Tools & Concepts for Cloud Deployments

Solution for Exercise 1

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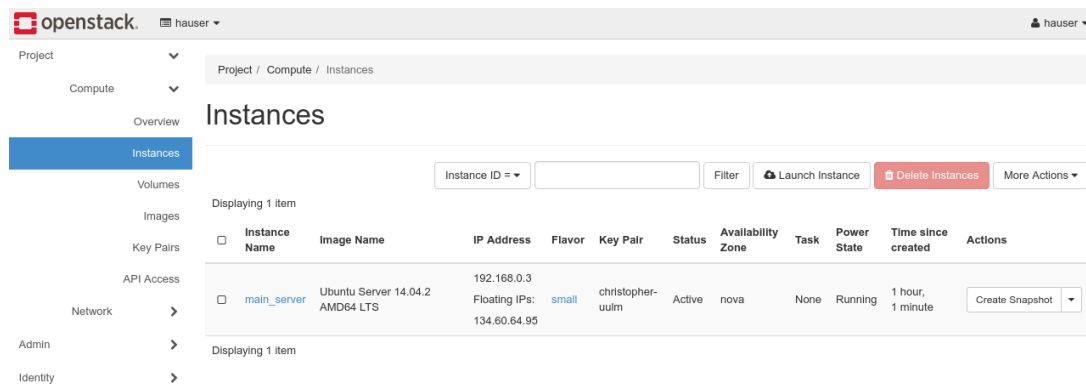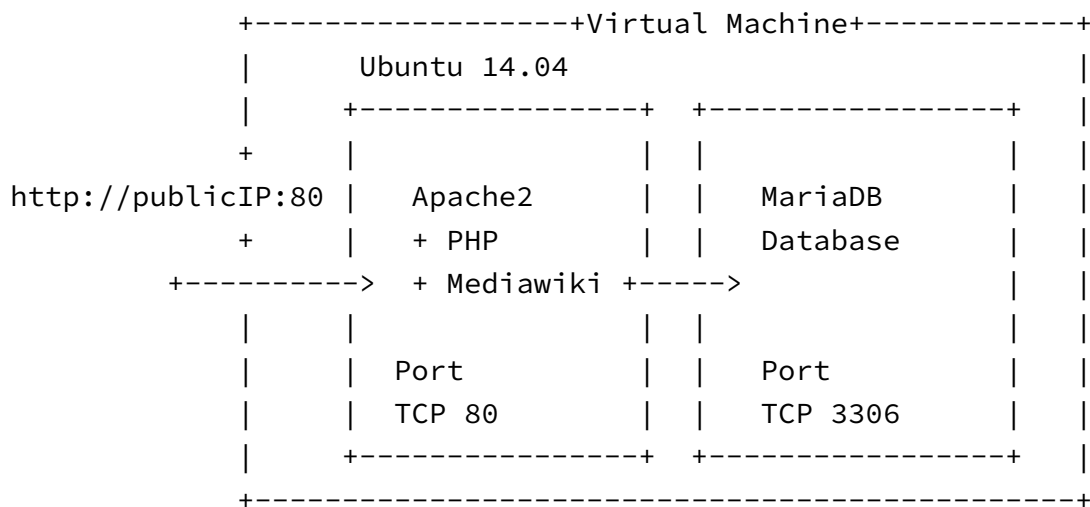
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Lesson 1: OpenStack Basics

Question: Hypervisors and Virtual Machines

What are the basic tasks of a hypervisor?

