

Cloud e Datacenter Networking

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OpenStack: a quick guided tour



Lesson outline



- ▶ **OpenStack installation with DevStack**
- ▶ **Use of the dashboard to instantiate a VM and manage volumes**
- ▶ **Some CLI commands to interact with OpenStack services**

OpenStack installation: all-in-one VM with DevStack (1)



- ▶ DevStack is a system for automatic installation of OpenStack services
- ▶ **WARNING:** *DevStack is targeted at developers to use the raw upstream code. It makes many choices that are not appropriate for production systems.*
- ▶ Follow instructions at <http://docs.openstack.org/developer/devstack/guides/single-vm.html>
- ▶ Start from a plain Ubuntu 14.04 VM with at least 3 GB of RAM
- ▶ For better performance, ensure that nested virtualization is enabled
 - ▶ `cat /sys/module/kvm_intel/parameters/nested` should return Y
 - ▶ See <http://docs.openstack.org/developer/devstack/guides/devstack-with-nested-kvm.html>
- ▶ Assume that 192.168.100.128 is the address of the eth0 interface of the VM
- ▶ By default:
 - ▶ 2 tenants are created: “admin” and “demo”
 - ▶ 2 users are created: “admin” and “demo” with password “openstack”
 - ▶ “admin” user has administrative privileges to make changes for all tenants



▶ Preliminary operations (*only once*):

```
openstack@vm01:~$ sudo apt-get install git -y
openstack@vm01:~$ git clone https://git.openstack.org/openstack-dev/devstack
openstack@vm01:~$ cd devstack/
openstack@vm01:~/devstack$ cp samples/local.conf .
openstack@vm01:~/devstack$ vi local.conf → Edit local.conf (see next slides)
```

▶ To install a previous (e.g. kilo) DevStack version:

```
git clone -b stable/kilo https://git.openstack.org/openstack-dev/devstack
```

▶ Start DevStack (*and wait about 30 minutes*):

```
openstack@vm01:~/devstack$ ./stack.sh
```

▶ Stop DevStack (*before VM is shutdown*):

```
openstack@vm01:~/devstack$ ./unstack.sh
```

▶ Remove files that Devstack installed:

```
openstack@vm01:~/devstack$ ./clean.sh
```

▶ Rejoin Devstack after reboot (*script removed in latest DevStack releases*):

```
openstack@vm01:~/devstack$ ./rejoin-stack.sh
```

OpenStack installation: all-in-one VM with DevStack (2)



- ▶ The content of the `local.conf` file determines the system configuration
- ▶ Sample `local.conf` for an all-in-one VM with neutron networking

```
[[local|localrc]]
ADMIN_PASSWORD=decideyours
DATABASE_PASSWORD=decideyours
RABBIT_PASSWORD=decideyours
SERVICE_PASSWORD=$ADMIN_PASSWORD
HOST_IP=192.168.56.2
SERVICE_HOST=192.168.56.2
MYSQL_HOST=192.168.56.2
RABBIT_HOST=192.168.56.2
GLANCE_HOSTPORT=192.168.56.2:9292
# Do not use Nova-Network
disable_service n-net
# Enable Neutron
ENABLED_SERVICES+=,q-svc,q-dhcp,q-meta,q-agt,q-13
...
```



▶ Sample local.conf for an all-in-one VM with neutron networking (*continues*)

```
...
## Neutron options
Q_USE_SECGROUP=True
FLOATING_RANGE="192.168.56.0/24"
FLOATING_RANGE="10.0.3.0/24"
FIXED_RANGE="10.10.3.0/24"
Q_FLOATING_ALLOCATION_POOL=start=10.0.3.101,end=10.0.3.110
PUBLIC_NETWORK_GATEWAY="10.0.3.2"
NETWORK_GATEWAY=10.10.3.1
Q_L3_ENABLED=True
PUBLIC_INTERFACE=eth1

# Open vSwitch provider networking configuration
Q_USE_PROVIDERNET_FOR_PUBLIC=True
OVS_PHYSICAL_BRIDGE=br-ex
PUBLIC_BRIDGE=br-ex
OVS_BRIDGE_MAPPINGS=public:br-ex
```

OpenStack installation: all-in-one VM with DevStack (4)



```
openstack@vm01:~/devstack$ ./stack.sh
...
This is your host ip: 192.168.56.2
Horizon is now available at http://192.168.56.2/
Keystone is serving at http://192.168.56.2:5000/
The default users are: admin and demo
The password: openstack
openstack@vm01:~/devstack$
```

OpenStack dashboard: login



The screenshot shows a web browser window with the URL `http://192.168.56.2/auth/login/?next=/`. The page displays the OpenStack logo and the text "openstack DASHBOARD". Below this, the heading "Log In" is followed by two input fields: "User Name" containing the text "admin" and "Password" containing a masked password of ten dots. A blue "Sign In" button is positioned at the bottom right of the form.

