PLEASE COMPLETE TASK 1 BEFORE THE BEGINNING OF THE COURSE!
Task 1 gives instructions for preparing the cloud environments for the hands-on exercises.

Course Format

The Practical High-Performance Computing System Administration 2022 takes place in an online format utilizing two Big Blue Button rooms.
The main room is called **HPCSA**. In this room the lecturer will present the slides and guide you through the course. HPCSA features a wide set of lecturers from the GWDG and the university, who are experts for the topics they are presenting.
As this course is intended to provide hands-on experience, the lecturers will ask you to complete exercises during the course. These exercises should be completed individually, however, you will form groups to support each other in case you get stuck. To allow for communication within said groups, each group will receive its own breakout room in BBB. The second BBB room called **HPCSA-Support** will be used for this. We will use two BBB rooms as Big Blue Button is limited, and it is currently not possible to be connected to a breakout room while also being able to listen the main room. If you need help from outside your group, feel free to ask for help in the broadcast room where the lecturer and a few helpers will be available. The format will be explained in more detail during the first session.

For the beginning of the course it is enough to join the Broadcast room.

Broadcast Room (HPCSA): `https://meet.gwdg.de/b/jul-pfo-7mr-txo`

Breakout Room (HPCSA-Support): `https://meet.gwdg.de/b/jul-mii-pfh-shu`

Please confirm before the course that you can connect to a BBB room and your microphone is working.
`https://test.bigbluebutton.org/` can be used for testing your setup.

For the block course, you will use course accounts with access to GWDG cloud resources such that you can roll out your own VMs and follow along with the hands-on exercises.
Follow the instructions below to prepare your frontend VM.
During the course you will deploy additional worker VMs.
The course accounts are valid until the 01.03.23.

Task 1: Prepare Cloud Environment (0 min)

Login

1. Open the attached file and find your username and password.

2. Open `https://cloud.gwdg.de` in your browser and select **Login via AcademicID**.

3. Use your username and password to login on the AcademicID web page.

4. You should be directed back to `https://cloud.gwdg.de` and see the OpenStack Horizon Dashboard as shown in Figure 1.
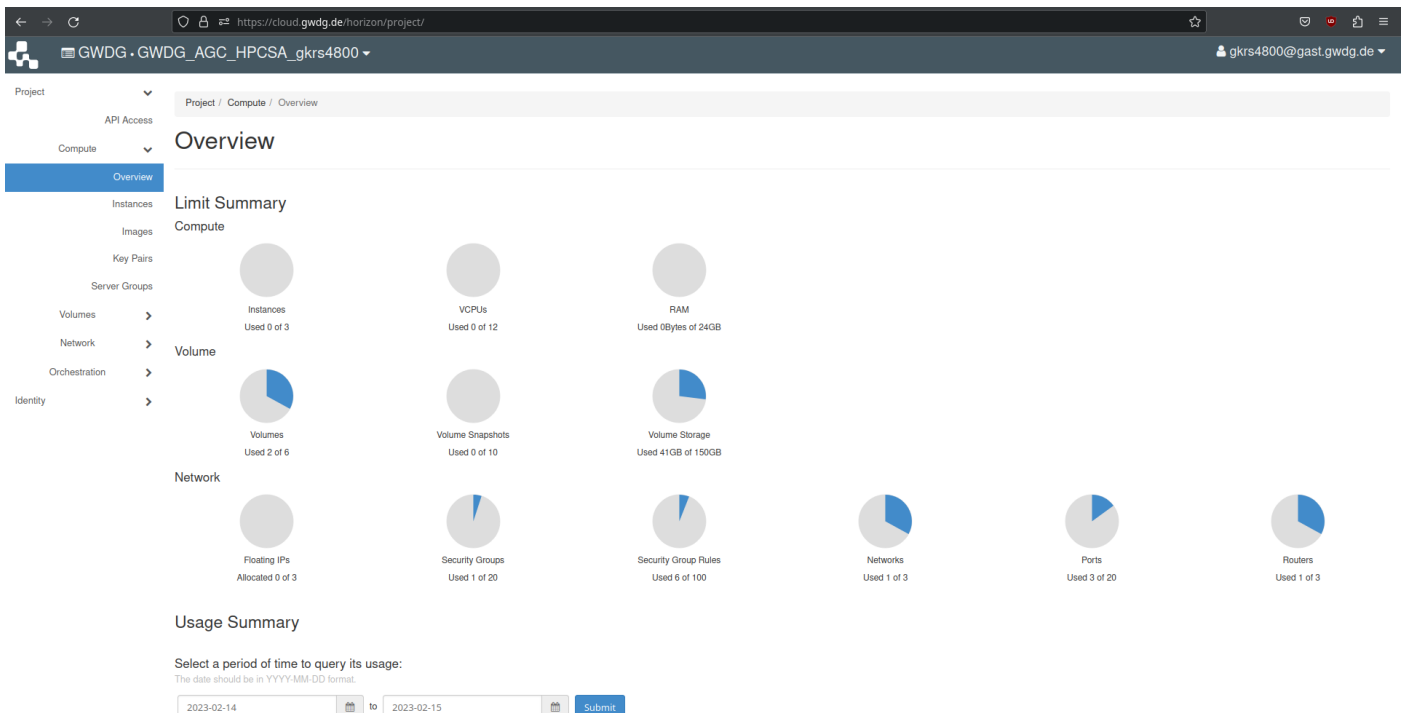
Figure 1: GWDG OpenStack Horizon Dashboard

If you are already logged in on AcademicID with a different account, you need to switch to the course account. In order to do so, you can clear your browser cache or switch to a different browser.

Instance Launch

1. One the left side, under **Compute** tab, select **Key Pairs**.
   You should see the menu as shown in Figure 2

2. Click on **Create Key Pair** and name it **hpcsa-course-vm-key**.
   See Figure 3 for reference.

   This will create a key pair and download the private key to your computer, which will be required later to connect to the machine.
   You should see the created key pair as shown in Figure 4

3. One the left side, under **Compute** tab, select **Instances**.
   The instances overview should show no instances as shown in Figure 5

4. Click on **Launch Instance**.
   This will open a dialog as shown in Figure 6

5. In the new dialog, name your instance **cluster-manager** and press **Next**.

6. Find **CentOS Stream 8 Server x86_64 (ssd)** in the list and click on the arrow on the right.

7. Set **Delete Volume on Instance Delete** to **Yes**.
   Check that the dialog looks as shown in Figure 7 and press **Next**.

8. Find **m1.large** in the list, click on the arrow to the right
   Verify that the dialog looks as shown in Figure 8 and press **Next**.

9. Under **Networks** press the arrow on the right for the **private** but NOT for the **private-pxe** network.
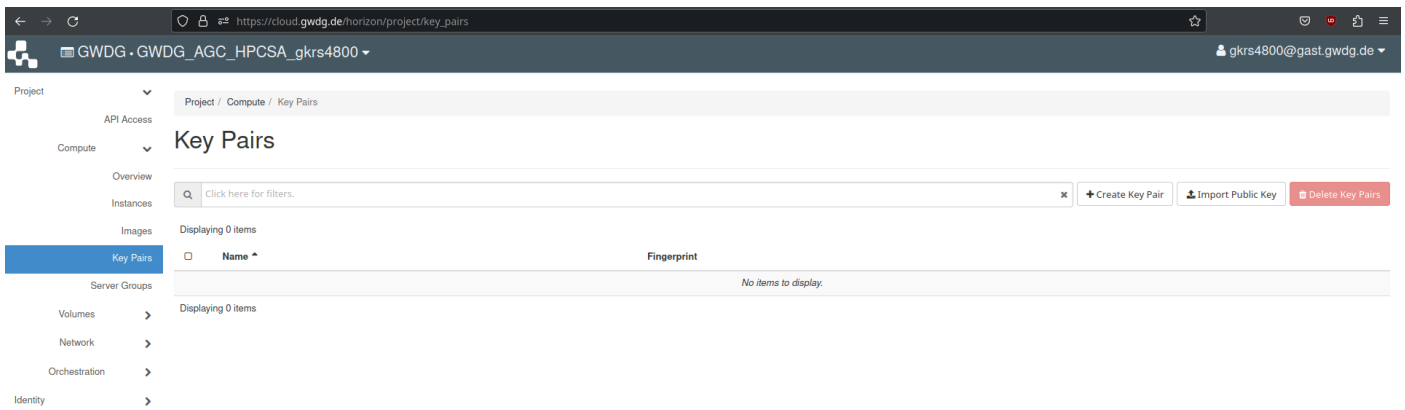
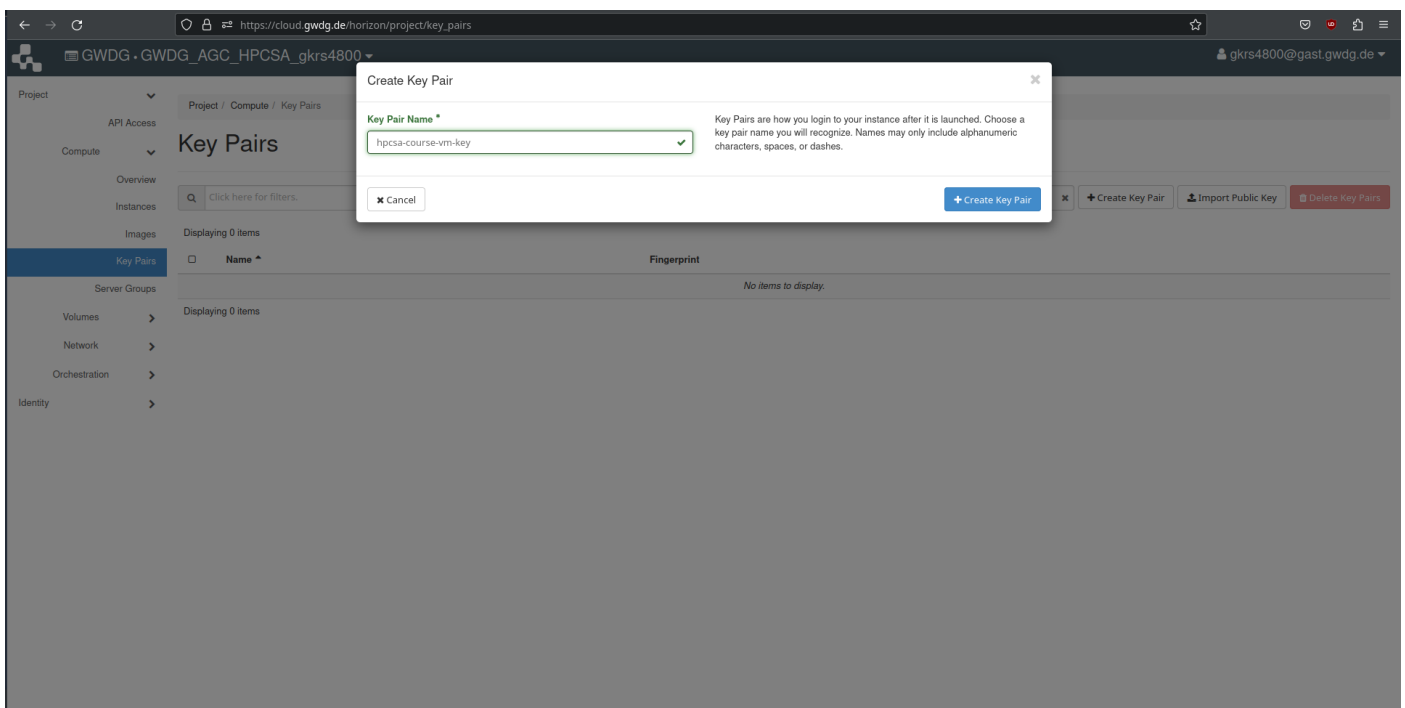Figure 2: OpenStack Key Pairs

Figure 3: OpenStack Create a Key Pair

This is shown in Figure 9.

