

Name: Quizon, Nowell Gabriel C.	Date Performed: 12/06/2023
Course/Section: CPE31S5	Date Submitted: 12/06/2023
Instructor: Engr. Roman Richard	Semester and SY: 1 st semester – 2023-2024
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	
<ol style="list-style-type: none"> 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	
<p>Oracle VirtualBox (Hypervisor)</p> <p>1x Ubuntu VM or Centos VM</p>	
4. Tasks	
<ol style="list-style-type: none"> 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/ <ol style="list-style-type: none"> a. Keystone (Identity Service) b. Glance (Imaging Service) c. Nova (Compute Service) d. Create different plays in installing per server type (controller, compute etc.) and identify it as a group in the Inventory file. e. Add, commit and push it to your GitHub repo. 	
5. Output (screenshots and explanations)	

1) Create a new repository for this activity.

The screenshot shows a GitHub repository page for **HOA14.1** (Public). The repository is empty, with options to "Set up GitHub Copilot" and "Add collaborators to this repository". A "Quick setup" section offers instructions for setting up on Desktop or HTTPS, and a link to "Get started by creating a new file or upload". Below this, a section titled "...or create a new repository" provides a series of git commands to create a new repository, commit a README.md file, and push it to the main branch. A terminal window in the foreground shows the execution of these commands:

```
nowellgabriel@workstation: ~  
nowellgabriel@workstation:~$ ls  
CPE232_Quizon    Documents    HOA11.1    HOA9.1    Public    snap  
CPE_MIDEXAM_QUIZON Downloads    HOA13.1    Music    Quizon_PrelimExam Templates  
Desktop          HOA10.1    HOA8.1    Pictures  site.yml  Videos  
nowellgabriel@workstation:~$ git clone git@github.com:CPEQUIZON/HOA14.1.git  
Cloning into 'HOA14.1'...  
warning: You appear to have cloned an empty repository.  
nowellgabriel@workstation:~$ ls  
CPE232_Quizon    Downloads    HOA14.1    Pictures    snap  
CPE_MIDEXAM_QUIZON HOA10.1    HOA8.1    Public    Templates  
Desktop          HOA11.1    HOA9.1    Quizon_PrelimExam Videos  
Documents        HOA13.1    Music    site.yml  
nowellgabriel@workstation:~$
```

ansible.cfg

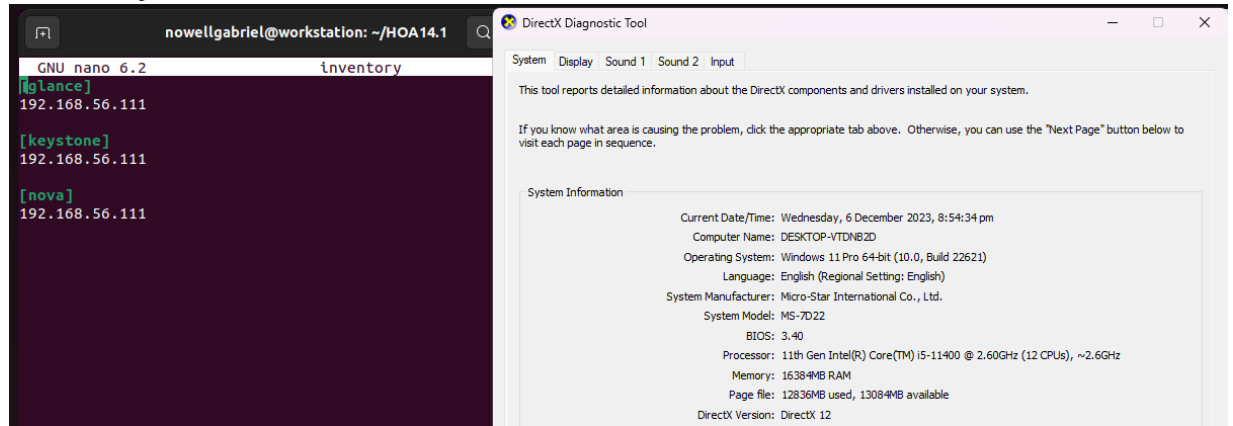
The screenshot shows a terminal window with the **ansible.cfg** file open in nano. The configuration includes:

```
GNU nano 6.2 ansible.cfg  
[Defaults]  
  
inventory = inventory  
host_key_checking = False  
  
deprecation_warnings = False  
  
remote_user = nowellgabriel  
private_key_file = ~/.ssh/  
  
[ssh_connection]  
ssh_args = -o ControlMaster=auto -o ControlPersist=30m  
scp_if_ssh = True  
pipelining = True  
ssh_control_path = ~/.ssh/control_path
```

