Week#10 Labs

Neha Agrawal

Table of Contents

10.1g: Dataproc, Dataflow

1. Dataproc Lab #1 (π)

2. Calculating π

3. Code

4. Dataproc setup

5. Create Compute Engine cluster

6. Run computation

For your lab notebook:

- **How long did the job take to execute?**
  ~66sec
- **Examine `output.txt` and show the estimate of π calculated.**
  Pi is roughly 3.1417039514170395

7. Scale cluster

8. Run computation again

- **How long did the job take to execute? How much faster did it take?**
  ~11sec
- **Examine `output2.txt` and show the estimate of π calculated.**
  Pi is roughly 3.1415359514153596

9. Clean up

10. Dataflow Lab #1 (Java package popularity)

11. Setup

12. Beam code

Answer the following questions for your lab notebook.

- **Where is the input taken from by default?**

`../javahelp/src/main/java/com/google/cloud/training/dataanalyst/javahelp/`

- **Where does the output go by default?**

  `/tmp/output`

- **Examine both the `getPackages()` function and the `splitPackageName()` function. What operation does the '`PackageUse()`' transform implement?**

  PackageUse() will call call the getPackages() to get the packages and pass it as parameter to the splitPackageName() which will return package names.

  Example:

  1. PackageUse(line, 'import') where line = import java.util.Scanner is passed as a parameter;

  2. getPackages() will strip off the "import" and ";" so packageName = java.util.Scanner

  3. Now it will call splitPackageName() which will return a list containing java, java.util, java.util.Scanner to the calling function.

- **Look up Beam's `CombinePerKey`. What operation does the `TotalUse` operation implement?**

  CombinePerKey accepts a function that takes a list of values as an input, and combines them for each key.

  TotalUse corresponds to Reduce operation or Shuffle-Reduce operation

The operations in the pipeline mimic a Map-Reduce pattern, demonstrating Beam's ability to support it.

Answer the following question for your lab notebook.

- **Which operations correspond to a "Map"?**

  PackageUse

- **Which operation corresponds to a "Shuffle-Reduce"?**

  TotalUse

- **Which operation corresponds to a "Reduce"?**

  TotalUse

13. Run pipeline locally

- **Take a screenshot of its contents**

```
n (cloud-f20-neha-agrawal-agrawal)$ cat /tmp/output-00000-of-00001
[('org', 45), ('org.apache', 44), ('org.apache.beam', 44), ('org.apache.beam.sdk', 43), ('org.apache.beam.sdk
.transforms', 16)]
```

- **Explain what the data in this output file corresponds to based on your understanding of the program.**

  Each package name returned by the list of splitPackageName() is a key here and the value corresponding to it shows the total count.

14. Dataflow Lab #2 (Word count)

- **What are the names of the stages in the pipeline?**

  Split

  PairWIthOne

  GroupAndSum

- **Describe what each stage does.**

  Split: The split will take each line and split into words as strings

  PairWIthOne: It will create a map of each word where it will keep its count as 1

  GroupAndSum: As the name suggests, this will take the output from previous step and aggregate them for each key. Thus as an output we get the number of occurrences of each word.

15. Run code locally

- **Use wc with an appropriate flag to determine the number of unique words in King Lear.**

  4784

```
agrawal@cloudshell:~/training-data-analyst/courses/machine_learning/deepdive/04_features/dataflow/python (cloud-f20-neha
-agrawal-agrawal)$ wc -l outputs-00000-of-00001
4784 outputs-00000-of-00001
```

- **Use sort with appropriate flags to perform a *numeric* sort on the *key field* containing the count for each word in *descending* order. Pipe the output into head to show the top 3 words in King Lear and the number of times they appear**

  sort -k2 -n -r outputs-00000-of-00001 | head -n 3

```
agrawal@cloudshell:~/training-data-analyst/courses/machine_learning/deepdive/04_features/dataflow/python (cloud-f20-neha
-agrawal-agrawal)$ sort -k2 -n -r outputs-00000-of-00001 | head -n 3
the: 786
I: 622
and: 594
```

