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Course/Section: CPE 232 / CPE31S22	**Date Submitted:** Dec 9, 2022
Instructor: Dr. Jonathan Taylar	**Semester and SY:** 1st Sem, 2022 - 2023

Activity 15: OpenStack Installation (Neutron, Horizon, Cinder)

1. Objectives

Create a workflow to install OpenStack using Ansible as your Infrastructure as Code (IaC).

2. Intended Learning Outcomes

1. Analyze the advantages and disadvantages of cloud services
2. Evaluate different Cloud deployment and service models
3. Create a workflow to install and configure OpenStack base services using Ansible as documentation and execution.

3. Resources

Oracle VirtualBox (Hypervisor)

1x Ubuntu VM or Centos VM

4. Tasks

1. Create a new repository for this activity.
2. Create a playbook that converts the steps in the following items in https://docs.openstack.org/install-guide/
    a. Neutron
    b. Horizon
    c. Cinder
    d. Add, commit and push it to your GitHub repo.

5. Output (screenshots and explanations)

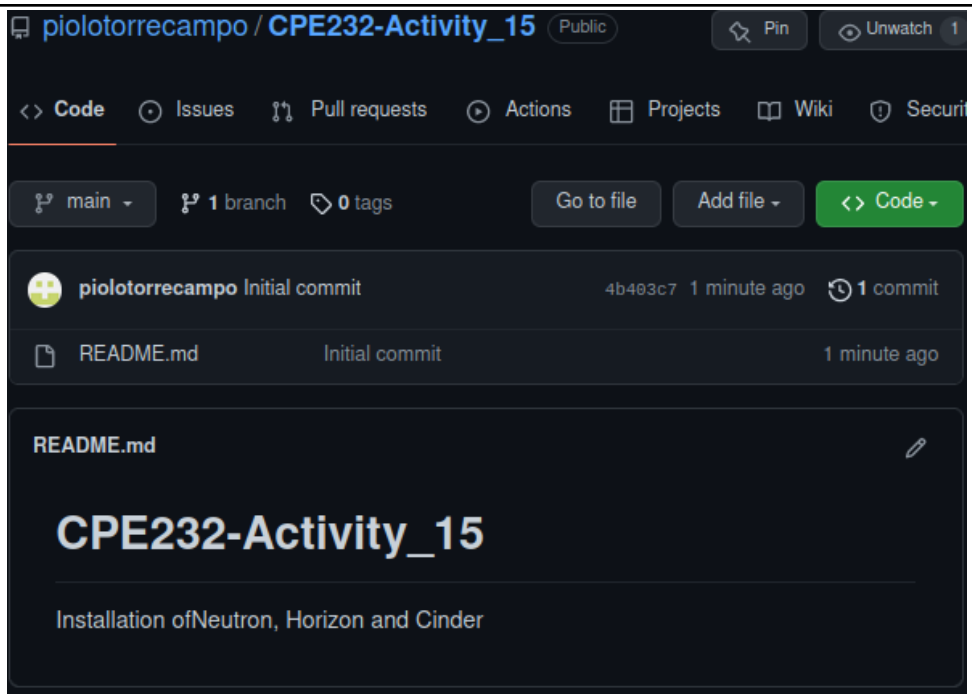


Figure 1. The image above shows the newly created page for this activity.

```
~/Documents/repos +2 ❯ git clone git@github.com:piolotorrecampo/CPE232-Activity_15.git
Cloning into 'CPE232-Activity_15'...
remote: Enumerating objects: 6, done.
remote: Counting objects: 100% (6/6), done.
remote: Compressing objects: 100% (4/4), done.
remote: Total 6 (delta 0), reused 0 (delta 0), pack-reused 0
Receiving objects: 100% (6/6), done.
```

Figure 2. Cloning the created repository to the local machine.

```
Documents/repos/CPE232-Activity_15 ❯ tree
.
├── ansible.cfg
├── install_nhc.yml
├── inventory
└── roles
    ├── cinder
    │   ├── files
    │   │   ├── cinder.conf
    │   │   └── nova.conf
    │   ├── handlers
    │   │   └── main.yml
    │   └── tasks
    │       ├── configure.yml
    │       ├── install.yml
    │       ├── main.yml
    │       └── prereq.yml
    ├── horizon
    │   ├── files
```

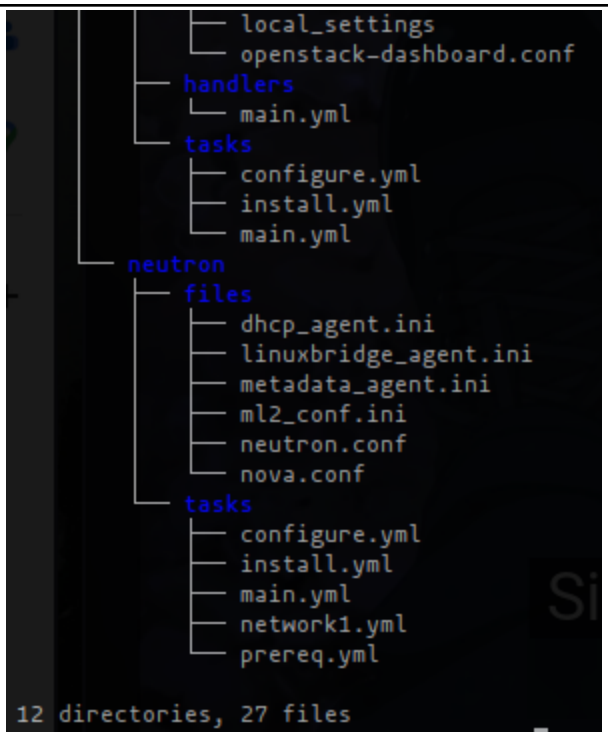


Figure 3. The picture above shows the file structure of the activity.

File Name	Ansible Script

install_nhc.yml	```
	--- 	
	
	- hosts: all
	  become: true
	  pre_tasks:
	
	  - name: Updating and upgrading the operating system
	    yum:
	      name: "*"
	      state: latest
	      update_cache: true
	
	- hosts: controller_node
	  become: true
	  roles:
	    - neutron
	    - horizon
	    - cinder
	``

ansible.cfg	`[defaults]`
	
	`inventory = inventory`
	`host_key_checking = False`
	`deprecation_warnings = False`
	`private_key_file = ~/.ssh/id_rsa`

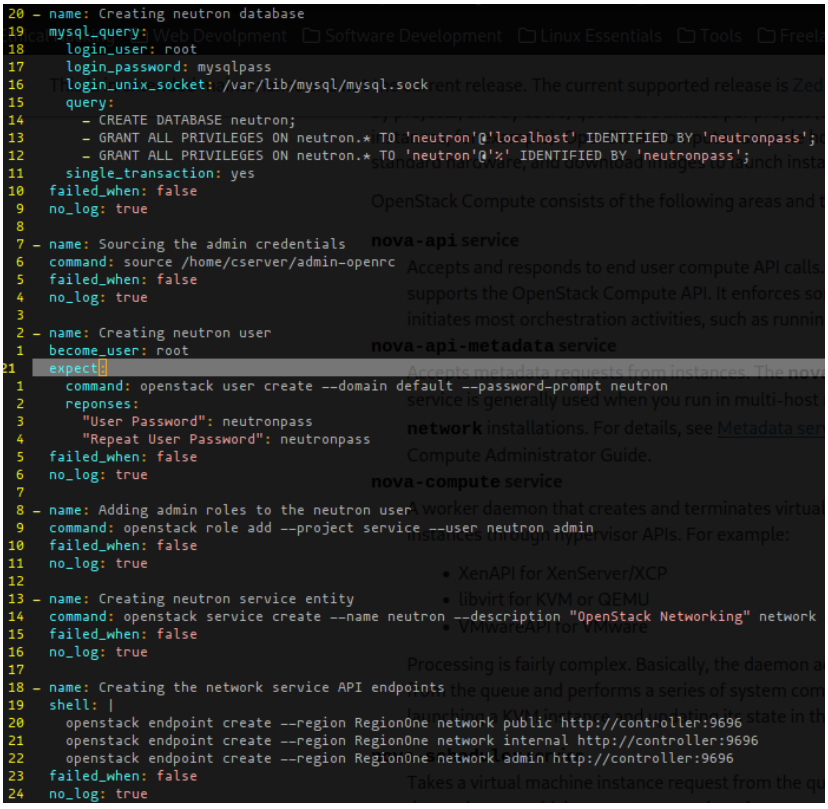
inventory	`[controller_node]` `192.168.30.164 ansible_user=cserver`

Table 1. The table above shows the contents of install_kgn.yml, ansible.cfg, and inventory.

