CS530 F23 Week 7 Lab
Prof. Feng

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11/12/23

✅ indicates that a section was completed but did not request any screenshots or written answers.

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I. Lab 7.1a: Terraform AWS Guestbook

1. Terraform

✅

2. Setup

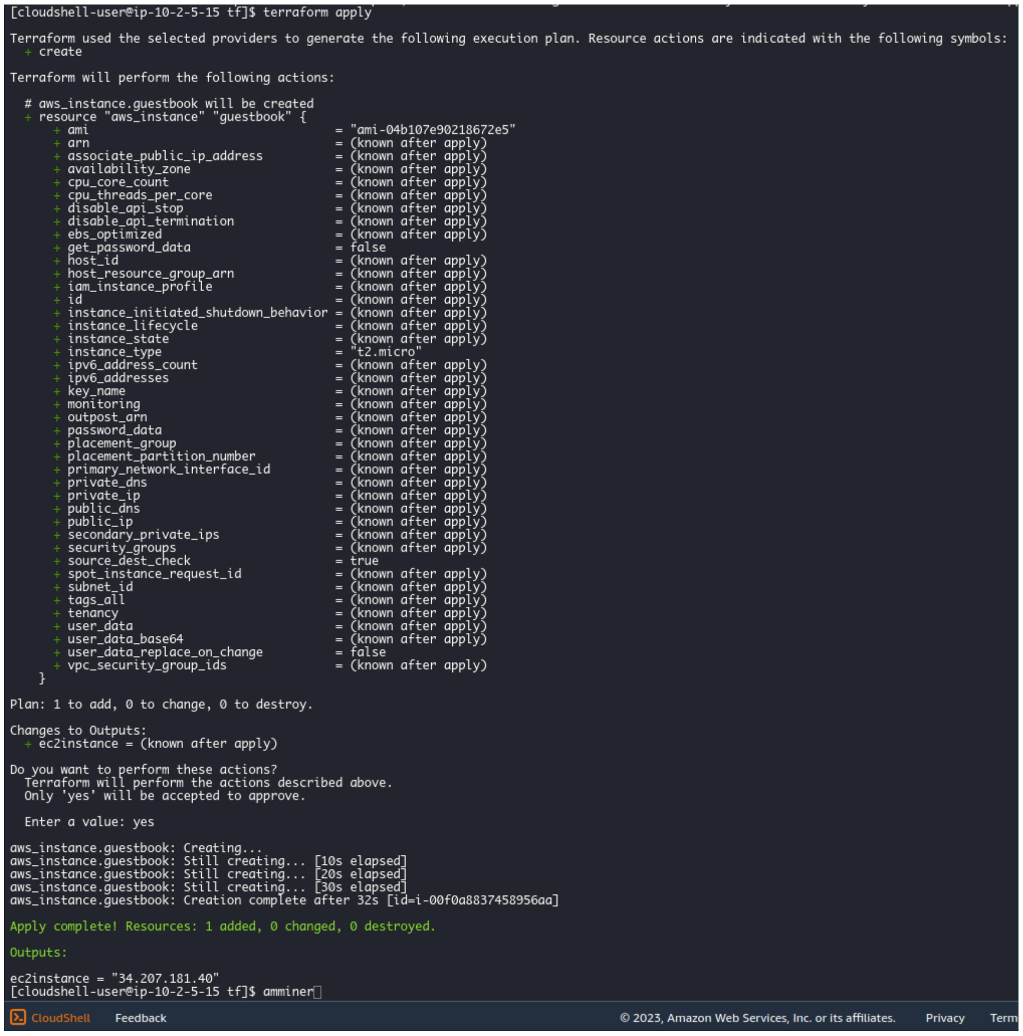
- In AWS cloud shell, install yum-utils, add the hashicorp repo, and install terraform. Make a directory for your terraform deployment and cd in. ✅

3. Initial Configuration

- Examine and copy over the main.tf file contents from the lab. ✅

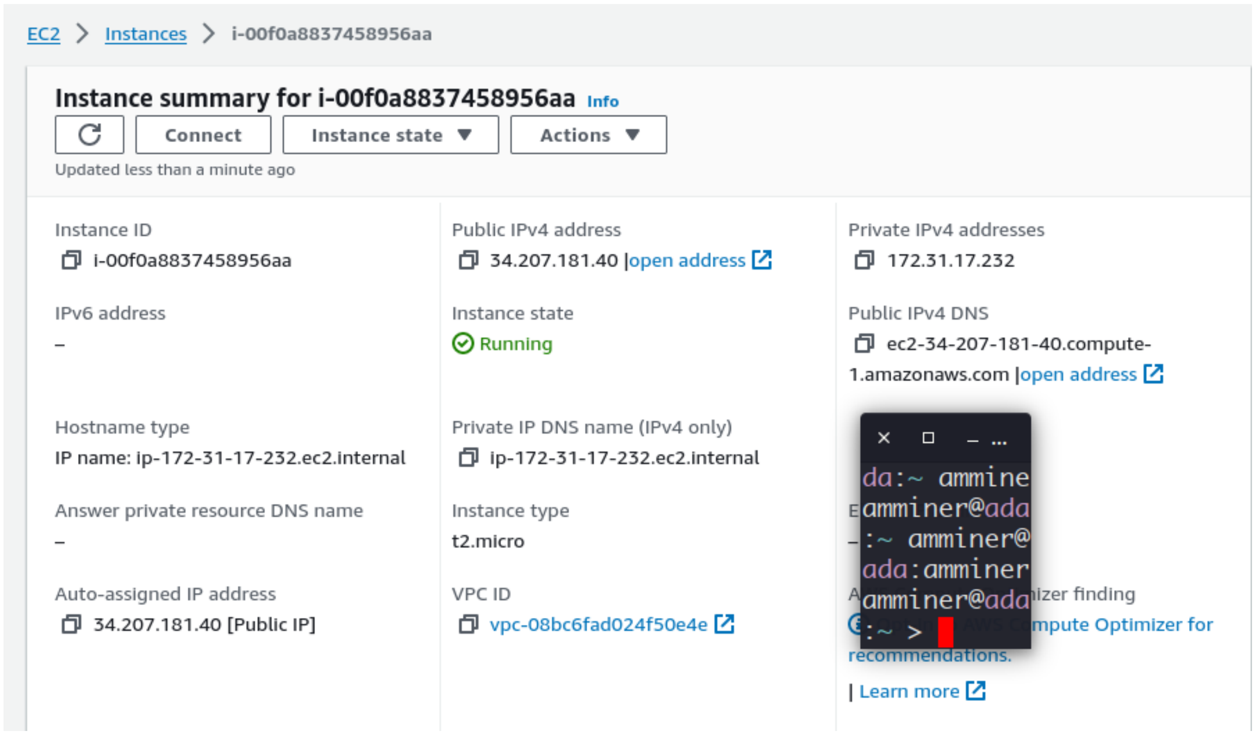
4. Launching Configuration

- init, plan, and apply the terraform configuration. Show the output of the appliy command.



```
[cloudshell-user@ip-10-2-5-15 tf]$ terraform apply

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the following symbols:
  + create

Terraform will perform the following actions:

  # aws_instance.guestbook will be created
  + resource "aws_instance" "guestbook" {
      + ami                                  = "ami-04b107e90218672e5"
      + arn                                  = (known after apply)
      + associate_public_ip_address          = (known after apply)
      + availability_zone                    = (known after apply)
      + cpu_core_count                       = (known after apply)
      + cpu_threads_per_core                 = (known after apply)
      + disable_api_stop                     = (known after apply)
      + disable_api_termination              = (known after apply)
      + ebs_optimized                        = (known after apply)
      + get_password_data                    = false
      + host_id                              = (known after apply)
      + host_resource_group_arn              = (known after apply)
      + iam_instance_profile                 = (known after apply)
      + id                                   = (known after apply)
      + instance_initiated_shutdown_behavior = (known after apply)
      + instance_lifecycle                   = (known after apply)
      + instance_state                       = (known after apply)
      + instance_type                        = "t2.micro"
      + ipv6_address_count                   = (known after apply)
      + ipv6_addresses                       = (known after apply)
      + key_name                             = (known after apply)
      + monitoring                           = (known after apply)
      + outpost_arn                          = (known after apply)
      + password_data                        = (known after apply)
      + placement_group                      = (known after apply)
      + placement_partition_number           = (known after apply)
      + primary_network_interface_id         = (known after apply)
      + private_dns                          = (known after apply)
      + private_ip                           = (known after apply)
      + public_dns                           = (known after apply)
      + public_ip                            = (known after apply)
      + secondary_private_ips                = (known after apply)
      + security_groups                      = (known after apply)
      + source_dest_check                    = true
      + spot_instance_request_id             = (known after apply)
      + subnet_id                            = (known after apply)
      + tags_all                             = (known after apply)
      + tenancy                              = (known after apply)
      + user_data                            = (known after apply)
      + user_data_base64                     = (known after apply)
      + user_data_replace_on_change          = false
      + vpc_security_group_ids               = (known after apply)
    }

Plan: 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: Creation complete after 32s [id=i-00f0a8837458956aa]

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

Outputs:

ec2instance = "34.207.181.40"
[cloudshell-user@ip-10-2-5-15 tf]$ amminer
```

- Visit EC2 within the web console and refresh it to see that the IP address has been bound to the VM


EC2 > Instances > i-00f0a8837458956aa

Instance summary for i-00f0a8837458956aa Info

Updated less than a minute ago

Instance ID
i-00f0a8837458956aa

Public IPv4 address
34.207.181.40 |open address

Private IPv4 addresses
172.31.17.232

IPv6 address
–

Instance state
Running

Public IPv4 DNS
ec2-34-207-181-40.compute-1.amazonaws.com |open address

Hostname type
IP name: ip-172-31-17-232.ec2.internal

Private IP DNS name (IPv4 only)
ip-172-31-17-232.ec2.internal

Answer private resource DNS name
–

Instance type
t2.micro

Auto-assigned IP address
34.207.181.40 [Public IP]

VPC ID
vpc-08bc6fad024f50e4e

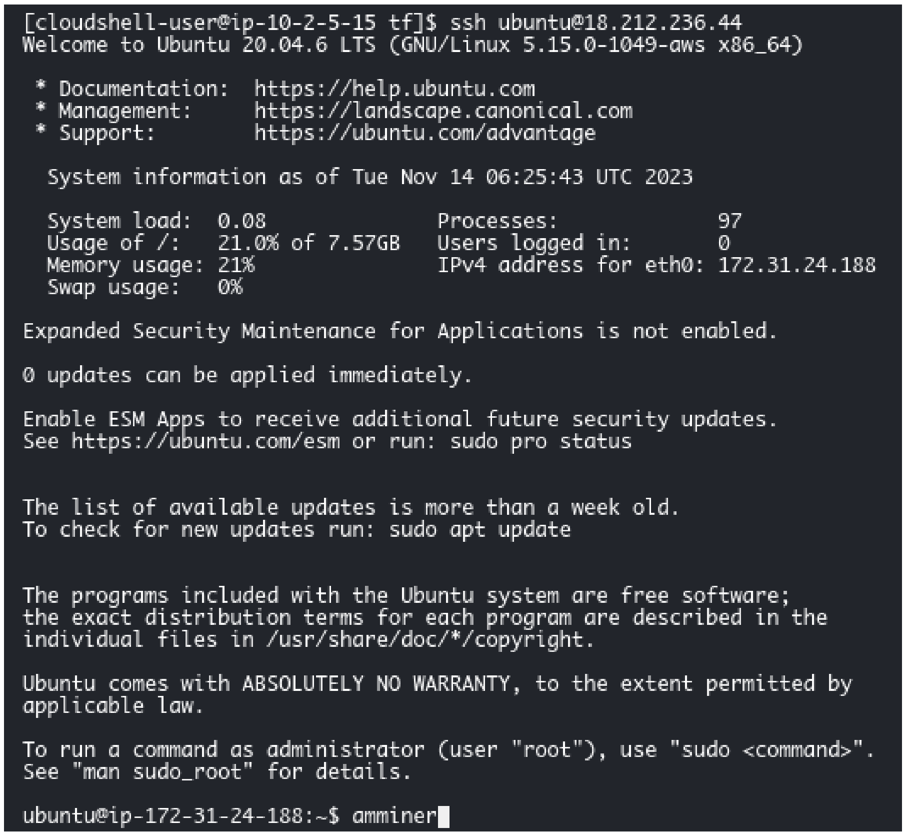
```
da:~ ammine
amminer@ada
:~ amminer@
ada:amminer
amminer@ada
:~ >
```

5. Adding Network Access

- Copy the new blocks into the tf file, plan, and apply.
  ✅

6. Adding ssh access

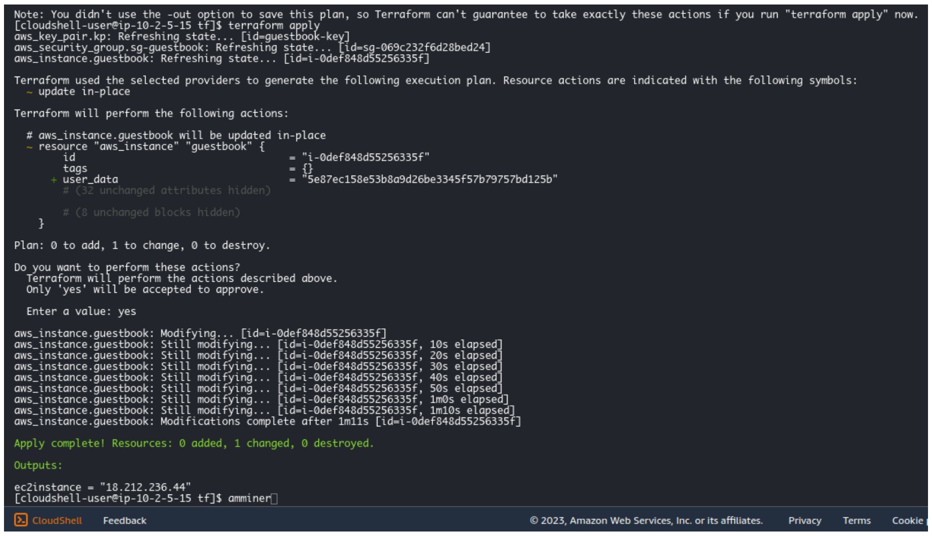
- Generate a keypair, add it to the config, redeploy, log in.



```
[cloudshell-user@ip-10-2-5-15 tf]$ ssh ubuntu@18.212.236.44
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1049-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

  System information as of Tue Nov 14 06:25:43 UTC 2023

  System load:  0.08              Processes:             97
  Usage of /:   21.0% of 7.57GB   Users logged in:       0
  Memory usage: 21%               IPv4 address for eth0: 172.31.24.188
  Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status


The list of available updates is more than a week old.
To check for new updates run: sudo apt update


The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-24-188:~$ amminer
```

7. Adding the guestbook application

- copy the code from the lab in, plan, and apply.

