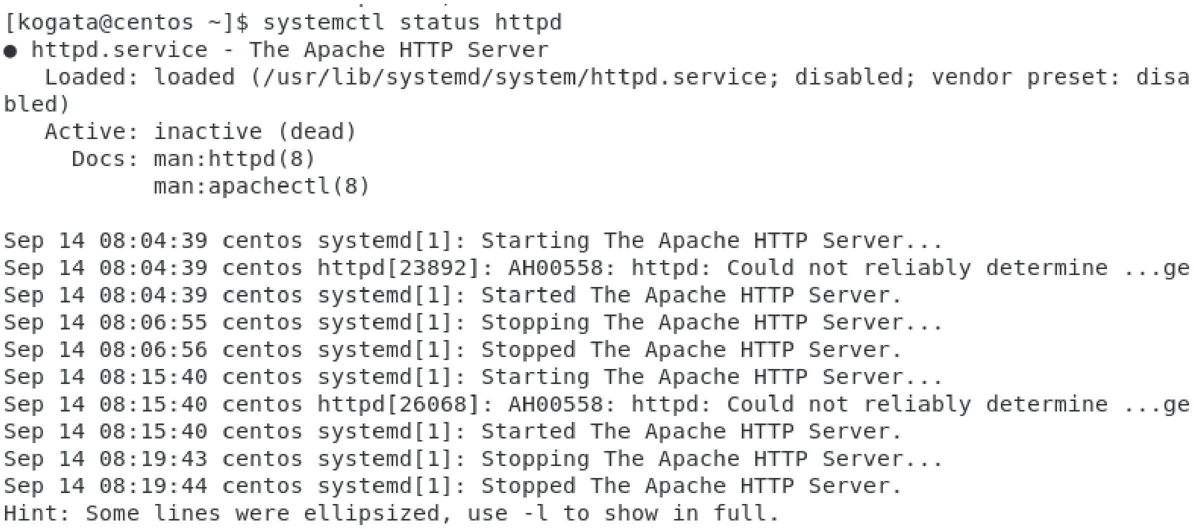
Figure 1.5.1.1 - Checking the Status of httpd

There is currently no httpd on CentOS, that is also the reason why can't verify my installation earlier using my CentOS'IP address and Web Browser.



```
[kogata@centos ~]$ sudo dnf install httpd
Last metadata expiration check: 2:10:38 ago on Thu 14 Sep 2023 05:57:04 AM PST.
Dependencies resolved.
=====================================================================================
 Package            Arch         Version                         Repository      Size
=====================================================================================
Installing:
 httpd              x86_64       2.4.6-99.el7.centos.1           updates        2.7 M
Installing dependencies:
 apr                x86_64       1.4.8-7.el7                     base           104 k
 mailcap            noarch       2.1.41-2.el7                    base            31 k
 apr-util           x86_64       1.5.2-6.el7_9.1                 updates         92 k
 httpd-tools        x86_64       2.4.6-99.el7.centos.1           updates         94 k

Transaction Summary
=====================================================================================
Install  5 Packages

Total download size: 3.0 M
Installed size: 10 M
Is this ok [y/N]: y
Downloading Packages:
(1/5): mailcap-2.1.41-2.el7.noarch.rpm                297 kB/s |  31 kB     00:00
(2/5): apr-1.4.8-7.el7.x86_64.rpm                     711 kB/s | 104 kB     00:00
(3/5): apr-util-1.5.2-6.el7_9.1.x86_64.rpm            608 kB/s |  92 kB     00:00
(4/5): httpd-tools-2.4.6-99.el7.centos.1.x86_64.rpm   1.4 MB/s |  94 kB     00:00
(5/5): httpd-2.4.6-99.el7.centos.1.x86_64.rpm         3.9 MB/s | 2.7 MB     00:00
-------------------------------------------------------------------------------------
Total                                                 1.8 MB/s | 3.0 MB     00:01
Running transaction check
Transaction check succeeded.
Running transaction test
Transaction test succeeded.
Running transaction
  Preparing        :                                                          1/1
  Installing       : apr-1.4.8-7.el7.x86_64                                   1/5
  Running scriptlet: apr-1.4.8-7.el7.x86_64                                   1/5
  Installing       : apr-util-1.5.2-6.el7_9.1.x86_64                          2/5
  Running scriptlet: apr-util-1.5.2-6.el7_9.1.x86_64                          2/5
  Installing       : httpd-tools-2.4.6-99.el7.centos.1.x86_64                 3/5
  Installing       : mailcap-2.1.41-2.el7.noarch                              4/5
  Running scriptlet: httpd-2.4.6-99.el7.centos.1.x86_64                       5/5
  Installing       : httpd-2.4.6-99.el7.centos.1.x86_64                       5/5
  Running scriptlet: httpd-2.4.6-99.el7.centos.1.x86_64                       5/5
  Verifying        : apr-1.4.8-7.el7.x86_64                                   1/5
  Verifying        : mailcap-2.1.41-2.el7.noarch                              2/5
  Verifying        : apr-util-1.5.2-6.el7_9.1.x86_64                          3/5
  Verifying        : httpd-2.4.6-99.el7.centos.1.x86_64                       4/5
  Verifying        : httpd-tools-2.4.6-99.el7.centos.1.x86_64                 5/5

Installed:
  httpd-2.4.6-99.el7.centos.1.x86_64            apr-1.4.8-7.el7.x86_64
  mailcap-2.1.41-2.el7.noarch                   apr-util-1.5.2-6.el7_9.1.x86_64
  httpd-tools-2.4.6-99.el7.centos.1.x86_64

Complete!
```