Confirm that only the **private** network and NOT the **private-pxe** network is added and press **Next**.

10. Leave **Network Ports** as they are and press **Next**.

11. Confirm that for **Security Groups**, the default security group is set such that it looks as shown in Figure 10 and press **Next**.
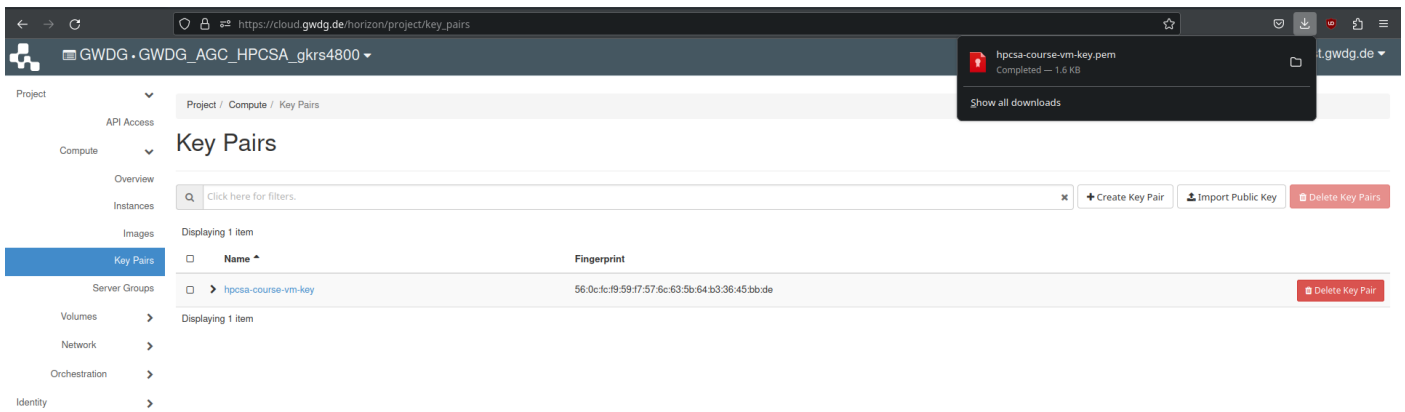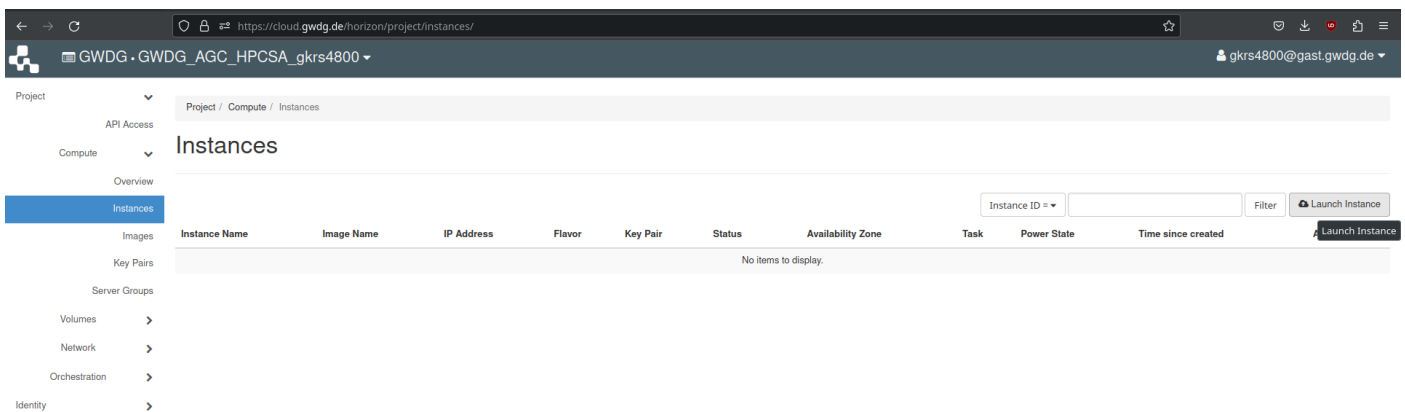
Figure 4: OpenStack Key Pair created

Figure 5: OpenStack Instances

12. In the **Key Pair** dialog, ensure that your key pair is selected and if it is not, move it up by pressing the arrow on the right.
    Confirm that it looks as shown in Figure 11.

13. Press **Launch Instance** to launch the instance and it should look like Figure 12.

This will launch a new VM running CentOS 8 with the public key of your key pair already installed.
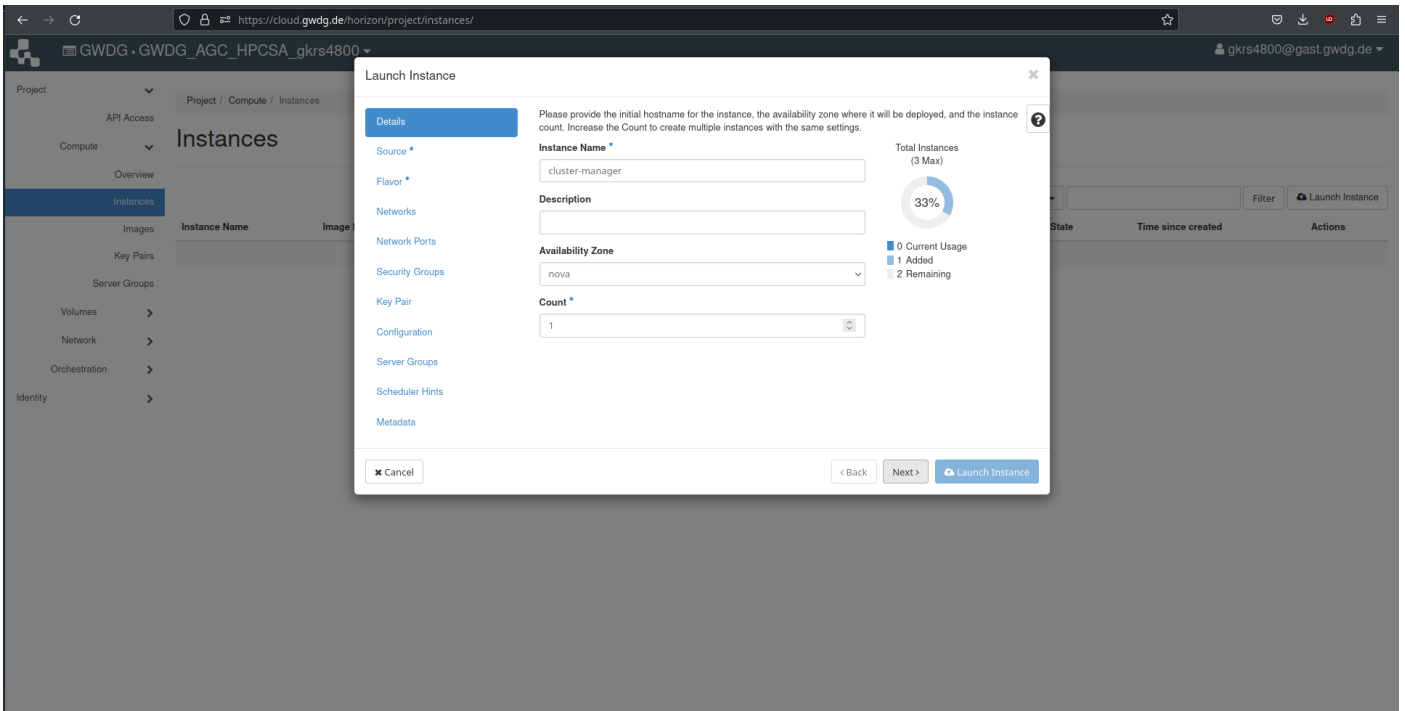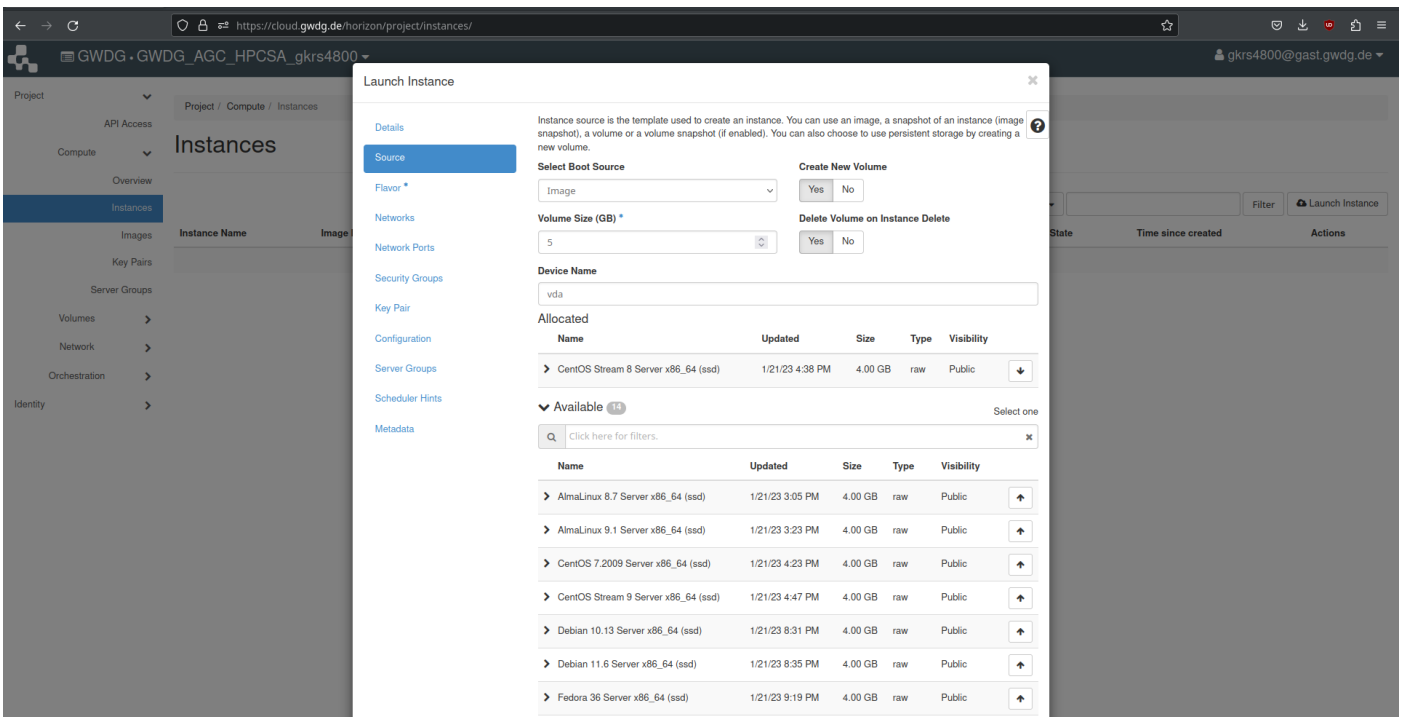
Figure 6: OpenStack Launch Instance dialog

Figure 7: OpenStack Set Source dialog

However, the setup is not complete as an additional network must be attached and a public IP address must be assigned.