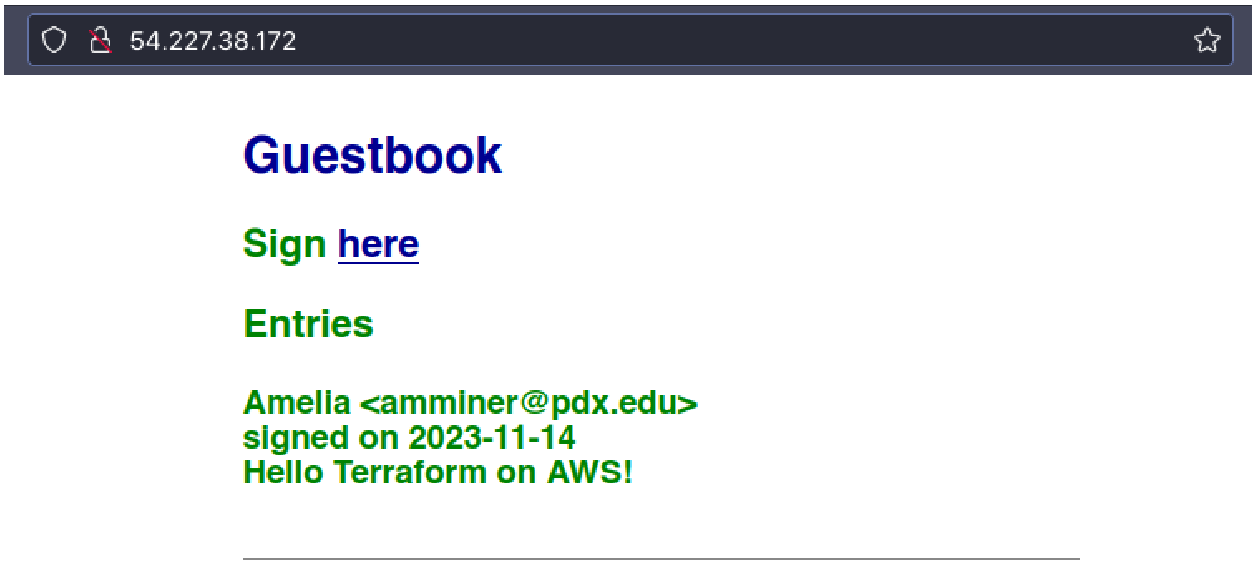


```
Note: You didn't use the -out option to save this plan, so Terraform can't guarantee to take exactly these actions if you run "terraform apply" now.
[cloudshell-user@ip-10-2-5-15 tf]$ terraform apply
aws_key_pair.kp: Refreshing state... [id=guestbook-key]
aws_security_group.sg-guestbook: Refreshing state... [id=sg-069c232f6d28bed24]
aws_instance.guestbook: Refreshing state... [id=i-0def848d55256335f]

Terraform used the selected providers to generate the following execution plan. Resource actions are indicated with the following symbols:
  ~ update in-place

Terraform will perform the following actions:

  # aws_instance.guestbook will be updated in-place
  ~ resource "aws_instance" "guestbook" {
        id                                   = "i-0def848d55256335f"
        tags                                 = {}
      + user_data                            = "5e87ec158e53b8a9d26be3345f57b79757bd125b"
        # (32 unchanged attributes hidden)

        # (8 unchanged blocks hidden)
    }

Plan: 0 to add, 1 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

aws_instance.guestbook: Modifying... [id=i-0def848d55256335f]
aws_instance.guestbook: Still modifying... [id=i-0def848d55256335f, 10s elapsed]
aws_instance.guestbook: Still modifying... [id=i-0def848d55256335f, 20s elapsed]
aws_instance.guestbook: Still modifying... [id=i-0def848d55256335f, 30s elapsed]
aws_instance.guestbook: Still modifying... [id=i-0def848d55256335f, 40s elapsed]
aws_instance.guestbook: Still modifying... [id=i-0def848d55256335f, 50s elapsed]
aws_instance.guestbook: Still modifying... [id=i-0def848d55256335f, 1m0s elapsed]
aws_instance.guestbook: Still modifying... [id=i-0def848d55256335f, 1m10s elapsed]
aws_instance.guestbook: Modifications complete after 1m11s [id=i-0def848d55256335f]

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

Outputs:

ec2instance = "18.212.236.44"
[cloudshell-user@ip-10-2-5-15 tf]$ amminer
```

- `ssh` in and perform a process listing until the `gunicorn` process appears. ✅

8. View the guestbook

- Sign it.



54.227.38.172

Guestbook

Sign here

Entries

Amelia <amminer@pdx.edu>
signed on 2023-11-14
Hello Terraform on AWS!

9. Clean up

✅

II. Lab 7.1g: Terraform GCP Guestbook

1. Terraform

✅

2. Setup

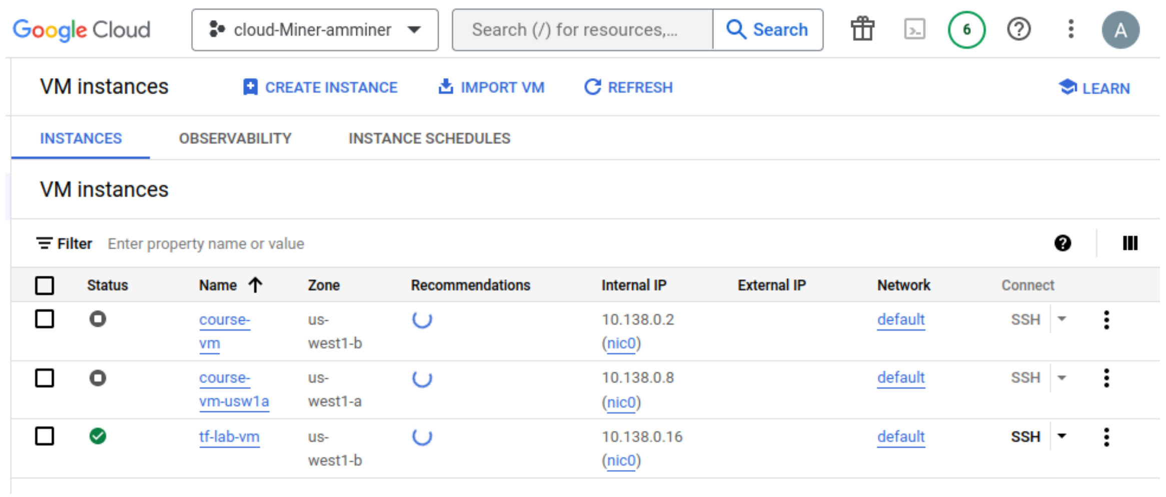
✅

3. Initial Configuration

- Copy the main.tf code. Substitute in the fmi and your project name. ✅

4. Launching Configuration

- Init, plan and apply. Show the VM's IP addresses in the CE web console.



VM instances

Status	Name	Zone	Recommendations	Internal IP	External IP	Network	Connect
●	course-vm	us-west1-b		10.138.0.2 (nic0)		default	SSH
●	course-vm-usw1a	us-west1-a		10.138.0.8 (nic0)		default	SSH
✓	tf-lab-vm	us-west1-b		10.138.0.16 (nic0)		default	SSH

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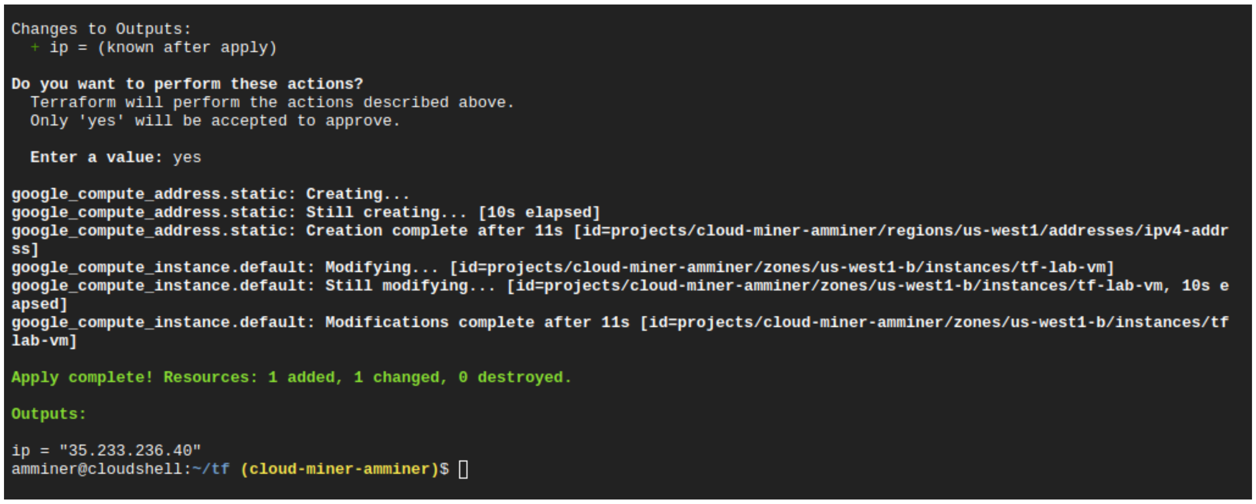
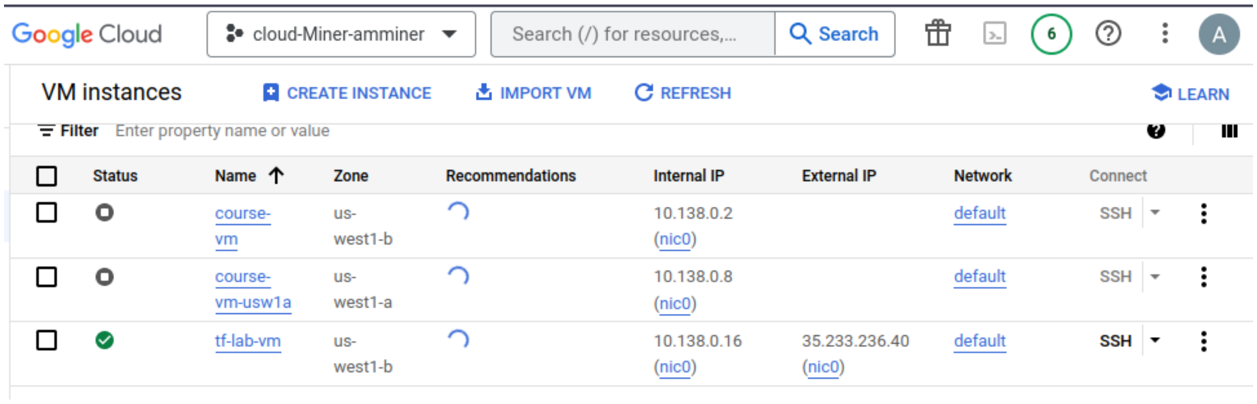
5. Adding an external IP Address

- Copy the code in from the lab to add an external IP to the machine. Plan. Apply. Show the output.



```
Changes to Outputs:
  + ip = (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

google_compute_address.static: Creating...
google_compute_address.static: Still creating... [10s elapsed]
google_compute_address.static: Creation complete after 11s [id=projects/cloud-miner-amminer/regions/us-west1/addresses/ipv4-addr
ss]
google_compute_instance.default: Modifying... [id=projects/cloud-miner-amminer/zones/us-west1-b/instances/tf-lab-vm]
google_compute_instance.default: Still modifying... [id=projects/cloud-miner-amminer/zones/us-west1-b/instances/tf-lab-vm, 10s e
apsed]
google_compute_instance.default: Modifications complete after 11s [id=projects/cloud-miner-amminer/zones/us-west1-b/instances/tf
lab-vm]

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

Outputs:

ip = "35.233.236.40"
amminer@cloudshell:~/tf (cloud-miner-amminer)$ 
```

- Visit the Compute Engine web console and refresh it to see that the IP address has been bound to the VM. Take a screenshot that includes the VM's IP addresses.

