

LAB – OpenStack basic operations

Hands on experience with OpenStack basic operations

References:

- OpenStack documentation

Flavors

- A flavor is a configuration for a virtual machine
- It defines the set of resources that are allocated to a VM at the time of creation
- The administrator must create at least one flavor
- Admin->Flavors->Create Flavor

Create Flavor

Flavor Information *

Flavor Access

Name *

ID ?

VCPUs *

RAM (MB) *

Root Disk (GB) *

Ephemeral Disk (GB)

Swap Disk (MB)

RX/TX Factor

Flavors define the sizes for RAM, disk, number of cores, and other resources and can be selected when users deploy instances.

Cancel

Create Flavor

Pre-created Flavors

openstack.

admin

admin

Project

Admin

Overview

Compute

Hypervisors

Host Aggregates

Instances

Flavors

Images

Volume

Network

System

Identity

Admin / Compute / Flavors

Flavors

Displaying 5 items

Filter

+ Create Flavor

Delete Flavors

	Flavor Name	VCPUs	RAM	Root Disk	Ephemeral Disk	Swap Disk	RX/TX factor	ID	Public	Metadata	Actions
<input type="checkbox"/>	m1.large	4	8GB	20GB	0GB	0MB	1,0	4	Si	No	Update Metadata
<input type="checkbox"/>	m1.medium	2	4GB	20GB	0GB	0MB	1,0	3	Si	No	Update Metadata
<input type="checkbox"/>	m1.small	1	2GB	20GB	0GB	0MB	1,0	2	Si	No	Update Metadata
<input type="checkbox"/>	m1.tiny	1	512MB	1GB	0GB	0MB	1,0	1	Si	No	Update Metadata
<input type="checkbox"/>	m1.xlarge	8	16GB	20GB	0GB	0MB	1,0	5	Si	No	Update Metadata

Displaying 5 items

Images

- VMs are created from images, template of a virtual hard drive in which the OS is preinstalled
- At least one image must be imported
- Download a template in your PC using the following link:
 - http://download.cirros-cloud.net/0.4.0/cirros-0.4.0-x86_64-disk.img
- Admin->Images->Create Image
 - Select the downloaded image

The screenshot shows the 'Create Image' form in OpenStack. The form is titled 'Create Image' and has a close button (X) and a help button (?). It is divided into two tabs: 'Image Details' (selected) and 'Metadata'. The 'Image Details' section contains the following fields:

- Image Name:** A text input field containing 'Cirros'.
- Image Description:** A text input field.
- Image Source:** A section with a 'File' label and a 'Browse...' button. A file named 'cirros-0.5.1-x86_64-disk' is selected.
- Format:** A dropdown menu showing 'QCOW2 - QEMU Emulator'.
- Image Requirements:** A section with three sub-sections:
 - Kernel:** A dropdown menu showing 'Choose an image'.
 - Ramdisk:** A dropdown menu showing 'Choose an image'.
 - Architecture:** A text input field containing 'amd64'.
- Minimum Disk (GB):** A numeric input field with a value of '0'.
- Minimum RAM (MB):** A numeric input field with a value of '0'.
- Image Sharing:** A section with two sub-sections:
 - Visibility:** A group of buttons: 'Private', 'Shared' (selected), 'Community', and 'Public'.
 - Protected:** A group of buttons: 'Yes' and 'No'.

At the bottom of the form, there are three buttons: 'Cancel', '< Back', and 'Next >', and a large orange 'Create Image' button.

Pre-created Images

Project

Admin

Overview

Compute

Hypervisors

Host Aggregates

Instances

Flavors

Images

>

▼

▼

Admin / Compute / Images

Images

🔍

Click here for filters or full text search.

×

+ Create Image

🗑️ Delete Images

Displaying 1 item

	Owner	Name ^	Type	Status	Visibility	Protected	Disk Format	Size	
<input type="checkbox"/>	> admin	cirros	Image	Active	Public	No	QCOW2	12.13 MB	<div>Launch ▼</div>

Instantiate the first VM

- Project->Compute->Instances->Launch Instance

Launch Instance

Details

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 *

test

Description

Availability Zone

nova

Count *

1

Total Instances (10 Max)

10%

0 Current Usage

1 Added

9 Remaining

< Back

Next >

Launch Instance

Launch Instance

Details

Source

Flavor *

Networks *

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

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

Create New Volume

Yes

No

Allocated

Displaying 1 item

Name	Updated	Size	Type	Visibility
◀ cirros	4/15/23 1:09 PM	12.13 MB	QCOW2	Public

Displaying 1 item

▼ Available 1

Select one

Click here for filters or full text search.

