

# **Openstack Hands On**

## Introduction and first steps Jan Krüger 14.2.2018

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## Hands on: Users, Cloud, Domains & Projects



## Hands on: first login

- Open browser
- Goto http://openstack.cebitec.uni-bielefeld.de
- Domain: **default**
- Username / Password

	Openstack DASHBOARD	
Log in		
Domain		
css		
User Name		
Password		
		۲
		Connect

#### Hands on: first login User's Domain & Project User settings 🔲 openstack 🛛 🖃 css • css41 🗸 🛔 css41 👻 Project ~ Project / Compute / Overview Compute ~ Overview Instances Volumes Limit Summary Images Access & Security > Network Instances RAM VCPUs Floating IPs Security Groups Volumes Used 0 of 100 Used 0 of 100 Used 0Bytes of 50GB Used 0 of 1 Used 1 of 10 Used 0 of 10 Orchestration > Data Processing > Currently used resources Object Store > Volume Storage > dentity Used 0Bytes of 1000GB Usage Summary Select a period of time to query its usage: Control menu The date should be in YYYY-MM-DD format. From: 2017-06-06 To: 2017-06-07 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 Lownload CSV Summary Usage Instance Name VCPUs RAM Disk Time since created No items to display. Running virtual machines ("instances")

#### Hands on: first login User's Domain & Project User settings 🔲 openstack 🛛 🖃 css • css41 🗸 👗 css41 🔻 Project ~ Project / Compute / Overview Compute Overview Instances Volumes Limit Summary Images Access & Security Network > Instances Volumes Used 0 of 100 Used 0 of 10 First task: change password Orchestration > Data Processing > Object Store > Volume Storage > (hint: User settings....) lentity Used 0Bytes of 1000GB Usage Summary Select a period of time to query its usage: Control menu The date should be in YYYY-MM-DD format. From: 2017-06-06 To: 2017-06-07 Active Instances: 0 Active RAM: 08ytes This Period's VCPU-Hours: 0.00 This Period's GB-Hours: 0.00 This Period's RAM-Hours: 0.00 Lownload CSV Summary Usage Instance Name VCPUs RAM Disk Time since created No items to display. Running virtual machines ("instances")

## Hands on: SSH setup



## Hands on: SSH key generation

- Open terminal (<left windows key> t)
- Run "ssh-keygen -t rsa -f openstack.key"
- Enter passphrase twice

Command creates two files:

- openstack.key ← private key
- openstack.key.pub ← public key
- Run "cat openstack.key.pub" to display public key

#### Hands on: SSH upload

- Goto Project → Compute → Access & Security
- Select Key Pairs and click on Import Key Pair

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	Project	~								
	Compute	~	Project / Compute / Access & Se	ecurity						
1.		Overview	Access & Secu	ırity						
	Instances Volumes Security Groups Key Pairs Floating IPs API Acc									
	/	Images						Filter Q	+ Create Key Pair	1 Import Key Pair
	Access & Security		Key Pair Name			Fi	ngerprint	Actions		
	Network	>					No items to display.			
	Orchestration	n 🔉								
	Data Processi	ina 🔉								

#### Hands on: first login

- Enter key name (e.g. "cws\_key")
- Copy & paste public key from terminal window
- Press Import Key Pair

 Key should be listed afterwards

mport Key Pair	×
Key Pair Name *	
css_key	Description:
Public Key *	Key Pairs are how you login to your instance after it is launched.
SSh-TS8 AAAAB3NzaC1yc2EAAAADAQABAAABAQCvGx	Choose a key pair name you will recognise and paste your SSH public key into the space provided.
JLXBITv2rnBcNz63xtOfpuiL8ajzfZHZupAYJWZb4	SSH key pairs can be generated with the ssh-keygen

command:

JLXBITv2rnBcNz63xtOfpuiL8ajztZHZupAYJWZb4 ut4YunYxF7FL5VzutYxr6mLqHAy8LskrBC++8MQ AOsU0Nza8xAKx+EQzulM8ynYPvW3RXmwSc9y hLS5x780S/ZS71CkQe4kiPm4Lu8EF54lbqMfN20 QwMUVzy2UjZ4tcly86sIPwltz05X9pSrSKIPVDFT +2FDHiy5TE2K2QytSEvpEtqQD8TB11u6gtsIBfzrlz GYUUJvMNHXn0fu38njiuyraQWTZeN+ghq29Kbjy PLvjvor3XP01UlaUV1PuEnU1PueefsPUkRspb101 DPdbkWXx/ImHKfxAbAzimN blinke@bcf-oc01

ssh-keygen -t rsa -f cloud.key

This generates a pair of keys: a key you keep private (cloud.key) and a public key (cloud.key.pub). Paste the contents of the public key file here.

After launching an instance, you login using the private key (the username might be different depending on the image you launched):

ssh -i cloud.key <username>@<instance\_ip>

Cancel Import Key Pair



• Select Project → Network → Networks - > Create Network



• Enter a name for the network, e.g. "cws\_net"

Create Network	×
Network Subnet Subnet Details     Network Name     css_net     Admin State      UP     Shared     Create Subnet	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 »

- Enter a name for the subnet, e.g. "cws subnet"
- Enter a network address, e.g. "192.168.0.0/24"

Create Network	×
Network     Subnet     Subnet Details       Subnet Name     css_subnet       Css_subnet     192.168.0.0/24	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.
Gateway IP 🚱	
	Cancel « Back Next »

• Enter "192.168.0.10,192.168.0.100" for allocation pool & click "Create"

Create Network		×	
Network Subnet Subnet Details			l
C Enable DHCP	Specify additional attributes for the subnet.		
Allocation Pools 😧			e
192.168.0.10,192.168.0.100			ļ
DNS Name Servers 😧			I

## • Your network is now listed!

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Project		~	Project / Network / Networks										
Compute	Compute >												
Network	Network ~ Networks												
Network	rk Topolog	9y											
	Network	s						Name = 🕶			Filter	+ Create Network	📋 Delete Networks
	Deuterr		□ Name	Subnets Assoclated		Shared	External		Status	Admi	n State		Actions
Orchestration	1	>	css_net	• css_subnet 192.168.0.0/24		No	No		Active	UP			Edit Network 💌
Data Processin	na	>	external_network			No	Yes		Active	UP			
Object Store		>	Displaying 2 items										
Identity		>											

## Hands on: Images & Flavors

Dashboard	Clou	d
LISer	Domain	
PUB PRIV	Project	
<ul> <li>Flavor: "hardware" of VM</li> <li>RAM</li> <li>CPU core</li> <li>Other aspects</li> <li>Image: "software" of VM</li> <li>Operating system</li> <li>Bundled software</li> </ul>	Network	
<ul> <li>"hardware" requirements</li> </ul>		

### Hands on: Starting a virtual machine



• Select Project  $\rightarrow$  Instances  $\rightarrow$  Launch Instance

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Project	* *	Project / Compute / Instances											
c	Overview	Instances											
Ir	nstances												\
,	Volumes									Instance Name = •		Filter	Launch Instance
	Images	Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created		Actions
Access &	Security						No items	to display.					
Network	>												
Orchestration	>												
Data Processing	>												
Object Store	>												
Identity	>												

Choose a name for the VM, e.g. "my\_first\_vm"
Click on "Next"

Details	Please provide the initial hostname for the instance, th count. Increase the Count to create multiple instances	he availability zone where it will be deployed, and the instance with the same settings.
Source *	Instance Name *	Total Instances (100 Max)
-lavor *	my_first_vm	1%
Networks	Availability Zone	
Network Ports	Count *	0 Current Usage 1 Added 99 Remaining
Security Groups	1	
Key Pair		
Configuration		
Server Groups		
Scheduler Hints		
Metadata		

- Select "No" for "Create New Volume"
- Click on "+" at Ubuntu 16.04 Xenial
- Click on "Next"

