

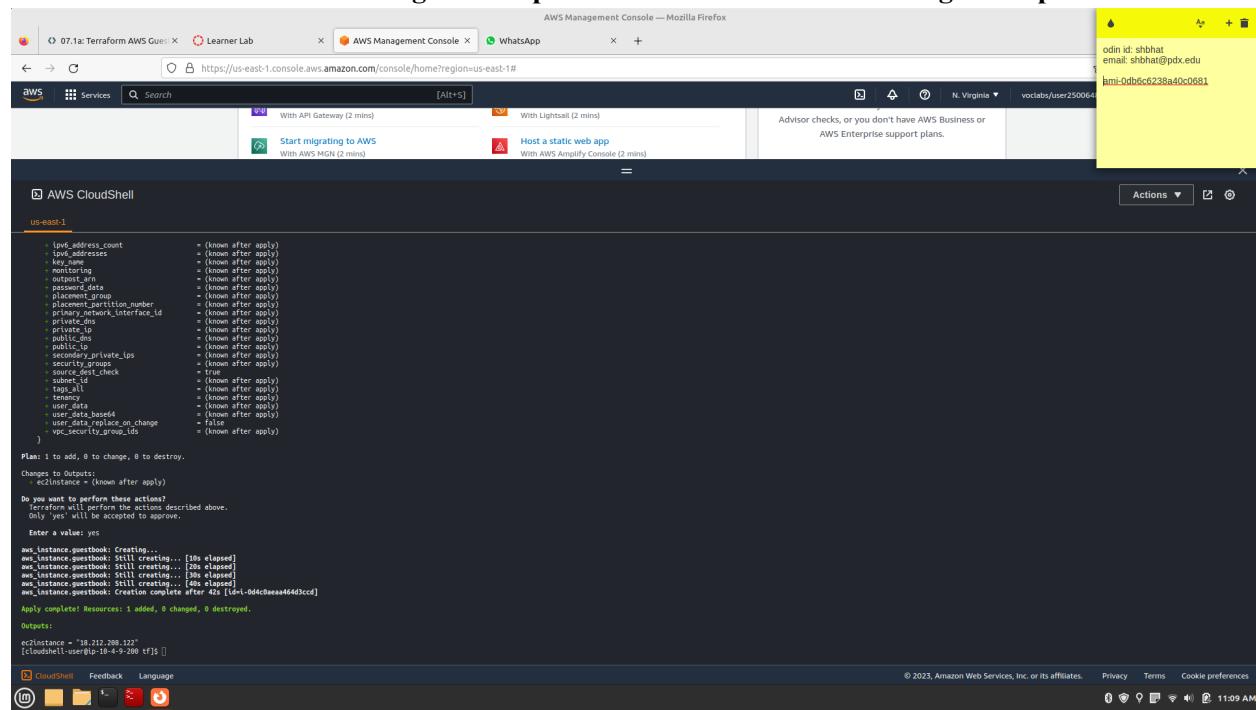
Lab Notebook Week 7

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7.1 a - Terraform AWS Guestbook

7.1a.1 Take a screenshot showing the completion of the command including its output



```

AWS Management Console — Mozilla Firefox
https://us-east-1.console.aws.amazon.com/console/home?region=us-east-1#
aws Services Search [Alt+S]
With API Gateway (2 mins) With Lightsail (2 mins)
Start migrating to AWS With AWS MGN (2 mins) Host a static web app With AWS Amplify Console (2 mins)
Advisor checks, or you don't have AWS Business or AWS Enterprise support plans.
Actions ▾

AWS CloudShell
us-east-1
iplan: 1 to add, 0 to change, 0 to destroy.
Changes to Outputs:
  ec2instance = (known after apply)

Do you want to perform these actions?
  Terraform will perform the actions described above.
  Only 'yes' will be accepted to approve.

Enter a value: yes

aws_instance.guestbook: Creating...
aws_instance.guestbook: Still creating... [10s elapsed]
aws_instance.guestbook: Still creating... [20s elapsed]
aws_instance.guestbook: Still creating... [30s elapsed]
aws_instance.guestbook: Still creating... [40s elapsed]
aws_instance.guestbook: Creation complete after 42s [id=d-0d4cbeaa4640cccd]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.

Outputs:
  ec2instance = "39.212.209.227"
[CloudShell-user@ip-18-4-9-200 tf]$ 
CloudShell Feedback Language

```

7.1a.2 Take a screenshot that includes the VM's IP addresses

The screenshot shows the AWS Management Console with the EC2 service selected. The main pane displays the 'Instance details' for an instance with ID `i-0d4c0aeaa464d3cc`. Key network information shown includes:

- Public IPv4 address: `18.212.208.122` [open address]
- Private IP4 address: `172.31.18.204`
- Public IPv4 DNS: `ec2-18-212-208-122.compute-1.amazonaws.com` [open address]
- Elastic IP addresses: `172.31.18.204`

The AWS CloudShell interface is open at the bottom, showing the command prompt and some initial output related to instance destruction.

7.1a.3 Take a screenshot of the successful ssh login from Cloud Shell.

The screenshot shows the AWS Management Console with the EC2 service selected. The main pane displays the 'Instance details' for an instance with ID `i-0d4c0aeaa464d3cc`. Key network information shown includes:

- Public IPv4 address: `18.212.208.122` [open address]
- Private IP4 address: `172.31.18.204`
- Public IPv4 DNS: `ec2-18-212-208-122.compute-1.amazonaws.com` [open address]
- Elastic IP addresses: `172.31.18.204`

The AWS CloudShell interface is open at the bottom, showing the command prompt and a successful SSH session to the instance, displaying the Ubuntu welcome message.

7.1a.4 Take a screenshot of the output of the command that includes the IP address of the instance

Instances | EC2 Management Console — Mozilla Firefox

07.1a: Terraform AWS Guest

Instances | EC2 Management Console

Learner Lab

WhatsApp

Lab7 - Google Docs

https://us-east-1.console.aws.amazon.com/ec2/home?region=us-east-1#Instances?v=3;Scase=tags,true\;client:false\;reregex=tags=false\;client:false

New EC2 Experience

Tell us what you think

Instance: i-0d4c0aea464d3cccd

AWS CloudShell

Actions

us-east-1

```
  cidr_blocks = [
    "0.0.0.0/0",
  ]
  description = ""
  free_tier = 80
  ipv6_cidr_blocks = []
  private_ip_ids = []
  protocol = "tcp"
  security_groups = []
  subnet_id = "subnet-00000000"
  to_port = 80
),
]
name = "guessbook-0"
name_prefix = "(known after apply)"
owner_id = "(known after apply)"
renewable_on_delete = false
tags_all = "(known after apply)"
vpc_id = "(known after apply)
}

Plan: 3 to add, 0 to change, 0 to destroy.

Changes to Outputs:
  environment = "(known after apply)"

Do you want to perform these changes?
terrafom will perform the actions described above.
Only 'yes' will be accepted to approve.

Enter a value: yes

aws_key_pair.gp: Creating...
aws_security_group.sg: Creating...
aws_security_group.sg-applycomplete: Create after 0s [id:guessbook-key]
aws_security_group.sg-guessbook: Creation complete after 2s [id:sg-06ea6745f23d4328]
aws_instance.guessbook: Still creating... [10s elapsed]
aws_instance.guessbook: Still creating... [20s elapsed]
aws_instance.guessbook: Still creating... [30s elapsed]
aws_instance.guessbook: Creation complete after 31s [id:i-01494a7ec8a7e23db]

Apply complete! Resources: 3 added, 0 changed, 0 destroyed.

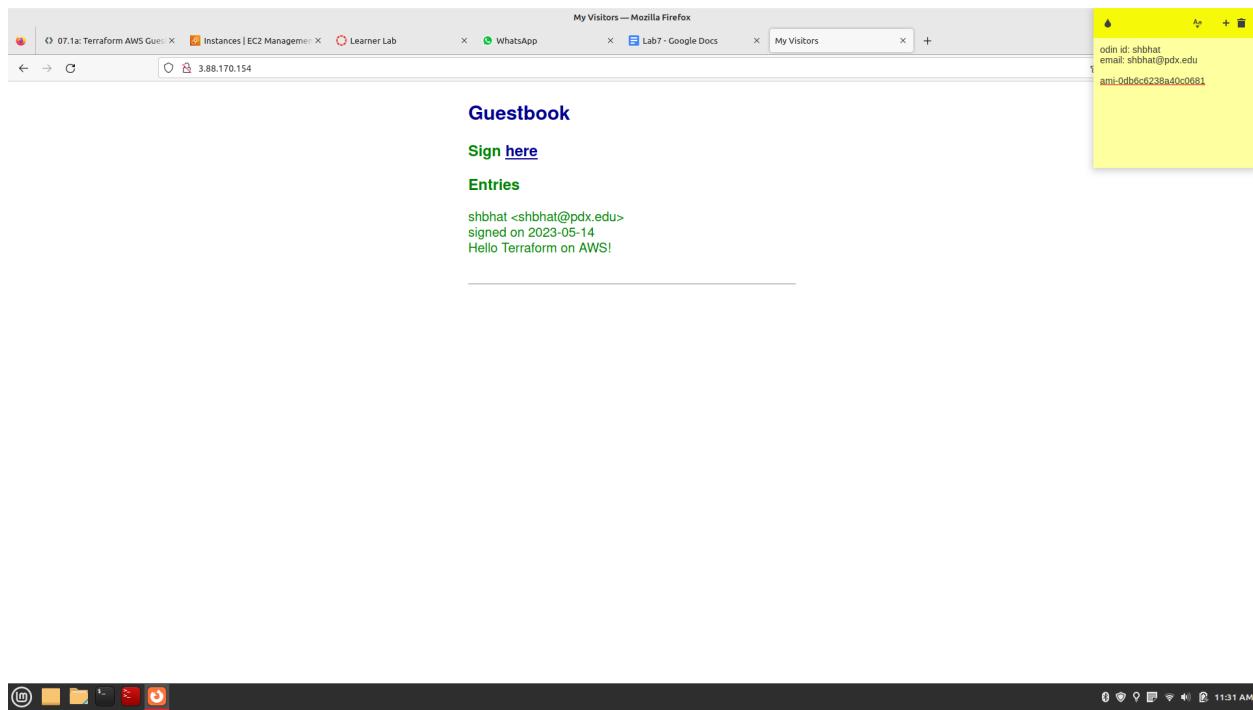
Outputs:
ec2instance = "i-00-178-154"
[cloudshell-user@ip-10-4-9-280 tf] |
```

