Compute Canada Cloud

Venkat Mahadevan
Cloud Systems Administrator
UBC Advanced Research Computing
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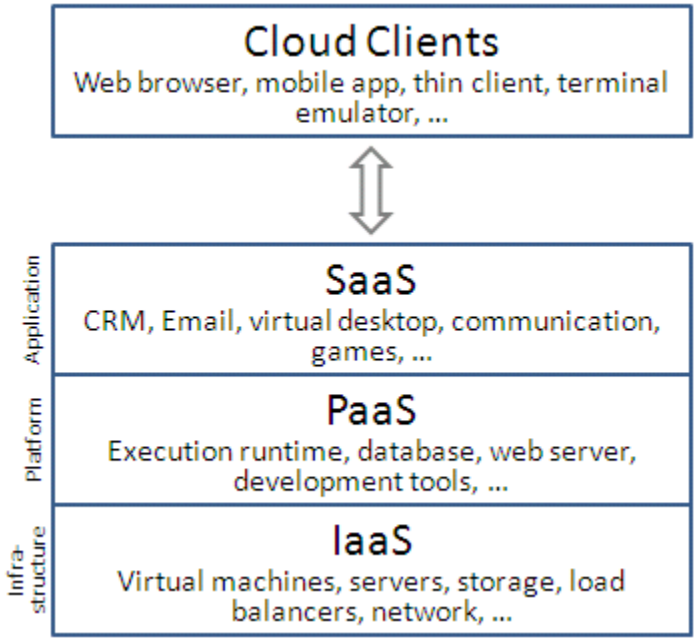
Introduction

https://en.wikipedia.org/wiki/Cloud_Computing_(horse)#/media/File:142nd_Preakness_Stakes_Pimlico_Race_Course_(34783544586).jpg

Introduction (cont.)

- Delivers high level services and access to system resources over the Internet.
- Services: collaboration (E-mail, calendaring, etc.), web, Dropbox-like file hosting, etc.
- System resources i.e. infrastructure: compute, disk, networking, load balancing, etc.

Introduction (cont.)



https://en.wikipedia.org/wiki/Cloud_computing#/media/File:Cloud_computing_layers.png

Compute Canada Cloud

Arbutus cloud (arbutus.cloud.computecanada.ca)

Node count	CPU	Memory (GB)	Local (ephemeral) storage	Interconnect	GPU	Total cores
32	2 x Gold 6130	256	4 x 900GB 10k SAS in RAID5	1 x 10GbE	N/A	1024
4	2 x Gold 6130	768	4 x 900GB 10k SAS in RAID5	2 x 10GbE	N/A	128
8	2 x Gold 6130	256	4 x 1.92TB SSD in RAID5	1 x 10GbE	N/A	256
240	2 x E5-2680 v4	256	4 x 900GB 10k SAS in RAID5	1 x 10GbE	N/A	6720
8	2 x E5-2680 v4	512	4 x 900GB 10k SAS in RAID5	2 x 10GbE	N/A	224
2	2 x E5-2680 v4	128	4 x 900GB 10k SAS in RAID5	1 x 10GbE	2 x Tesla K80	56
32	2 x E5-2650 v2	256	3 x 600GB 10K SAS in RAID0	1 x 10GbE	N/A	512
8	2 x E5-2650 v2	512	3 x 600GB 10K SAS in RAID0	1 x 10GbE	N/A	128

Location: University of Victoria

Total compute cores: 9048 (334 nodes)

5.7 PB of persistent **Ceph** storage.

89,344 GB of RAM.

Compute Canada Cloud (cont.)

East cloud (east.cloud.computecanada.ca)

Node count	CPU	Memory (GB)	Local (ephemeral) storage	Interconnect	GPU	Total cores
36	2 x E5-2650 v2	128	2x 1TB SATA 7.2K in RAID0 + SSD bcache	1 x 10GbE	N/A	576

Location: Université de Sherbrooke
Total compute cores: 576
100 TB of persistent Ceph storage.
4,608 GB of RAM

Graham cloud (graham.cloud.computecanada.ca)

Node count	CPU	Memory (GB)	Local (ephemeral) storage	Interconnect	GPU	Total cores
56	2 x E5-2683 v4	256	2x 500GB SSD in RAID0	1 x 10GbE	N/A	1792

Location: University of Waterloo
Total compute cores: 1792
84 TB of persistent Ceph storage.
14,336 GB of RAM

Compute Canada Cloud (cont.)

