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Activity 14: OpenStack Installation (Keystone, Glance, Nova)

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.

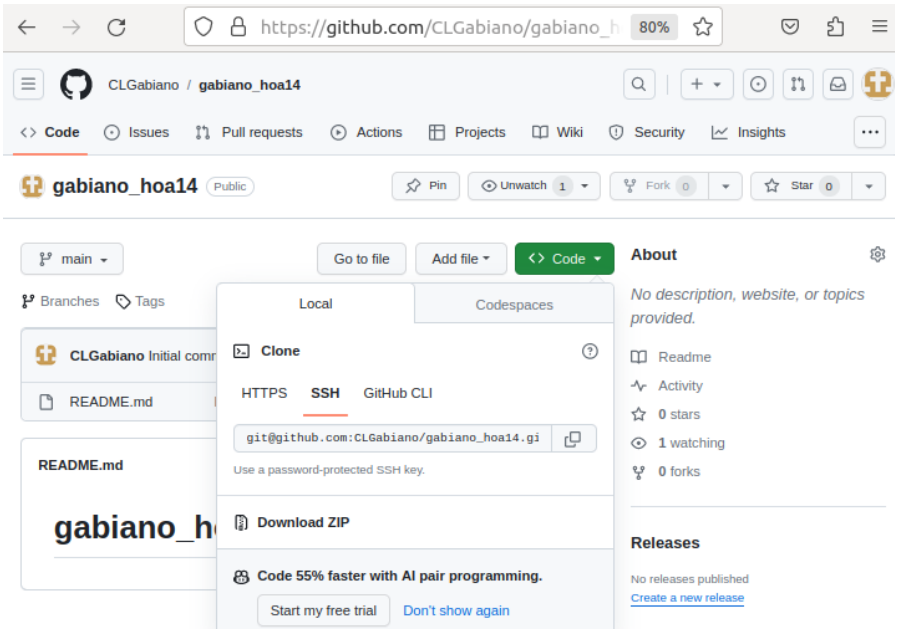
3. Resources

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. Keystone (Identity Service)

```yaml
#This is the main.yml playbook for installing Glance

- name: Install Glance (Ubuntu)
  apt:
    name:
      - glance
    state: latest

- name: Configure Glance database
  replace:
    dest: /etc/glance/glance-api.conf
    regexp: connection = mysql+pymysql://glance:GLANCE_DBPASS@controller/glance
    replace: connection = mysql+pymysql://glance:admin123@controller/glance
    backup: yes

- name: Configure Glance Authentication Key
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[keystone_authtoken\]'
    line: "{{ item }}"
    state: present
    backup: yes

  with_items:
    - www_authenticate_uri = http://controller:5000
    - auth_url = http://controller:5000
    - memcached_servers = controller:11211
    - auth_type = password
    - project_domain_name = Default
    - user_domain_name = Default
    - project_name = service
    - username = glance
    - password = admin123

- name: Configure Glance paste_deploy
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[paste_deploy\]'
    line: 'flavor = keystone'
    backup: yes
```

```yaml
  - name: COnfigure Glance glance_store
    lineinfile:
      dest: /etc/glance/glance-api.conf
      insertafter: '\[glance_store\]'
      line: "{{ item }}"
      state: present
      backup: yes

    with_items:
      - stores = file,http
      - default_store = file
      - filesystem_store_datadir = /var/lib/glance/images/

  - name: Configure Glance oslo_limit
    lineinfile:
      dest: /etc/glance/glance-api.conf
      insertafter: '\[oslo_limit\]'
      line: "{{ item }}"
      state: present
      backup: yes

    with_items:
      - auth_url = http://controller:5000
      - auth_type = password
      - user_domain_id = default
      - username = MY_SERVICE
      - system_scope = all
      - password = MY_PASSWORD
      - endpoint_id = ENDPOINT_ID
      - region_name = RegionOne

  - name: Configure Glance DEFAULT
    lineinfile:
      dest: /etc/glance/glance-api.conf
      insertafter: '\[DEFAULT\]'
      line: 'use_keystone_limits = True'
      backup: yes

  - name: Populating Image Service Database
    shell:
      sudo glance-manage db_sync
```

