

ZYC2 User Guide

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Connecting to ZYC2

In order to use the ZYC2 infrastructure you will need to connect to it via a VPN client. You should have received an OpenVPN configuration file together with your ZYC2 credentials upon registration.

INFO: The OpenVPN client must be version 2.4 or later

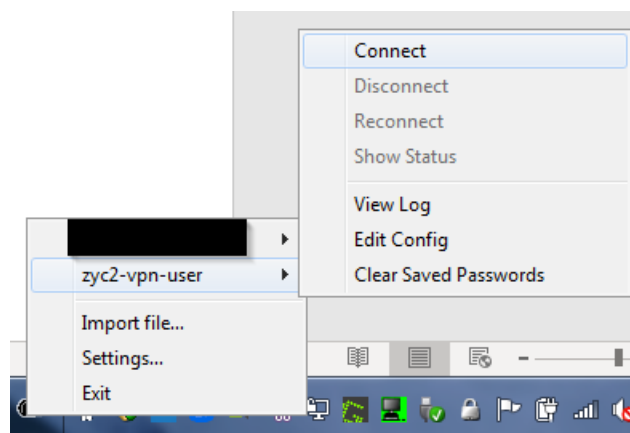
Linux

On most Linux distributions you can either import the OpenVPN configuration file to the Network Manager or use the file directly with the openvpn client.

Windows

On Windows you can download the OpenVPN client software (Windows Installer) from here: <https://openvpn.net/community-downloads/>

After installation you can launch the OpenVPN GUI and a small tray icon should appear. If you right click on it you can select "Import file..." and navigate to the ZYC2 OpenVPN configuration file. After successful import, the connection should appear in the menu as shown in the figure below.



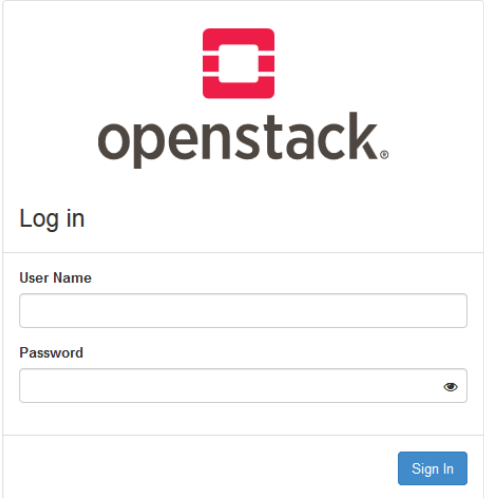
When you click connect you will be prompted a username and password. These are the credentials provided in the registration email.

Mac

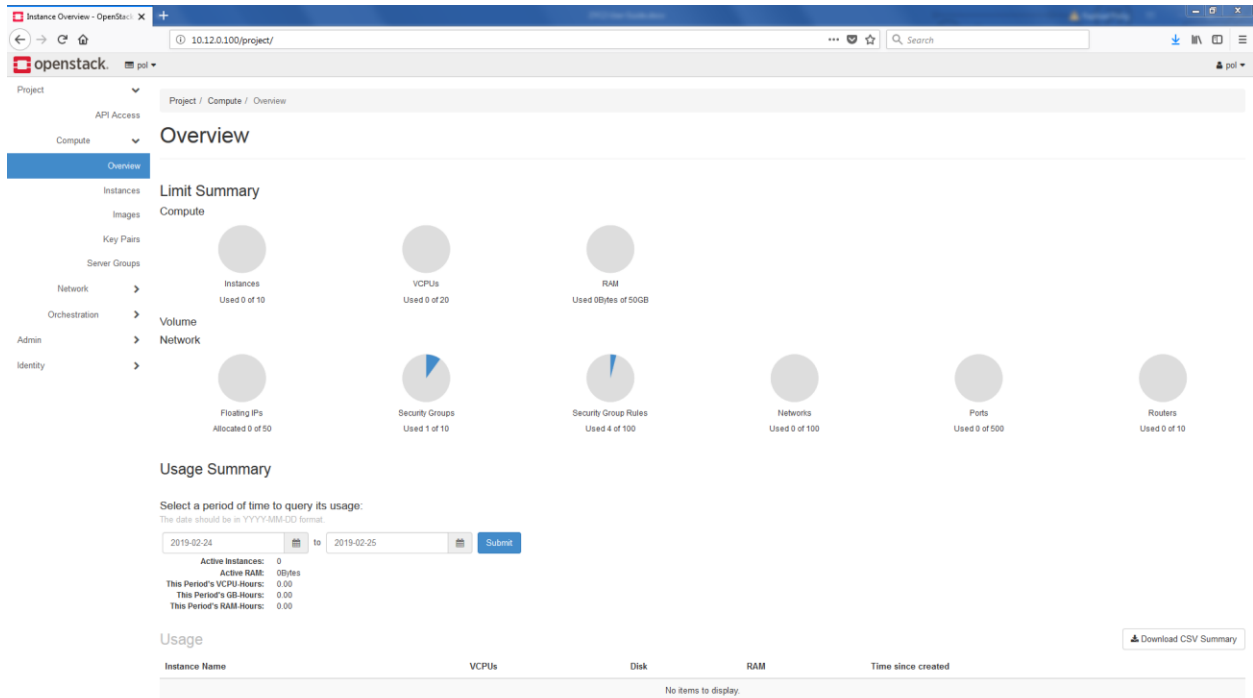
To be tested

Getting started with OpenStack

ZYC2 runs OpenStack to provide an Infrastructure-as-a-Service cloud. This means you can create your own virtual networks and machines. The main point of interaction is the OpenStack Dashboard which can be reached via <http://10.12.0.201/>

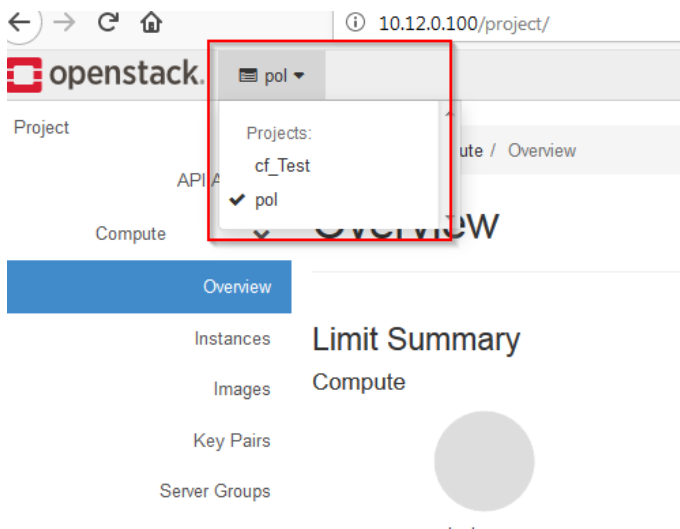
The image shows a web form for logging into the OpenStack dashboard. At the top, there is the OpenStack logo, which consists of a red square with a white 'O' inside, followed by the word 'openstack' in a lowercase, sans-serif font. Below the logo, the text 'Log in' is displayed. Underneath, there are two input fields: the first is labeled 'User Name' and the second is labeled 'Password'. The password field has a small eye icon to its right, indicating a toggle for password visibility. At the bottom right of the form, there is a blue button with the text 'Sign In' in white.

You can login using you ZYC2 credentials. After successful login you are presented an overview of your current project resource usage.



