

Computer Assignment II

Course: Applied Cloud Computing

Course-ID:1TD265

Instructors:

Salman Toor, Salman.Toor@it.uu.se

Teacher Assistants:

Areeb Asad, Hafizareeb.Asad.7965@student.uu.se

Hamza Saeed, Hamzaimran.Saeed.8603@student.uu.se

Task 1

This task is to be completed by everyone and is a requirement for a passing grade on this assignment (1 point).

In this task you will familiarize yourself with the OpenStack command line clients (CLIs) and Python APIs for interacting with the IaaS layer. You will also get introduced to the orchestration engine in OpenStack, “heat”.

Part 1: In this task, you will study the effect of virtualization by doing a simple performance comparison between the VM and the physical host. Access your VM and execute the following command:

```
time echo "scale=5000; a(1)*4" | bc -l
```

The command will calculate the value of PI up to 5000 digits. It is a CPU intensive task. Record the time taken to execute the command. The time on the physical machine is UPPMAX: 20.856 seconds.

Question: Explain your findings in part 1. Are VMs slower than the physical machine? If yes, explain the reason. Are there alternative to VMs? How do you compare them with VMs? Keep the answer fairly short, limit it to a few sentences, max ¼ of a page.

Important: Do not forget to set password for command-line and API access to the cloud.

Part 2: Complete Task-0, Task-2, Task-4 and Task-5 of this tutorial:

<https://github.com/SNICScienceCloud/technical-training/tree/master/automation>

Answer all the associated questions.

Task 2

This task is not a requirement to pass the assignment, but can give you up to 2 points, counting towards higher grades (see grading table).

Part 1: The Jupyter Notebook 'OpenStack-API-Lab2-PartI-2020.ipynb' (available in the student portal) contains exercises and questions. Open the notebook and complete it, then export it to pdf and upload that in the student portal.

Part 2:

Cloud interoperability is needed to expand applications across the boundaries of a single cloud infrastructure, for example in combined use of private and public clouds. It allows scalability and high availability for cloud applications. Write half a page mini-essay where you highlight some of the key issues that can hinder cloud interoperability and also suggest possible solutions to those issues. Cite the references you build on in your discussion. We have posted a few articles in the student portal to get you started, but you can and should seek additional sources (this is a requirement for grade).

Part 3:

In this part, you need to design and explain a highly available cloud native application architecture for CSaaS (CowSay-as-a-Service). You are not required to implement your solution. Here are the concepts you need to consider while preparing a highly available architecture:

1. Availability Zones and Regions
2. Contextualization and Orchestration (CouldInit, Heat or Ansible, etc)
3. Load balancer (HAproxy software)
4. Scalability using containers (Docker Swarm or Kubernetes)

Your task is to draw an architectural diagram and write a paragraph explaining your design choices.

Useful links:

- 1 - <https://medium.freecodecamp.org/how-to-manage-more-containers-with-docker-swarm-332b5fc4c346>
- 2 - <https://docs.docker.com/engine/swarm/>
- 3 - <https://kubernetes.io>
- 4 - <http://www.haproxy.org>