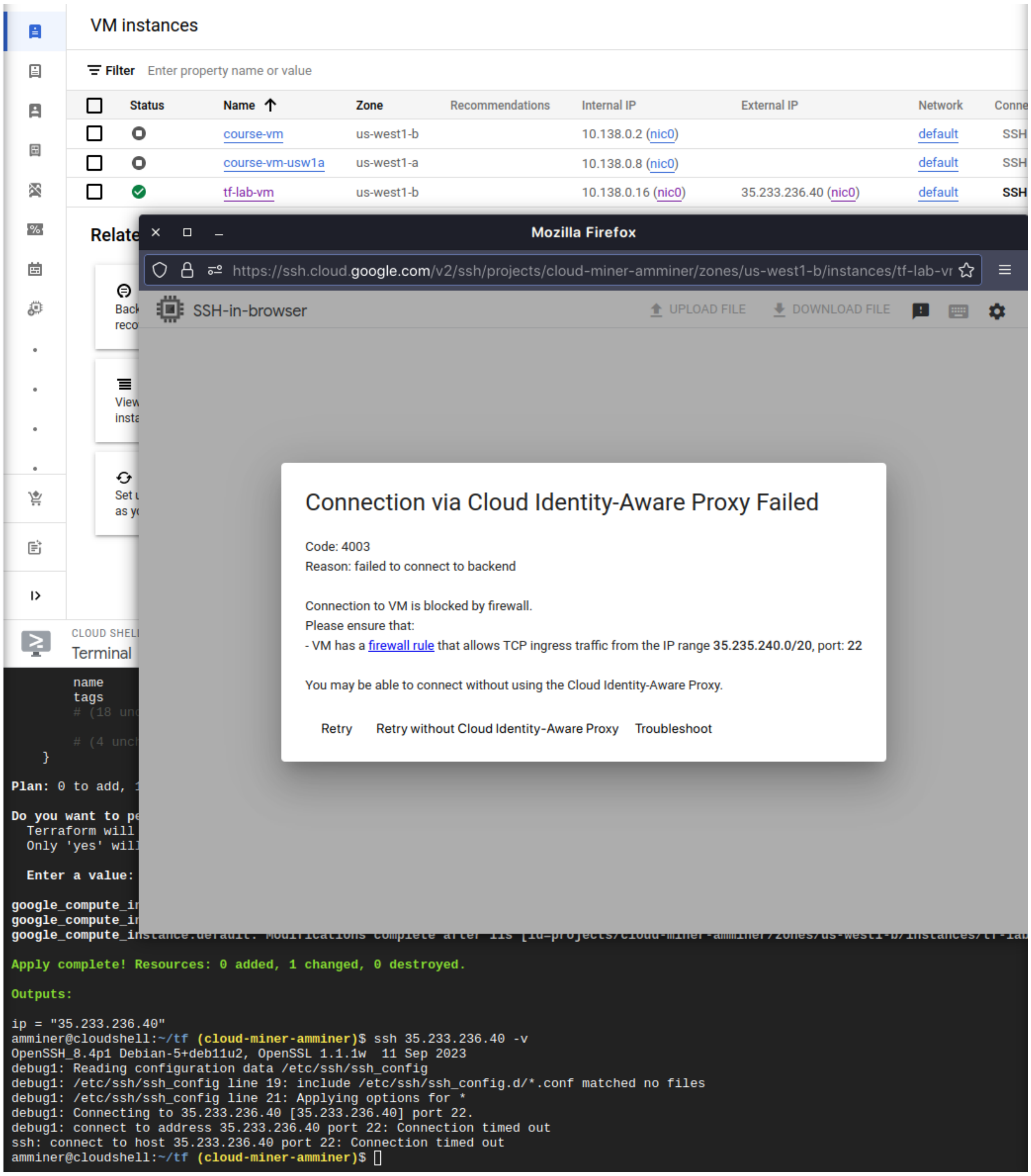


Status	Name	Zone	Recommendations	Internal IP	External IP	Network	Connect
	course-vm	us-west1-b		10.138.0.2 (nic0)		default	SSH
	course-vm-usw1a	us-west1-a		10.138.0.8 (nic0)		default	SSH
✓	tf-lab-vm	us-west1-b		10.138.0.16 (nic0)	35.233.236.40 (nic0)	default	SSH

6. Adding ssh access

- Create ssh keys for the cloud console and add the key file to the terraform config. ssh in from cloud shell and show the successful log in.

I can' access the machine. Any attempt I make to ssh in eventually times out. Google cloud's GUI says I'm being blocked by the machine's firewall but there's a rule in place to allow ssh. When I look at the VM details in CE I see that the ssh keys were copied over successfully but I still can't log in. It appears to be some kind of backend issue with google cloud. Moving on to the next lab for now.


VM instances
Filter
Enter property name or value
Related
CLOUD SHELL
Terminal
Mozilla Firefox
https://ssh.cloud.google.com/v2/ssh/projects/cloud-miner-amminer/zones/us-west1-b/instances/tf-lab-vm
SSH-in-browser
UPLOAD FILE
DOWNLOAD FILE

Status	Name	Zone	Recommendations	Internal IP	External IP	Network	Conne
○	course-vm	us-west1-b		10.138.0.2 (nic0)		default	SSH
○	course-vm-usw1a	us-west1-a		10.138.0.8 (nic0)		default	SSH
✓	tf-lab-vm	us-west1-b		10.138.0.16 (nic0)	35.233.236.40 (nic0)	default	SSH

Connection via Cloud Identity-Aware Proxy Failed

Code: 4003
Reason: failed to connect to backend

Connection to VM is blocked by firewall.
Please ensure that:
- VM has a firewall rule that allows TCP ingress traffic from the IP range 35.235.240.0/20, port: 22

You may be able to connect without using the Cloud Identity-Aware Proxy.

Retry   Retry without Cloud Identity-Aware Proxy   Troubleshoot

```
        name
        tags
        # (18 unc
        # (4 unch
    }

Plan: 0 to add, 1

Do you want to pe
  Terraform will
  Only 'yes' will

  Enter a value:

google_compute_in
google_compute_in
google_compute_instance.default: Modifications complete after 11s [id=projects/cloud-miner-amminer/zones/us-west1-b/instances/tf-lab

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

Outputs:

ip = "35.233.236.40"
amminer@cloudshell:~/tf (cloud-miner-amminer)$ ssh 35.233.236.40 -v
OpenSSH_8.4p1 Debian-5+deb11u2, OpenSSL 1.1.1w  11 Sep 2023
debug1: Reading configuration data /etc/ssh/ssh_config
debug1: /etc/ssh/ssh_config line 19: include /etc/ssh/ssh_config.d/*.conf matched no files
debug1: /etc/ssh/ssh_config line 21: Applying options for *
debug1: Connecting to 35.233.236.40 [35.233.236.40] port 22.
debug1: connect to address 35.233.236.40 port 22: Connection timed out
ssh: connect to host 35.233.236.40 port 22: Connection timed out
amminer@cloudshell:~/tf (cloud-miner-amminer)$ 
```

After coming back to this, I discovered that terraform seemed to be lying about applying the change. Terraform plan had the same output after the apply after multiple successful-looking attempts. After destroying and re-deploying,

7. Adding the guestbook application

todo

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8. View the Guestbook

todo

9. Clean up

todo

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III. Lab 7.2g: Kubernetes Guestbook

1. Kubernetes

✅

2. Setup

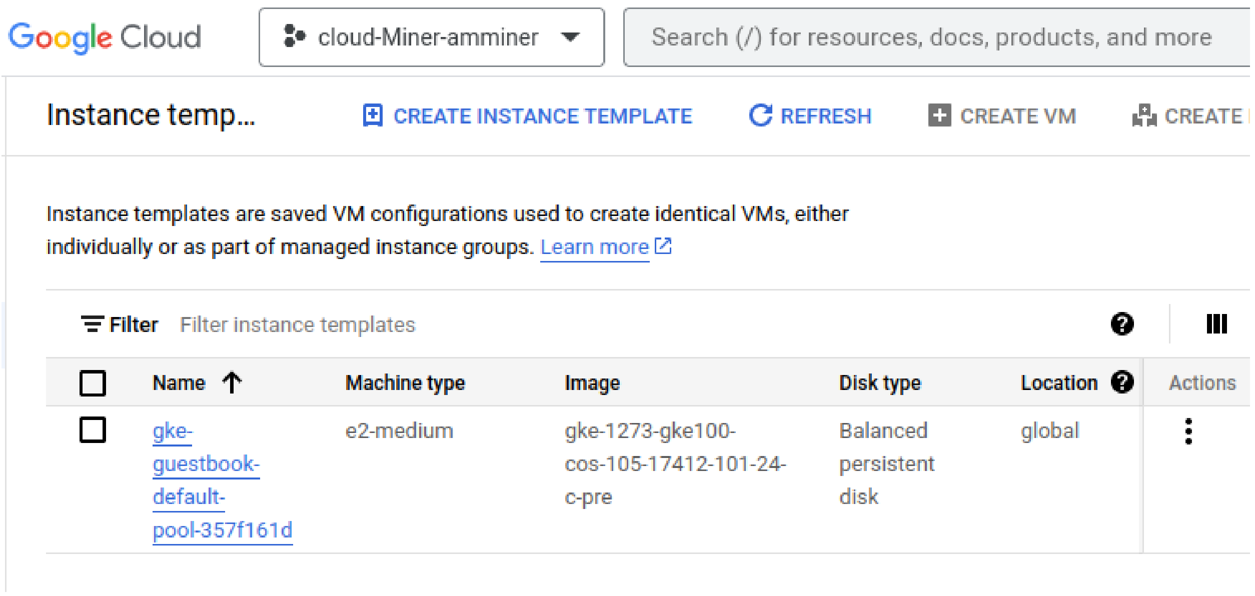
✅

3. Assigning Privileges

✅

4. Create Kubernetes Cluster

- What is the name of the Instance Template dynamically generated to create the two nodes (VMs)?
  gke-guestbook-default-pool-357f161d



Instance templates are saved VM configurations used to create identical VMs, either individually or as part of managed instance groups. Learn more

Name	Machine type	Image	Disk type	Location
gke-guestbook-default-pool-357f161d	e2-medium	gke-1273-gke100-cos-105-17412-101-24-c-pre	Balanced persistent disk	global

- What is the name of the Instance Group dynamically generated that the two nodes belong to?
  gke-guestbook-default-pool-357f161d-grp

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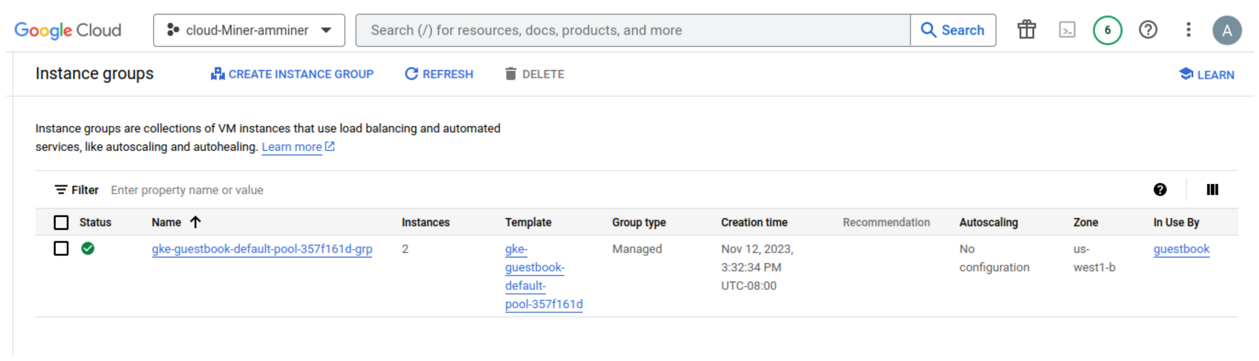
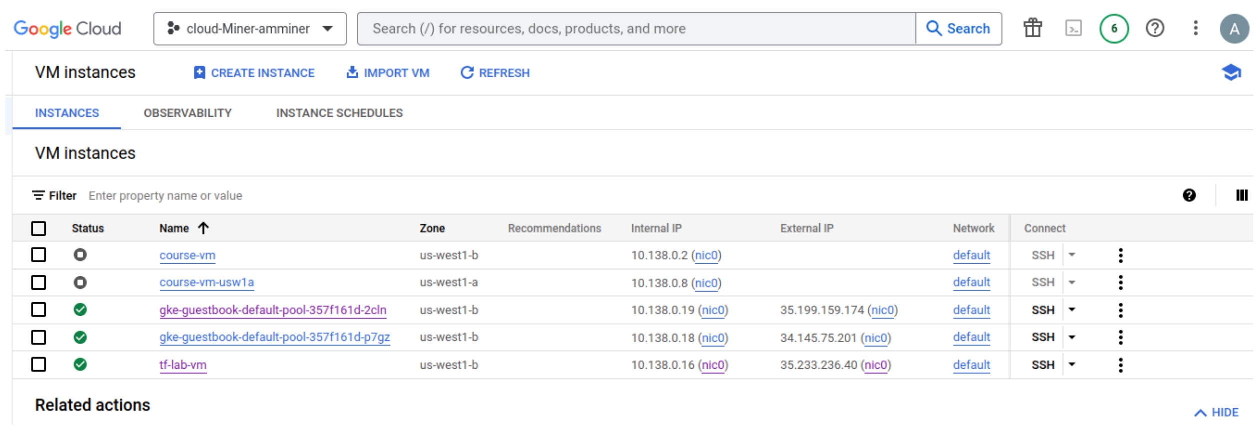


Instance groups are collections of VM instances that use load balancing and automated services, like autoscaling and autohealing. Learn more

Filter Enter property name or value

Status	Name ↑	Instances	Template	Group type	Creation time	Recommendation	Autoscaling	Zone	In Use By
✓	gke-guestbook-default-pool-357f161d-grp	2	gke-guestbook-default-pool-357f161d	Managed	Nov 12, 2023, 3:32:34 PM UTC-08:00		No configuration	us-west1-b	guestbook

- What are the names of the two nodes?
  gke-guestbook-default-pool-357f161d-2cln and gke-guestbook-default-pool-357f161d-p7gz