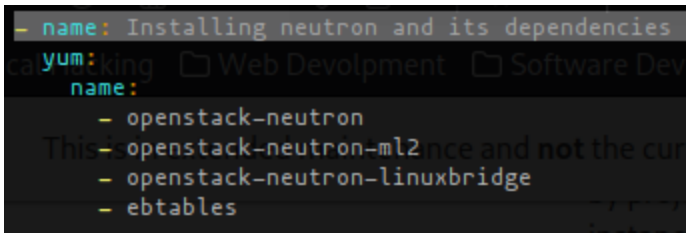
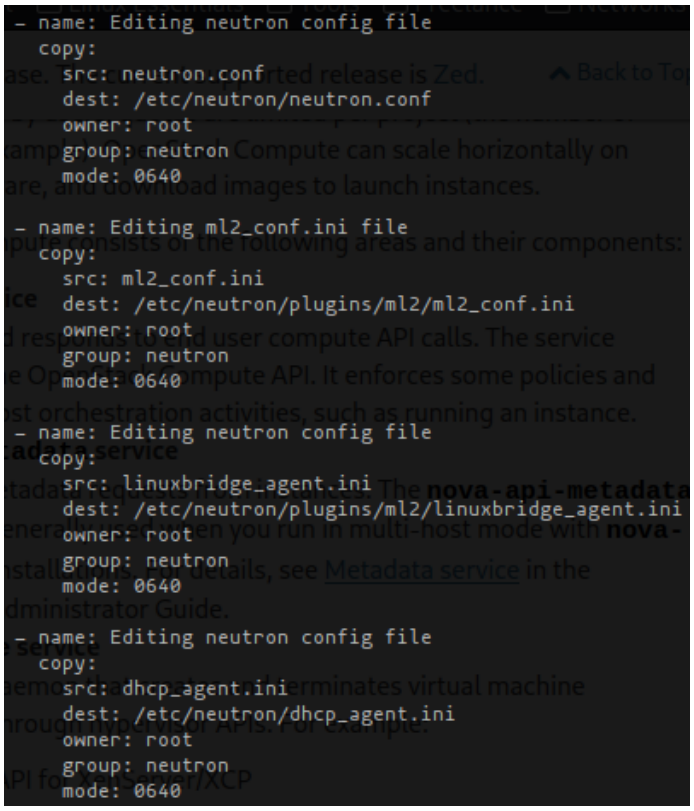
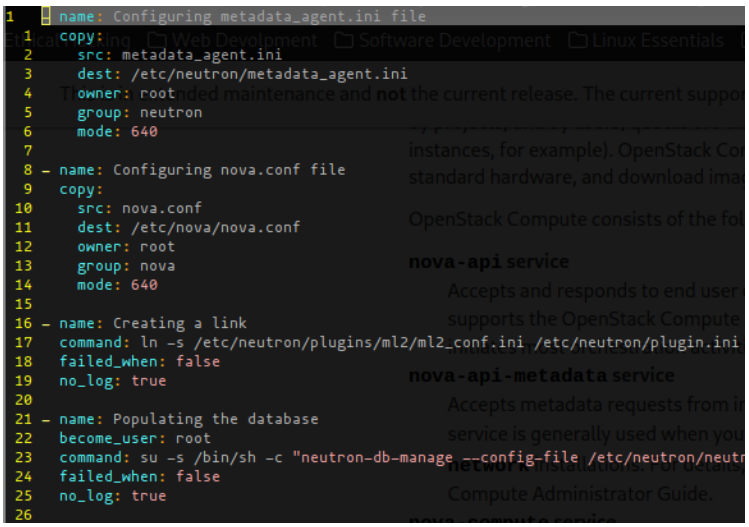
ROLES AND ITS CONTENTS

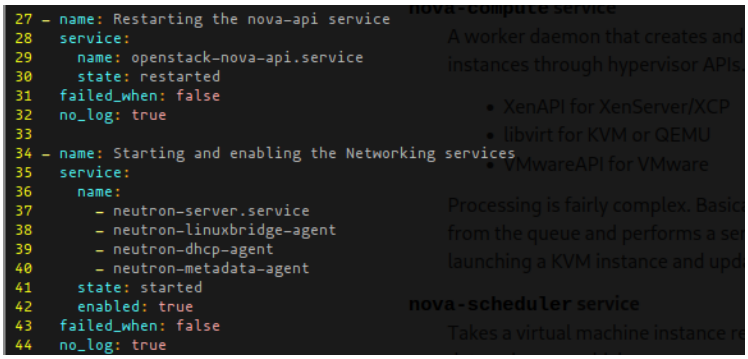
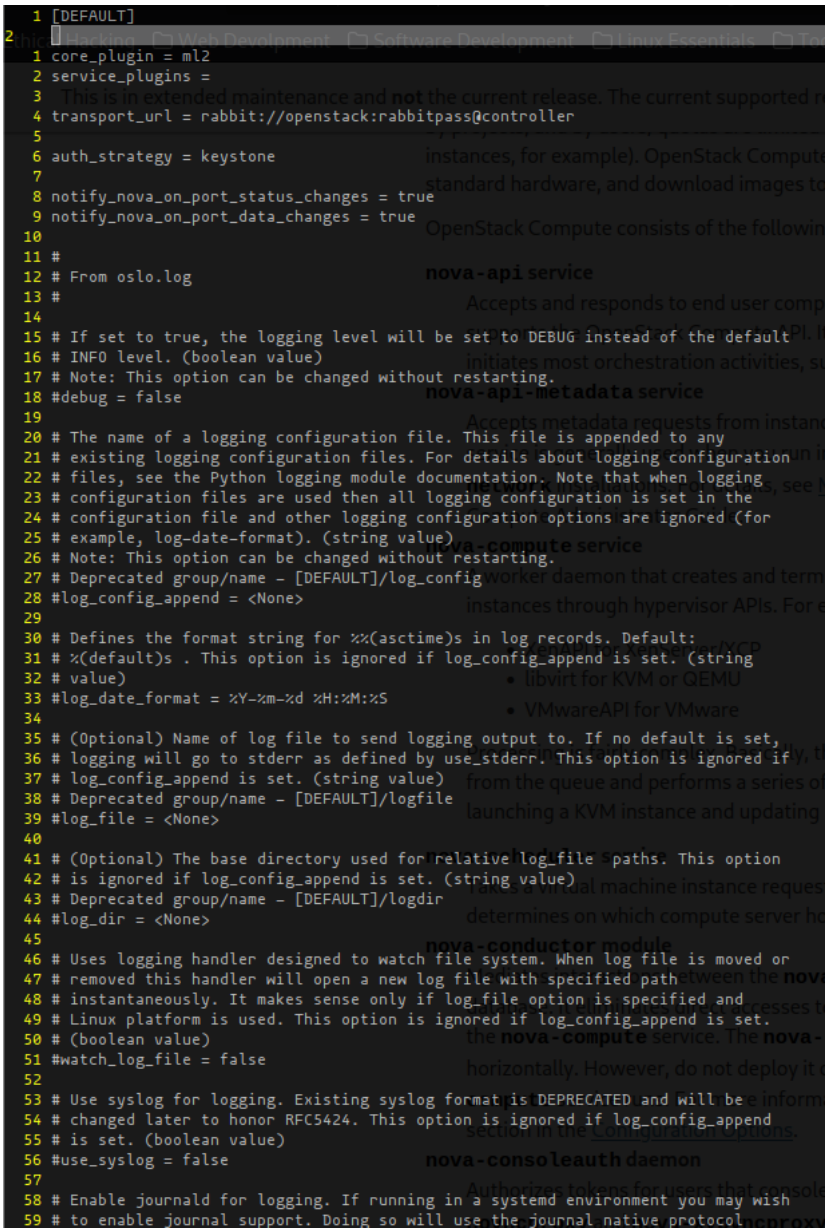
Neutron		
Directory Name	**File Name**	**Ansible Script**