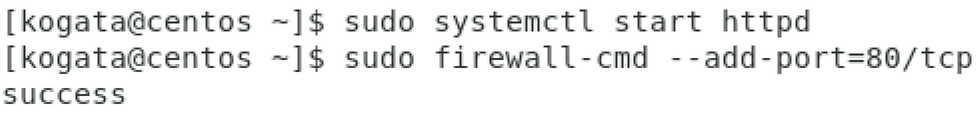
Figure 1.5.1.2 - Installing httpd in CentOS



```
[kogata@centos ~]$ 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)

Sep 14 08:04:39 centos systemd[1]: Starting The Apache HTTP Server...
Sep 14 08:04:39 centos httpd[23892]: AH00558: httpd: Could not reliably determine ...ge
Sep 14 08:04:39 centos systemd[1]: Started The Apache HTTP Server.
Sep 14 08:06:55 centos systemd[1]: Stopping The Apache HTTP Server...
Sep 14 08:06:56 centos systemd[1]: Stopped The Apache HTTP Server.
Sep 14 08:15:40 centos systemd[1]: Starting The Apache HTTP Server...
Sep 14 08:15:40 centos httpd[26068]: AH00558: httpd: Could not reliably determine ...ge
Sep 14 08:15:40 centos systemd[1]: Started The Apache HTTP Server.
Sep 14 08:19:43 centos systemd[1]: Stopping The Apache HTTP Server...
Sep 14 08:19:44 centos systemd[1]: Stopped The Apache HTTP Server.
Hint: Some lines were ellipsized, use -l to show in full.
```

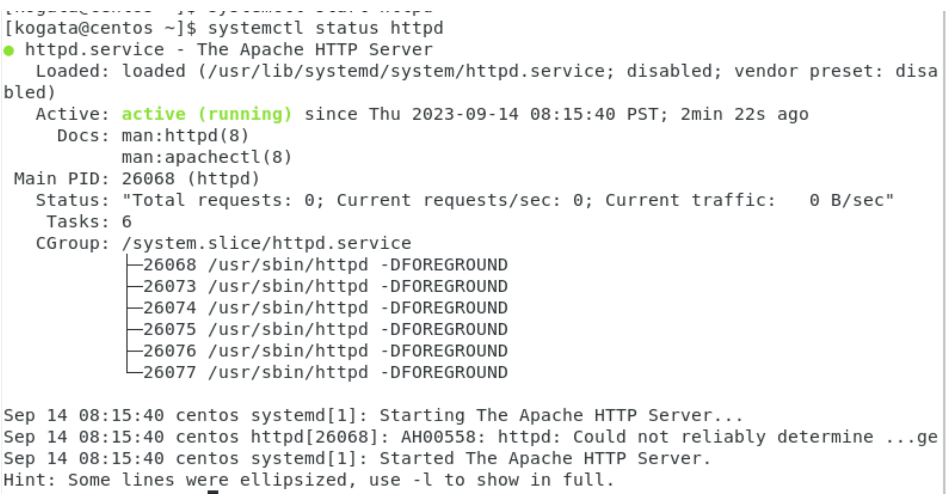
Figure 1.5.1.3 - Checking the Status of httpd

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)



```
[kogata@centos ~]$ sudo systemctl start httpd
[kogata@centos ~]$ sudo firewall-cmd --add-port=80/tcp
success
```

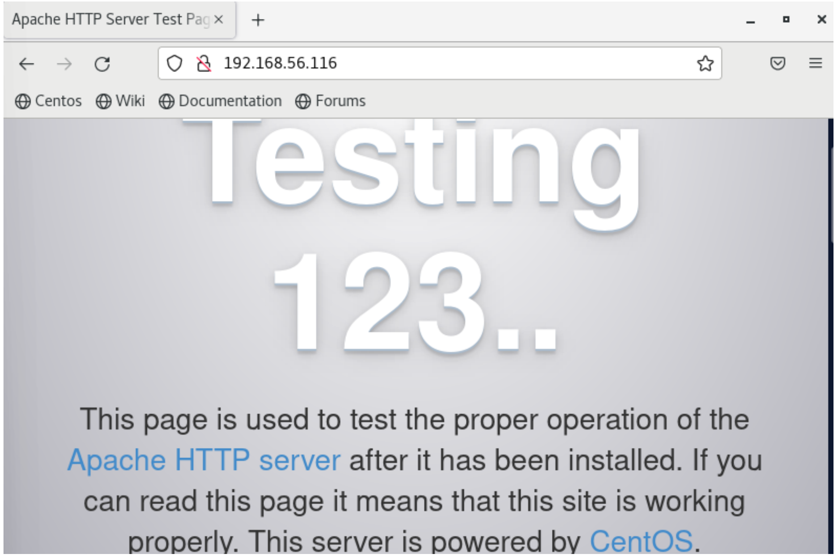
Figure 1.5.2.1 - Starting the httpd and Adding Firewall



```
[kogata@centos ~]$ systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; vendor preset: disa
bled)
   Active: active (running) since Thu 2023-09-14 08:15:40 PST; 2min 22s ago
     Docs: man:httpd(8)
           man:apachectl(8)
 Main PID: 26068 (httpd)
   Status: "Total requests: 0; Current requests/sec: 0; Current traffic:   0 B/sec"
    Tasks: 6
   CGroup: /system.slice/httpd.service
           ├─26068 /usr/sbin/httpd -DFOREGROUND
           ├─26073 /usr/sbin/httpd -DFOREGROUND
           ├─26074 /usr/sbin/httpd -DFOREGROUND
           ├─26075 /usr/sbin/httpd -DFOREGROUND
           ├─26076 /usr/sbin/httpd -DFOREGROUND
           └─26077 /usr/sbin/httpd -DFOREGROUND

Sep 14 08:15:40 centos systemd[1]: Starting The Apache HTTP Server...
Sep 14 08:15:40 centos httpd[26068]: AH00558: httpd: Could not reliably determine ...ge
Sep 14 08:15:40 centos systemd[1]: Started The Apache HTTP Server.
Hint: Some lines were ellipsized, use -l to show in full.
```

