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# Rapport de TP VCL

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2ème Année Cycle Supérieur (2CS)  
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Option : Systèmes Informatiques et Logiciels ( SIL )

## TP7

<b>Openstack</b>
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# Chapitre 1

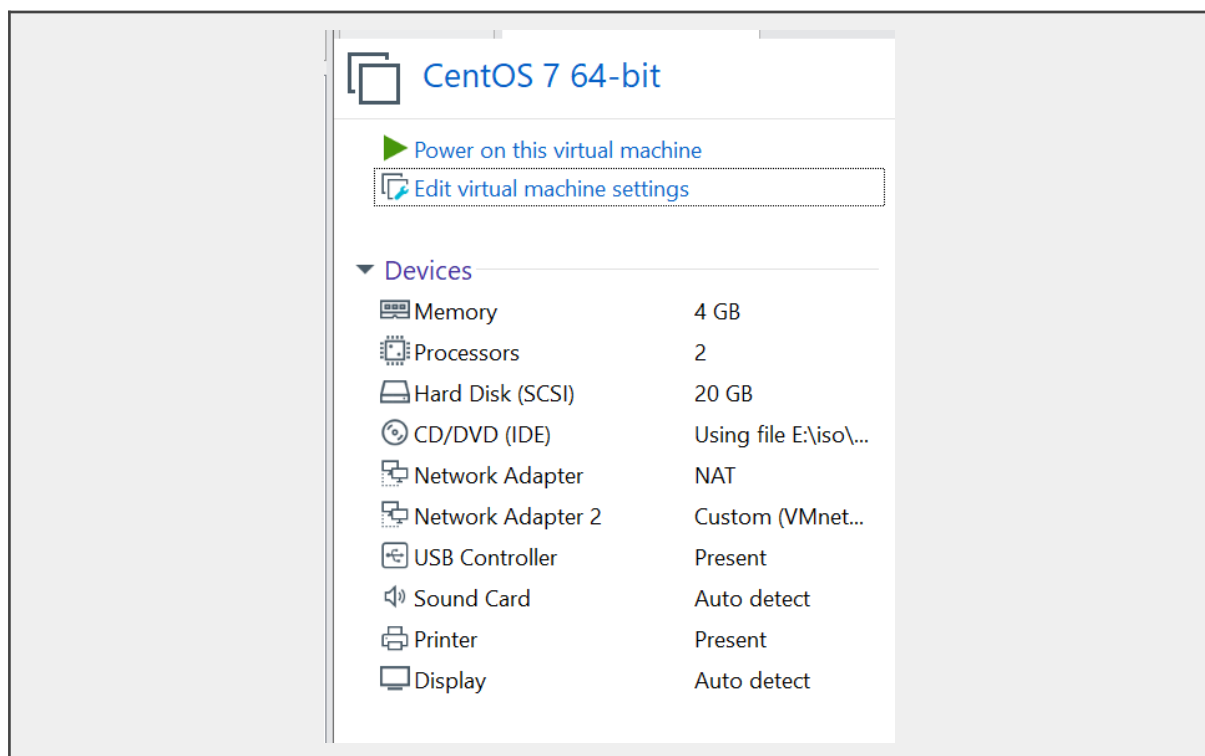
## 1. Introduction

OpenStack est une technologie open source qui permet de déployer des infrastructures de cloud computing. Cette infrastructure en tant que service (IaaS) offre une architecture modulaire composée de plusieurs projets corrélés tels que Nova, Swift et Glance. Ces projets permettent de contrôler les différentes ressources des machines virtuelles, telles que la puissance de calcul, le stockage ou encore le réseau, inhérents au centre de données sollicité.