b. Glance (Imaging Service)

```yaml
#This is the main.yml playbook for installing Keystone

- name: Installing Keystone (Ubuntu)
  apt:
    name: keystone
    state: latest

- name: Configuring Config File
  lineinfile:
    dest: /etc/keystone/keystone.conf
    insertafter: '\[database\]'
    regexp: 'connection = mysql+pymysql://keystone:KEYSTONE_DBPASS@controller/keystone'
    line: 'connection = mysql+pymysql://keystone:admin123@controller/keystone'
    backup: yes
    backrefs: yes

- name: Configuring Config File
  lineinfile:
    dest: /etc/keystone/keystone.conf
    insertafter: '\[token\]'
    line: 'provider = fernet'
    backup: yes

- name: Populating the Database
  shell:
    sudo keystone-manage db_sync

- name: Initialize Fernet Key
  shell:
    keystone-manage fernet_setup --keystone-user keystone --keystone-group keystone

- name: Initialize Fernet Key
  shell:
     keystone-manage credential_setup --keystone-user keystone --keystone-group keystone

 - name: Configuring the Apache (HTTP) Server
   lineinfile:
     dest: /etc/apache2/apache2.conf
     line: 'ServerName controller'
     state: present
     backup: yes

 - name: Configure Administrative Account Environmental Variables
   shell:
     export OS_USERNAME=admin
     export OS_PASSWORD=ADMIN_PASS
     export OS_PROJECT_NAME=admin
     export OS_USER_DOMANI_NAME=Default
     export OS_PROJECT_DOMAIN_NAME=Default
     export OS_AUTH_URL=http://controller:5000/v3
     export OS_IDENTITY_API_VERSION=3
```

c. Nova (Compute Service)

```yaml
#This is the main.yml playbook for installing Nova

- name: Installing Nova (Ubuntu)
  apt:
    name:
      - nova-api
      - nova-conductor
      - nova-novncproxy
      - nova-scheduler
    state: latest

- name: Configuring Nova API
  lineinfile:
    dest: /etc/nova/nova.conf
    regexp: connection = mysql+pymysql://nova:NOVA_DBPASS@controller/nova_api
    line: connection = mysql+pymysql://nova:admin123@controller/nova_api
    backup: yes
    backrefs: yes

- name: Configure Nova API
  lineinfile:
    dest: /etc/nova/nova.conf
    insertafter: '\[api\]'
    line: 'auth_strategy = keystone'
    state: present
    backup: yes

- name: Configuring Nova Database
  lineinfile:
    dest: /etc/nova/nova.conf
    regexp: mysql+pymysql://nova:NOVA_DBPASS@controller/nova
    line: mysql+pymysql://nova:admin123@controller/nova
    backup: yes
    backrefs: yes
```

```yaml
- name: Configure Nova Authentication Token (for Keystone)
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[keystone_authtoken\]'
    line: "{{ item }}"
    state: present
    backup: yes
  with_items:
    - www_authenticate_uri = http://controller:5000/
    - auth_url = http://controller:5000/
    - memcached_servers = controller:11211
    - auth_type = password
    - project_domain_name = Default
    - user_domain_name = Default
    - project_name = service
    - username = nova
    - password = admin123

- name: Configure Nova VNC
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[vnc\]'
    line: "{{ item }}"
    state: present
    backup: yes

  with_items:
    - enabled = true
    - server_listen = $my_ip
    - server_proxyclient_address = $my_ip

- name: Configure Nova placement
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[placement\]'
    line: "{{ item }}"
    state: present
    backup: yes
```

d. Create different plays in installing per server type (controller, compute etc.) and identify it as a group in the Inventory file.

```
#This is the playbook for installing openstack prerequisites

---


- hosts: keystone
  become: true
  roles:
    - role: keystone

- hosts: glance
  become: true
  roles:
    - role: glance

- hosts: nova
  become: true
  roles:
    - role: nova
```