Displaying 0 items

Name	Updated	Size	Type	Visibility
No items to display.				

Displaying 0 items

< Back

Next >

Launch Instance

Launch Instance

Details

Source

Flavor

Networks *

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

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.tiny	1	512 MB	1 GB	1 GB	0 GB	Yes

▼ Available 4

Select one

Click here for filters or full text search.

Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public
▶ m1.xsmall	1	2 GB	20 GB	20 GB	0 GB	Yes
▶ m1.medium	2	4 GB	20 GB	20 GB	0 GB	Yes
▶ m1.large	4	8 GB	20 GB	20 GB	0 GB	Yes
▶ m1.xlarge	8	16 GB	20 GB	20 GB	0 GB	Yes

< Back

Next >

Launch Instance

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	test	test-subnet	No	Up

▼ Available 1

Select at least one network

Click here for filters or full text search.

Network	Subnets Associated	Shared	Admin State	Status
▶ external	external-subnet	No	Up	Active

< Back

Next >

Launch Instance

Check the image running

- Admin->Compute->Instances
- The image runs on a certain host and has a certain IP in the internal network

Overview

Compute

Hypervisors

Host Aggregates

Instances

Flavors

Images

Instances

Project Name = Filter Delete Instances

Displaying 1 item

<input type="checkbox"/>	Project	Host	Name	Image Name	IP Address	Flavor	Status	Task	Power State	Age	Actions	
<input type="checkbox"/>	admin	cloud2023	test	cirros	192.168.222.64	m1.tiny	Active		None	Running	0 minuti	Rescue Instance ▼

Displaying 1 item

Console

Overview

Compute

Hypervisors

Host Aggregates

Instances

Flavors

Overview Log Console Action Log

Instance Console

If console is not responding to keyboard input: click the grey status bar below. [Click here to show only console](#)

To exit the fullscreen mode, click the browser's back button.

```
Mem: 37960K used, 462192K free, 88K shrd, 3648K buff, 11396K cached
CPU:  0% usr  4% sys  0% nic 95% idle  0% io  0% irq  0% irq
Load average: 0.00 0.00 0.00 1/75 418
```

PID	PPID	USER	STAT	VSZ	%VSZ	%CPU	COMMAND
418	413	ciros	R	3312	1%	5%	top
7	2	root	SW	0	0%	0%	[rcu_sched]
338	1	root	S	9216	2%	0%	/usr/sbin/dropbear -R
413	1	ciros	S	3320	1%	0%	-sh
230	1	root	S	3316	1%	0%	udhcpd -p /var/run/udhcpd.eth0.pid -R
1	0	root	S	3312	1%	0%	init
412	1	root	S	3312	1%	0%	/sbin/getty -L 115200 ttyS0 vt100
184	1	root	S	3308	1%	0%	/sbin/acpid
157	1	root	S	3300	1%	0%	/sbin/syslogd -n
158	1	root	S	3296	1%	0%	/sbin/klogd -n
25	2	root	SW	0	0%	0%	[kworker/0:1]
48	2	root	SW	0	0%	0%	[vballoon]
6	2	root	SW	0	0%	0%	[kworker/u2:0]
10	2	root	SW	0	0%	0%	[watchdog/0]
128	2	root	SW<	0	0%	0%	[kworker/0:1H]
2	0	root	SW	0	0%	0%	[kthreadd]
126	2	root	SW	0	0%	0%	[jbd2/vda1-8]
11	2	root	SW	0	0%	0%	[kdevtmpfs]
14	2	root	SW	0	0%	0%	[khungtaskd]
5	2	root	SW<	0	0%	0%	[kworker/0:0H]
3	2	root	SW	0	0%	0%	[ksoftirqd/0]

