

WORKSHOP on CLOUD BASED ACADEMIC COMPUTING

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Aims

- ≡ To build an opensource driven cloud computing platform
- ≡ We chose openstack for implementing this
- ≡ We set out to use an external storage as against the default design of implementation
- ≡

Recap

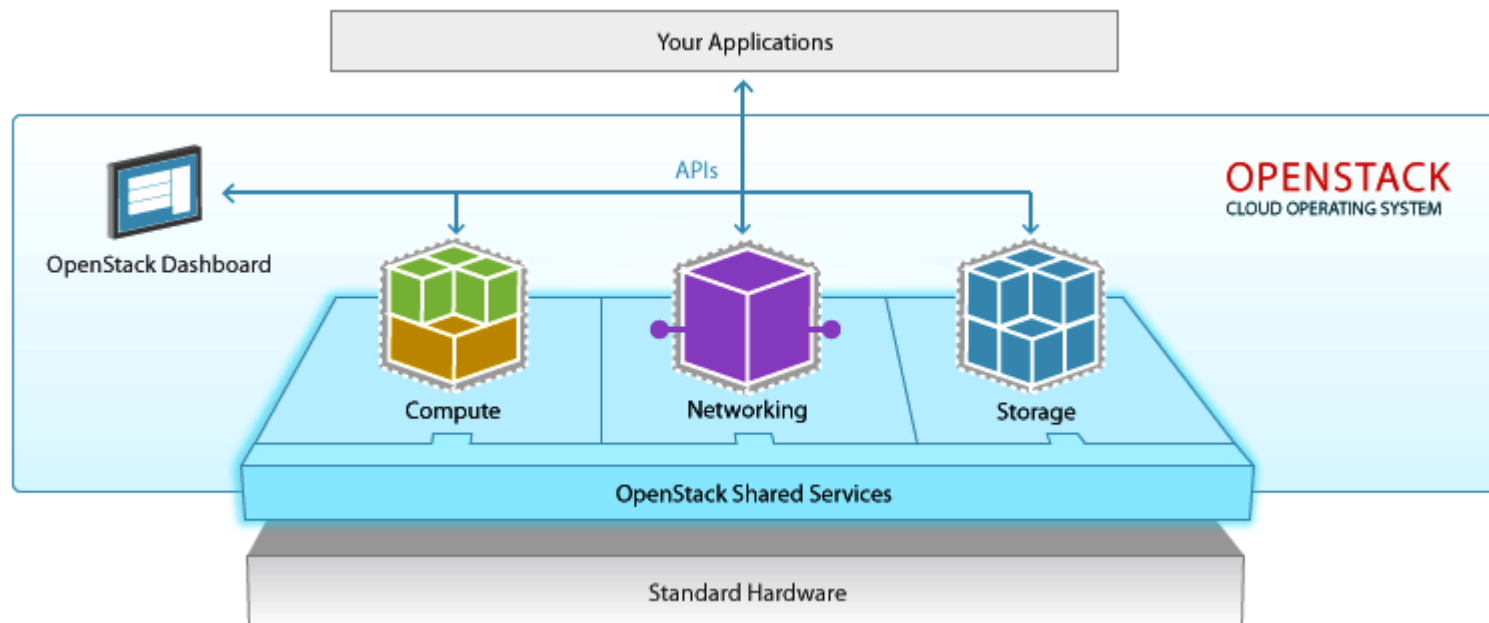
- Openstack consists of the controller and compute nodes
- Openstack has a number of core components as well as optional components.
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-

Our Implementation

- Components
 - - Horizon: Dashboard
 - - Neutron: Networking
 - - Glance: Imaging
 - - Nova: Compute
 - - Keystone: Identity service
 - - Manila: Shared filesystem
 - - Lbaas: Load balancer

Our Implementation

Openstack: is an open source cloud software which controls a large pools of computing, storage, and network resources in a data center while managing through a dashboard



Our Implementation

Horizon: is the authorized implementation of OpenStack's Dashboard, which is the only graphical interface to automate cloud-based resources. To service providers and other commercial vendors, it supports with third party services such as monitoring, billing, and other management tools.

Our Implementation

Neutron: provides networking capability like managing networks and IP addresses for OpenStack. It ensures that the network is not a limiting factor in a cloud deployment and offers users with self-service ability over network configurations. OpenStack networking allows users to create their own networks and connect devices and servers to one or more networks.