	Launch Instance						2		
	Details	Instance source is the template used to image, or a volume (if enabled). You can	create an instance. You also choose to use pe	u can use a snar rsistent storage	oshot of an ex by creating a	xisting instance new volume.	e, an		
	Source *	Select Boot Source Create New Volume							
	Flavor *	Image	•	Yes No					
	Networks	Allocated							
	Network Ports	Name Updated	Size	Type	Visibii	lity			
	Security Groups						Select or		
	Key Pair	Q Click here for filters.					×		
	Configuration	Name	Updated	Size	Туре	Visibility			
	Server Groups	> cloud-developer-box-1.0.0	5/31/17 1:50 PM	535.56 MB	qcow2	Public	•		
	Scheduler Hints	> kubenow-v020a1	4/29/17 9:25 PM	3.23 GB	qcow2	Public	•		
List of accessible images	Metadata	> Ubuntu 16.04 Xenial 2017/04/19	4/21/17 3:16 PM	272.06 MB	qcow2	Public	+		
(either public or project-own	eu)								

1.

2.

- Click on "+" next to "de.NBI default"
- "Launch Instance" should be clickable now  $\rightarrow$  do it!

l	Launch Instance									×			
	Details	Flavo	rs manage the sizing	g for the con	npute, memo	ry and storage	e capacity of th	ne instance.		8			
	Source		lame VCPUS	RAM	Total D	lisk Ro	ot Disk	Ephemeral Disk	Public				
	Flavor *	avor * Select an item from Available items below											
	Networks	✔ Av	ailable 10						Sel	ect one			
	Network Ports	Q Click here for filters.								×			
	Security Groups	N	lame	VCPUS	RAM <sup>▲</sup>	Total Disk	Root Disk	Ephemeral Disk	Public				
	Key Pair	<b>&gt;</b> m	1.micro	1	🛕 64 MB	10 GB	🛕 10 GB	0 GB	Yes	+			
	Configuration	<b>&gt;</b> d	e.NBI.default	2	2 GB	20 GB	20 GB	0 GB	Yes	+			
	Server Groups	<b>&gt;</b> p	ublic.small	2	2 GB	10 GB	🔺 10 GB	0 GB	Yes	+			
	Scheduler Hints	<b>&gt;</b> p	hnmnl-node	3	7.81 GB	50 GB	50 GB	0 GB	Yes	+			
	Metadata												

1.

- Web UI switches to instance list
- Instance is built, status will change several time
- Status is active after VM is ready to use

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Project	~	Project /	Compute / Instanc	es										
Compute	~													
	Overview	Insta	nces											
	Instances							[						
	Volumes							Instance Na	ame = 🔻		Filter	Launch Instance	Delete Instances	More Actions -
	Images	Inst	ance Name	Image Name	IP Address	Size	Key Pair	Status	Availabil	ity Zone Task	Power State	e Time since c	reated Acti	ons
Acces	s & Security	🗆 my_	first_vm	Ubuntu 16.04 Xenial 2017/04/19	• 192.168.0.20	de.NBI.default	css_key	Active	nova	None	Running	0 minutes	Cr	reate Snapshot 👻
Network	>	Displaying	1 item											
Orchestratio	on >													
Data Process	ing 🔉													

- Launch dialog allows many different options, but is also very complex
- Pages with mandatory settings are marked
- Skipped Network and Key pair
  - Only one possible selection
  - Correctly assigned (see instance list)
- Other settings beyond our scope



### Hands on: Starting a virtual machine



de.NBI

Select Project → Network → Network Topology
Click on "Create Router"



- Select a name for the router, e.g. "cws\_router"
- Select the only available external network
- Click on "Create Router"

Create Router			×
Router Name			
CSS_router			
UP	•		
External Network			
external_network	•		
		Cancel Create	Router

- A router is shown in the topology
- It is connected to the external network
- No connection to the project network (yet)



- Hover with mouse over router to bring up its tool tip
- Select "Add Interface"



- Select the subnet
- Click on "Submit"

	Add Interface		×
Select subnet	Subnet * css_net: 192.168.0.0/24 (css_subnet) • IP Address (optional) @ Router Name * css_router Router ID * 1aadb6cf-040e-4e5b-b40e-d9cf6441d994	• Description: You can connect a specified subnet to the router. The default IP address of the interface created is a gateway of the selected subnet. You can specify another IP address of the interface here. You must select a subnet to which the specified IP address belongs to from the above list.	