SPICE Send Ctrl-Alt-Delete

```
[ 3.383005] zswap: loaded using pool lzo/zbud
[ 3.401471] Key type trusted registered
[ 3.412918] Key type encrypted registered
[ 3.535569] AppArmor: AppArmor sha1 policy hashing enabled
[ 3.549326] ima: No TPM chip found, activating TPM-bypass!
[ 3.559197] evm: HMAC attrs: 0x1
[ 3.574825] Magic number: 3:75:635
[ 3.582742] rtc_cmos 00:00: setting system clock to 2023-04-15 13:37:35 UTC (
1681565855)
[ 3.598076] BIOS EDD facility v0.16 2004-Jun-25, 0 devices found
[ 3.612574] EDD information not available.
[ 3.645578] Freeing unused kernel memory: 1480K (ffffffffff81f42000 - fffffff8
20b4000)
[ 3.661136] Write protecting the kernel read-only data: 14336k
[ 3.705720] Freeing unused kernel memory: 1860K (ffff88000182f000 - ffff88000
1a00000)
[ 3.723397] Freeing unused kernel memory: 168K (ffff880001dd6000 - ffff880001
e00000)

further output written to /dev/ttyS0
[ 4.250010] random: dd urandom read with 24 bits of entropy available

login as 'ciros' user. default password: 'gocubsgo'. use 'sudo' for root.
test login:
```

```
3 2 root SW 0 0% 0% [ksoftirqd/0]
$ ip addr show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1442 qdisc pfifo_fast qlen 1000
    link/ether fa:16:3e:0f:5e:97 brd ff:ff:ff:ff:ff:ff
    inet 192.168.222.64/24 brd 192.168.222.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe0f:5e97/64 scope link
        valid_lft forever preferred_lft forever
```

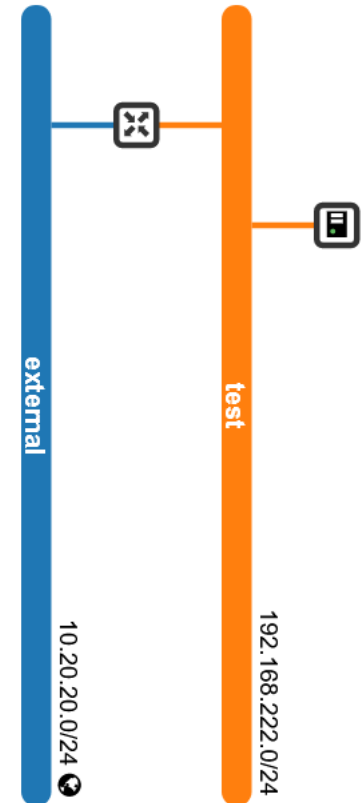

Network configuration

- By default, two networks are created, one internal and one external

Displaying 2 items

<input type="checkbox"/>	Name	Subnets Associated	Shared	External	Status	Admin State	Availability Zones	Actions
<input type="checkbox"/>	external	external-subnet 10.20.20.0/24	No	Si	Active	UP	-	Edit Network ▼
<input type="checkbox"/>	test	test-subnet 192.168.222.0/24	No	No	Active	UP	-	Edit Network ▼

Displaying 2 items



Create a network

- Admin -> Network
-> Networks ->
Create Network

Create Network

Network*

Subnet

Subnet Details

Name

prova

Project*

admin

Provider Network Type ⓘ

Local

☒ Enable Admin State ⓘ

☐ Shared

☐ External Network

☒ Create Subnet

Availability Zone Hints ⓘ

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

Cancel

« Back

Next »

Create Network

Network

Subnet

Subnet Details

Subnet Name

prova

Network Address ⓘ

192.168.1.0/24

IP Version

IPv4

Gateway IP ⓘ

192.168.1.1

☐ Disable Gateway

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.

Cancel

« Back

Next »

Create Network

Network*

Subnet

Subnet Details

☒ Enable DHCP

Specify additional attributes for the subnet.

Allocation Pools ⓘ

192.168.1.2,192.168.1.20

DNS Name Servers ⓘ

8.8.8.8

Host Routes ⓘ

Cancel

« Back

Create

Connect the VM to the new network

- Instances->Attach Interface

Attach Interface

The way to specify an interface *

by Network (and IP address)

Network *

prova (192.168.1.0/24)

Fixed IP Address ?

Description:

Select the network for interface attaching.