Our Implementation

Glance: OpenStack image service offers discovering, registering, and restoring virtual machine images. Glance has client-server architecture and delivers a user REST API, which allows querying of virtual machine image metadata and also retrieval of the actual image. While deploying new virtual machine instances, Glance uses the stored images as templates.

Our Implementation

Nova/Compute: is a cloud computing fabric controller, which manages pools of computer resources and work with virtualization technologies, bare metals, and high-performance computing configurations. Nova's architecture provides flexibility to design the cloud with no proprietary software or hardware requirements and also delivers the ability to integrate the legacy systems and third-party products.

Our Implementation

Keystone provides a central list of users, mapped against all the OpenStack services, which they can access. It integrates with existing backend services such as LDAP while acting as a common authentication system across the cloud computing system.

Keystone supports various forms of authentication like standard username & password credentials, AWS-style (Amazon Web Services) logins and token-based

Our Implementation

Manila: The OpenStack Manila provides shared filesystems as a service.

Our Implementation

Lbaas: The OpenStack Lbaas provides load balancing as a service.

Our Implementation

Other optional Openstack components

- Swift : Object Storage
 - Cinder: Block Storage
 - Heat: Orchestration
- etc

Our implementation

1 Regions

1 Host Aggregate:

1 Availability Zones

Multiple domains

Our implementation

Regions: Each Region has its own full Openstack deployment, including its own API endpoints, networks and compute resources. Different Regions share one set of Keystone and Horizon services, to provide access control and a Web interface

Our implementation

Availability Zone: Inside a Region, compute nodes can be logically grouped into Availability Zones (AZ): when launching a new VM instance we can specify the AZ we want it instantiated in, or even a specific node inside an AZ to run the VM instance.