e. Add, commit and push it to your GitHub repo.

```
leonard@workstation:~/gabiano_hoa14$ git add *
leonard@workstation:~/gabiano_hoa14$ git commit -m "ugh"
[main e81e649] ugh
 6 files changed, 294 insertions(+)
 create mode 100644 ansible.cfg
 create mode 100644 inventory
 create mode 100644 openstack.yml
 create mode 100644 roles/glance/tasks/main.yml
 create mode 100644 roles/keystone/tasks/main.yml
 create mode 100644 roles/nova/tasks/main.yml
leonard@workstation:~/gabiano_hoa14$ git push origin
Counting objects: 15, done.
Delta compression using up to 2 threads.
Compressing objects: 100% (9/9), done.
Writing objects: 100% (15/15), 2.86 KiB | 1.43 MiB/s, done.
Total 15 (delta 1), reused 0 (delta 0)
remote: Resolving deltas: 100% (1/1), done.
To github.com:CLGabiano/gabiano_hoa14.git
   45a05a5..e81e649  main -> main
leonard@workstation:~/gabiano_hoa14$
```

5. **Output** (screenshots and explanations)

```
leonard@workstation:~/gabiano_hoa14$ ansible-playbook --ask-become-pass opensta
ck.yml
/home/leonard/.local/lib/python2.7/site-packages/ansible/parsing/vault/__init__
.py:44: CryptographyDeprecationWarning: Python 2 is no longer supported by the
Python core team. Support for it is now deprecated in cryptography, and will be
 removed in the next release.
  from cryptography.exceptions import InvalidSignature
BECOME password:

PLAY [keystone] ****************************************************************
*

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

TASK [keystone : Installing Keystone (Ubuntu)] *********************************
*
changed: [192.168.56.103]

TASK [keystone : Configuring Config File] **************************************
*
ok: [192.168.56.103]

TASK [keystone : Configuring Config File] **************************************
*
changed: [192.168.56.103]
```

```
TASK [keystone : Populating the Database] **************************************
*
changed: [192.168.56.103]

TASK [keystone : Initialize Fernet Key] ****************************************
*
changed: [192.168.56.103]

TASK [keystone : Initialize Fernet Key] ****************************************
*
changed: [192.168.56.103]

TASK [keystone : Configuring the Apache (HTTP) Server] *************************
*
changed: [192.168.56.103]

TASK [keystone : Configure Administrative Account Environmental Variables] ****
*
changed: [192.168.56.103]

PLAY [glance] ******************************************************************
*

TASK [Gathering Facts] *********************************************************
*
ok: [192.168.56.103]
```

```
TASK [glance : Install Glance (Ubuntu)] ****************************************
*
changed: [192.168.56.103]

TASK [glance : Configure Glance database] **************************************
*
ok: [192.168.56.103]

TASK [glance : Configure Glance Authentication Key] ****************************
*
changed: [192.168.56.103] => (item=www_authenticate_uri = http://controller:500
0)
changed: [192.168.56.103] => (item=auth_url = http://controller:5000)
changed: [192.168.56.103] => (item=memcached_servers = controller:11211)
changed: [192.168.56.103] => (item=auth_type = password)
changed: [192.168.56.103] => (item=project_domain_name = Default)
changed: [192.168.56.103] => (item=user_domain_name = Default)
changed: [192.168.56.103] => (item=project_name = service)
changed: [192.168.56.103] => (item=username = glance)
changed: [192.168.56.103] => (item=password = admin123)

TASK [glance : Configure Glance paste_deploy] **********************************
*
changed: [192.168.56.103]

TASK [glance : COnfigure Glance glance_store] ***********************************
*
```

```
TASK [glance : COnfigure Glance glance_store] ********************************
*
changed: [192.168.56.103] => (item=stores = file,http)
changed: [192.168.56.103] => (item=default_store = file)
changed: [192.168.56.103] => (item=filesystem_store_datadir = /var/lib/glance/i
mages/)

TASK [glance : Configure Glance oslo_limit] **********************************
*
ok: [192.168.56.103] => (item=auth_url = http://controller:5000)
ok: [192.168.56.103] => (item=auth_type = password)
changed: [192.168.56.103] => (item=user_domain_id = default)
changed: [192.168.56.103] => (item=username = MY_SERVICE)
changed: [192.168.56.103] => (item=system_scope = all)
changed: [192.168.56.103] => (item=password = MY_PASSWORD)