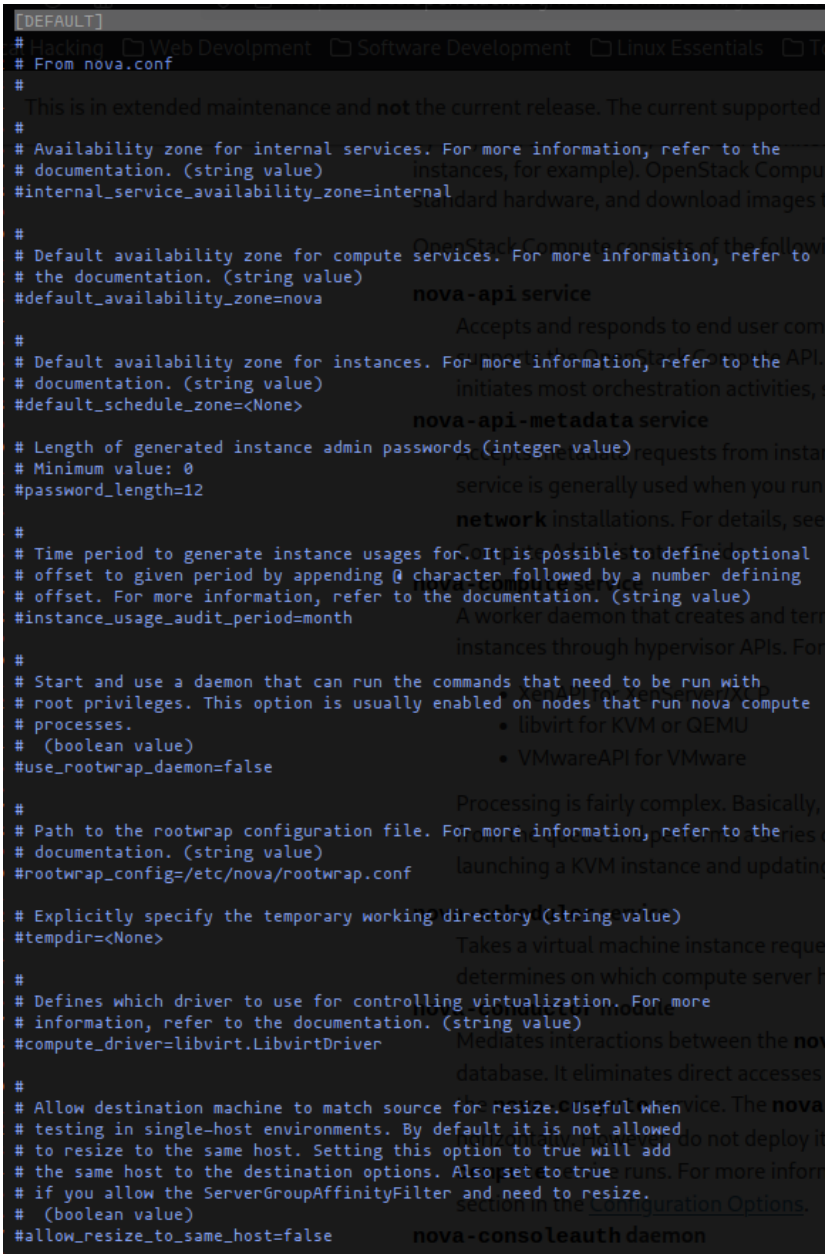
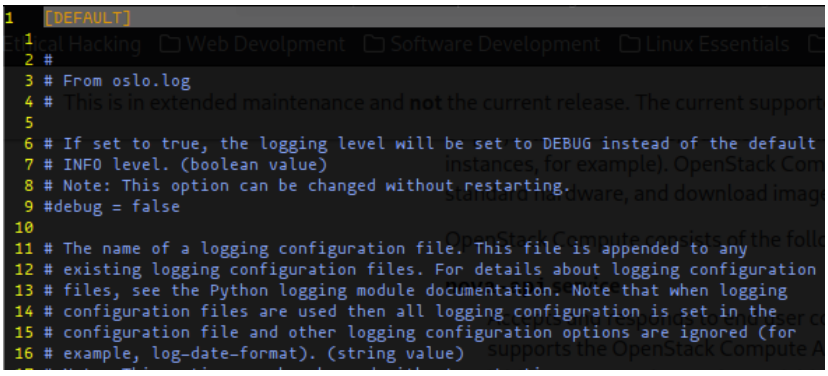
tasks	main.yml	`- import_tasks: prereq.yml`
		`- import_tasks: install.yml`
		`- import_tasks: network1.yml`
		`- import_tasks: configure.yml`