Attach Interface

Displaying 1 item

<input type="checkbox"/>	Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Age	Actions
<input type="checkbox"/>	test	cirros	prova 192.168.1.15 test 192.168.222.64	m1.tiny	-	Active	nova	None	Running	39 minuti	Create Snapshot

Displaying 1 item

Floating IPs

- VMs can be assigned a public IP address to connect to the internet via Floating IP addresses
- A Floating IP is an IP address that is assigned to a VM to access an external network
- The IP address is not actually assigned to the VM, instead, NAT is performed by the router
- To assign a floating IP address go to the menu of the instance and select 'Associate Floating IP'

<input type="checkbox"/>	Prova	Cirros	10.1.1.70, 192.168.1.87	basic
--------------------------	-------	--------	----------------------------	-------

The image shows two screenshots of the 'Manage Floating IP Associations' dialog box. The left screenshot shows the 'Request a new' button highlighted with a blue arrow. The right screenshot shows the 'IP Address' dropdown set to '192.168.1.87'.

Manage Floating IP Associations

Request a new

IP Address *
No floating IP addresses alloc... +
Select the IP address you wish to associate with the selected instance or port.

Port to be associated *
Prova: 10.1.1.70

Cancel Associate

Manage Floating IP Associations

IP Address *
192.168.1.87 +
Select the IP address you wish to associate with the selected instance or port.

Port to be associated *
Prova: 10.1.1.70

Cancel Associate

Allow ingress traffic

- By default ingress traffic to VMs is disabled
- To enable some type of traffic:
 - Network->Security Groups->Manage Rules->Add Rule

Add Rule

Rule *

Custom TCP Rule

Description ?

Direction

Ingress

Open Port *

Port

Port * ?

Remote * ?

CIDR

CIDR * ?

0.0.0.0/0

Description:

Rules define which traffic is allowed to instances assigned to the security group. A security group rule consists of three main parts:

Rule:

You can specify the desired rule template or use custom rules, the options are Custom TCP Rule, Custom UDP Rule, or Custom ICMP Rule.

Open Port/Port Range:

For TCP and UDP rules you may choose to open either a single port or a range of ports. Selecting the "Port Range" option will provide you with space to provide both the starting and ending ports for the range. For ICMP rules you instead specify an ICMP type and code in the spaces provided.

Remote:

You must specify the source of the traffic to be allowed via this rule. You may do so either in the form of an IP address block (CIDR) or via a source group (Security Group). Selecting a security group as the source will allow any other instance in that security group access to any other instance via this rule.

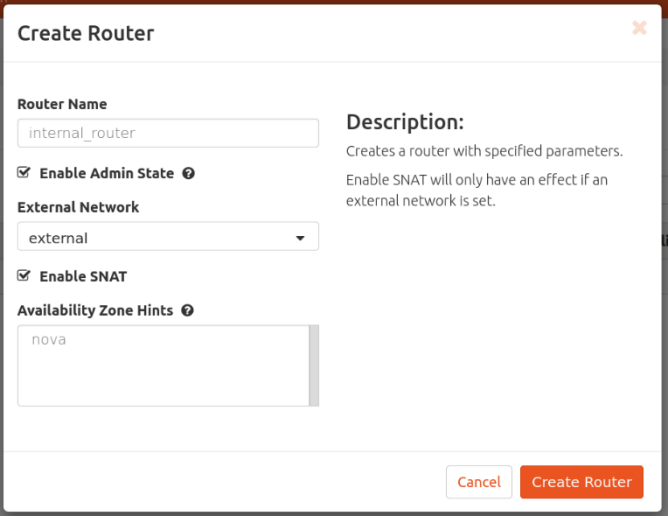
Cancel

Add

Create a virtual router for the internal net

- Create a virtual router or gateway to link the virtual network with the external one
- Project -> Network -> Routers -> Create Router

The router will have an interface on the external network



The screenshot shows the 'Create Router' dialog box. It contains the following fields and options:

- Router Name:** A text input field containing 'internal_router'.
- Enable Admin State:** A checked checkbox with a help icon.
- External Network:** A dropdown menu showing 'external'.
- Enable SNAT:** A checked checkbox.
- Availability Zone Hints:** A text input field containing 'nova'.
- Description:** A text area with the text: 'Creates a router with specified parameters. Enable SNAT will only have an effect if an external network is set.'
- Buttons:** 'Cancel' and 'Create Router' at the bottom right.

Connect router to the internal network

- The router needs to be explicitly connected to the internal network
- Enter in the router configuration, interfaces tab
- Then Add Interface:

Add Interface

Subnet *
internal: 10.1.1.0/24 (internal)

IP Address (optional) ?
10.1.1.1

Description:

You can connect a specified subnet to the router.