Figure 1.5.2.2 - Verifying and Checking httpd status

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)



Testing 123..

This page is used to test the proper operation of the Apache HTTP server after it has been installed. If you can read this page it means that this site is working properly. This server is powered by CentOS.

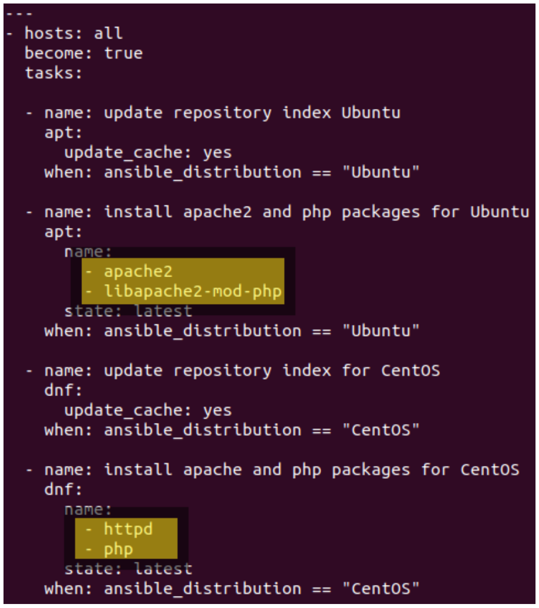
Figure 1.5.3.1 - Verifying the Installation

Yes, the installation was successful.

Task 2: Refactoring playbook

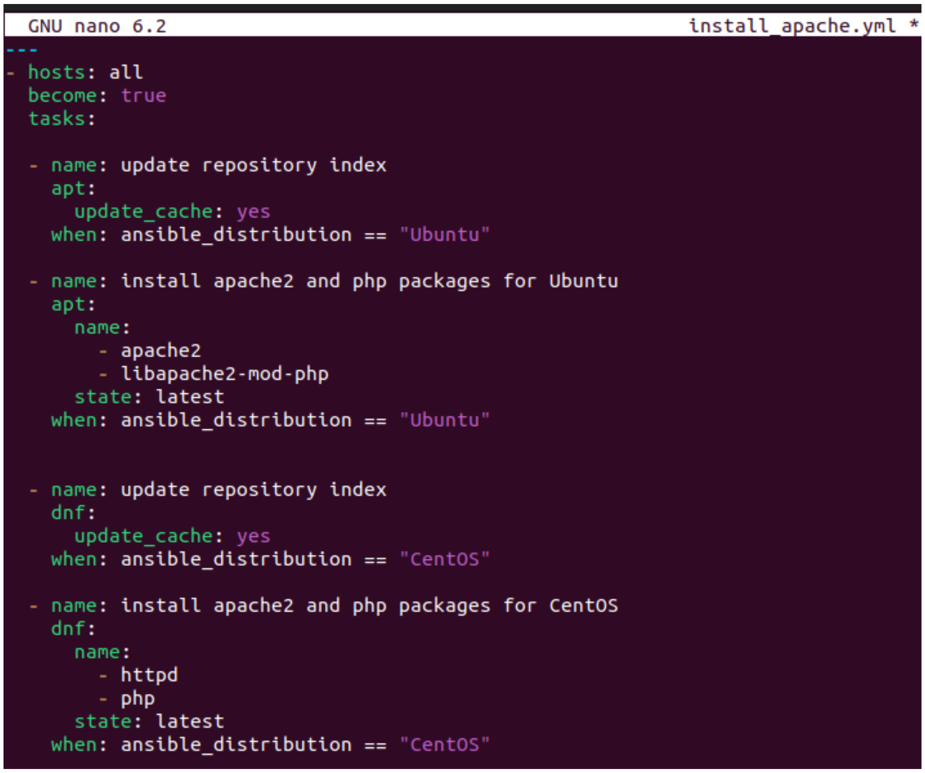
This time, we want to make sure that our playbook is efficient and that the codes are easier to read. This will also makes run ansible more quickly if it has to execute fewer tasks to do the same thing.