Projects

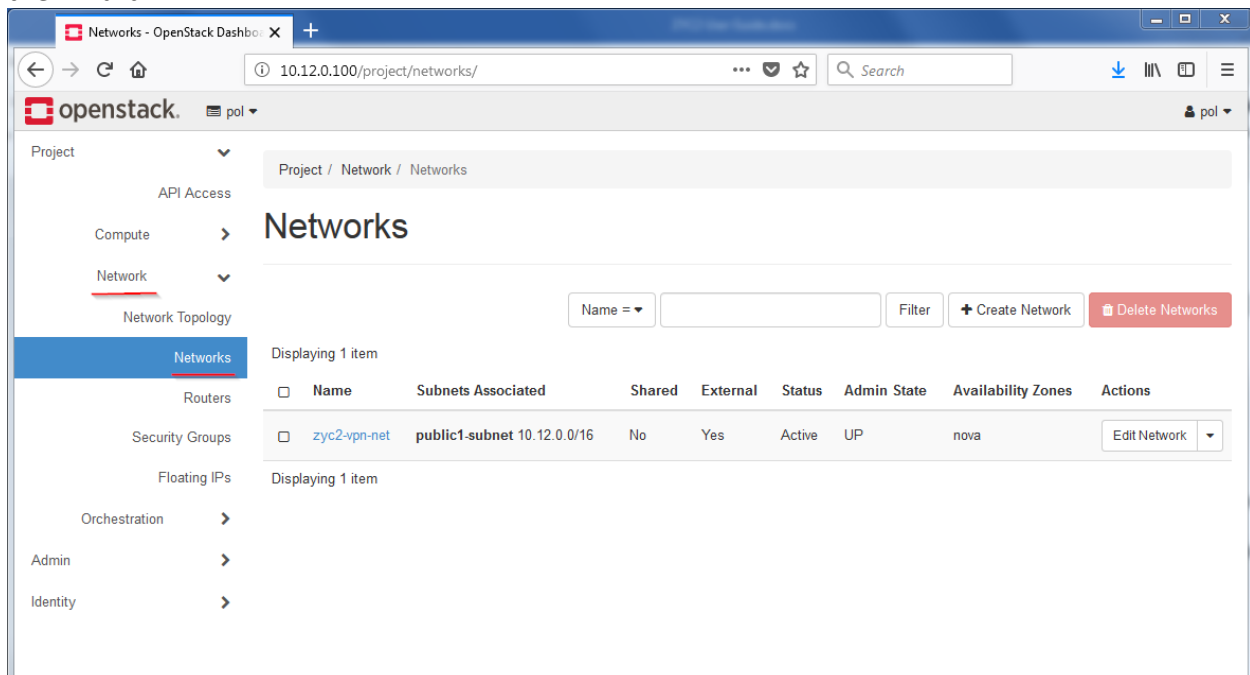
On the top left of the dashboard you can see the project you currently work with. If you click on it a drop-down list will appear of all projects, you are a member of. All members of a project can see and modify the virtual infrastructure of the project. A project also has its own resource limits. You will always be a member of your own project which is named as your username.



Networks

An important aspect of the infrastructure is the network. In OpenStack you may create multiple private networks that belong to your project. Think of them as your “home network”. After creation of your network you may add virtual machines to it. All machines on the same network can communicate with each other.

Let’s create our first network. In the dashboard menu on the left select Network and then click Networks. An overview of networks available to you is shown. The zyc2-vpn-net is available to all projects as the external network. It will come into play later. Click on Create Network to start the wizard.



The screenshot shows the OpenStack Networks dashboard. The left sidebar contains a menu with options: Project, API Access, Compute, Network (selected), Network Topology, Routers, Security Groups, Floating IPs, Orchestration, Admin, and Identity. The main content area is titled 'Networks' and displays a table with one network entry. The table has columns: Name, Subnets Associated, Shared, External, Status, Admin State, Availability Zones, and Actions. The entry for 'zyc2-vpn-net' shows it is associated with 'public1-subnet 10.12.0.0/16', is not shared, is external, and is active. The 'Actions' column for this network includes an 'Edit Network' button.

Name	Subnets Associated	Shared	External	Status	Admin State	Availability Zones	Actions
zyc2-vpn-net	public1-subnet 10.12.0.0/16	No	Yes	Active	UP	nova	Edit Network

Enter a network name, leave the rest default (as in screenshot) and click **Next**.

The screenshot shows the 'Create Network' wizard in the OpenStack dashboard. The 'Network' tab is selected. The 'Network Name' field contains 'pol-net'. The 'Enable Admin State' checkbox is checked. The 'Shared' checkbox is unchecked. The 'Create Subnet' checkbox is checked. The 'Availability Zone Hints' dropdown shows 'nova'. The 'Next' button is highlighted in blue.

Networks - OpenStack Dashboard

10.12.0.100/project/networks/#/create_network__createnetwork

openstack

Project

- API Access
- Compute
- Network
- Network Topology
- Networks**
- Routers
- Security Groups
- Floating IPs
- Orchestration
- Admin
- Identity

Create Network

Network Subnet Subnet Details

Network Name

pol-net

Create a new network. In addition, a subnet associated with the network can be created in the following steps of this wizard.

☒ Enable Admin State

☐ Shared

☒ Create Subnet

Availability Zone Hints

nova

Cancel « Back Next »

Enter a subnet name and a network address range. **192.168.0.0/24** is a good option but it can be any valid range. Click **Next**.

The screenshot shows the 'Create Network' wizard in the OpenStack dashboard, now on the 'Subnet' tab. The 'Subnet Name' field contains 'pol-subnet'. The 'Network Address' field contains '192.168.0.0/24'. The 'IP Version' dropdown is set to 'IPv4'. The 'Gateway IP' field is empty. The 'Disable Gateway' checkbox is unchecked. The 'Next' button is highlighted in blue.

Networks - OpenStack Dashboard

10.12.0.100/project/networks/#/create_network__createnetwork

openstack

Project

- API Access
- Compute
- Network
- Network Topology
- Networks**
- Routers
- Security Groups
- Floating IPs
- Orchestration
- Admin
- Identity

Create Network

Network Subnet Subnet Details

Subnet Name

pol-subnet

Creates a subnet associated with the network. You need to enter a valid "Network Address" and "Gateway IP". If you did not enter the "Gateway IP", the first value of a network will be assigned by default. If you do not want gateway please check the "Disable Gateway" checkbox. Advanced configuration is available by clicking on the "Subnet Details" tab.

Network Address

192.168.0.0/24

IP Version

IPv4

Gateway IP

☐ Disable Gateway

Cancel « Back Next »

You can leave all field blank on the details page and click **Create**.

The screenshot shows the OpenStack Dashboard interface with a 'Create Network' modal dialog box open. The dialog has three tabs: 'Network', 'Subnet', and 'Subnet Details'. The 'Subnet Details' tab is currently selected. Inside this tab, there is a checkbox for 'Enable DHCP' which is checked. Below this, there are three text input fields: 'Allocation Pools', 'DNS Name Servers', and 'Host Routes'. Each field has a small help icon to its right. At the bottom of the dialog, there are three buttons: 'Cancel', '« Back', and 'Create'. The background of the dashboard is dimmed, showing a sidebar with various navigation options like Project, API Access, Compute, Network, and Admin.

Networks - OpenStack Dashboard

10.12.0.100/project/networks/#/create_network__createnetwork

openstack

Project

- API Access
- Compute
- Network
- Network Topology
- Networks
- Routers
- Security Groups
- Floating IPs
- Orchestration
- Admin
- Identity

Create Network

Network Subnet Subnet Details

☒ Enable DHCP

Specify additional attributes for the subnet.