Dans ce TP, nous avons eu l'opportunité de nous familiariser avec cet outil passionnant. Nous avons exploré les différentes étapes d'installation et de configuration, ainsi que la création d'une instance. Grâce à OpenStack, nous avons appris à gérer efficacement les ressources de notre infrastructure, à déployer des applications et à améliorer la flexibilité de notre système. Dans cet article, nous allons explorer plus en détail les fonctionnalités d'OpenStack et ses avantages pour les entreprises et les organisations qui souhaitent mettre en place une infrastructure de cloud computing solide et efficace

## 2. Prérequis

Pour suivre ce TP, on aura besoin la machine virtuelle CentOS 7 avec la configuration suivante :



## Chapitre 2

### 1. Installation d'Openstack

#### 1.1. rdo-release.rpm

Installation du package rdo-release.rpm, vérification des dépôts et l'installation des packages des dépôts Openstack

```
#yum install -y https://rdoproject.org/repos/rdo-release.rpm
#yum repolist
#yum install -y centos-release-openstack-rocky
```

```
[root@centos esi]# yum install -y https://rdoproject.org/repos/rdo-release.rpm
Loaded plugins: fastestmirror, langpacks
rdo-release.rpm                               | 6.7 kB      00:00
Examining /var/tmp/yum-root-FNqteQ/rdo-release.rpm: rdo-release-train-1.noarch
Marking /var/tmp/yum-root-FNqteQ/rdo-release.rpm to be installed
Resolving Dependencies
--> Running transaction check

Install 1 Package

Total size: 3.1 k
Installed size: 3.1 k
Downloading packages:
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : rdo-release-train-1.noarch                1/1
  Verifying   : rdo-release-train-1.noarch                1/1

Installed:
  rdo-release.noarch 0:train-1

Complete!
```

```
[root@centos esi]# yum repolist
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
* base: ftp.csuc.cat
* extras: ftp.csuc.cat
* openstack-train: ftp.csuc.cat
* rdo-qemu-ev: ftp.csuc.cat
* updates: ftp.csuc.cat
openstack-train | 3.0 kB 00:00
rdo-qemu-ev | 3.0 kB 00:00
(1/2): rdo-qemu-ev/x86_64/primary_db | 57 kB 00:00
(2/2): openstack-train/x86_64/primary_db | 1.2 MB 00:00
repo id repo name status
base/7/x86_64 CentOS-7 - Base 10,072
extras/7/x86_64 CentOS-7 - Extras 515
openstack-train/x86_64 OpenStack Train Repository 3,168
rdo-qemu-ev/x86_64 RDO CentOS-7 - QEMU EV 63
updates/7/x86_64 CentOS-7 - Updates 4,691
repolist: 18,509
[root@centos esi]#
```

```
[root@centos esi]# yum install -y centos-release-openstack-rocky
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
* base: ftp.cica.es
* extras: ftp.cica.es
* openstack-train: ftp.cica.es
* rdo-qemu-ev: ftp.cica.es
* updates: ftp.cica.es
Resolving Dependencies
--> Running transaction check
---> Package centos-release-openstack-rocky.noarch 0:1-1.el7.centos will be installed
```

```
Installed:
  centos-release-openstack-rocky.noarch 0:1-1.el7.centos
```

```
Dependency Installed:
  centos-release-ceph-luminous.noarch 0:1.1-2.el7.centos
  centos-release-qemu-ev.noarch 0:1.0-4.el7.centos
  centos-release-storage-common.noarch 0:2-2.el7.centos
  centos-release-virt-common.noarch 0:1-1.el7.centos
```

```
Complete!
```

## 1.2. Installation des packages Openstack

- Une fois l'environnement installé, on peut installer maintenant les packages Openstack :

```
#yum install -y openstack-packstack openstack-utils
```

```
[root@centos esi]# yum install -y openstack-packstack openstack-utils
Loaded plugins: fastestmirror, langpacks
Loading mirror speeds from cached hostfile
* base: mirror.librelabucm.org

Dependency Updated:
  python2-cryptography.x86_64 0:2.5-1.el7

Replaced:
  pyOpenSSL.x86_64 0:0.13.1-4.el7      python-cffi.x86_64 0:1.6.0-5.el7
  python-idna.noarch 0:2.4-1.el7      python-ipaddress.noarch 0:1.0.16-2.el7
  python-netaddr.noarch 0:0.7.5-9.el7  python-six.noarch 0:1.9.0-2.el7

Complete!
```

