SHARCNET Cloud
What is Cloud Computing?

- Traditional Computing
  - User needs computing resources
  - A physical server is purchased
  - New user = New server

- Problems
  - Management of physical servers
  - Expansion (space, power, cooling...)
  - Resource utilization
Computing Virtualization

- Virtualization
  - A virtual server instead of a physical server
  - Many VMs on the same physical server
  - Space and power needed are reduced
  - Resource utilization increased
Is that sufficient?

Whether Physical or Virtual servers:

- Human factor
  - Provisioning physical servers
  - Creating VMs, configuring network ...etc
- Users with security/isolation requirements
  - Do not share the same network. i.e. isolated networks
  - Require firewalling (VMs on the same host)
Cloud computing

- Virtualization of Infrastructure with
  - Self service model
    - Users create VMs using a web portal
  - Isolated virtual networks
    - Users can’t reach each other’s networks
  - Virtual firewalls between VMs and each other & public networks
    - Security group concept
    - Defines what traffic can flow ingress and egress (inbound and outbound) and from where
Openstack

- Cloud enabling framework
- Opensource, community driven
- Many industry and research/academic adopters
- Self service web portal called horizon
SHARCNET Cloud

- [https://cloud.sharcnet.ca/dashboard/](https://cloud.sharcnet.ca/dashboard/)
- By request only
- Default allocation
  - 4 cores
  - 8 GB memory
  - 50 GB persistent storage
  - 1 Floating IP
How to request access?

- Open a ticket
  - help@sharcnet.ca
  - Portal

- What needs to be included in the ticket?
  - Use case for the cloud
  - Your PC/Laptop public IP (google what is my ip)
  - How long is the account and VMs needed for?
How does it look like?
Overview

Limit Summary

Instances
Used 0 of 10

VCPUs
Used 0 of 10

RAM
Used 0 bytes of 50GB

Floating IPs
Used 0 of 3

Security Groups
Used 1 of 10

Volumes
Used 0 of 10

Volume Storage
Used 0 bytes of 4000GB

Usage Summary

Select a period of time to query its usage:

From: 2017-08-20 To: 2017-09-21
Submit

The date should be in YYYY-MM-DD format.

Active Instances: 0 Active RAM: 0 bytes This Period's VCPU-Hours: 0.00 This Period's GB-Hours: 0.00 This Period's RAM-Hours: 0.00

Usage

<table>
<thead>
<tr>
<th>Instance Name</th>
<th>VCPUs</th>
<th>Disk</th>
<th>RAM</th>
<th>Time since created</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No items to display
Concepts

- **Instances**
  - VMs that consume CPU and Memory resources
  - Can be ephemeral or persistent
    - Ephemeral: Storage on the compute host
    - Persistent: Storage on a backend storage server (more reliable)

- **To specify CPU/Memory for Instances**
  - Flavors are used
  - Flavors are defined by the Cloud Administrator
  - A flavor specifies: # of cores, Size of memory and disk (for ephemeral VMs)
Volumes

- Persistent storage on the storage backend
- 3 replicas are maintained
- More reliable than ephemeral storage
- Limited capacity
- Could be slower
Floating IPs

- 1 Floating IP per user (public IP)
- Private IPs are assigned to instances automatically
- Public IPs to assign to VMs manually by the user
- This is how you reach your VMs
- IPs start with 199.241.164.xx
- Floating IPs are assigned to VMs after they are created
Security Groups

- Virtual firewall rules
- Applied to instances
- Define what traffic can flow in/out
- Define what IPs can communicate in/out
- Users can create multiple security groups
- Default security group is created when a project is created
Keypairs

- For Linux VMs, a keypair needs to be generated
- Keypairs have two components
  - Public portion: injected into the VM
  - Private portion: Exists at the user’s side
Overview

Limit Summary

Instances
Used 0 of 10

VCPUs
Used 0 of 10

RAM
Used 0/Bytes of 500GB

Floating IPs
Used 0 of 2

Security Groups
Used 1 of 10

Volumes
Used 0 of 10

Volume Storage
Used 0/Bytes of 4000GB

Usage Summary

Select a period of time to query its usage:

From: 2017-09-20    To: 2017-09-21    Submit

The date should be in YYYY-MM-DD format.