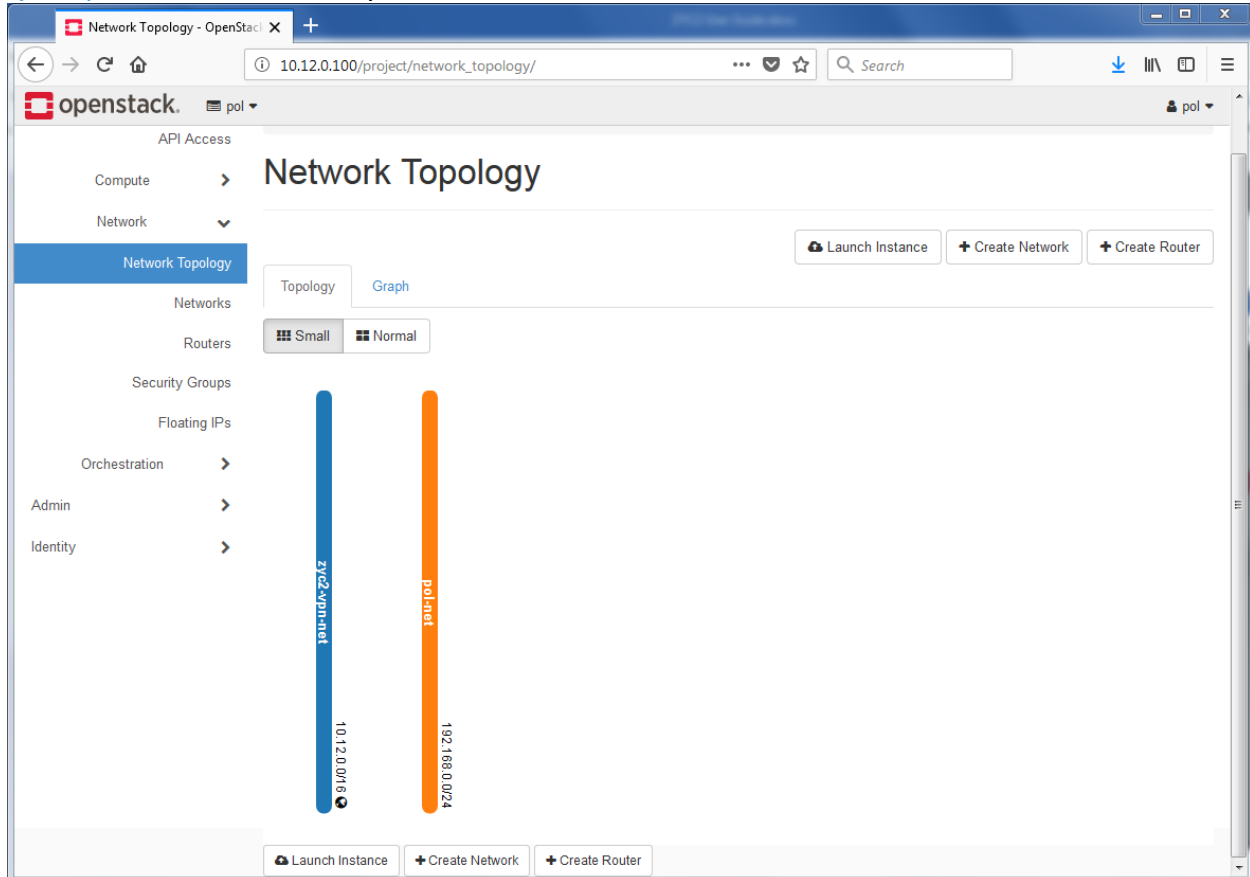
Allocation Pools

DNS Name Servers

Host Routes

Cancel « Back Create

If you now go to **Network Topology** you can see the two networks available to your project. The external [zyc2-vpn-net](#) and your private network. The external network provides access to the VPN network. If you want to SSH from your VPN client into your virtual machines which reside on your private network, we must create a connection from your private network to the [zyc2-vpn-net](#). This is done by a router. Therefore, we click on **Create Router**.



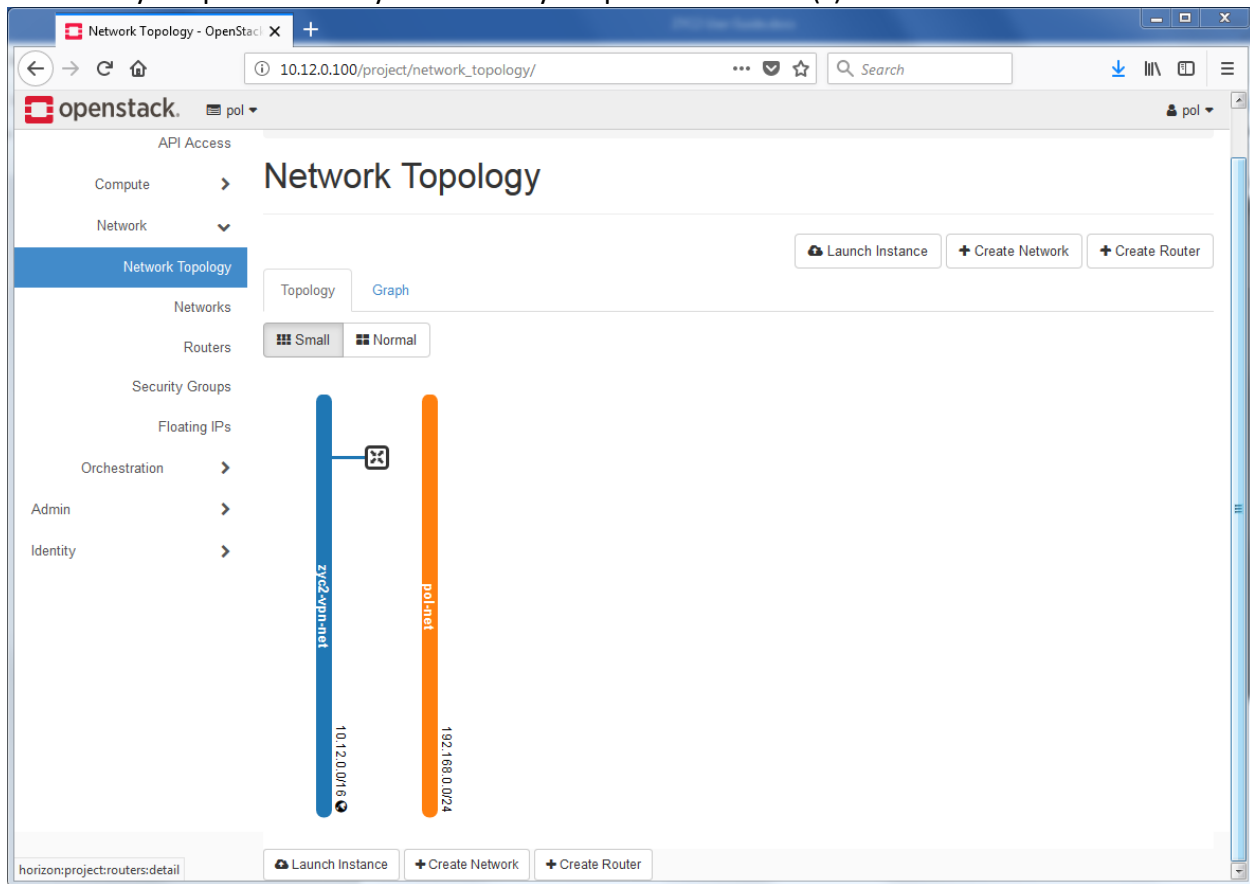
Provide a router name and select *zyc2-vpn-net* as the external network. Leave SNAT and Admin State checked and click **Create Router**.

The screenshot shows the OpenStack Network Topology interface. A modal dialog titled "Create a Router" is open. The dialog contains the following fields and options:

- Router Name:** A text input field containing "pol-router".
- Description:** A text area containing the text: "Creates a router with specified parameters. Enable SNAT will only have an effect if an external network is set."
- Enable Admin State:** A checked checkbox.
- External Network:** A dropdown menu showing "zyc2-vpn-net".
- Enable SNAT:** A checked checkbox.
- Availability Zone Hints:** A text input field containing "nova".

At the bottom of the dialog are two buttons: "Cancel" and "Create Router". The background interface shows a sidebar with navigation options like "Compute", "Network", "Network Topology", "Networks", "Routers", "Security Groups", "Floating IPs", "Orchestration", "Admin", and "Identity". The main area displays a network diagram with two vertical bars representing IP addresses: "10.12.0.0/16" and "192.168.0.0/24". At the bottom of the interface are three buttons: "Launch Instance", "Create Network", and "Create Router".