VM instances

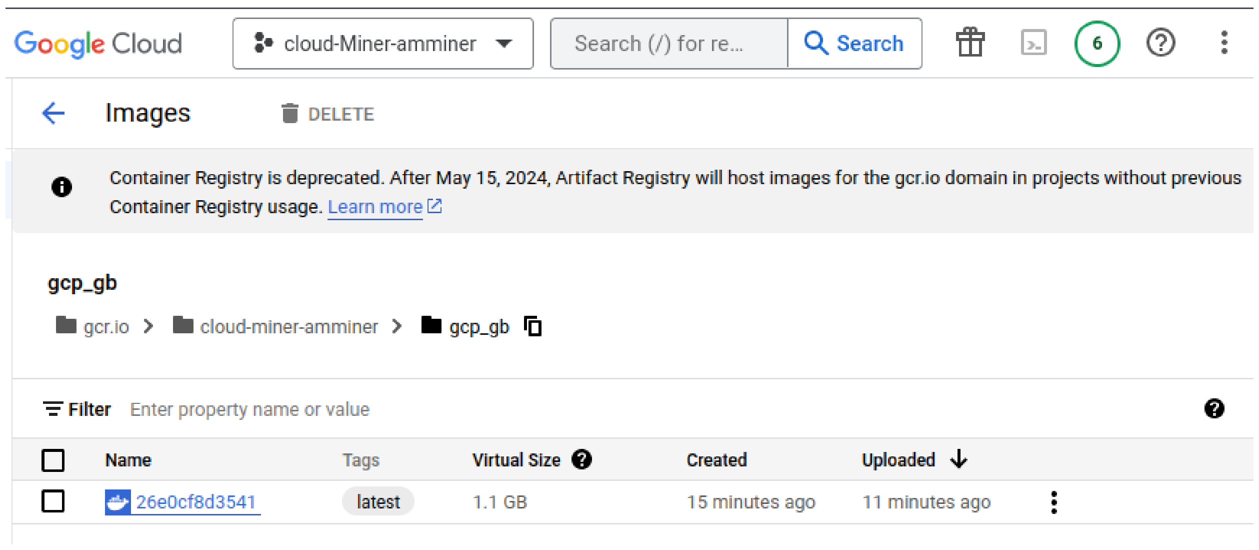
Filter Enter property name or value

Status	Name ↑	Zone	Recommendations	Internal IP	External IP	Network	Connect
○	course-vm	us-west1-b		10.138.0.2 (nic0)		default	SSH
○	course-vm-usw1a	us-west1-a		10.138.0.8 (nic0)		default	SSH
✓	gke-guestbook-default-pool-357f161d-2cln	us-west1-b		10.138.0.19 (nic0)	35.199.159.174 (nic0)	default	SSH
✓	gke-guestbook-default-pool-357f161d-p7gz	us-west1-b		10.138.0.18 (nic0)	34.145.75.201 (nic0)	default	SSH
✓	tf-lab-vm	us-west1-b		10.138.0.16 (nic0)	35.233.236.40 (nic0)	default	SSH

Related actions

5. Prepare a container image

- Visit the Artifact Registry UI and navigate to its container images section. Show the container image created



Container Registry is deprecated. After May 15, 2024, Artifact Registry will host images for the gcr.io domain in projects without previous Container Registry usage. Learn more

gcp_gb

gcr.io > cloud-miner-amminer > gcp_gb

Filter Enter property name or value

Name	Tags	Virtual Size	Created	Uploaded ↓
26e0cf8d3541	latest	1.1 GB	15 minutes ago	11 minutes ago

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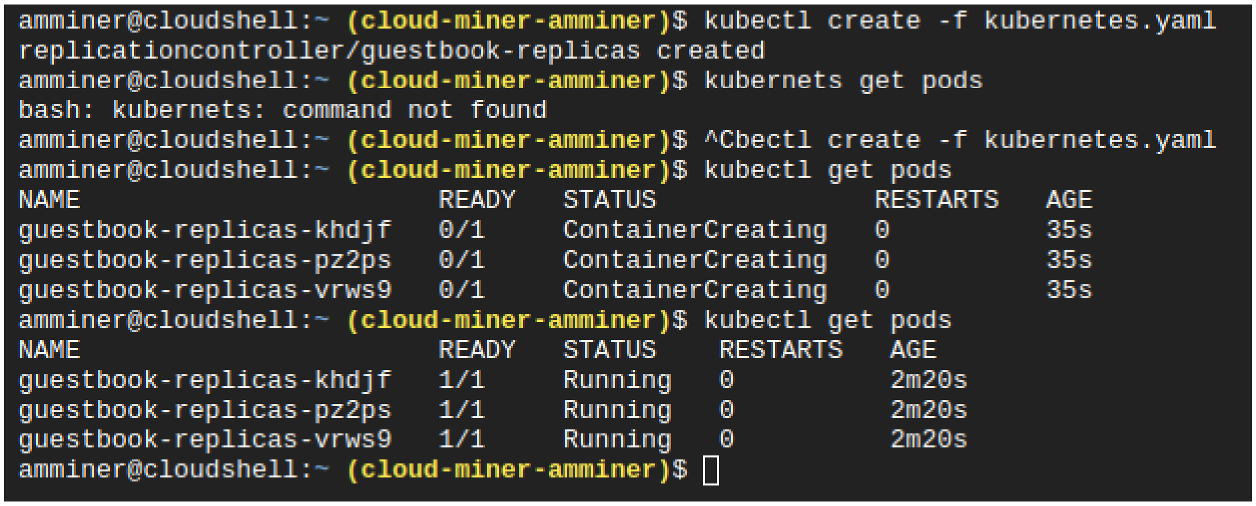
6. kubernetes.yaml

- Copy over the kubernetes configuration yaml, editing in your project ID. ✅

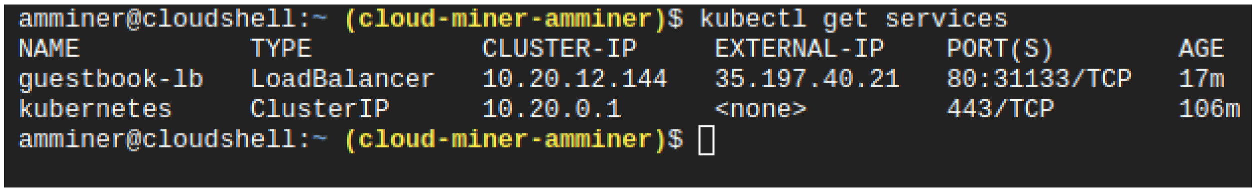
7. Deploy the configuration

- Obtain credentials from the cluster:
  `gcloud container clusters get-credentials guestbook --zone us-west1-b`
  Then deploy the configuration on the cluster.
  `kubectl create -f kubernetes.yaml`
  Note that the configuration file is portable and can run on any other cloud provider, locally, etc. Get the status of the pods running in the cluster.
  `kubectl get pods`
  Take a screenshot of the output of the following command when all 3 replicas reach a "Running" state.
  When I did this in the order the lab instructs, it appeared to run successfully but failed to bring up my pods. When I did it manually they failed at the container image pull stage. I inverted the order of the declarations so that the Service is specified at the top of the file and the ReplicationController at the bottom. This worked.



```
amminer@cloudshell:~ (cloud-miner-amminer)$ kubectl create -f kubernetes.yaml
replicationcontroller/guestbook-replicas created
amminer@cloudshell:~ (cloud-miner-amminer)$ kubernets get pods
bash: kubernets: command not found
amminer@cloudshell:~ (cloud-miner-amminer)$ ^Cbectl create -f kubernetes.yaml
amminer@cloudshell:~ (cloud-miner-amminer)$ kubectl get pods
NAME                       READY   STATUS              RESTARTS   AGE
guestbook-replicas-khdjf   0/1     ContainerCreating   0          35s
guestbook-replicas-pz2ps   0/1     ContainerCreating   0          35s
guestbook-replicas-vrws9   0/1     ContainerCreating   0          35s
amminer@cloudshell:~ (cloud-miner-amminer)$ kubectl get pods
NAME                       READY   STATUS    RESTARTS   AGE
guestbook-replicas-khdjf   1/1     Running   0          2m20s
guestbook-replicas-pz2ps   1/1     Running   0          2m20s
guestbook-replicas-vrws9   1/1     Running   0          2m20s
amminer@cloudshell:~ (cloud-miner-amminer)$
```

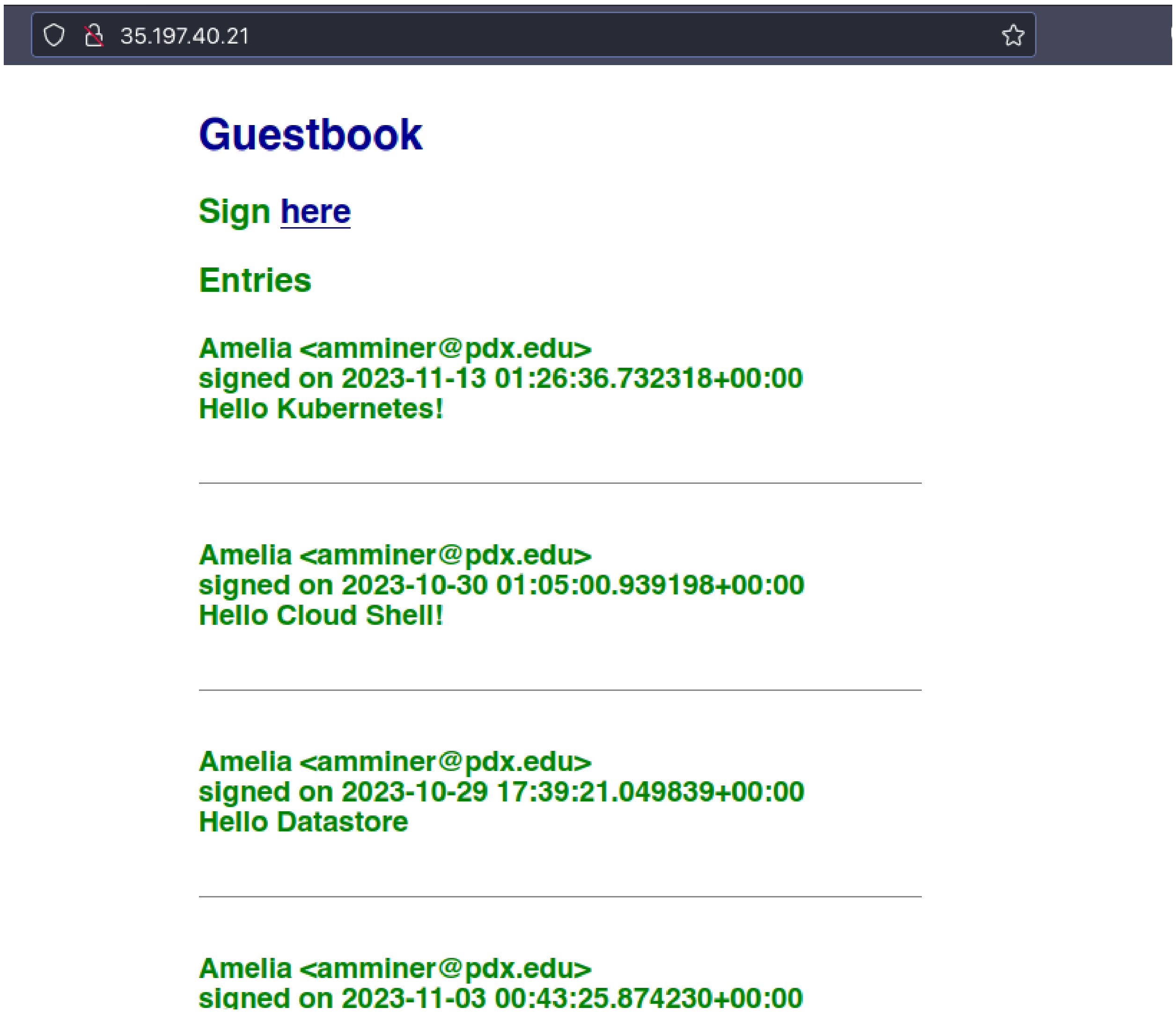
- Then, find the service that is exported from the deployment.
  `kubectl get services`
  Take a screenshot of listing services with LoadBalancer indicating an external IP address that is ready for access.



```
amminer@cloudshell:~ (cloud-miner-amminer)$ kubectl get services
NAME           TYPE           CLUSTER-IP     EXTERNAL-IP    PORT(S)        AGE
guestbook-lb   LoadBalancer   10.20.12.144   35.197.40.21   80:31133/TCP   17m
kubernetes     ClusterIP      10.20.0.1      <none>         443/TCP        106m
amminer@cloudshell:~ (cloud-miner-amminer)$
```

8. view the guestbook

- Bring the guestbook up at its external IP and sign it "Hello Kubernetes!".



35.197.40.21

Guestbook

Sign here

Entries

Amelia <amminer@pdx.edu>
signed on 2023-11-13 01:26:36.732318+00:00
Hello Kubernetes!

Amelia <amminer@pdx.edu>
signed on 2023-10-30 01:05:00.939198+00:00
Hello Cloud Shell!