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"
```

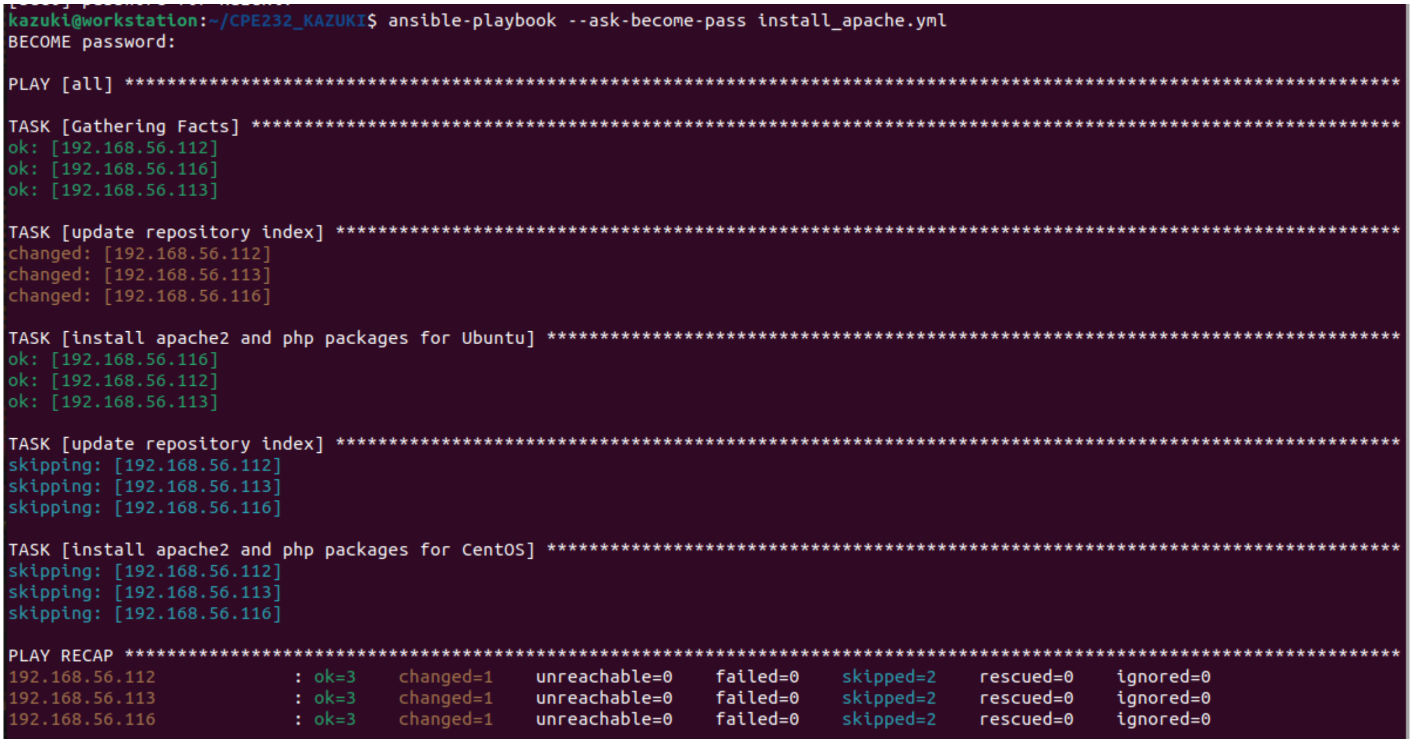
Make sure to save the file and exit.



```
  GNU nano 6.2                                          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
    dnf:
      update_cache: yes
    when: ansible_distribution == "CentOS"

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

Figure 2.1.1 - Consolidating Tasks in Playbook

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

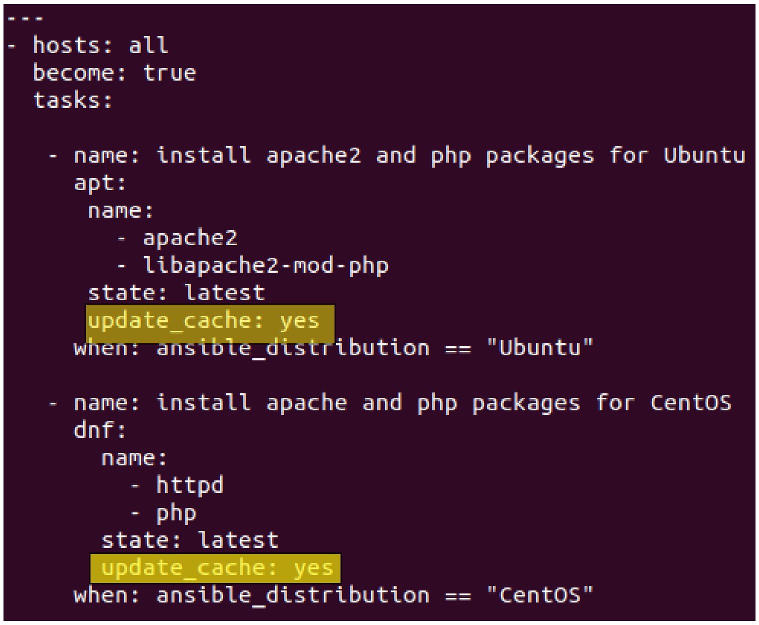


```
kazuki@workstation:~/CPE232_KAZUKI$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

TASK [Gathering Facts] ************************************************************************************************************
ok: [192.168.56.112]
ok: [192.168.56.116]
ok: [192.168.56.113]

TASK [update repository index] ****************************************************************************************************
changed: [192.168.56.112]
changed: [192.168.56.113]
changed: [192.168.56.116]

TASK [install apache2 and php packages for Ubuntu] ********************************************************************************
ok: [192.168.56.116]
ok: [192.168.56.112]
ok: [192.168.56.113]

TASK [update repository index] ****************************************************************************************************
skipping: [192.168.56.112]
skipping: [192.168.56.113]
skipping: [192.168.56.116]

TASK [install apache2 and php packages for CentOS] ********************************************************************************
skipping: [192.168.56.112]
skipping: [192.168.56.113]
skipping: [192.168.56.116]

PLAY RECAP ************************************************************************************************************************
192.168.56.112             : ok=3    changed=1    unreachable=0    failed=0    skipped=2    rescued=0    ignored=0
192.168.56.113             : ok=3    changed=1    unreachable=0    failed=0    skipped=2    rescued=0    ignored=0
192.168.56.116             : ok=3    changed=1    unreachable=0    failed=0    skipped=2    rescued=0    ignored=0
```