OpenStack dashboard: hypervisors



Browser address bar: <http://192.168.56.2/admin/hypervisors/>

openstack demo admin

All Hypervisors

Hypervisor Summary

VCPU Usage
Used 0 of 1

Memory Usage
Used 512MB of 2.9GB

Local Disk Usage
Used 0Bytes of 16GB

Hypervisor: [Compute Host](#)

Hostname	Type	VCPUs (used)	VCPUs (total)	RAM (used)	RAM (total)	Local Storage (used)	Local Storage (total)	Instances
vm01	QEMU	0	1	512MB	2.9GB	0Bytes	16GB	0

Displaying 1 item

OpenStack dashboard: projects (tenants)



The screenshot shows the OpenStack dashboard interface. The browser address bar indicates the URL is <http://192.168.56.2/identity/>. The dashboard header includes the OpenStack logo, a 'demo' dropdown menu, and a user profile for 'admin'. The main content area is titled 'Projects' and features a search filter, a '+ Create Project' button, and a 'Delete Projects' button. A table lists the following projects:

<input type="checkbox"/>	Name	Description	Project ID	Enabled	Actions
<input type="checkbox"/>	service	-	38210365ad144af2995d906801e1b7f1	Yes	Manage Members
<input type="checkbox"/>	demo	-	662e1be32a544065a96b6c4302d3b181	Yes	Manage Members
<input type="checkbox"/>	alt_demo	-	9eeb865493a448ef909e3fb440717beb	Yes	Manage Members
<input type="checkbox"/>	admin	-	faff7f0d890343e583e5c0458ea49923	Yes	Manage Members
<input type="checkbox"/>	invisible_to_admin	-	ff19dfdce8f74fc6a4fcfe984aace2f1	Yes	Manage Members

Displaying 5 items

OpenStack dashboard: resources used by a project



openstack demo admin

Overview

Limit Summary

Resource	Used	Limit
Instances	0 of 10	10
VCPUs	0 of 20	20
RAM	0Bytes of 50GB	50GB
Floating IPs	Allocated 0 of 50	50
Security Groups	Used 1 of 10	10
Volumes	Used 0 of 10	10
Volume Storage	Used 0Bytes of 1000GB	1000GB

Usage Summary

Select a period of time to query its usage:

From: To: The date should be in YYYY-mm-dd format.

Active Instances: 0 Active RAM: 0Bytes This Period's VCPU-Hours: 0.00 This Period's GB-Hours: 0.00 This Period's RAM-Hours: 0.00

OpenStack dashboard: launch instance



Launch Instance Step 1/3

Details * Access & Security Networking * Post-Creation Advanced Options

Availability Zone
nova

Instance Name *
test01

Flavor * ?
m1.nano

Instance Count * ?
1

Instance Boot Source * ?
Boot from image

Image Name *
cirros-0.3.4-x86_64-uec (24.0 MB)

Specify the details for launching an instance.
The chart below shows the resources used by this project in relation to the project's quotas.

Flavor Details

Name	m1.nano
VCPUs	1
Root Disk	0 GB
Ephemeral Disk	0 GB
Total Disk	0 GB
RAM	64 MB

Project Limits

Number of Instances 0 of 10 Used

Number of VCPUs 0 of 20 Used

Total RAM 0 of 51,200 MB Used

Cancel Launch

Launch Instance Step 2/3

Details * Access & Security Networking * Post-Creation Advanced Options

Key Pair ?
openstack-kilo-demo +

Control access to your instance via key pairs, security groups, and other mechanisms.

Security Groups ?
 default

Cancel Launch

Launch Instance Step 3/3

Details * Access & Security Networking * Post-Creation Advanced Options

Selected networks

NIC: 1 private (612359b6-3482-4f09-b29e-0a5e36f7114)

Choose network from Available networks to Selected networks by push button or drag and drop, you may change NIC order by drag and drop as well.