- There is also the OwnCloud service which provides 50GB of backed up Dropbox-like storage (https://www.westgrid.ca/resources_services/data_storage/cloud_storage)

Compute Canada Cloud (cont.)

- The IaaS clouds are built on OpenStack.
- OpenStack is a open-source software platform for deploying clouds i.e. build your own cloud environment.
- Can work with a variety of hardware, network switches, hypervisors.

Compute Canada Cloud (cont.)

- Various commercial vendors provide OpenStack:
  - SUSE
  - Redhat
  - Ubuntu
  - Huawei
  - Mirantis

- Also exists a free implementation called OpenStack-Ansible which is in use by Compute Canada:
  - https://github.com/openstack/openstack-ansible

Cloud Resources

Attributes	Compute Cloud[1]	Persistent Cloud[1][2]
Who can request	PIs only	PIs only
VCPUs (see VM flavours)	80	25
Instances	20	10
Volumes	2	10
Volume snapshots	2	10
RAM (GB)	300	50
Floating IP	2	2
Persistent storage (GB)	10000	
Default duration	1 year[3], with 1 month wall-time	1 year (renewable)[3]
Default renewal	April[3]	April[3]

Cloud Resources (cont.)

- You can request resources via the Rapid Access Service (RAS) or Resource Allocation Competition (RAC):

- https://www.computecanada.ca/research-portal/accessing-resources/rapid-access-service/

Other Free Services

- https://www.infoworld.com/article/3179785/cloud-computing/aws-vs-azure-vs-google-cloud-which-free-tier-is-best.html

- Google: 20% of 1 VCPU

- AWS, Azure: No VMs in the always free tier.

- Data downloads are charged.

Time to login

- https://arbutus.cloud.computecanada.ca

- Use the guest account “wgtrainingXX” or your Compute Canada account.

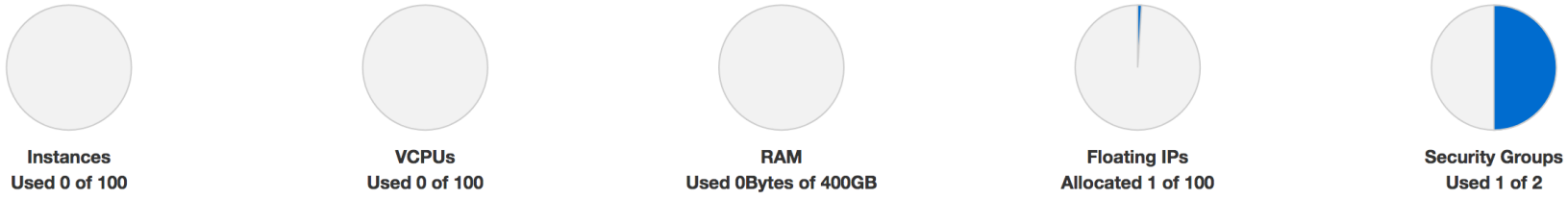
- Password will be provided in class.

- Don’t use Safari; use Firefox or Chrome.

Hands-On

Overview

Limit Summary



Instances
Used 0 of 100

VCPUs
Used 0 of 100

RAM
Used 0Bytes of 400GB

Floating IPs
Allocated 1 of 100

Security Groups
Used 1 of 2

Volumes
Used 0 of 100

Volume Storage
Used 0Bytes of 3.9TB

Usage Summary

Select a period of time to query its usage:

From: 2018-06-01 **To:** 2018-06-13 Submit The date should be in YYYY-mm-dd format.

Active Instances: 0 **Active RAM:** 0Bytes **This Period's VCPU-Hours:** 0.32 **This Period's GB-Hours:** 15.96 **This Period's RAM-Hours:** 2451.20

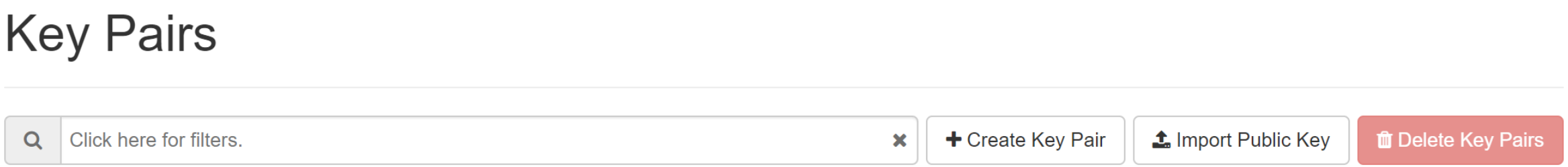
Usage

Download CSV Summary

Instance Name	VCPUs	Disk	RAM	Time since created
No items to display.				

