Assignment 03: Distributed Prime Number Generation

Identifying new prime numbers is a challenging task. The most recent found prime number consists of 22,338,618 digits, identified on March, 2022 [1]. Here in this assignment, you will prepare a distributed prime number generator.

Milestone 01: Prime Number Generation Microservice (PNGM)

You need to prepare a network-enabled (Socket, XMLRPC, REST, etc) microservice and deploy it on Docker container which can perform the following tasks:

1. `generate`: accept two input parameters, `from` and `to`, as a range of numbers to identify the prime numbers. This method should instantiate a background job to start generating prime numbers within the given range.

2. `monitor`: The method should return the CPU and memory consumption of the machine for the last k minutes. The parameter k would be an input to this method.

3. `get`: returns the updated list of prime numbers generated till the request received.

   The deliverable of this milestone is to provide the source code of the program and provide the link of your Docker Hub repository showing the container image for this microservice.

Milestone 02: Run three PNGM containers

Run three containers for PNGM and then show a screenshot for `docker ps` command as a deliverable for this milestone.
   The deliverable of this milestone is to provide the screenshot for `docker ps` command.

Milestone 03: Develop a Master Microservice

In this microservice, you need to give work to already running three PNGM containers. You can divide the work from 1 to 10^{12} to all three PNGM containers, invoke `generate` methods. Make sure to get the resource utilization from any one of the PNGM containers through `monitor` method after every minute and log it to a CSV file in the following format:

```
time_stamp,            cpu, memory
06-01-2022 09:30:55,    50,    20
06-01-2022 09:31:55,    45,    18
06-01-2022 09:32:55,    48,    23
... ,    ...,    ...
```

The master should query each running PNGM after every 2 minutes and get the latest prime number lists. Make sure the master removes any duplicates and only keep the identical and sorted prime number list.
   The deliverable of this milestone is to provide the source code of the program and provide the link of your Docker Hub repository showing the container image for this microservice. Provide a graph showing CPU and memory consumption's for the system during the generation of the prime numbers. Remember, you have already collected it!

Submission Guidelines

You need to prepare a small report in PDF format containing deliverable for all the milestones before **Tuesday 2 May, 11:59pm via email to** abdullah.assignmentbox@gmail.com. The title of the email should be A3:[ID]:[First-Name] and the report should name the same.

References

[1] Largest known prime number. https://en.wikipedia.org/wiki/Largest_known_prime_number.