CloudShell Feedback Language

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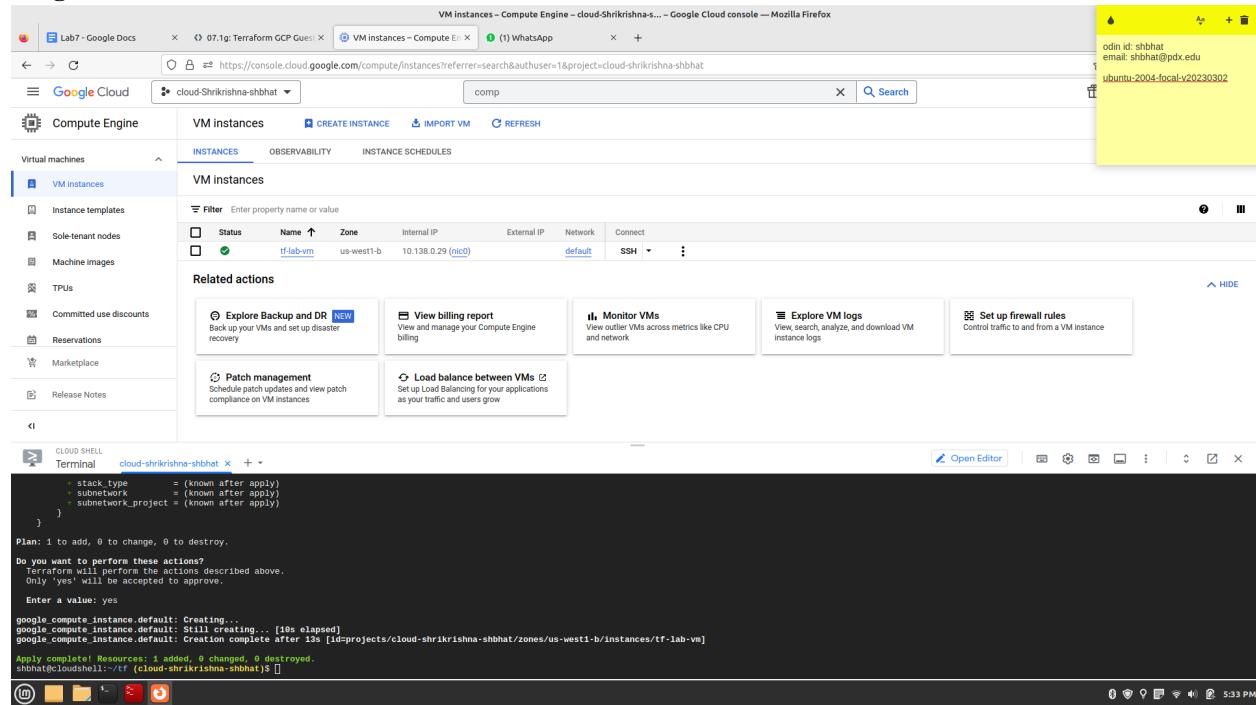
7.1a.5 Perform a process listing until the `gunicorn` process appears.

7.1a.6 Take a screenshot of the Guestbook including the URL with the entry in it.



7.1g Terraform GCP Guestbook

7.1.g.1 Take a screenshot that includes the VM's IP addresses



VM instances - Compute Engine - cloud-Shrikrishna-shbhat - Google Cloud console — Mozilla Firefox

odin id: shbhat
email: shbhat@pdx.edu
ubuntu-2004-focal-y20230302

Google Cloud

cloud-Shrikrishna-shbhat

Compute Engine

VM instances

INSTANCES OBSERVABILITY INSTANCE SCHEDULES

Virtual machines

VM Instances

Instance templates

Sole-tenant nodes

Machine images

TPUs

Committed use discounts

Reservations

Marketplace

Release Notes

Related actions

- Explore Backup and DR
- View billing report
- Monitor VMs
- Explore VM logs
- Set up firewall rules
- Patch management
- Load balance between VMs

CLOUD SHELL Terminal

```
+ stack_type = (known after apply)
+ subnetnetwork = (known after apply)
+ subnetnetwork_project = (known after apply)
}

Plan: 1 to add, 0 to change, 0 to destroy.

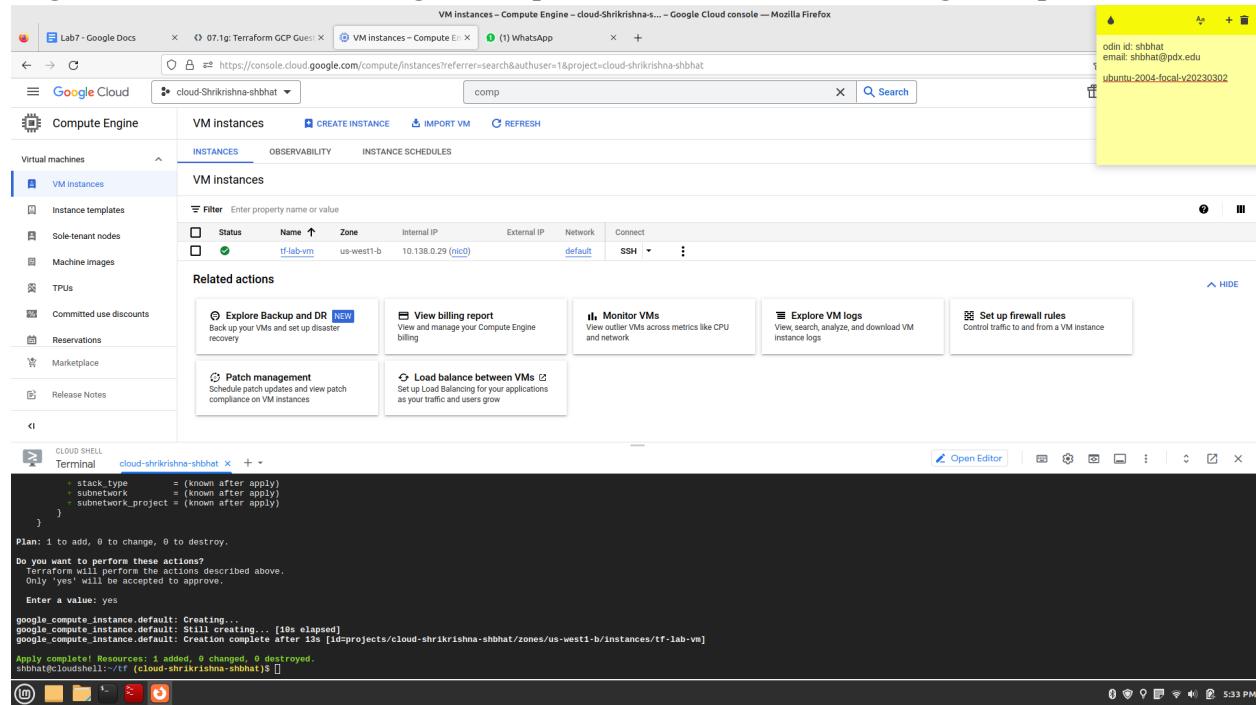
Do you want to perform these actions?
Terraform will perform the actions described above.
Only 'yes' will be accepted to approve.

Enter a value: yes

google_compute_instance.default: Creating...
google_compute_instance.default: Still creating... [10s elapsed]
google_compute_instance.default: Creation complete after 13s [id=projects/cloud-shrikrishna-shbhat/zones/us-west1-b/instances/tf-lab-vm]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
shbhat@[cloudshell]:~$ tf (cloud-shrikrishna-shbhat)$
```

7.1.g.2 Take a screenshot showing the completion of the command including its output



VM instances - Compute Engine - cloud-Shrikrishna-shbhat - Google Cloud console — Mozilla Firefox

odin id: shbhat
email: shbhat@pdx.edu
ubuntu-2004-focal-y20230302

Google Cloud

cloud-Shrikrishna-shbhat

Compute Engine

VM instances

INSTANCES OBSERVABILITY INSTANCE SCHEDULES

Virtual machines

VM Instances

Instance templates

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Release Notes

Related actions

- Explore Backup and DR
- View billing report
- Monitor VMs
- Explore VM logs
- Set up firewall rules
- Patch management
- Load balance between VMs

CLOUD SHELL Terminal

```
+ stack_type = (known after apply)
+ subnetnetwork = (known after apply)
+ subnetnetwork_project = (known after apply)
}

Plan: 1 to add, 0 to change, 0 to destroy.

Do you want to perform these actions?
Terraform will perform the actions described above.
Only 'yes' will be accepted to approve.

Enter a value: yes

google_compute_instance.default: Creating...
google_compute_instance.default: Still creating... [10s elapsed]
google_compute_instance.default: Creation complete after 13s [id=projects/cloud-shrikrishna-shbhat/zones/us-west1-b/instances/tf-lab-vm]

Apply complete! Resources: 1 added, 0 changed, 0 destroyed.
shbhat@[cloudshell]:~$ tf (cloud-shrikrishna-shbhat)$
```

7.1g.3 Take a screenshot that includes the VM's IP addresses

The screenshot shows the Google Cloud Compute Engine interface. On the left, a sidebar lists 'Virtual machines' under 'VM instances'. In the main area, a table displays 'VM instances' with one entry: 'tf-lab-vm' (Status: green, Zone: us-west1-b, Internal IP: 10.138.0.29, External IP: 34.168.65.241). Below the table are 'Related actions' cards for Backup & DR, Billing, Monitoring, VM logs, Patch management, Load balancing, and Firewall rules. At the bottom, a terminal window titled 'CLOUD SHELL' shows the command 'ssh -i "cloud-shrirkishna-key.ppk" -t tf-lab-vm' being run, resulting in the message 'Apply complete! Resources: 1 added, 1 changed, 0 destroyed.' The terminal also shows the IP address 'ip = "34.168.65.241"' and the prompt 'shbhat@cloudshell:~\$'.

7.1g.4 Take a screenshot of the successful ssh login from Cloud Shell

The screenshot shows a successful SSH session in the Cloud Shell terminal. The terminal window is titled 'CLOUD SHELL' and shows the prompt 'shbhat@tf-lab-vm:~\$'. The session output includes:

```
google compute instance default: Still modifying... [id=projects/cloud-shrirkishna-shbhat/zones/us-west1-b/instances/tf-lab-vm, 10s elapsed]
google compute instance default: Modifications complete after 11s [id=projects/cloud-shrirkishna-shbhat/zones/us-west1-b/instances/tf-lab-vm]
Apply complete! Resources: 1 added, 1 changed, 0 destroyed.

Outputs:
ip = "34.168.65.241"
shbhat@cloudshell:~$ ssh 34.168.65.241
shbhat@tf-lab-vm:~$
```

Below the terminal, a yellow sticky note displays user information: 'odin id: shbhat', 'email: shbhat@pdx.edu', and 'ubuntu-2004-focal-v20230302'.

7.1g.4 What resources are being added, changed, or destroyed?