- Pour une installation silencieuse, on va préparer un fichier de configuration, pour générer ce fichier automatiquement, on utilise le paramètre "gen-answer-file" de la commande packstack :

```
#packstack --gen-answer-file /root/answers.txt
```

```
[root@centos esi]# packstack --gen-answer-file /root/answers.txt
Packstack changed given value to required value /root/.ssh/id_rsa.pub
Additional information:
* Parameter CONFIG_NEUTRON_L2_AGENT: You have chosen OVN Neutron backend. Note
that this backend does not support the VPNaaS or FWaaS services. Geneve will be
used as the encapsulation method for tenant networks
[root@centos esi]#
```

- Par la suite on va effectuer les modifications suivantes

```
CONFIG_SERVICE_WORKERS=1
CONFIG_NTP_SERVERS=pool.ntp.org
CONFIG_KEYSTONE_ADMIN_PW=password
CONFIG_DEFAULT_PASSWORD=password
CONFIG_HORIZON_SSL=n
CONFIG_PROVISION_DEMO=n
```

```
# The amount of service workers/threads to use for each service.
# Useful to tweak when you have memory constraints. Defaults to the
# amount of cores on the system.
CONFIG_SERVICE_WORKERS=1
```

```
# Comma-separated list of NTP servers. Leave plain if Packstack
# should not install ntpd on instances.
CONFIG_NTP_SERVERS=pool.ntp.org
```

```
# Default password to be used everywhere (overridden by passwords set
# for individual services or users).
CONFIG_DEFAULT_PASSWORD=password
```

```
# Specify 'y' to provision for demo usage and testing. ['y', 'n']
CONFIG_PROVISION_DEMO=n
```

- Finalement on va installer Openstack:

```
#packstack --answer-file /root/answers.txt
```

```
[root@centos ~]# packstack --answer-file /root/answers.txt
Welcome to the Packstack setup utility


The installation log file is available at: /var/tmp/packstack/20230212-134317-lg
8wh3/openstack-setup.log

Installing:
Clean Up [ DONE ]
Discovering ip protocol version [ DONE ]
Setting up ssh keys [ DONE ]
Preparing servers [ DONE ]
```

L'installation est enfin terminée, on récupère les informations de d'authentification depuis le fichier "/root/keystonerc\_admin/"

## 2. Création d'une instance

### 2.1. Connexion au Dashboard :




openstack®

Log in

User Name

Password

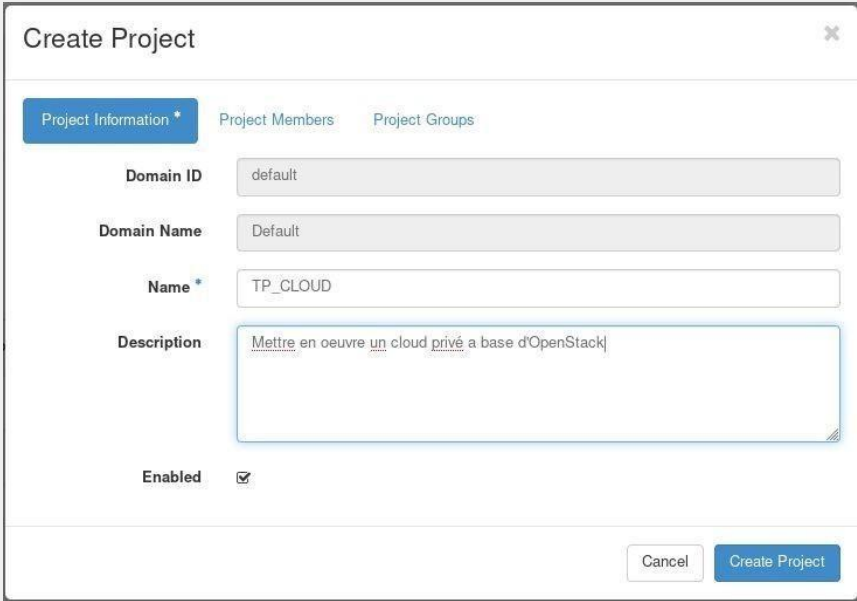
 

Sign In



## 2.2. Création du projet :

- Dans l'onglet "Identity -> Projects->Create Project" , on insère les informations suivantes :