Amelia <amminer@pdx.edu>
signed on 2023-10-29 17:39:21.049839+00:00
Hello Datastore

Amelia <amminer@pdx.edu>
signed on 2023-11-03 00:43:25.874230+00:00

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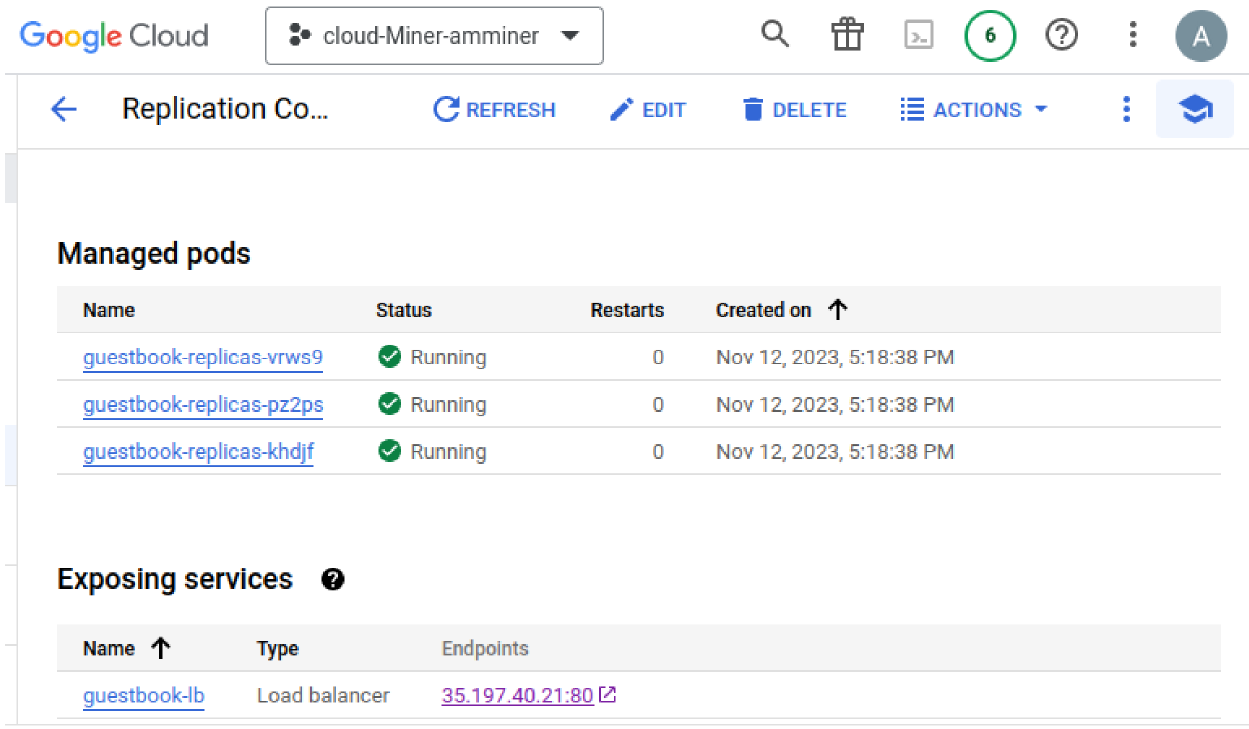
- View the resources kubernetes has deployed across your cloud project:
  - Take a screenshot of the managed guestbook pods and the service being exposed:



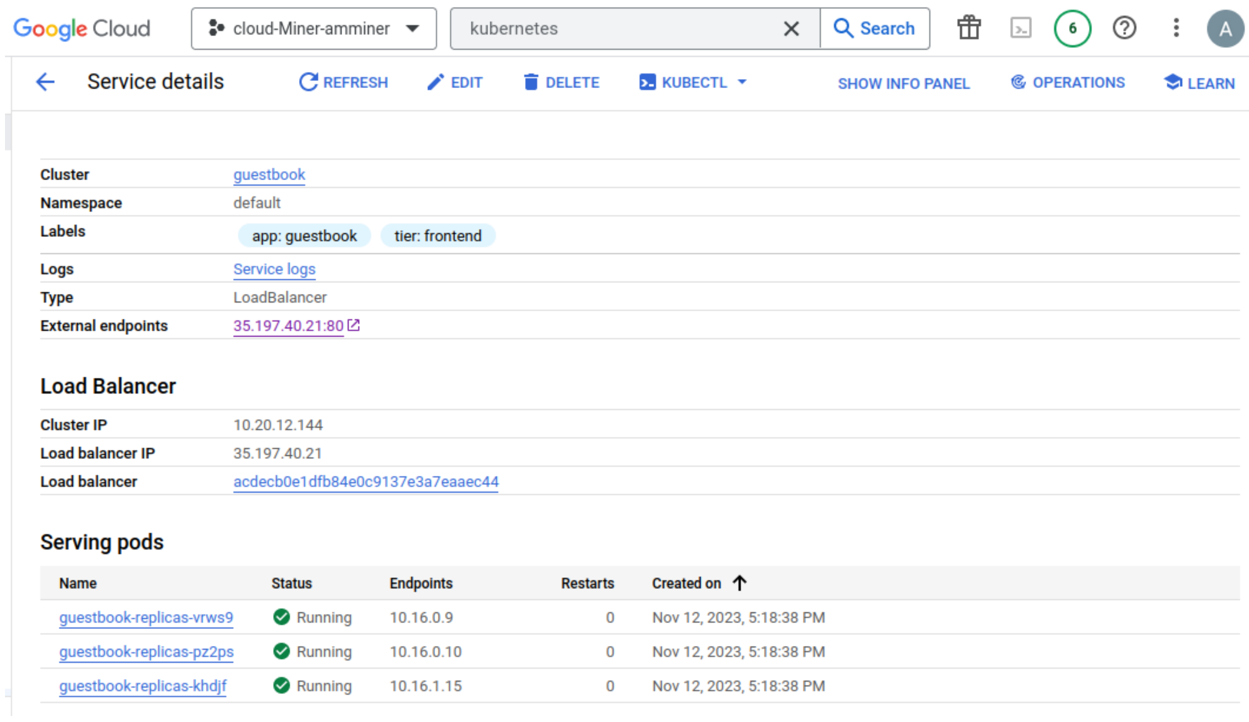
Managed pods

Name	Status	Restarts	Created on
guestbook-replicas-vrws9	✓ Running	0	Nov 12, 2023, 5:18:38 PM
guestbook-replicas-pz2ps	✓ Running	0	Nov 12, 2023, 5:18:38 PM
guestbook-replicas-khdjf	✓ Running	0	Nov 12, 2023, 5:18:38 PM

Exposing services

Name	Type	Endpoints
guestbook-lb	Load balancer	35.197.40.21:80

  - Take a screenshot of the load balancer and its details:



Cluster	guestbook
Namespace	default
Labels	app: guestbook, tier: frontend
Logs	Service logs
Type	LoadBalancer
External endpoints	35.197.40.21:80

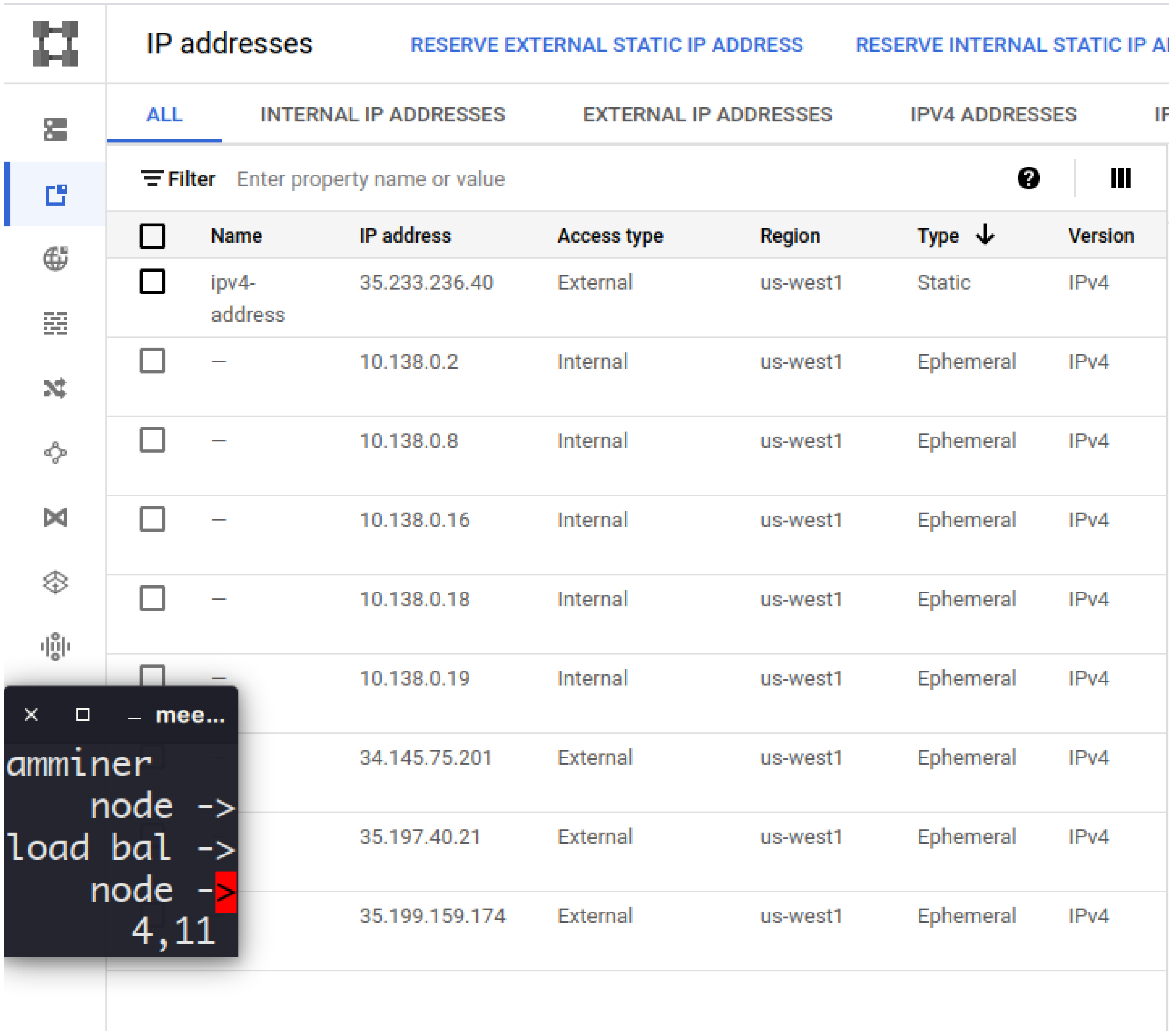
Load Balancer

Cluster IP	10.20.12.144
Load balancer IP	35.197.40.21
Load balancer	acdecb0e1dfb84e0c9137e3a7eaaec44

Serving pods

Name	Status	Endpoints	Restarts	Created on
guestbook-replicas-vrws9	✓ Running	10.16.0.9	0	Nov 12, 2023, 5:18:38 PM
guestbook-replicas-pz2ps	✓ Running	10.16.0.10	0	Nov 12, 2023, 5:18:38 PM
guestbook-replicas-khdjf	✓ Running	10.16.1.15	0	Nov 12, 2023, 5:18:38 PM

- Take a screenshot of the addresses allocated and indicate the ones associated with nodes versus the load balancer.


IP addresses
RESERVE EXTERNAL STATIC IP ADDRESS
RESERVE INTERNAL STATIC IP A
ALL
INTERNAL IP ADDRESSES
EXTERNAL IP ADDRESSES
IPV4 ADDRESSES
Filter
Enter property name or value

Name	IP address	Access type	Region	Type	Version
ipv4-address	35.233.236.40	External	us-west1	Static	IPv4
–	10.138.0.2	Internal	us-west1	Ephemeral	IPv4
–	10.138.0.8	Internal	us-west1	Ephemeral	IPv4
–	10.138.0.16	Internal	us-west1	Ephemeral	IPv4
–	10.138.0.18	Internal	us-west1	Ephemeral	IPv4
–	10.138.0.19	Internal	us-west1	Ephemeral	IPv4
	34.145.75.201	External	us-west1	Ephemeral	IPv4
	35.197.40.21	External	us-west1	Ephemeral	IPv4
	35.199.159.174	External	us-west1	Ephemeral	IPv4

```
amminer
    node ->
load bal ->
    node ->
      4,11
```

9. delete workload and service

```
kubectl delete -f kubernetes.yaml
gcloud container images delete
gcr.io/${GOOGLE_CLOUD_PROJECT}/gcp_gb
```
✅

10. CI/CD build automation

- Run:

```
GOOGLE_CLOUD_PROJECT_NUMBER=$(gcloud projects describe
$GOOGLE_CLOUD_PROJECT --format="value(projectNumber)")

echo $GOOGLE_CLOUD_PROJECT_NUMBER

gcloud projects add-iam-policy-binding ${GOOGLE_CLOUD_PROJECT}
--member
serviceAccount:${GOOGLE_CLOUD_PROJECT_NUMBER}@cloudbuild.gservice
account.com --role=roles/container.developer
```