Available networks

Cancel Launch

OpenStack dashboard: instances (VMs)



The screenshot shows the OpenStack dashboard interface. The main content area is titled "Instances" and contains a table with the following data:

<input type="checkbox"/>	Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
<input type="checkbox"/>	openstack-test01	cirros-0.3.4-x86_64-uec	10.10.10.3	m1.nano	openstack-kilo-demo	Active	nova	None	Running	5 hours, 28 minutes	Create Snapshot

Below the table, it says "Displaying 1 item".

OpenStack dashboard: console



The screenshot displays the OpenStack dashboard interface. The browser address bar shows the URL: `http://192.168.56.2/project/instances/a2188057-7085-4b93-8c`. The page title is "Instance Details: openstack-test01". The dashboard includes a sidebar with navigation options: Project, Compute, Overview, Instances, Volumes, Images, Access & Security, Network, Admin, and Identity. The main content area shows the "Instance Console" for the instance "openstack-test01". The console output is as follows:

```
Connected (unencrypted) to: QEMU (instance-00000001)
$ ifconfig
eth0  Link encap:Ethernet  HWaddr FA:16:3E:63:05:71
      inet addr:10.0.0.3  Bcast:10.0.0.255  Mask:255.255.255.0
      inet6 addr: fd7e:e41d:ca70:0:f816:3eff:fe63:571/64 Scope:Global
      inet6 addr: fe80::f816:3eff:fe63:571/64 Scope:Link
      UP BROADCAST RUNNING MULTICAST  MTU:1450  Metric:1
      RX packets:121 errors:0 dropped:0 overruns:0 frame:0
      TX packets:109 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:1000
      RX bytes:12429 (12.1 KiB)  TX bytes:8753 (8.5 KiB)

lo    Link encap:Local Loopback
      inet addr:127.0.0.1  Mask:255.0.0.0
      inet6 addr: ::1/128 Scope:Host
      UP LOOPBACK RUNNING  MTU:16436  Metric:1
      RX packets:0 errors:0 dropped:0 overruns:0 frame:0
      TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:0
      RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

$ arp -a
host-10-0-0-4.openstacklocal (10.0.0.4) at fa:16:3e:c0:d8:af [ether] on eth0
host-10-0-0-2.openstacklocal (10.0.0.2) at fa:16:3e:50:ac:48 [ether] on eth0
$
$ _
```

OpenStack dashboard: virtual network topology



The screenshot shows the OpenStack dashboard interface for the 'Network Topology' section. The browser address bar displays the URL `http://192.168.56.2/project/network_topology/`. The dashboard header includes the OpenStack logo, a 'demo' dropdown menu, and the user 'admin'. On the left, a navigation sidebar lists 'Project', 'Compute', and 'Network' (selected), with sub-items for 'Network Topology', 'Networks', and 'Routers'. The main content area is titled 'Network Topology' and features two view options: 'Small' (selected) and 'Normal'. Three action buttons are visible: 'Launch Instance', 'Create Network', and 'Create Router'. The central diagram illustrates a virtual network topology with two vertical bars representing networks: a blue bar labeled 'public' with IP address '192.168.56.0/24' and an orange bar labeled 'private' with IP address '10.10.10.0/24'. A router icon connects the two networks, and a server icon is connected to the private network.

OpenStack dashboard: networks



The screenshot shows the OpenStack dashboard interface for managing networks. The main content area displays a table of networks. The table has columns for Name, Subnets Associated, Shared, Status, Admin State, and Actions. A single network named 'private' is listed with the subnets 'private-subnet 10.10.10.0/24'. The status is 'Active' and the admin state is 'UP'. The 'Actions' column contains an 'Edit Network' button.

<input type="checkbox"/>	Name	Subnets Associated	Shared	Status	Admin State	Actions
<input type="checkbox"/>	private	private-subnet 10.10.10.0/24	No	Active	UP	Edit Network

Displaying 1 item

OpenStack CLI commands: nova (1)