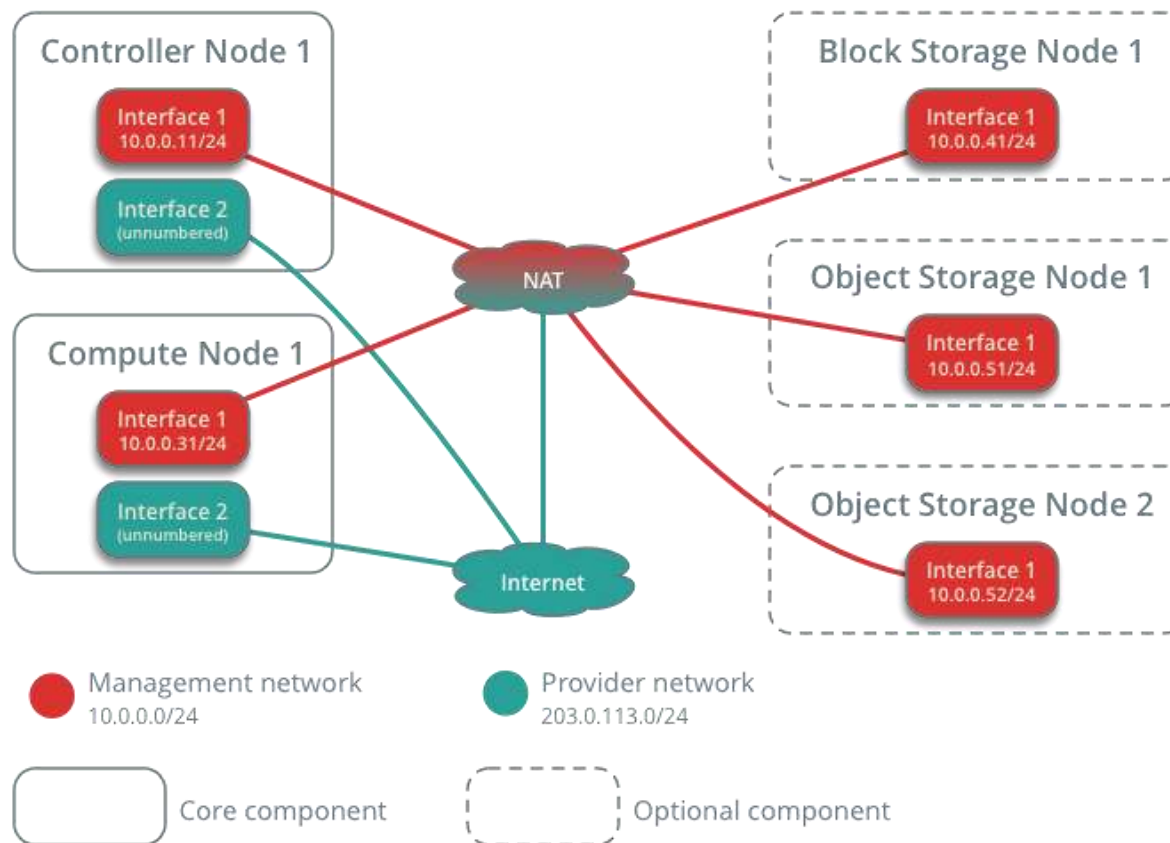
Our implementation

Host Aggregates: Besides AZs, compute nodes can also be logically grouped into Host Aggregates.

Host Aggregates have meta-data to tag groups of compute nodes, e.g. all nodes with an SSD disk can belong to one Host Aggregate, while another Host Aggregate may contain all nodes with 10 GB NICs.

