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Configuration Manual for Optimizing Kubernetes Performance by Handling Resource Contention with Custom Scheduler

MSc Research Project
Cloud Computing

Akshatha Mulubagilu Nagaraj
Student ID: 18113575

School of Computing
National College of Ireland

Supervisor: Mr. Vikas Sahni

National College of Ireland
Project Submission Sheet
School of Computing

National College of Ireland

Student Name:	Akshatha Mulubagilu Nagaraj
Student ID:	18113575
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Optimizing Kubernetes Performance by Handling Resource Contention with Custom Scheduler

Akshatha **Mulubagilu Nagaraj**
18113575

1 Introduction

This manual explains in detail the tools, platforms and development language used with the creation environment and steps for the execution.

Python simulation has been done for the architecture of kubernetes.

2 Prerequisites

2.1 AWS EC2 Instance

Deployment of the project is done on virtual machine of AWS EC2. To connect to the AWS instance, sign in to amazon.com. All the services of AWS will be categorized and listed in the top left corner.

Select EC2, if there are no instances running, we create an instance.

Instances and select launch instance Step 1: Choose Amazon Machine Image and choose Ubuntu Server 16.04 Lts (HVM), SSD, Volume type-ami- 2ef48339 Select and use 64-bit version

Step 2: Choose an instance Use a t2.micro instance (low to moderate). Go to¿ Next

Step 3: Configure Instance Details Number of instance is 1 Default VPC and default subnet

Step 4: Go to Add storage EC2 comes with an 8GiB disk size by default. In general, this will not be sufficient with logs and other storage, so choose a provision for 25 GiB space. Always use 'Delete on termination'. This will ensure the volume to be deleted after the deletion of server.

Step 5: Go to Add tag Name the server as thesis.

Step 6:Go to Configure Security Group One security group will be present by default. Create a new security group SSH will be selected by default to control the sources. Step 7:Go to Review and Launch Review all the settings and launch Select 'Create new key pair value for the server; and name as awsinstance Download and save the key pair. Launch instance. Login is done through SSH.

2.2 Python

The approach is implemented using Python 3.8. By default, AWS EC2 Ubuntu 16.04 Instance contains Bash, Python 2.7 and Python 3.8 version. If Public Cloud Platform or Python 3.8 is not installed,then one can install it by using below command.

$ sudo aptget install python3

One can download python from official site*Python* (n.d.)

1. Download .exe file of python installer.

2. Double click the file that downloaded and install as below.

Folow the instructions as mentioned in the manual of installation. Once installed successfully, a success message will pop up.

3 Tools and Platform installation

Visual studio, code editor provides functionalities such as auto completion, search, navigation, method overrides. Visual studio Object browser helps in the inspection of classes define in the modules of python and also the functions of each class.

Download and run the installer of visual studio from the official site*Visual Studio* (n.d.)

1.Double click the .exe file of visual studio.

2.Accept the agreement of license.

After the acceptance of licence, visual studio is all set to install.

3.Select install.

Once the Microsoft Visual Studio is installed successfully, add python.

The installer provides a list of workloads, bunch of options related to specific development areas. Select **Python development** workload for Python.

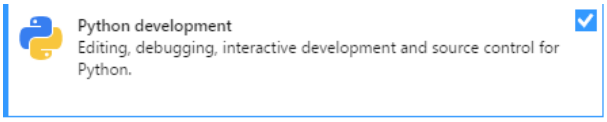

Figure 1: **Python**

For additional options other than default options, choose as desired. After the installation, options such as repair, modify, or un-installation of visual studio are available.

