Cloud and 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

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

- 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-l3
...
```

OpenStack installation: all-in-one VM with DevStack (3)

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

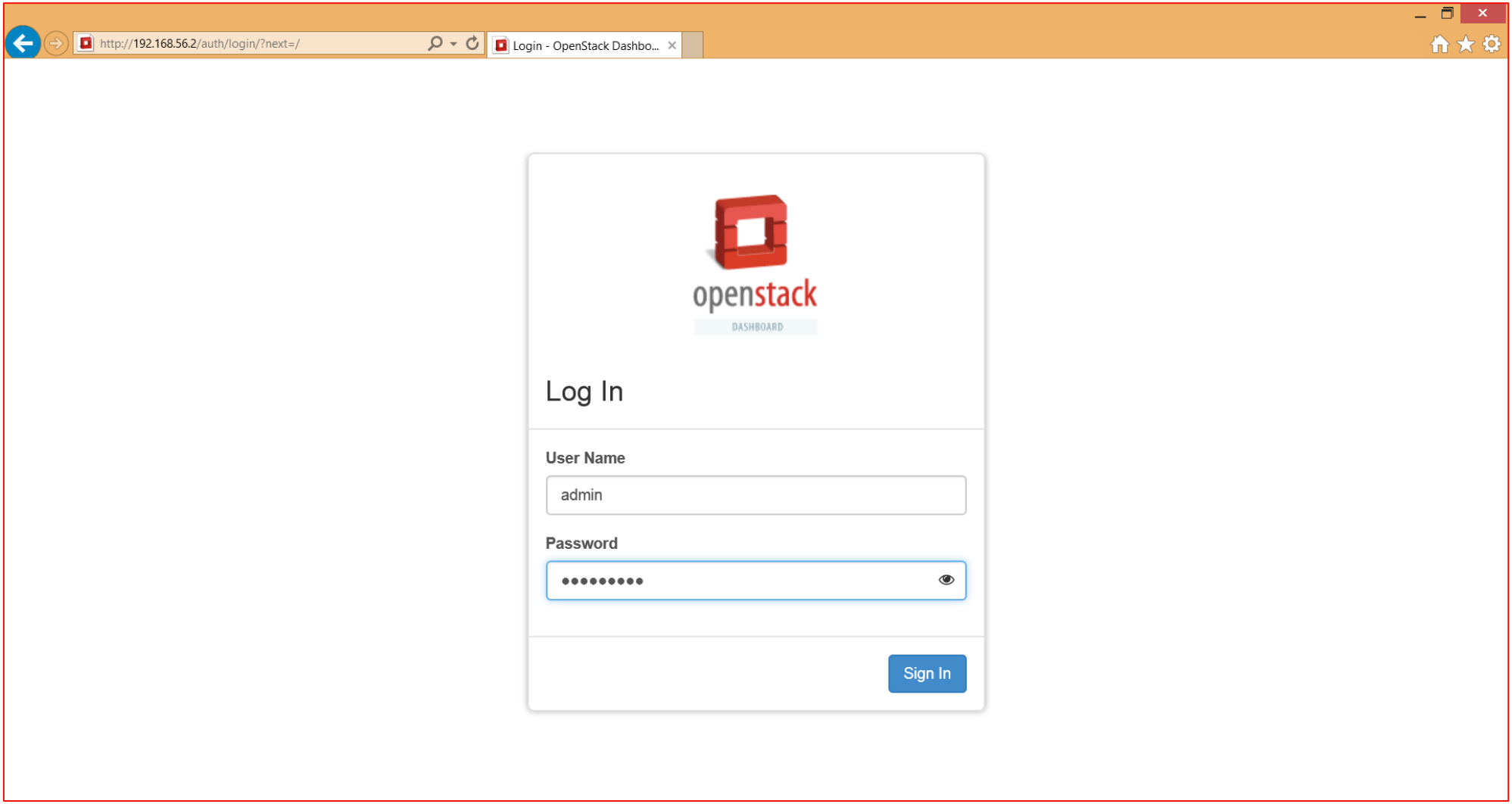
```
...