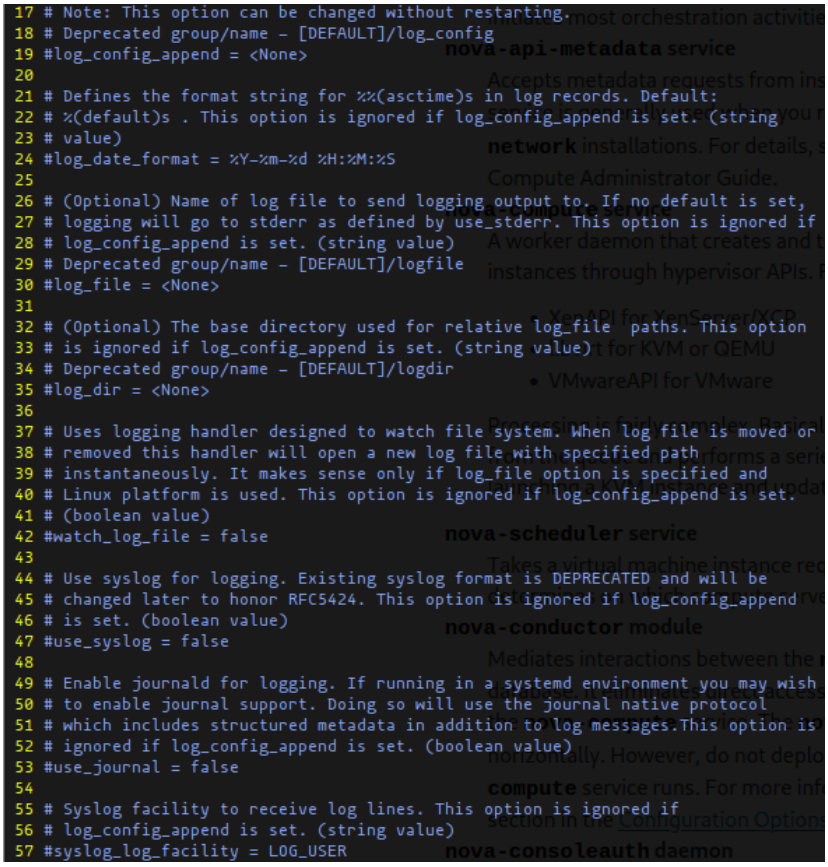
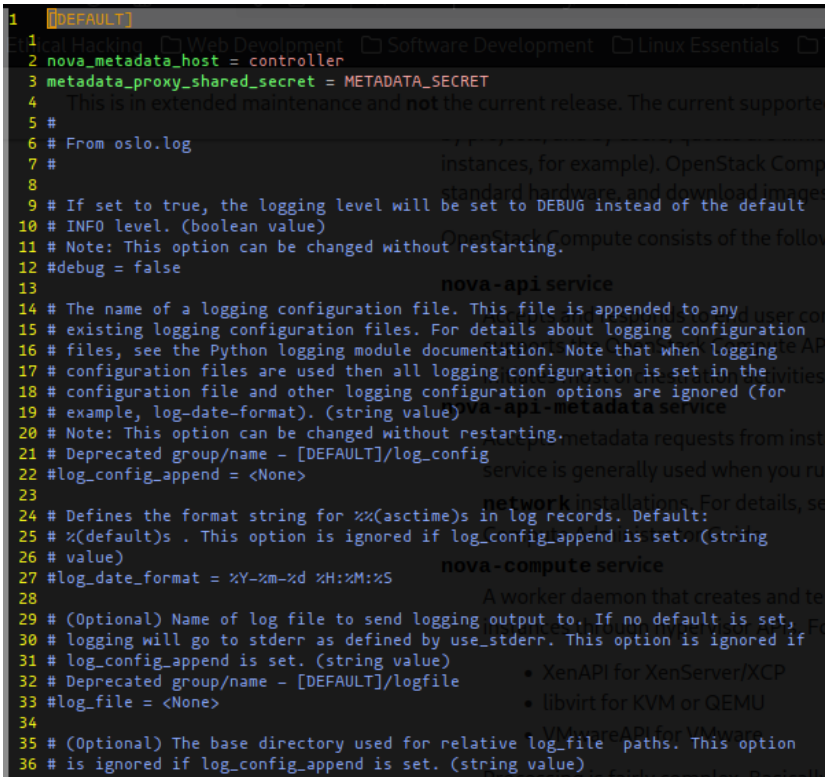
	prereq.yml	

```
- name: Creating neutron database
  mysql_query:
    login_user: root
    login_password: mysqlpass
    login_unix_socket: /var/lib/mysql/mysql.sock
    query:
      - CREATE DATABASE neutron;
      - GRANT ALL PRIVILEGES ON neutron.* TO 'neutron'@'localhost' IDENTIFIED BY 'neutronpass';
      - GRANT ALL PRIVILEGES ON neutron.* TO 'neutron'@'%' IDENTIFIED BY 'neutronpass';
    single_transaction: yes
  failed_when: false
  no_log: true

- name: Sourcing the admin credentials
  command: source /home/cserver/admin-openrc
  failed_when: false
  no_log: true

- name: Creating neutron user
  become_user: root
  expect:
    command: openstack user create --domain default --password-prompt neutron
    reponses:
      "User Password": neutronpass
      "Repeat User Password": neutronpass
  failed_when: false
  no_log: true

- name: Adding admin roles to the neutron user
  command: openstack role add --project service --user neutron admin
  failed_when: false
  no_log: true

- name: Creating neutron service entity
  command: openstack service create --name neutron --description "OpenStack Networking" network
  failed_when: false
  no_log: true

- name: Creating the network service API endpoints
  shell: |
    openstack endpoint create --region RegionOne network public http://controller:9696
    openstack endpoint create --region RegionOne network internal http://controller:9696
    openstack endpoint create --region RegionOne network admin http://controller:9696
  failed_when: false
  no_log: true
```

	install.yml	
	network1.yml	
	configure.yml	

		
files (not all contents are included due to its massive content)	neutron.conf	

	nova.conf	
	ml2_conf.ini	

		
	metadata_agent.ini	

```
# Deprecated group/name - [DEFAULT]/logdir
#log_dir = <None>

# Uses logging handler designed to watch file system. When log file is moved or
# removed this handler will open a new log file with specified path
# instantaneously. It makes sense only if log_file option is specified and
# Linux platform is used. This option is ignored if log_config_append is set.
# (boolean value)
#watch_log_file = false

# Use syslog for logging. Existing syslog format is DEPRECATED and will be
# changed later to honor RFC5424. This option is ignored if log_config_append
# is set. (boolean value)
#use_syslog = false

# Enable journald for logging. If running in a systemd environment you may wish
# to enable journal support. Doing so will use the journal native protocol
# which includes structured metadata in addition to log messages.This option is
# ignored if log_config_append is set. (boolean value)
#use_journal = false

# Syslog facility to receive log lines. This option is ignored if
# log_config_append is set. (string value)
#syslog_log_facility = LOG_USER
```

linuxbridge_agent.ini

```
[DEFAULT]
#
# From oslo.log
#

# If set to true, the logging level will be set to DEBUG instead of the default
# INFO level. (boolean value)
# Note: This option can be changed without restarting.
#debug = false

# The name of a logging configuration file. This file is appended to any
# existing logging configuration files. For details about logging configuration
# files, see the Python logging module documentation. Note that when logging
# configuration files are used then all logging configuration is set in the
# configuration file and other logging configuration options are ignored (for
# example, log-date-format). (string value)
# Note: This option can be changed without restarting.
# Deprecated group/name - [DEFAULT]/log_config
#log_config_append = <None>

# Defines the format string for %%(asctime)s in log records. Default:
# %(default)s . This option is ignored if log_config_append is set. (string
# value)
#log_date_format = %Y-%m-%d %H:%M:%S

# (Optional) Name of log file to send logging output to. If no default is set,
# logging will go to stderr as defined by use_stderr. This option is ignored if
# log_config_append is set. (string value)
# Deprecated group/name - [DEFAULT]/logfile
#log_file = <None>

# (Optional) The base directory used for relative log_file  paths. This option
# is ignored if log_config_append is set. (string value)
# Deprecated group/name - [DEFAULT]/logdir
#log_dir = <None>

# Uses logging handler designed to watch file system. When log file is moved or
# removed this handler will open a new log file with specified path
# instantaneously. It makes sense only if log_file option is specified and
# Linux platform is used. This option is ignored if log_config_append is set.
# (boolean value)
#watch_log_file = false

# Use syslog for logging. Existing syslog format is DEPRECATED and will be
# changed later to honor RFC5424. This option is ignored if log_config_append
# is set. (boolean value)
#use_syslog = false

# Enable journald for logging. If running in a systemd environment you may wish
# to enable journal support. Doing so will use the journal native protocol
# which includes structured metadata in addition to log messages.This option is
# ignored if log_config_append is set. (boolean value)
#use_journal = false
```