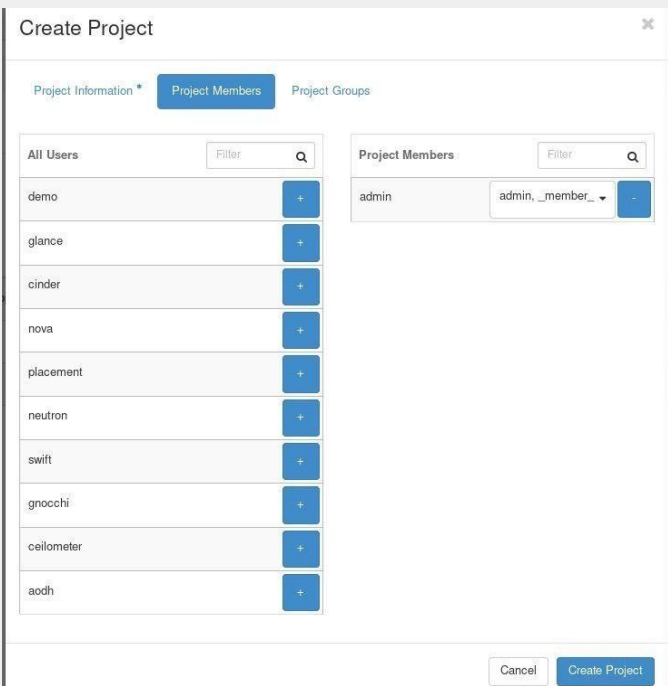


The screenshot shows the 'Create Project' dialog box with the 'Project Information' tab selected. The fields are as follows:

Field	Value
Domain ID	default
Domain Name	Default
Name *	TP_CLOUD
Description	Mettre en oeuvre un cloud privé a base d'OpenStack
Enabled	<input checked="" type="checkbox"/>

Buttons: Cancel, Create Project

- On va ajouter l'administrateur a la liste des membres comme roles "admin" et "membre":



The screenshot shows the 'Create Project' dialog box with the 'Project Members' tab selected. The 'All Users' list on the left contains the following users:

User	Action
demo	+
glance	+
cinder	+
nova	+
placement	+
neutron	+
swift	+
gnocchi	+
ceilometer	+
aodh	+

The 'Project Members' list on the right contains the following member:

Member	Role	Action
admin	admin, _member_	-

Buttons: Cancel, Create Project

- Le projet est effectivement ajouté à la liste des projets, et on peut le switcher vers ce projet dans la liste déroulante en haut :

Projects:

- admin
- TP\_CLOUD

Projects

Project Name:  Filter [+ Create Project](#) [Delete Projects](#)

Displaying 4 items

	Name	Description	Project ID	Domain Name	Enabled	Actions
<input type="checkbox"/>	TP_CLOUD	Mettre en oeuvre un cloud privé à base d'OpenStack	3693b6a0c492400aa9ae7cd21755e0b8	Default	Yes	<a href="#">Manage Members</a>
<input type="checkbox"/>	services	Tenant for the openstack services	885b50207ac24846856db29951c34084	Default	Yes	<a href="#">Manage Members</a>
<input type="checkbox"/>	admin	admin tenant	8b8101dbb0fe4d119d7bda99a88f1ce0	Default	Yes	<a href="#">Manage Members</a>
<input type="checkbox"/>	demo	default tenant	a01ad378bfba40f6bdeda2f6a231bc61	Default	Yes	<a href="#">Manage Members</a>

Displaying 4 items

- Pour créer un nouvel utilisateur on sélectionne "Create User" dans l'onglet Identity -> Users ,et on l'affecte au projet

### Create User

**Domain ID**  
default

**Domain Name**  
Default

**User Name \***  
Student

**Description**  
Utilisateur du projet TP\_Cloud

**Email**

**Password \***  
••••••••

**Confirm Password \***  
••••••••

**Primary Project**  
TP\_CLOUD

**Role**  
\_member\_

☒ Enabled

[Cancel](#) [Create User](#)