Overlaid on the terminal is the **DirectIX Diagnostic Tool** window, which displays system information:

```
System Information  
Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm  
Computer Name: DESKTOP-VTDNB2D  
Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)  
Language: English (Regional Setting: English)  
System Manufacturer: Micro-Star International Co., Ltd.  
System Model: MS-7D22  
BIOS: 3.40  
Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz  
Memory: 16384MB RAM  
Page file: 12836MB used, 13084MB available  
DirectX Version: DirectX 12  
  
[x] Check for WHQL digital signatures
```

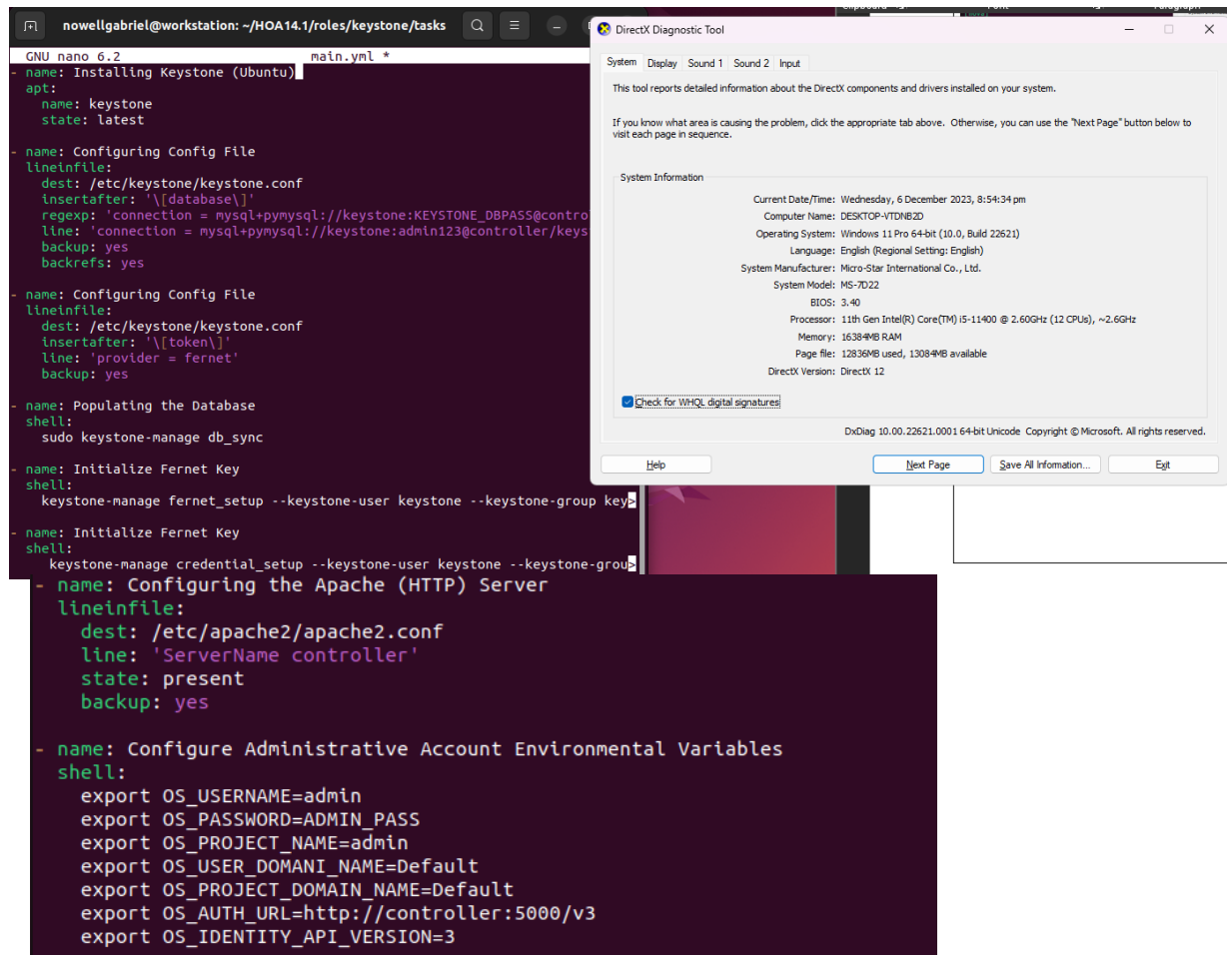
inventory



2) Create a playbook that converts the steps in the following items in

<https://docs.openstack.org/install-guide/>

a.) Keystone (Identity Service)



b.) Glance (Imaging Service)