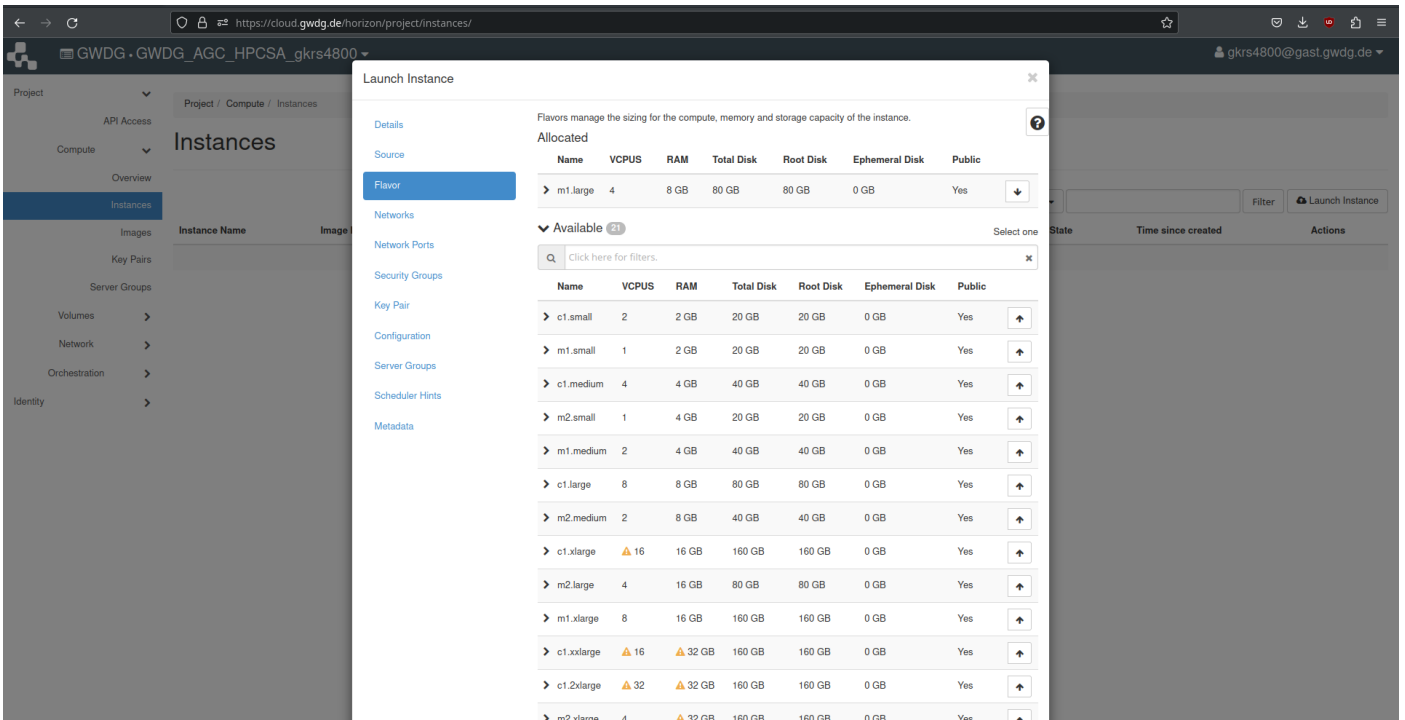Furthermore, the worker nodes need to be prepared.
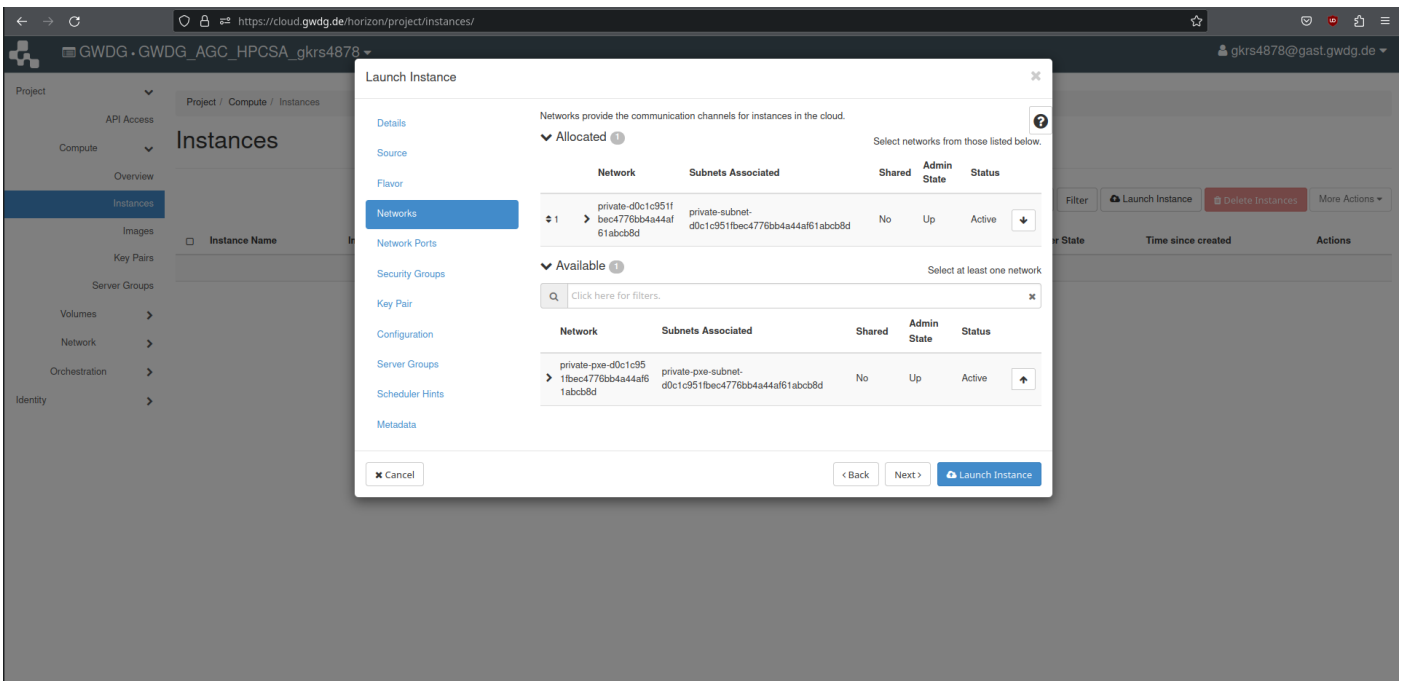
Figure 8: OpenStack Set Flavor dialog

Figure 9: OpenStack Set Network dialog

Attaching an Additional Network

1. Wait for the **cluster-manager** instance to finish provisioning and reach the status **Active**.

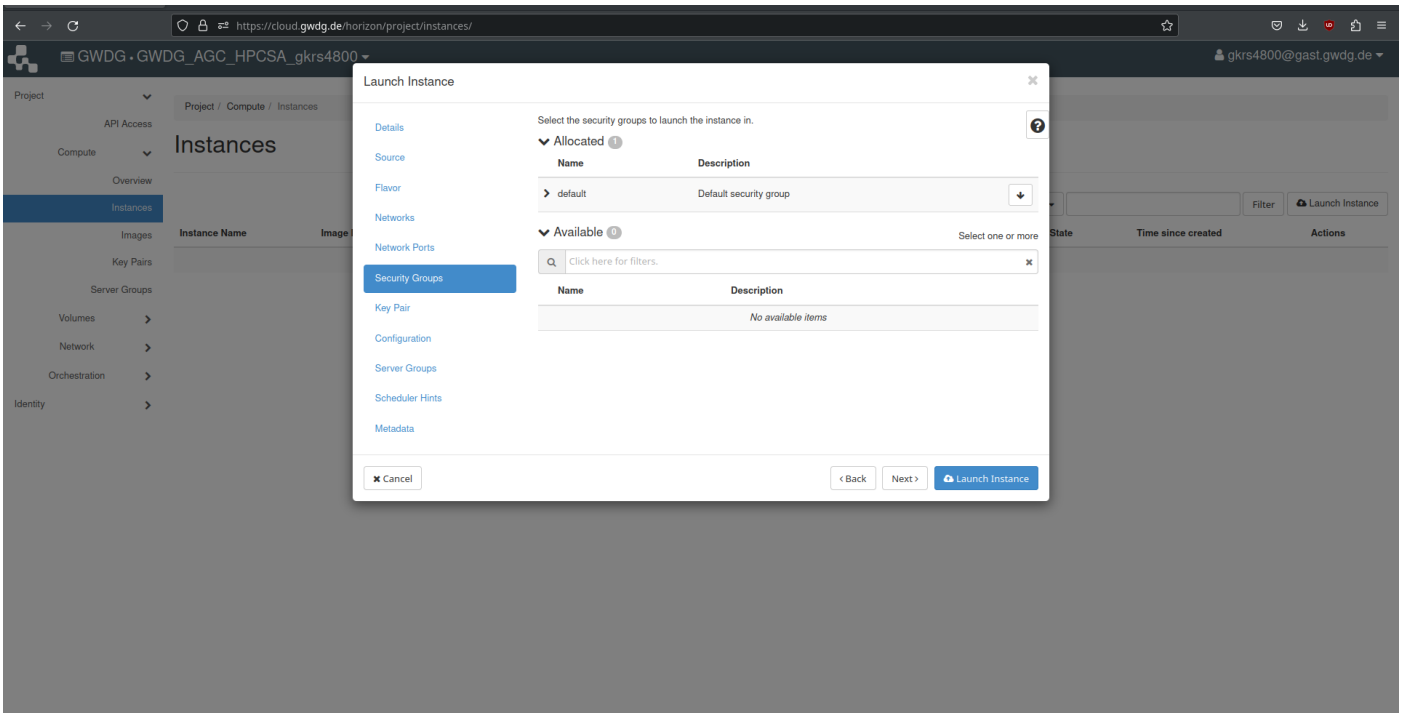2. From the **Actions** drop down menu find the **Attach Interface** option as shown in Figure 13 and press it.