- ▶ Executable from a command shell, after setting environment variables with openrc

```
openstack@vm01:~/devstack$ . openrc admin
openstack@vm01:~/devstack$ nova hypervisor-list
```

```
+-----+-----+-----+-----+
| ID | Hypervisor hostname | State | Status |
+-----+-----+-----+-----+
| 1 | vm01 | up | enabled |
+-----+-----+-----+-----+
```

```
openstack@vm01:~/devstack$ nova list
```

```
+-----+-----+-----+-----+-----+-----+-----+
| ID | Name | Status | Task State | Power State | Networks |
+-----+-----+-----+-----+-----+-----+-----+
| c1fa803e-ccdb-4d38-8505-043fc9d15c07 | test01 | ACTIVE | - | Running | private=10.0.0.3,
fd7e:e41d:ca70:0:f816:3eff:fe63:571 |
| 66f46996-4ed1-4866-8db4-1b47331b623e | test02 | ACTIVE | - | Running | private=10.0.0.4,
fd7e:e41d:ca70:0:f816:3eff:fec0:d8af |
+-----+-----+-----+-----+-----+-----+-----+
```

This is how KVM identifies the two running instances

```
openstack@vm01:~/devstack$ virsh list
Id Name State
-----
2 instance-00000001 running
3 instance-00000002 running
```

OpenStack CLI commands : nova (2)



- ▶ Executable from a command shell, after setting environment variables with openrc

```
openstack@vm01:~/devstack$ nova flavor-list
```

ID	Name	Memory_MB	Disk	Ephemeral	Swap	VCPUs	RXTX_Factor	Is_Public
1	m1.tiny	512	1	0		1	1.0	True
2	m1.small	2048	20	0		1	1.0	True
3	m1.medium	4096	40	0		2	1.0	True
4	m1.large	8192	80	0		4	1.0	True
42	m1.nano	64	0	0		1	1.0	True
5	m1.xlarge	16384	160	0		8	1.0	True
84	m1.micro	128	0	0		1	1.0	True
c1	cirros256	256	0	0		1	1.0	True
d1	ds512M	512	5	0		1	1.0	True
d2	ds1G	1024	10	0		1	1.0	True
d3	ds2G	2048	10	0		2	1.0	True
d4	ds4G	4096	20	0		4	1.0	True

OpenStack CLI commands: neutron (1)



- ▶ Executable from a command shell, after setting environment variables with openrc

```
openstack@vm01:~/devstack$ neutron net-list
```

id	name	subnets
15c4c732-a782-4125-ad30-6ed6f5b1f70e	private	7259d9f9-ac6a-4971-8670-ca79e7ae9477 10.0.0.0/24 c913db5c-a40d-4fa7-8a34-22d8c30f7ba0 fd7e:e41d:ca70::/64
1d565847-786c-48d8-9586-00f3224816fd	public	0389480a-a8e5-415a-b9fd-94f7e4aa0b55 192.168.100.0/24 3965810d-6ece-4648-aae8-33fe59c666b9 2001:db8::/64

OpenStack CLI commands: neutron (2)



```
openstack@vm01:~/devstack$ neutron port-list
```

```
+-----+-----+-----+-----+
| id                    | name | mac_address            | fixed_ips                    |
+-----+-----+-----+-----+
| 14c6ced0-88c6-41ea-   |      | fa:16:3e:63:05:71     | {"subnet_id": "7259d9f9-ac6a-4971-8 |
| 90c5-bdba8e717acc    |      |                        | 670-ca79e7ae9477", "ip_address":    |
|                        |      |                        | "10.0.0.3"}                  |
|                        |      |                        | {"subnet_id": "c913db5c-a40d-     |
|                        |      |                        | 4fa7-8a34-22d8c30f7ba0",          |
|                        |      |                        | "ip_address": "fd7e:e41d:ca70:0:f81 |
|                        |      |                        | 6:3eff:fe63:571"}            |
| 83b0cf30-230e-      |      | fa:16:3e:c0:d8:af     | {"subnet_id": "7259d9f9-ac6a-4971-8 |
| 4be8-94e2-509d12f2f175 |      |                        | 670-ca79e7ae9477", "ip_address":    |
|                        |      |                        | "10.0.0.4"}                  |
|                        |      |                        | {"subnet_id": "c913db5c-a40d-     |
|                        |      |                        | 4fa7-8a34-22d8c30f7ba0",          |
|                        |      |                        | "ip_address": "fd7e:e41d:ca70:0:f81 |
|                        |      |                        | 6:3eff:fec0:d8af"}           |
| 85ad1afd-77fa-423f-a8ed- |      | fa:16:3e:7b:e6:a5     | {"subnet_id": "c913db5c-a40d-     |
| 344aff30e81a         |      |                        | 4fa7-8a34-22d8c30f7ba0",          |
|                        |      |                        | "ip_address": "fd7e:e41d:ca70::1"}  |
| ...                  |      |                        |
```