The screenshot displays a workstation environment with two main windows. The primary window is a terminal running GNU nano 6.2, editing a file named `main.yml`. The file contains Ansible playbooks for configuring the Glance service. The second window is the Windows 'DirectX Diagnostic Tool', which provides system information.

Terminal Window (GNU nano 6.2):

```
main.yml *
- 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 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'
```

Windows System Information Window:

System Information

Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
Computer Name: DESKTOP-VTDNBZD
Operating System: Windows 11 Pro 64-bit (10.0, Build 22621)
Language: English (Regional Setting: English)
System Manufacturer: Micro-Star International Co., Ltd.
System Model: MS-7D22
BIOS: 3.40
Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
Memory: 16384MB RAM
Page file: 12836MB used, 13084MB available
DirectX Version: DirectX 12

Check for WHQL digital signatures

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Reflections:
Answer the following:
1. Describe Keystone, Glance and Nova service

Conclusions:

b.) Glance (Imaging Service)

c.) Nova (Compute Service)

c.) Nova (Compute Service)

The image displays three screenshots of a terminal window using nano 6.2 to edit the `main.yml` file for Nova configuration, alongside three screenshots of the DirectX Diagnostic Tool window.

Terminal Screenshot 1: Shows the initial configuration for installing Nova (Ubuntu) and configuring the Nova API.

```
GNU nano 6.2 main.yml *
- 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
```

Terminal Screenshot 2: Shows the configuration for Nova Authentication Token (for Keystone) and Nova VNC.

```
GNU nano 6.2 main.yml *
- 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
```

Terminal Screenshot 3: Shows the configuration for Nova placement and Nova Default.

```
GNU nano 6.2 main.yml *
- name: Configure Nova placement
  lineinfile:
    dest: /etc/glance/glance-api.conf
    insertafter: '\[placement\]'
    line: '{{ item }}'
    state: present
    backup: yes
  with_items:
    - region_name = RegionOne
    - project_domain_name = Default
    - project_name = service
    - auth_type = password
    - user_domain_name = Default
    - auth_url = http://controller:5000/v3
    - username = placement
    - password = admin123

- name: Configure Nova Default
  lineinfile:
    dest: /etc/nova/nova.conf
    line: 'my_ip = 10.0.0.11'
    state: present
    backup: yes

- name: Configure Nova Glance
  lineinfile:
    dest: /etc/nova/nova.conf
    line: 'api_server = http://controller:9292'
    state: present
    backup: yes
```

DirectX Diagnostic Tool Screenshot 1: Shows the System Information tab.

System Information

- Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
- Computer Name: DESKTOP-VTDNB2D
- Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)
- Language: English (Regional Setting: English)
- System Manufacturer: Micro-Star International Co., Ltd.
- System Model: MS-7022
- BIOS: 3.40
- Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
- Memory: 16384MB RAM
- Page file: 12836MB used, 13084MB available
- DirectX Version: DirectX 12

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DirectX Diagnostic Tool Screenshot 2: Shows the System Information tab.

System Information

- Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
- Computer Name: DESKTOP-VTDNB2D
- Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)
- Language: English (Regional Setting: English)
- System Manufacturer: Micro-Star International Co., Ltd.
- System Model: MS-7022
- BIOS: 3.40
- Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
- Memory: 16384MB RAM
- Page file: 12836MB used, 13084MB available
- DirectX Version: DirectX 12

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DirectX Diagnostic Tool Screenshot 3: Shows the System Information tab.