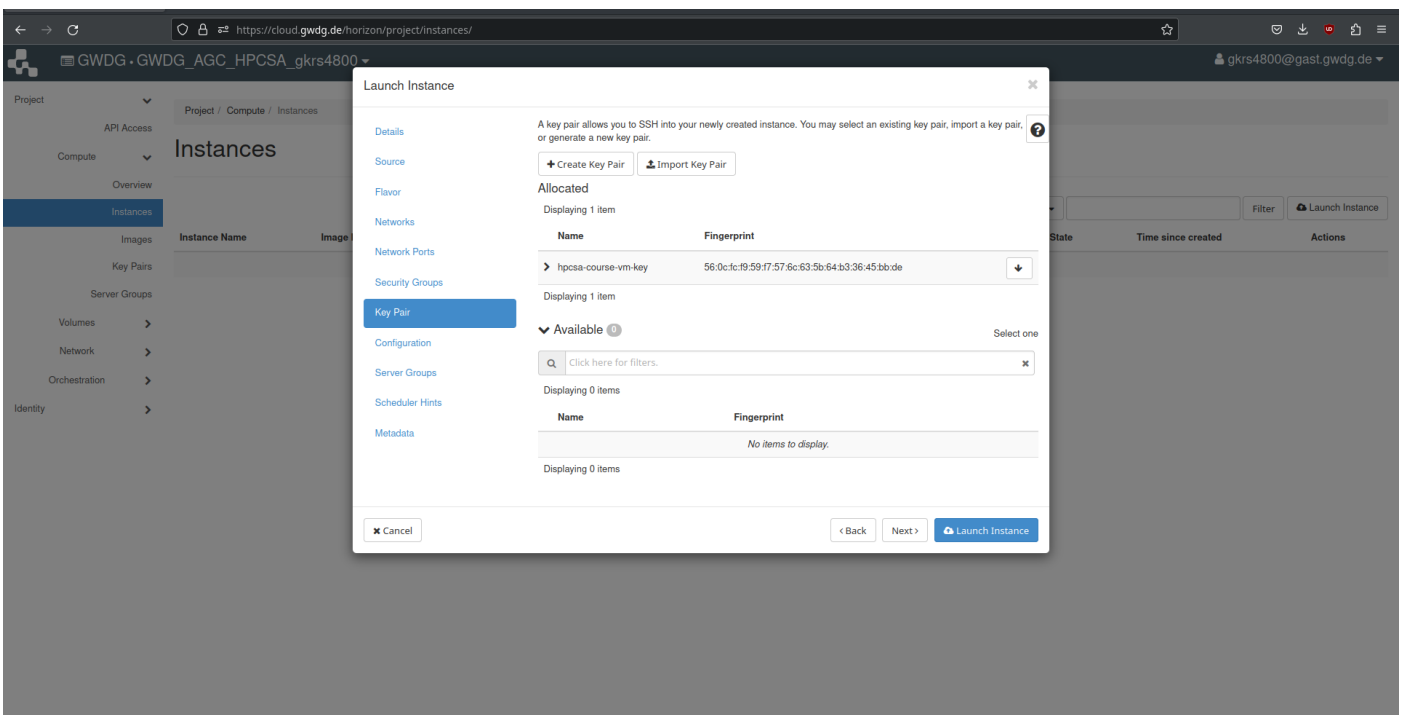Figure 10: OpenStack Set Security Groups dialog

Figure 11: OpenStack Set Key Pair dialog

3. In the new **Attach Interface** dialog, select the **private-pxe** network in the **Network** drop-down menu as shown in Figure 14 and confirm by pressing **Attach Interface**.

4. The **cluster-manager** instance should now have two IPs in the **IP Address** column.

Attaching a network after a node was already initialized does not correctly configure the new network inside the node. In order to complete the setup, the new interface must be created and configured on the node itself.
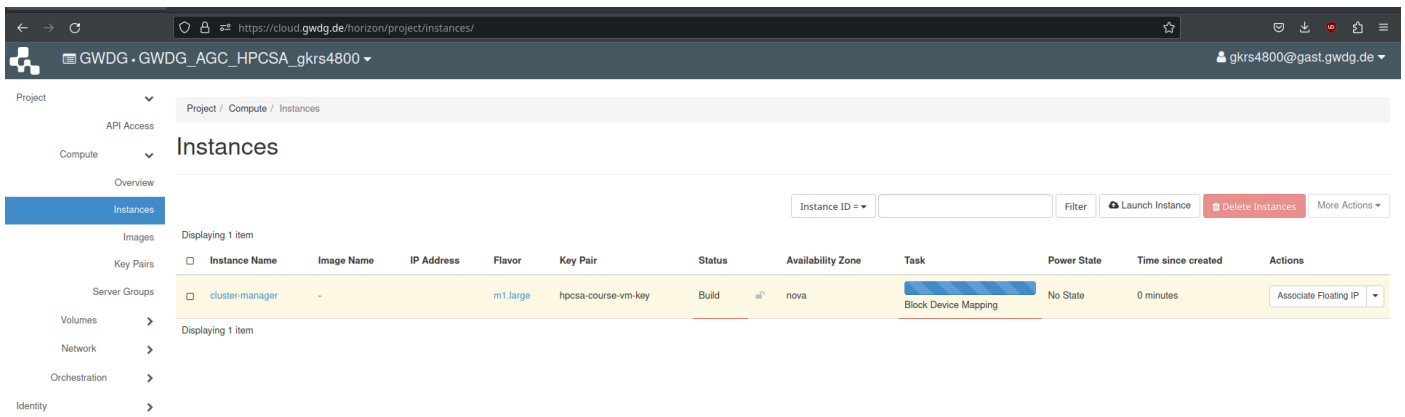
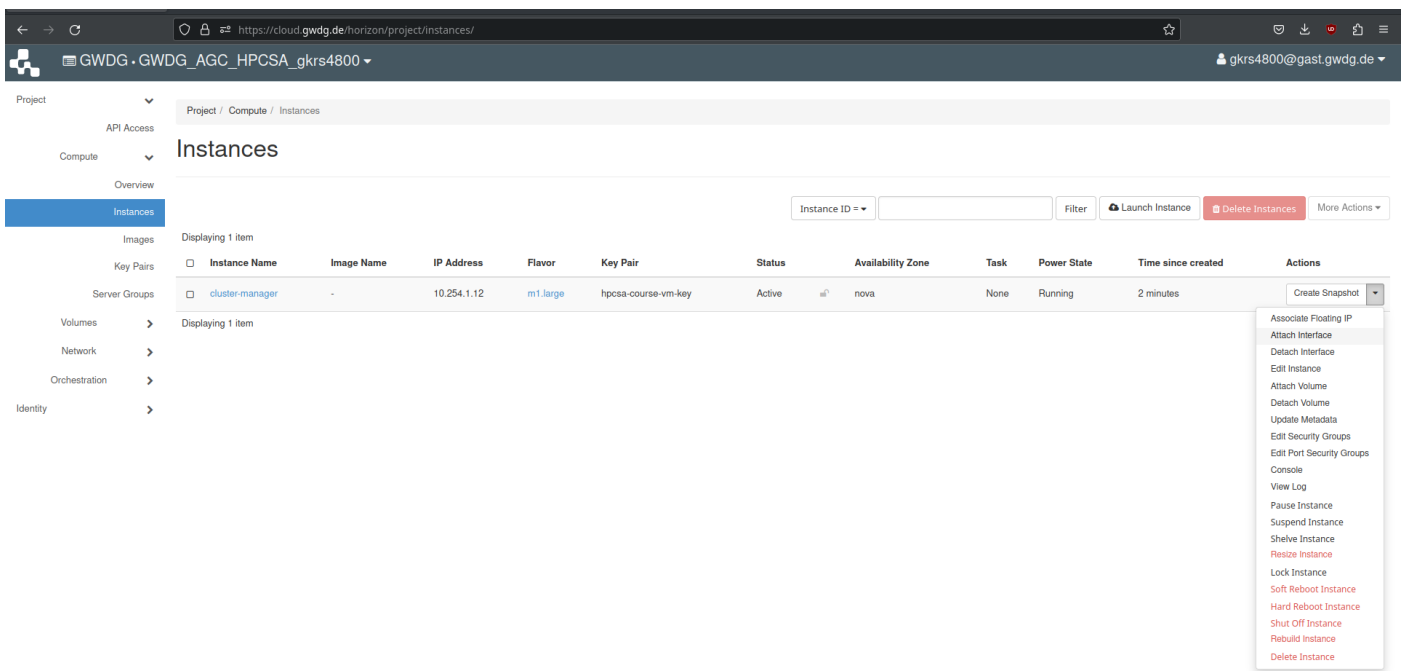Figure 12: OpenStack Instances; cluster-manager launching

Figure 13: OpenStack Instances; Attach Interface option

The instructions for this can be found on the **Configure Network** sheet and should be completed after this sheet.
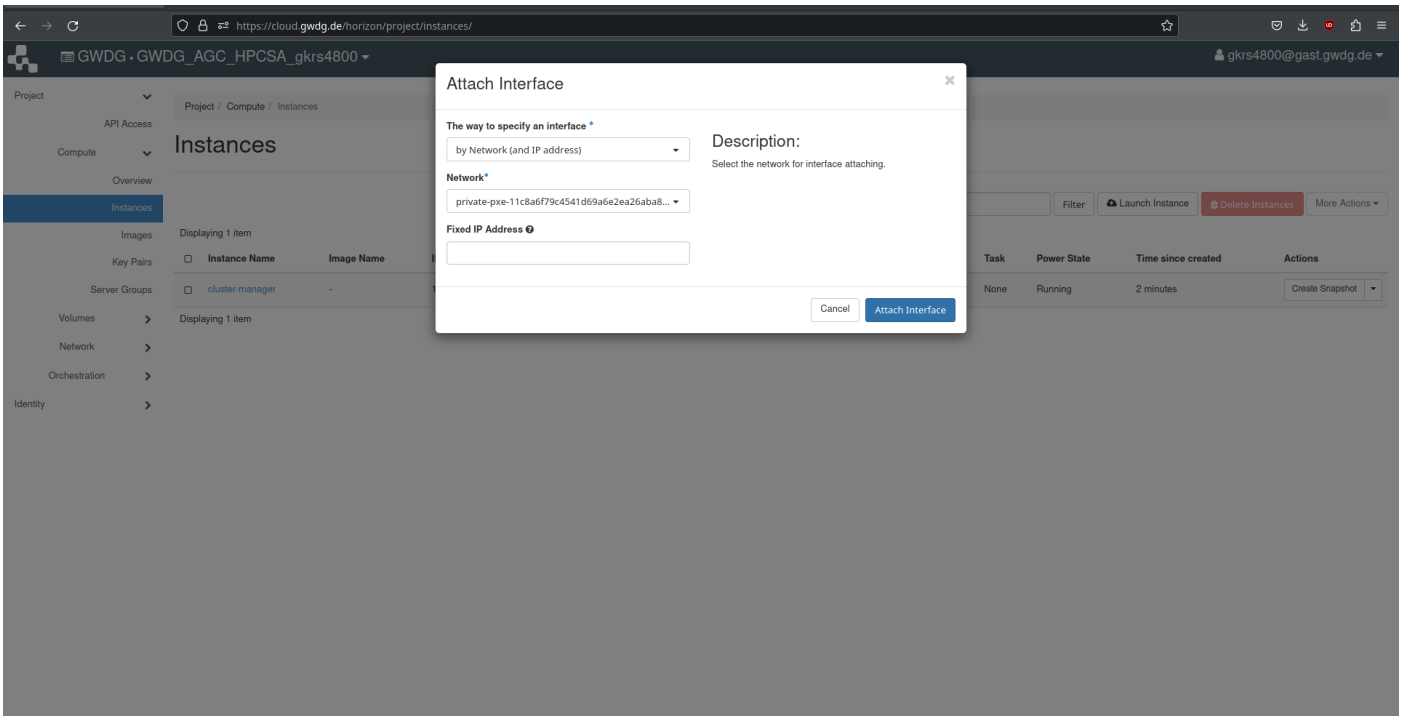
Figure 14: OpenStack Attach Interface dialog