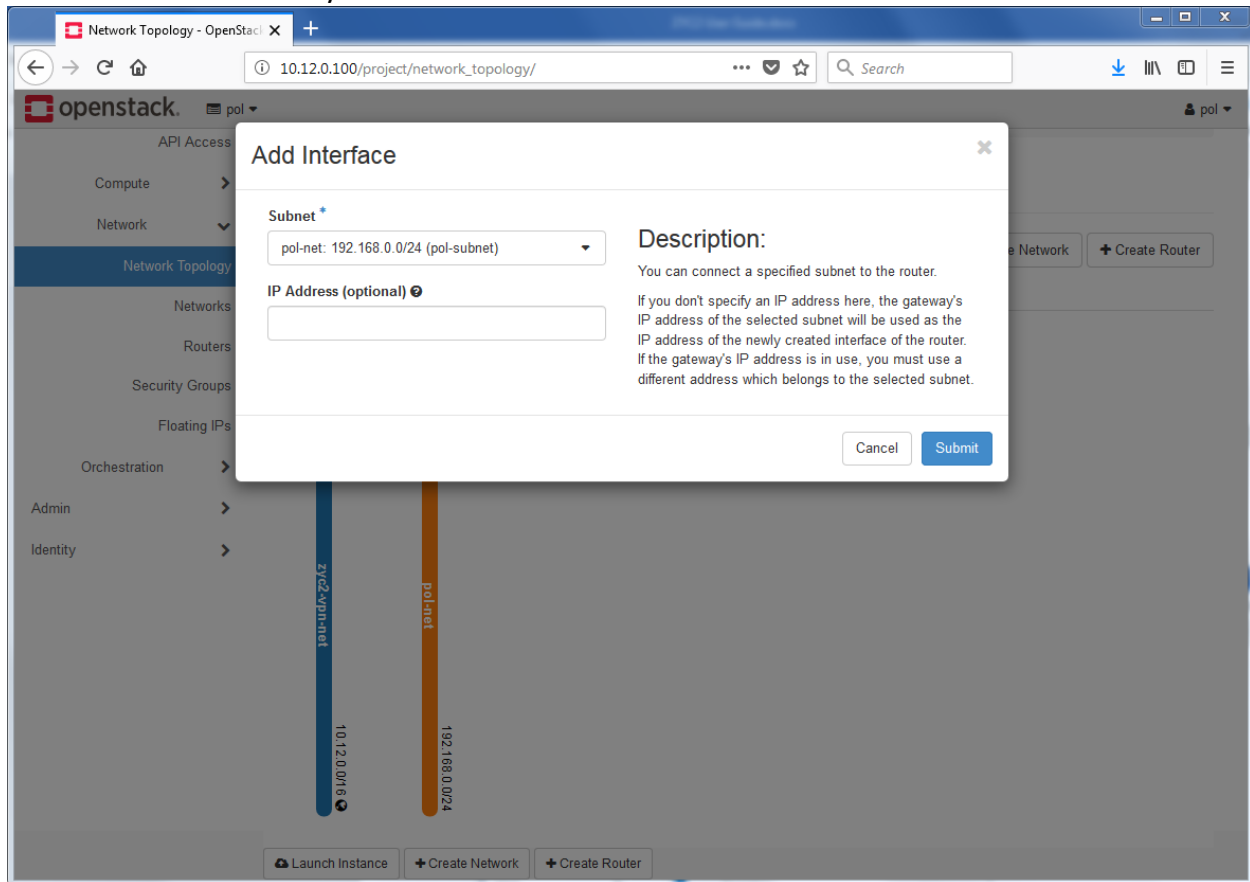
After creation of the router it will appear in the network topology and is connected to the external zyc2-vpn-net. Now you can add your private network(s) to this router.



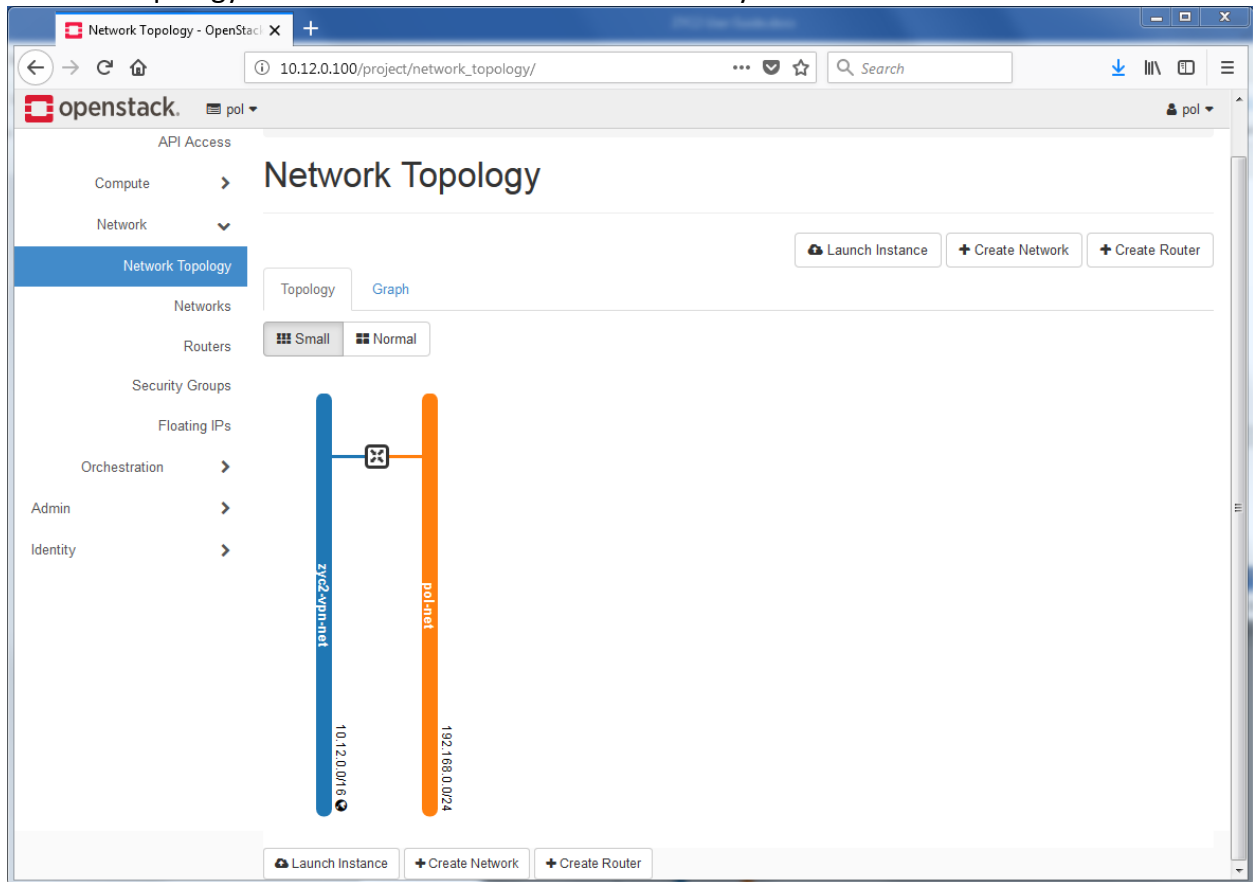
Hover over the router icon and a bubble will appear. Click on Add interface to add your network.

The screenshot displays the OpenStack Network Topology interface in a web browser. The browser's address bar shows the URL `10.12.0.100/project/network_topology/`. The OpenStack logo is visible in the top left corner, and the user 'pol' is logged in, as indicated in the top right. A left-hand navigation menu lists various OpenStack components: Compute, Network, Network Topology (highlighted), Networks, Routers, Security Groups, Floating IPs, Orchestration, Admin, and Identity. The main content area is titled 'Network Topology' and includes tabs for 'Topology' and 'Graph', along with 'Small' and 'Normal' view toggles. At the top right of the main area are buttons for 'Launch Instance', 'Create Network', and 'Create Router'. The 'Topology' view shows a network diagram with a blue vertical line labeled 'zyg2-vpn-net' and an IP address '10.12.0.0/16'. An orange vertical line is labeled '192.168.0.0/24'. A router icon is connected to the blue line. A popup window titled 'pol-router' is open, displaying the router's ID '60479fc0-9cd8-4422-b78e-b625812b4a91' and its status as 'Active'. The 'Interfaces' section lists one interface: 'e9a4e398-3a...' with IP '10.12.1.30', role 'router_gateway', and status 'Active'. The popup includes buttons for '+ Add Interface', 'Delete Interface', 'View Router Details', and 'Delete Router'. At the bottom of the interface, there are buttons for 'Launch Instance', 'Create Network', and 'Create Router'.