If you don't specify an IP address here, the gateway's IP address of the selected subnet will be used as the IP address of the newly created interface of the router. If the gateway's IP address is in use, you must use a different address which belongs to the selected subnet.

Cancel

Submit

The screenshot shows the OpenStack Dashboard interface for configuring a router. The breadcrumb navigation is Project / Network / Routers / internal_router. The 'internal_router' configuration page has three tabs: Overview, Interfaces (selected), and Static Routes. On the right side, there are buttons for '+ Add Interface' and 'Delete Interfaces'. Below these, a table displays the current interface configuration:

Displaying 1 Item						
<input type="checkbox"/>	Name	Fixed IPs	Status	Type	Admin State	Actions
<input type="checkbox"/>	(631c740e-8faa)	• 192.168.1.27	Active	External Gateway	UP	Delete Interface

Below the table, it says 'Displaying 1 Item'. On the left sidebar, the 'Network' section is expanded, showing 'Routers' and 'Security Groups'.

Volumes

- A volume is a secondary hard drive that can be connected dynamically to a VM
- Volumes->Create volume
- The volume module is not installed in microstack

Displaying 1 item

<input type="checkbox"/>	Name	Description	Size	Status	Group	Type	Attached To	Availability Zone	Bootable	Encrypted	Actions
<input type="checkbox"/>	test	-	1GiB	Error	-	__DEFAULT__	nova		No	No	Delete Volume

Displaying 1 item

Create Volume

Volume Name

test

Description

Volume Source

No source, empty volume

Type

__DEFAULT__

Size (GiB)

1

Availability Zone

No availability zones found

Group

No group

Description:

Volumes are block devices that can be attached to instances.

Volume Type Description:

__DEFAULT__

Default Volume Type

Volume Limits

Total Gibibytes

0 of 1.000 GiB Used

Number of Volumes

0 of 10 Used

Cancel

Create Volume

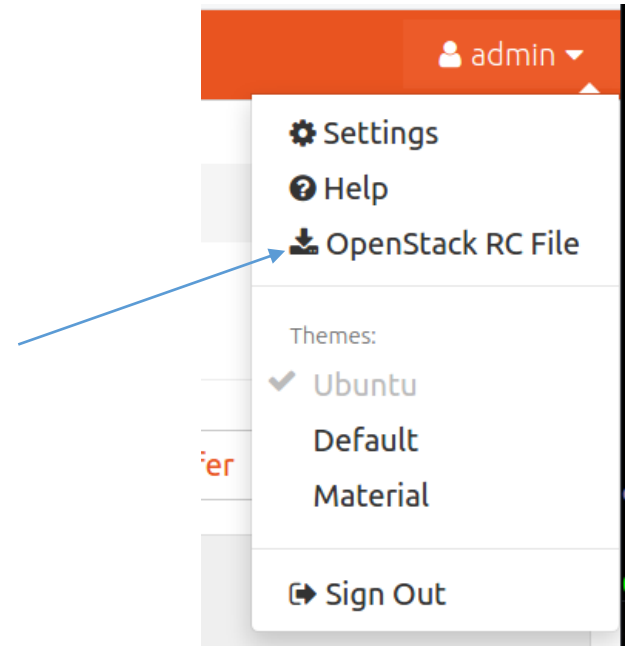
OpenStack SDK

- OpenStack provides an SDK to create applications that interact with the platform, one SDK version is available for python3
- To install it (e.g. on the controller node):

```
apt-get install python3-pip  
pip3 install openstacksdk
```

- Download the authentication file and authenticate
- Upload the file on the controller and activate

```
source openstack.sh
```



Simple Application

```
import openstack
```

```
# Connect
```

```
conn=openstack.connect()
```

```
# list images
```

```
for image in conn.compute.images():  
    print(image)
```

```
# list VMs
```

```
print("List Servers:")
```

```
for server in conn.compute.servers():  
    print(server)
```

Command line

- OpenStack offers a command line interface alternative to the web one
`snap install --classic openstackclients`

```
wget https://cloud-images.ubuntu.com/bionic/current/bionic-server-cloudimg-amd64.img
```

```
source admin.sh
```

```
openstack image create --public --disk-format qcow2 --  
container-format bare --file bionic-server-cloudimg-  
amd64.img Ubuntu
```

Other examples

- <https://github.com/openstack/openstacksdk/blob/master/examples/>