Adding a Floating IP Address

1. For your **cluster-manager** instance, open the drop-down menu in the **Actions** column and find the **Associate Floating IP** option as shown in Figure 15 and press it.
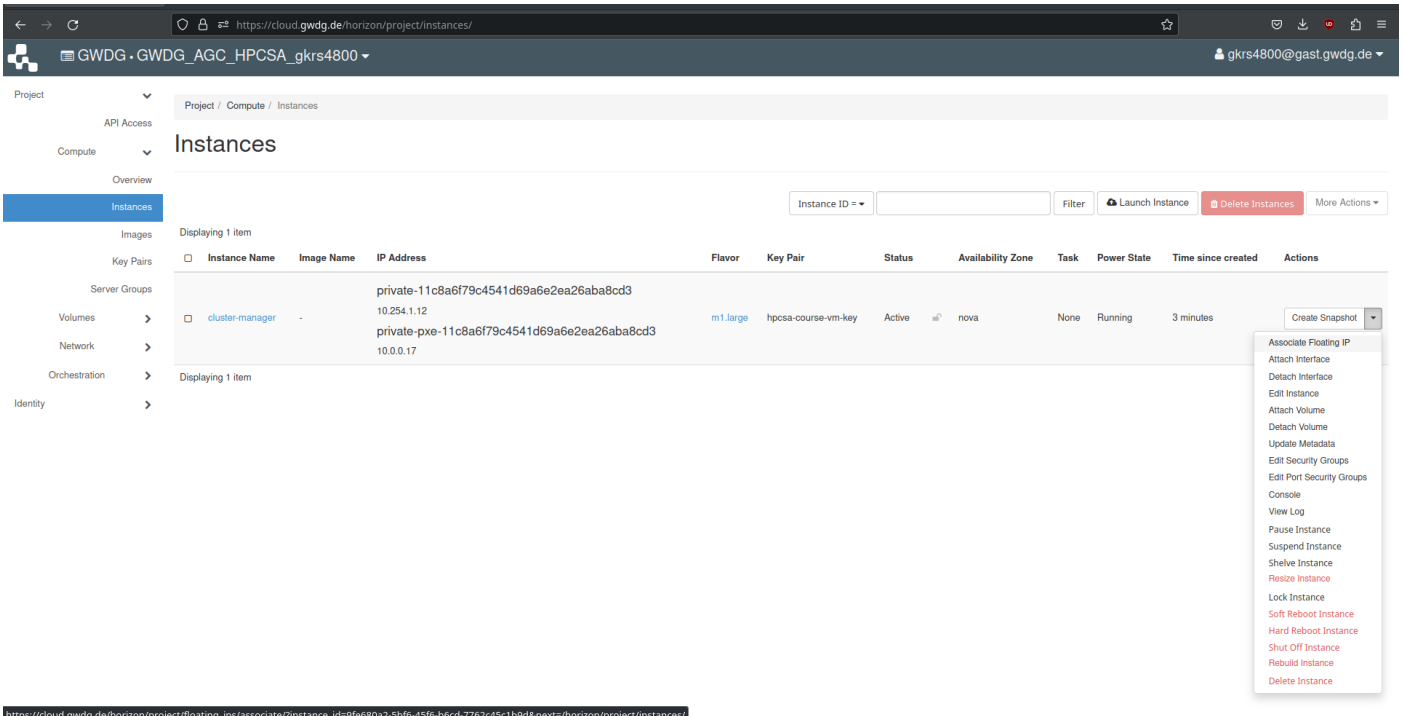

Figure 15: OpenStack Instances; Associate Floating IP option

2. If under **IP Address** it says **No floating IP addresses allocated**, press on the plus button next to it
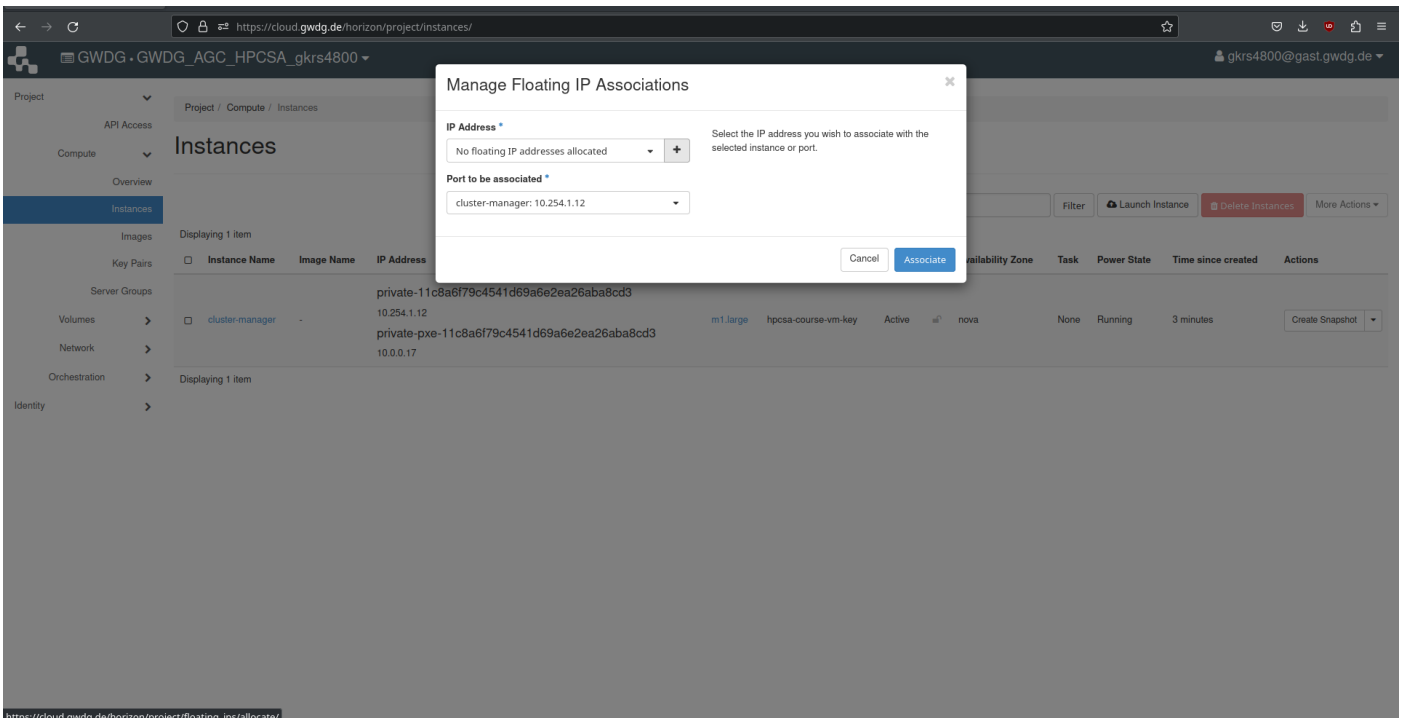
as shown in Figure 16.

Figure 16: OpenStack Managing Floating IP Associations dialog; missing IP

3. In the new **Allocate Floating IP** dialog press **Allocate IP** without changing anything as shown in Figure 17.
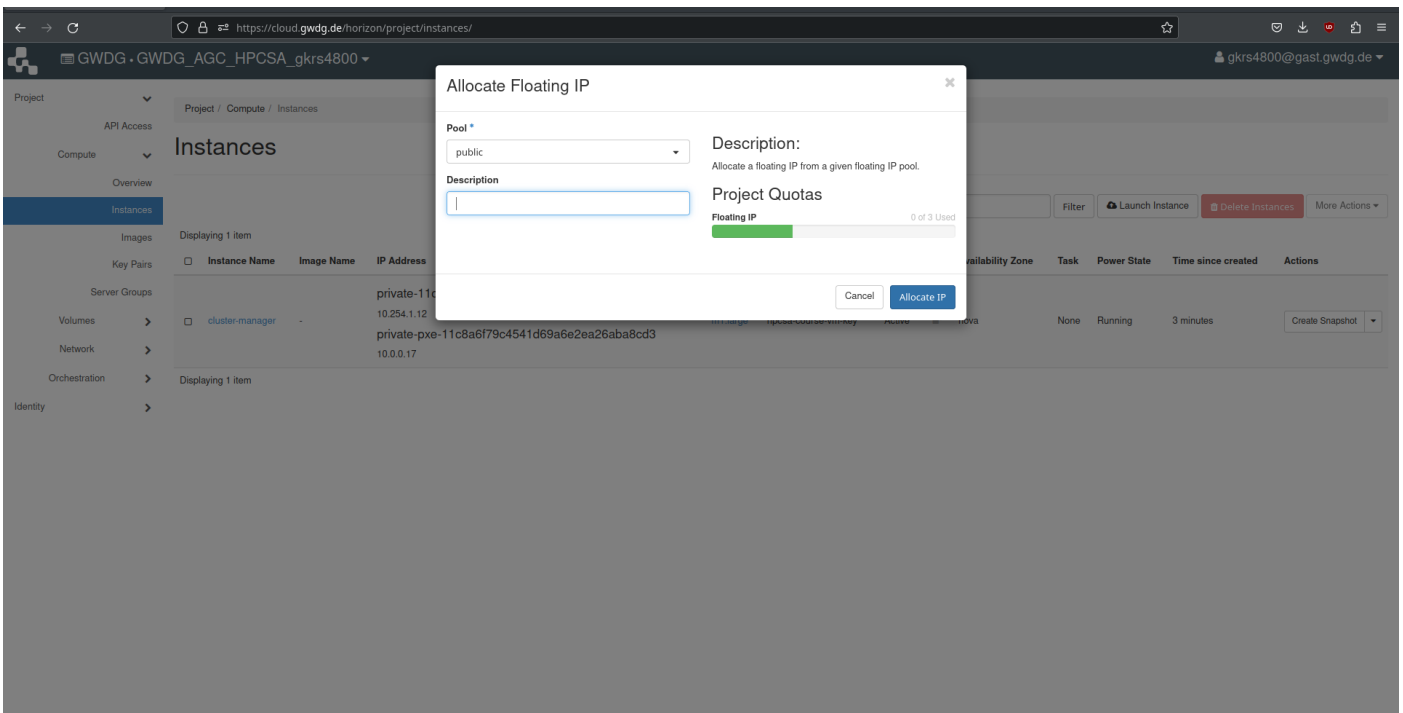

Figure 17: OpenStack Allocate Floating IP dialog

4. Back in the **Manage Floating IP Associations** dialog, select an IP address in the **IP Address** drop-down menu and make sure that **Port to be associated** is set to your **cluster-manager** as shown in
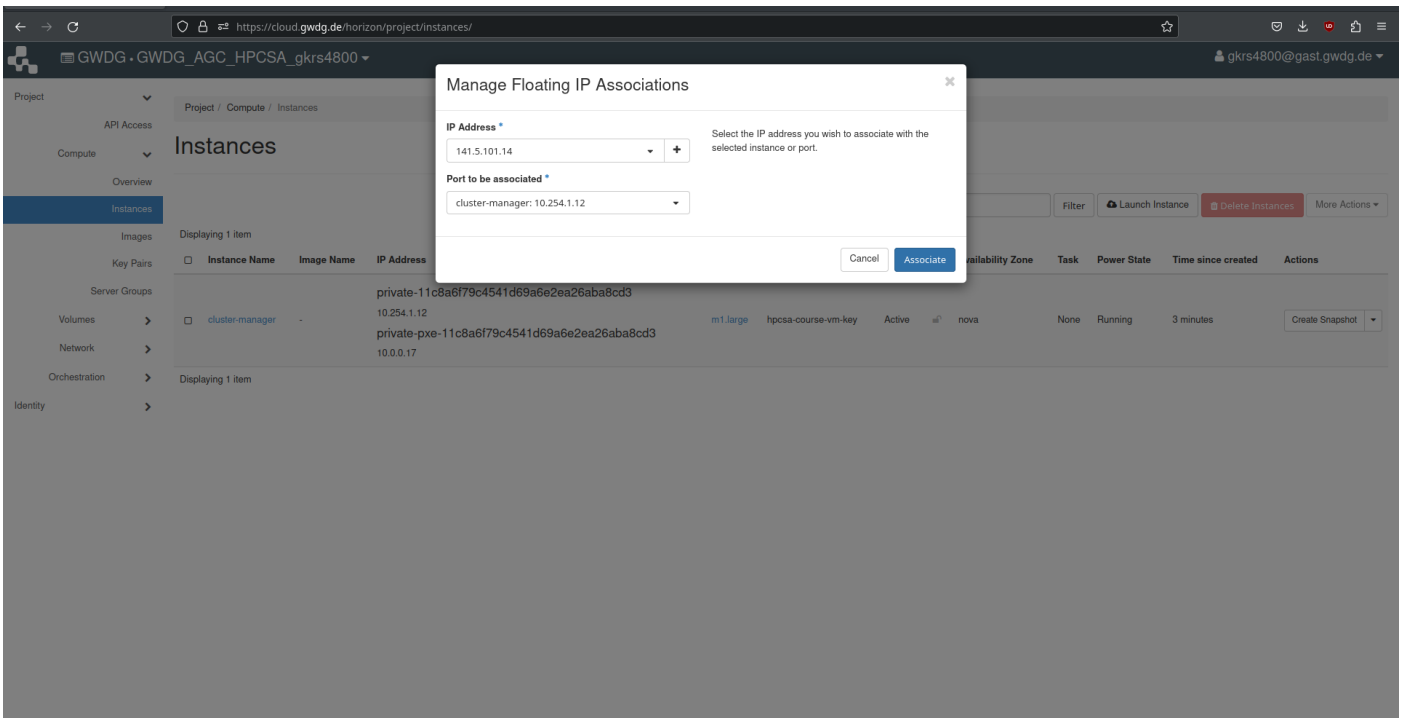
Figure 18.