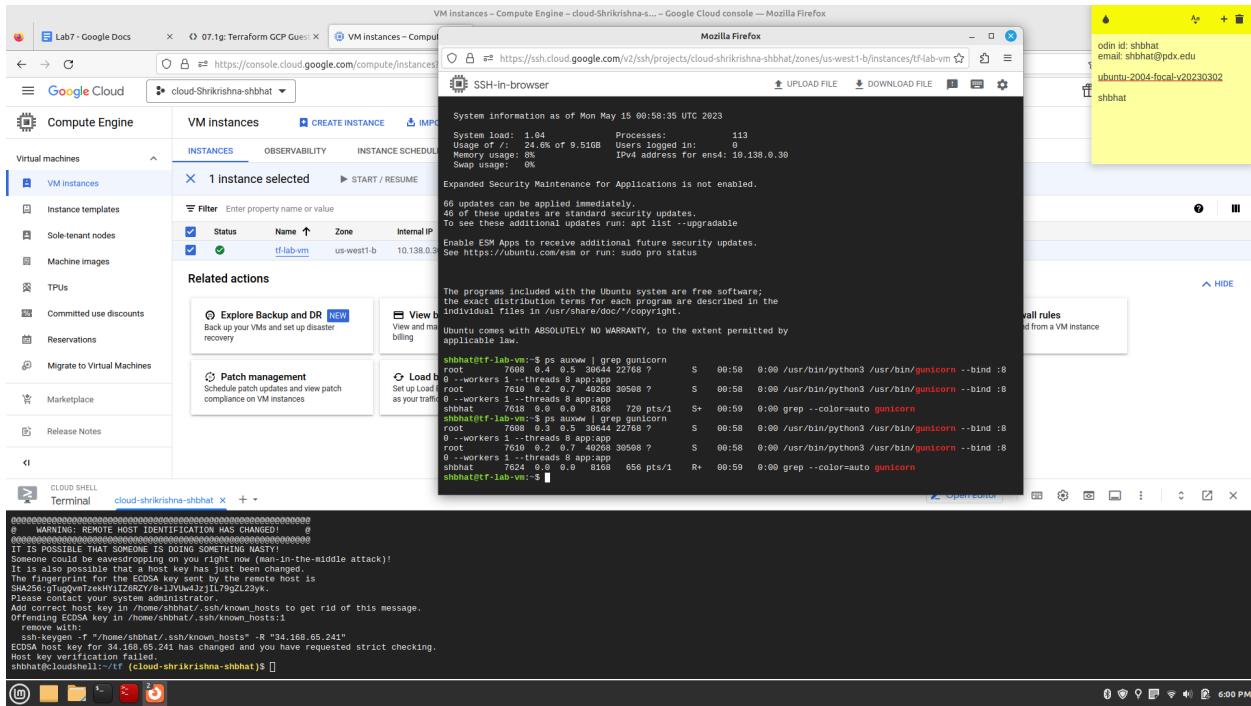
The following resources are being added, changed or destroyed:

- A. **cpu_platform**: The value of this attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply).
- B. **current_status**: This attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply).
- C. **enable_display**: This attribute is being removed from the resource. Its current value is **false**, and it will be set to **null** after the resource is destroyed.
- D. **guest_accelerator**: This attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply).
- E. **id**: This attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply).
- F. **instance_id**: This attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply).
- G. **label_fingerprint**: This attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply).
- H. **labels**: This attribute is being removed from the resource. Its current value is an empty map {}, and it will be set to **null** after the resource is destroyed.
- I. **metadata_fingerprint**: This attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply).
- J. **metadata_startup_script**: This attribute is being added to the resource. It contains a multi-line string that defines a Bash script that will be run when the new instance is created.
- K. **min_cpu_platform**: This attribute is being added to the resource. Its value is marked as (known after apply) because Terraform can't determine its value until after the apply action is performed.
- L. **name**: This attribute is not changing. Its value is "tf-lab-vm".
- M. **project**: This attribute is not changing. Its value is "cloud-shrikrishna-shbhat".
- N. **resource_policies**: This attribute is being removed from the resource. Its current value is an empty list [], and it will be set to **null** after the resource is destroyed.
- O. **self_link**: This attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply).
- P. **tags**: This attribute is changing. A new tag "http-server" is being added to the resource.
- Q. **tags_fingerprint**: This attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply).
- R. **boot_disk**: This block is changing. It contains details about the boot disk that will be attached to the new instance. The **device_name** attribute is changing, but Terraform can't determine the new value until after the apply action is performed, so it's marked as (known after apply). The **initialize_params** block contains attributes whose values are changing, but Terraform can't determine their new values until after the apply action is performed

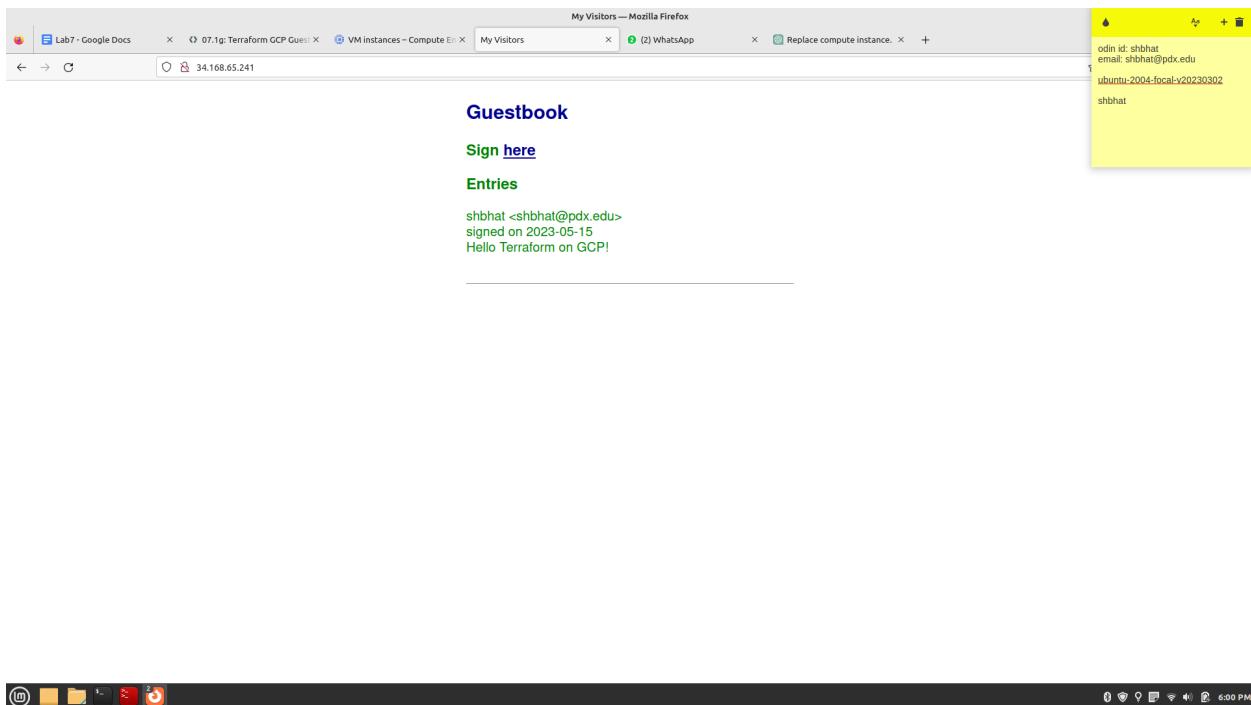
7.1g.5 What part of the configuration forces a replacement to occur?

Metadata_startup_script

7.1g.6 ps auxww | grep gunicorn



7.1g.7 Take a screenshot of the Guestbook including the URL with the entry in it.



7.2 G Kubernetes Guestbook

7.2g.1 What is the name of the Instance Template dynamically generated to create the two nodes (VMs)?

Answer: gke-guestbook-default-pool-eea1254e

7.2g.2 What is the name of the Instance Group dynamically generated that the two nodes belong to?

Answer: Gke-guestbook-default-pool-eea1254e-grp

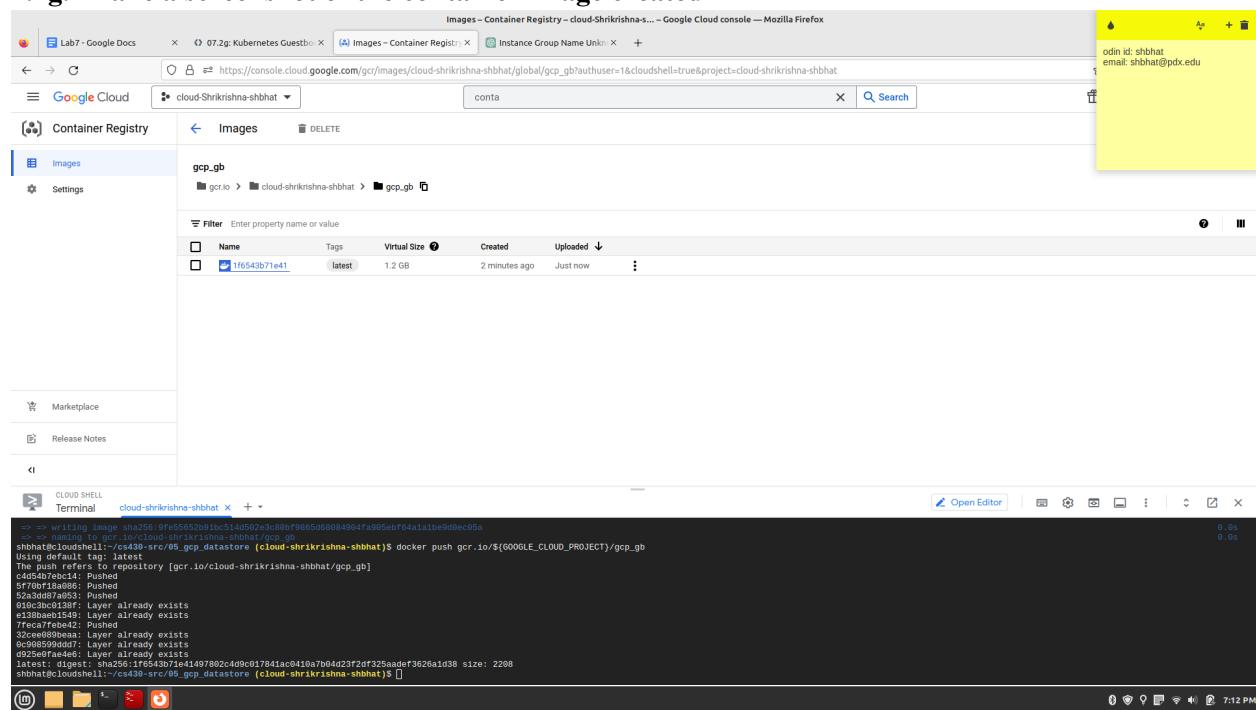
7.2g.3 What are the names of the two nodes?