Select the subnet which you wish to connect to the external world and hit submit.



Now the topology shows the two networks and how they are connected.



Now your private network can communicate with the outside world.

Compute

To create a virtual machine, you navigate to Compute and then Instances. This gives you an overview of the current virtual machines in your project.

You can click on Launch instance to create a new VM. When the wizard pops up, give the instance a name and click next.

Launch Instance

Please provide the initial hostname for the instance, the availability zone where it will be deployed, and the instance count. Increase the Count to create multiple instances with the same settings.

Instance Name *

vm1

Description

Availability Zone

nova

Count *

1

Total Instances (10 Max)

10%

0 Current Usage
1 Added
9 Remaining

Cancel < Back Next > Launch Instance

Next you can select the image you want the VM to run. Click on the arrow on the right to select the image you want to run. In the example CentOS with installed Xilinx tools will be launched.

The screenshot shows the 'Launch Instance' dialog in the OpenStack dashboard. The 'Source' tab is selected, showing a list of available images. The 'Allocated' section is empty, and the 'Available' section contains a table of images. The 'Launch Instance' button is highlighted in blue.

Instance source is the template used to create an instance. You can use an image, a snapshot of an instance (image snapshot), a volume or a volume snapshot (if enabled). You can also choose to use persistent storage by creating a new volume.

Select Boot Source

Image

Allocated

Name	Updated	Size	Type	Visibility
CentOS 7 Vivado 2018.1	2/11/19 11:04 PM	33.72 GB	qcow2	Public

Available 5

Select one

Click here for filters.

Name	Updated	Size	Type	Visibility
4_topFlash_impl_RoleFlash_monolithic.bit	2/8/19 5:03 PM	15.57 MB	raw	Private
CentOS 7	2/8/19 1:44 AM	6.17 GB	qcow2	Public
CentOS 7 POWER8	2/12/19 10:07 AM	2.07 GB	qcow2	Public
cirros	2/7/19 1:19 PM	12.13 MB	qcow2	Public
topFlash.bit	2/22/19 12:11 PM	14.42 MB	raw	Private

Cancel Back Next Launch Instance

Now we can select a flavor of the virtual machine, meaning how many CPUs, memory and disk space it should have.

The screenshot shows the OpenStack 'Launch Instance' dialog box. The 'Flavor' tab is selected in the left sidebar. The dialog displays two sections: 'Allocated' and 'Available'. The 'Available' section is expanded, showing a list of VM flavors with their respective specifications. The background shows the OpenStack dashboard interface with a sidebar menu and a main content area.

Flavors manage the sizing for the compute, memory and storage capacity of the instance.

Allocated

Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public
m1.large	4	8 GB	80 GB	80 GB	0 GB	Yes

Available 4

Click here for filters.

Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public
m1.tiny	1	512 MB	1 GB	1 GB	0 GB	Yes
m1.small	1	2 GB	20 GB	20 GB	0 GB	Yes
m1.medium	2	4 GB	40 GB	40 GB	0 GB	Yes
m1.xlarge	8	16 GB	160 GB	160 GB	0 GB	Yes

Buttons: Cancel, < Back, Next >, Launch Instance

Finally, we can select which network we want this VM to connect to.

The screenshot shows the OpenStack 'Launch Instance' dialog box. The 'Networks' tab is selected in the left sidebar. The main area displays a table of available networks. The 'Allocated' section shows one network, 'pol-net', which is associated with 'pol-subnet', is not shared, and is in an 'Up' state. The 'Available' section is currently empty, showing 'No available items'. The dialog includes a 'Cancel' button, a '< Back' button, a 'Next >' button, and a 'Launch Instance' button.

Launch Instance

Details
Source
Flavor
Networks
Network Ports
Security Groups
Key Pair
Configuration
Server Groups
Scheduler Hints
Metadata

Networks provide the communication channels for instances in the cloud.

▼ Allocated 1 Select networks from those listed below.

	Network	Subnets Associated	Shared	Admin State	Status
1	pol-net	pol-subnet	No	Up	Active

▼ Available 0 Select at least one network

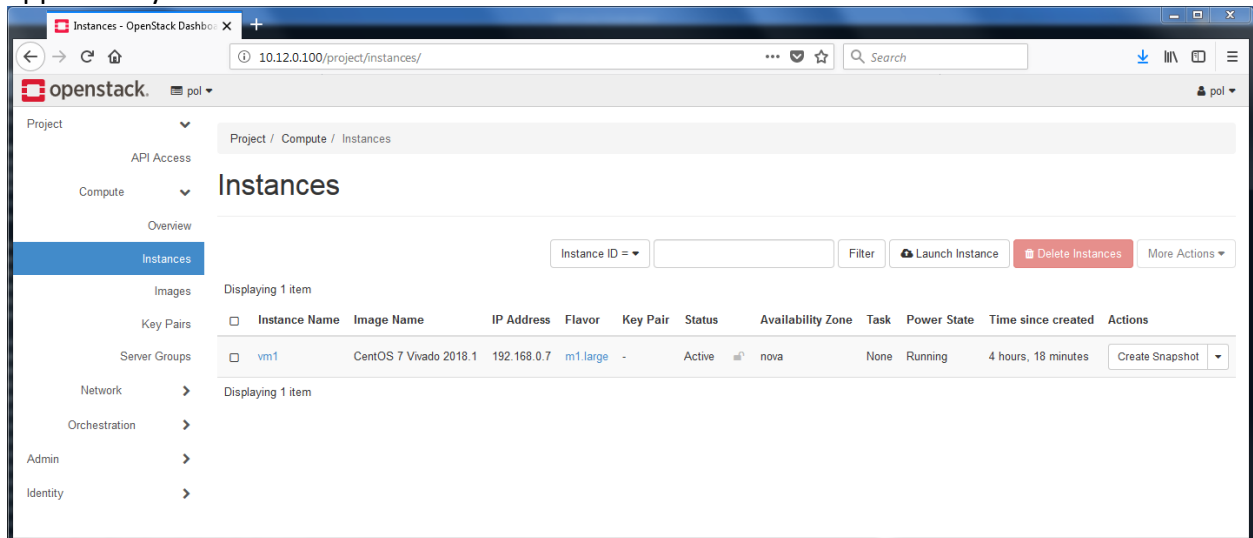
Click here for filters.

Network	Subnets Associated	Shared	Admin State	Status
No available items				

Cancel < Back Next > Launch Instance

All provided images use public key authentication for accessing the VMs. A public key is injected during launch of an instance. Under **Key Pair** you need to add (or generate) the key you want to use.

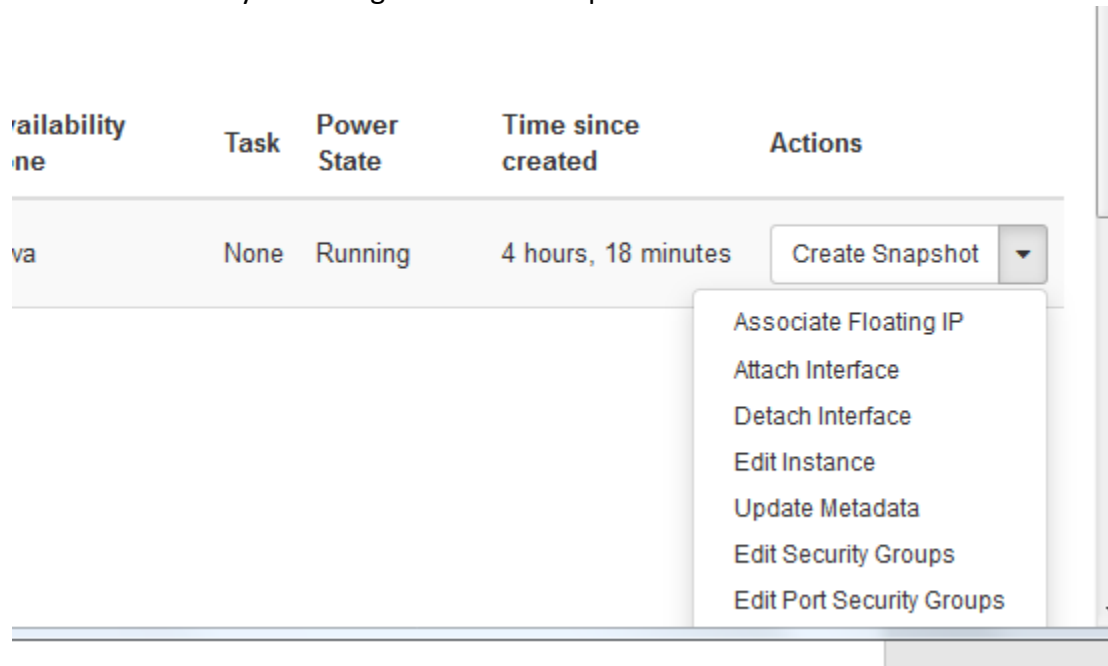
Click **Launch Instance** to start the VM. This may take a few minutes. If successful, the VM appears in your list of instances.