Figure 18: OpenStack Managing Floating IP Associations dialog

5. Make a note of the IP address and confirm by pressing **Associate**.
   Confirm that the IP address appears for the **cluster-manager** in the **IP Address** column as shown in
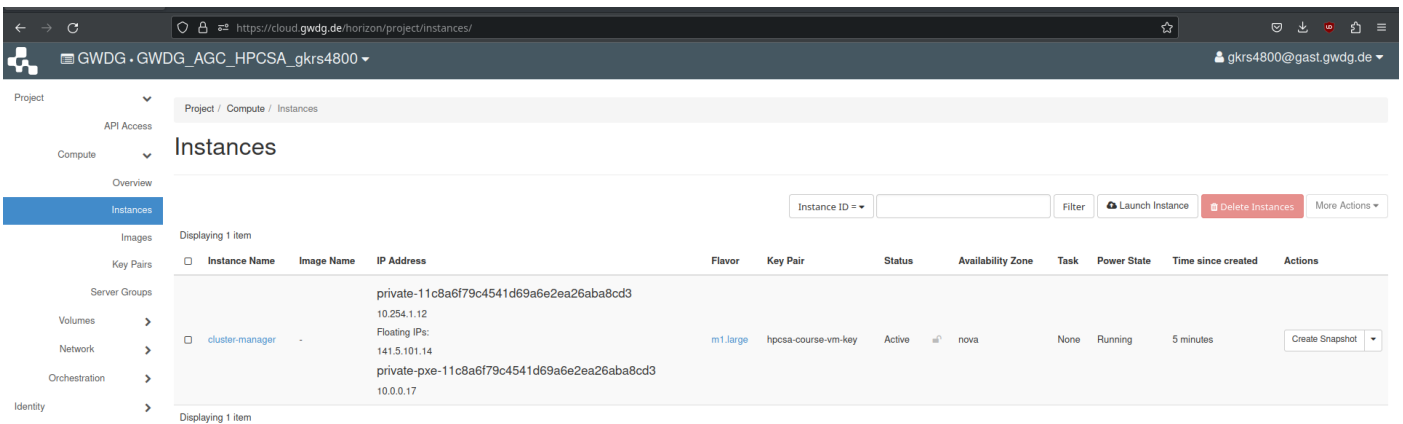   Figure 19

Figure 19: OpenStack Instances; cluster-manager fully set up

The next step is to set up 2 worker instances using the PXE boot volume snapshot.

This does not provide them with a full operating system, instead, their setup will be completed as part of the WareWulf hands-on exercise.

Provisioning Worker Nodes

1. Click on **Launch Instance**, name the new instances **worker** and set the **Count** to **2**.
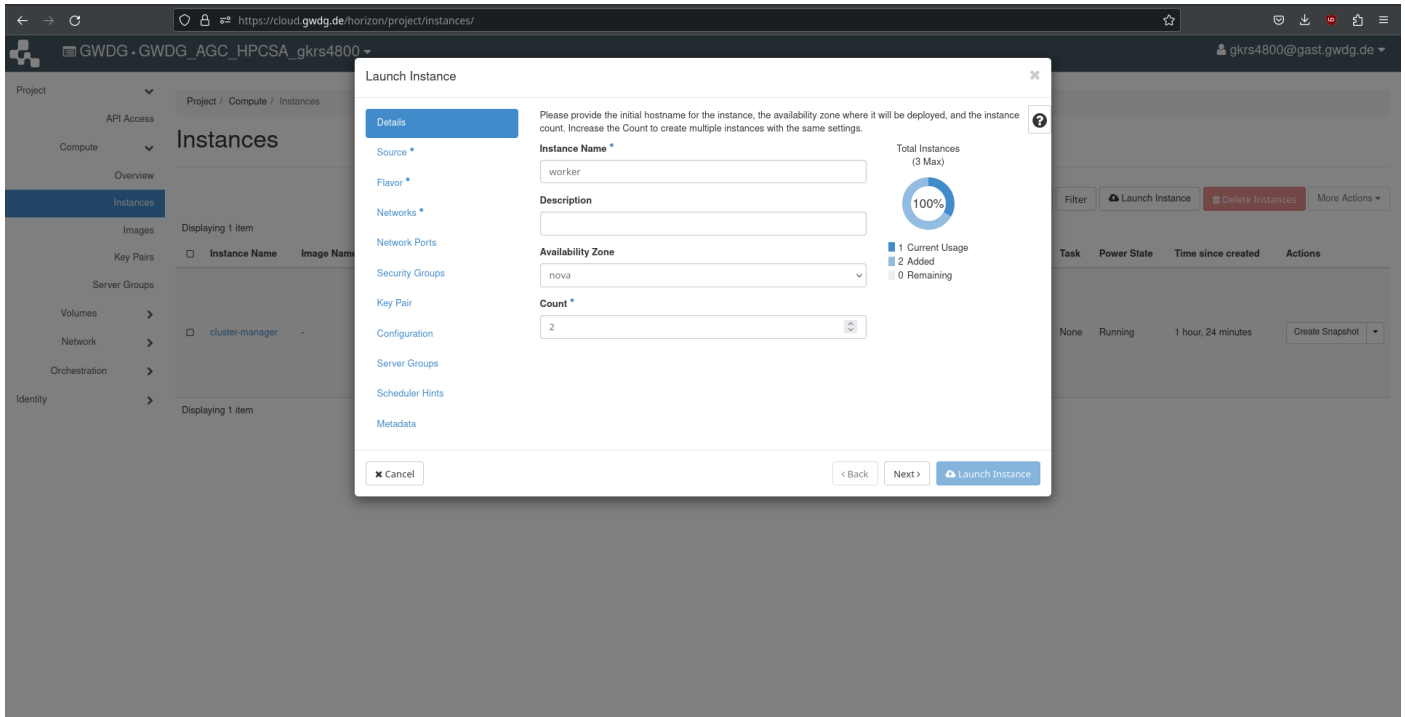   Confirm that it looks as shown in Figure 20 and press **Next**.

Figure 20: OpenStack Launch Instance worker dialog

2. Under **Source** select **Volume Snapshot** as the **Boot Source** from the drop-down menu, set **Delete Volume on Instance Delete** to **Yes** and select the **PXE-Boot** volume snapshot by clicking on the arrow to the right.
   Confirm that it looks as shown in Figure 21 and press **Next**.

3. Under **Flavor** select **c1.medium** flavor by pressing the arrow to the right.
   Confirm that it looks as shown in Figure 22 and press **Next**.

4. Under **Networks** select the **private-pxe** network and NOT the other **private** network as shown in Figure 23 and press **Next**.

5. Leave **Network Ports** as they are and press **Next**.

6. Under **Security Groups** remove the **default** security group by pressing the arrow on the right such that no security groups are set as shown in Figure 24 and press **Next**.

7. Under **Key Pair** remove the **hpcsa-course-vm-key** if it is selected by pressing the arrow on the right such that it looks as shown in Figure 25 and press **Launch Instance**.

8. Observe that two new instances, **worker-1** and **worker-2** appear and become ready after a short time as shown in Figure 26.
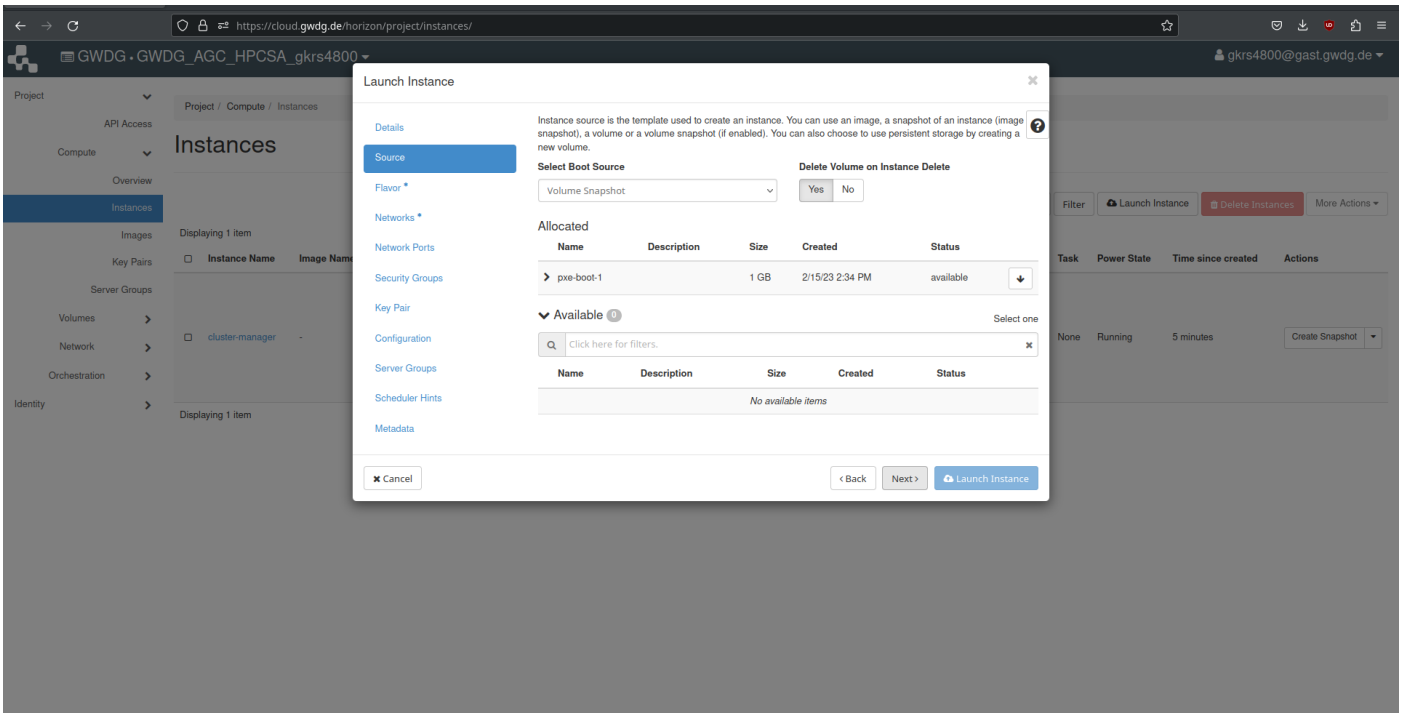
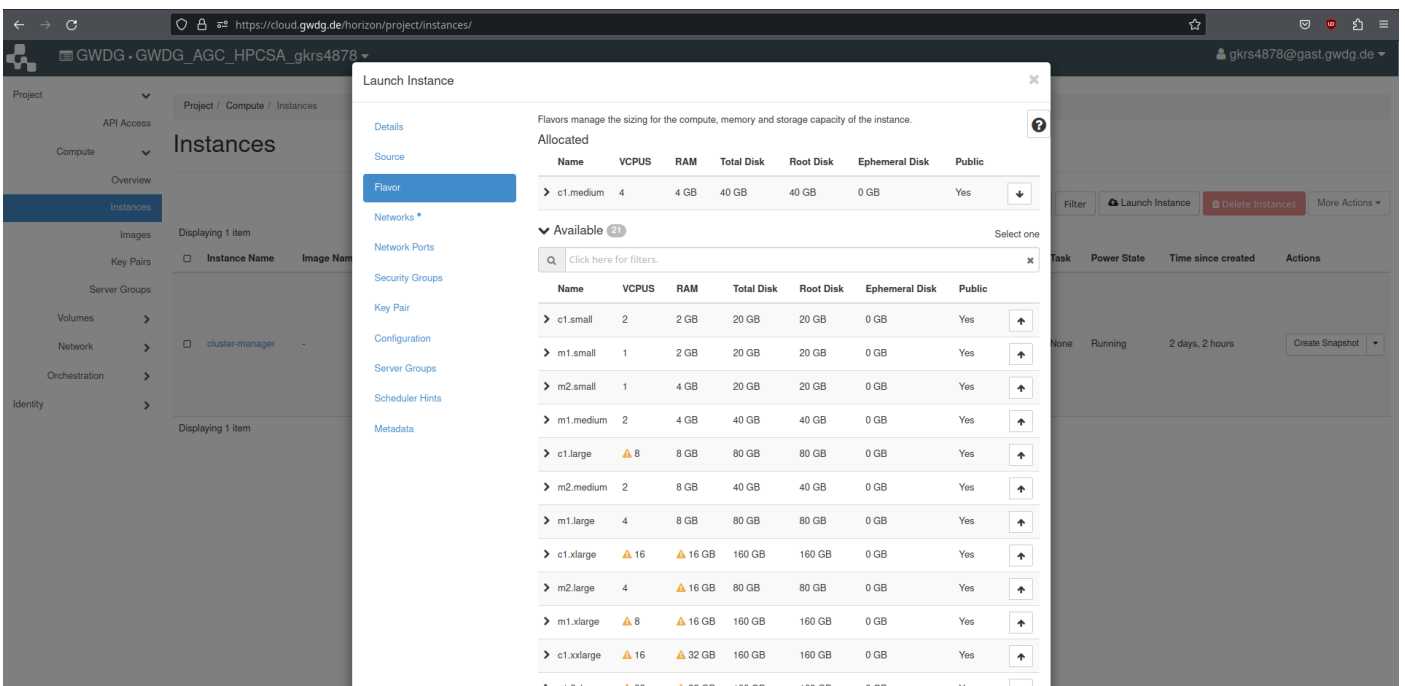Figure 21: OpenStack Set Source worker dialog