Figure 2.1.2 - Executing the Modified Playbook

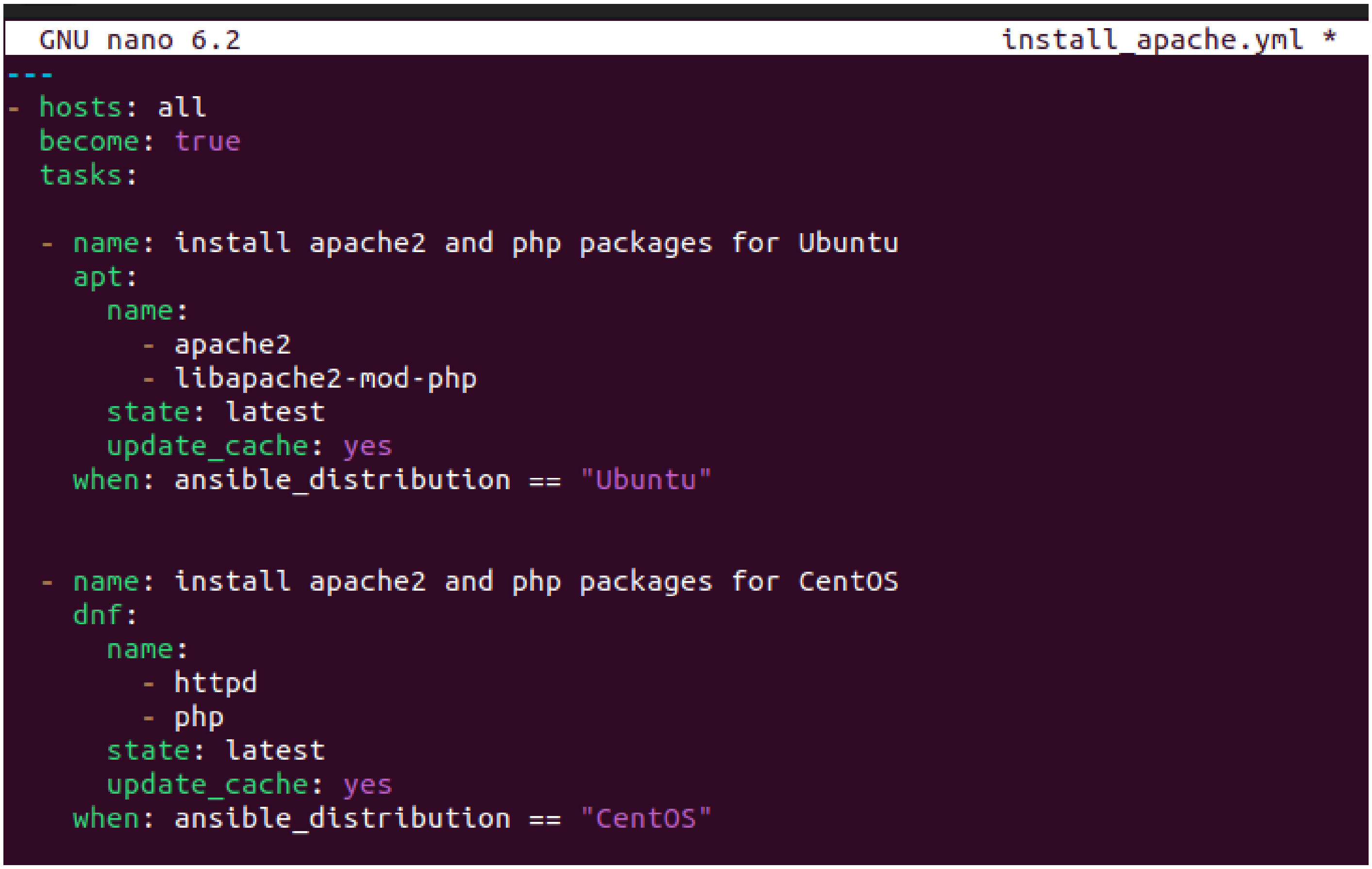
The output was successful just like from the past parts of this activity but this is it is lesser or the play/tasks are consolidated.