OpenStack CLI commands: neutron (3)



```
...
| cc69df25-ad9d-4388-8c05-e1f7f5ee26 | | fa:16:3e:73:27:aa | {"subnet_id": "0389480a-a8e5-415a- |
| 9b | | | b9fd-94f7e4aa0b55", "ip_address": |
| | | | "192.168.100.250"} |
| | | | {"subnet_id": "3965810d- |
| | | | 6ece-4648-aae8-33fe59c666b9", |
| | | | "ip_address": "2001:db8::3"} |
| d8c5161c-eaae- | | fa:16:3e:50:ac:48 | {"subnet_id": "7259d9f9-ac6a-4971-8 |
| 4d22-8272-b8bd8c8194b5 | | | 670-ca79e7ae9477", "ip_address": |
| | | | "10.0.0.2"} |
| | | | {"subnet_id": "c913db5c-a40d- |
| | | | 4fa7-8a34-22d8c30f7ba0", |
| | | | "ip_address": "fd7e:e41d:ca70:0:f81 |
| | | | 6:3eff:fe50:ac48"} |
| faa330ca- | | fa:16:3e:b8:77:4d | {"subnet_id": "7259d9f9-ac6a-4971-8 |
| 601a-4417-a5d7-ab359a978054 | | | 670-ca79e7ae9477", "ip_address": |
| | | | "10.0.0.1"} |
+-----+-----+-----+-----+
```



- ▶ Executable from a command shell, after setting environment variables with openrc

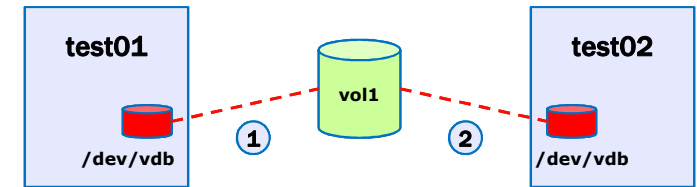
```
openstack@vm01:~/devstack$ glance image-list
```

ID	Name
187abda1-ce7e-4bde-8dd6-a97439478edc	cirros-0.3.4-x86_64-uec
43b53766-cc1c-4e34-8c40-b1e35e55bc3d	cirros-0.3.4-x86_64-uec-kernel
bbf60680-9d1b-40a7-9b87-bf6bb9e33e57	cirros-0.3.4-x86_64-uec-ramdisk

Experiment with persistent storage



1. Create a VM *test01*
2. Create a 1GB Volume *vol1*
3. Attach the volume *vol1* to the *test01* VM
 - ▶ *test01* will see *vol1* as a block device (*/dev/vdb*)
4. From *test01* create with *fdisk* a single partition */dev/vdb1* in */dev/vdb* using all the available space
5. From *test01*, format */dev/vdb1* with *mkfs* to create an EXT3 or EXT3 filesystem
6. Mount */dev/vdb1* in the *test01* filesystem (e.g. using */mnt/disk1* as mountpoint)
7. Create a new file (e.g. *test*) in */mnt/disk1*
8. Terminate the *test01* instance
 - ▶ Since *vol1* is persistent storage, it will exist after *test01* has been terminated
9. Create a new VM *test02*
10. Attach the persistent volume *vol1* to the *test02* VM
 - ▶ *test02* will see *vol1* as a block device (*/dev/vdb*)
11. Mount */dev/vdb1* in the *test02* filesystem (e.g. using */mnt/disk1* as mountpoint)
12. Verify that *test02* sees the *test* file previously created by *test01* in */mnt/disk1*





- ▶ DevStack runs all the OpenStack the services in a standalone mode (foreground running daemon) in different *screen* sessions
 - ▶ *screen* keeps the terminal/session active even when we detach from it
- ▶ To bring up all the services DevStack uses a big parent screen where it encapsulates child screens
- ▶ The command `screen -x <screen-name>` allows to attach to a specific screen
- ▶ By clicking `ctrl + a + "` inside the parent screen, you have the list of child screens
- ▶ Select one and press enter to get into one child screen
- ▶ If you want to change the behavior of a daemon, let's say nova-api, just modify your `nova.conf` then kill the process in the child n-api with `ctrl + c` and re-run it (last command in history)
- ▶ Other screen commands:
 - ▶ `ctrl + a + p` (switch to previous child's screen)
 - ▶ `ctrl + a + n` (switch to next child's screen)
 - ▶ `ctrl + a + d` (detach from screen)