Figure 22: OpenStack Set Flavor worker dialog

Rebooting Instances

When working with VMs, it might be necessary to reboot them via an external command.
In the **Instances** view of OpenStack, the **Actions** drop-down menu for each instances reveals the option to **Soft Reboot Instance** and **Hard Reboot Instance** as shown in Figure 27.
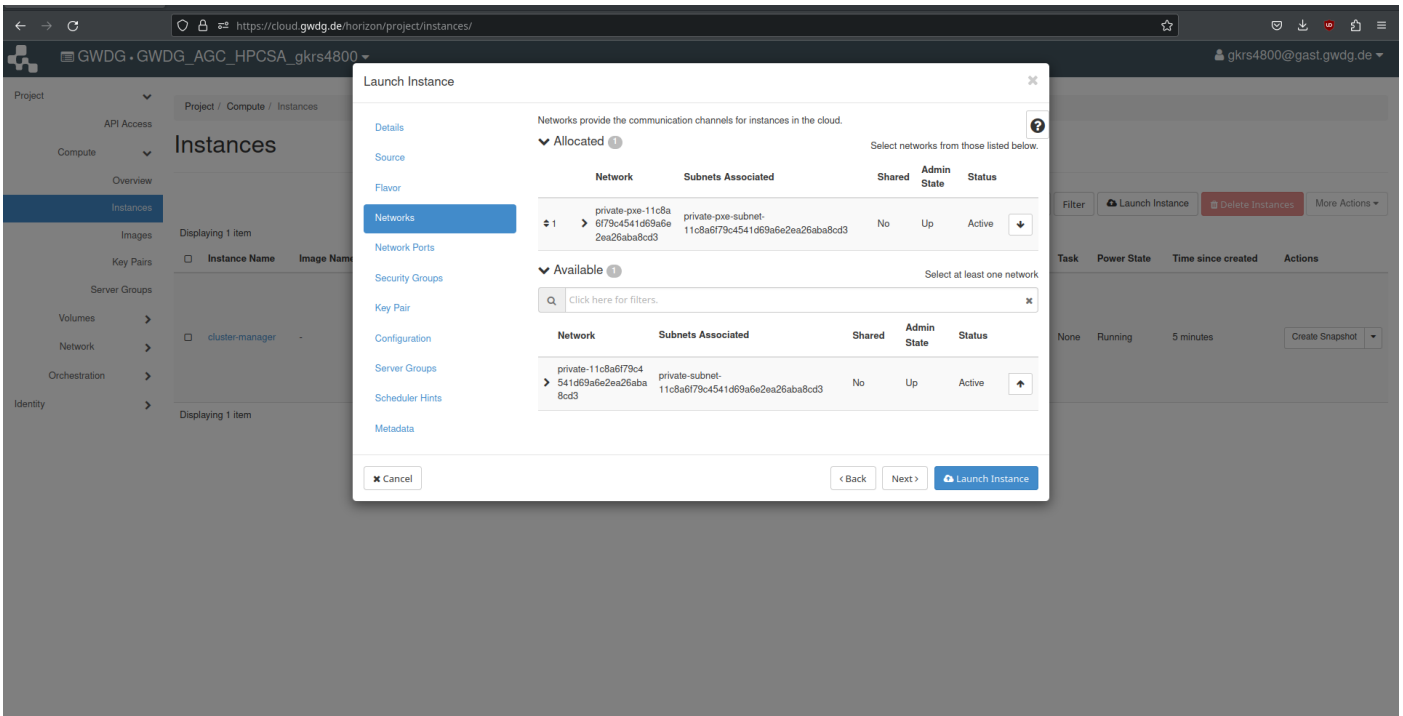
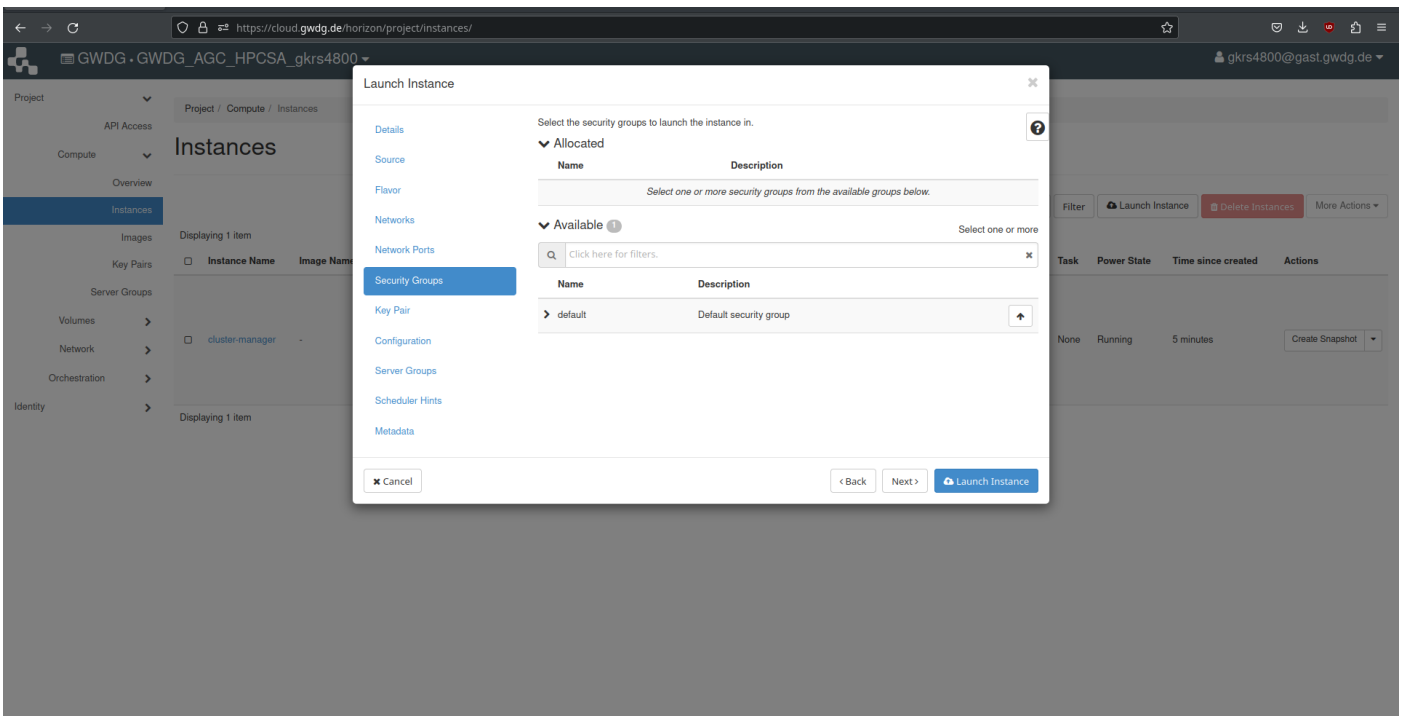Figure 23: OpenStack Set Networks worker dialog

Figure 24: OpenStack Set Security Groups worker dialog

Connecting with SSH

1. Find the **hpcsa-course-vm-key.pem** you downloaded in your **Downloads** folder or where you have saved it and move it into your user folder.