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"
```

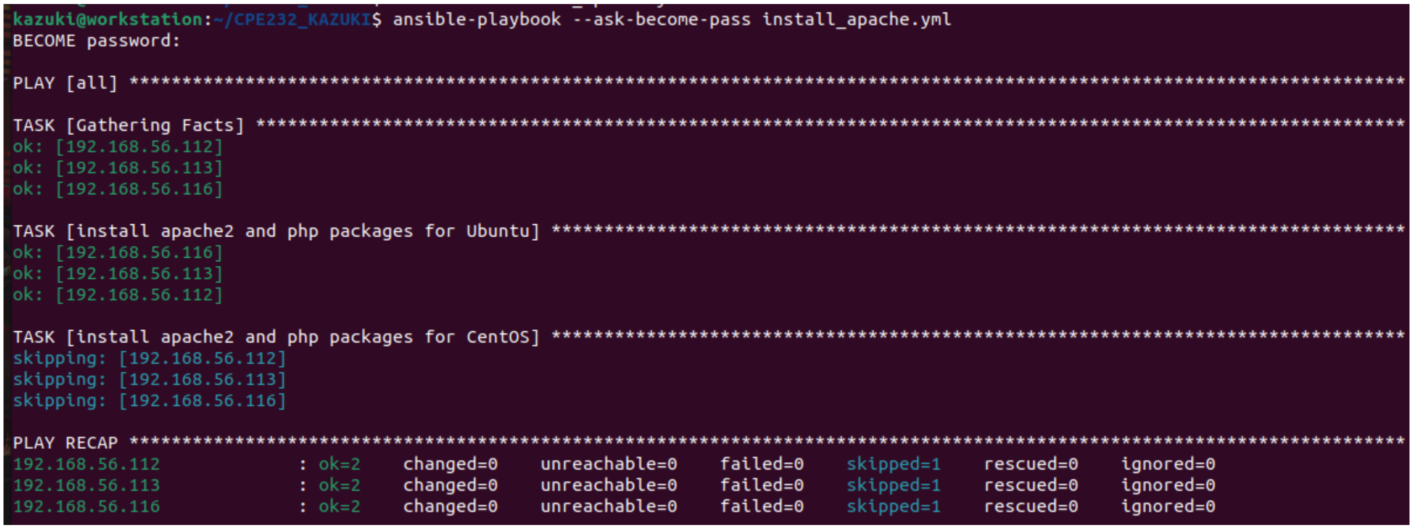
Make sure to save the file and exit.



```
  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"
```

Figure 2.2.1 - Consolidating Multiple Play into One Play

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

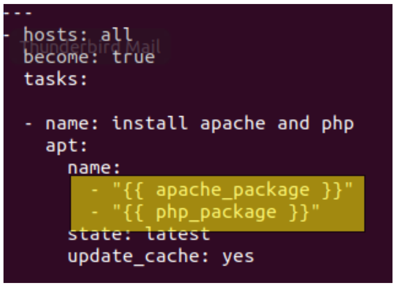


```
kazuki@workstation:~/CPE232_KAZUKI$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

TASK [Gathering Facts] ***************************************************************************************************
ok: [192.168.56.112]
ok: [192.168.56.113]
ok: [192.168.56.116]

TASK [install apache2 and php packages for Ubuntu] ***********************************************************************
ok: [192.168.56.116]
ok: [192.168.56.113]
ok: [192.168.56.112]

TASK [install apache2 and php packages for CentOS] ***********************************************************************
skipping: [192.168.56.112]
skipping: [192.168.56.113]
skipping: [192.168.56.116]

PLAY RECAP ***************************************************************************************************************
192.168.56.112             : ok=2    changed=0    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
192.168.56.113             : ok=2    changed=0    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
192.168.56.116             : ok=2    changed=0    unreachable=0    failed=0    skipped=1    rescued=0    ignored=0
```

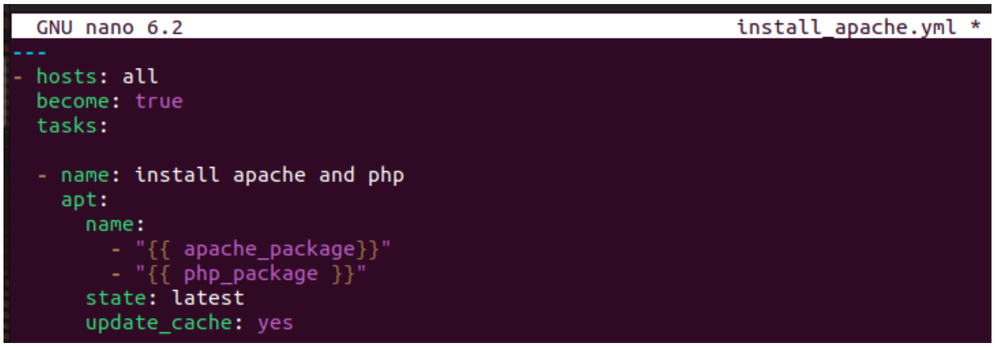
Figure 2.2.2 - Executing the Modified Playbook

The runtime here is much faster compared to when the plays are assigned separately.

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.



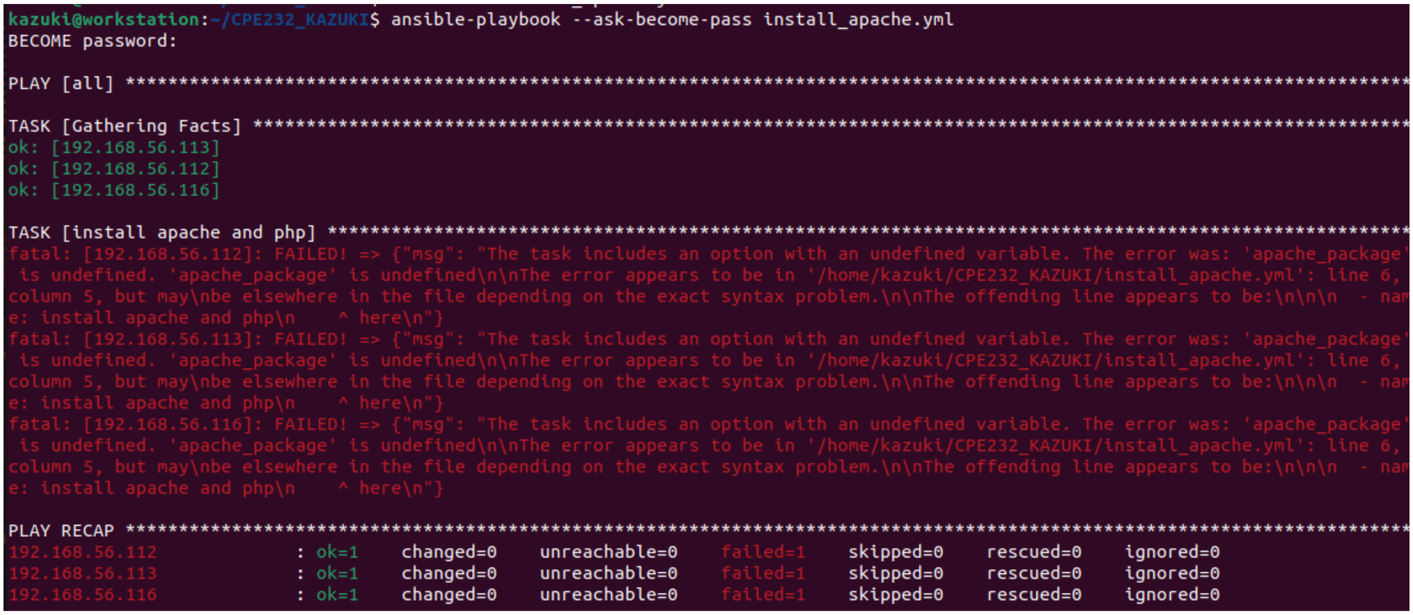
```
---
- hosts: all
  become: true
  tasks:

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



```
  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
```

Figure 2.3.1 - Consolidating 2 Plays in just 1 Play

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

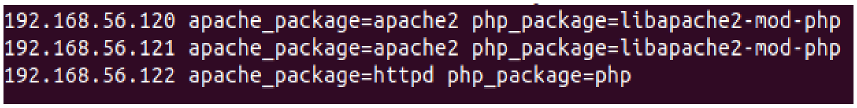


```
kazuki@workstation:~/CPE232_KAZUKI$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

TASK [Gathering Facts] ***************************************************************************************************
ok: [192.168.56.113]
ok: [192.168.56.112]
ok: [192.168.56.116]

TASK [install apache and php] ********************************************************************************************
fatal: [192.168.56.112]: FAILED! => {"msg": "The task includes an option with an undefined variable. The error was: 'apache_package'
 is undefined. 'apache_package' is undefined\n\nThe error appears to be in '/home/kazuki/CPE232_KAZUKI/install_apache.yml': line 6,
column 5, but may\nbe elsewhere in the file depending on the exact syntax problem.\n\nThe offending line appears to be:\n\n\n  - nam
e: install apache and php\n    ^ here\n"}
fatal: [192.168.56.113]: FAILED! => {"msg": "The task includes an option with an undefined variable. The error was: 'apache_package'
 is undefined. 'apache_package' is undefined\n\nThe error appears to be in '/home/kazuki/CPE232_KAZUKI/install_apache.yml': line 6,
column 5, but may\nbe elsewhere in the file depending on the exact syntax problem.\n\nThe offending line appears to be:\n\n\n  - nam
e: install apache and php\n    ^ here\n"}
fatal: [192.168.56.116]: FAILED! => {"msg": "The task includes an option with an undefined variable. The error was: 'apache_package'
 is undefined. 'apache_package' is undefined\n\nThe error appears to be in '/home/kazuki/CPE232_KAZUKI/install_apache.yml': line 6,
column 5, but may\nbe elsewhere in the file depending on the exact syntax problem.\n\nThe offending line appears to be:\n\n\n  - nam
e: install apache and php\n    ^ here\n"}

PLAY RECAP ***************************************************************************************************************
192.168.56.112             : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
192.168.56.113             : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
192.168.56.116             : ok=1    changed=0    unreachable=0    failed=1    skipped=0    rescued=0    ignored=0
```

Figure 2.3.2 - Executing the Modified Playbook

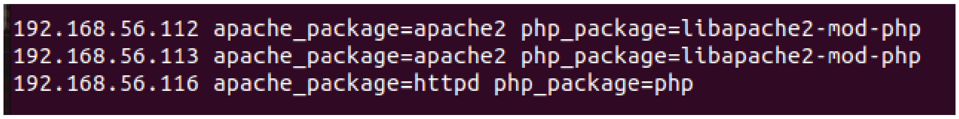
There is an error because the command only has “apt” in there and the CentOs does not use that package manager, so it will affect all of them.

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.

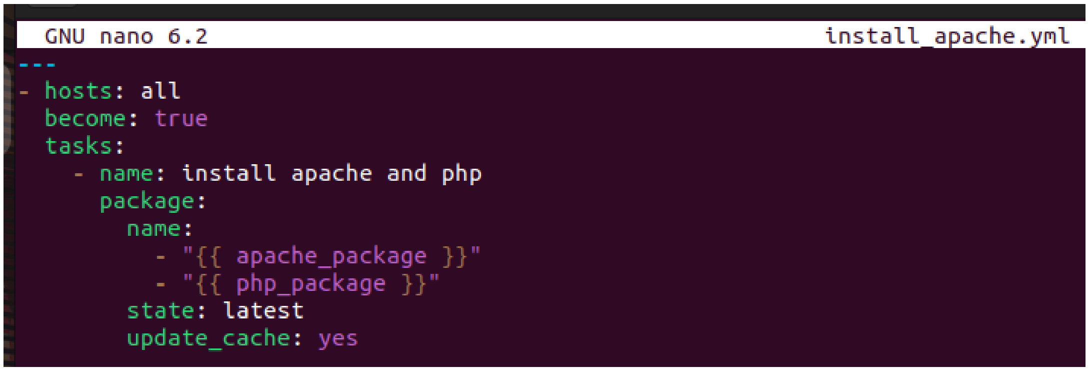


```
192.168.56.112 apache_package=apache2 php_package=libapache2-mod-php
192.168.56.113 apache_package=apache2 php_package=libapache2-mod-php
192.168.56.116 apache_package=httpd php_package=php
```