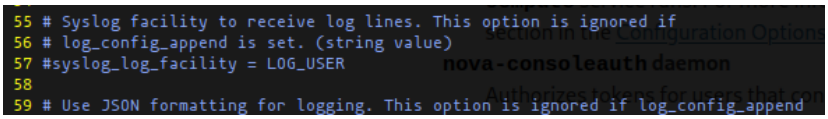
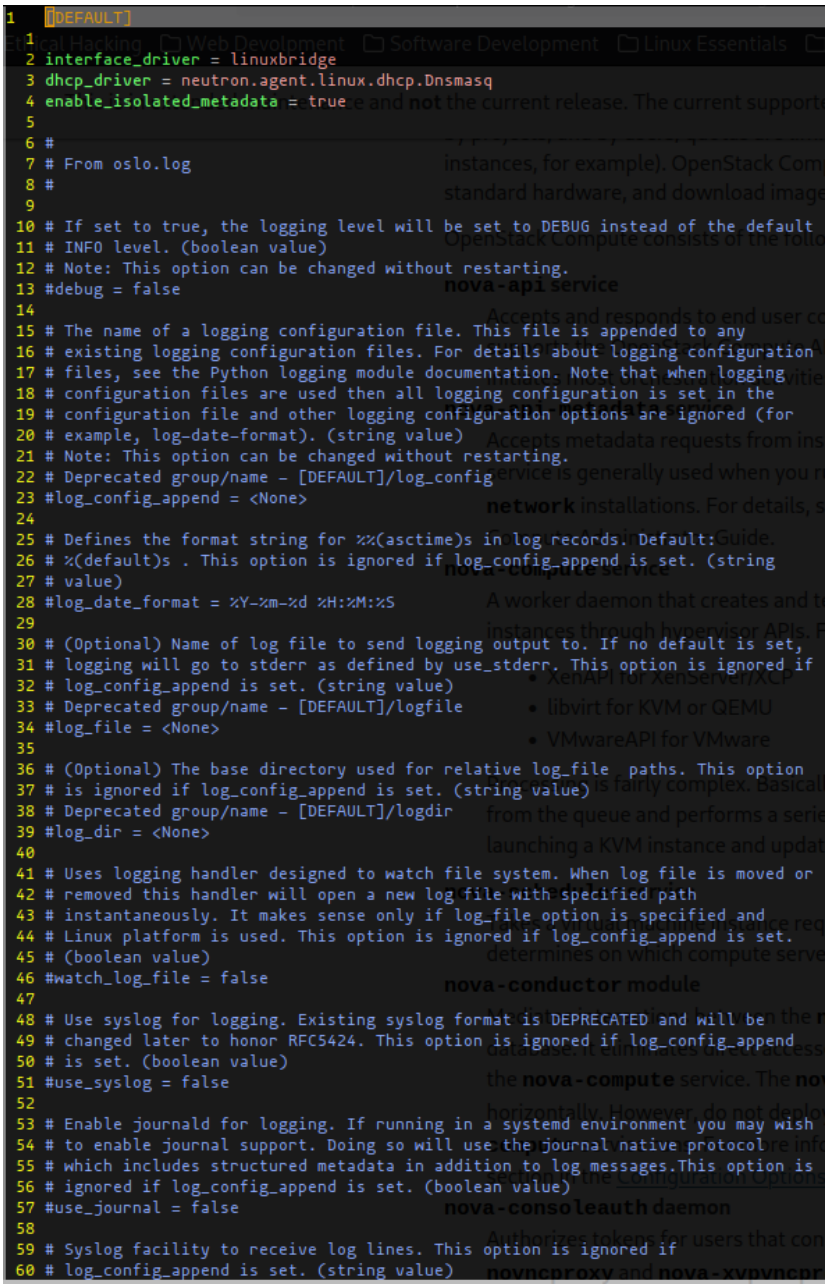
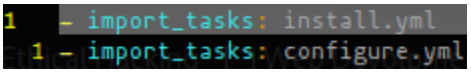
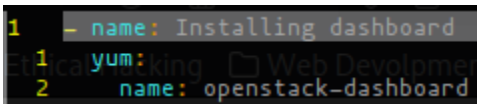
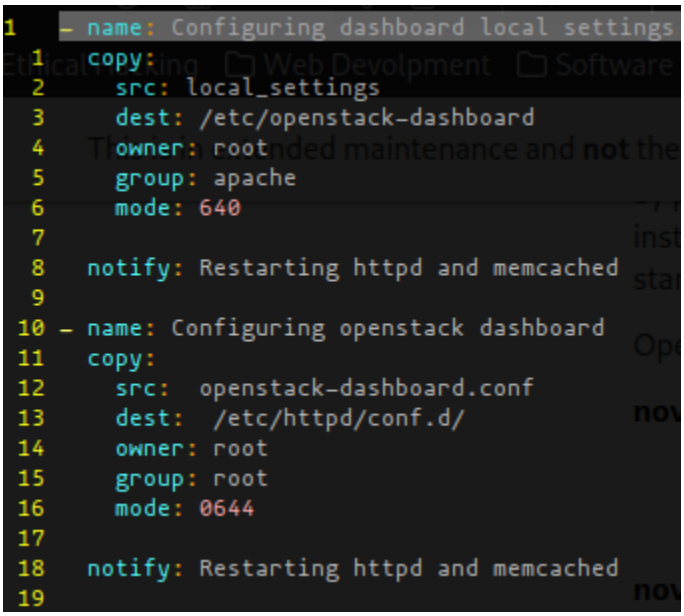
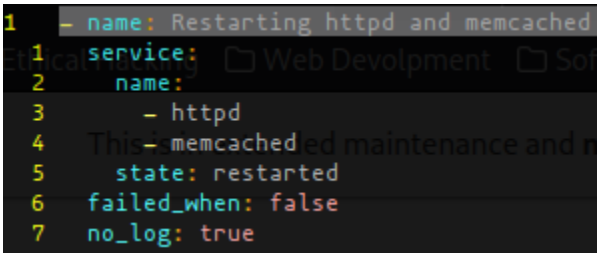
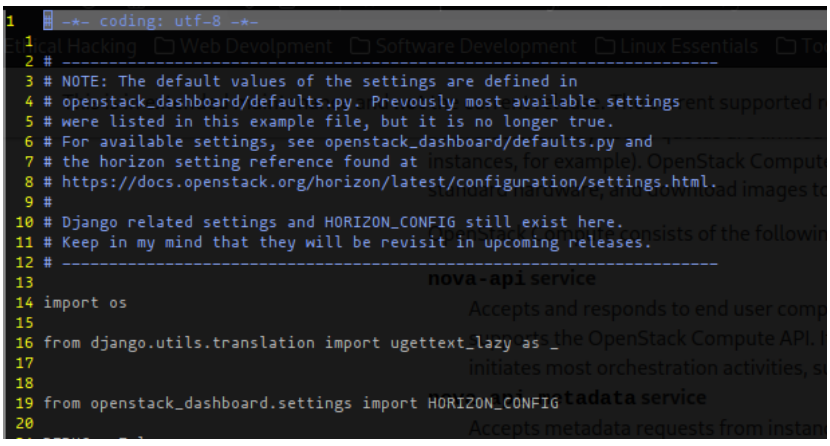
		
	dhcp_agent.ini	

Table 2. The table above shows the file and its contents for the Neutron role.

Horizon		
Directory	**File Name**	**Ansible Script**

Name		
tasks	main.yml	
	install.yml	
	configure.yml	
handlers	main.yml	
files (not all contents are included due to its massive content)	local_settings	

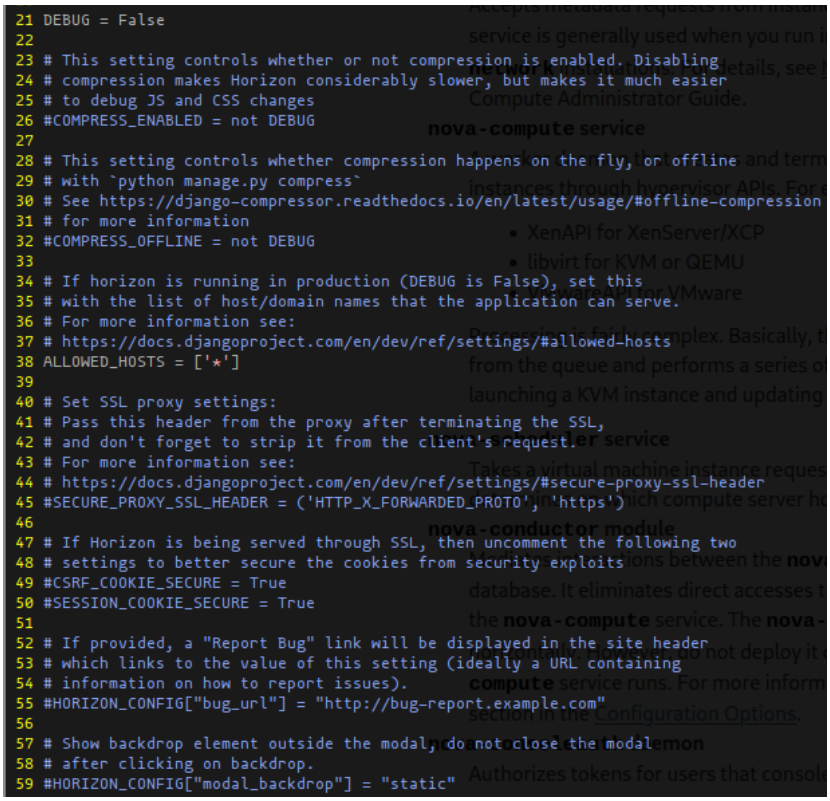
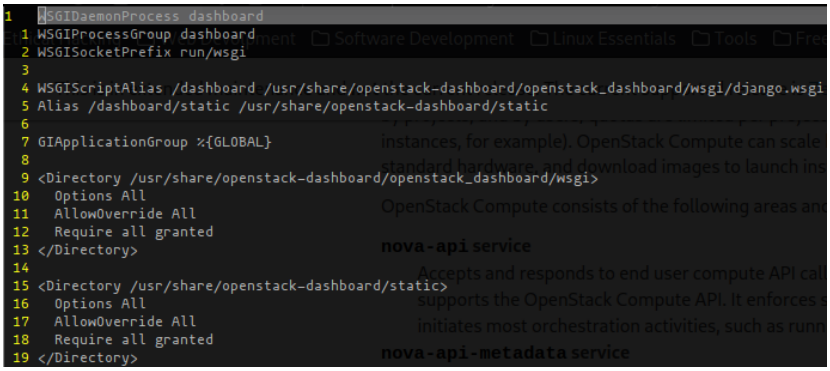
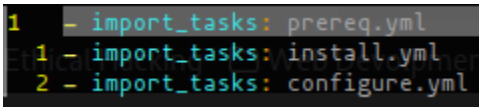
		