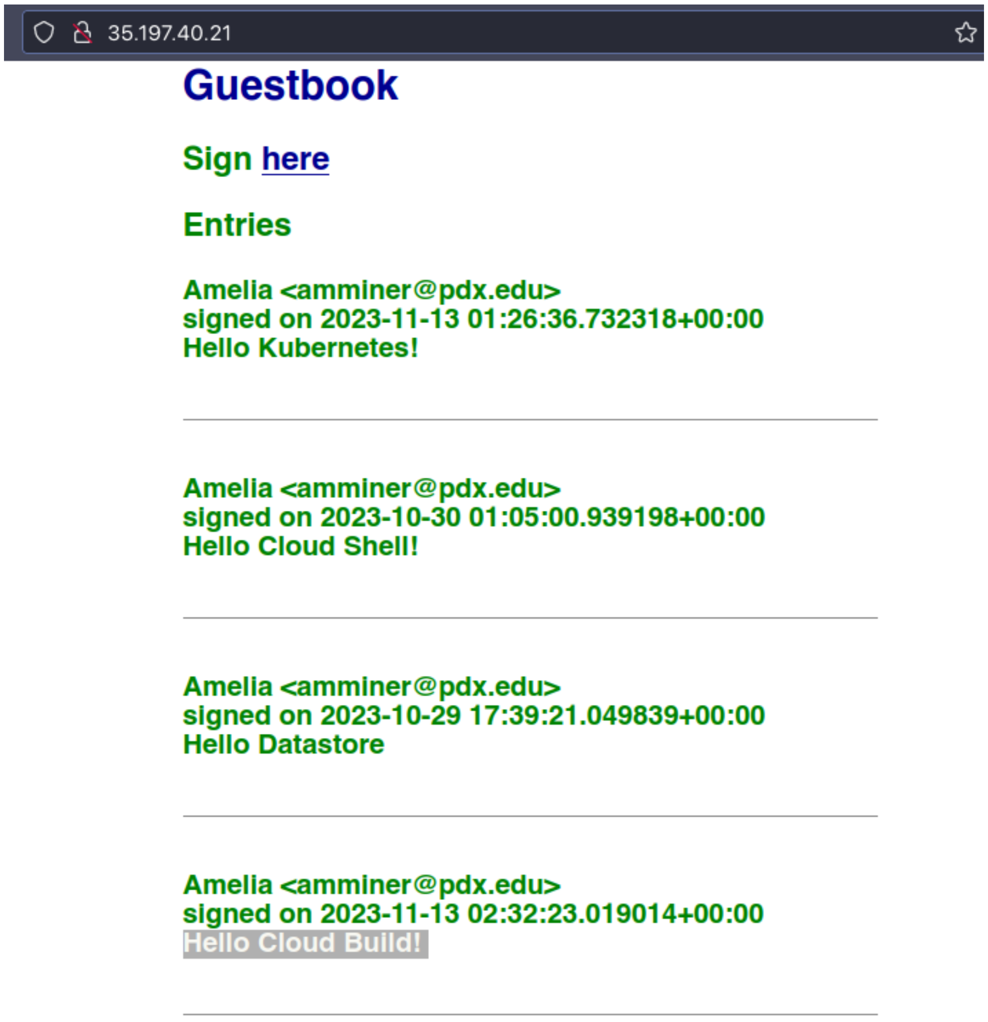
  ✅

11. Configure build automation

- In cloud shell create cloudbuild.yaml from the code in the lab.
  ✅

12. Deploy and view application

- Build and deploy the app:
  `gcloud builds submit --config=cloudbuild.yaml`
  Visit the load balancer and sign the guest book "Hello Cloud Build!".



35.197.40.21

Guestbook

Sign here

Entries

Amelia <amminer@pdx.edu>
signed on 2023-11-13 01:26:36.732318+00:00
Hello Kubernetes!

Amelia <amminer@pdx.edu>
signed on 2023-10-30 01:05:00.939198+00:00
Hello Cloud Shell!

Amelia <amminer@pdx.edu>
signed on 2023-10-29 17:39:21.049839+00:00
Hello Datastore

Amelia <amminer@pdx.edu>
signed on 2023-11-13 02:32:23.019014+00:00
Hello Cloud Build!

13. Clean up

- `kubectl delete -f kubernetes.yaml`
- `gcloud container images delete gcr.io/${GOOGLE_CLOUD_PROJECT}/gcp_gb`
  ✅

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IV. Lab 7.3g: APIs (Slack, Knowledge Graph)

1. Slack and Knowledge Graph Integration

We're setting up a slack command /kg to query google's knowledge graph API on demaind via a cloud function. The slack client sends a payload + token to the cloud function's trigger endpoint. The function verifies the token and sends a request to the knowledge graph API + an API key.

- `git clone https://github.com/GoogleCloudPlatform/python-docs-samples.git`
- `cd python-docs-samples/functions/slack/`

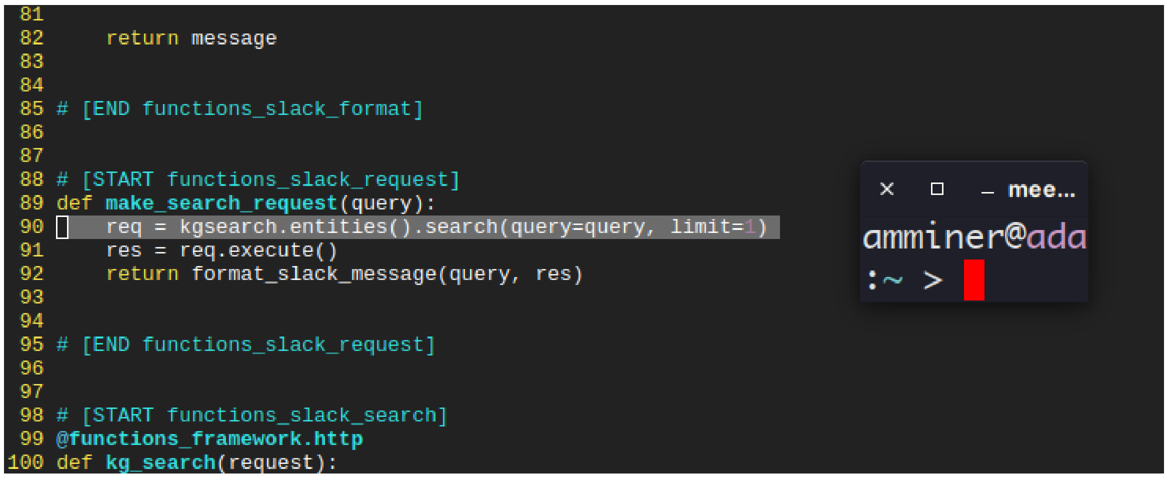
✅

2. Code

- Does Google provide a Python package specifically for accessing the Knowledge Graph API?
  No. Google provides the googleapiclient.discovery module as a generic interface to all of their backend APIs. It uses parameters to its build function to determine which API to instantiate.

3. Code

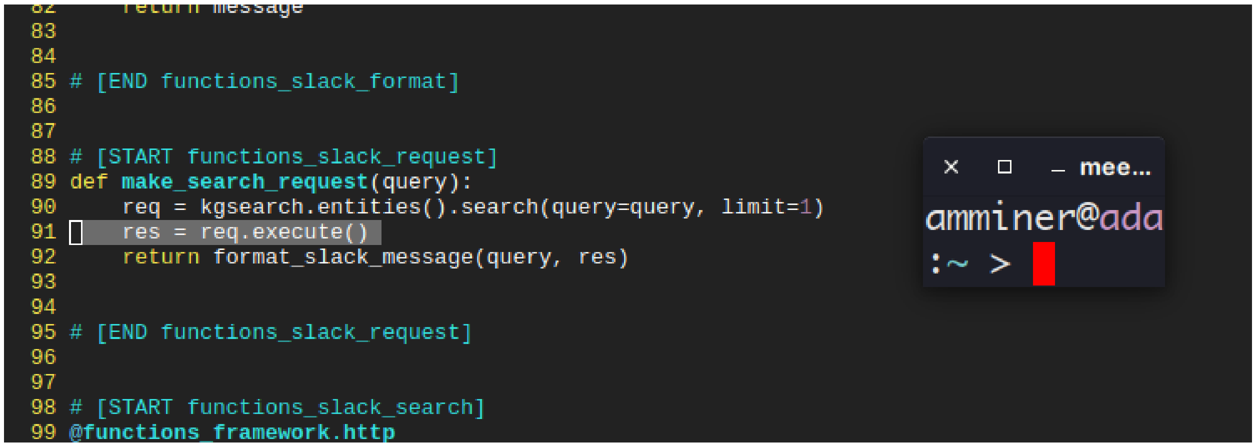
- Show the source line that constructs the query we wish to send to the Knowledge Graph API.



```
    return message


# [END functions_slack_format]


# [START functions_slack_request]
def make_search_request(query):
    req = kgsearch.entities().search(query=query, limit=1)
    res = req.execute()
    return format_slack_message(query, res)


# [END functions_slack_request]


# [START functions_slack_search]
@functions_framework.http
def kg_search(request):
```

```
amminer@ada
:~ >
```

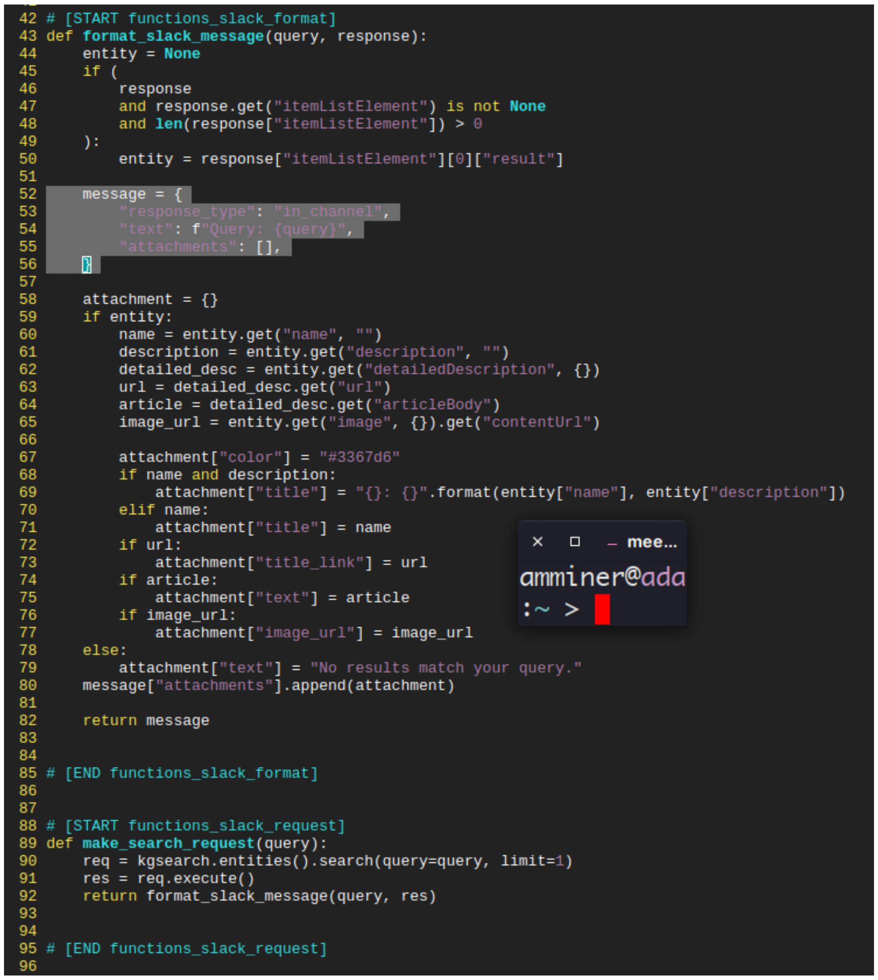
- Show the source line that then executes the query and saves the response. What is the name of the method that sends the query to the Knowledge Graph API?
  the execute method of the knowledge graph search query object, whose name is req in the program, sends the query to the API.



```
    return message


# [END functions_slack_format]


# [START functions_slack_request]
def make_search_request(query):
    req = kgsearch.entities().search(query=query, limit=1)
    res = req.execute()
    return format_slack_message(query, res)


# [END functions_slack_request]


# [START functions_slack_search]
@functions_framework.http
```

```
× □ – mee...
amminer@ada
:~ >
```

- What is the Python data type that is used to represent the formatted message?
  A dictionary.



```
# [START functions_slack_format]
def format_slack_message(query, response):
    entity = None
    if (
        response
        and response.get("itemListElement") is not None
        and len(response["itemListElement"]) > 0
    ):
        entity = response["itemListElement"][0]["result"]

    message = {
        "response_type": "in_channel",
        "text": f"Query: {query}",
        "attachments": [],
    }

    attachment = {}
    if entity:
        name = entity.get("name", "")
        description = entity.get("description", "")
        detailed_desc = entity.get("detailedDescription", {})
        url = detailed_desc.get("url")
        article = detailed_desc.get("articleBody")
        image_url = entity.get("image", {}).get("contentUrl")

        attachment["color"] = "#3367d6"
        if name and description:
            attachment["title"] = "{}: {}".format(entity["name"], entity["description"])
        elif name:
            attachment["title"] = name
        if url:
            attachment["title_link"] = url
        if article:
            attachment["text"] = article
        if image_url:
            attachment["image_url"] = image_url
    else:
        attachment["text"] = "No results match your query."
    message["attachments"].append(attachment)

    return message


# [END functions_slack_format]


# [START functions_slack_request]
def make_search_request(query):
    req = kgsearch.entities().search(query=query, limit=1)
    res = req.execute()
    return format_slack_message(query, res)


# [END functions_slack_request]

```

```
× □ – mee...
amminer@ada
:~ >
```

- What are the three main attributes of the formatted message passed back to Slack?
  response_type, text, and attachments… see above.

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4. Knowledge Graph Setup

- Enable the KG API and issue an API key.

```
gcloud services enable kgsearch.googleapis.com
gcloud alpha services api-keys create \
  --display-name="KG API Key" \
  --api-target=service=kgsearch.googleapis.com
```

✅

5. Create a Slack Workspace

- Also create a slack app and associate it with your workspace. Obtain the slack app's signing secret: basic info -> app credentials -> show. Keep this page up.

✅

6. Configure and Deploy

- in Cloud Shell, deploy the code substituting your kg key and slack secret. Note the URL of the function endpoint.

✅

https://us-central1-cloud-miner-amminer.cloudfunctions.net/kg_search

7. Create Slack Command

- Create the /kg command and connect it to the above endpoint. Install the app on your workspace.