Answer:

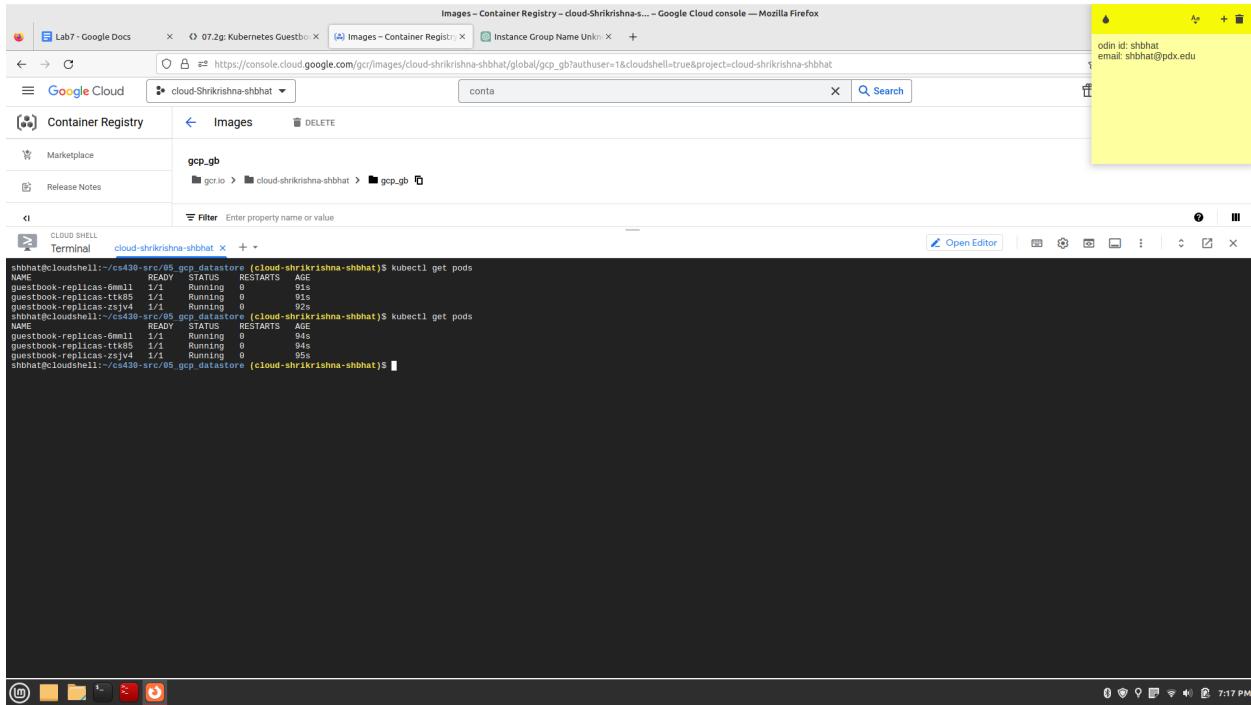
gke-guestbook-default-pool-eea1254e-4nd0

gke-guestbook-default-pool-eea1254e-765m

7.2g.4 Take a screenshot of the container image created



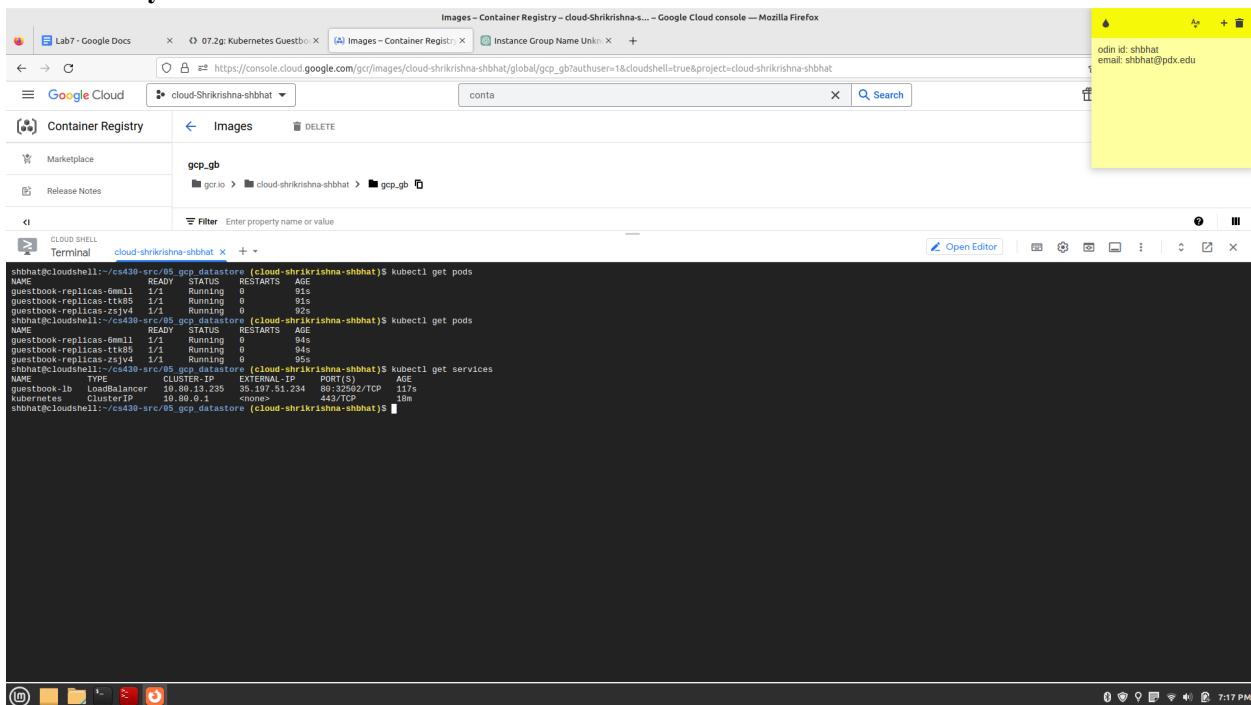
7.2g.5 Take a screenshot of the output of the following command when all 3 replicas reach a "Running" state.



The screenshot shows a Mozilla Firefox browser window with the URL https://console.cloud.google.com/gcr/images/cloud-shrikrishna-shbhat/global/gcp_gb?authuser=1&cloudshell=true&project=cloud-shrikrishna-shbhat. The page displays the 'Container Registry' interface for the 'gcp_gb' image. A yellow sticky note in the top right corner contains the text: 'odin id: shbhat email: shbhat@pdx.edu'. The terminal window below shows the output of the 'kubectl get pods' command:

```
shbhat@cloudshell:~/cs430/src/05_gcp_datastore$ (cloud-shrikrishna-shbhat)$ kubectl get pods
NAME           READY   STATUS    RESTARTS   AGE
guestdbook-replicas-6mml 1/1     Running   0          91s
guestdbook-replicas-ttk85 1/1     Running   0          91s
guestdbook-replicas-zsyv4 1/1     Running   0          92s
shbhat@cloudshell:~/cs430/src/05_gcp_datastore$ (cloud-shrikrishna-shbhat)$ kubectl get pods
NAME           READY   STATUS    RESTARTS   AGE
guestdbook-replicas-6mml 1/1     Running   0          94s
guestdbook-replicas-ttk85 1/1     Running   0          94s
guestdbook-replicas-zsyv4 1/1     Running   0          95s
shbhat@cloudshell:~/cs430/src/05_gcp_datastore$ (cloud-shrikrishna-shbhat)$
```

7.2g.6 Take a screenshot of listing services with LoadBalancer indicating an external IP address that is ready for access.



The screenshot shows a Mozilla Firefox browser window with the same URL as the previous screenshot. The terminal window below shows the output of the 'kubectl get pods' and 'kubectl get services' commands:

```
shbhat@cloudshell:~/cs430/src/05_gcp_datastore$ (cloud-shrikrishna-shbhat)$ kubectl get pods
NAME           READY   STATUS    RESTARTS   AGE
guestdbook-replicas-6mml 1/1     Running   0          91s
guestdbook-replicas-ttk85 1/1     Running   0          91s
guestdbook-replicas-zsyv4 1/1     Running   0          92s
shbhat@cloudshell:~/cs430/src/05_gcp_datastore$ (cloud-shrikrishna-shbhat)$ kubectl get services
NAME            TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
guestdbook-lb   LoadBalancer   10.80.13.239   <none>        80:32592/TCP   117s
kubernetes     ClusterIP   10.80.6.1   <none>        443/TCP     18m
shbhat@cloudshell:~/cs430/src/05_gcp_datastore$ (cloud-shrikrishna-shbhat)$
```

7.2g.7 Take a screenshot of the Guestbook including the URL with the entry in it.

The screenshot shows a Mozilla Firefox browser window with the title "My Visitors — Mozilla Firefox". The address bar shows the URL "34.83.173.125". The main content area displays five entries from a guestbook:

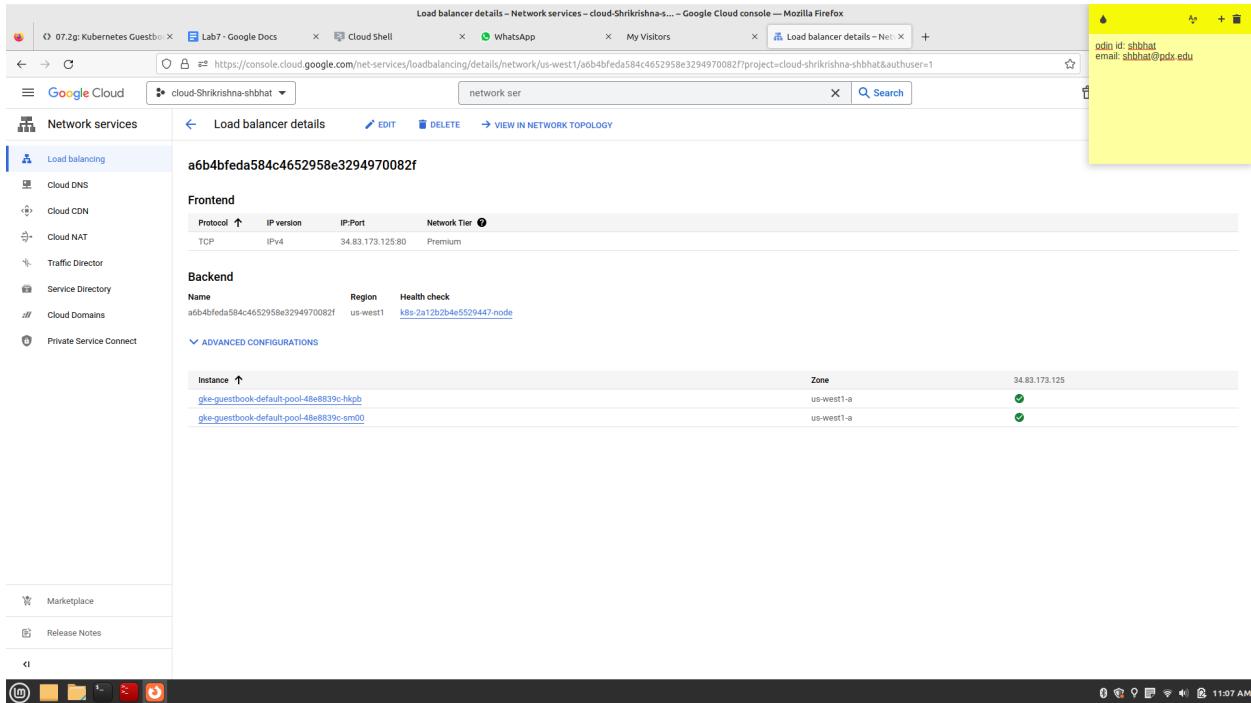
- shbhat <shbhat@pdx.edu>
signed on 2023-05-07 04:06:10.022562+00:00
Hello App Engine!
- shbhat <shbhat@pdx.edu>
signed on 2023-05-21 17:17:18.242054+00:00
Hello Cloud Functions from Python Requests
- shbhat <shbhat@pdx.edu>
signed on 2023-05-02 02:46:38.9444829+00:00
Hello Docker Datastore!
- shbhat <shbhat@pdx.edu>
signed on 2023-05-21 17:47:08.624089+00:00
Hello API Gateway from SPA in GCS
- shbhat <shbhat@pdx.edu>
signed on 2023-05-02 03:10:38.153055+00:00
Hello Compute Engine!
- shbhat <shbhat@pdx.edu>
signed on 2023-05-21 18:04:07.412944+00:00
Hello Kubernetes!

7.2g.8 Take a screenshot of the managed guestbook pods and the service being exposed.