2. Open a terminal and confirm that you have **SSH** installed by following the platform specific instructions:
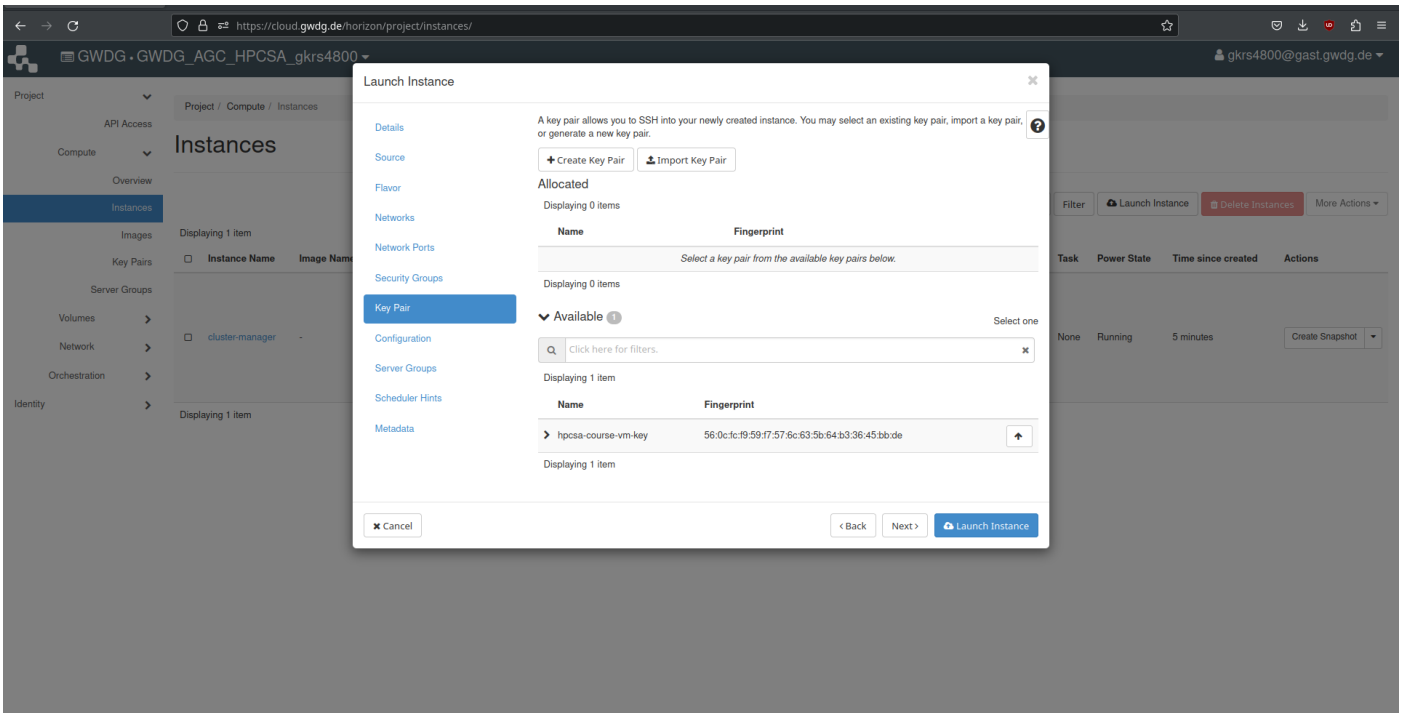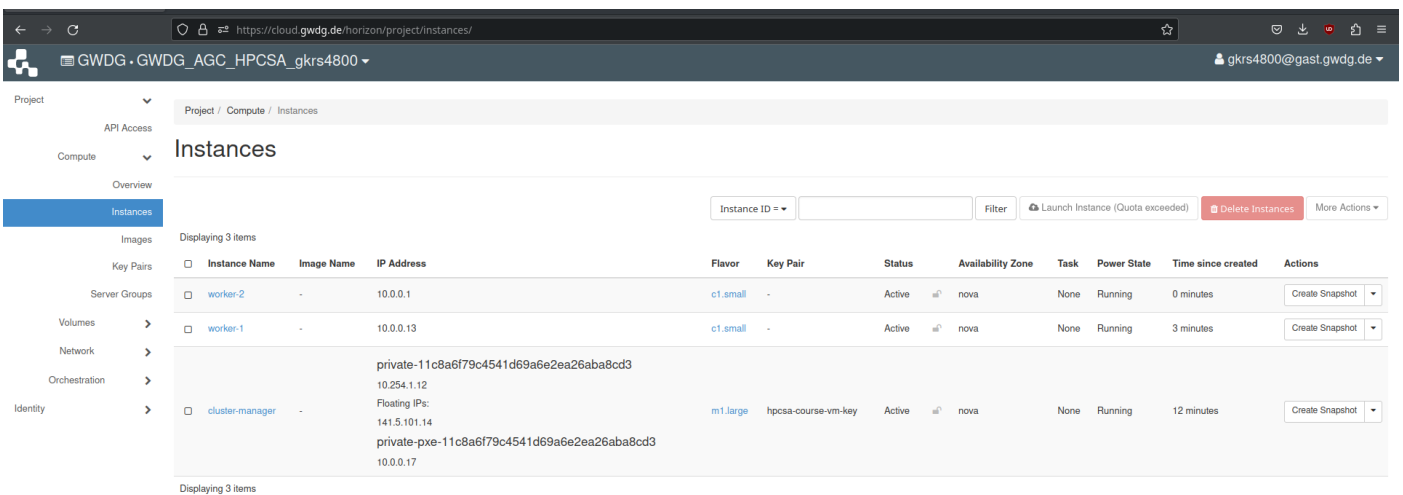
Figure 25: OpenStack Set Key Pair worker dialog

Figure 26: OpenStack Instances; cluster-manager and 2 workers

Windows 10/11

1. Search for **Powershell**, right click, run as administrator

2. `Get-WindowsCapability -Online|Where-Object Name -like '*SSH*'`
   If SSH client is not installed run the following command:
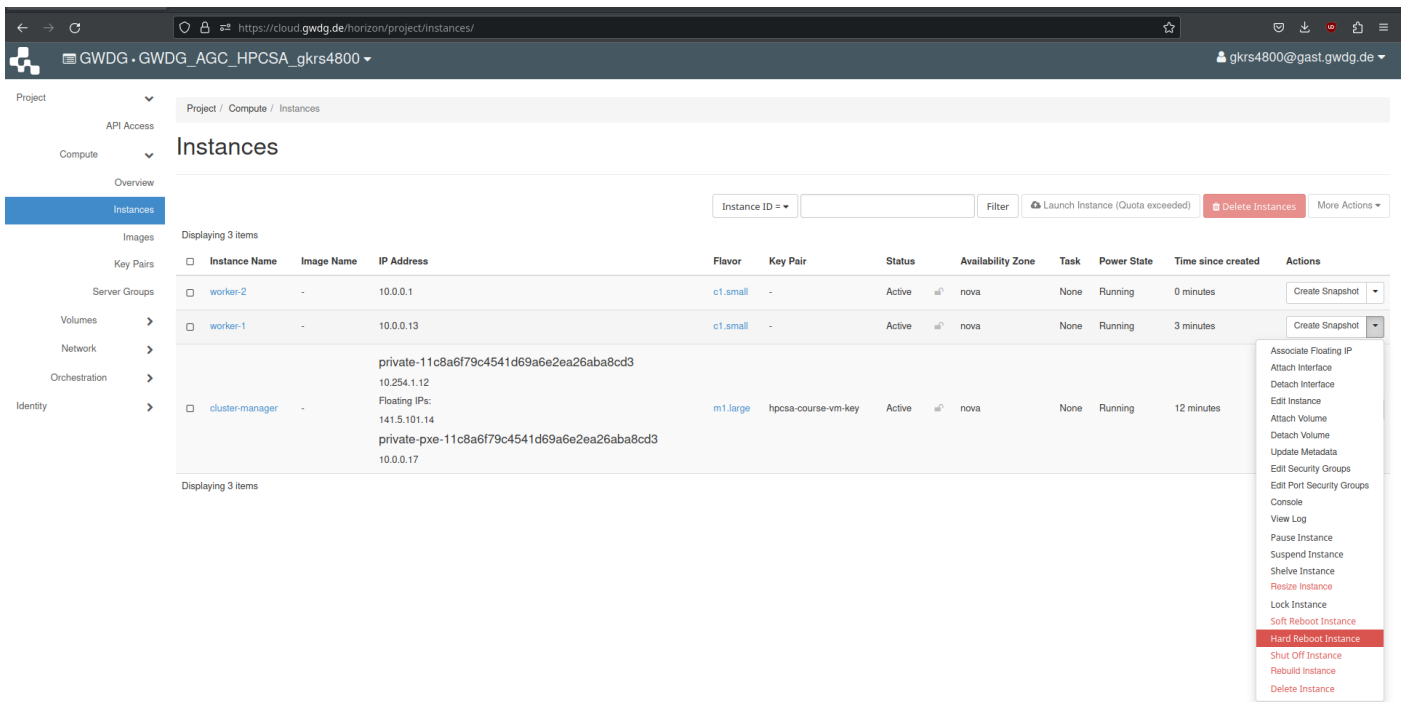   `Add-WindowsCapability -Online -Name OpenSSH.Client~~~~0.0.1.0`
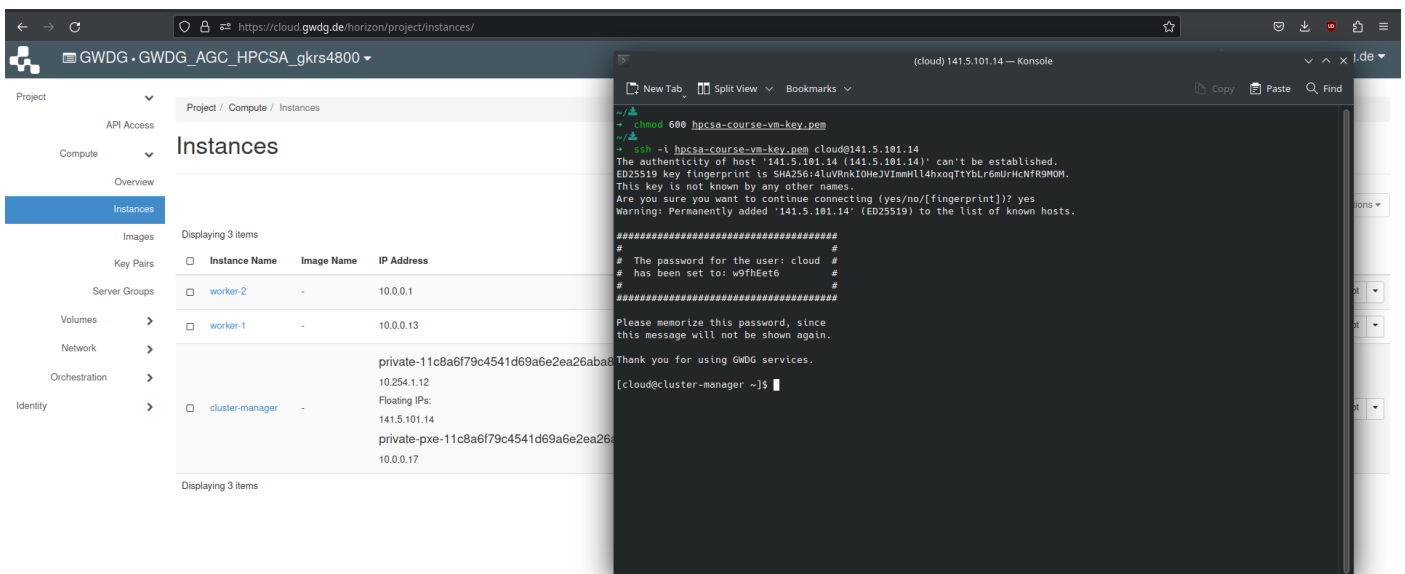
Figure 27: OpenStack Instances; reboot options

Figure 28: OpenStack Instances; Terminal connected with SSH

3. Confirm that it works by running `ssh -V`

MacOS/Linux

1. Search for **Terminal** and open it

2. Check ssh is provided by running the command `ssh -V`

On MacOS/Linux you need to set the correct permission for the **hpcsa-course-vm-key.pem** key before it can be used with SSH.
Run `chmod 600 hpcsa-course-vm-key.pem`
in the same folder as the key.

Using SSH

1. In PowerShell or Terminal type the following command
   `ssh -i hpcsa-course-vm-key.pem -o ServerAliveInterval=60 cloud@YOUR_IP`
   where YOUR_IP is the IP address you got earlier.

2. When asked whether you want to continue, type in `yes`.
   See Figure 28 for comparison.

3. Confirm that running `hostname` returns **cluster-manager.novalocal**.

After getting a running shell on the cluster-manager, follow the instructions provided in the **Configure Network** sheet to finalize the setup of the cluster-manager.