Cancel Submit

- Go back to Project → Network → Network topology
- Router should be connected to both networks



### Hands on Goal: make VMs accessible



- Go to Project → Compute → Access & Security
   → Floating Ips
- Click on "Allocate IP To Project"
- Dialog is already configured correctly, click on "Allocate IP"

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Project	~	Project / Compute / Access a	& Security					
Compute	erview	Access & Sec	curity					
Insta	ances lumes	Security Groups Key Pair	Floating IPs	API Access				
In	nages	IP Address		Mapped Fixed IP Address		Pool	Status	Allocáte IP To Project
Access & Se	cunty				No items to display.			
Orchestration	>							
Data Processing	>							
Object Store	>							
Identity	>							
						Click here		/

- One IP address should be listed in overview
- Click on "Associate" to associate it with a VM

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Project Compute	Project / Compute / Access & Security				
Overvie	Access & Security	у			
Instance Volume	s Security Groups Key Pairs Flo	oating IPs API Access			
Image	S			% Allocate IP To Project (Quota exceeded)	S Release Floating IPs
Access & Securi	U IP Address	Mapped Fixed IP Address	Pool	Status	Actions
Network	134.176.27.176		-	Down	Associate -
Orchestration	Displaying 1 item				
Data Processing	•				
Object Store	•				

- IP Address is already selected correctly
  - Only one floating IP to associate
- Select the network port to use as destination
  - Format is <VM name>: <internal IP address>
- Click on "Associate"

(Same functionality also available in instance view, not shown here)

	Manage Floating IP Association	ns	×
1	IP Address *	Select the	IP address you wish to associate with the
1.	134.176.27.176	+ selected in	stance or port.
	Port to be associated *		
	my_first_vm: 192.168.0.20	•	
			Cancel Associate
	L		
	-	2	
	4		

- IP overview should show a mapping now
- Every user will have a different floating IP address!
- Remember the IP address, we are going to work with it...

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Project	•	Project / Compute / Access & Secur	ity			
Compute	Overview	Access & Securi	ity			
	Instances Volumes	Security Groups Key Pairs	Floating IPs API Access			
	Images				Allocate IP To Project (Quota exceeded)	S Release Floating IPs
Access	& Security	IP Address	Mapped Fixed IP Address	Pool	Status	Actions
Network	>	134.176.27.176	my_first_vm 192.168.0.20	external_network	Down	Disassociate -
Orchestration	n <b>&gt;</b>	Displaying 1 item				
Data Processi	ng 🕨					
Object Store	>					
Identity	>					

## Hands on: external access (ping)

- Check that the VM is accessible
- Open a terminal
- Enter "ping <IP address>"
  - Sends network package to computer
  - Expects a reply
  - Useful to check whether a host is alive / accessible

\$_			Terr	ninal ·	blinke@bcf-pc01: ~	↑ _ □	×
File	Edit	View	Terminal	Tabs	Help		
blink PING	e@bcf 134.17	-pc01:- 76.27.1	-\$ ping 1: 176 (134.:	34.176 176.27	.27.176 .176) 56(84) bytes of data.		

- But: no replies.....
- Leave the window open and switch back to browser....

- Check that the VM is accessible
- Open a terminal
- Enter "nc <IP address> 22"
  - Check if a ssh service is listen
  - Expects a reply
  - Alternative is ICMP is blocked

- Several firewalls protect cloud setup / VMs
- CeBiTec restricts to network to ssh, http(s)
- Security group(s) configurable by user
- User is responsible for a secure setup of VMs!