changed: [192.168.56.103] => (item=endpoint_id = ENDPOINT_ID)
changed: [192.168.56.103] => (item=region_name = RegionOne)

TASK [glance : Configure Glance DEFAULT] *************************************
*
changed: [192.168.56.103]

TASK [glance : Populating Image Service Database] ****************************
*
changed: [192.168.56.103]

PLAY [nova] ******************************************************************
*
```

```
PLAY [nova] ******************************************************************
*

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

TASK [nova : Installing Nova (Ubuntu)] ***************************************
*
changed: [192.168.56.103]

TASK [nova : Configuring Nova API] *******************************************
*
ok: [192.168.56.103]

TASK [nova : Configure Nova API] *********************************************
*
changed: [192.168.56.103]

TASK [nova : Configuring Nova Database] **************************************
*
ok: [192.168.56.103]

TASK [nova : Configure Nova Authentication Token (for Keystone)] *************
*
changed: [192.168.56.103] => (item=www_authenticate_uri = http://controller:500
0/)
```

```
changed: [192.168.56.103] => (item=auth_url = http://controller:5000/)
ok: [192.168.56.103] => (item=memcached_servers = controller:11211)
ok: [192.168.56.103] => (item=auth_type = password)
ok: [192.168.56.103] => (item=project_domain_name = Default)
ok: [192.168.56.103] => (item=user_domain_name = Default)
ok: [192.168.56.103] => (item=project_name = service)
changed: [192.168.56.103] => (item=username = nova)
ok: [192.168.56.103] => (item=password = admin123)

TASK [nova : Configure Nova VNC] *********************************************
*
changed: [192.168.56.103] => (item=enabled = true)
changed: [192.168.56.103] => (item=server_listen = $my_ip)
changed: [192.168.56.103] => (item=server_proxyclient_address = $my_ip)

TASK [nova : Configure Nova placement] ***************************************
*
ok: [192.168.56.103] => (item=region_name = RegionOne)
ok: [192.168.56.103] => (item=project_domain_name = Default)
ok: [192.168.56.103] => (item=project_name = service)
ok: [192.168.56.103] => (item=auth_type = password)
ok: [192.168.56.103] => (item=user_domain_name = Default)
changed: [192.168.56.103] => (item=auth_url = http://controller:5000/v3)
changed: [192.168.56.103] => (item=username = placement)
ok: [192.168.56.103] => (item=password = admin123)

TASK [nova : Configure Nova Default] *****************************************
*
```

```
TASK [nova : Configure Nova Default] ***************************************
*
changed: [192.168.56.103]

TASK [nova : Configure Nova Glance] ****************************************
*
changed: [192.168.56.103]

TASK [nova : Configure Nova olso_concurrency] ******************************
*
changed: [192.168.56.103]

TASK [nova : Additional Configuration of Nova] *****************************
*
changed: [192.168.56.103]

TASK [nova : Additional Configuration] *************************************
*
changed: [192.168.56.103]

TASK [nova : Additional Configuration] *************************************
*
changed: [192.168.56.103]

TASK [nova : Additional Configuration] *************************************
*
changed: [192.168.56.103]
```

```
TASK [nova : Additional Configuration] *************************************
*
changed: [192.168.56.103]

TASK [nova : Additional Configuration] *************************************
*
changed: [192.168.56.103]

PLAY RECAP *********************************************************************
*
192.168.56.103             : ok=33   changed=26   unreachable=0    failed=0
skipped=0    rescued=0    ignored=0
```

OUTPUT:

NOVA:

```
leonard@SERVER1:~$ sudo systemctl status nova-api
● nova-api.service - OpenStack Compute API
   Loaded: loaded (/lib/systemd/system/nova-api.service; enabled; vendor preset
   Active: active (running) since Thu 2023-11-30 17:59:38 PST; 1min 6s ago
 Main PID: 7468 (nova-api)
    Tasks: 4 (limit: 4884)
   CGroup: /system.slice/nova-api.service
           ├─7468 /usr/bin/python2 /usr/bin/nova-api --config-file=/etc/nova/no
           ├─8097 /usr/bin/python2 /usr/bin/nova-api --config-file=/etc/nova/no
           └─8098 /usr/bin/python2 /usr/bin/nova-api --config-file=/etc/nova/no

Nov 30 17:59:38 SERVER1 systemd[1]: Started OpenStack Compute API.
```

