#### **Cloud and Datacenter Networking**

Università degli Studi di Napoli Federico II Dipartimento di Ingegneria Elettrica e delle Tecnologie dell'Informazione DIETI Laurea Magistrale in Ingegneria Informatica

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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 <u>http://docs.openstack.org/developer/devstack/guides/single-vm.html</u>
- 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 <u>http://docs.openstack.org/developer/devstack/guides/devstack-with-nested-kvm.html</u>
- 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-aqt,q-13
. . .
```

## 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
O_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) (

7

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\$





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(C) I http://192.168.56.2/ad	min/hypervisors/	Q	- C 🚺 Hypervisor	rs - OpenStack D ×					<b>î ★</b>
	I demo ◄								🛓 admin -
Project ~	All Hyp	ervisors	S						
Admin ^									
System ^	Hyperviso	r Summar	У						
Overview									
Hypervisors									
Host Aggregates									
Instances									
Volumes	Us	PU Usage ed 0 of 1	Use	Memory Usage ed 512MB of 2.9GB	Loca Used 0	l Disk Usage Bytes of 16GB			
Flavors	Hypervisor	Compute Host							
Images									
Networks	Hostname	Туре	VCPUs (used)	VCPUs (total)	RAM (used)	RAM (total)	Local Storage (used)	Local Storage (total)	Instances
Routers	vm01	QEMU	0	1	512MB	2.9GB	0Bytes	16GB	0
Defaults	Displaying 1 ite	m							
Metadata Definitions									
System Information									
Identity ~	_								
,									



### **OpenStack dashboard: projects (tenants)**



								- 0	×
A ttp://192.168.56.2/ide	entity/	P → C Projects -	OpenStack Dashb ×					<b>1</b>	* 🌣
🧰 openstack	🔳 d	emo 🗸						🛔 adm	nin 🗸
	Dre	pioete							
Project ~	PI	Jects							
Admin ~					Filter	Q	+ Create Project	× Delete Proje	ects
Identity ^									
Projects		Name	Description	Project ID		Enabled	I A	tions	
Users		service	-	38210365ad144af2995d906801e1b7f1		Yes		Manage Members	•
		demo	-	662e1be32a544065a96b6c4302d3b181		Yes		Manage Members	•
		alt_demo	-	9eeb865493a448ef909e3fb440717beb		Yes		Manage Members	•
		admin	-	faff7f0d890343e583e5c0458ea49923		Yes		Manage Members	-
		invisible_to_admin	-	ff19dfdce8f74fc6a4fcfe984aace2f1		Yes		Manage Members	-
	Displa	ying 5 items							

## **OpenStack dashboard: resources used by a project**





#### **OpenStack dashboard: launch instance**

Cancel



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#### **OpenStack dashboard: instances (VMs)**

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← → I http://192.168.56.2/pro	oject/instar	nces/	🔎 – 🖒 🧾 Instance	s - OpenStack Da	sh ×							☆ ★	\$
🧰 openstack	🔳 d	lemo 🗸										🛔 admin 🗸	
Project ^	Ins	stances											
Compute ^						Instance Name	Filter		Filter	Launch Ins	tance × Terminate Inst	ances More Actions -	]
Overview		Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions	
Instances		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 👻	<u>ר</u>
Volumes	Displa	aying 1 item											
Images													
Access & Security													
Network ~													
Admin ~													
Identity ~													

		_ 🗇 🗙
(-) http://192.168.56.2/pr	oject/instances/a2188057-7085-4b93-8c 🔎 😴 🚺 Instance Details - OpenStac ×	<b>☆</b> ★ \$
openstack	📾 demo 🗸	🛓 admin 👻
Project ^	Instance Details: openstack-test01	
Compute ^		Create Snapshot 👻
Overview	Overview Log Console Action Log	
Instances	Instance Consolo	
Volumes		
append	Connected (unencrypted) to: QEMU (instance-00000001)	Send CtrlAltDel