#### Hands on: security groups

Go to Project → Access & Security → Security Groups
Click on "Manage Rules" for the "default" group

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Project	*	Project / Compute	e / Access & Se	curity								
Compute	verview	Access	& Secu	rity								
In	stances /olumes	Security Groups	Key Pairs	Floating IPs	API Access							
	Images								Filter	Q	+ Create Security Group	🛍 Delete Security Groups
Access & :	Security	Name				Description						Actions
Network	>	default				Default security group						Manage Rules
Orchestration Data Processing	> >	Displaying 1 item										
Object Store	>											
								Click	here			

- Default security groups does not allow any access
- Click on "Add Rule"

						C	Click here	
openstack	CSS • CSS	\$41 ▼						å css41 ▼
Project	~	Project / Compute / Ac	ccess & Security / Manage Securi	ty Group Rul				
Compute	✓	Manage Se	ecurity Group	Rules: default (	9734df5a-ff83-	4189-a5c7-44249	9b8b286f)	
	Instances							+ Add Rule â Delete Rules
	Volumes	Direction	Ether Type	IP Protocol	Port Range	Remote IP Prefix	Remote Security Group	Actions
	Images	Egress	IPv6	Any	Any	::/0	-	Delete Rule
Network	s & Security	Egress	IPv4	Any	Any	0.0.0/0	-	Delete Rule
Orchestration	n <b>&gt;</b>	□ Ingress	IPv6	Any	Any		default	Delete Rule
Data Processi	ng 🕨	Ingress	IPv4	Any	Any		default	Delete Rule
Object Store	>	Displaying 4 items						
Identity	>							

- Default security groups does not allow any access
- Click on "Add Rule"

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Project	~	Project / Compute	/ Access & Security / Manage Securit	y Group Rul				
Compute	<b>∨</b> Overview	Manage	Security Group I	Rules: default	(9734df5a-ff83-	4189-a5c7-44249	b8b286f)	
	Instances							+ Add Rule
	Volumes	Direction	Ether Type	IP Protocol	Port Range	Remote IP Prefix	Remote Security Group	Actions
	Images	Egress	IPv6	Any	Any	::/0	-	Delete Rule
Network	s & Security	Egress	IPv4	Any	Any	0.0.0.0/0		Delete Rule
Orchestration	• •	Ingress	IPv6	Any	Any		default	Delete Rule
Data Processir	ng >	Ingress	IPv4	Any	Any		default	Delete Rule
Object Store Identity	>	Displaying 4 items						

- Select "ALL ICMP" rule
- Leave everything else at default
- Click on "Add"

Rule *	
ALL ICMP	Description:
Direction	Rules define which traffic is allowed to instances assigned to the security group. A security group rule consists of three main parts:
Ingress Remote * @	Rule: You can specify the desired rule template or use     custom rules, the options are Custom TCP Rule, Custo     UDP Rule, or Custom ICMP Rule.
	Open Port/Port Range: For TCP and UDP rules you n choose to open either a single port or a range of ports. Selecting the "Port Range" option will provide you with
0.0.0/0	space to provide both the starting and ending ports for range. For ICMP rules you instead specify an ICMP ty and code in the spaces provided.
	Remote: You must specify the source of the traffic to I allowed via this rule. You may do so either in the form 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 gro access to any other instance via this rule.

- Switch to terminal with the running "ping" command
- You should see replies now!

\$-				Те	rmina	ıl - blin	ke@bcf-	pc01: ~			 r _	×
Fi	le Edi	t Vie	ew T	ermina	l Tab	s Help						
bl:	inke@bo	cf-pc0	91:~\$	ping	134.1	76.27.1	76					
PI	NG 134.	176.2	27.176	5 (134	.176.	27.176)	56(84)	bytes o	of data.			
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1271	ttl=61	time=1.95	ms		
64	bytes	from	134.1	176.27	.176:	icmp s	eq=1272	ttl=61	time=1.75	ms		
64	bytes	from	134.1	176.27	.176:	icmp s	eq=1273	ttl=61	time=1.77	ms		
64	bytes	from	134.1	176.27	.176:	icmp s	eq=1274	ttl=61	time=1.25	ms		
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1275	ttl=61	time=1.50	ms		
64	bytes	from	134.1	176.27	.176:	icmp s	eq=1276	ttl=61	time=1.36	ms		
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1277	ttl=61	time=1.36	ms		
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1278	ttl=61	time=1.99	ms		
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1279	ttl=61	time=1.36	ms		
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1280	ttl=61	time=1.20	ms		
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1281	ttl=61	time=1.47	ms		
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1282	ttl=61	time=1.18	ms		
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1283	ttl=61	time=1.19	ms		
64	bytes	from	134.1	176.27	.176:	icmp_s	eq=1284	ttl=61	time=1.87	ms		