**Description:**  
Create a new user and set related properties including the Primary Project and Role.

- L'utilisateur "Student" est ajouté avec succès à la liste des utilisateurs :

## Users

Displaying 12 items

<input type="checkbox"/>	User Name	Description	Email	User ID	Enabled	Domain Name	Actions
<input type="checkbox"/>	admin	-	root@localhost	4dd3ee101b34278865e975807361a0	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	demo	-		5b2ce08716c142a1aca8032f54bf5a4b	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	glance	-	glance@localhost	1d4ae3dc00844a4beaa087385d776cd	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	cinder	-	cinder@localhost	710d6980117c4a2ea31078ecb256229	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	nova	-	nova@localhost	0ab5d0aa4db4198afcd792a34c5ee3	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	placement	-	placement@localhost	784709a7587496490c7a5aa8521a899	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	neutron	-	neutron@localhost	1dc509590201478db8be205c45ad4ae5	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	swift	-	swift@localhost	651ca46ab3024690ddcd2338481d0d454	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	gnocchi	-	gnocchi@localhost	0512a146eede11da9a3236227541e96d	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	ceilometer	-	ceilometer@localhost	6863a90bd857403d59396cb2406044dd	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	aodh	-	aodh@localhost	8b7c9ef282a144259d23420ca748ea2	Yes	Default	<input type="button" value="Edit"/>
<input type="checkbox"/>	Student	Utilisateur du projet TP_Cloud		10731c4353b543108288003139346b18	Yes	Default	<input type="button" value="Edit"/>

### 3. Création des réseaux :

- Se déplacer vers l'onglet Project -> Network -> Networks ,et choisir "Create Network" . Puis créer les réseaux Reseau\_privé\_1 et Reseau\_public\_1 avec les informations fournies dans l'énoncé :
- Configuration pour le réseau privé :

### 3.1. Configuration du réseau privé :

[illegible]

Create Network

Network

Subnet

Subnet Details

Subnet Name

services\_public

Network Address ⓘ

192.168.13.0/24

IP Version

IPv4

Gateway IP ⓘ

192.168.13.1

☐ Disable Gateway

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.

Cancel

Back

Next

Create Network

Network

Subnet

Subnet Details

☒ Enable DHCP

Specify additional attributes for the subnet.

Allocation Pools ⓘ

192.168.13.100-192.168.13.110

DNS Name Servers ⓘ

Host Routes ⓘ

Cancel

Back

Create

### 3.2. Configuration du réseau public :

The image displays two sequential screenshots of the 'Create Network' wizard in the Azure portal.

**Top Screenshot: Network Tab**

- Network Name:** Reseau\_public\_1
- Enable Admin State:** ☒
- Shared:** ☐
- Create Subnet:** ☒
- Availability Zone Hints:** (Empty text area)
- Buttons:** Cancel, Back, Next