Active Instances: 0
Active RAM: 0/Bytes
This Period’s VCPU-Hours: 0.00
This Period’s GB-Hours: 0.00
This Period’s RAM-Hours: 0.00

Usage

Instance Name  VCPUs  Disk  RAM  Time since created

No items to display
## Instances

<table>
<thead>
<tr>
<th>Instance Name</th>
<th>Image Name</th>
<th>IP Address</th>
<th>Size</th>
<th>Key Pair</th>
<th>Status</th>
<th>Availability Zone</th>
<th>Task</th>
<th>Power State</th>
<th>Time since created</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No items to display.
Launch Instance

Instance source is the template used to create an instance. You can use a snapshot of an existing instance, an image, or a volume if enabled. You can also choose to use persistent storage by creating a new volume.

Select Boot Source

<table>
<thead>
<tr>
<th>Name</th>
<th>Updated</th>
<th>Size</th>
<th>Type</th>
<th>Visibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>CentOS-7.1704_x86_64</td>
<td>8/20/17 1:33 PM</td>
<td>1.29 GB</td>
<td>qcow2</td>
<td>Public</td>
</tr>
<tr>
<td>Ubuntu-stock</td>
<td>9/12/17 12:57 PM</td>
<td>304.88 MB</td>
<td>raw</td>
<td>Public</td>
</tr>
<tr>
<td>VHD</td>
<td>3/9/17 3:43 PM</td>
<td>53.96 MB</td>
<td>iso</td>
<td>Public</td>
</tr>
<tr>
<td>Fedora-23-x86_64</td>
<td>3/9/17 3:43 PM</td>
<td>223.51 MB</td>
<td>qcow2</td>
<td>Public</td>
</tr>
<tr>
<td>Citros</td>
<td>3/9/17 3:43 PM</td>
<td>12.67 MB</td>
<td>qcow2</td>
<td>Public</td>
</tr>
</tbody>
</table>

Allocate

Select an item from Available items below

Available 3

Select one

Click here for filters.

Launch Instance
Launch Instance

**Details**

*Source*

- **Image**

*Flavor*

*Networks*

*Network Pairs*

*Security Groups*

*Key Pair*

*Configuration*

*Server Groups*

*Scheduler Hints*

*Metadata*

---

Instance source is the template used to create an instance. You can use a snapshot of an existing instance, an image, or a volume (if enabled). You can also choose to use persistent storage by creating a new volume.

**Select Boot Source**

- **Yes**
- **No**

**Create New Volume**

- **Yes**
- **No**

**Volume Size (GB)**

**Delete Volume on Instance Delete**

<table>
<thead>
<tr>
<th>Name</th>
<th>Updated</th>
<th>Size</th>
<th>Type</th>
<th>Visibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>CentOS-7_1704_x86_64</td>
<td>9/2/17 1:33 PM</td>
<td>1.29 GB</td>
<td>qcow2</td>
<td>Public</td>
</tr>
<tr>
<td>Ubuntu-18.04.04</td>
<td>9/2/17 1:33 PM</td>
<td>304.86 MB</td>
<td>raw</td>
<td>Public</td>
</tr>
<tr>
<td>VINO</td>
<td>9/2/17 3:43 PM</td>
<td>53.96 MB</td>
<td>iso</td>
<td>Public</td>
</tr>
<tr>
<td>Fedora-23-x86_64</td>
<td>9/2/17 3:43 PM</td>
<td>223.51 MB</td>
<td>qcow2</td>
<td>Public</td>
</tr>
<tr>
<td>Citros</td>
<td>9/2/17 3:43 PM</td>
<td>12.67 MB</td>
<td>qcow2</td>
<td>Public</td>
</tr>
</tbody>
</table>
Launch Instance

Flavors manage the sizing for the compute, memory and storage capacity of the instance.