The screenshot shows the "Replication Controller details" page for the "guestbook-replicas" replication controller in the "cloud-Shrikrishna-shbhat" project on Google Cloud. The page includes the following sections:

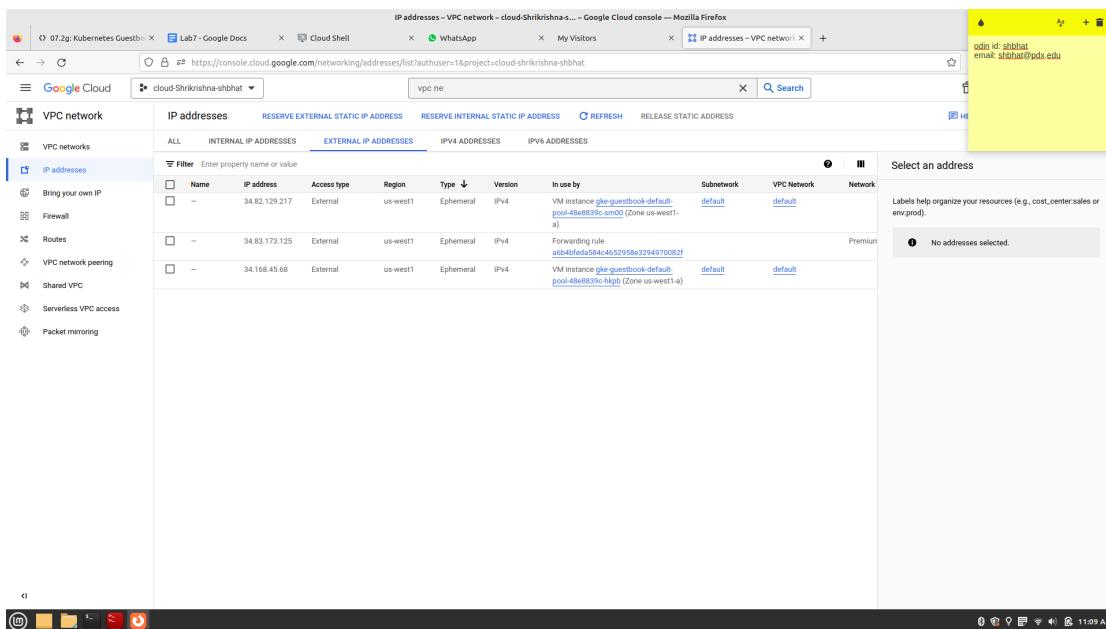
- Pod specification:** Shows labels (app: guestbook, tier: frontend), termination grace period (30s), restart policy (Always), and containers (guestbook-app).
- Managed pods:** Lists three running pods: "guestbook-replicas-lnt7h", "guestbook-replicas-tfwm", and "guestbook-replicas-zhhv".
- Exposing services:** Shows a load balancer service named "guestbook-lb" with an endpoint at "34.83.173.125:80".

7.2g.9 Take a screenshot of the load balancer and its details



The screenshot shows the 'Load balancer details' page in the Google Cloud console. The URL is https://console.cloud.google.com/net-services/loadbalancing/details/network/us-west1/a6b4bfeda584c4652958e3294970082f?project=cloud-shrirkishna-shbhat&authuser=1. The page displays the configuration for a load balancer named 'a6b4bfeda584c4652958e3294970082f'. Under the 'Frontend' section, it shows a single entry with TCP as the protocol, IPv4 as the IP version, and port 34.83.173.125:80. The 'Network Tier' is listed as Premium. In the 'Backend' section, it shows a single instance named 'gke-guestbook-default-pool-48e8839c-hkpb' located in 'us-west1-a'. The 'Advanced Configurations' section lists two instances: 'gke-guestbook-default-pool-48e8839c-sm00' and 'gke-guestbook-default-pool-48e8839c-hkpb', both in 'us-west1-a'. The zone is 34.83.173.125. The interface includes a sidebar with Network services, Load balancing, and other Google Cloud services like Cloud DNS, Cloud CDN, Cloud NAT, Traffic Director, Service Directory, Cloud Domains, and Private Service Connect.

7.2g.10 Take a screenshot of the addresses allocated and indicate the ones associated with nodes versus the one associated with the load balancer.



The screenshot shows the 'IP addresses' page in the Google Cloud console. The URL is https://console.cloud.google.com/networking/addresses/list?authuser=1&project=cloud-shrirkishna-shbhat. The page displays a list of IP addresses under the 'EXTERNAL IP ADDRESSES' tab. There are four entries:

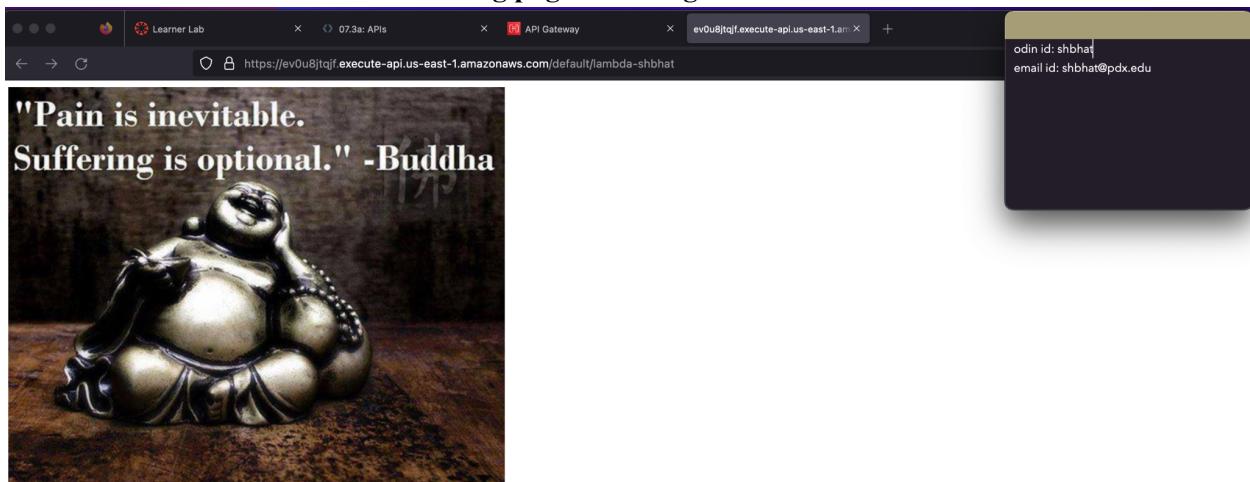
Name	IP address	Access type	Region	Type	Version	In use by	Subnetwork	VPC Network	Network
~	34.82.129.217	External	us-west1	Ephemeral	IPv4	VM instance gke-guestbook-default-pool-48e8839c-sm00 (Zone us-west1-a)	default	default	
~	34.83.173.125	External	us-west1	Ephemeral	IPv4	Forwarding rule a6b4bfeda584c4652958e3294970082f			Premium
~	34.168.45.68	External	us-west1	Ephemeral	IPv4	VM instance gke-guestbook-default-pool-48e8839c-hkpb (Zone us-west1-a)	default	default	

The interface includes a sidebar with VPC network, IP addresses, Bring your own IP, Firewall, Routes, VPC network peering, Shared VPC, Serverless VPC access, and Packet mirroring.

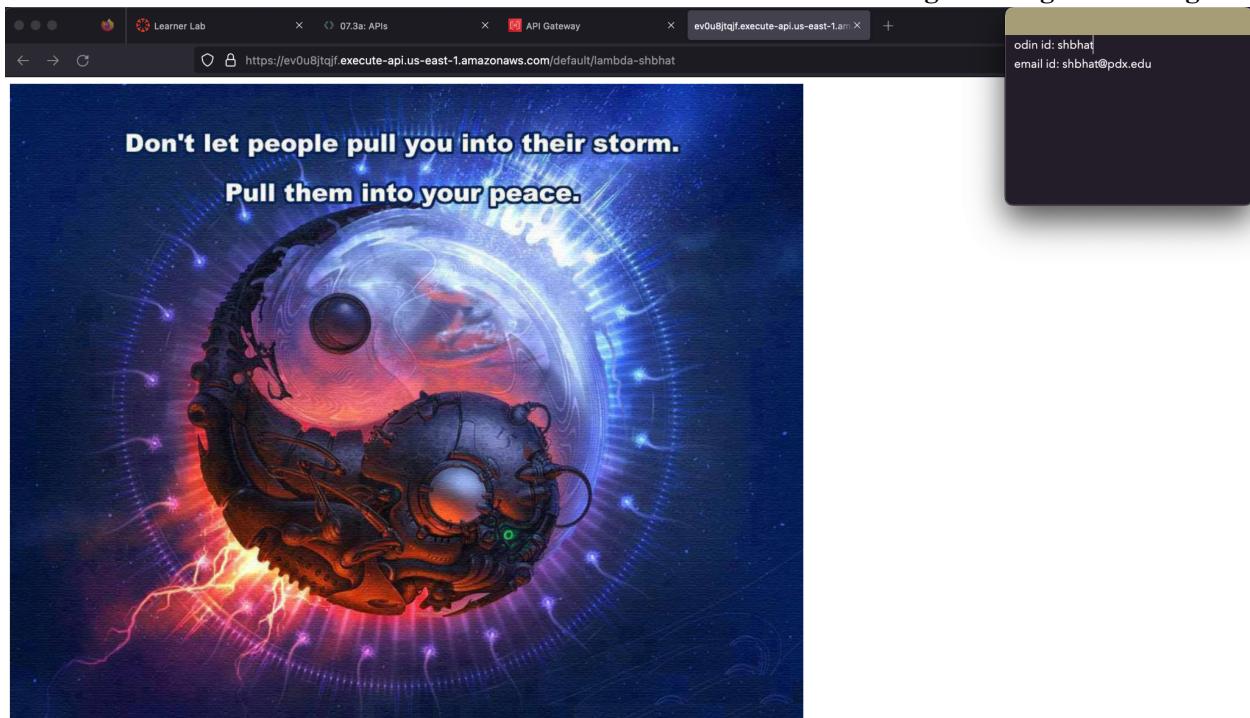
In the above screenshot, the second IP address is of the load balancer and the others are of the nodes.