The screenshot shows the OpenStack Dashboard interface. The left sidebar contains a navigation menu with options like Project, API Access, Compute, Overview, Instances (selected), Images, Key Pairs, Server Groups, Network, Orchestration, Admin, and Identity. The main content area is titled 'Instances' and shows a table with one instance named 'vm1'. The table columns are: Instance Name, Image Name, IP Address, Flavor, Key Pair, Status, Availability Zone, Task, Power State, Time since created, and Actions. The instance 'vm1' is in a 'Running' state, using the 'CentOS 7 Vivado 2018.1' image, with IP address '192.168.0.7' and flavor 'm1.large'. The 'Launch Instance' button is visible at the top right of the table.

Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
vm1	CentOS 7 Vivado 2018.1	192.168.0.7	m1.large	-	Active	nova	None	Running	4 hours, 18 minutes	Create Snapshot

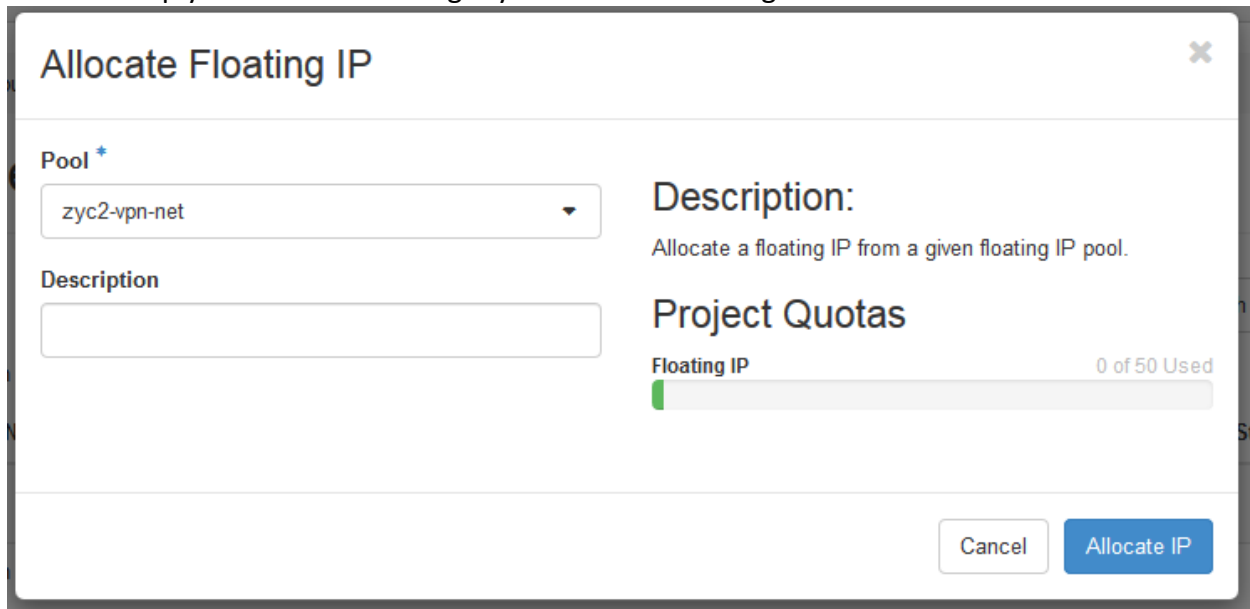
The VM receives an IP address from the private network it has been associated to. To be able to communicate via the external [zyc2-vpn-net](#) network you need to associate a floating IP to it. You can do that by unfolding the actions drop down menu and click on associate floating IP.



A project can receive a limited number of floating IPs from the external network. These floating IPs can then be assigned to specific VMs in the project. If you open this wizard for the first time, there is no floating IP allocated to the project. Click on the plus (+) symbol to allocate one now.

A dialog box titled 'Manage Floating IP Associations' with a close button (X) in the top right corner. It contains two main sections. The first section is 'IP Address *' with a dropdown menu showing 'No floating IP addresses allocated' and a plus (+) button. To the right of this section is the text 'Select the IP address you wish to associate with the selected instance or port.' The second section is 'Port to be associated *' with a dropdown menu showing 'vm1: 192.168.0.7'. At the bottom right of the dialog are two buttons: 'Cancel' and 'Associate'.

You can simply click allocate IP to get your external floating IP.



The 'Allocate Floating IP' dialog box features a title bar with a close button. It contains a 'Pool' dropdown menu with 'zyc2-vpn-net' selected, a 'Description' text input field, and a 'Project Quotas' section with a 'Floating IP' progress bar showing '0 of 50 Used'. At the bottom right are 'Cancel' and 'Allocate IP' buttons.

Allocate Floating IP

Pool *
zyc2-vpn-net

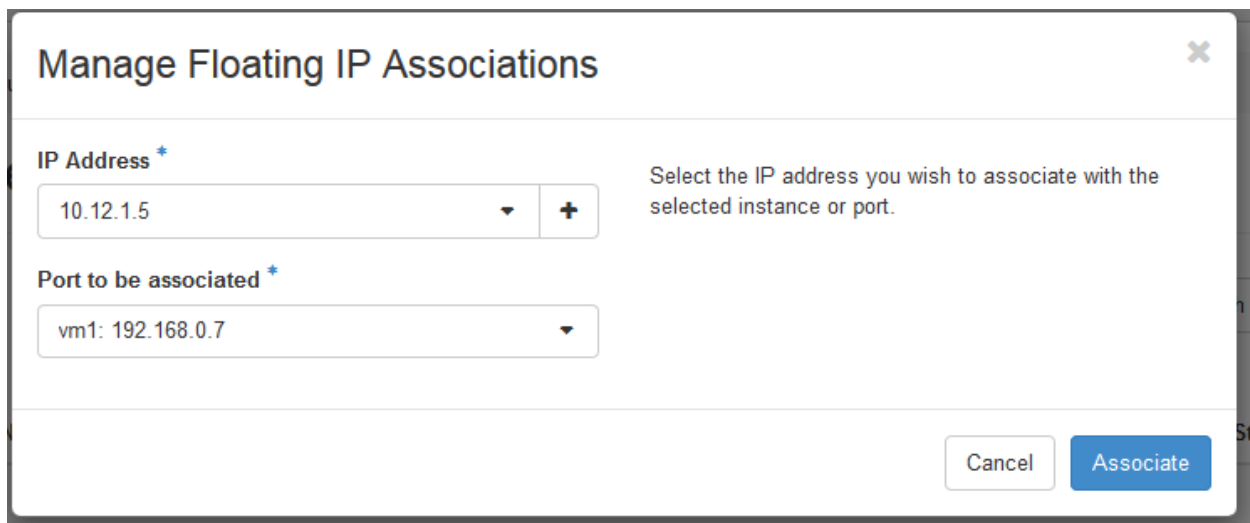
Description

Description:
Allocate a floating IP from a given floating IP pool.

Project Quotas
Floating IP 0 of 50 Used

Cancel Allocate IP

The wizard returns to the previous one and now shows the newly allocated floating IP. You can now associate this IP to a port of your VM. Since there is only one port for now this is a 1-to-1 mapping. Click associate to complete this step.