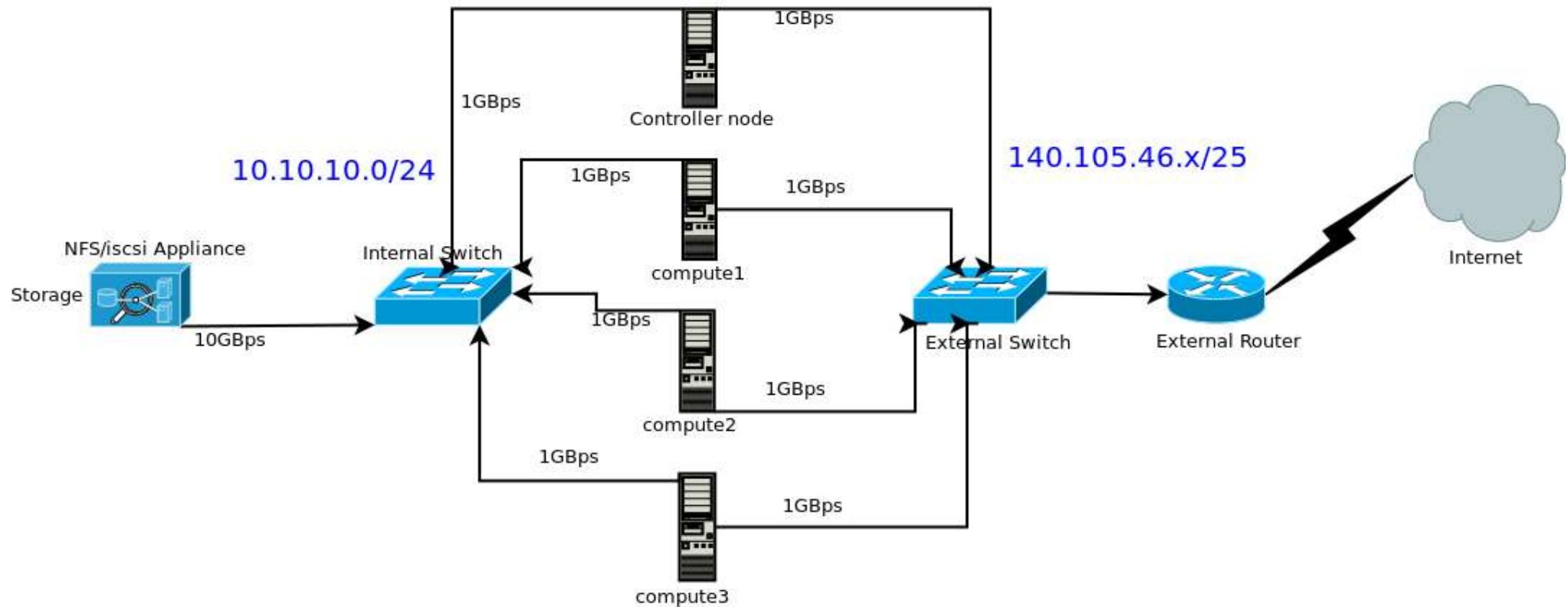
Generic Architecture

Network Layout



ICTP Architecture

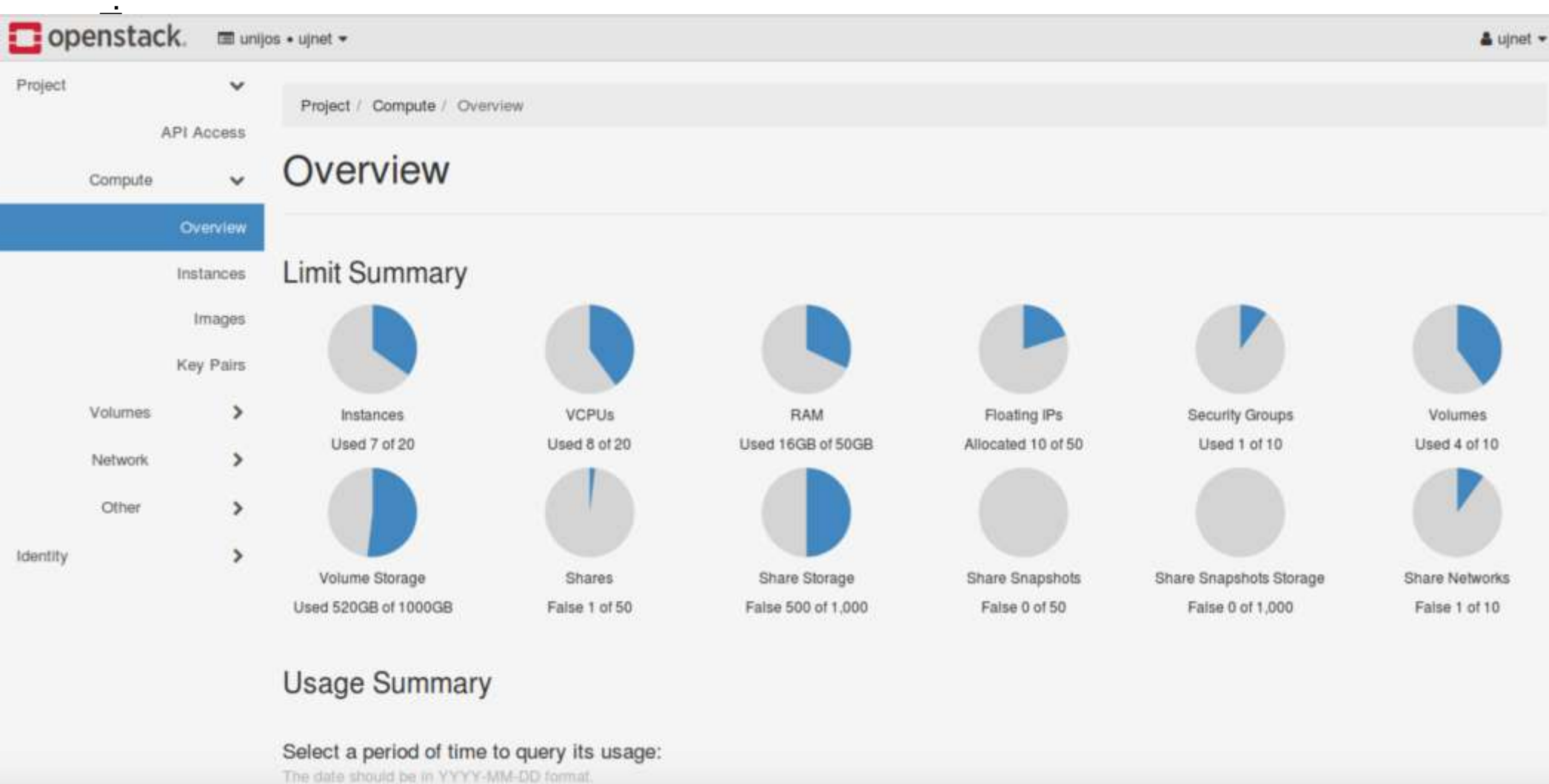
Openstack Architecture for ICTP



Instances

- ≡ - Instances are created with an image already stored.
- ≡ - A script is executed at instance creation to install required packages and mount the necessary mount points
- ≡ - Scaling is achieved by non-persistent storage on instances

Sample Dashboard Overview



Creating an Instance

openstack.