System Information

- Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
- Computer Name: DESKTOP-VTDNB2D
- Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)
- Language: English (Regional Setting: English)
- System Manufacturer: Micro-Star International Co., Ltd.
- System Model: MS-7022
- BIOS: 3.40
- Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
- Memory: 16384MB RAM
- Page file: 12836MB used, 13084MB available
- DirectX Version: DirectX 12

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```

- name: Configure Nova also_concurrency
  lineinfile:
    dest: /etc/nova/nova.conf
    line: 'lock_path = /var/lib/nova/tmp'
    state: present
    backup: yes

- name: Additional Configuration of Nova
  shell:
    sudo nova-manage api_db sync

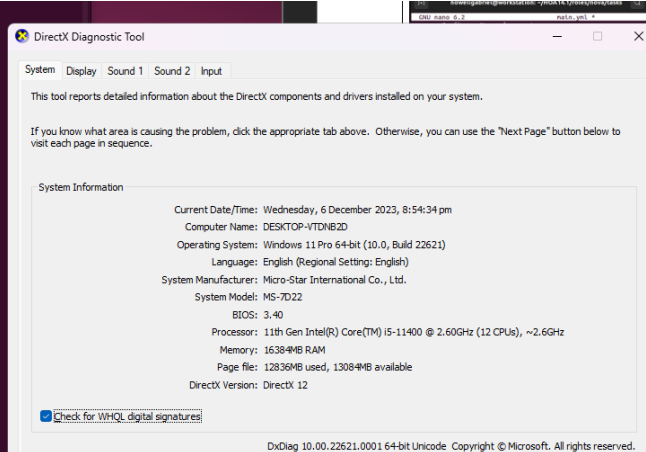
- name: Additional Configuration
  shell:
    sudo nova-manage cell_v2 map_cell0

# name: Additional Configuration
# shell:
#   sudo nova-manage cell_v2 create_cell --name=cell1 --verbose

- name: Additional Configuration
  shell:
    sudo nova-manage db sync

- name: Additional Configuration
  shell:
    sudo nova-manage cell_v2 list_cells

```



- Proof

```

nowellgabriel@workstation:~/HOA14.1$ ansible-playbook --ask-become-pass install_kgn.yml
BECOME password:

```

```

PLAY [keystone] *****
*
TASK [Gathering Facts] *****
*
ok: [192.168.56.111]
*
TASK [keystone : Installing Keystone (Ubuntu)] **
*
changed: [192.168.56.111]
*
TASK [keystone : Configuring Config File] *****
*
ok: [192.168.56.111]
*
TASK [keystone : Configuring Config File] *****
*
changed: [192.168.56.111]
*
TASK [keystone : Populating the Database] *****
*
changed: [192.168.56.111]
*
TASK [keystone : Initialize Fernet Key] *****
*
changed: [192.168.56.111]
*
TASK [keystone : Initialize Fernet Key] *****
*
changed: [192.168.56.111]
*
TASK [keystone : Configuring the Apache (HTTP) Server] *****
*
changed: [192.168.56.111]
*
TASK [keystone : Configure Administrative Account Environmental Variables] *
*
changed: [192.168.56.111]
*
PLAY [glance] *****
*
TASK [Gathering Facts] *****
*
ok: [192.168.56.111]
*
TASK [glance : Install Glance (Ubuntu)] *****
*
changed: [192.168.56.111]

```



```
TASK [glance : Configure Glance database] *****
*
ok: [192.168.56.111]

TASK [glance : Configure Glance Authentication Key] *****
*
changed: [192.168.56.111] => (item=www_authenticate_url = http://controller:5000/)
changed: [192.168.56.111] => (item=auth_url = http://controller:5000/)
changed: [192.168.56.111] => (item=memcached_servers = controller:11211)
changed: [192.168.56.111] => (item=auth_type = password)
changed: [192.168.56.111] => (item=project_domain_name = Default)
changed: [192.168.56.111] => (item=user_domain_name = Default)
changed: [192.168.56.111] => (item=project_name = service)
changed: [192.168.56.111] => (item=username = glance)
changed: [192.168.56.111] => (item=password = admin123)

TASK [glance : Configure Glance paste_deploy] *****
*
changed: [192.168.56.111]

TASK [glance : Configure Glance glance_store] *****
*
changed: [192.168.56.111] => (item=stores = file,http)
changed: [192.168.56.111] => (item=default_store = file)
changed: [192.168.56.111] => (item=filesystem_store_datadir = /var/lib/glance/images/)

TASK [glance : Configure Glance oslo_limit] *****
*
ok: [192.168.56.111] => (item=auth_url = http://controller:5000/)
ok: [192.168.56.111] => (item=auth_type = password)
changed: [192.168.56.111] => (item=user_domain_id = default)
changed: [192.168.56.111] => (item=username = MY_SERVICE)
changed: [192.168.56.111] => (item=system_scope = all)
changed: [192.168.56.111] => (item=password = MY_PASSWORD)
changed: [192.168.56.111] => (item=endpoint_id = ENDPOINT_ID)
changed: [192.168.56.111] => (item=region_name = RegionOne)