Figure 2.4.1 - Modifying the Inventory File

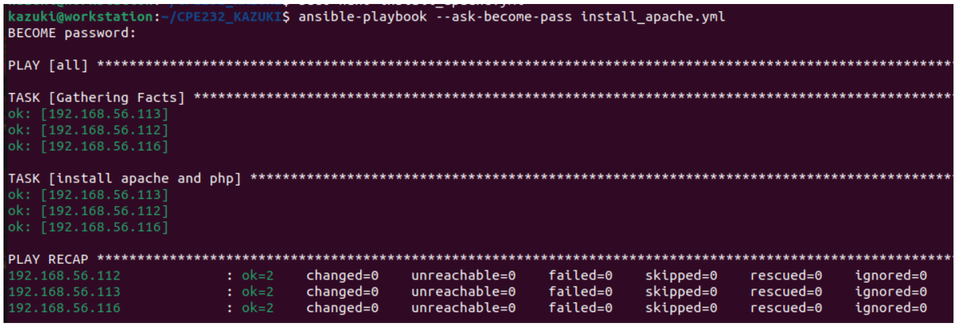
Finally, we still have one more thing to change in our *install_apache.yml* file. In task 2.3, you may notice that the package is assign as apt, which will not run in CentOS. Replace the *apt* with *package*. Package is a module in ansible that is generic, which is going to use whatever package manager 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.



```
  GNU nano 6.2                                              install_apache.yml
---
- hosts: all
  become: true
  tasks:
    - name: install apache and php
      package:
        name:
          - "{{ apache_package }}"
          - "{{ php_package }}"
        state: latest
        update_cache: yes
```

Figure 2.4.2 - Modified Playbook



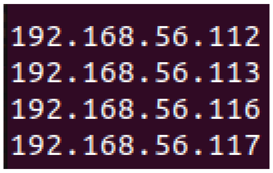
```
kazuki@workstation:~/CPE232_KAZUKI$ ansible-playbook --ask-become-pass install_apache.yml
BECOME password:

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

TASK [Gathering Facts] *****************************************************************************
ok: [192.168.56.113]
ok: [192.168.56.112]
ok: [192.168.56.116]

TASK [install apache and php] **********************************************************************
ok: [192.168.56.113]
ok: [192.168.56.112]
ok: [192.168.56.116]

PLAY RECAP *****************************************************************************************
192.168.56.112             : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.113             : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
192.168.56.116             : ok=2    changed=0    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

Figure 2.4.3 - Executing the Modified Playbook

It successfully executed the modified Playbook with only 1 play but with multiple purposes or tasks.

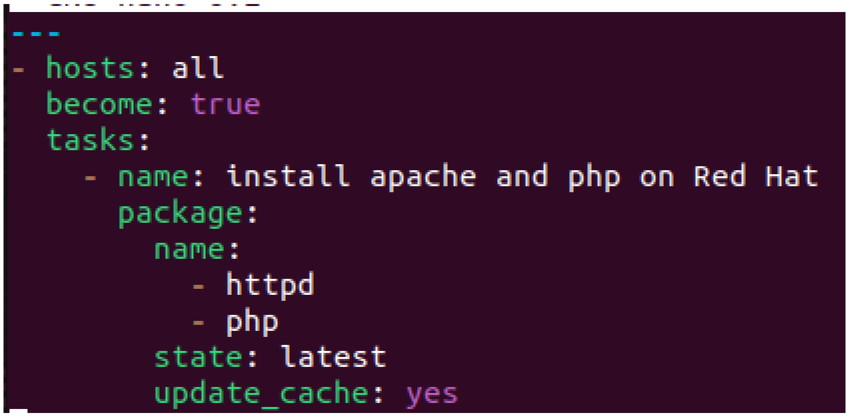
Supplementary Activity:

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



```
192.168.56.112
192.168.56.113
192.168.56.116
192.168.56.117
```

Figure 3.1 - Inventory with Red Hat IP Address



```
---
- hosts: all
  become: true
  tasks:
    - name: install apache and php on Red Hat
      package:
        name:
          - httpd
          - php
        state: latest
        update_cache: yes
```

Figure 3.2 - Playbook for Installing apache and php on RedHat

Reflections:

Answer the following:

1. Why do you think refactoring of playbook codes is important?
    - I think refactoring of playbook codes is very important. It reduces the complexity of the codes and makes our playbook easier to read and understand. With this, we can easily add, remove, or modify something with it faster. Lesser code = lesser errors, we can easily identify and fix the errors that we might encounter. For example, in this activity, I started with multiple plays in the Playbook and it took me some time to type all those commands plus I encountered some errors, but in the end, it is much shorter and easier to fix when there are errors encountered.

2. When do we use the “when” command in the playbook?
    - We use the “When” command when we need to control a task when it will be executed based on specified conditions. For example, we use the “When” command to execute a task when “only” a certain conditions is met, like a specific variable of the target host.