- **Use the previous method to show the top 3 words in King Lear, case-insensitive, and the number of times they appear.**

```
(env) agrawal@cloudshell:~/training-data-analyst/courses/machine_learning/deepdive/04_features/dataflow/python (cloud-f2
0-neha-agrawal-agrawal)$ sort -k2 -n -r outputs-00000-of-00001 | head -n 3
the: 908
and: 738
i: 622
```

16. Setup for Cloud Dataflow

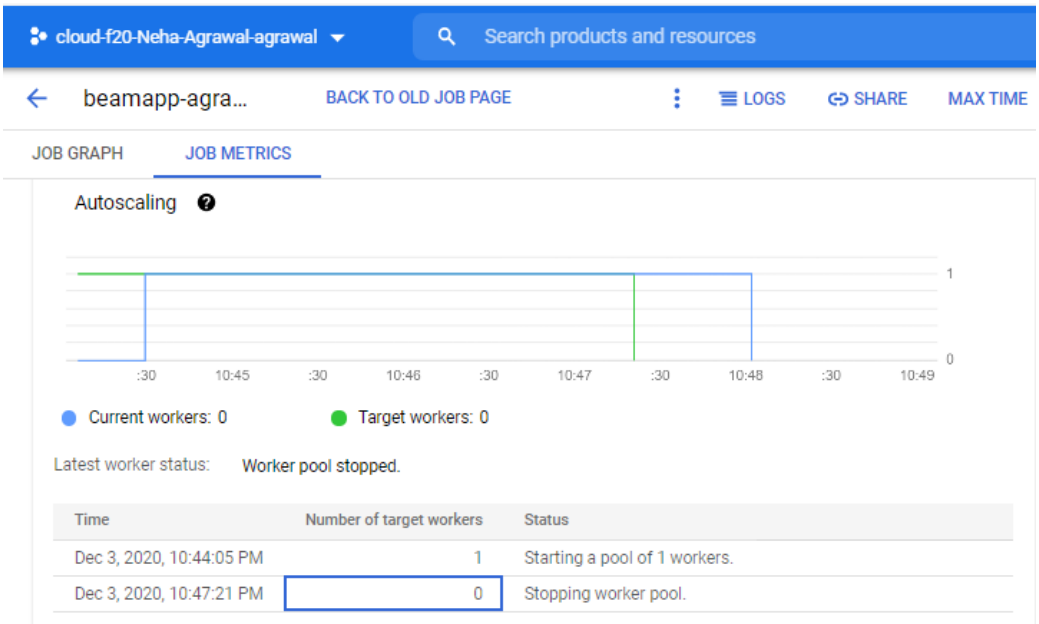
17. Service account setup

18. Run code using Dataflow runner

- **The part of the job graph that has taken the longest time to complete.**

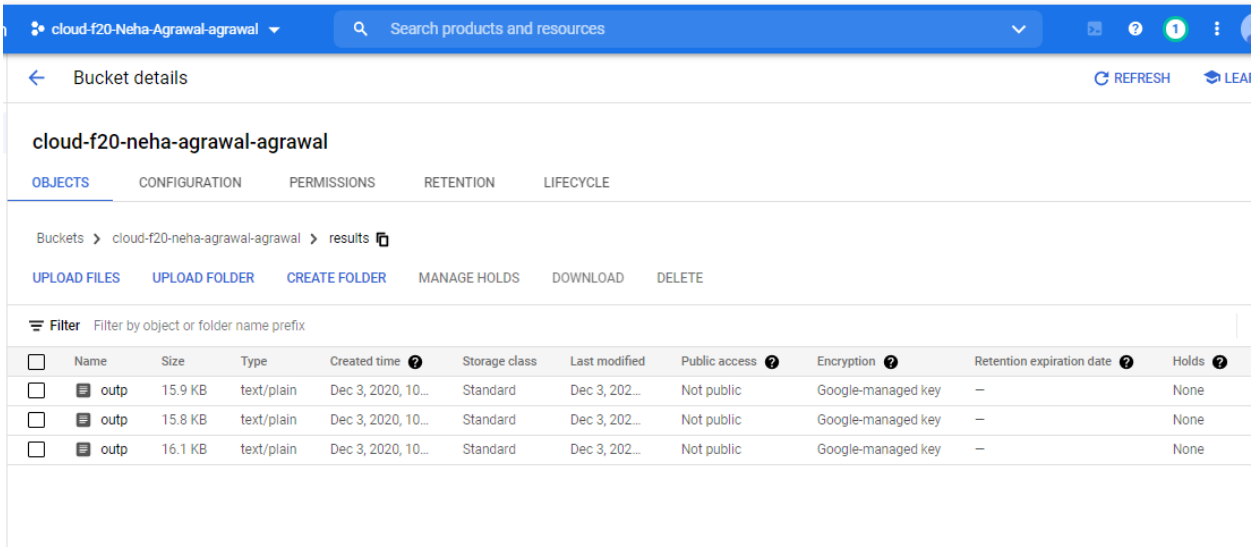
  Write

- **The autoscaling graph showing when the worker was created and stopped.**



- **Examine the output directory in Cloud Storage. How many files has the final write stage in the pipeline created?**

  It has created 3 files in the result directory:



19. Clean up

10.2g: CDN

1. Part 1: Networks and VMs

2. Deployment specification

3. Network deployment specification

4. Subnetwork deployment specification

5. Virtual machine deployment specification

6. Deployment

- **Take a screenshot of the output to include in your lab notebook. How many networks, subnetworks, and VM instances have been created?**