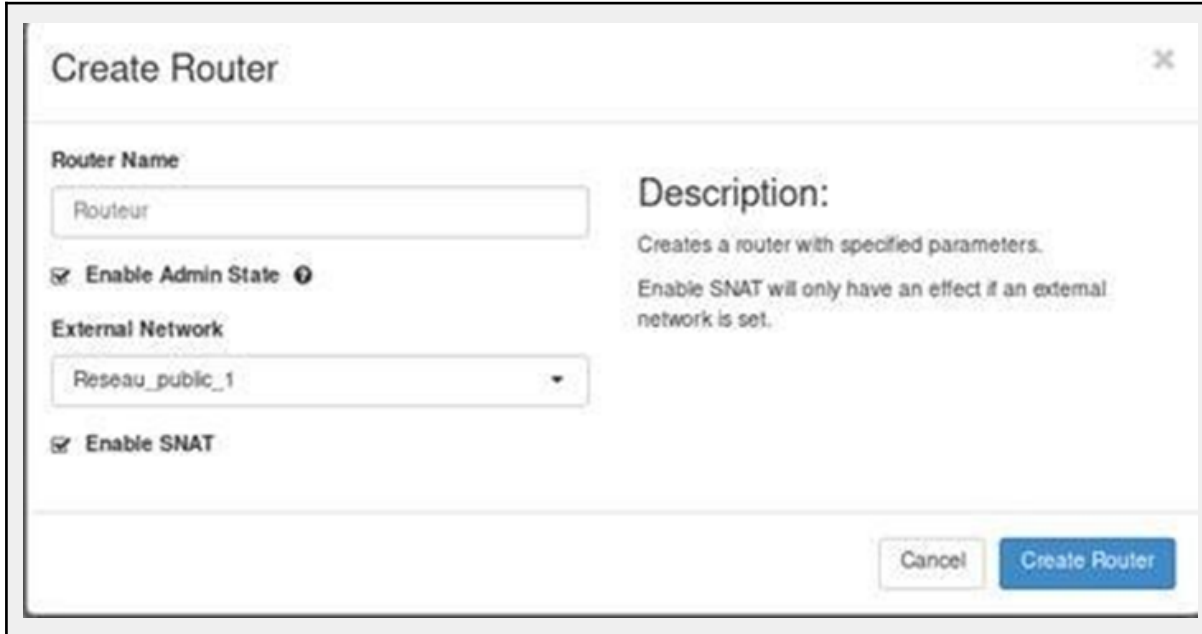
**Bottom Screenshot: Subnet Tab**

- Subnet Name:** sousres\_public
- Network Address:** 192.168.122.0/24
- IP Version:** IPv4
- Gateway IP:** 192.168.122.1
- Disable Gateway:** ☐
- Buttons:** Cancel, Back, Next



### 3.3. Création d'un routeur avec le réseau externe:

- Pour ajouter un routeur, on va dans l'onglet Project -> Network-> Routeurs, et on choisit "Add Router",on assigne ce routeur au réseau public :



- On vérifie que le routeur est créé :



Routers				
Router Name				
Filter				
+ Create Router				
+ Delete Router				
Displaying 1 item				
Name	Status	External Network	Admin State	Actions
Routeur	Active	Reseau_public_1	UP	Clear Filters

## 4. Définir un groupe de sécurité pour cette machine

- On navigue vers l'onglet Project -> Network -> Security Groups et on choisit "Create Security Group", on crée un groupe de sécurité avec le nom "Groupe\_Sécurité", et on ajoute les règles suivantes :

## Add Rule

Rule \*

ALL ICMP

Description ⓘ

Direction

Egress

Remote \* ⓘ

Security Group

Security Group\*

Group\_Sécurité (current)

Ether Type

IPv4

### Description:

Rules define which traffic is allowed to instances assigned to the security group. A security group rule consists of three main parts:

**Rule:** You can specify the desired rule template or use custom rules, the options are Custom TCP Rule, Custom UDP Rule, or Custom ICMP Rule.

**Open Port/Port Range:** For TCP and UDP rules you may choose to open either a single port or a range of ports. Selecting the "Port Range" option will provide you with space to provide both the starting and ending ports for the range. For ICMP rules you instead specify an ICMP type and code in the spaces provided.

**Remote:** You must specify the source of the traffic to be allowed via this rule. You may do so either in the form of 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 group access to any other instance via this rule.

Cancel

Add

## Add Rule

Rule \*

ALL ICMP

Description ⓘ

Direction

Ingress

Remote \* ⓘ

Security Group

Security Group\*

Group\_Sécurité (current)

Ether Type

IPv4

### Description:

Rules define which traffic is allowed to instances assigned to the security group. A security group rule consists of three main parts:

**Rule:** You can specify the desired rule template or use custom rules, the options are Custom TCP Rule, Custom UDP Rule, or Custom ICMP Rule.

**Open Port/Port Range:** For TCP and UDP rules you may choose to open either a single port or a range of ports. Selecting the "Port Range" option will provide you with space to provide both the starting and ending ports for the range. For ICMP rules you instead specify an ICMP type and code in the spaces provided.

**Remote:** You must specify the source of the traffic to be allowed via this rule. You may do so either in the form of 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 group access to any other instance via this rule.