	openstack-dashboard.conf	

Table 3. The table above shows the file and its contents for the Horizon role.

Cinder		
Directory Name	**File Name**	**Ansible Script**
tasks	main.yml	

prereq.yml

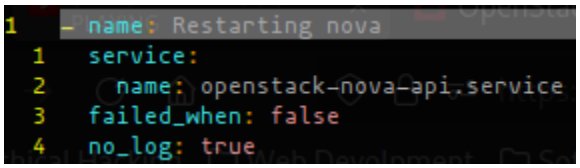
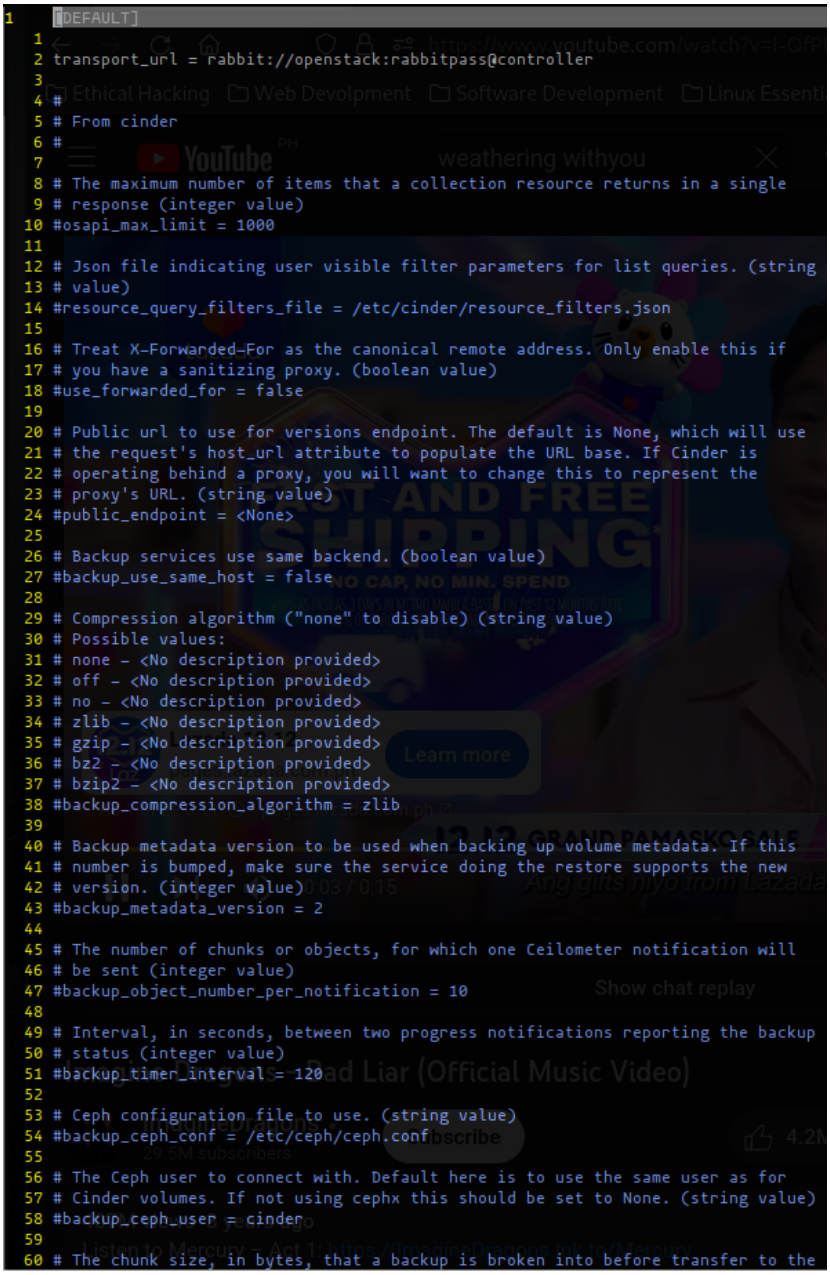
```yaml
- name: Creating cinder database
  mysql_query:
    login_user: root
    login_password: mysqlpass
    login_unix_socket: /var/lib/mysql/mysql.sock
    query:
      - CREATE DATABASE cinder;
      - GRANT ALL PRIVILEGES ON cinder.* TO 'cinder'@'localhost' IDENTIFIED BY 'cinderpass';
      - GRANT ALL PRIVILEGES ON cinder.* TO 'cinder'@'%' IDENTIFIED BY 'cinderpass';
    single_transaction: yes
  failed_when: false
  no_log: true

- name: Sourcing the admin credentials
  command: source /home/cserver/admin-openrc
  failed_when: false
  no_log: true

- name: Creating cinder user
  become_user: root
  expect:
    command: openstack user create --domain default --password-prompt cinder
    reponses:
      "User Password": cinderpass
      "Repeat User Password": cinderpass
  failed_when: false
  no_log: true


- name: Creating cinderv2 and cinderv3 service entities
  shell: |
    openstack service create --name cinderv2 --description "OpenStack Block Storage" volumev2
    openstack service create --name cinderv3 --description "OpenStack Block Storage" volumev3
  failed_when: false
  no_log: true

- name: Creating a block storage service API endpoints
  shell: |
    openstack endpoint create --region RegionOne volumev2 public http://controller:8776/v2/%\(project_id\)s
    openstack endpoint create --region RegionOne volumev2 internal http://controller:8776/v2/%\(project_id\)s
    openstack endpoint create --region RegionOne volumev2 admin http://controller:8776/v2/%\(project_id\)s
    openstack endpoint create --region RegionOne volumev3 public http://controller:8776/v3/%\(project_id\)s
    openstack endpoint create --region RegionOne volumev3 internal http://controller:8776/v3/%\(project_id\)s
    openstack endpoint create --region RegionOne volumev3 admin http://controller:8776/v3/%\(project_id\)s
  failed_when: false
  no_log: true
```