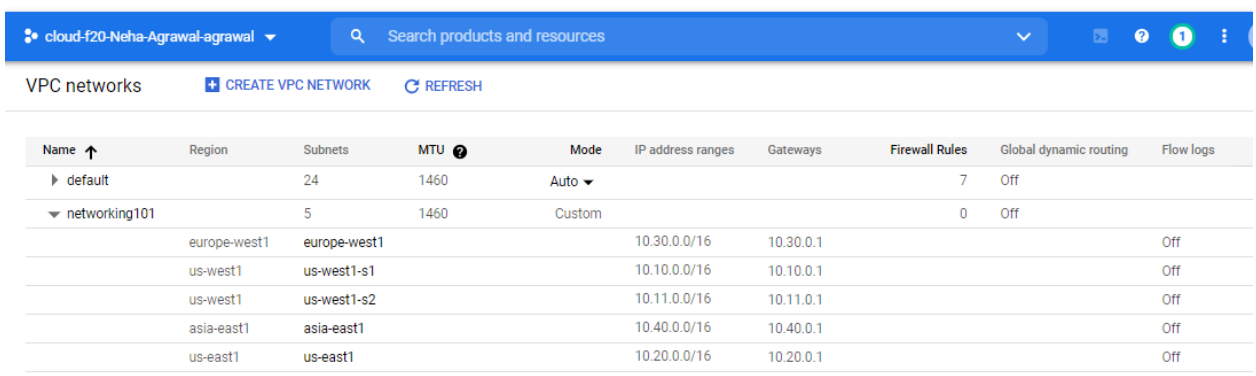
```
(env) agrawal@cloudshell:~/networking101 (cloud-f20-neha-agrawal-agrawal)$ gcloud deployment-manager deployments create networking101 --config networking-lab.yaml
The fingerprint of the deployment is b'XZH1cWMErqGQ2J4xyDNwHg=='
Waiting for create [operation-1607197964912-5b5bcefc84927-4be29ff6-199800a8]...done.
Create operation operation-1607197964912-5b5bcefc84927-4be29ff6-199800a8 completed successfully.
NAME            TYPE                  STATE      ERRORS  INTENT
asia-east1      compute.v1.subnetwork COMPLETED  []
asia1-vm        compute.v1.instance   COMPLETED  []
e1-vm           compute.v1.instance   COMPLETED  []
eu1-vm          compute.v1.instance   COMPLETED  []
europe-west1    compute.v1.subnetwork COMPLETED  []
networking101   compute.v1.network    COMPLETED  []
us-east1        compute.v1.subnetwork COMPLETED  []
us-west1-s1     compute.v1.subnetwork COMPLETED  []
us-west1-s2     compute.v1.subnetwork COMPLETED  []
w1-vm           compute.v1.instance   COMPLETED  []
w2-vm           compute.v1.instance   COMPLETED  []
```