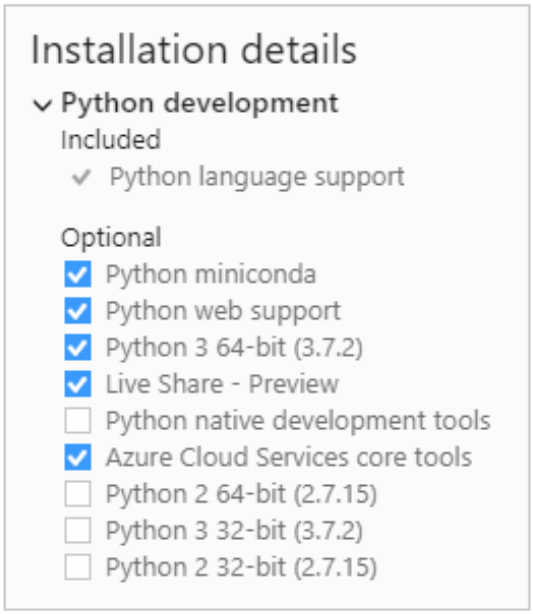

Figure 2: **Python Options**

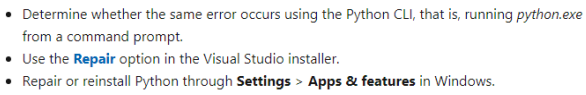

Figure 3: **Troubleshoot**

Visual Studio irrespective of versions, automatically detects each installed Python interpreter and its environment by checking the registry according to PEP 514 - Python registration in the Windows registry. Python installations are typically found under "$\mathrm{HKEY}_{L}OCAL_{M}ACHINE$"$(32-bit)and$"$HKEY_{L}OCAL_{M}ACHINE6432Node$"$(64-bit), then within nodes for the distributions such as PythonCore(CPython) and ContinuumAnalytics(Ana$

4 Evaluation

Proposed kubernetes scheduler is compared with the existing scheduler for five times for the validation purpose.

4.1 Generation of Workload

Fabricated workload has been used for the implementation. This workload is generated using random number generator. For simulation purpose, it considers parameters like RAM, CPU, Storage, and network. These parameters can be changed as per application's request. For real implementation actual data set can be passed as input for this application.

4.2 Initialization of host

Host is initialized using the following configuration

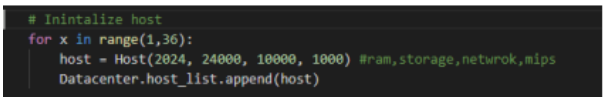

Figure 4: **Host Installation**

4.3 Initialization of Virtual Machine

Resources are divided into 4 virtual machines after the creation of host as shown below Host is initialized using the following configuration

Figure 5: **Virtual Machine Installation**

4.4 Algorithm

2 types of schedulers are available.
1. Default Scheduler
2. Proposed Scheduler

Default Scheduler: Execute workload method with "original" parameter should be executed for behaviour of default scheduler. Execution of the same can be found below

Figure 6: **Original**

Proposed Scheduler: Proposed scheduler works with flag unlike the default scheduler. A flag is set for each request type categorizing with respect to intensiveness of resource usage. First, it checks for the type of flag being set and is the container present already in the present virtual machine. It then launches the new virtual machine after confirming the availability of resources else launching the same virtual machine.

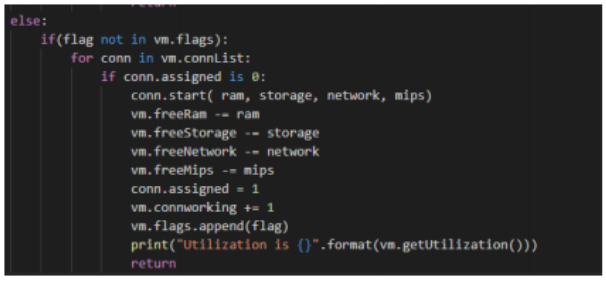

Figure 7: **Proposed**

4.5 Output

Workload should be generated for the execution of developed application for the type of selected scheduler. Once the workload has been generated, file, execute.py from code-base has to be executed. This creates output file for all the 4 types utilization of resources for every request.

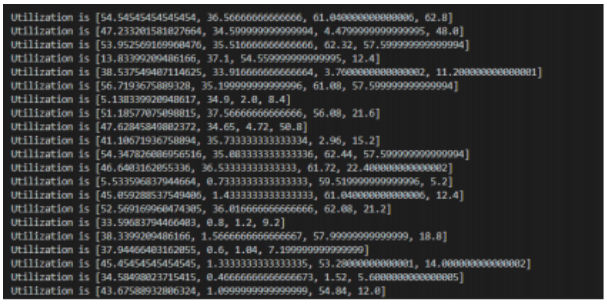

Figure 8: **Terminal**

References

Python (n.d.). `https://docs.python.org/3.8/`.

Python Installation (n.d.). `https://docs.microsoft.com/en-us/visualstudio/python/installing-python-support-in-visual-studio?view=vs-2019`.

Visual Studio (n.d.). `https://code.visualstudio.com/`.