✅

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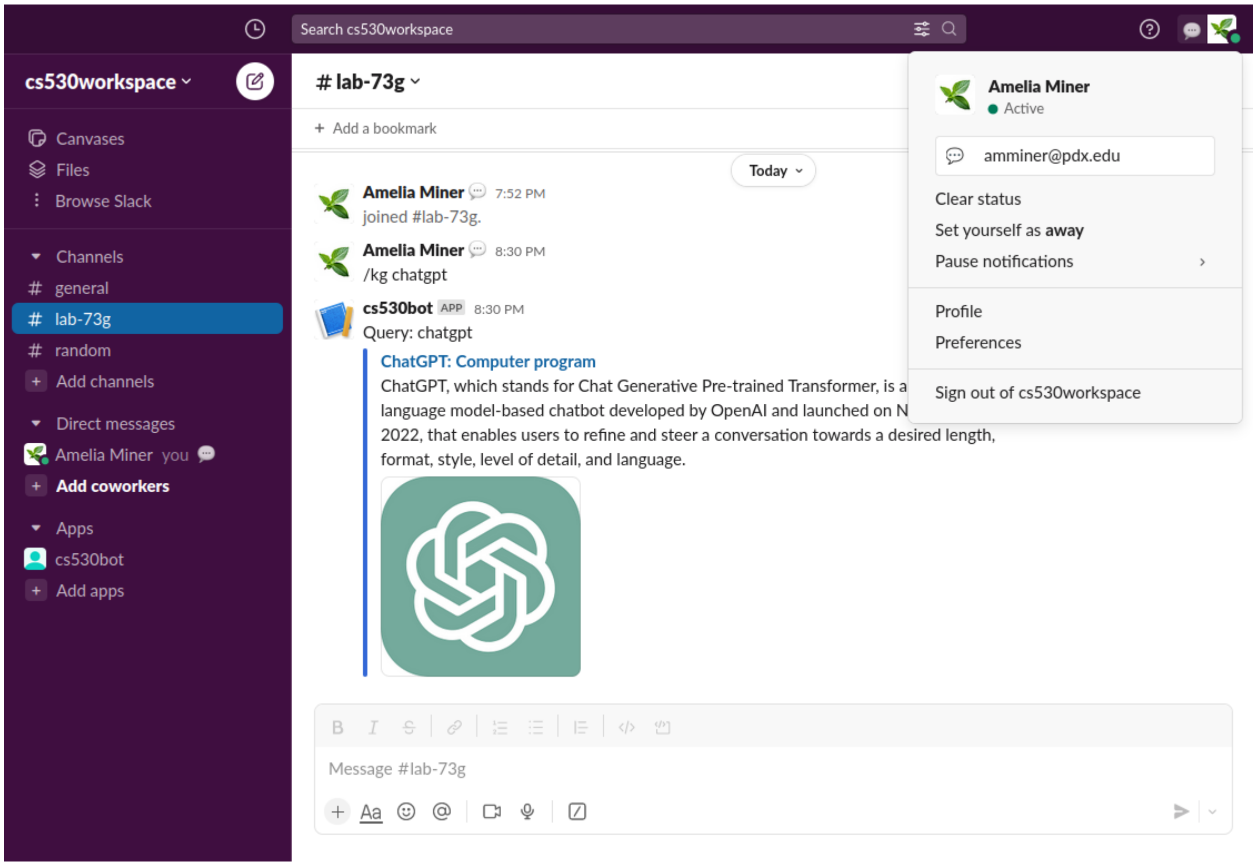
8. Test the command

- Run the command /kg chatgpt in your workspace.



Amelia Miner 7:52 PM
joined #lab-73g.

Amelia Miner 8:30 PM
/kg chatgpt

cs530bot APP 8:30 PM
Query: chatgpt
ChatGPT: Computer program
ChatGPT, which stands for Chat Generative Pre-trained Transformer, is a language model-based chatbot developed by OpenAI and launched on N 2022, that enables users to refine and steer a conversation towards a desired length, format, style, level of detail, and language.

- Visit Cloud Shell and examine the logs for the function. Delete the function. ✅

V. Lab 7.4g: ML APIs

1. APIS #1 (Vision, Speech, Translate, Natural Language APIs)

- Enable the APIs in the cloud shell. Create a python venv. ✅

2. IAM Service Account Setup

- Create a service account, bind a role that allows ML services to the account, generate a key for the account, and save the key to an environment variable. ✅

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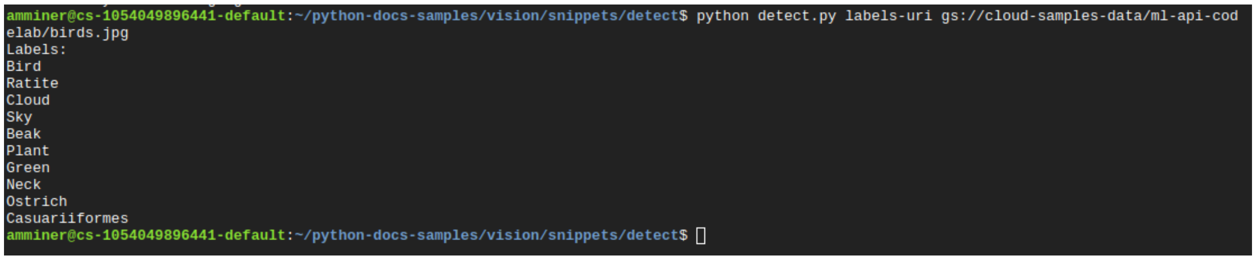
3. Vision

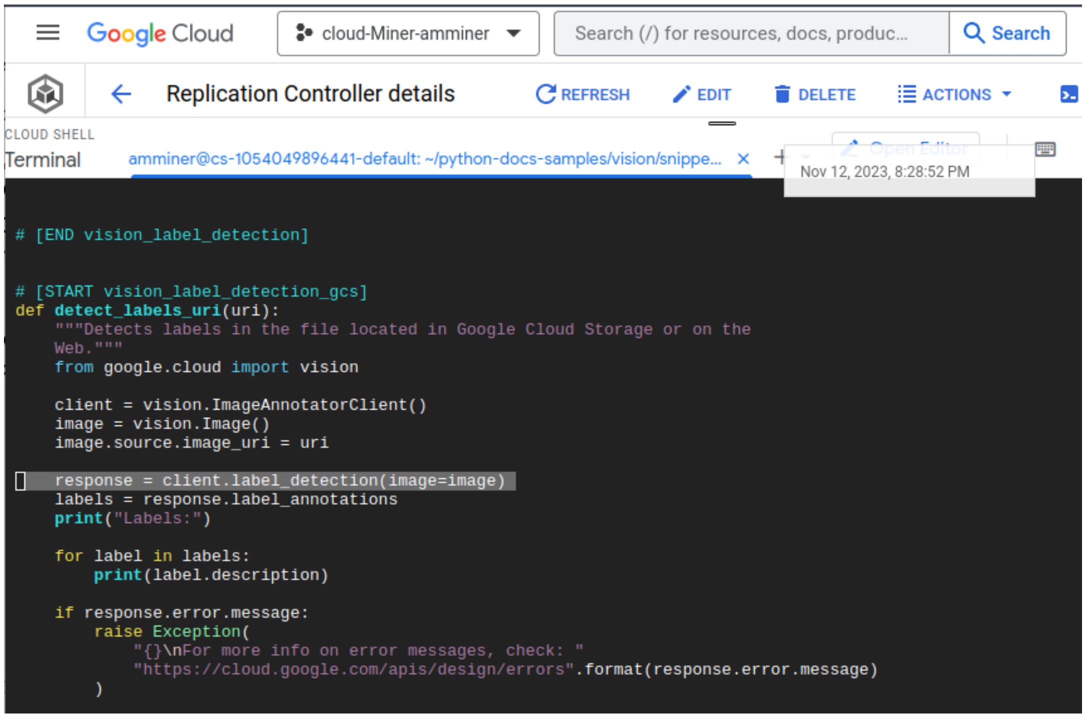
- Install the cloud vision python package and cd into python-docs-samples/vision/snippets/detect. Run the following and show the output:
  `python detect.py labels-uri gs://cloud-samples-data/ml-api-codelab/birds.jpg`



```
amminer@cs-1054049896441-default:~/python-docs-samples/vision/snippets/detect$ python detect.py labels-uri gs://cloud-samples-data/ml-api-cod
elab/birds.jpg
Labels:
Bird
Ratite
Cloud
Sky
Beak
Plant
Green
Neck
Ostrich
Casuariiformes
amminer@cs-1054049896441-default:~/python-docs-samples/vision/snippets/detect$ 
```

  My PS1 changed when I sourced the rc file, but rest assured I am in the venv.

- Answer the following questions regarding the function call that handles the detection in the code:
  - What is the name of the function?
    detect_labels_uri


Google Cloud
cloud-Miner-amminer
Search (/) for resources, docs, produc...
Search
Replication Controller details
REFRESH
EDIT
DELETE
ACTIONS
CLOUD SHELL
Terminal
amminer@cs-1054049896441-default: ~/python-docs-samples/vision/snippe...
Nov 12, 2023, 8:28:52 PM

```
# [END vision_label_detection]

# [START vision_label_detection_gcs]
def detect_labels_uri(uri):
    """Detects labels in the file located in Google Cloud Storage or on the
    Web."""
    from google.cloud import vision

    client = vision.ImageAnnotatorClient()
    image = vision.Image()
    image.source.image_uri = uri

    response = client.label_detection(image=image)
    labels = response.label_annotations
    print("Labels:")

    for label in labels:
        print(label.description)

    if response.error.message:
        raise Exception(
            "{}\nFor more info on error messages, check: "
            "https://cloud.google.com/apis/design/errors".format(response.error.message)
        )
```

  - What type of Vision client is instantiated in it?
    ImageAnnotatorClient… see above.
  - What method is invoked in the Vision client to perform the detection?
    label_detection(image)… see above
  - What is the name of the attribute in the response object that contains the results we seek?
    label_annotations… see above

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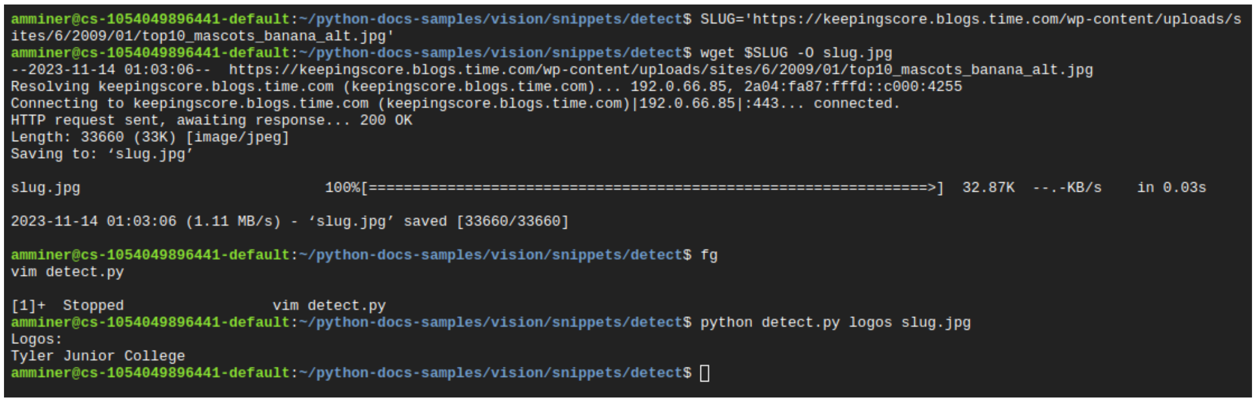
- using Google Images, download an image of a university logo to Cloud Shell via wget. Invoke detect.py to call the Vision API to determine whose logo it is. Show the output. What method is invoked *in the Vision client* to perform the detection?
  The function of the vision client that performs the detection is logo_detection. Interestingly, the detection was incorrect. The logo is not current - I think it was modernized in 2020 - but it is not uncommon as far as I'm aware.



```
amminer@cs-1054049896441-default:~/python-docs-samples/vision/snippets/detect$ SLUG='https://keepingscore.blogs.time.com/wp-content/uploads/s
ites/6/2009/01/top10_mascots_banana_alt.jpg'
amminer@cs-1054049896441-default:~/python-docs-samples/vision/snippets/detect$ wget $SLUG -O slug.jpg
--2023-11-14 01:03:06--  https://keepingscore.blogs.time.com/wp-content/uploads/sites/6/2009/01/top10_mascots_banana_alt.jpg
Resolving keepingscore.blogs.time.com (keepingscore.blogs.time.com)... 192.0.66.85, 2a04:fa87:fffd::c000:4255
Connecting to keepingscore.blogs.time.com (keepingscore.blogs.time.com)|192.0.66.85|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 33660 (33K) [image/jpeg]
Saving to: ‘slug.jpg’

slug.jpg                            100%[==============================================================>]  32.87K  --.-KB/s    in 0.03s

2023-11-14 01:03:06 (1.11 MB/s) - ‘slug.jpg’ saved [33660/33660]

amminer@cs-1054049896441-default:~/python-docs-samples/vision/snippets/detect$ fg
vim detect.py

[1]+  Stopped                 vim detect.py
amminer@cs-1054049896441-default:~/python-docs-samples/vision/snippets/detect$ python detect.py logos slug.jpg
Logos:
Tyler Junior College
amminer@cs-1054049896441-default:~/python-docs-samples/vision/snippets/detect$ 
```