Networks = 1

Subnetworks = 5

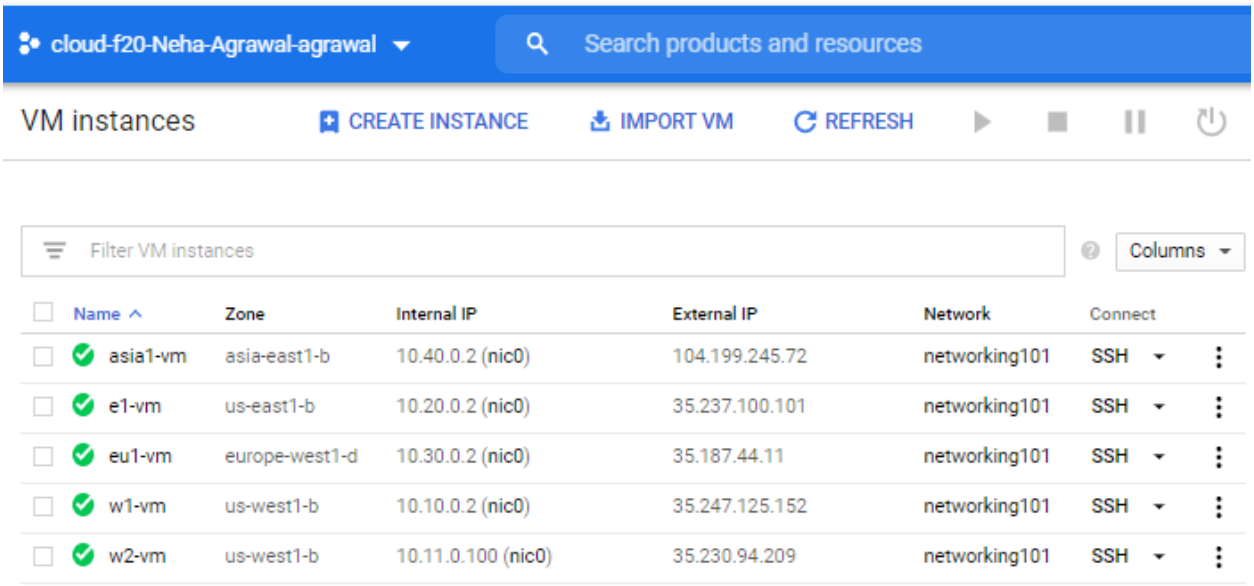
VM instances = 5

- **Visit the web console for VPC network and show the network and the subnetworks that have been created. Validate that it has created the infrastructure in the initial figure. Note the number of firewall rules that are in the deployment.**