<table>
<thead>
<tr>
<th>Name</th>
<th>VCPUS</th>
<th>RAM</th>
<th>Total Disk</th>
<th>Root Disk</th>
<th>Ephemeral Disk</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-2C-4G</td>
<td>2</td>
<td>4 GB</td>
<td>0 GB</td>
<td>0 GB</td>
<td>0 GB</td>
<td>No</td>
</tr>
<tr>
<td>2C-4G-20G</td>
<td>2</td>
<td>4 GB</td>
<td>20 GB</td>
<td>20 GB</td>
<td>0 GB</td>
<td>No</td>
</tr>
<tr>
<td>4C-8G-40G</td>
<td>4</td>
<td>8 GB</td>
<td>40 GB</td>
<td>40 GB</td>
<td>0 GB</td>
<td>No</td>
</tr>
<tr>
<td>8C-16G-80G</td>
<td>8</td>
<td>16 GB</td>
<td>80 GB</td>
<td>80 GB</td>
<td>0 GB</td>
<td>No</td>
</tr>
<tr>
<td>4C-16G-40G</td>
<td>4</td>
<td>16 GB</td>
<td>40 GB</td>
<td>40 GB</td>
<td>0 GB</td>
<td>No</td>
</tr>
</tbody>
</table>
Launch Instance

Networks provide the communication channels for instances in the cloud.

Allocated

Select networks from those listed below.

Network | Subnets Associated | Shared | Admin State | Status
---|---|---|---|---
1 | demo-tenant-net | demo-tenant-subnet | No | Up | Active

Available

Select at least one network.

Search: Click here for filters.

Network | Subnets Associated | Shared | Admin State | Status
---|---|---|---|---
No available items

Network Ports
Security Groups
Key Pair
Configutation
Server Groups
Scheduler Hints
Metadata

Cancel Back Next Launch Instance
Launch Instance

Details

Source *

Flavor *

Networks *

Network Ports

Security Groups

Key Pair

Configuration

Server Groups

Scheduler Hints

Metadata

Details

Select the security groups to launch the instance in.

Allocated 1

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>default</td>
<td>Default security group</td>
</tr>
</tbody>
</table>

Available 0

Select one or more

Security Groups

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>

No available items

_CANCEL_
Launch Instance

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.

**Details**

**Source** *

**Flavor** *

**Networks** *

**Network Ports**

**Security Groups**

**Key Pair**

**Configuration**

<table>
<thead>
<tr>
<th>Name</th>
<th>Fingerprint</th>
</tr>
</thead>
</table>

Select a key pair from the available key pairs below.

Displaying 0 Items

Available 21

Click here for filters.
Launch Instance

This step allows you to add Metadata items to your instance.

You can specify resource metadata by moving items from the left column to the right column. In the left column there are metadata definitions from the Glance Metadata Catalog. Use the “Custom” option to add metadata with the key of your choice.

<table>
<thead>
<tr>
<th>Available Metadata</th>
<th>Filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Custom</td>
<td></td>
</tr>
</tbody>
</table>

No available metadata

<table>
<thead>
<tr>
<th>Existing Metadata</th>
<th>Filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>No existing metadata</td>
<td></td>
</tr>
</tbody>
</table>

Click each item to get its description here.
# Instances

<table>
<thead>
<tr>
<th>Instance Name</th>
<th>Image Name</th>
<th>IP Address</th>
<th>Size</th>
<th>Key Pair</th>
<th>Status</th>
<th>Availability Zone</th>
<th>Task</th>
<th>Power State</th>
<th>Time since created</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>test</td>
<td></td>
<td>192.168.2.7</td>
<td>P-2C-4G</td>
<td>student1</td>
<td>Active</td>
<td>nova</td>
<td>None</td>
<td>Running</td>
<td>1 minute</td>
<td>Create Snapshot</td>
</tr>
<tr>
<td>Instance Name</td>
<td>Image Name</td>
<td>IP Address</td>
<td>Size</td>
<td>Key Pair</td>
<td>Status</td>
<td>Availability Zone</td>
<td>Task</td>
<td>Power State</td>
<td>Time since created</td>
<td>Actions</td>
</tr>
<tr>
<td>---------------</td>
<td>------------</td>
<td>------------</td>
<td>------</td>
<td>----------</td>
<td>--------</td>
<td>-------------------</td>
<td>------</td>
<td>-------------</td>
<td>-------------------</td>
<td>---------</td>
</tr>
<tr>
<td>test</td>
<td>-</td>
<td>192.168.2.7</td>
<td>P-2C-4G</td>
<td>student1</td>
<td>Active</td>
<td>nova</td>
<td>None</td>
<td>Running</td>
<td>1 minute</td>
<td>Create Snapshot</td>
</tr>
</tbody>
</table>