Images Access & Security <u>Network</u> ~ Admin ~ Identity ~	<pre>\$ ifconfig eth@ Link encap:Ethernet HWaddr FA:16:3E:63:05:71</pre>	

14

## **OpenStack dashboard: virtual network topology**





A D http://192.168.56.2/pro	niect/networks/	Q z Či 🗊 Nuturaliz, Qaze Stadi Dash, X						– 🗖 ×	ļ
openstack	i demo →	Networks - Opensidok Dash X						admin <del>-</del>	2
Project ^	Networks								
Compute ~					Filter	Q	+ Create Network	X Delete Networks	
Network ^	□ Name	Subnets Associated	Shared	Status		Admin State		Actions	
Network Topology	private	private-subnet 10.10.10.0/24	No	Active		UP		Edit Network -	
Networks	Displaying 1 item								
Routers									
Admin ~	-								
Identity ~	-								
									-

#### **OpenStack CLI commands: nova (1)**



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

openstad	ck@vm01:~/devstack\$ . ck@vm01:~/devstack\$ r	openrc nova hype	admin rvisor-list					
ID	Hypervisor hostname	+   State	Status					
1   \		up	enabled					
opensta	ck@vm01:~/devstack\$ r	•••••• nova list •••••	++	-+	+		+	+
ID 			-+   Name	Statu	ıs	Task State	Power State	Networks
   c1fa80 fd7e:e42	03e-ccdb-4d38-8505-04 1d:ca70:0:f816:3eff:f	 ↓3fc9d15c ₽e63:571	-+ 07   test01 	-   ACTI\	/E	-	Running	private=10.0.0.3,
66f469 fd7e:e42	996-4ed1-4866-8db4-1k 1d:ca70:0:f816:3eff:f 	047331b62 Fec0:d8af	3e   test02	ACTI\ -+	/E   +	-	Running +	private=10.0.0.4,
			-+		ope Id	enstack@vm01: Name	v/devstack\$ virsh State	ı list
This is	how KVM identifies t	he two ru	nning instar	nces	2 3	instance-0000 instance-0000	00001 run 00002 run	ning ning

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

+	L	L	1	+	L	L	L	L
+ 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
+	+	<b>+</b>	+	+	+	+	L	++

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



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

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

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

### **OpenStack CLI commands: neutron (2)**



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

. . .

+	name	mac_address	fixed_ips
14c6ced0-88c6-41ea-   90c5-bdba8e717acc		fa:16:3e:63:05:71	<pre>{"subnet_id": "7259d9f9-ac6a-4971-8   670-ca79e7ae9477", "ip_address":   "10.0.0.3"}</pre>
			{"subnet_id": "c913db5c-a40d-     4fa7-8a34-22d8c30f7ba0",
 			"ip_address": "fd7e:e41d:ca70:0:f81     6:3eff:fe63:571"}
83b0cf30-230e-   4be8-94e2-509d12f2f175		fa:16:3e:c0:d8:af	{"subnet_id": "7259d9f9-ac6a-4971-8     670-ca79e7ae9477", "ip_address":
			"10.0.0.4"}     {"subnet_id": "c913db5c-a40d-
			4fa7-8a34-22d8c30f7ba0",     "ip_address": "fd7e:e41d:ca70:0:f81
   85ad1afd-77fa-423f-a8ed-   344aff30e81a		fa:16:3e:7b:e6:a5	6:3err:recu:d8ar }   {"subnet_id": "c913db5c-a40d-     4fa7-8a34-22d8c30f7ba0"
			"ip_address": "fd7e:e41d:ca70::1"}

## **OpenStack CLI commands: neutron (3)**



$cc60df25_ad0d_4388_8c05_a1f7f5aa26$	1	fa:16:30:73:27:22	{"cubpot id": "03804802-2805-4152-	
CC030123-a030-4388-8C03-E11713EE20		1 1a.10.5e.75.27.aa		
9b			b9fd-94f7e4aa0b55", "1p_address":	
			"192.168.100.250"}	
			{"subnet_id": "3965810d-	
			6ece-4648-aae8-33fe59c666b9",	
			"ip_address": "2001:db8::3"}	ļ
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

penstack@vm01:~/devstack\$ glance image-list							
ID							
<pre>  187abda1-ce7e-4bde-8dd6-a97439478edc   43b53766-cc1c-4e34-8c40-b1e35e55bc3d   bbf60680-9d1b-40a7-9b87-bf6bb9e33e57 +</pre>	cirros-0.3.4-x86_64-uec     cirros-0.3.4-x86_64-uec-kernel     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*

23





#### **How DevStack works**

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- 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)