Cloud Computing

Assignment 2

You can collect up to 20 points for this assignment

VM performance and cost-efficiency comparisons

- **Do start working on this assignment several days before the deadline!**

This is an individual assignment. *Discussing the assignment tasks and specific issues with other course participants is allowed and even encouraged. However, you should be the only author of all the solutions you provide in this assignment. Teamwork, pair programming, or copying solutions or program code from other persons is consider plagiarism and it will be handled following the Åbo Akademi University protocol for such cases.*

Instructions:

- Upload your assignment as a single **PDF** file through the Moodle system!
- The file should be named **Assignment2_LastName_Firstname_studentID.pdf**.
- **Each page** of your submission should have:
  - Your name
  - Student ID at Åbo Akademi University
  - A page number / total number of pages
- **Pay attention to the readability of your report!**

The goal of this assignment is to evaluate the relative performance of different VMs and their cost efficiency (i.e., how much computational work they can provide per cost unit). As the choice offered by IaaS providers for VM types can be very large, being able to select the right type of machines from a computational capacity and cost efficiency point of view is essential.

Step 1:

- Get an idea of what is the Phoronix Test Suite and what it is used for:
  - *https://www.phoronix-test-suite.com*
  - *https://linux.die.net/man/1/phoronix-test-suite*
- Create an account on http://openbenchmarking.org
- **Provide the link to your profile** (http://openbenchmarking.org/user/your_username)

Step 2: Have a look at all possible instance types provided by AWS

- https://aws.amazon.com/ec2/instance-types/
- https://aws.amazon.com/ec2/pricing/on-demand/

Step 3: Select different instance types, with at least one from each of the following families: T, M and C.

Note: AWS Academy Student Accounts support only following instance types: nano, micro, small, medium, and large.

Step 4: Launch a VM

- Using an Ubuntu Server image should be fine.

Step 5: Packages installation

- Install the phoronix-test-suite
  - Using the 'sudo apt-get install phoronix-test-suite' command which uses the package management tool for Ubuntu distribution
  - You might need to update the list of packages: sudo apt-get update
  - **If you do get error messages during the installation, read the messages carefully, understand them and follow the provided hint!'**
- Install the 'unzip' package

Note: it looks like phoronix-test-suite was removed from the default package repositories in the current ubuntu distribution. You can install it by downloading the package manually after installing the required dependencies:

- sudo apt-get update
- sudo apt-get install php
- sudo apt-get install php-xml php7.4-xml
- sudo apt-get install unzip
- wget http://phoronix-test-suite.com/releases/repo/pts.debian/files/phoronix-test-suite_10.2.2_all.deb
- sudo dpkg -i phoronix-test-suite_10.2.2_all.deb

Step 6: Install the following Test Suites and Tests **and** the required dependencies (check the main page of phoronix-test-suite to get the command). Some tests might take several minutes to be installed.

1. pts/openssl (*measures the RSA 4096-bit performance of OpenSSL*)
2. pts/stream (**add option only** - *tests the system memory (RAM) performance*)
3. pts/encode-mp3 (*measures the time required to encode a WAV file to MP3 format*)
4. pts/apache (*measures how many requests per second a given system can sustain*)
5. pts/network-loopback *(measures the loopback network adapter performance)*
6. pts/john-the-ripper (**blowfish options only -** *measure the time to crack a password*)

NOTE: if **a test does not work, try an older version**. For example:

- If pts/apache does not work, pts/apache-1.7.2 should work.
- Similarly, if pts/stream-1.3.3 does not work, please try pts/stream-1.3.1, pts/stream-1.3.0, or even pts/stream-1.2.0.

When you run phoronix-test-suite for the first time, you will need to:

- "Agree with the terms and wish to proceed"
- "Enable anonymous usage / statistics reporting"
- "Enable anonymous statistical reporting of installed software/hardware"

Check the provided link below to debug any possible issues

Step 7: login to your openbenchmarking.org account from the phoronix-test-suite command line with the following command:

- *phoronix-test-suite openbenchmarking-login*

Step 8: Execute the 6 benchmarks

Before executing the benchmarks, you will need to answer the following questions:

- Would you like to save these test results (Y/n): ***Y***
- Enter a name to save these results under: ***CC24AutAssignment2***
- Enter a unique name to describe this test run/configuration: ***WriteHereTheVMType***
- Keep the proposed *Current Description* as such

At the end of the benchmark execution, you will need to answer:

- Would you like to upload the results to OpenBenchmarking.org (Y/n): ***Y***
- Would you like to attach the system logs (lspci, dmesg, lsusb, etc) to the test result (Y/n): ***Y***

Step 9: Congratulation! You are now done with this VM**!** Go back to Step 4, to benchmark all other VM types you have in your list.

- You probably do not want to go through the phoronix-test-suite installation steps for each of the new VM types you are going to benchmark:
    - Create an image from your first VM before you terminate it (from the AWS console for example)
        - Your image will be listed under “Images -> AMIs”
    - Use this created image to launch the next VM types to be tested (from the “My AMIs” tab)
    - Remember to login to your openbenchmarking.org account on your new VMs
        - *phoronix-test-suite openbenchmarking-login*

- You probably don’t want to manually run the tests one by one again
    - Check from your result page on http://openbenchmarking.org the command to execute again the exact same list of tests. It should look like:
        - *phoronix-test-suite benchmark 1234567-XXXX-XXXXXXXXXX*

Useful links/information

- [ubuntu 18.04.2] pts/apache fails to compile, libexpat1-dev missing https://github.com/phoronix-test-suite/phoronix-test-suite/issues/362
- Use `phoronix-test-suite debug-run testName` to debug a test and get more concrete error messages
- `phoronix-test-suite remove-installed-tests test1 test2 ...` to remove the faulty tests and then install them again.

Remember to terminate the VMs you do not use anymore!

Report

You should prepare a report documenting the work performed during this exercise. The report should contain information on *what you did*, *how you did it* and *why you did it* this way.

You report should contain the following:

- The link to your profile on http://openbenchmarking.org
- (4 points) Report on the selected instance types, and briefly explain why you chose them.
- (8 points) Report the obtained results and comment on them (**do not** copy/paste all obtained graphs, only the most representative ones). **Pay attention to the units of the results** for the different benchmarks.
- (8 points) Provide your own evaluation and analysis on the obtained **relative cost-efficiency** of the tested VMs (i.e., the ratio between obtained performance and cost in $ or €). Are some VMs more cost efficient that others?

At the end of the report you should also provide a reflection on what you learned during this exercise. This section could provide answers to the following questions:

- Have you learned anything completely new?
- Did anything surprise you?
- Did you find anything challenging? Why?
- Did you find anything satisfying? Why?

You should now terminate all VMs, deregister your AMI and delete its corresponding Snapshot!