The 'Manage Floating IP Associations' dialog box has a title bar with a close button. It includes an 'IP Address' dropdown menu with '10.12.1.5' and a '+' button, a 'Port to be associated' dropdown menu with 'vm1: 192.168.0.7', and a descriptive text area. At the bottom right are 'Cancel' and 'Associate' buttons.

Manage Floating IP Associations

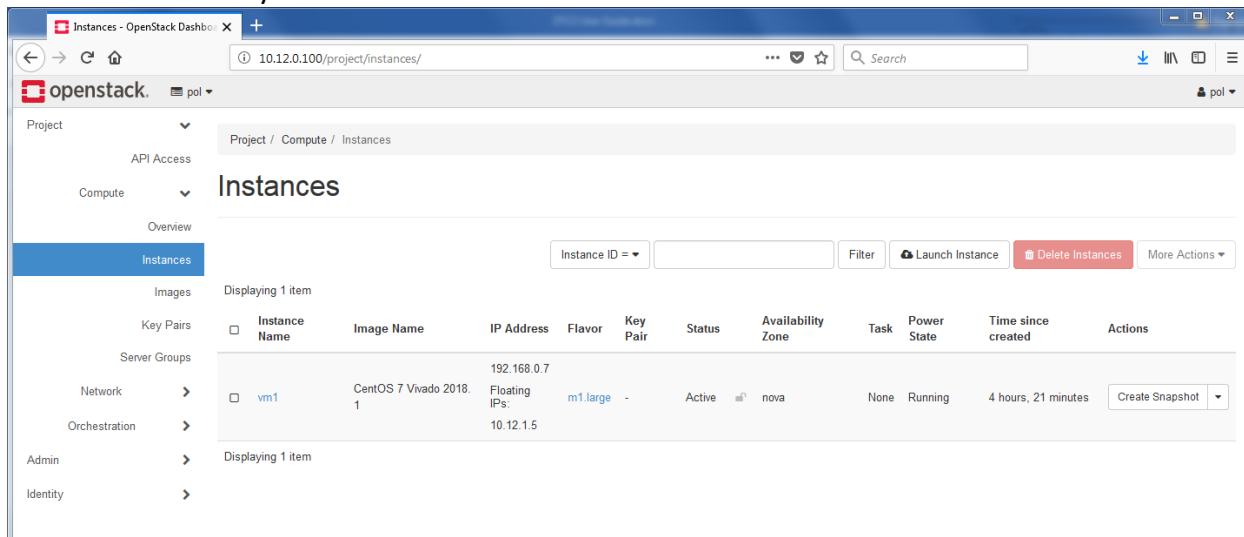
IP Address *
10.12.1.5 +

Port to be associated *
vm1: 192.168.0.7

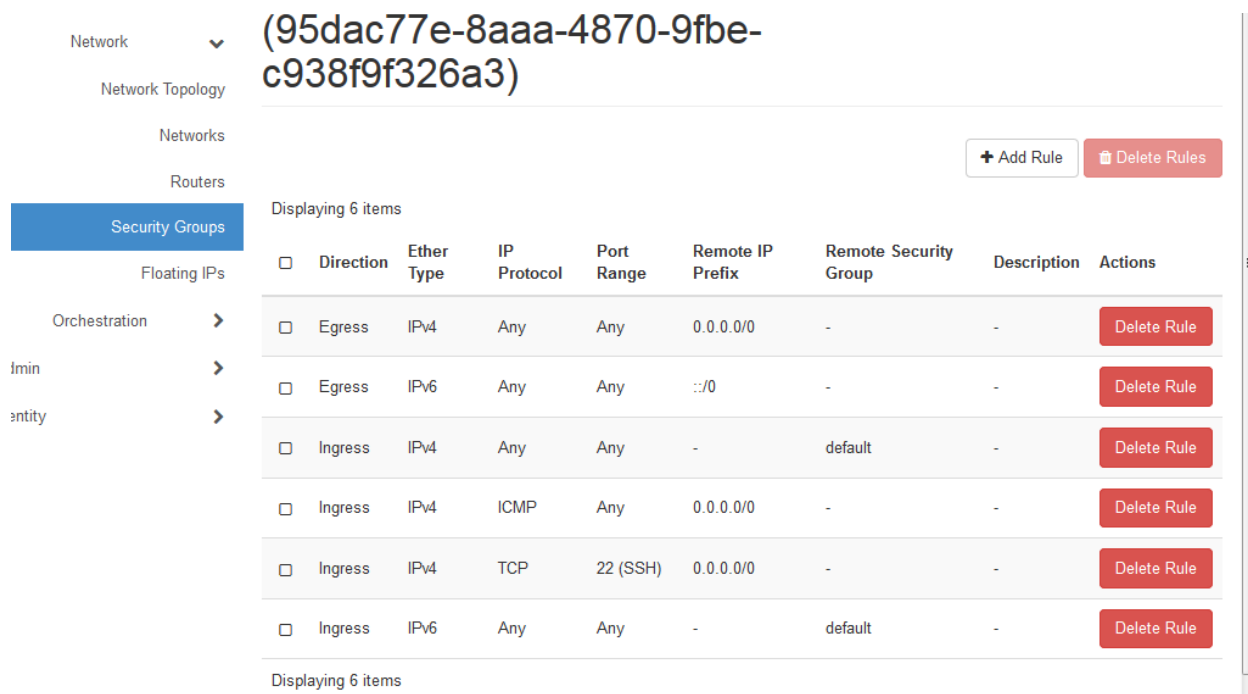
Select the IP address you wish to associate with the selected instance or port.

Cancel Associate

Now the floating IP will also appear in the list of your instances. This is the IP you can use to communicate with your VM.



A last but important step is to adjust or review the security group rules associated with the VM. At VM creation you can select which security group to apply. In our case this was the default security group as it is the only one. Navigate to **Network → Security Groups** and select the group to review or modify. By default, the rules are very restrictive. Click on Add Rule and add at least the all ICMP and SSH rules to the security group. This will allow you to ping the VMs and use ssh for communication.



Accessing your VMs

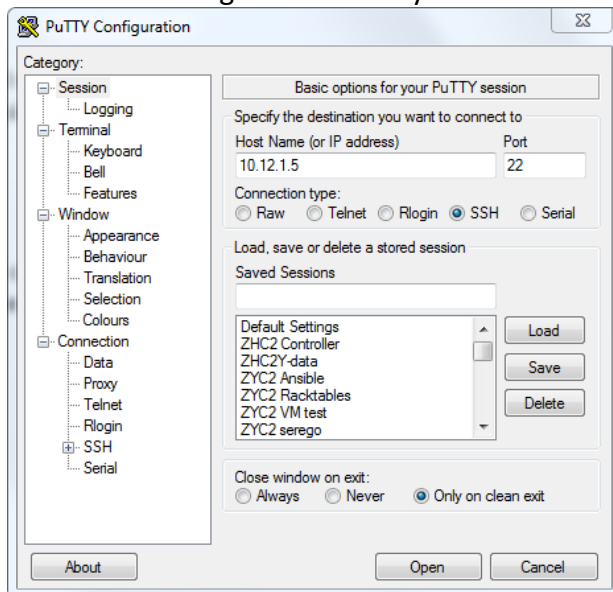
There are two ways of accessing your virtual machines. One is through the Console interface of the OpenStack dashboard. The other is by using SSH and potentially tunneling a VNC session over it.