unijos • ujnet

ujnet

Project

API Access

Compute

Overview

Instances

Images

Key Pairs

Volumes

Network

Other

Identity

Project / Compute / Instances

Instances

Instance ID =

Filter

Launch Instance

Delete Instances

More Actions

Displaying 7 items

<input type="checkbox"/>	Instance Name	Image Name	IP Address	Flavor	Key Pair	Status		Availability Zone	Task	Power State	Time since created	Actions
<input type="checkbox"/>	ujnet-dspace	centos-6	192.168.100.56	m1.medium	unijos	Active		nova	None	Running	6 months	Create Snapshot
<input type="checkbox"/>	ujnet-koha	debian9	192.168.100.54	m1.medium	unijos	Active		nova	None	Running	6 months	Create Snapshot
<input type="checkbox"/>	ujnet-www1	debian9	192.168.100.47	m1.medium	unijos	Active		nova	None	Running	6 months	Create Snapshot
<input type="checkbox"/>	ujnet-elearn1	debian9	192.168.100.45	m1.medium	unijos	Active		nova	None	Running	6 months	Create Snapshot
<input type="checkbox"/>	ujnet-mis1	debian9	192.168.100.42	m1.medium	unijos	Active		nova	None	Running	6 months	Create Snapshot
<input type="checkbox"/>	ujnet-www2	debian9	192.168.100.46	m1.medium	unijos	Active		nova	None	Running	6 months	Create Snapshot
<input type="checkbox"/>	unijosdb1	-	192.168.100.11 Floating IPs: 140.105.46.137	m1.large	unijos	Active		nova	None	Running	6 months, 1 week	Create Snapshot

Creating an Instance

Launch Instance

Details

Source

Flavor

Networks

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

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

testing

Availability Zone

nova

Count

1

Total Instances
(20 Max)

40%

7

 Current Usage

1

 Added

12

 Remaining

Cancel

Back

Next

Launch Instance

Creating an Instance

Details

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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

Volume Size (GB)

1

Delete Volume on Instance Delete

Yes

No

Allocated

Name	Updated	Size	Type	Visibility
Select an item from Available items below				

Available 6

Select one

Q Click here for filters.

Name	Updated	Size	Type	Visibility
> ubuntu-16.04-server	5/1/18 8:02 AM	277.81 MB	qcow2	Public
> centos-7	5/1/18 8:00 AM	832.25 MB	qcow2	Public
> centos-6	5/1/18 8:00 AM	770.19 MB	qcow2	Public
> debian9	5/1/18 7:57 AM	601.43 MB	qcow2	Public

Creating an Instance

Details

Source

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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

Volume Size (GB)

1

Delete Volume on Instance Delete

Yes

No

Allocated

Name	Updated	Size	Type	Visibility
Select an item from Available items below				

Available 6

Select one

Q Click here for filters.

Name	Updated	Size	Type	Visibility
> ubuntu-16.04-server	5/1/18 8:02 AM	277.81 MB	qcow2	Public
> centos-7	5/1/18 8:00 AM	832.25 MB	qcow2	Public
> centos-6	5/1/18 8:00 AM	770.19 MB	qcow2	Public
> debian9	5/1/18 7:57 AM	601.43 MB	qcow2	Public

Creating an Instance

Launch Instance

Details

Source *

Flavor *

Networks *

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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
Select an item from Available items below						

▼ Available 5

Select one

Q Click here for filters.

Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public	
> m1.nano	1	64 MB	1 GB	1 GB	0 GB	Yes	↑
> m1.tiny	1	512 MB	1 GB	1 GB	0 GB	Yes	↑
> m1.small	1	1 GB	10 GB	10 GB	0 GB	Yes	↑
> m1.medium	1	2 GB	15 GB	15 GB	0 GB	Yes	↑
> m1.large	2	4 GB	20 GB	20 GB	0 GB	Yes	↑

✕ Cancel

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Launch Instance

Creating an Instance

Launch Instance

Details

Source

Flavor

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Scheduler Hints

Metadata

Networks provide the communication channels for instances in the cloud.

▼ Allocated

Select networks from those listed below.

Network	Subnets Associated	Shared	Admin State	Status
Select an item from Available items below				

▼ Available 2

Select at least one network

Q

Click here for filters.