## Neutron options
Q_USE_SECGROUP=True
FLOATING_RANGE="192.168.56.0/24"
FLOATING_RANGE="10.0.3.0/24"
FIXED_RANGE="10.10.3.0/24"
Q_FLOATING_ALLOCATION_POOL=start=10.0.3.101,end=10.0.3.110
PUBLIC_NETWORK_GATEWAY="10.0.3.2"
NETWORK_GATEWAY=10.10.3.1
Q_L3_ENABLED=True
PUBLIC_INTERFACE=eth1

# 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
```

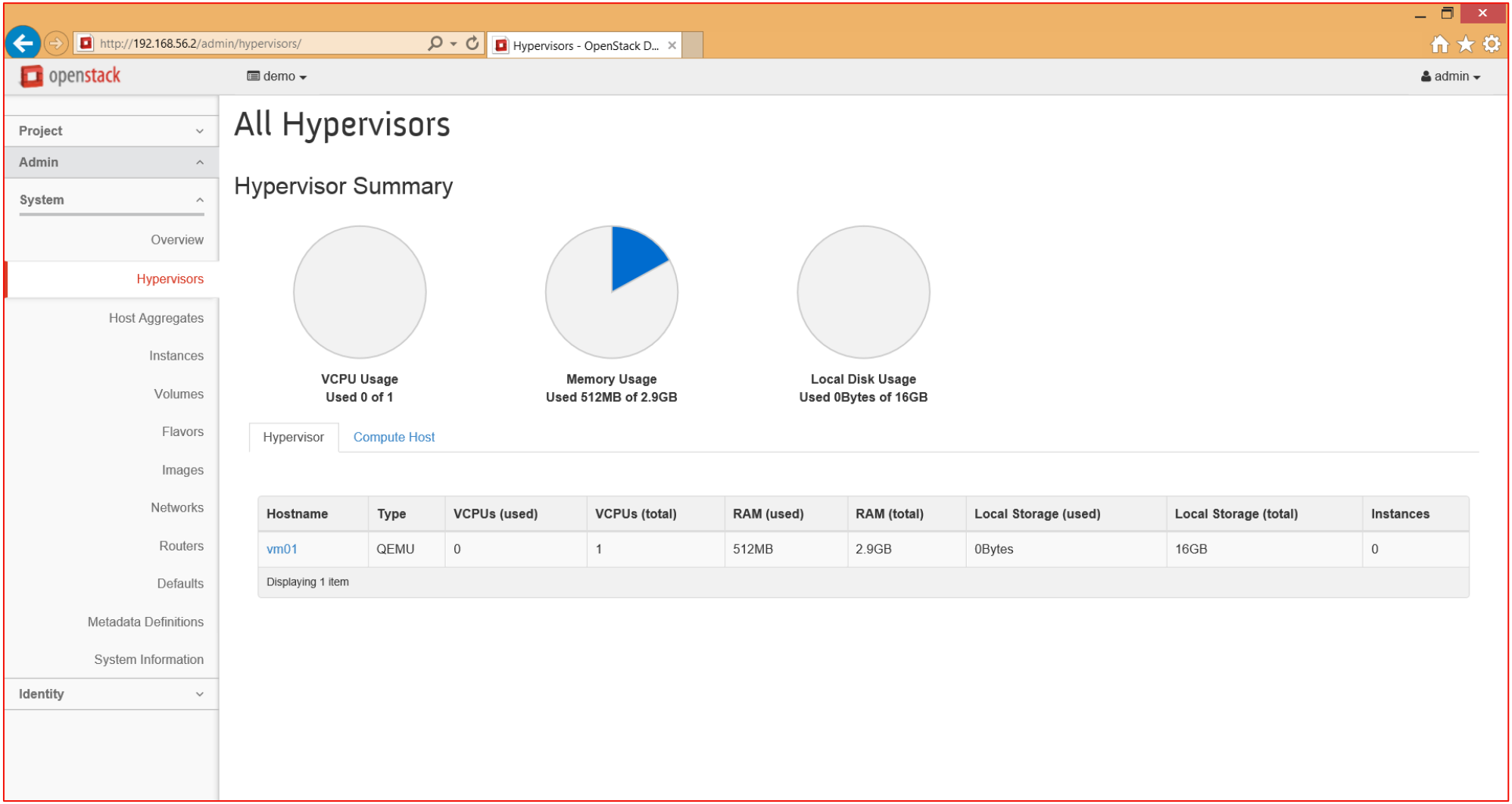
OpenStack installation: all-in-one VM with DevStack (4)

```
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$
```

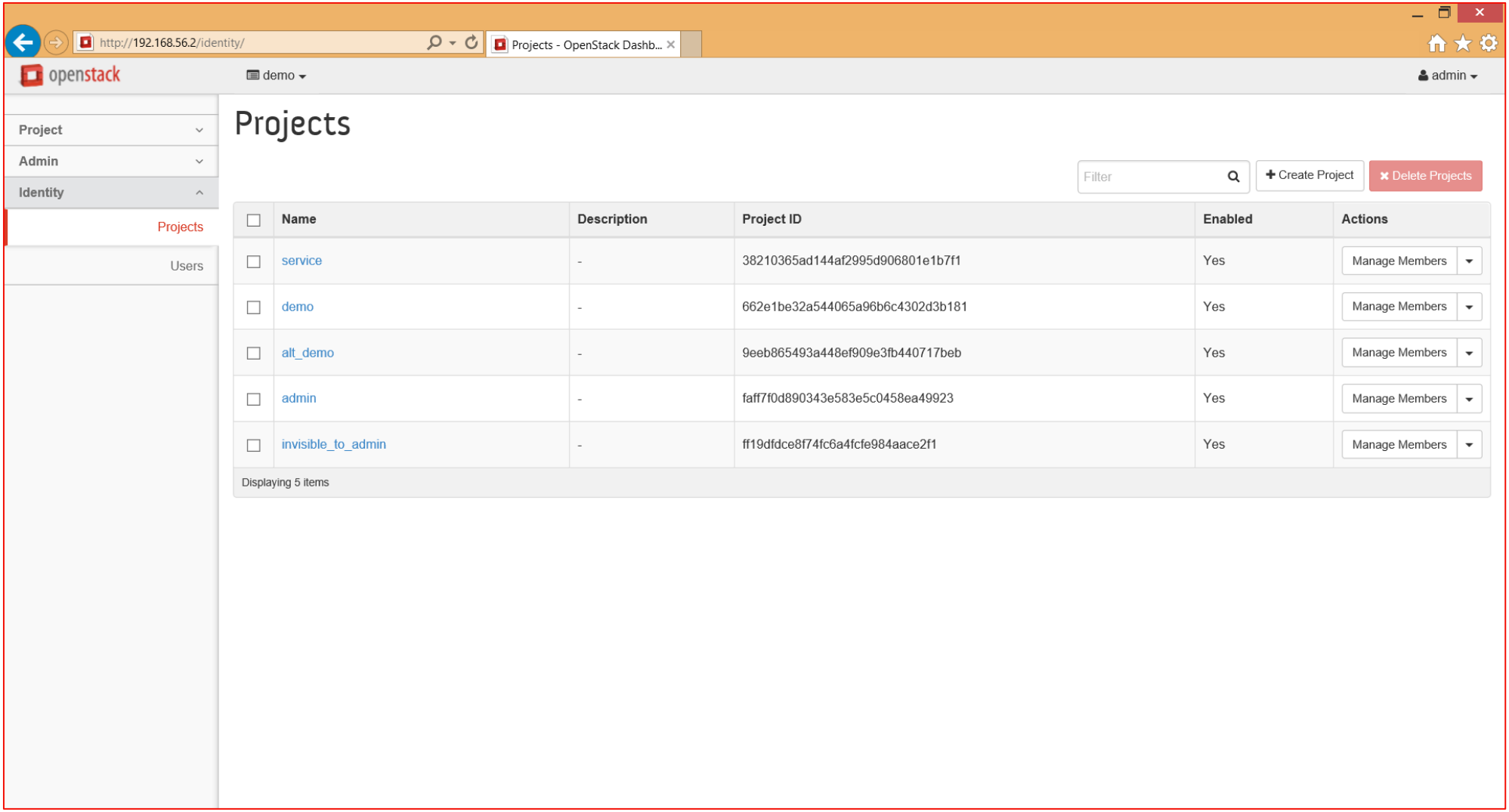
OpenStack dashboard: login



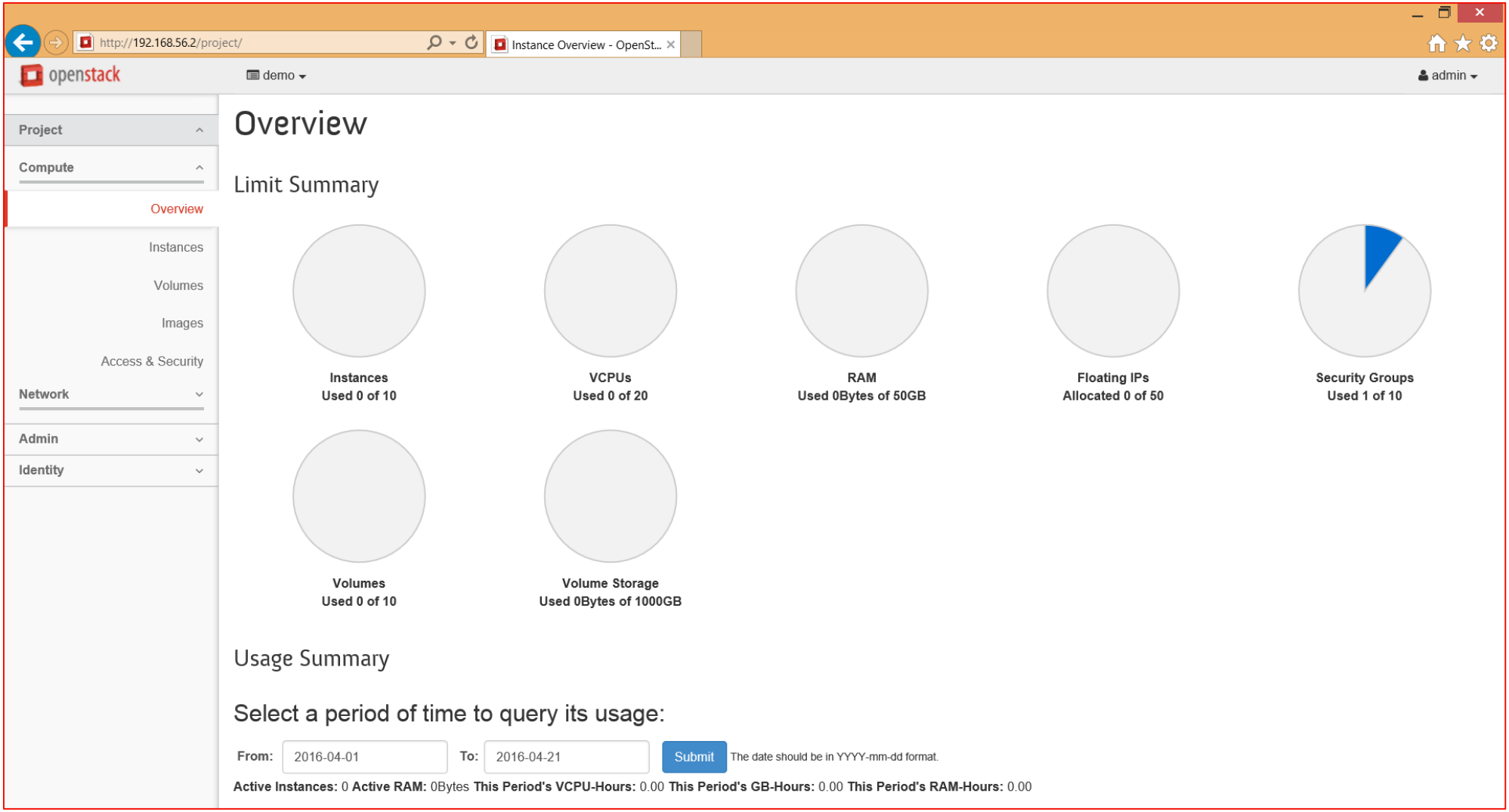
OpenStack dashboard: hypervisors



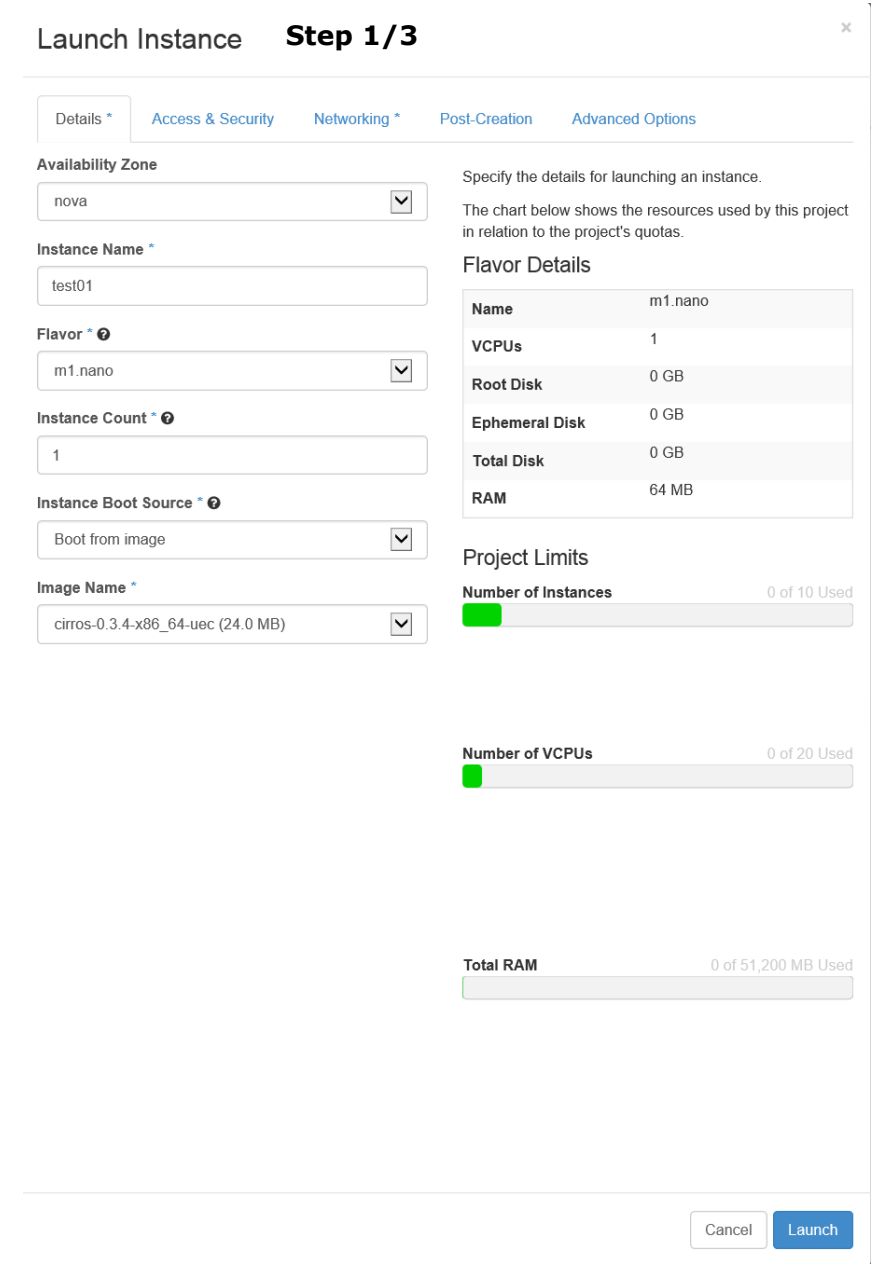
OpenStack dashboard: projects (tenants)