Displaying 1 item
Manage Floating IP Associations

**IP Address**
- No floating IP addresses allocated

**Port to be associated**
- No ports available

Select the IP address you wish to associate with the selected instance or port.
## Allocate Floating IP

### Pool

<table>
<thead>
<tr>
<th>Pool</th>
</tr>
</thead>
<tbody>
<tr>
<td>public-network-100</td>
</tr>
</tbody>
</table>

### Description:

Allocate a floating IP from a given floating IP pool.

### Project Quotas

<table>
<thead>
<tr>
<th>Floating IP (0)</th>
<th>3 Available</th>
</tr>
</thead>
</table>

[Cancel][Allocate IP]
Manage Floating IP Associations

**IP Address** *

192.241.164.90

Select the IP address you wish to associate with the selected instance or port.

**Port to be associated** *

Test: 192.168.2.7

Cancel  Associate
ssh -i privatekey.pem ubuntu/centos/fedora@publicIP
Access & Security

<table>
<thead>
<tr>
<th>Security Groups</th>
<th>Key Pairs</th>
<th>Floating IPs</th>
<th>API Access</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Filter

- Create Security Group
- Delete Security Groups

- Name: default
- Description: Default security group

Displaying 1 item

Actions

- Manage Rules
<table>
<thead>
<tr>
<th>Direction</th>
<th>Ether Type</th>
<th>IP Protocol</th>
<th>Port Range</th>
<th>Remote IP Prefix</th>
<th>Remote Security Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingress</td>
<td>IPv6</td>
<td>Any</td>
<td>Any</td>
<td>-</td>
<td>default</td>
</tr>
<tr>
<td>Egress</td>
<td>IPv4</td>
<td>Any</td>
<td>Any</td>
<td>0.0.0.0/0</td>
<td>-</td>
</tr>
<tr>
<td>Egress</td>
<td>IPv6</td>
<td>Any</td>
<td>Any</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ingress</td>
<td>IPv4</td>
<td>Any</td>
<td>Any</td>
<td>-</td>
<td>default</td>
</tr>
<tr>
<td>Ingress</td>
<td>IPv4</td>
<td>TCP</td>
<td>22 (SSH)</td>
<td>0.0.0.0/0</td>
<td>-</td>
</tr>
</tbody>
</table>
Add Rule

**Rule**: Custom TCP Rule

**Direction**: Ingress

**Open Port**: 
**Port**: 

**Remote**:  
**CIDR**: 0.0.0.0/0

**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.

[Add button]
Add and remove security groups to this instance from the list of available security groups.

<table>
<thead>
<tr>
<th>All Security Groups</th>
<th>Instance Security Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter</td>
<td>Filter</td>
</tr>
</tbody>
</table>

No security groups found.

- default
<table>
<thead>
<tr>
<th>Instance Name</th>
<th>Image Name</th>
<th>IP Address</th>
<th>Size</th>
<th>Key Pair</th>
<th>Status</th>
<th>Availability Zone</th>
<th>Task</th>
<th>Power State</th>
<th>Time since created</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>test</td>
<td>-</td>
<td>192.168.2.7 Floating IP:</td>
<td>P-2C-4G</td>
<td>student1</td>
<td>Active</td>
<td>nova</td>
<td>None</td>
<td>Running</td>
<td>0 minutes</td>
<td>Create Snapshot</td>
</tr>
</tbody>
</table>
Common notes about the cloud

- No Backups are taken to VMs or attached storage
- Compute/Network usage under University acceptable usage policy
- Non mission critical applications