TASK [glance : Configure Glance DEFAULT] *****
*
changed: [192.168.56.111]

TASK [glance : Populating Image Service Database] *****
*
changed: [192.168.56.111]

PLAY [nova] *****
*

TASK [Gathering Facts] *****
*
ok: [192.168.56.111]

TASK [Gathering Facts] *****
*
ok: [192.168.56.111]

TASK [nova : Installing Nova (Ubuntu)] *****
*
changed: [192.168.56.111]

TASK [nova : Configuring Nova API] *****
*
ok: [192.168.56.111]

TASK [nova : Configure Nova API] *****
*
changed: [192.168.56.111]

TASK [nova : Configuring Nova Database] *****
*
ok: [192.168.56.111]

TASK [nova : Configure Nova Authentication Token (for Keystone)] *****
*
changed: [192.168.56.111] => (item=www_authenticate_url = http://controller:5000/)
changed: [192.168.56.111] => (item=auth_url = http://controller:5000/)
ok: [192.168.56.111] => (item=memcached_servers = controller:11211)
ok: [192.168.56.111] => (item=auth_type = password)
ok: [192.168.56.111] => (item=project_domain_name = Default)
ok: [192.168.56.111] => (item=user_domain_name = Default)
ok: [192.168.56.111] => (item=project_name = service)
changed: [192.168.56.111] => (item=username = nova)
ok: [192.168.56.111] => (item=password = admin123)