Windows: SSH using PuTTY

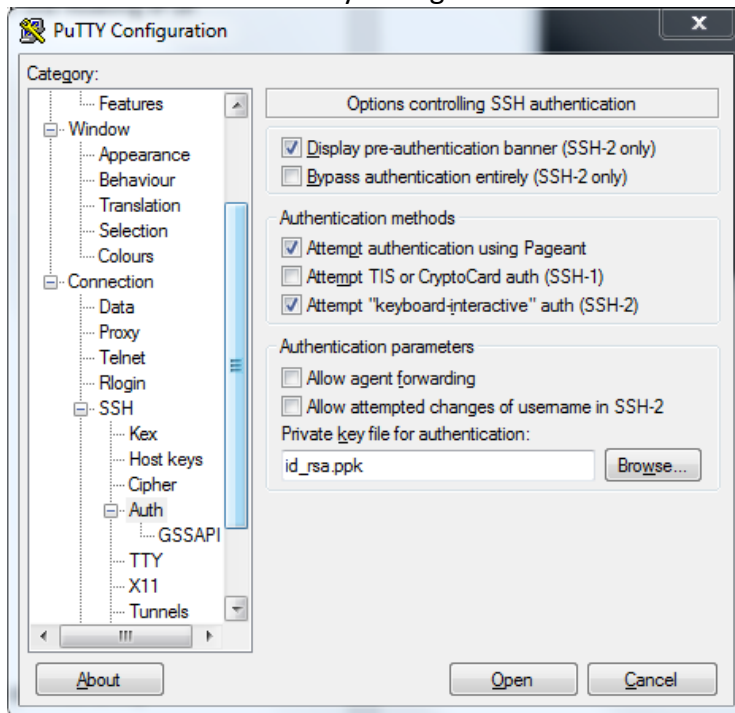
On Windows you can use the [putty](https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html) client to connect to your VM via SSH.

Link: <https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>

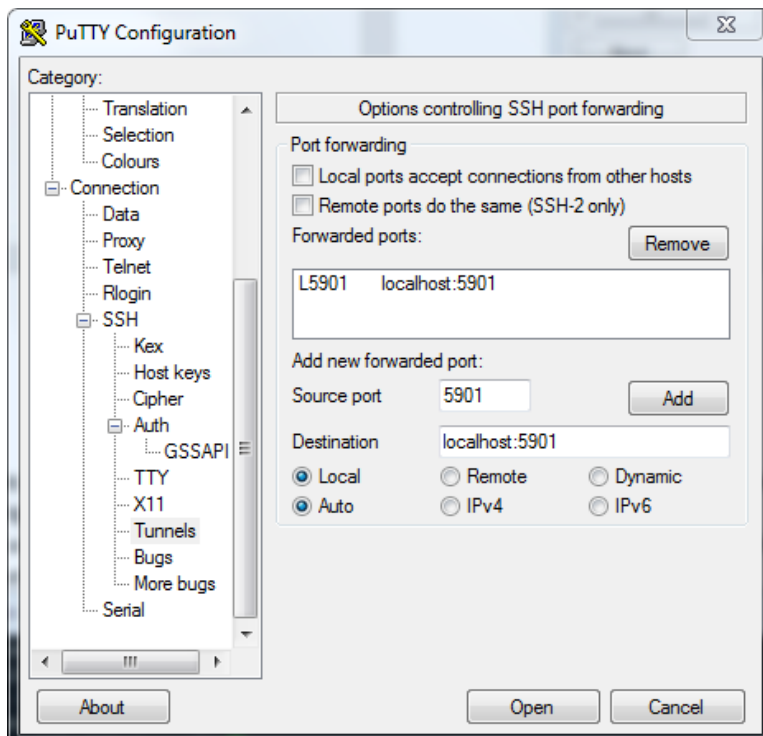
Enter the floating IP of the VM you want to connect to.



Next navigate to **Connection** → **SSH** → **Auth** to indicate and select your private key file. Putty has its own format which you might need to convert to using the [puttygen](#) tool.

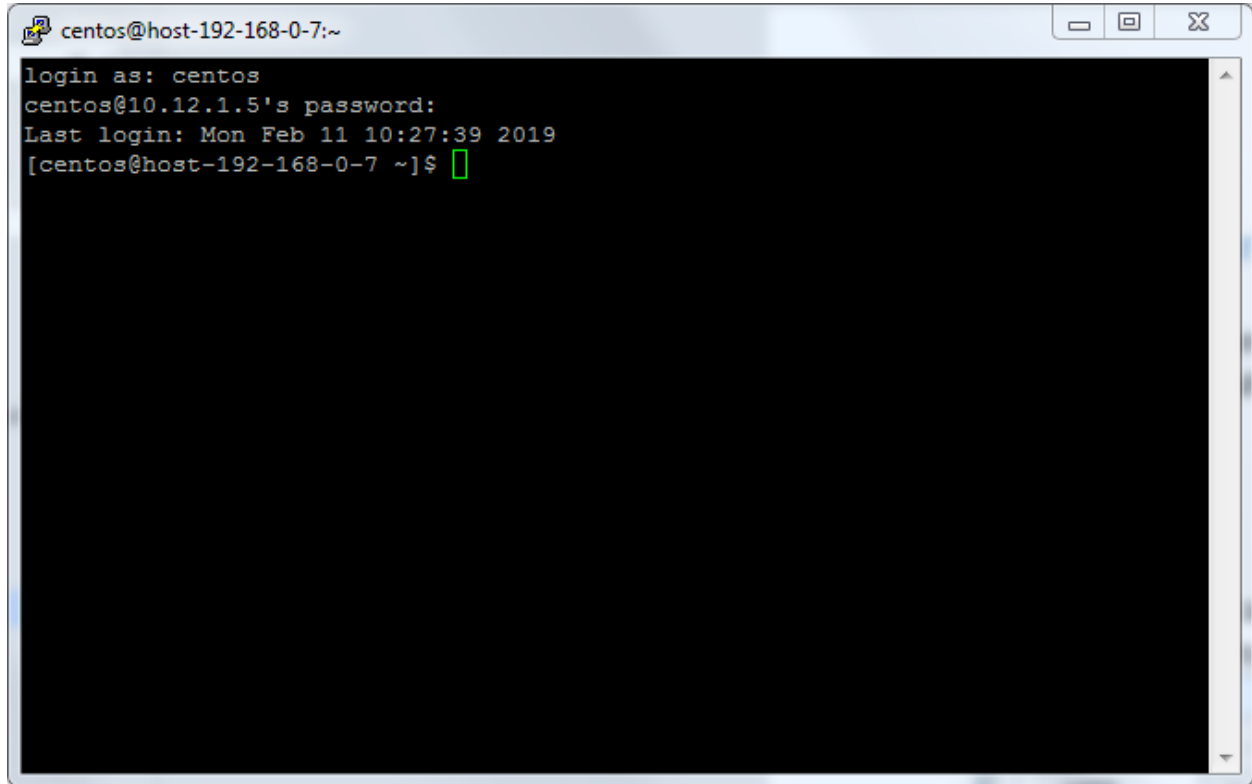


Optional: If the image provides a graphical session then you must use port forwarding to be able to access the VNC session. Go to **Connection** → **SSH** → **Tunnels** and enter [5901](#) as **Source port** and [localhost:5901](#) as **Destination** and click **Add**.



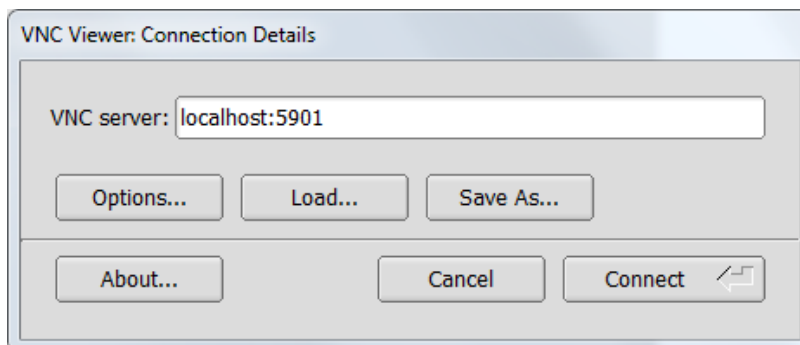
A warning may appear asking whether this is the correct host key. Click yes to permanently accept this finger print.

The terminal window will open and ask you for a username. For all CentOS images the username is set to *centos*.



To access the VNC session you can use TigerVNC

Link: <https://bintray.com/tigervnc/stable/tigervnc/1.9.0>



Linux: SSH

On most Linux distributions you will find ssh already installed.

To use the graphical VNC session you must enable port forwarding with a command similar as follows

```
ssh -L 5901:localhost:5901 -N -f -l centos 10.12.1.15
```

This will forward port 5901 from/to your localhost. You can then connect to your localhost:5901 using your favorite VNC client.