Displaying 0 items

Create SSH Key Pair and Download Private Key



Launch Instance of a Virtual Machine

Instances

Instance Name | Filter | Filter | Launch Instance

	Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
No items to display.											

Displaying 0 items

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 *

myinstance

Description

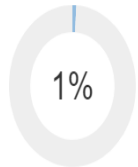
Availability Zone

Any Availability Zone

Count *

1

Total Instances
(100 Max)



0 Current Usage
1 Added
99 Remaining

✖ Cancel

‹ Back | Next › | Launch Instance

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

Allocated

Name	Updated	Size	Type	Visibility
CentOS-7-x64-2018-09	3/7/19 10:47 AM	886.56 MB	qcow2	Public

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
p1-1.5gb	1	1.5 GB	0 GB	0 GB	0 GB	No

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
mykey	ae:9f:ee:1c:f6:97:53:93:8d:bd:5e:4a:52:58:6b:63

Displaying 1 item

Launch the Instance

- Click launch to launch the virtual machine. Make sure to note the name of your instance.
- OpenStack will boot the VM and insert the SSH key into it.
- Once the VM is booted, we can try to access it remotely.
- But need to configure security and public networking first.

Configuring Remote Access

Instances

Instance Name | Filter | Filter | Launch Instance | Terminate Instances | More Actions

Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
myinstance	CentOS-7-x86_64-GenericCloud-1801-01	192.168.247.5	c1-7.5gb-30	mykey	Active	nova	None	Running	0 minutes	Create Snapshot

Displaying 1 item

Instances

Instance Name | Filter | Filter | Launch Instance | Terminate Instances | More Actions

Instance Name	Image Name	IP Address	Size	Key Pair	Status	Availability Zone	Task	Power State	Time since created	Actions
myinstance	CentOS-7-x86_64-GenericCloud-1801-01	192.168.247.5	c1-7.5gb-30	mykey	Active	nova	None	Running	2 minutes	Create Snapshot

Displaying 1 item

- Associate Floating IP
- Disassociate Floating IP
- Edit Instance
- Retrieve Password
- Edit Security Groups
- Console
- View Log
- Pause Instance
- Suspend Instance
- Resize Instance
- Lock Instance
- Unlock Instance
- Soft Reboot Instance
- Hard Reboot Instance
- Shut Off Instance
- Rebuild Instance
- Terminate Instance

Manage Floating IP Associations

IP Address *

IP Address *

206.12.102.153

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

Port to be associated *

myinstance3: 192.168.247.7

Cancel Associate

Access & Security

Security Groups | Key Pairs | Floating IPs | API Access

Filter | + Create Security Group | Delete Security Groups

	Name	Description	Actions
☐	default	Default security group	Manage Rules

Displaying 1 item

Add Rule

Rule *

SSH

Remote * ?

CIDR

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

Manage Security Group Rules: default (4fc62205-14d3-4380-905b-88d7cf61fa6b)

+ Add Rule | Delete Rules

Direction	Ether Type	IP Protocol	Port Range	Remote IP Prefix	Remote Security Group	Actions
Ingress	IPv6	Any	Any	-	default	Delete Rule
Egress	IPv6	Any	Any	::/0	-	Delete Rule
Egress	IPv4	Any	Any	0.0.0.0/0	-	Delete Rule
Ingress	IPv4	Any	Any	-	default	Delete Rule
Ingress	IPv4	TCP	22 (SSH)	0.0.0.0/0	-	Delete Rule
Ingress	IPv4	TCP	80 (HTTP)	0.0.0.0/0	-	Delete Rule
Ingress	IPv4	TCP	443 (HTTPS)	0.0.0.0/0	-	Delete Rule

Displaying 7 items

Connect to the Instance via SSH

```
ssh -i <key>.pem centos@<public ip>
```

If using MobaXTerm, see:

https://docs.computecanada.ca/wiki/Connecting_with_MobaXTerm#Using_a_Key_Pair

Installing RStudio

```
sudo yum install epel-release
sudo yum install R -y
<< will take a while >>

sudo yum install wget -y
wget https://download2.rstudio.org/rstudio-server-rhel-1.0.136-x86_64.rpm

sudo yum install rstudio-server-rhel-1.0.136-x86_64.rpm -y

sudo systemctl status rstudio-server.service
sudo systemctl enable rstudio-server.service
```