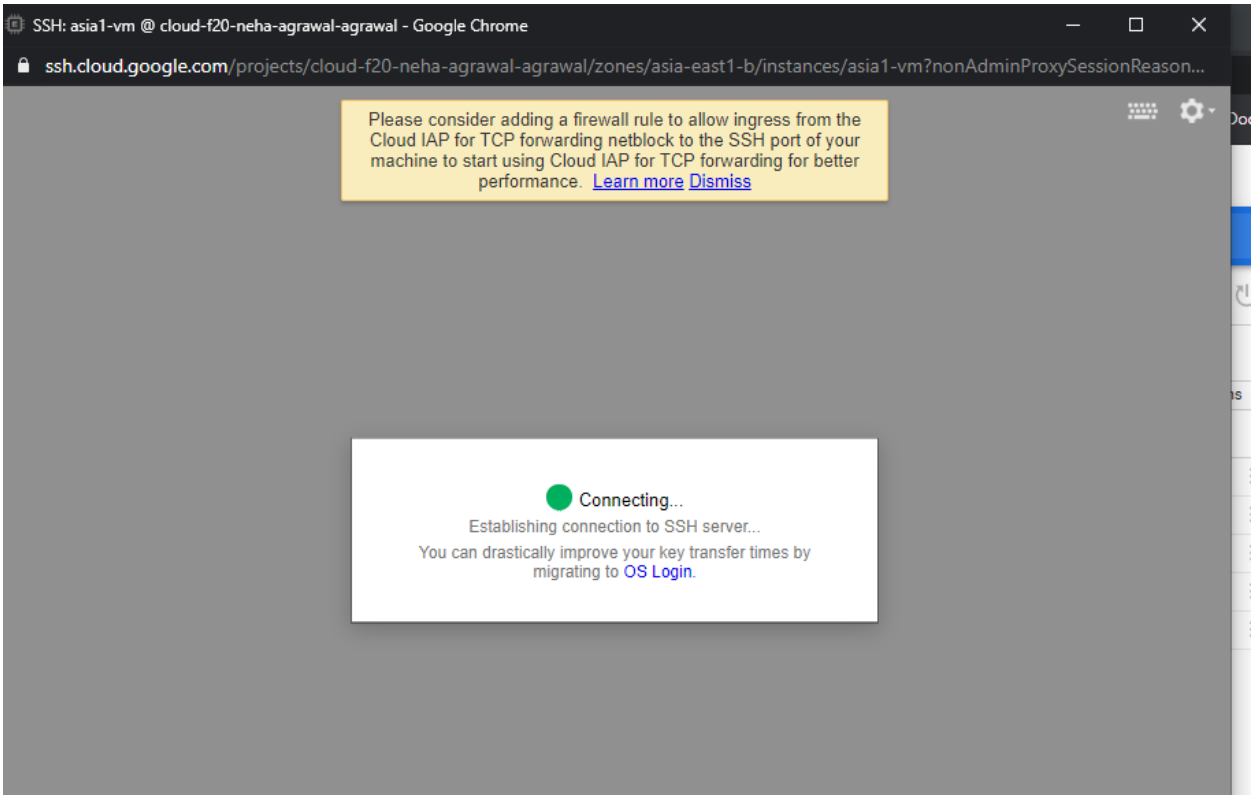
Name	Region	Subnets	MTU	Mode	IP address ranges	Gateways	Firewall Rules	Global dynamic routing	Flow logs
default		24	1460	Auto			7	Off	
networking101		5	1460	Custom			0	Off	
	europe-west1	europe-west1			10.30.0.0/16	10.30.0.1			Off
	us-west1	us-west1-s1			10.10.0.0/16	10.10.0.1			Off
	us-west1	us-west1-s2			10.11.0.0/16	10.11.0.1			Off
	asia-east1	asia-east1			10.40.0.0/16	10.40.0.1			Off
	us-east1	us-east1			10.20.0.0/16	10.20.0.1			Off

- **Visit the web console for Compute Engine and show all VMs that have been created, their internal IP addresses and the subnetworks they have been instantiated on. Validate that it has created the infrastructure shown in the initial figure.**



- **Click on the `ssh` button for one of the VMs and attempt to connect. Did it succeed? Take a screenshot and include it in your lab notebook.**

  It failed!