TASK [nova : Configure Nova VNC] *****
*
changed: [192.168.56.111] => (item=enabled = true)
changed: [192.168.56.111] => (item=server_listen = $my_ip)
changed: [192.168.56.111] => (item=server_proxyclient_address = $my_ip)
```

System Display Sound 1 Sound 2 Input

This tool reports detailed information about the DirectX components and drivers installed on your system.

If you know what area is causing the problem, click the appropriate tab above. Otherwise, you can use the "Next Page" button below to visit each page in sequence.

System Information

Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
Computer Name: DESKTOP-VTDN82D
Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)
Language: English (Regional Setting: English)
System Manufacturer: Micro-Star International Co., Ltd.
System Model: MS-7D22
BIOS: 3.40
Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
Memory: 16384MB RAM
Page file: 12836MB used, 13084MB available
DirectX Version: DirectX 12

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System Display Sound 1 Sound 2 Input

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System Information

Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
Computer Name: DESKTOP-VTDN82D
Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)
Language: English (Regional Setting: English)
System Manufacturer: Micro-Star International Co., Ltd.
System Model: MS-7D22
BIOS: 3.40
Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
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Page file: 12836MB used, 13084MB available
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DirectX Diagnostic Tool

System Display Sound 1 Sound 2 Input

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System Information

Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
Computer Name: DESKTOP-VTDN82D
Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)
Language: English (Regional Setting: English)
System Manufacturer: Micro-Star International Co., Ltd.
System Model: MS-7D22
BIOS: 3.40
Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
Memory: 16384MB RAM
Page file: 12836MB used, 13084MB available
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nowellgabriel@workstation: ~/HOA14.1

TASK [nova : Configure Nova placement] *****
*
ok: [192.168.56.111] => (item=region_name = RegionOne)
ok: [192.168.56.111] => (item=project_domain_name = Default)
ok: [192.168.56.111] => (item=project_name = service)
ok: [192.168.56.111] => (item=auth_type = password)
ok: [192.168.56.111] => (item=user_domain_name = Default)
changed: [192.168.56.111] => (item=auth_url = http://controller:5000/v3)
changed: [192.168.56.111] => (item=username = placement)
ok: [192.168.56.111] => (item=password = admin123)

TASK [nova : Configure Nova Default] *****
*
changed: [192.168.56.111]

TASK [nova : Configure Nova Glance] *****
*
changed: [192.168.56.111]

TASK [nova : Configure Nova also_concurrency] *****
*
changed: [192.168.56.111]

TASK [nova : Additional Configuration of Nova] *****
*
changed: [192.168.56.111]

TASK [nova : Additional Configuration] *****
*
changed: [192.168.56.111]

TASK [nova : Additional Configuration] *****
*
changed: [192.168.56.111]

TASK [nova : Additional Configuration] *****
*
changed: [192.168.56.111]

DirectX Diagnostic Tool
System Display Sound 1 Sound 2 Input
This tool reports detailed information about the DirectX components and drivers installed on your system.
If you know what area is causing the problem, click the appropriate tab above. Otherwise, you can use the "Next Page" button below to visit each page in sequence.
System Information
Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
Computer Name: DESKTOP-VTDN82D
Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2.1)
Language: English (Regional Setting: English)
System Manufacturer: Micro-Star International Co., Ltd.
System Model: MS-7D22
BIOS: 3.40
Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
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Help Next Page Save All Information... Exit

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

nowellgabriel@workstation: ~

nowellgabriel@workstation:~\$ openstack --version
openstack 5.8.0
nowellgabriel@workstation:~\$

nowellgabriel@workstation:~\$ sudo systemctl status glance-api
[sudo] password for nowellgabriel:
● glance-api.service - OpenStack Image Service API
Loaded: loaded (/lib/systemd/system/glance-api.service; enabled; vendor pre
Active: active (running) since Wed 2023-12-06 22:13:51 +08; 43min ago
Docs: man:glance-api(1)
Main PID: 13803 (glance-api)
Tasks: 5 (limit: 4593)
Memory: 78.4M
CPU: 21.376s
CGroup: /system.slice/glance-api.service
┌─13803 /usr/bin/python3 /usr/bin/glance-api --config-file=/etc/gl
├─14357 /usr/bin/python3 /usr/bin/glance-api --config-file=/etc/gl
├─14359 /usr/bin/python3 /usr/bin/glance-api --config-file=/etc/gl
├─14362 /usr/bin/python3 /usr/bin/glance-api --config-file=/etc/gl
└─14363 /usr/bin/python3 /usr/bin/glance-api --config-file=/etc/gl

Dec 06 22:13:51 workstation systemd[1]: Started OpenStack Image Service API.
lines 1-16/16 (END)

DirectX Diagnostic Tool
System Display Sound 1 Sound 2 Input
This tool reports detailed information about the DirectX components and drivers installed on your system.
If you know what area is causing the problem, click the appropriate tab above. Otherwise, you can use the "Next Page" button below to visit each page in sequence.
System Information
Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
Computer Name: DESKTOP-VTDN82D
Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2.1)
Language: English (Regional Setting: English)
System Manufacturer: Micro-Star International Co., Ltd.
System Model: MS-7D22
BIOS: 3.40
Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
Memory: 16384MB RAM
Page file: 12836MB used, 13084MB available
DirectX Version: DirectX 12
☒ Check for WHQL digital signatures
DxDiag 10.00.22621.0001 64-bit Unicode Copyright © Microsoft. All rights reserved.
Help Next Page Save All Information... Exit

The screenshot shows a terminal window with the following commands and output:

```
nowellgabriel@workstation: ~  
nowellgabriel@workstation:~$ sudo apt list --installed | grep keystone  
WARNING: apt does not have a stable CLI interface. Use with caution in scripts.  
keystone-common/jammy-updates,jammy-updates,now 2:21.0.1-0ubuntu1 all [installed,automatic]  
keystone/jammy-updates,jammy-updates,now 2:21.0.1-0ubuntu1 all [installed]  
python3-keystone/jammy-updates,jammy-updates,now 2:21.0.1-0ubuntu1 all [install  
d,automatic]  
python3-keystoneauth1/jammy,jammy,now 4.4.0-0ubuntu1 all [installed,automatic]  
python3-keystoneclient/jammy,jammy,now 1:4.4.0-0ubuntu1 all [installed,automatic]  
python3-keystonemiddleware/jammy-updates,jammy-updates,now 9.4.0-0ubuntu1.1 all  
[installed,automatic]  
nowellgabriel@workstation:~$  
  