Cancel

Add



## Add Rule

Rule \*

SSH

Description ⓘ

Remote \* ⓘ

Security Group

Security Group\*

Group\_Sécurité (current)

Ether Type

IPv4

### Description:

Rules define which traffic is allowed to instances assigned to the security group. A security group rule consists of three main parts:

**Rule:** You can specify the desired rule template or use custom rules, the options are Custom TCP Rule, Custom UDP Rule, or Custom ICMP Rule.

**Open Port/Port Range:** For TCP and UDP rules you may choose to open either a single port or a range of ports. Selecting the "Port Range" option will provide you with space to provide both the starting and ending ports for the range. For ICMP rules you instead specify an ICMP type and code in the spaces provided.

**Remote:** You must specify the source of the traffic to be allowed via this rule. You may do so either in the form of 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 group access to any other instance via this rule.

Cancel

Add

## Add Rule

Rule \*

HTTP

Description ⓘ

Remote \* ⓘ

Security Group

Security Group\*

Group\_Sécurité (current)

Ether Type

IPv4

### Description:

Rules define which traffic is allowed to instances assigned to the security group. A security group rule consists of three main parts:

**Rule:** You can specify the desired rule template or use custom rules, the options are Custom TCP Rule, Custom UDP Rule, or Custom ICMP Rule.

**Open Port/Port Range:** For TCP and UDP rules you may choose to open either a single port or a range of ports. Selecting the "Port Range" option will provide you with space to provide both the starting and ending ports for the range. For ICMP rules you instead specify an ICMP type and code in the spaces provided.

**Remote:** You must specify the source of the traffic to be allowed via this rule. You may do so either in the form of 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 group access to any other instance via this rule.

Cancel

Add

- On vérifie que toutes les règles ont été ajoutées :

Displaying 6 items							<a href="#">Add Rule</a> <a href="#">Delete Rules</a>
<input type="checkbox"/> Direction	Ether Type	IP Protocol	Port Range	Remote IP Prefix	Remote Security Group	Description	Actions
<input type="checkbox"/> Egress	IPv4	Any	Any	0.0.0.0	-	-	<a href="#">Delete Rule</a>
<input type="checkbox"/> Egress	IPv4	ICMP	Any	-	Group_Security	-	<a href="#">Delete Rule</a>
<input type="checkbox"/> Egress	IPv4	Any	Any	0/0	-	-	<a href="#">Delete Rule</a>
<input type="checkbox"/> Ingress	IPv4	ICMP	Any	-	Group_Security	-	<a href="#">Delete Rule</a>
<input type="checkbox"/> Ingress	IPv4	TCP	22 (SSH)	-	Group_Security	-	<a href="#">Delete Rule</a>
<input type="checkbox"/> Ingress	IPv4	TCP	80 (HTTP)	-	Group_Security	-	<a href="#">Delete Rule</a>
Displaying 6 items							

## 5. Affectation une adresse flottante

Dans l'onglet Project -> Network -> Floating IP ,on choisit "Allocate Floating IP" et on choisit comme pool le réseau public "Reseau\_public\_1" :

### Allocate Floating IP

**Pool \***  

Reseau\_public\_1

**Description**  

ip flottante

**DNS Domain**

**DNS Name**

**Description:**  
 Allocate a floating IP from a given floating IP pool.

**Project Quotas**  
**Floating IP** 0 of 50 Used

Cancel

Allocate IP

## 6. Création d'une clé SSH

- Naviguer vers l'onglet Project -> Compute -> key pairs ,et choisir "Create key pair" ,et "ssh" comme type de clé :



Create Key Pair

Key Pair Name \*

Cle SSH ✓

Key Type \*

SSH Key

Cancel Create Key Pair

- Depuis le même menu ,on sélectionne la paire de clés créée et on copie la valeur de la clé publique:



Cle SSH

ID 1

Name Cle SSH


Fingerprint 22:c3:24:0a:71:b2:44:14:91:5b:59:88:95:90:96:38

Created Mar 10, 2020 8:04:59 PM

User ID 4693ee1015427886e2875807381a0

Public Key ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAQCAuHxTtU2NCZ7X0zBQyP4BsdG8OCmCmzTpwNwDvTq2RzshyQr4mle3K0M,ZL2cm1aB0R1N44gPhyechN4skDMH+QzEshvDk1wudFeh1AScAD7RQzhn2Nyb  
qB9p4czYYPQZv5OmImGK3R1gblN0vD5pNvPyn7oopZP9NXYUdEY8Qy7gnljeG5FT1U4EawuXKhn1u,5aEJyG4SveW8ByKZLSptCpE9y4Fulmm-P801P9YBXSQ2F4LX7DB1-venOU3yRE5eakqz Generated by Nova

- On crée un nouveau fichier my\_os dans le répertoire /home/student/.ssh et on l'attribue les droits 400 (read only), et on stocke la valeur de la clé publique dans ce fichier :



```
student@localhost:~/ssh
File Edit View Search Terminal Help
[student@localhost ~]$ mkdir .ssh
[student@localhost ~]$ cd .ssh
[student@localhost .ssh]$ nano my_os
[student@localhost .ssh]$ chmod 400 my_os
[student@localhost .ssh]$ ls -l
total 4
-r----- 1 student student 401 Mar 10 19:15 my_os
[student@localhost .ssh]$
```

## 7. Démarrage de l'instance

- Se déplace vers l'onglet Project -> Compute -> Instances et cliquer sur le bouton "Launch instance" puis suivre les étapes suivantes:

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 \*

Instance1

Description

Availability Zone

nova

Count \*

1

Total Instances (10 Max)

10%

0 Current Usage

1 Added

9 Remaining

Cancel

Back

Next

Launch Instance

Launch Instance

Details

Source

Flavor

Networks

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

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
◀ cims	3/3/20 9:05 PM	273 bytes	gpw2	Public

Available

Click here for filters or full text search

Name	Updated	Size	Type	Visibility
No available items				

Cancel

Back

Next

Launch Instance

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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
> m1.tiny	1	512 MB	1 GB	1 GB	0 GB	Yes

**Available**

Click here for filters or full text search

Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public
> m1.small	1	2 GB	20 GB	20 GB	0 GB	Yes
> m1.medium	2	4 GB	40 GB	40 GB	0 GB	Yes
> m1.large	4	8 GB	80 GB	80 GB	0 GB	Yes
> m1.xlarge	8	16 GB	160 GB	160 GB	0 GB	Yes

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Networks provide the communication channels for instances in the cloud.

**Allocated**

Select networks from those listed below

Network	Subnets Associated	Shared	Admin State	Status
> Resou_public_1	subnet_public	No	Up	Active

**Available**

Click here for filters or full text search

Select at least one network

Network	Subnets Associated	Shared	Admin State	Status
> Resou_local_1	subnet_public	No	Up	Active

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Select the security groups to launch the instance in.

**Allocated**

Name	Description
> default	Default security group
> Group_Security	

**Available**

Select one or more

Click here for filters or full text search

Name	Description
No available items	

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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	Type	Fingerprint
> Old SSH	ssh	22:c3:24:9a:7f:b3:44:14:91:5b:f9:8b:b5:90:96:38

Displaying 1 item

**Available**

Select one

Click here for filters or full text search

Displaying 0 items

Name	Type	Fingerprint
No items to display.		

Displaying 0 items

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## Chapitre 3

### Conclusion

En conclusion, ce TP nous a permis de découvrir et de nous familiariser avec OpenStack, un outil puissant et open source pour déployer des infrastructures de cloud computing. Nous avons appris à installer et configurer les différents projets qui composent OpenStack, ainsi qu'à créer une instance.

Nous avons également compris les avantages de cette technologie pour les entreprises et les organisations qui souhaitent déployer une infrastructure de cloud computing solide et flexible. En utilisant OpenStack, les utilisateurs peuvent facilement gérer les ressources de leur infrastructure, déployer des applications et améliorer la performance de leur système.

En somme, OpenStack est un outil de cloud computing puissant et polyvalent qui offre des avantages indéniables aux organisations qui souhaitent migrer vers le cloud. Ce TP nous a permis de découvrir ses fonctionnalités et de comprendre comment l'utiliser efficacement pour répondre aux besoins de nos projets et de notre infrastructure.