7. Firewall deployment specification

8. Update deployment

9. Latency measurements

Location pair	Ideal latency	Measured latency
us-west1 us-east1	37.12 ms	63.5ms
us-west1 europe-west1	80.01 ms	137ms
us-west1 asia-east1	99.59 ms	113ms
us-east1 europe-west1	67.51 ms	92.1ms
us-east1 asia-east1	131.44 ms	187ms
europe-west1 asia-east1	95.61 ms	246ms

10. Part 2: Scaling via Instance Groups and Load Balancing

11. Firewall rule for HTTP

12. Instance templates

13. Health check

14. Managed Instance Group (europe-west1-mig)

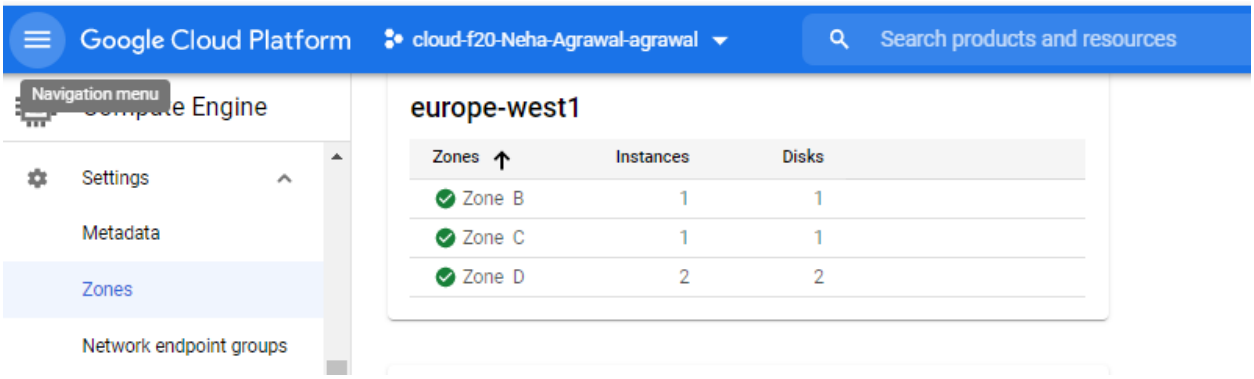
15. Managed Instance Group (us-east1-mig)

16. Test groups

- Are the instances in the same availability zone or in different ones?

  The instances are in the different availability zones. One is in zone B, other is in zone C and the third one is in Zone D

- List all availability zones that your servers show up in for your lab notebook.