7.3a APIs

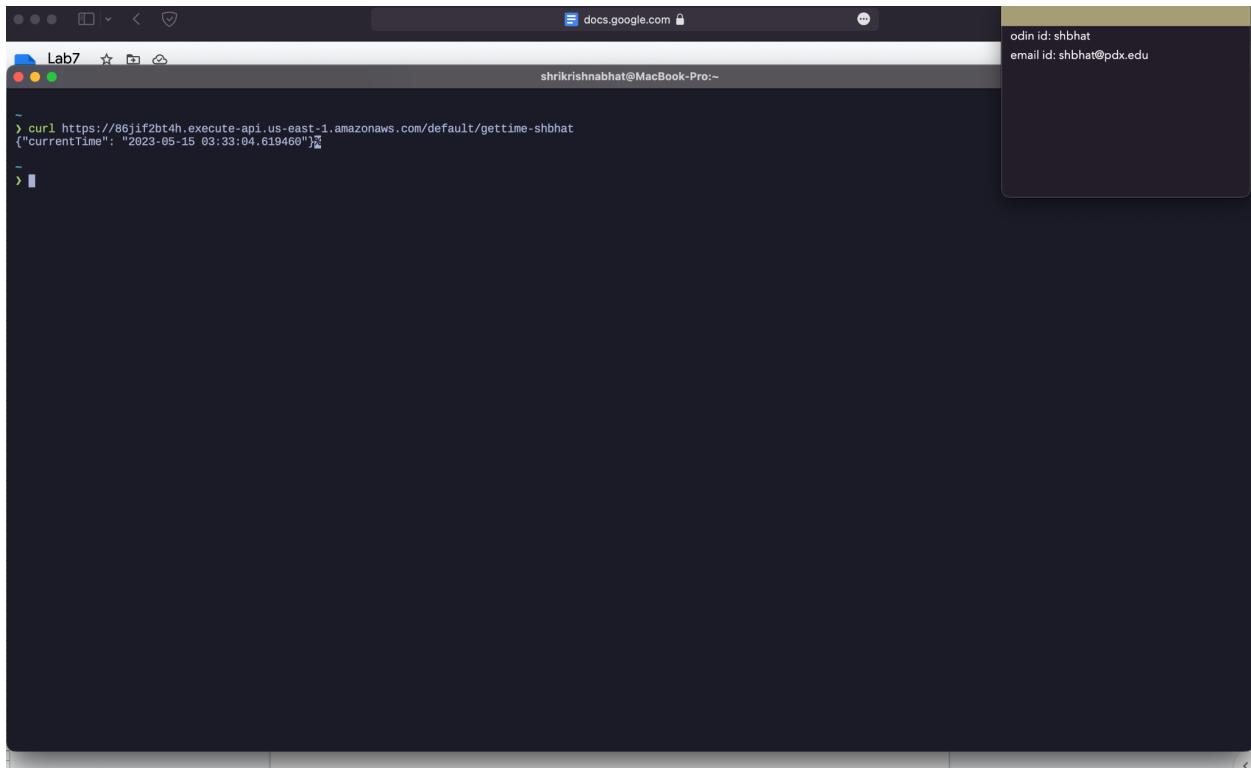
7.3a.1 Take a screenshot of the resulting page including the URL bar.



7.3a.2 Click "Reload" in the browser and take another screenshot showing the image has changed:



7.3a.3 Use `curl` on your Linux VM to access the API endpoint and show the results. Take a screenshot for your lab notebook.



A screenshot of a terminal window on a Mac OS X desktop. The window title is "Lab7". The URL bar shows "docs.google.com". The terminal prompt is "shrikrishnabhat@MacBook-Pro:~>". A command is being typed: ". curl https://06jif2bt4h.execute-api.us-east-1.amazonaws.com/default/gettime-shbhat". The response is: "{"currentTime": "2023-05-15 03:33:04.619460"}". A status bar at the top right of the screen displays "odin id: shbhat" and "email id: shbhat@pdx.edu".

```
. curl https://06jif2bt4h.execute-api.us-east-1.amazonaws.com/default/gettime-shbhat
{"currentTime": "2023-05-15 03:33:04.619460"}
```

7.3g APIs - Slack and Knowledge Graph

7.3g.1 Could we have used the API Discovery package to interact with the Vision API?

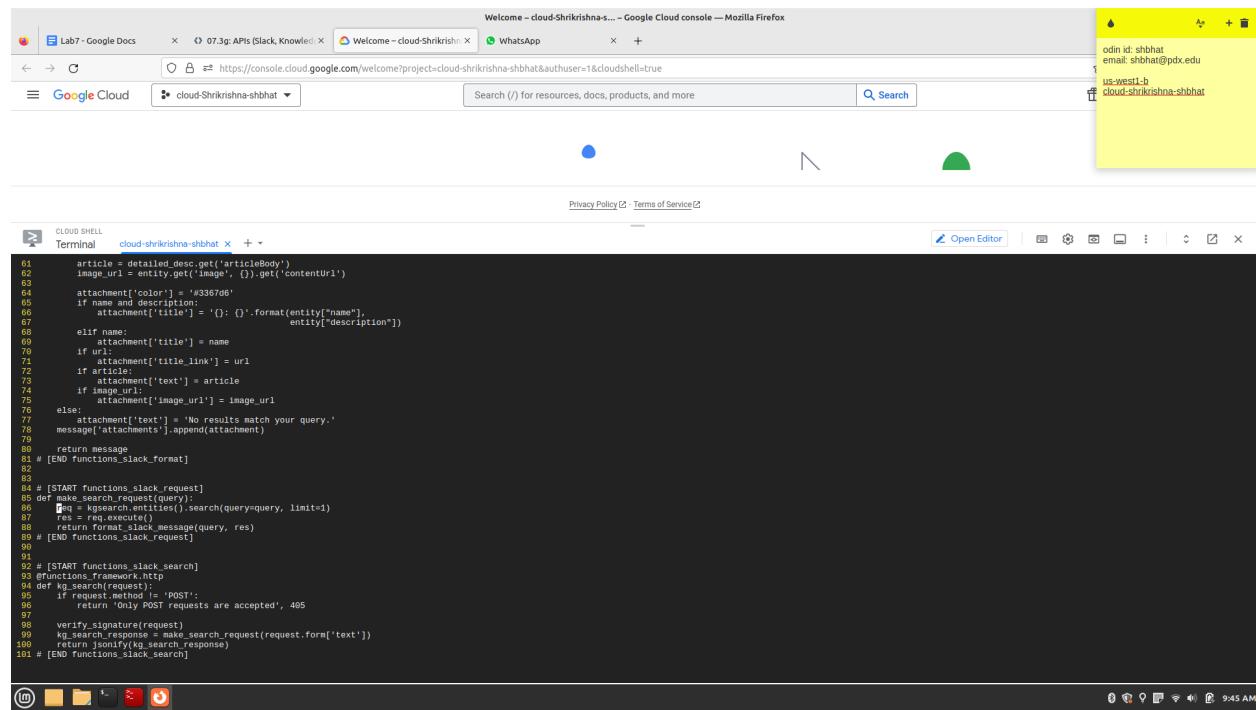
Yes we could have used the API discovery package to interact with vision API.

7.3g.2 Does Google provide a Python package specifically for accessing the Knowledge Graph API?

As of now we do not have any python package specific for Knowledge graph API

7.3g.3 Show the source line that constructs the query we wish to send to the Knowledge Graph API.

Line number 86



```
81     article = detailed_desc.get('articleBody')
82     image_url = entity.get('image', {}).get('contentUrl')
83
84     attachment['color'] = '#336700'
85     if name and description:
86         attachment['title'] = '{}: {}'.format(entity['name'],
87                                         entity['description'])
88     elif name:
89         attachment['title'] = name
90     if url:
91         attachment['title_link'] = url
92     if article:
93         attachment['text'] = article
94     if image_url:
95         attachment['image_url'] = image_url
96     else:
97         attachment['text'] = 'No results match your query.'
98     message['attachments'].append(attachment)
99
100    return message
101 # [END functions_slack_format]
```

```
84 # [START functions_slack_request]
85 def make_search_request(query):
86     req = kgsearch.entities().search(query=query, limit=1)
87     return format_slack_message(query, res)
88 # [END functions_slack_request]
```

```
92 # [START functions_slack_search]
93 @functions_framework.http
94 def search(request):
95     if request.method != 'POST':
96         return 'Only POST requests are accepted', 405
97
98     verify_signature(request)
99     kg_search_response = make_search_request(request.form['text'])
100    return kg_search_response
101 # [END functions_slack_search]
```

7.3g.4 Show the source line that then executes the query and saves the response. What is the name of the method that sends the query to the Knowledge Graph API?

Method name is: make_search_request()

Line number 87

```
Welcome - cloud-Shrkrishna-s... - Google Cloud console — Mozilla Firefox
Lab7 - Google Docs × 07.3g: APIs (Slack, Knowledge) × Welcome - cloud-Shrkrishna-s... × WhatsApp × +
https://console.cloud.google.com/welcome?project=cloud-shrkrishna-shbhat&authuser=1&cloudshell=true
Google Cloud cloud-Shrkrishna-shbhat Search Search
Privacy Policy Terms of Service
CLOUD SHELL Terminal cloud-Shrkrishna-shbhat + v
01     article = detailed_desc.get('articleBody')
02     image_url = entity.get('image', {}).get('contentUrl')
03
04     attachment['color'] = '#3387d6'
05     if name and description:
06         attachment['title'] = '{} {}'.format(entity['name'],
07                                         entity['description'])
08     elif name:
09         attachment['title'] = name
10     if url:
11         attachment['title_link'] = url
12     if article:
13         attachment['text'] = article
14         if image_url:
15             attachment['image_url'] = image_url
16     else:
17         attachment['text'] = 'No results match your query.'
18     message['attachments'].append(attachment)
19
20 return message
21 # [END functions_slack_format]
22
23
24 # [START functions_slack_request]
25 def make_search_request(query):
26     res = requests.get(f'{SLACK_API_URL}/search/{query}', limit=1)
27     if res.status_code == 200:
28         return format_slack_message(query, res.json())
29     else:
30         return 'Error: Unable to search for query'
31 # [END functions_slack_request]
32
33
34 # [START functions_slack_search]
35 def functions_framework_http():
36     def kg_search(request):
37         if request.method != 'POST':
38             return 'Error: Only POST Requests are accepted', 405
39         verify_signature(request)
40         response = make_search_request(request.form['text'])
41         return jsonify(kg_search_response(response))
42     return kg_search
43 # [END functions_slack_search]
```

7.3g.5 What is the Python data type that is used to represent the formatted message?

Text data type can be used to represent formatted messages.

7.3g.6 What are the three main attributes of the formatted message passed back to Slack?

Title, title_link and image_url

7.3g.6 Take a screenshot of its response for your lab notebook.

The screenshot shows a Mozilla Firefox browser window with several tabs open. The active tab is 'general - shbhat-workspace - Slack — Mozilla Firefox' at <https://app.slack.com/client/T057N3GUDTQ/C057UHH76RH>. The page displays the '# general' channel. A message from 'Shrikrishna Bhat' at 9:53 AM says 'joined #general'. Another message from 'Shrikrishna Bhat' at 10:03 AM says '/kg chatgpt'. A message from 'cs530bot-shbhat' at 10:03 AM says 'Query: chatgpt' followed by a detailed description of ChatGPT. The interface includes a search bar, a sidebar with workspace navigation, and a message input field. A tooltip on the right side of the screen shows a URL: https://us-central1-cloud-shrikishna-shbhat.cloudfunctions.net/kg_search.

7.4a Lambda and API Gateway Guestbook

7.4a.1 Take a screenshot that shows that you can view the entries in the backend database.

The screenshot shows a Mozilla Firefox window with several tabs open. The active tab displays a 'Guestbook' form with fields for Name, Email, and Message, along with a 'Sign' button. Below the form, there is a section titled 'Entries' containing four entries:

- shbhat <shbhat@pdx.edu>
signed on 2023-05-01 18:44:56.712083
Hello DynamoDB
- shbhat <shbhat@pdx.edu>
signed on 2023-05-02 01:58:04.339982
Hello Docker DynamoDB
- shbhat <shbhat@pdx.edu>
signed on 2023-05-02 22:32:46.667032
Hello Cloud9!
- shbhat <shbhat@pdx.edu>
signed on 2023-05-03 16:43:25.437366
Hello EC2!

A yellow sidebar on the right provides AWS Lambda details:

- Function name: shbhat@pdx.edu
- Last invocation: 2023-05-03 16:43:25.437366
- Role: LabRole
- Runtime: Node.js 18
- Memory: 128 MB
- Timeout: 300 seconds
- HTTP API: t1vhuvuepf.execute-api.us-east-1.amazonaws.com/prod
- Logs: https://t1vhuvuepf.execute-api.us-east-1.amazonaws.com/prod/logs

7.4a.2 Take a screenshot showing that the submission worked.