• Close the terminal window

Changes to security groups do not require a VM restart

- Add another rule to "default" group
- Use predefined "SSH" rule
- Leave other fields at default

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Project	* *	Project / Compute /										
o	verview	Manage S	anage Security Group Rules: default (9734df5a-ff83-4189-a5c7-44249b8b286f)									
In	stances							+ Add Rule				
\ \	/olumes	Direction	Ether Type	IP Protocol	Port Range	Remote IP Prefix	Remote Security Group	Actions				
Access & S	Images Security	Egress	IPv6	Any	Any	::/0		Delete Rule				
Network	>	Egress	IPv4	Any	Any	0.0.0/0	-	Delete Rule				
Orchestration	>	Ingress	IPv6	Any	Any		default	Delete Rule				
Data Processing	>	Ingress	IPv4	Any	Any	-	default	Delete Rule				
Object Store	>	Ingress	IPv4	ICMP	Any	0.0.0/0		Delete Rule				
		Ingress	IPv4	ТСР	22 (SSH)	0.0.0/0		Delete Rule				
		Displaving 6 items										

- Open a new terminal (<left windows key>+<t>)
- Connect to your VM via ssh using the generated key

ssh -i cws.key ubuntu@134.176.27.XYZ

- ssh might ask for accepting host key on first connect
- You will end up with a command prompt within the VM:



Hands on: what we had so far..

- User have access to projects in domains
- Users need a ssh key pair
- A network is required to start a VM
- Image: prebuilt software collection / operating system
- Flavor: specification of VM size
- Instance: Image + Flavor + Network + Key pair + ....
- Router: access between networks
- Floating IP: (usually) externally accessible IP address
  - Need router between external and project networks
- Security group: project internal firewall

• Most important: user is responsible for security!

- Go to Project  $\rightarrow$  Compute  $\rightarrow$  Volumes
- Click on "Create Volume"



- Choose a name for the volume, e.g. "css\_vol"
- Select a suitable size (default of 1 GB should be OK now)
- Click on "Create Volume"

Create Volume	×
Volume Name Css_vol Description	Description: Volumes are block devices that can be attached to instances.
	Volume Type Description: external-ceph No description available.
Volume Source	Volume Limits
No source, empty volume	Total Giblbytes (0 GiB) 1,000 GiB Available
Type external-ceph	Number of Volumes (0) 10 Available
Size (GIB) *	
1	
Availability Zone	
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	Cancel Create Volume

- Volume was created and is available now
- Extend menu for volume and select "Manage Attachments"

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Project Compute	* *	Project / Co	ompute / Vol	umes											
Ove	erview	Volumes													
Inst	ances	Volumes	Volume Sn	napshots											
l	nages									Filter Q	+ Create Volume		â Delete Volumes		
Access & Se	ecurity	□ Name		Description	Size	Status	Туре	Attached To	Availability	Zone Boo	table E	ncrypted	Actions		
Network	>	C css_vo	ol	-	1GiB	Available	external-ceph		nova	No	1	lo	Edit Volume 💌		
Orchestration	>	Displaying 1 it	item												
Data Processing	>														
Object Store	>														
Identity	>														
									Click or	arrow to	exten	d menu			

- Select the instance we have created before
- Click on "Attach Volume"



- Volume list now shows the volume as attached
- No more fancy feedback in dashboard...
- ... but in the VM!