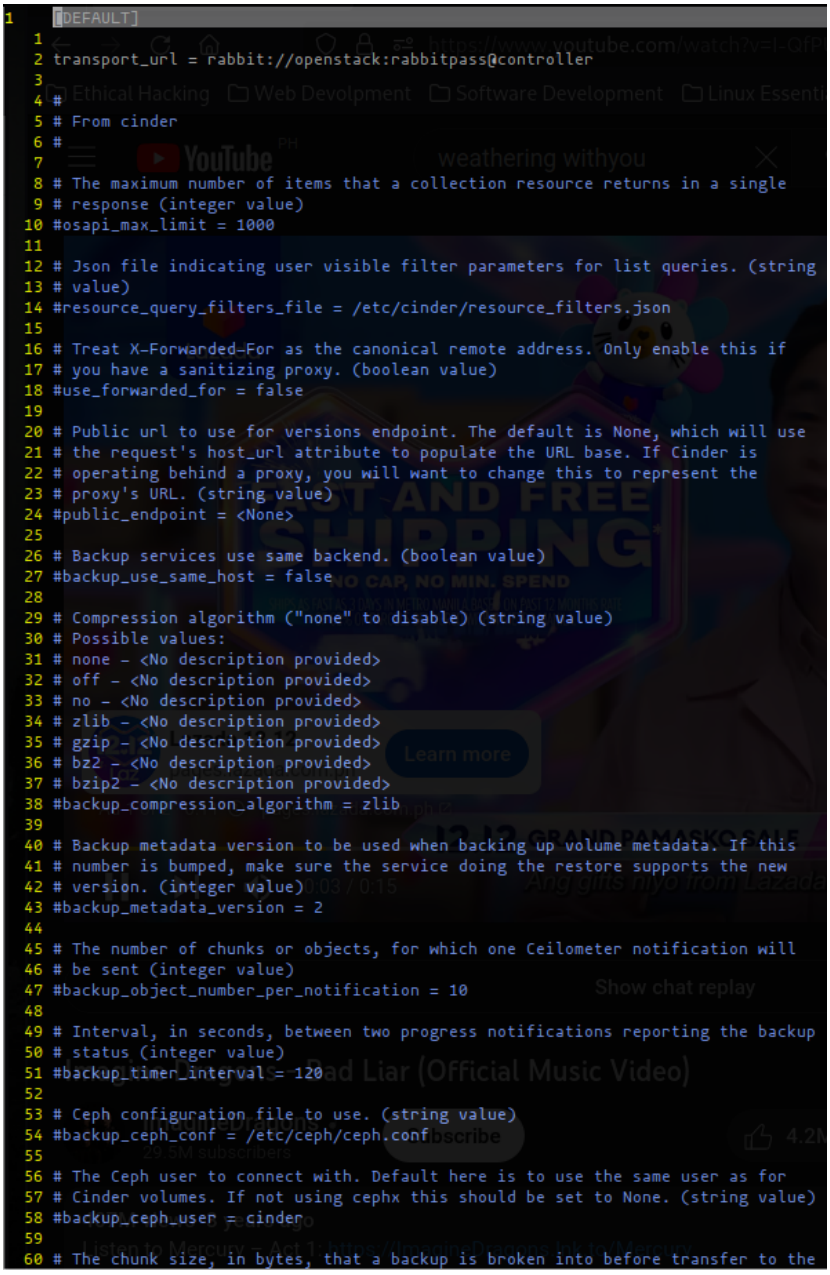
install.yml

```yaml
- name: Installing cinder
  yum:
    name: openstack-cinder
```

configure.yml

```yaml
- name: Configuring cinder config file
  copy:
    src: cinder.conf
    dest: /etc/cinder/cinder.conf
    owner: root
    group: cinder
    mode: 0640

- name: Configuring nova config file
  copy:
    src: nova.conf
    dest: /etc/nova/nova.conf
    owner: root
    group: nova
    mode: 640

  notify: Restarting nova

- name: Populating the Block Storage database
  become_user: root
  command: su -s /bin/sh -c "cinder-manage db sync" cinder
  failed_when: false
  no_log: true

- name: Starting and enabling cinder service
  service:
    name:
      - openstack-cinder-api.service
      - openstack-cinder-scheduler.service
    state: started
```

		
handlers	main.yml	
files (not all contents are included due to its massive content)	cinder.conf	

	nova.conf	

```
[DEFAULT]

transport_url = rabbit://openstack:rabbitpass@controller

#
# From cinder
#

# The maximum number of items that a collection resource returns in a single
# response (integer value)
#osapi_max_limit = 1000

# Json file indicating user visible filter parameters for list queries. (string
# value)
#resource_query_filters_file = /etc/cinder/resource_filters.json

# Treat X-Forwarded-For as the canonical remote address. Only enable this if
# you have a sanitizing proxy. (boolean value)
#use_forwarded_for = false

# Public url to use for versions endpoint. The default is None, which will use
# the request's host_url attribute to populate the URL base. If Cinder is
# operating behind a proxy, you will want to change this to represent the
# proxy's URL. (string value)
#public_endpoint = <None>

# Backup services use same backend. (boolean value)
#backup_use_same_host = false

# Compression algorithm ("none" to disable) (string value)
# Possible values:
# none - <No description provided>
# off - <No description provided>
# no - <No description provided>
# zlib - <No description provided>
# gzip - <No description provided>
# bz2 - <No description provided>
# bzip2 - <No description provided>
#backup_compression_algorithm = zlib

# Backup metadata version to be used when backing up volume metadata. If this
# number is bumped, make sure the service doing the restore supports the new
# version. (integer value)
#backup_metadata_version = 2

# The number of chunks or objects, for which one Ceilometer notification will
# be sent (integer value)
#backup_object_number_per_notification = 10

# Interval, in seconds, between two progress notifications reporting the backup
# status (integer value)
#backup_timer_interval = 120

# Ceph configuration file to use. (string value)
#backup_ceph_conf = /etc/ceph/ceph.conf

# The Ceph user to connect with. Default here is to use the same user as for
# Cinder volumes. If not using cephx this should be set to None. (string value)
#backup_ceph_user = cinder

# The chunk size, in bytes, that a backup is broken into before transfer to the
```

Table 4. The table above shows the file and its contents for the Cinder role.

```
Documents/repos/CPE232-Activity_15 +2 ❯ ansible-playbook --ask-become-pass install_nhc.yml
BECOME password:

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

TASK [Gathering Facts] *********************************************************************************************
***
ok: [192.168.30.164]

TASK [Updating and upgrading the operating system] *****************************************************************
***
ok: [192.168.30.164]
```

```
PLAY [controller_node] *********************************************************************************************************
***

TASK [Gathering Facts] *********************************************************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Creating neutron database] *************************************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Sourcing the admin credentials] ********************************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Creating neutron user] *****************************************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Adding admin roles to the neutron user] ************************************************************************
***
changed: [192.168.30.164]

TASK [neutron : Creating neutron service entity] *******************************************************************************
***
changed: [192.168.30.164]

TASK [neutron : Creating the network service API endpoints] ********************************************************************
***
changed: [192.168.30.164]

TASK [neutron : Installing neutron and its dependencies] ***********************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Editing neutron config file] ***********************************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Editing ml2_conf.ini file] *************************************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Editing neutron config file] ***********************************************************************************
***
ok: [192.168.30.164]
```

```
TASK [neutron : Editing neutron config file] ***********************************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Configuring metadata_agent.ini file] ***************************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Configuring nova.conf file] ************************************************************************************
***
changed: [192.168.30.164]

TASK [neutron : Creating a link] ***********************************************************************************************
***
changed: [192.168.30.164]

TASK [neutron : Populating the database] ***************************************************************************************
***
changed: [192.168.30.164]

TASK [neutron : Restarting the nova-api service] *******************************************************************************
***
ok: [192.168.30.164]

TASK [neutron : Starting and enabling the Networking services] *****************************************************************
***
ok: [192.168.30.164]

TASK [horizon : Installing dashboard] ******************************************************************************************
***
ok: [192.168.30.164]

TASK [horizon : Configuring dashboard local settings] **************************************************************************
***
ok: [192.168.30.164]

TASK [horizon : Configuring openstack dashboard] *******************************************************************************
***
ok: [192.168.30.164]
```

```
TASK [cinder : Creating cinder database] ***************************************************************************
***
ok: [192.168.30.164]

TASK [cinder : Sourcing the admin credentials] *********************************************************************
***
ok: [192.168.30.164]

TASK [cinder : Creating cinder user] *******************************************************************************
***
ok: [192.168.30.164]

TASK [cinder : Creating cinderv2 and cinderv3 service entities] ****************************************************
***
changed: [192.168.30.164]

TASK [cinder : Creating a block storage service API endpoints] *****************************************************
***
changed: [192.168.30.164]
```

```
TASK [cinder : Installing cinder] **********************************************************************************
***
ok: [192.168.30.164]

TASK [cinder : Configuring cinder config file] *********************************************************************
***
changed: [192.168.30.164]

TASK [cinder : Configuring nova config file] ***********************************************************************
***
changed: [192.168.30.164]

TASK [cinder : Populating the Block Storage database] **************************************************************
***
changed: [192.168.30.164]

TASK [cinder : Starting and enabling cinder service] ***************************************************************
***
ok: [192.168.30.164]

RUNNING HANDLER [cinder : Restarting nova] *************************************************************************
***
ok: [192.168.30.164]

PLAY RECAP *********************************************************************************************************
***
192.168.30.164             : ok=34   changed=11   unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

Figure 4. The screenshots above shows the output after running the ansible playbook file.

