Introduction to OpenStack Community Cloud

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Workshop

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What is cloud computing?

From Wikipedia (Cloud Computing):

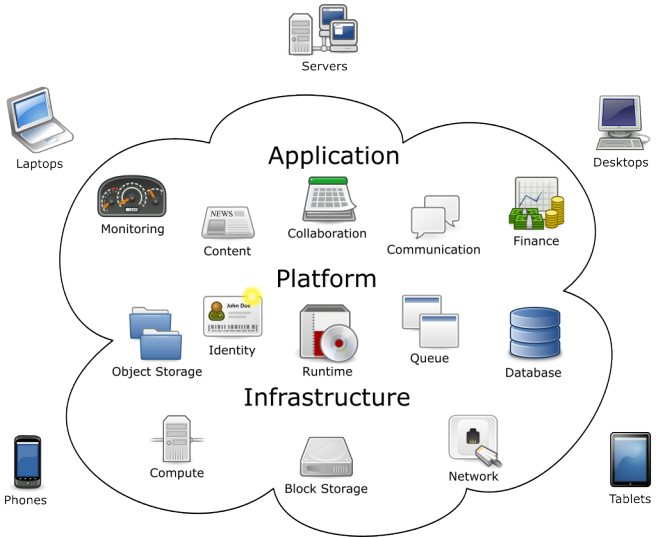
> *Cloud computing is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user.*
>
> *...*
>
> *Cloud computing relies on sharing of resources.*

The single elements providing services does not need to be managed individually by the users.

The provider manages the entire suite of hardware and software, which can be thought of as an amorphous cloud.

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What is cloud computing?



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Cloud computing models

Infrastructure as a service (IaaS)

Users are able to deploy and run arbitrary software (including operating systems and applications). The users have control over operating systems, storage, and deployed applications (and possibly limited control of selected networking components).

Platform as a service (PaaS)

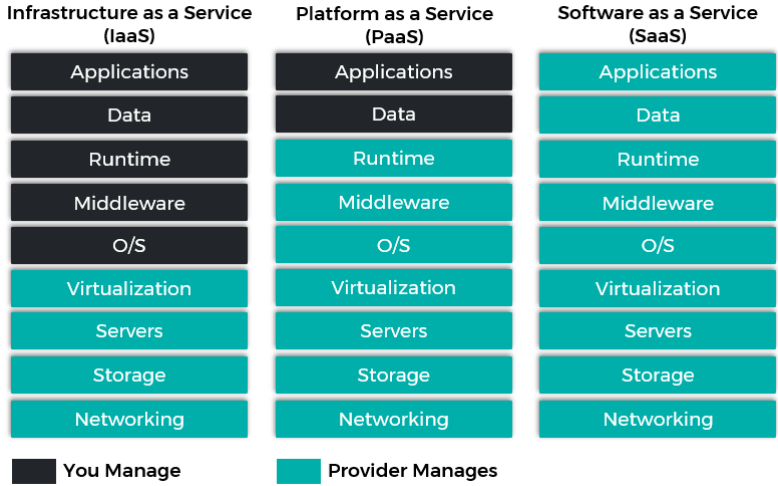
Users are able to deploy and run consumer-created or acquired applications (created using programming languages, libraries, services, and tools supported by the provider). The users only have control over the deployed applications and possibly configuration settings for the application-hosting environment.

Software as a service (SaaS)

Users are able to access applications deployed by the provider. The users don't have control over the applications (one possible exception are user-specific configuration settings).

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Cloud computing models



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Cloud computing models

An analogy

Cloud model	Analogy (renting a house)
IaaS	Landlord provides you some land and bricks to build your house. You must comply with rules and regulations, and must know how to actually build a house.
PaaS	Landlord provides you an empty house. You must buy furniture, internet connection, etc.
SaaS	Landlord provides you a ready to use/fully furnished house.



DRAC cloud offering

The DRAC offers a cloud IaaS platform for free to all the Canadian university researchers.

There are four cloud system sites[1] (recently upgraded):

Arbutus cloud	University of Victoria	16,008 CPUs 108 GPUs
Béluga cloud	École de Technologie Supérieure	3,584 CPUs
Nibi cloud (previously Graham cloud)	University of Waterloo	1,368 CPUs
Fir cloud (previously Cedar cloud)	Simon Fraser University	1,024 CPUs

[1] https://docs.alliancecan.ca/wiki/Cloud_resources

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Getting a cloud project

If you have a RRG or RPP allocation for a cloud system, then you should already have a project.

The following steps are required to ask for a cloud project[1]:

- understand the important role you are about to take on to safeguard your research and the shared cloud infrastructure
- obtain a CCDB account
- use the RAS request form to
  - request access to an existing project
  - request a new project (PIs only)
  - request a quota increase for an existing project (PIs only)[2]

[1] https://docs.alliancecan.ca/wiki/CC-Cloud

[2] https://docs.alliancecan.ca/wiki/Cloud_RAS_Allocations

Preparing the request

When requesting a new project or an increase in quota for an existing project, some justification is required:

- why you need cloud resources
- why an HPC cluster is not suitable
- your plans for efficient usage of your resources
- your plans for maintenance and security

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Common use cases

Common use cases usually involve some sort of persistent workload (e.g. processes that run indefinitely):

- Configure a data server
- Configure a web server
- Configure a GUI Desktop instance
- Configure an infrastructure to deploy a specialized workload

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OpenStack

OpenStack is a cloud computing platform that is mostly used to create IaaS cloud-models.