The screenshot shows the AWS API Gateway Console in Mozilla Firefox. The left sidebar lists the API named 'shbhat-gb-rest...'. The main area shows the 'POST /entries' method configuration. The 'Request Body' section contains the JSON input for the fourth entry:

```
1 {
  "name": "shbhat",
  "email": "shbhat@pdx.edu",
  "message": "Hello API Gateway"
}
```

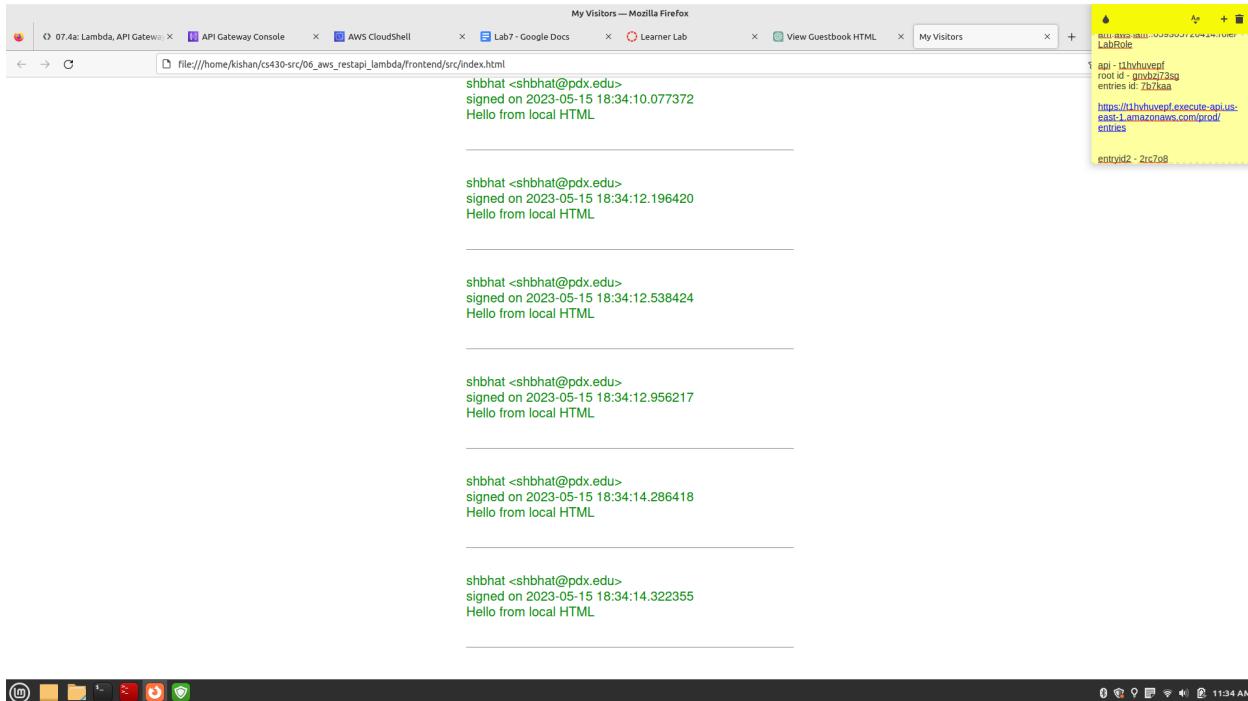
The 'Response Body' section shows the JSON output of the Lambda function, which includes the entry details and a timestamp:

```
[{"message": "Hello DynamoDB", "date": "2023-05-01 18:44:56.712083", "email": "shbhat@pdx.edu"}, {"message": "Hello Docker DynamoDB", "date": "2023-05-02 01:58:04.339982", "email": "shbhat@pdx.edu"}, {"message": "Hello Cloud9!", "date": "2023-05-02 22:32:46.667032", "email": "shbhat@pdx.edu"}, {"message": "Hello EC2!", "date": "2023-05-03 16:43:25.437366", "email": "shbhat@pdx.edu"}]
```

The 'Logs' section shows the execution log for the Lambda function:

```
Execution log for request 08692e1e-77ed-4e4a-b132-9b6363595add
Mon May 15 18:29:07 UTC 2023 : Starting execution for request: 08692e1e-77ed-4e4a-b132-9b6363595add
Mon May 15 18:29:07 UTC 2023 : HTTP Method: POST, Resource Path: /entries
Mon May 15 18:29:07 UTC 2023 : Method request path: {}
Mon May 15 18:29:07 UTC 2023 : Method request query string: {}
Mon May 15 18:29:07 UTC 2023 : Method request headers: {}
Mon May 15 18:29:07 UTC 2023 : Method request body before transformation
{
  "name": "shbhat",
  "email": "shbhat@pdx.edu",
  "message": "Hello API Gateway"
}
Mon May 15 18:29:07 UTC 2023 : Endpoint request URI: https://lambda.us-east-1.amazonaws.com/2015-03-31/functions/arn:aws:lambda:us-east-1:059305720414:function:shbhat-gb-sign-lambda:invocations
Mon May 15 18:29:07 UTC 2023 : Endpoint request headers: {X-Amz-Date=2023-05-15T18:29:07Z, X-Amzn-ApiGateway-API-ID=t1vhuvuepf, Accept=application/json, User-Agent=AmazonAPIGateway_t1vhuvuepf, Host=lambda.us-east-1.amazonaws.com, X-Amz-Content-Sha256=d3e7f13582c907ea0793dc38856c8b0da494bc62776d34fac02fe3a6367f3c94, X-Amzn-Trace-Id=Root=1-059305720414:464279f3-4f6da241433c1e1}
```

7.4a.3 Use it to enter another entry into the Guestbook and see that it is returned.



The screenshot shows a Mozilla Firefox window with several tabs open. The active tab is titled "My Visitors — Mozilla Firefox" and displays a guestbook entry from "shbhat <shbhat@pdx.edu>" signed on 2023-05-15 18:34:10.077372. Below this, there are five more entries, each with a timestamp and a "Hello from local HTML" message. A yellow highlight box on the right side of the screen contains API endpoint details: "id: 11bfhuvepf", "root_id: 4d-guduq2f3sg", "entries_id: 7b7kaa", and the URL "https://11bfhuvepf.execute-api.us-east-1.amazonaws.com/prod/entries".

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 18:34:10.077372
Hello from local HTML

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 18:34:12.196420
Hello from local HTML

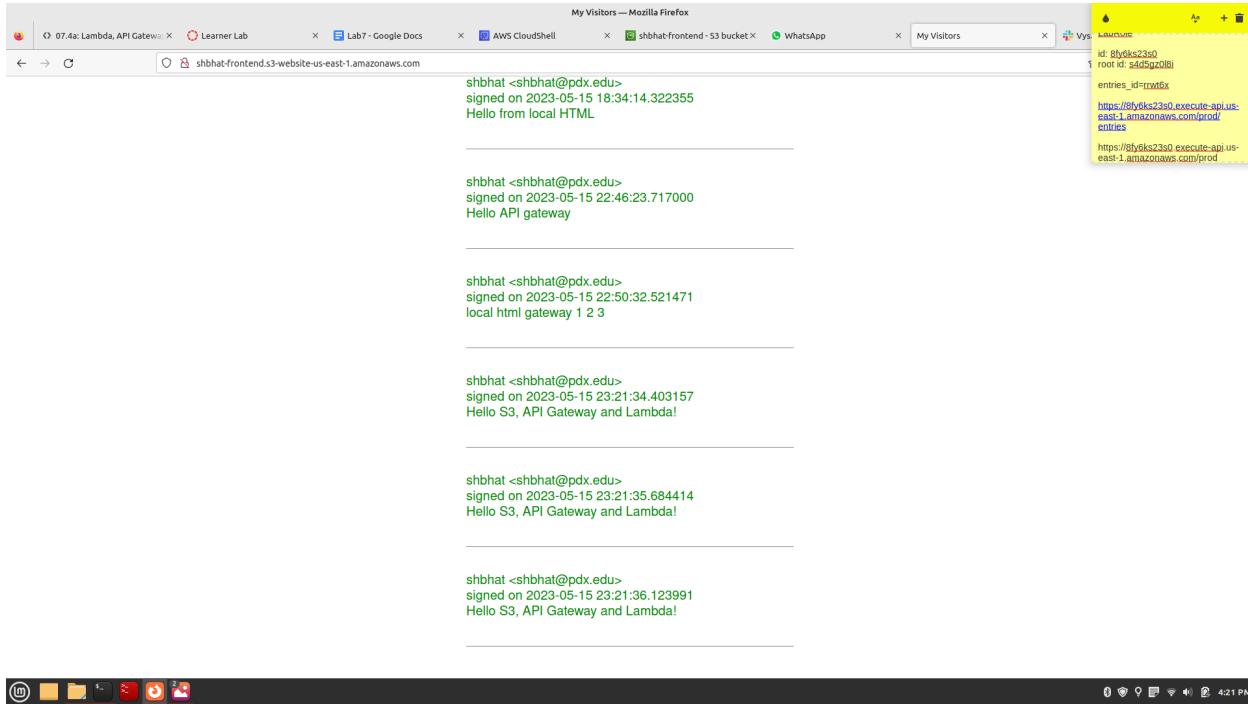
shbhat <shbhat@pdx.edu>
signed on 2023-05-15 18:34:12.538424
Hello from local HTML

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 18:34:12.956217
Hello from local HTML

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 18:34:14.286418
Hello from local HTML

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 18:34:14.322355
Hello from local HTML

7.4a.4 Take a screenshot as before that shows your entry and the static website hosting URL.



The screenshot shows a Mozilla Firefox window with several tabs open. The active tab is titled "My Visitors — Mozilla Firefox" and displays a guestbook entry from "shbhat <shbhat@pdx.edu>" signed on 2023-05-15 18:34:14.322355. Below this, there are four more entries, each with a timestamp and a "Hello API gateway" message. A yellow highlight box on the right side of the screen contains API endpoint details: "id: 8fy6ks23sg", "root_id: s4fdg208", "entries_id: rmwtx", and the URL "https://8fy6ks23sg.execute-api.us-east-1.amazonaws.com/prod/entries".

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 18:34:14.322355
Hello from local HTML

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 22:46:23.717000
Hello API gateway

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 22:50:32.521471
local html gateway 1 2 3

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 23:21:34.403157
Hello S3, API Gateway and Lambda!

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 23:21:35.684414
Hello S3, API Gateway and Lambda!

shbhat <shbhat@pdx.edu>
signed on 2023-05-15 23:21:36.123991
Hello S3, API Gateway and Lambda!

7.4g Cloud Functions API Gateway Guestbook

7.4g.1 Include the hostname for the API gateway in your lab notebook.