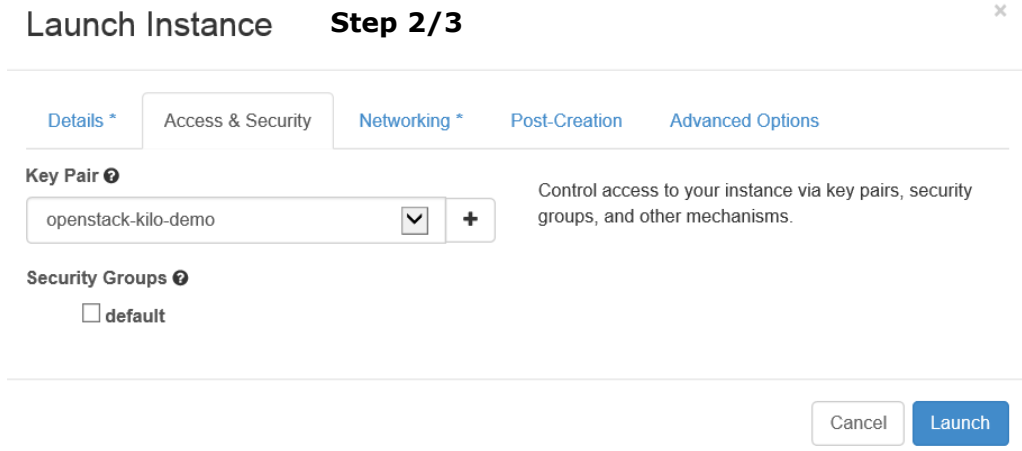


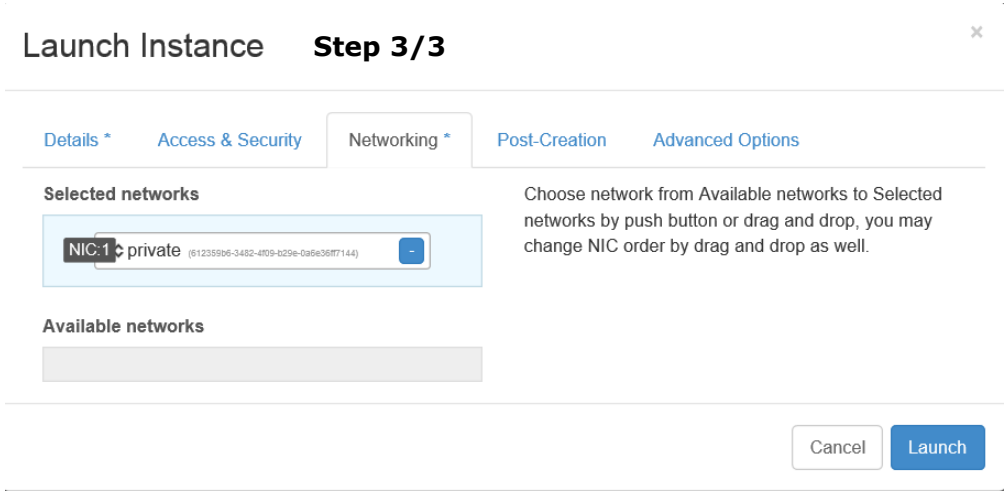
OpenStack dashboard: resources used by a project



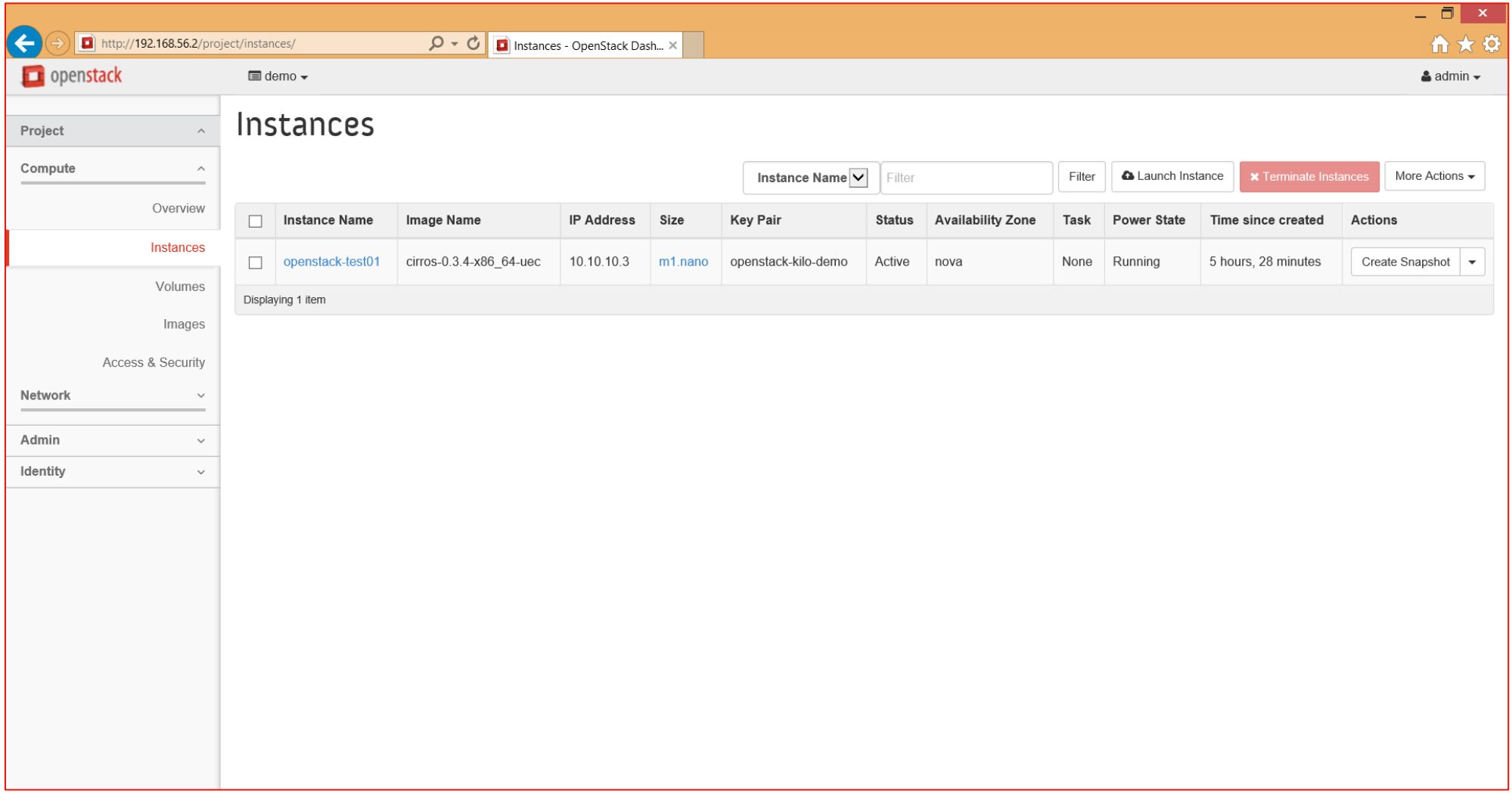
OpenStack dashboard: launch instance



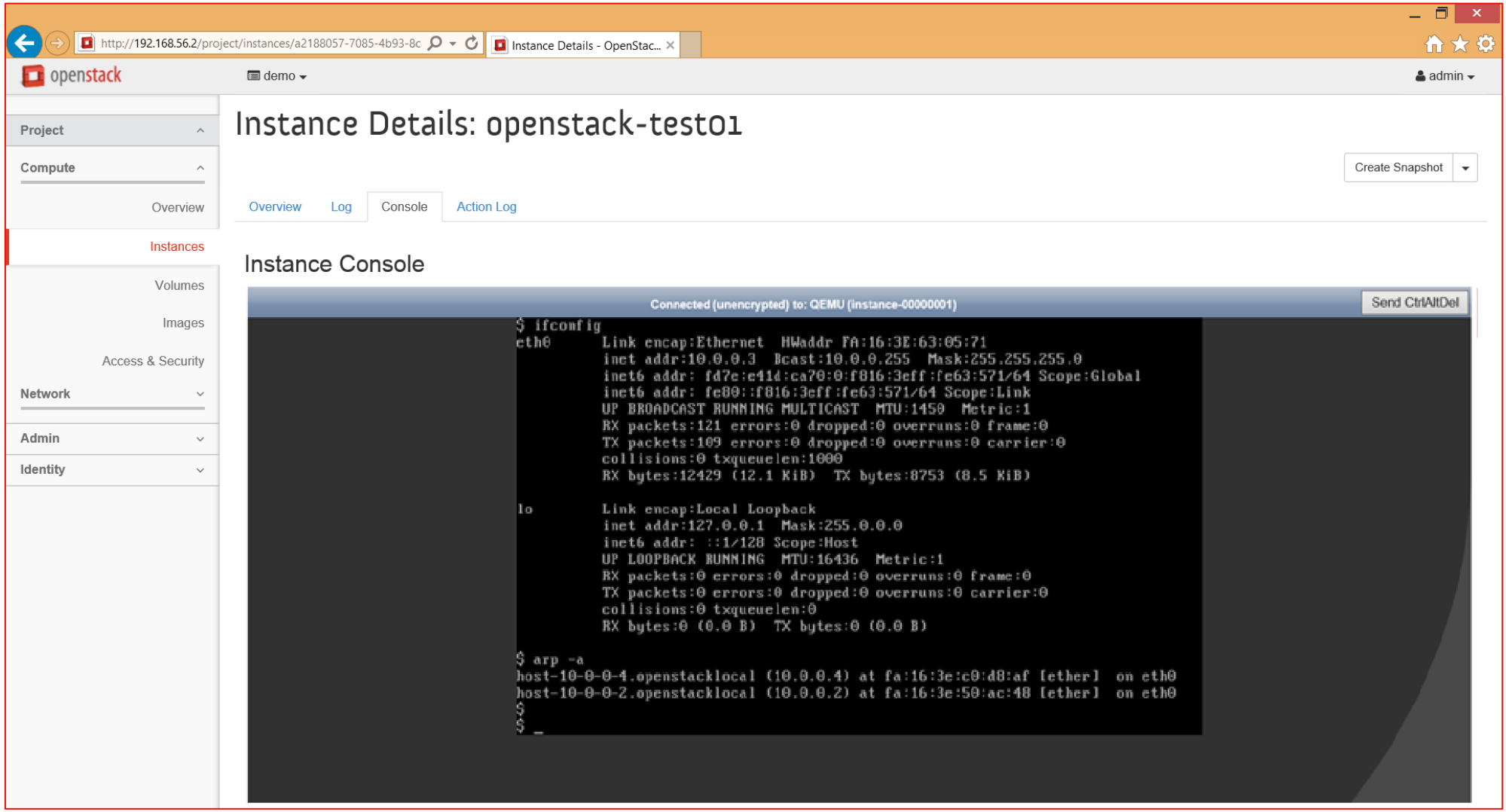




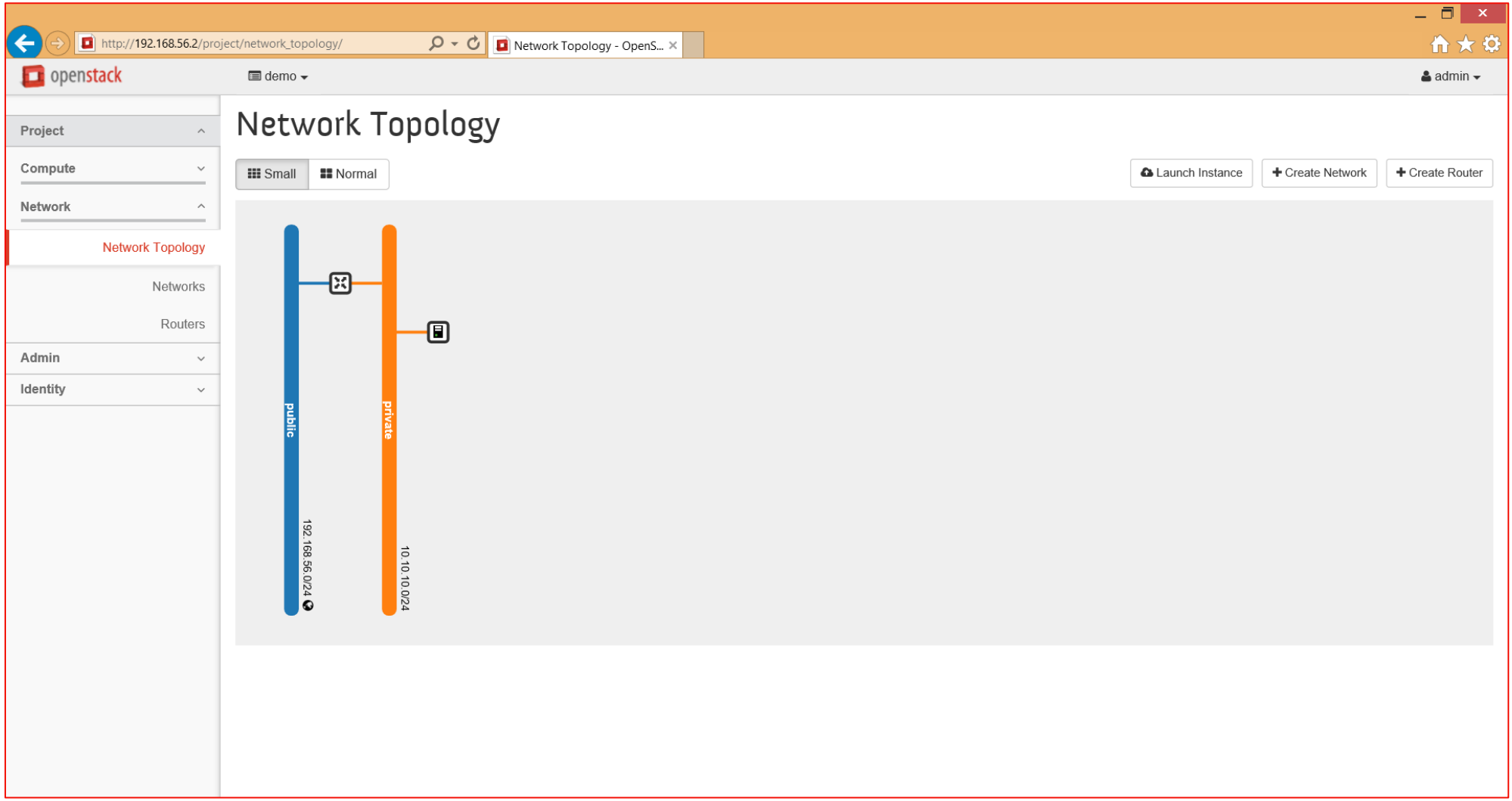
OpenStack dashboard: instances (VMs)