A hypervisor (sometimes "virtual machine monitor" or VMM) manages physical hardware and divides it into usually smaller virtual hardware, used by virtual machines. Type-1 and Type-2 hypervisors differ in their location (Type 1 runs on bare metal, Type 2 runs on top of an operating system). Examples: XEN (Type 1), KVM (Type 2 but since part of operating system close to Type 1), VirtualBox (Type 2).

```
                                       +------+------+
                                       |      |      |
       +------+------+------+          |  VM  |  VM  |
       |      |      |      |  +------+      |      |
       |  VM  |  VM  |  VM  |  |      |      |      |
       |      |      |      |  | App  +------+------+
       |      |      |      |  |      |  Hypervisor  |
       +------------+------+  +------+------------+
       | Hypervisor (Type 1)|  |  Operating System  |
       +-------------------+  +-------------------+
       |                   |  |                   |
       |      Hardware     |  |      Hardware     |
       |                   |  |                   |
       +-------------------+  +-------------------+
```

What are benefits / drawbacks of using virtual machines compared to physical servers?

- Drawback: Virtualisation costs performance and may lead to resource interference when more than one VM is hosted
- Benefit: virtual machine is abstracted from hardware and can be freely moved between hardware

Lesson 2: First Steps with Omistack

Task: Launch your first Instance

Your first instance in Openstack should look like follows:

Figure 1: *First instance in Openstack*

Lesson 3: Install Mediawiki Application

How the setup looks like

The setup looks as follows at the moment: one virtual machine, based on an Ubuntu 14.04 operating system, with an Apache2 web server and a MariaDB database server.

```
                    +-----------------+Virtual Machine+------------+
                    |     Ubuntu 14.04                            |
                    |    +---------------+  +----------------+     |
                    +    |               |  |                |     |
http://publicIP:80  |    Apache2         |  |    MariaDB     |     |
                    +    |   + PHP        |  |    Database    |     |
      +---------->  +  Mediawiki  +----->                    |     |
                    |    |               |  |                |     |
                    |    | Port          |  |  Port          |     |
                    |    | TCP 80        |  |  TCP 3306      |     |
                    |    +---------------+  +----------------+     |
                    +--------------------------------------------+
```

The ready Mediawiki installation looks like follows:

Question: One Instance for Database and Application

Pro:

- connection via 127.0.0.1 is fast
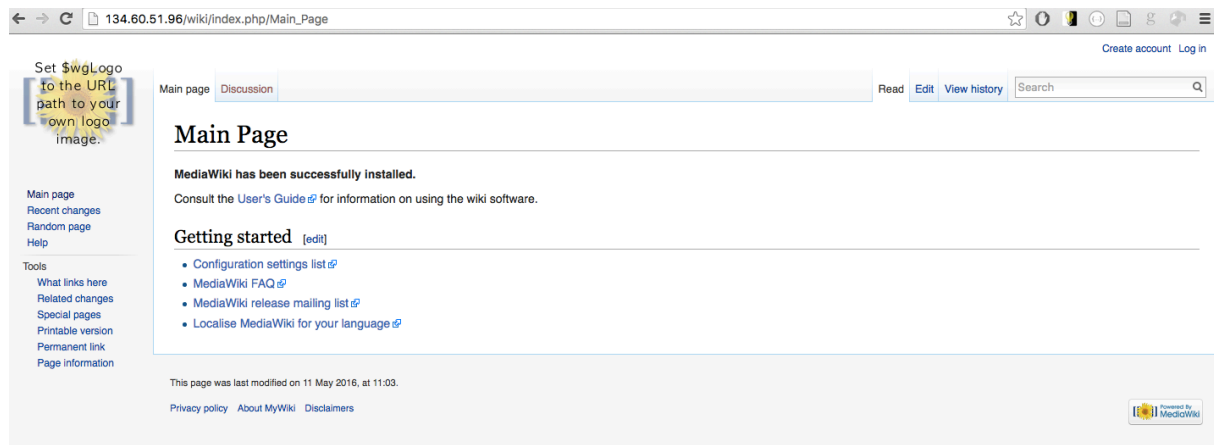- Traffic does not leave the host
- high bandwidth, low latency

Figure 2: *Mediawiki Installation*

Con:

- Scalability is limited, since database is bound to application

- Apache2 and mariaDB have to run on the same node

- DB and Web server have different resource demand (CPU vs Memory/Disk)

Alternative:

- Move database to separate host

- Connect apache2 via TCP

- Scale horizontally by adding more web servers