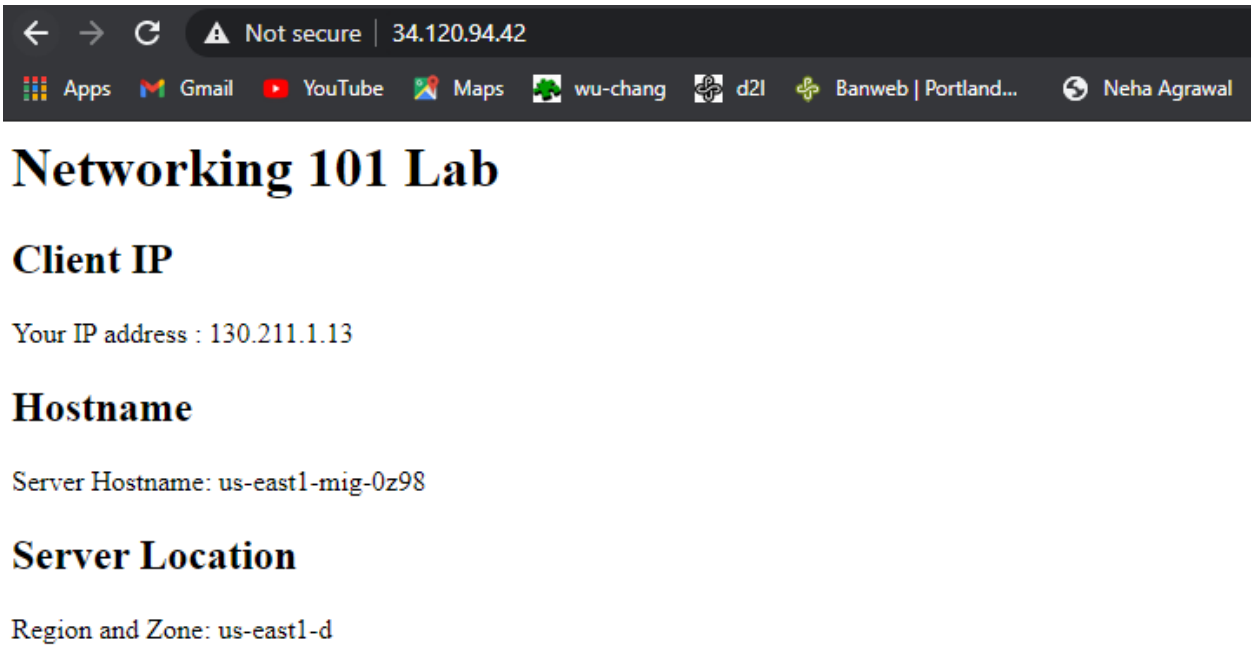


17. HTTP load balancer

18. HTTP load balancer

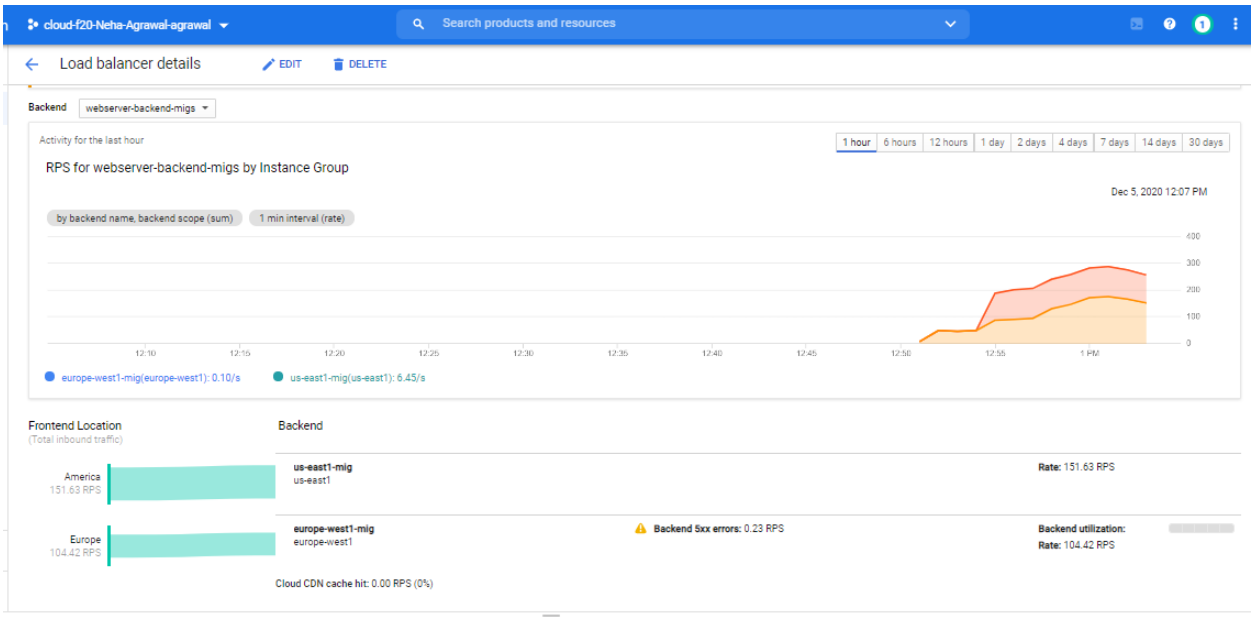
19. Test load balancer

Show a screenshot of the page that is returned. If you get an error, you may need to wait several minutes for the load balancer to finish deploying. Which region does the server handling your request reside in?



Region: us-east1

20. Siege!



I couldn't get the graph to display much on the monitoring tab till 10 mins, neither the instances scaled up. And then I hit the refresh and above is the plot I saw. So, I do not have intermittent screenshots to show all the 5 instances up.

21. Clean-up