X

Network	Subnets Associated	Shared	Admin State	Status	
> unijos-selfservice	unijos	No	Up	Active	↑
> provider	provider	Yes	Up	Active	↑

✕ Cancel

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Launch Instance

Creating an Instance

Launch Instance

Details

Source *

Flavor *

Networks *

Network Ports

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Server Groups

Scheduler Hints

Metadata

Ports provide extra communication channels to your instances. You can select ports instead of networks or a mix of both.

▼ Allocated

Select ports from those listed below.

Name	IP	Admin State	Status
Select an item from Available items below			

▼ Available 0

Select one

Q

Filter

Name	IP	Admin State	Status
No available items			

✕ Cancel

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Launch Instance

Creating an Instance

Launch Instance

Details

Source

Flavor

Networks

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

Select the security groups to launch the instance in.

▼ Allocated 1

Name	Description
> default	Default security group

▼ Available 0

Select one or more

Q

Click here for filters.

X

Name	Description
No available items	

X Cancel

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Next >

Launch Instance

Creating an Instance

Launch Instance

Details

Source

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Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

A key pair allows you to SSH into your newly created instance. You may select an existing key pair, import a key pair, or generate a new key pair.

+ Create Key Pair

Import Key Pair

Allocated

Displaying 1 item

Name	Fingerprint
unijos	58:b1:67:e1:90:75:05:54:63:e0:e0:22:12:1f:2b:3e

Displaying 1 item

Available 0

Select one

Q

Click here for filters.

X

Displaying 0 items

Name	Fingerprint
No items to display.	

Displaying 0 items

Cancel

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Launch Instance

Creating an Instance

Launch Instance

Details

Source *

Flavor *

Networks *

Network Ports

Security Groups

Key Pair

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Server Groups

Scheduler Hints

Metadata

You can customize your instance after it has launched using the options available here. "Customization Script" is analogous to "User Data" in other systems.

Load Customization Script from a file

No file selected.

Customization Script Content size: 0 bytes of 16.00 KB

Disk Partition

☐ **Configuration Drive**

Creating an Instance

Launch Instance

Details

Source *

Flavor *

Networks *

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

Select the server group to launch the instance in.

Allocated

Name

Select a server group from the available groups below.

▼ Available 0

Select one

Q Filter

Name

No available items

✕ Cancel

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Launch Instance

Creating an Instance

Launch Instance

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Source *

Flavor *

Networks *

Network Ports

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Server Groups

Scheduler Hints

Metadata

This step allows you to add scheduler hints to your instance.

You can specify scheduler hints by moving items from the left column to the right column. In the left column there are scheduler hint definitions from the Glance Metadata Catalog. Use the "Custom" option to add scheduler hints with the key of your choice.

Available Scheduler Hints

Filter

Q

Custom

+

No available scheduler hints

Existing Scheduler Hints

Filter

Q

No existing scheduler hints

on/project/Instances/#

Creating an Instance

Flavor

Networks

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

Available Metadata

Filter

Q

Custom

+

No available metadata

Existing Metadata

Filter

Q

No existing metadata

Click each item to get its description here.

✕ Cancel

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Launch Instance

Creating an Instance

||.

The screenshot shows the OpenStack dashboard interface. The top navigation bar includes the OpenStack logo, the project name 'unijos', and the user 'ujnet'. The left sidebar contains a menu with 'Project', 'API Access', 'Compute', 'Overview', 'Instances' (highlighted), 'Images', 'Key Pairs', 'Volumes', and 'Network'. The main content area is titled 'Instances' and shows a table of 8 items. The table has the following columns: Instance Name, Image Name, IP Address, Flavor, Key Pair, Status, Availability Zone, Task, Power State, Time since created, and Actions. The first row in the table is for an instance named 'test', which is highlighted. The instance is in the 'Build' status, using the 'm1.nano' flavor and 'unijos' key pair. The 'Availability Zone' is 'nova' and the 'Task' is 'Scheduling'. The 'Power State' is 'No State' and the 'Time since created' is '0 minutes'. The 'Actions' column for this instance includes a button labeled 'Associate Floating IP'.

Instance Name	Image Name	IP Address	Flavor	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
test	-		m1.nano	unijos	Build	nova	Scheduling	No State	0 minutes	Associate Floating IP

Thank you

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Questions and Discussions