GLANCE:

```
leonard@SERVER1:~$ sudo systemctl status glance-api
● glance-api.service - OpenStack Image Service API
   Loaded: loaded (/lib/systemd/system/glance-api.service; enabled; vendor pres
   Active: active (running) since Thu 2023-11-30 18:02:05 PST; 38s ago
 Main PID: 9231 (glance-api)
    Tasks: 3 (limit: 4884)
   CGroup: /system.slice/glance-api.service
           ├─9231 /usr/bin/python2 /usr/bin/glance-api --config-file=/etc/glanc
           ├─9967 /usr/bin/python2 /usr/bin/glance-api --config-file=/etc/glanc
           └─9968 /usr/bin/python2 /usr/bin/glance-api --config-file=/etc/glanc

Nov 30 18:02:07 SERVER1 glance-api[9231]: /usr/lib/python2.7/dist-packages/past
Nov 30 18:02:07 SERVER1 glance-api[9231]:   return pkg_resources.EntryPoint.par
Nov 30 18:02:07 SERVER1 glance-api[9231]: /usr/lib/python2.7/dist-packages/past
Nov 30 18:02:07 SERVER1 glance-api[9231]:   return pkg_resources.EntryPoint.par
Nov 30 18:02:08 SERVER1 glance-api[9231]: /usr/lib/python2.7/dist-packages/past
Nov 30 18:02:08 SERVER1 glance-api[9231]:   return pkg_resources.EntryPoint.par
Nov 30 18:02:08 SERVER1 glance-api[9231]: /usr/lib/python2.7/dist-packages/past
Nov 30 18:02:08 SERVER1 glance-api[9231]:   return pkg_resources.EntryPoint.par
Nov 30 18:02:08 SERVER1 glance-api[9231]: /usr/lib/python2.7/dist-packages/past
Nov 30 18:02:08 SERVER1 glance-api[9231]:   val = callable(*args, **kw)
lines 1-20/20 (END)
```

KEYSTONE:

```
leonard@SERVER1:~$ sudo apt list --installed | grep keystone

WARNING: apt does not have a stable CLI interface. Use with caution in scripts.

keystone/bionic-updates,bionic-updates,bionic-security,bionic-security,now 2:13
.0.4-0ubuntu1 all [installed]
python-keystone/bionic-updates,bionic-updates,bionic-security,bionic-security,n
ow 2:13.0.4-0ubuntu1 all [installed,automatic]
python-keystoneauth1/bionic,bionic,now 3.4.0-0ubuntu1 all [installed,automatic]
python-keystoneclient/bionic,bionic,now 1:3.15.0-0ubuntu1 all [installed,automa
tic]
python-keystonemiddleware/bionic,bionic,now 4.21.0-0ubuntu1 all [installed,auto
matic]
leonard@SERVER1:~$
```

github link: https://github.com/CLGabiano/gabiano_hoa14.git

Reflections:

Answer the following:

1. Describe Keystone, Glance and Nova services

   Keystone, in simple terms, is like the gatekeeper of OpenStack, managing access and authentication, ensuring that only authorized users can enter and use the cloud services.

   Glance acts as the image repository in OpenStack, comparable to a photo album where it stores and manages virtual machine images. These images are like the templates for creating virtual machines, making it easier to replicate and deploy them.

   Nova is the workhorse of OpenStack, functioning as the compute service. It's like the brain that handles the creation and management of virtual machines, ensuring they run smoothly on the cloud infrastructure. Nova takes care of tasks like starting, stopping, and resizing virtual machines to meet user demands.

Conclusions:

In conclusion, embracing cloud services offers notable benefits, such as increased flexibility and scalability. Users can easily access resources and pay only for what they use, akin to having a customizable and cost-efficient computer on demand. However, drawbacks include potential security concerns and reliance on internet connectivity. When evaluating cloud deployment models, public clouds are like shared spaces offering cost-effective scalability, private clouds provide exclusive control over security, while hybrid models strike a balance between flexibility and control.