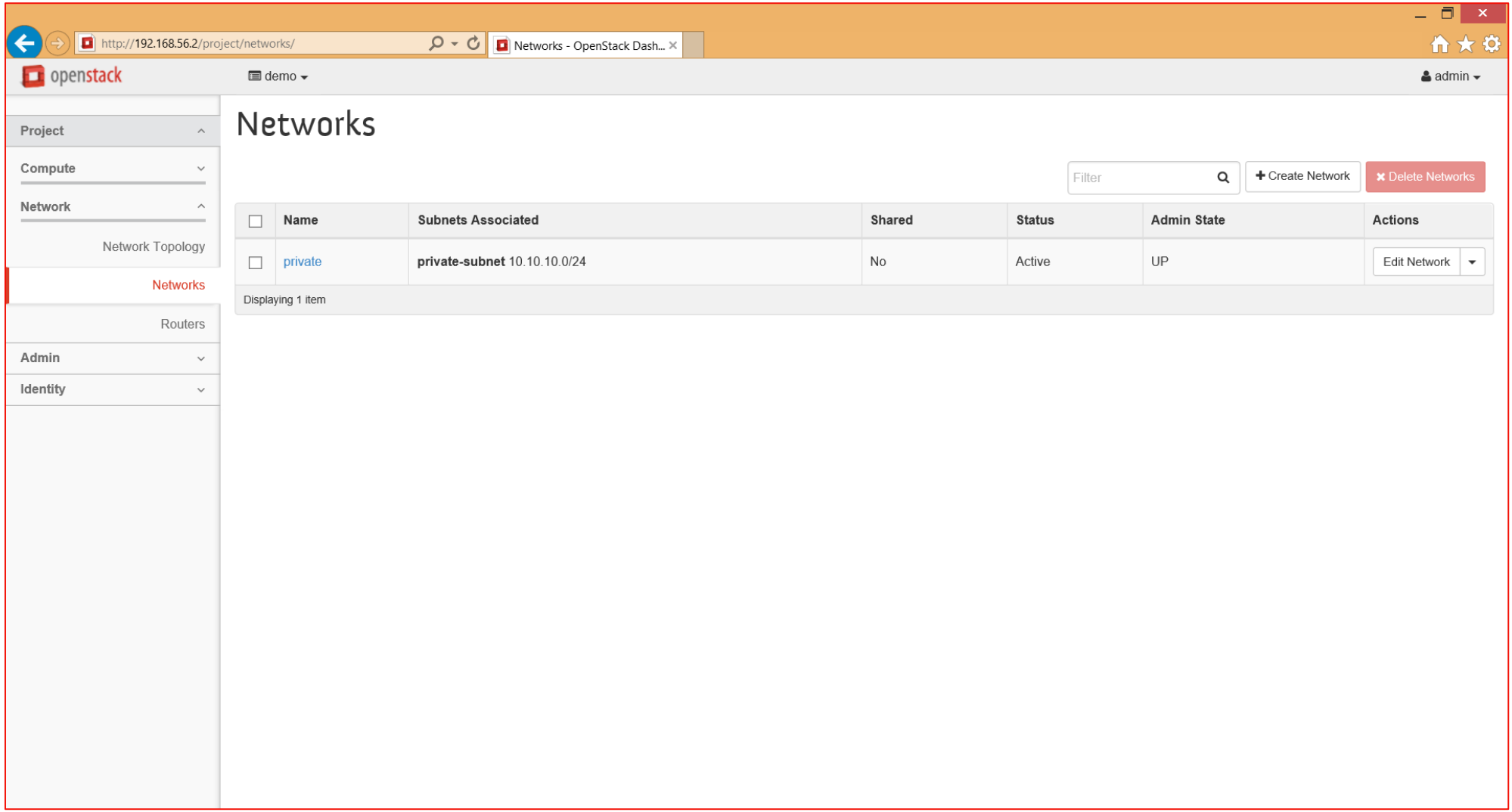
OpenStack dashboard: console



OpenStack dashboard: virtual network topology



OpenStack dashboard: networks



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 |
+--------------------------------------+-------+--------+------------+-------------+------------------
-----------------------------------+
```

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

This is how KVM identifies the two running instances

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)

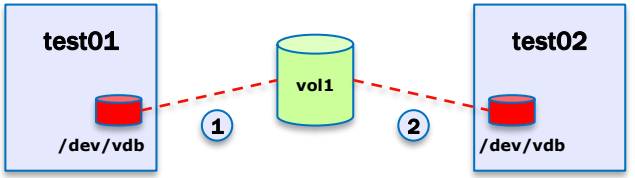
```
...
| cc69df25-ad9d-4388-8c05-e1f7f5ee26 |      | fa:16:3e:73:27:aa | {"subnet_id": "0389480a-a8e5-415a-  |
| 9b                                 |      |                   | b9fd-94f7e4aa0b55", "ip_address":   |
|                                    |      |                   | "192.168.100.250"}                  |
|                                    |      |                   | {"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"}                         |
+------------------------------------+------+-------------------+-------------------------------------+
```

OpenStack CLI commands: glance

- 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 *cfdisk* 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
    - *test01* 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 previoulsy created by *test01* in */mnt/disk1*

How DevStack works

- 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)