nowellgabriel@workstation:~$ sudo systemctl status nova-api  
● nova-api.service - OpenStack Compute API  
Loaded: loaded (/lib/systemd/system/nova-api.service; enabled; vendor pres  
Active: active (running) since Wed 2023-12-06 22:14:19 +08; 44min ago  
Docs: man:nova-api(1)  
Main PID: 14907 (nova-api)  
Tasks: 9 (limit: 4593)  
Memory: 304.8M  
CPU: 31.175s  
CGroup: /system.slice/nova-api.service  
├─14907 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova-  
├─16178 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova-  
├─16193 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova-  
├─16194 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova-  
├─16195 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova-  
├─16196 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova-  
├─16197 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova-  
├─16200 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova-  
└─16201 /usr/bin/python3 /usr/bin/nova-api --config-file=/etc/nova-  
Dec 06 22:14:19 workstation systemd[1]: Started OpenStack Compute API.  
Dec 06 22:14:20 workstation nova-api[14907]: Modules with known eventlet monkey  
lines 1-21/21 (END)
```

The Directx Diagnostic Tool window shows system information:

System Information

Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
Computer Name: DESKTOP-VTDNB2D
Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)
Language: English (Regional Setting: English)
System Manufacturer: Micro-Star International Co., Ltd.
System Model: MS-7D22
BIOS: 3.40
Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
Memory: 16384MB RAM
Page file: 12836MB used, 13084MB available
DirectX Version: DirectX 12

☒ Check for WHQL digital signatures

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

The screenshot shows a terminal window with the following commands and output:

```
nowellgabriel@workstation: ~/HOA14.1  
GNU nano 6.2 inventory  
[glance]  
192.168.56.111  
[keystone]  
192.168.56.111  
[nova]  
192.168.56.111
```

The Directx Diagnostic Tool window shows system information:

System Information

Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
Computer Name: DESKTOP-VTDNB2D
Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)
Language: English (Regional Setting: English)
System Manufacturer: Micro-Star International Co., Ltd.
System Model: MS-7D22
BIOS: 3.40
Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
Memory: 16384MB RAM
Page file: 12836MB used, 13084MB available
DirectX Version: DirectX 12

☒ Check for WHQL digital signatures

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

The image is a composite of three screenshots. The top-left screenshot shows a terminal window with the following commands and output:

```
nowellgabriel@workstation:~/HOA14.1$ git add *
nowellgabriel@workstation:~/HOA14.1$ git commit -m "HOA14.1 Done"
[main (root-commit) b9d512a] HOA14.1 Done
6 files changed, 283 insertions(+)
create mode 100644 ansible.cfg
create mode 100644 install_kgn.yml
create mode 100644 inventory
create mode 100644 roles/glance/tasks/main.yml
create mode 100644 roles/keystone/tasks/main.yml
create mode 100644 roles/nova/tasks/main.yml
nowellgabriel@workstation:~/HOA14.1$ git push origin
Enumerating objects: 15, done.
Counting objects: 100% (15/15), done.
Delta compression using up to 4 threads
Compressing objects: 100% (9/9), done.
Writing objects: 100% (15/15), 2.72 KiB | 2.72 MiB/s, done.
Total 15 (delta 1), reused 0 (delta 0), pack-reused 0
remote: Resolving deltas: 100% (1/1), done.
To github.com:CPEQUIZON/HOA14.1.git
 * [new branch]      main -> main
```

The top-right screenshot shows the 'System Information' page from the DirectX Diagnostic Tool. It displays the following information:

- Current Date/Time: Wednesday, 6 December 2023, 8:54:34 pm
- Computer Name: DESKTOP-VTDNB2D
- Operating System: Windows 11 Pro 64-bit (10.0, Build 22H2)
- Language: English (Regional Setting: English)
- System Manufacturer: Micro-Star International Co., Ltd.
- System Model: MS-7D22
- BIOS: 3.40
- Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz (12 CPUs), ~2.6GHz
- Memory: 16384MB RAM
- Page file: 12836MB used, 13084MB available
- DirectX Version: DirectX 12

The bottom screenshot shows the GitHub repository page for 'HOA14.1'. The repository is public and has 1 commit. The commit history shows a single commit 'HOA14.1 Done' by CPEQUIZON. The repository files include 'roles', 'ansible.cfg', 'install_kgn.yml', and 'inventory'. The 'About' section is empty, and the 'Releases' section shows no published releases.

Reflections:

Answer the following:

1. Describe Keystone, Glance and Nova services

Users are authenticated and authorized through the keystone service, virtual machine access is provided by the nova service, and the glance service manages various virtual machine images.

Conclusions:

This activity involved installing OpenStack on a server, choosing either Ubuntu or CentOS. I opted for Ubuntu due to my familiarity with it and the workstation being an Ubuntu machine. Using available online resources, tutorials, and reference GitHub repositories, I successfully installed Glance, Keystone, and Nova through a playbook, achieving the activity's goals.