Users can access an OpenStack installation either through a web-based dashboard, or through command-line tools.

DRAC national cloud systems use OpenStack as the base component to create their cloud offering[1].

[1] https://docs.alliancecan.ca/wiki/Cloud_resources

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Creating a virtual machine

Connect to OpenStack dashboard

Each national cloud system has its own URL to access the OpenStack web interface[1].

In this presentation the Juno cloud system will be used as the default reference.
Juno cloud is a regional system located in Quebec.

To connect to the OpenStack dashboard, use a browser to navigate to the correct URL, then use your CCDB username and password to login.

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[1] https://docs.alliancecan.ca/wiki/Cloud_resources

Creating a virtual machine

Preparation

Create a SSH keypair on your local pc (if you don't have one already):

```
ssh-keygen -t ed25519 -f arbutus_ssh_key
```

Import a SSH public key in OpenStack (if you don't have done so already):

Project » Compute » Key Pairs » Import Public Key button

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https://docs.alliancecan.ca/wiki/Cloud_Quick_Start

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Creating a virtual machine

VM details

To create a virtual machine, use the left menu to select
Project » Compute » Instances » Launch Instance button

A form will display, asking to define your virtual machine.

In the *Details* tab you must choose a name for your instance and an optional description.

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Creating a virtual machine

VM source

The *Source* tab is used to specify the boot source and volume.

The boot source can be “image” (standard) or “volume” (advanced).

When booting from an image, usually you also want to create a volume to store you virtual machine data.

Particular attention should be used when deciding whether delete the volume on instance delete.

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Creating a virtual machine

VM flavor

The *Flavor* tab allows to select how many resources will be allocated for the virtual machine.

On national cloud systems, flavors follow this naming convention:

- compute instance (e.g. "cb2-7.5gb-70", "cm2-15gb-70")
  c*<MEM_CONF>*`<VCPUS>-<RAM>gb-`*<DISK>*
- persistent instance (e.g. "p2-3gb")
  p*<VCPUS>*`-`*<RAM>*`gb`
- gpu instance (e.g. "g1-12gb-c3-35gb-125")
  g*<VGPUS>*`-`*<VRAM>*`gb-c`*<VCPUS>*`-`*<RAM>*`gb-`*<DISK>*

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Creating a virtual machine

VM flavor types

There are two main types of flavors for virtual machines:

- compute instances
  - limited life-time/wall-time (max 1 month)
  - constant high CPU usage
- persistent instances
  - unlimited life-time
  - low/average CPU usage (with spikes)

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Creating a virtual machine

VM security groups

The *Security Groups* tab is where to configure network access from/to the virtual machine.

You can create new security groups from the left menu

Project » Network » Security Groups » Create Security Group button

The "*default security group*" contains rules which allow the VM access the internet, but does not allow other VMs to access it (except for VMs belonging to the same "*default security group*").

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Creating a virtual machine

VM keypair

The *Key Pair* tab is where instructing the virtual machine to use a previously uploaded SSH keypair as the login method for the default virtual machine user.

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Demo

Creating a code hosting platform with Forgejo

Forgejo [Installation from binary]
Forgejo [Reverse proxy]



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Creating a code hosting platform

Specifications

Cloud system	$\Rightarrow$	Juno cloud (Quebec regional system)
Instance flavor	$\Rightarrow$	c1-3.75gb
Instance image	$\Rightarrow$	Debian 13.4
Reverse proxy	$\Rightarrow$	Nginx
TLS Certificate	$\Rightarrow$	Let's Encrypt (`certbot`)
Software	$\Rightarrow$	Forgejo + PostgreSQL

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Final thoughts

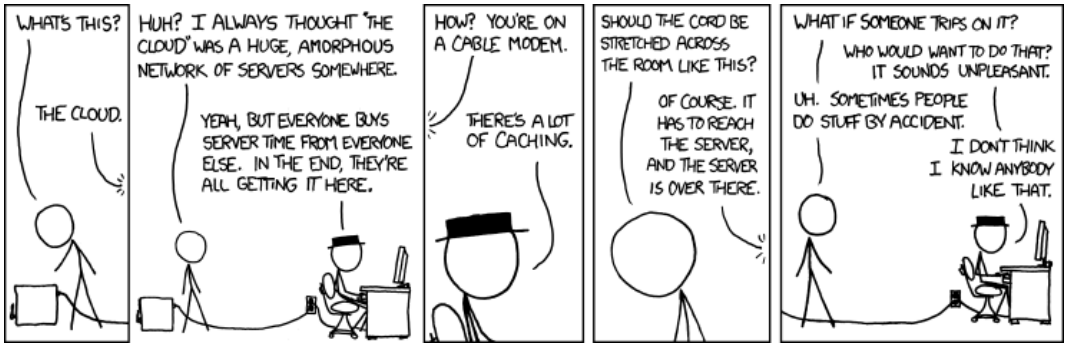
The information presented (along with the demonstration) are meant to be as generic as possible, in order to provide a basic knowledge of cloud systems and OpenStack functioning.

Useful links:

- DRAC cloud wiki page
- DRAC cloud quick start wiki page
- DRAC cloud resources wiki page

Remember to **read and understand** your responsibilities (including how to backup a VM).

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XKCD [908]

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Questions?

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Thank you