Add Security Rule

Rule *

Custom TCP Rule

Description

Direction

Ingress

Open Port *

Port

Port*

8787

Remote *

CIDR

CIDR

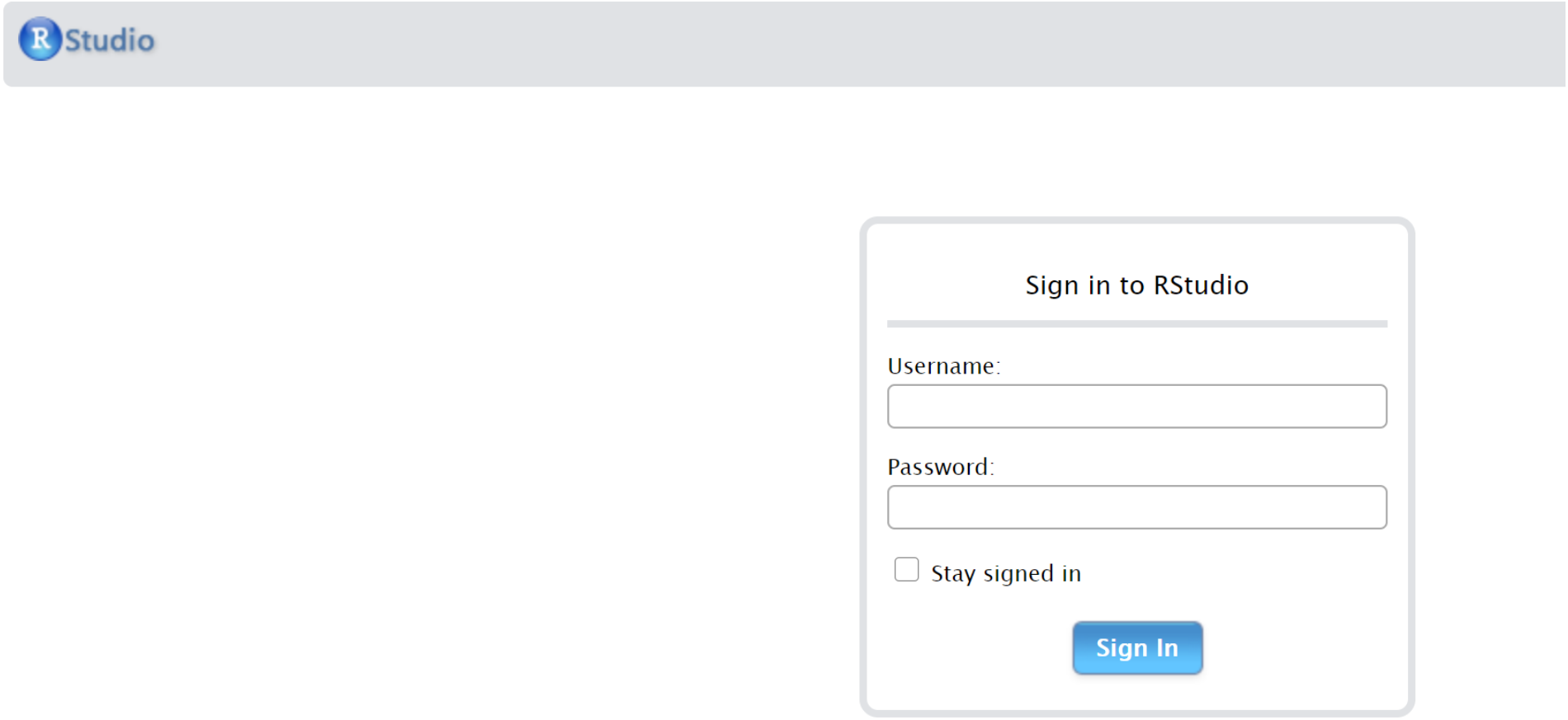
0.0.0.0/0

Add User

```
sudo useradd rstudiouser

sudo passwd rstudiouser
```

Done


RStudio
Sign in to RStudio
Username:
Password:
Stay signed in
Sign In

Maintaining Your Instance

- Install updates to the OS, e.g. for CentOS do “yum -y update”.

- Install application updates regularly for RStudio and other applications.

Resources

- Compute Canada Cloud
  - https://www.computecanada.ca/research-portal/national-services/compute-canada-cloud/
  - https://docs.computecanada.ca/wiki/Creating_a_Linux_VM

- UBC Advanced Research Computing
  - https://www.arc.ubc.ca