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Project	*	Project / Compute /	Volumes								
Compute	✓	Volumes									
In	nstances Volumes	Volumes Volum	ne Snapshots								
	Images							Filter Q	+ Create Volume		🛍 Delete Volumes
Access &	Security	□ Name	Description	Size	Status	Туре	Attached To	Availability Zone	Bootable	Encrypted	Actions
Network	>			1GiB	In-use	external-ceph	Attached to my_first_vm on /dev/vdb	nova	No	No	Edit Volume 💌
Orchestration	>	Displaying 1 item									
Data Processing	>										
Object Store	>										

### Hands on Goal:



- Switch back to the terminal running ssh (or restart it)
- Invoke "ls /dev/vd\*"

ubuntu@my-first-vm:~\$ ls /dev/vd\* /dev/vda /dev/vdal /dev/vdb ubuntu@my-first-vm:~\$

- New block device vdb appeared
- Create a filesystem on it: "sudo mkfs.ext4 /dev/vdb"
- "mount" it: "sudo mount /dev/vdb /mnt"
- Validate with e.g. "df" command:

ubuntu@mv_fir	st_vm·~\$ df				
ubuncu@my=111	st-viii.~ş ui				
Filesystem	1K-blocks	Used	Available	Use%	Mounted on
udev	1016956	0	1016956	<u>0</u> %	/dev
tmpfs	204816	3152	201664	2%	/run
/dev/vda1	20263528	844644	19402500	5%	/
tmpfs	1024060	0	1024060	0%	/dev/shm
tmpfs	5120	0	5120	<b>0</b> %	/run/lock
tmpfs	1024060	0	1024060	<b>0</b> %	/sys/fs/cgroup
tmpfs	204816	0	204816	<u>0</u> %	/run/user/1000
/dev/vdb	999320	1284	929224	1%	/mnt
ubuntu@my-fir	st-vm:~\$				

- Volume is now accessible as standard file system
- Can be detached and attached to other VMs
- Stays around until being deleted

- But:
  - Volumes only accessible within project
  - Choice of file system depends on operating system
  - Might require management of posix users/groups
  - Not a shared file system, attachable to one VM at a time
  - Durability / accessibility depends on site setup

- Only used dashboard so far
- Limited functionality / timeouts
- Well suited for simple tasks
- But: there are power users!

- Openstack provides ...
  - ... command line access
  - ... REST API

- Go to Project → Compute → Access & Security → API Access
- Click on "Download OpenStack RC File v3"
- Save the offered file



- Open a new terminal (<left windows key> + <t>)
- "source" the downloaded file: source Downloads/cwsXY-openrc.sh
- Enter your cloud password when prompted
- "sourcing" modifies your terminal environment, adding variables used by the openstack CLI
- Start openstack CLI: "openstack"
- Run a simple command, e.g. "server list"
- You get a list of your VM instances
- Run "help" for a complete list of commands....

- CLI gives a (more) complete access to Openstack (full access by individual CLI tools not shown here)
- Allows certain level of automation (e.g. simple scripts)
- Sometime cryptic usage (UUIDs instead of names)
- A matter of personal preference / use case
- More complex workflows use REST API

## Hands on: VM delete

- Go to Project  $\rightarrow$  Compute  $\rightarrow$  Instance
- Click on arrow to open instance menu
- Select "Delete Instance" and confirm dialog

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Project	~	Project / Compute / Ins	tances									
Compute	rview	Instances			Click	arro	w to	access	s me	enu —		<b>`</b>
Insta	ances umes						Instance N	Name = ▼		Filter	Launch Instance	Instances More Actions
		Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
In Access & Se	curity	my_first_vm	Ubuntu 16.04 Xenial 2017/04/19	• 192.168.0.12 Floating IPs:	de.NBI.default	css_key	Active	nova	None	Running	3 days, 5 hours	Create Snapshot -
Network	> >	Displaying 1 item		• 134.176.27.176								Disassociate Floating IP Attach Interface
Data Processing	>											Edit Instance Attach Volume
Object Store	>											Detach Volume Update Metadata
Identity	>											Edit Security Groups Console
												View Log Pause Instance
												Suspend Instance Shelve Instance
												Resize Instance Lock Instance
												Unlock Instance
												Hard Reboot Instance
												Rebuild Instance

## Summary

- dashboard allows easy access to cloud resources
- setting up a project
  - ssh keys
  - network
  - images / flavors
  - external access (router / floating lps)
  - starting VMs
- storage
  - ephemeral  $\rightarrow$  ephemeral / local disc
  - persistent  $\rightarrow$  volumes
- command line interface

## • And again: security is up to the user!

Thanks for your attention!

Questions?

#### <Title>