```
CPE232-Activity_15 on  main [?] +2 ❯ git add *
CPE232-Activity_15 on  main [+] +2 ❯ git commit -m "first commit"
[main 555aba1] first commit
 27 files changed, 20740 insertions(+)
 create mode 100644 ansible.cfg
 create mode 100644 install_nhc.yml
 create mode 100644 inventory
 create mode 100644 roles/cinder/files/cinder.conf
 create mode 100644 roles/cinder/files/nova.conf
 create mode 100644 roles/cinder/handlers/main.yml
 create mode 100644 roles/cinder/tasks/configure.yml
 create mode 100644 roles/cinder/tasks/install.yml
 create mode 100644 roles/cinder/tasks/main.yml
 create mode 100644 roles/cinder/tasks/prereq.yml
 create mode 100644 roles/horizon/files/local_settings
 create mode 100644 roles/horizon/files/openstack-dashboard.conf
 create mode 100644 roles/horizon/handlers/main.yml
 create mode 100644 roles/horizon/tasks/configure.yml
 create mode 100644 roles/horizon/tasks/install.yml
 create mode 100644 roles/horizon/tasks/main.yml
 create mode 100644 roles/neutron/files/dhcp_agent.ini
 create mode 100644 roles/neutron/files/linuxbridge_agent.ini
 create mode 100644 roles/neutron/files/metadata_agent.ini
 create mode 100644 roles/neutron/files/ml2_conf.ini
 create mode 100644 roles/neutron/files/neutron.conf
 create mode 100644 roles/neutron/files/nova.conf
 create mode 100644 roles/neutron/tasks/configure.yml
 create mode 100644 roles/neutron/tasks/install.yml
```

```
 create mode 100644 roles/neutron/tasks/main.yml
 create mode 100644 roles/neutron/tasks/network1.yml
 create mode 100644 roles/neutron/tasks/prereq.yml
CPE232-Activity_15 on  main [⇡] +2 ❯ git push git@github.com-school:piolotorrecampo/CPE232-Activity_15.git
Enumerating objects: 42, done.
Counting objects: 100% (42/42), done.
Delta compression using up to 4 threads
Compressing objects: 100% (39/39), done.
Writing objects: 100% (41/41), 107.47 KiB | 495.00 KiB/s, done.
Total 41 (delta 7), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (7/7), done.
To github.com-school:piolotorrecampo/CPE232-Activity_15.git
   dbb3585..555aba1  main -> main
```

Figure 5. Pushing the repository contents in Github.

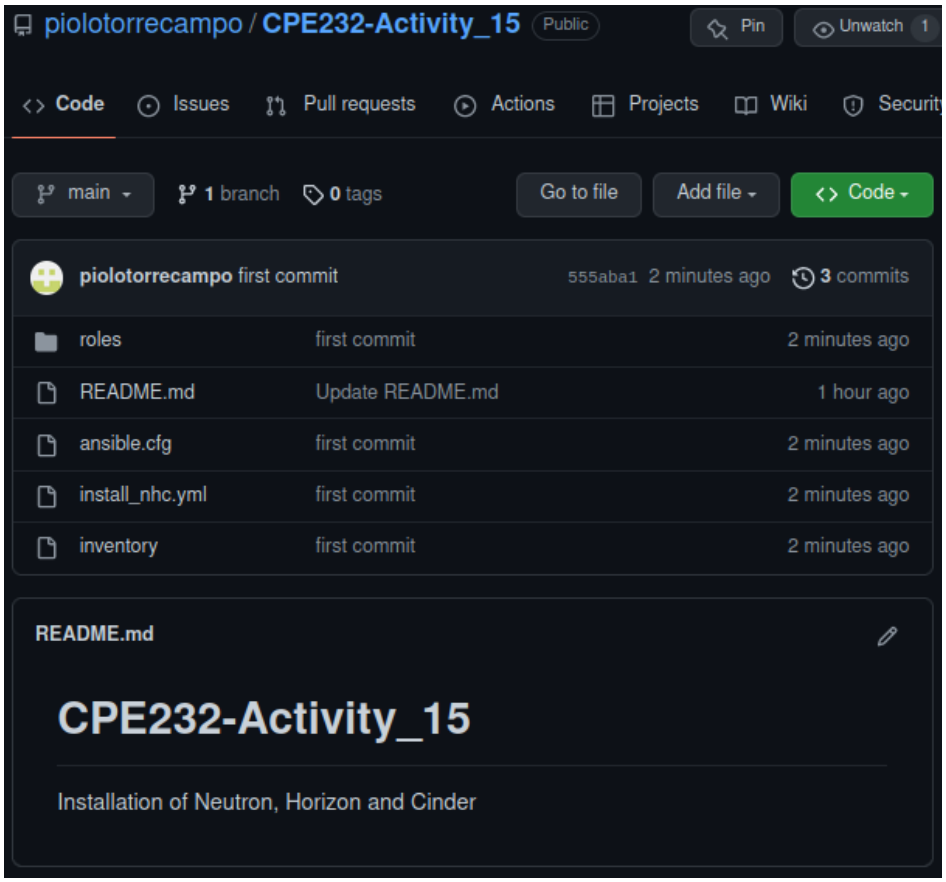


Figure 6. The image above shows the updated Github page.

Reflections:

Answer the following:

1. Describe Neutron, Horizon and Cinder services

   - Neutron is an OpenStack service that provides network connectivity as a service for other OpenStack services. It allows users to create and manage networks, subnets, and routers, as well as to attach interfaces to these networks. Horizon is the web-based dashboard for OpenStack. It provides a graphical user interface for users to manage and interact with the

various OpenStack services, including Neutron. Cinder is an OpenStack block storage service that provides persistent storage for use by other OpenStack services. It allows users to create, attach, and manage block storage volumes and snapshots. Cinder volumes can be used as primary storage for instances or as additional storage attached to instances.

Conclusions:

In conclusion, using Ansible as the Infrastructure as Code (IaC) tool in an OpenStack environment can provide several benefits. Ansible's simple, declarative language and agentless architecture make it easy to manage and deploy complex infrastructure. It also integrates well with other OpenStack components, allowing for a seamless and automated end-to-end workflow. Neutron, Horizon, and Cinder are all important components of the OpenStack cloud computing platform. Neutron provides network connectivity as a service for other OpenStack services, allowing users to create and manage networks, subnets, and routers. Horizon is the web-based dashboard for OpenStack, providing a graphical user interface for users to manage and interact with the various OpenStack services. Cinder provides block storage services, allowing users to create, attach, and manage persistent storage volumes and snapshots. Together, these components form a powerful and flexible platform for managing cloud infrastructure in a consistent and automated manner.

Honor Pledge:

“I affirm that I will not give or receive unauthorized help on this activity and that all will be my own.”