Answer: gbapigw-745hpadm.uc.gateway.dev

7.4g.2 Take a screenshot of the loop and its output

The screenshot shows a Cloud Shell terminal window in Mozilla Firefox. The terminal output is as follows:

```
>>> print(type(resp.json()))
<class 'list'>
>>> first_entry = resp.json()[0]
Traceback (most recent call last):
File "<stdin>", line 1, in <module>
NameError: name 'resp' is not defined
>>> first_entry = resp[0]
Traceback (most recent call last):
File "<stdin>", line 1, in <module>
TypeError: 'Response' object is not subscriptable
>>> first_entry = resp[0]
Traceback (most recent call last):
File "<stdin>", line 1, in <module>
TypeError: 'Response' object is not subscriptable
>>> first_entry = resp[0]
Traceback (most recent call last):
File "<stdin>", line 1, in <module>
TypeError: 'Response' object is not subscriptable
>>> entries = resp.json()
... # Print individual fields of each entry
...     print("Name:", entry['name'])
...     print("Email:", entry['email'])
...     print("Date:", entry['date'])
...     print("Message:", entry['message'])
...     print("-----") # Separator between entries
...
[1]+  Stopped                 python3
shubhat@shubhat-OptiPlex-5090:~/cloudfunctions$ python3
Python 3.9.2 (default, Feb 28 2021, 17:03:44)
[GCC 10.2.1 20210110] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> resp = requests.get('https://gbapigw-745hpadm.uc.gateway.dev/entries')
>>> print(resp)
<Response [200 OK]>
>>> print(resp[0])
Traceback (most recent call last):
File "<stdin>", line 1, in <module>
TypeError: 'Response' object is not subscriptable
>>> print(resp.json())
[{"id": 1, "name": "shubhat", "email": "shubhat@pdx.edu", "date": "2023-05-02 03:01:08.312046+00:00", "message": "Hello Cloud Shell!"}
>>> response = resp.json()
>>> response[0]
>>> for attribute, value in response.items():
...     print(attribute, value)
...
name shubhat
email shubhat@pdx.edu
date 2023-05-02 03:01:08.312046+00:00
message Hello Cloud Shell!
>>>
```

7.4g.3 Take a screenshot of the output for your lab notebook

Cloud Shell — Mozilla Firefox

0 07:48: Cloud Functions API x Welcome - cloud-shrikris... x Cloud Shell x Lab7 - Google Docs x Extracting API Response In x WhatsApp x New Tab +

https://shell.cloud.google.com/?hl=en_US&authuser=1&fromcloudshell=true&show=terminal

Cloud Shell Editor

cloud-shrikrishe-shbhat x +

```
>>> resp = requests.get('https://gbapigw-745hpadm.uc.gateway.dev/entries')
>>> print(resp)
<Response [200]>

Traceback (most recent call last):
  File "<stddf>", line 1, in <module>
    >>> print(resp)
TypeError: 'Response' object is not subscriptable
  >>> print(resp.json()[0])
{'name': 'shbhat', 'email': 'shbhat@pdx.edu', 'date': '2023-05-02 03:01:08.312046+00:00', 'message': 'Hello Cloud Shell!'}

  >>> resp = resp.json()
  >>> entry = resp[0]
  >>> for attribute, value in entry.items():
  ...     print(attribute, value)

Traceback (most recent call last):
  File "<stddf>", line 1, in <module>
    >>> AttributeError: 'dict' object has no attribute 'item'
  >>> response = resp.json()
  >>> entry = response[0]
  >>> for attribute, value in entry.items():
  ...     print(attribute, value)

  name shbhat
  email shbhat@pdx.edu
  date 2023-05-02 03:01:08.312046+00:00
  message Hello Cloud Shell!
  >>> print(entry)
  >>> mydict = {
  ...     'name': 'shbhat',
  ...     'email': 'shbhat@pdx.edu',
  ...     'date': '2023-05-02 03:01:08.312046+00:00',
  ...     'message': 'Hello Cloud Shell!'
  ... }

  >>> print(mydict)
SyntaxError: invalid syntax
  >>> mydict = {
  ...     'name': 'shbhat',
  ...     'email': 'shbhat@pdx.edu',
  ...     'date': '2023-05-02 03:01:08.312046+00:00',
  ...     'message': 'Hello Cloud Functions from Python Requests'
  ... }

  >>> resp = requests.post('https://gbapigw-745hpadm.uc.gateway.dev/entry', json=mydict)
  >>> print(resp.status_code)
200
  >>> print(resp.headers)
{'Content-Type': 'application/json', 'Access-Control-Allow-Origin': '*', 'Function-Execution-ID': 'yfx5a969sqwq', 'x-Cloud-Trace-Context': 'b8a1ccacd51b0fca3149cd644c70302;o=1', 'Alt-Svc': ':h3=\":443\"; ma=2592000,h3-29=\":443\"; ma=2592000', 'D
  >>> print(resp.text)
"[{"name": "shbhat", "email": "shbhat@pdx.edu", "date": "2023-05-02 03:01:08.312046+00:00", "message": "Hello Cloud Shell!"}, {"name": "shbhat", "email": "shbhat@pdx.edu", "date": "2023-05-02 03:01:08.312046+00:00", "message": "Hello Cloud Run!"}, {"name": "shbhat", "email": "shbhat@pdx.edu", "date": "2023-05-21 17:17:18.242054+00:00", "message": "Hello Cloud Functions From Python Requests"}, {"name": "shbhat", "email": "shbhat@pdx.edu", "date": "2023-05-02 03:01:08.312046+00:00", "message": "Hello App Engine!"}, {"name": "shbhat", "email": "shbhat@pdx.edu", "date": "2023-05-02 03:01:08.312046+00:00", "message": "Hello Docker Datastore!"}, {"name": "shbhat", "email": "shbhat@pdx.edu", "date": "2023-05-02 03:18:38.153055+00:00", "message": "Hello Compute Engine!"}]"
  >>> 
```

7.4g.4 Take a screenshot showing the preflight request to the API that allows API access, as well as the subsequent fetch request have been successful.

The screenshot shows a web browser window with two tabs open. The active tab displays a guestbook application titled "Guestbook". It has fields for "Name", "Email", and "Message", followed by a "Sign" button. Below the form, there's a section titled "Entries" containing three entries from different users:

- shbhat <shbhat@pdx.edu>
signed on 2023-05-02 03:01:08.312046+00:00
Hello Cloud Shell!
- shbhat <shbhat@pdx.edu>
signed on 2023-05-01 19:35:40.465330+00:00
Hello Datastore
- shbhat <shbhat@pdx.edu>
signed on 2023-05-11 21:10:37.273056+00:00
Hello Cloud Run!

A yellow callout box highlights the first entry, showing the following details:

- odin id: shbhat
- email: shbhat@pdx.edu
- <https://us-central1-cloud-shrirkrsna-shbhat.cloudfunctions.net/entries>
- <https://us-central1-cloud-shrirkrsna-shbhat.cloudfunctions.net/entry>
- obaniiw-745hdpdm uc.gateway.dev/

The browser's developer tools Network tab is open, showing the request for "index.html". The timeline shows the request taking approximately 92ms. The table below lists the requests:

Name	Status	Type	Initiator	Size	Time	Waterfall
index.html	200	document	Other	844 B	5 ms	↑
style.css	200	stylesheet	index.html	566 B	3 ms	↑
guestbook.js	200	script	index.html	2.3 kB	3 ms	↑
entries	200	fetch	guestbook.js:8	309 B	172 ms	↑
entries	200	preflight	Preflight ↗	0 B	92 ms	↑

7.4g.5 Take a screenshot of the Guestbook including the URL.

The screenshot shows a web browser window with the title "My Visitors". The address bar indicates the file path: "/home/kishan/cs430-src/06_gcp_restapi_cloudfunctions/frontend-src/index.html". The main content area displays a "Guestbook" form with fields for Name, Email, and Message. The message field contains the text "Hello API Gateway from local SPA". Below the form, a section titled "Entries" lists four entries, each with a timestamp and a message. The first entry is from "shbhat <shbhat@pdx.edu>" on May 2, 2023, at 03:01:08.312046+00:00, saying "Hello Cloud Shell!". The second entry is from "shbhat <shbhat@pdx.edu>" on May 21, 2023, at 17:35:05.088942+00:00, saying "Hello API Gateway from local SPA". The third entry is from "shbhat <shbhat@pdx.edu>" on May 1, 2023, at 19:35:40.465330+00:00, saying "Hello Datastore". The fourth entry is from "shbhat <shbhat@pdx.edu>" on May 11, 2023, at 21:10:37.273056+00:00, saying "Hello Cloud Run!". To the right of the browser window, the developer tools Network tab is open, showing a list of requests. The "entries" endpoint is listed with a status of 200, type of "Fetch", initiator of "questbook.js:8", and a time of 172 ms. The Waterfall panel shows the timeline of this request.

This screenshot is nearly identical to the one above, showing the same guestbook application and network traffic. The main difference is the timestamp in the bottom right corner of the browser window, which has changed from "10:36 AM" to "10:38 AM". The developer tools Network tab shows the same list of requests, with the "entries" endpoint taking 190 ms.

7.4g.6 Take a screenshot of the Guestbook including the URL.

Screenshot of a browser window showing a guestbook application and Network tab of the developer tools.

Guestbook

Name:
 Email:
 Message:

Entries

shbhat <shbhat@pdx.edu>
 signed on 2023-05-02 03:01:08.312046+00:00
 Hello Cloud Shell!

shbhat <shbhat@pdx.edu>
 signed on 2023-05-21 17:35:05.088942+00:00
 Hello API Gateway from local SPA

shbhat <shbhat@pdx.edu>
 signed on 2023-05-01 19:35:40.465330+00:00
 Hello Datastore

shbhat <shbhat@pdx.edu>
 signed on 2023-05-11 21:10:37.273056+00:00
 Hello Cloud Run!

Network tab details:

- Request count: 7 requests
- Total transferred: 6.6 kB
- Resources: 5.6 kB
- Finish time: 398 ms
- DOMContentLoaded: 121 ms
- Load time: 120 ms

Log entries:

```
odin kf: shbhat
email: shbhat@pdx.edu
https://us-central1-cloud-shrikhsa-shbhat.cloudfunctions.net/entries
https://us-central1-cloud-shrikhsa-shbhat.cloudfunctions.net/entry
gbapigw-745hpadmin.uc.gateway.dev
```

Screenshot of a browser window showing a guestbook application and Network tab of the developer tools.

My Visitors

storage.googleapis.com/gbapi-shbhat/index.html

shbhat <shbhat@pdx.edu>
 signed on 2023-05-11 21:10:37.273056+00:00
 Hello Cloud Run!

shbhat <shbhat@pdx.edu>
 signed on 2023-05-07 04:06:10.022562+00:00
 Hello App Engine!

shbhat <shbhat@pdx.edu>
 signed on 2023-05-21 17:17:18.242054+00:00
 Hello Cloud Functions from Python Requests

shbhat <shbhat@pdx.edu>
 signed on 2023-05-02 02:46:38.944829+00:00
 Hello Docker Datastore!

shbhat <shbhat@pdx.edu>
 signed on 2023-05-21 17:47:08.624089+00:00
 Hello API Gateway from SPA in GCS

shbhat <shbhat@pdx.edu>
 signed on 2023-05-02 03:10:38.153055+00:00
 Hello Compute Engine!

Network tab details:

- Request count: 9 requests
- Total transferred: 7.0 kB
- Resources: 6.8 kB
- Finish time: 3.4 min
- DOMContentLoaded: 121 ms
- Load time: 120 ms

Log entries:

```
odin kf: shbhat
email: shbhat@pdx.edu
https://us-central1-cloud-shrikhsa-shbhat.cloudfunctions.net/entries
https://us-central1-cloud-shrikhsa-shbhat.cloudfunctions.net/entry
gbapigw-745hpadmin.uc.gateway.dev
```