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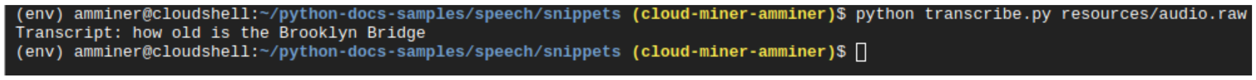
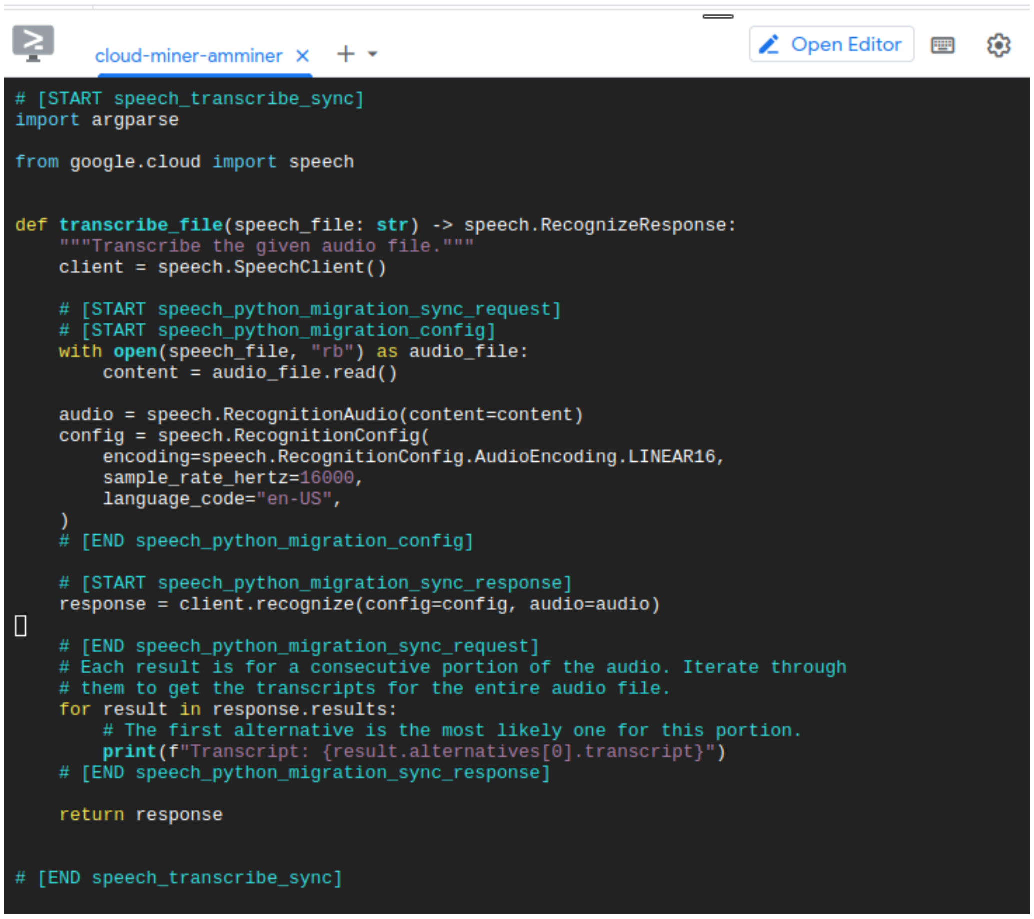
4. Speech

- Install the speech package. cd into python-docs-samples/speech/snippets and run python transcribe.py resources/audio.raw. Show the output for your lab notebook.



```
(env) amminer@cloudshell:~/python-docs-samples/speech/snippets (cloud-miner-amminer)$ python transcribe.py resources/audio.raw
Transcript: how old is the Brooklyn Bridge
(env) amminer@cloudshell:~/python-docs-samples/speech/snippets (cloud-miner-amminer)$
```

- What is the name of the function that handles the translation?
transcribe_file



```
# [START speech_transcribe_sync]
import argparse

from google.cloud import speech


def transcribe_file(speech_file: str) -> speech.RecognizeResponse:
    """Transcribe the given audio file."""
    client = speech.SpeechClient()

    # [START speech_python_migration_sync_request]
    # [START speech_python_migration_config]
    with open(speech_file, "rb") as audio_file:
        content = audio_file.read()

    audio = speech.RecognitionAudio(content=content)
    config = speech.RecognitionConfig(
        encoding=speech.RecognitionConfig.AudioEncoding.LINEAR16,
        sample_rate_hertz=16000,
        language_code="en-US",
    )
    # [END speech_python_migration_config]

    # [START speech_python_migration_sync_response]
    response = client.recognize(config=config, audio=audio)

    # [END speech_python_migration_sync_request]
    # Each result is for a consecutive portion of the audio. Iterate through
    # them to get the transcripts for the entire audio file.
    for result in response.results:
        # The first alternative is the most likely one for this portion.
        print(f"Transcript: {result.alternatives[0].transcript}")
    # [END speech_python_migration_sync_response]

    return response


# [END speech_transcribe_sync]
```

- What method is invoked in the Speech client to perform the detection?
recognize, see above
- What is the name of the attribute in the response object that contains the results we seek?
results, see above

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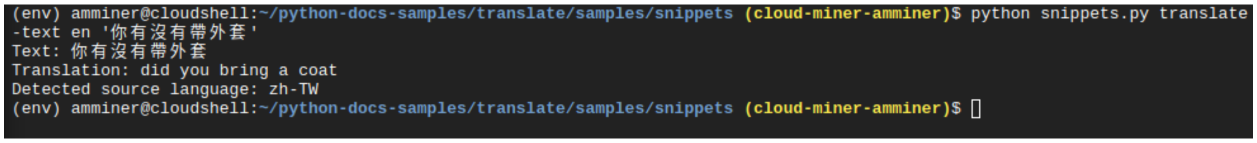
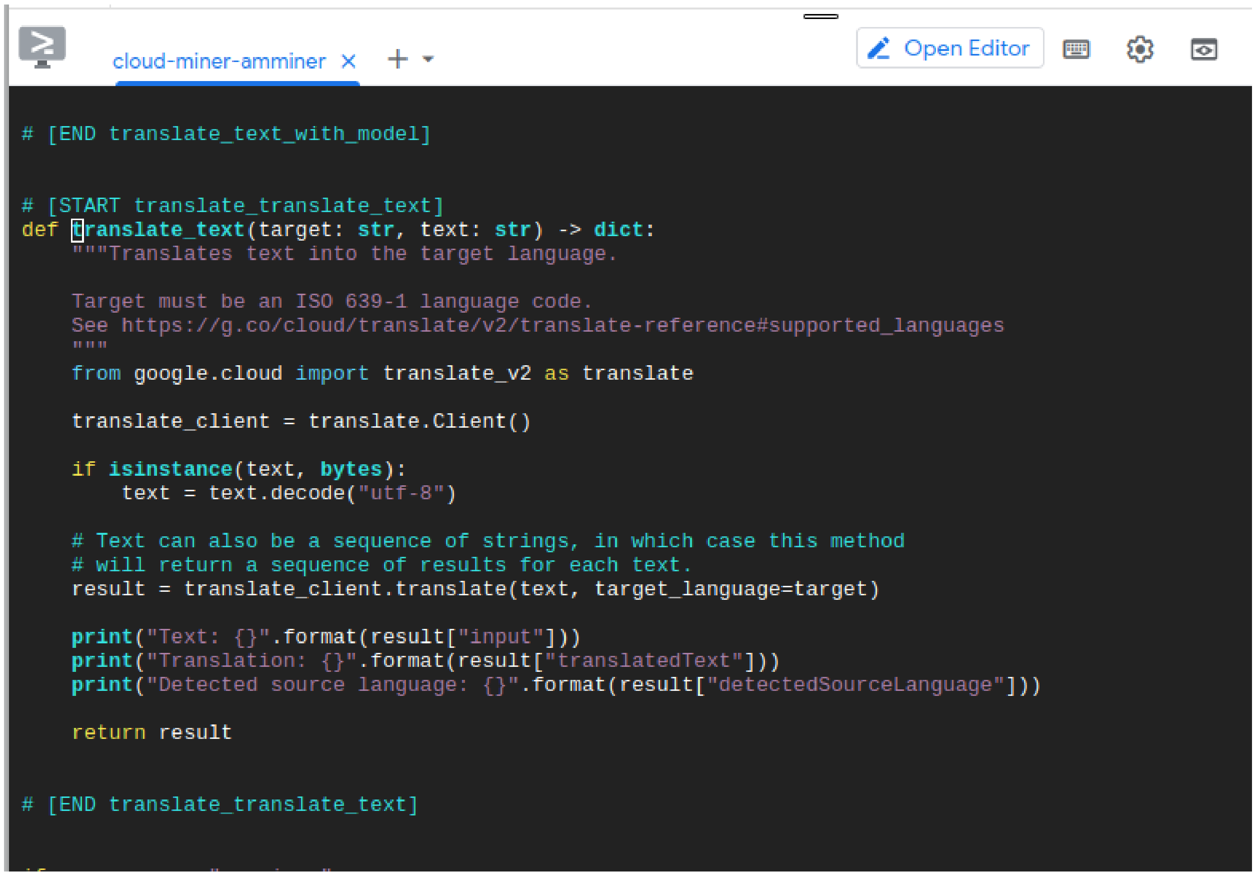
5. Translate

- … do the same as the above with the translate API. Run this: python snippets.py translate-text en '你有沒有帶外套'



```
(env) amminer@cloudshell:~/python-docs-samples/translate/samples/snippets (cloud-miner-amminer)$ python snippets.py translate
-text en '你有沒有帶外套'
Text: 你有沒有帶外套
Translation: did you bring a coat
Detected source language: zh-TW
(env) amminer@cloudshell:~/python-docs-samples/translate/samples/snippets (cloud-miner-amminer)$ 
```

- What is the name of the function that handles this translation?
translate_text. It just occurred to me that you might want me to show the part of the script that directs us to this function under if __name__ == "__main__":. Please have mercy on me - trust me, I understand how I got to the function I answered with. My proficiency with python is one of the most important links in the chain of skills that puts a roof over my head and food on my table.



```
# [END translate_text_with_model]


# [START translate_translate_text]
def translate_text(target: str, text: str) -> dict:
    """Translates text into the target language.

    Target must be an ISO 639-1 language code.
    See https://g.co/cloud/translate/v2/translate-reference#supported_languages
    """
    from google.cloud import translate_v2 as translate

    translate_client = translate.Client()

    if isinstance(text, bytes):
        text = text.decode("utf-8")

    # Text can also be a sequence of strings, in which case this method
    # will return a sequence of results for each text.
    result = translate_client.translate(text, target_language=target)

    print("Text: {}".format(result["input"]))
    print("Translation: {}".format(result["translatedText"]))
    print("Detected source language: {}".format(result["detectedSourceLanguage"]))

    return result


# [END translate_translate_text]
```

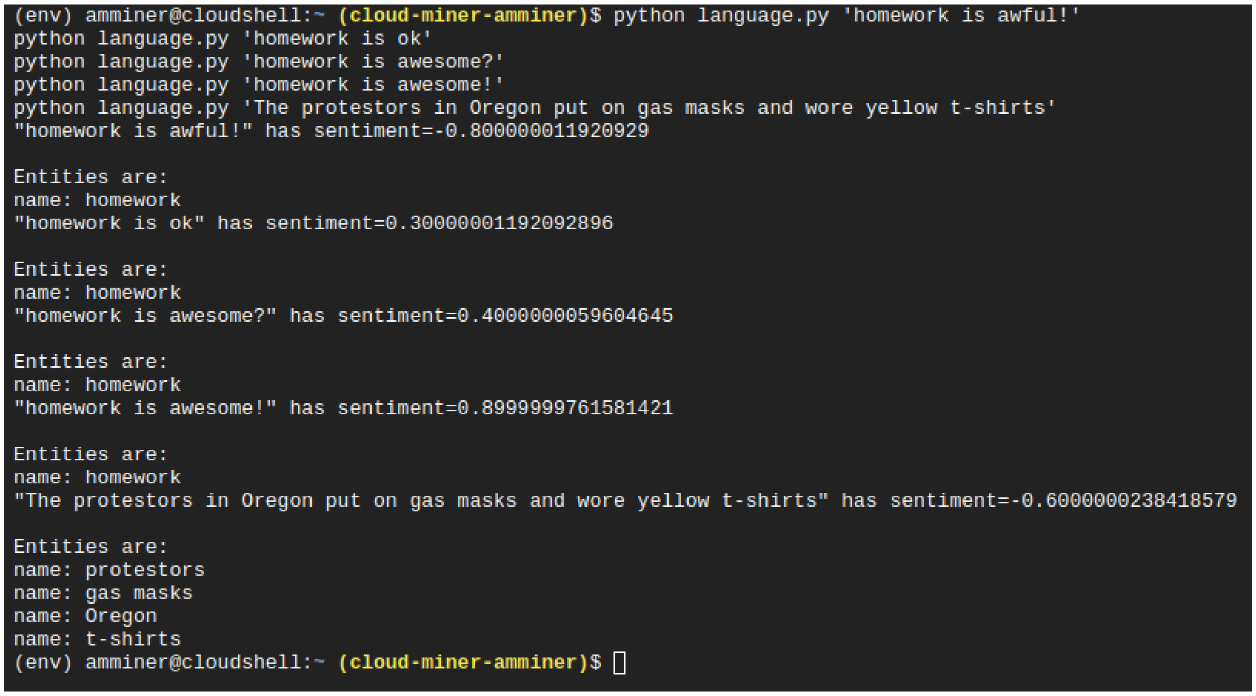
- What method is invoked in the Translate client to perform the detection?
translate
- What is the name of the attribute in the response object that contains the results we seek?
There is no such attribute of the response object, strictly speaking. The response object - the return value of translate_client.translate - is a dictionary with key-value pairs. The keys whose values contain the results we seek are input, translatedText, and detectedSourceLanguage. These values are not accessible via

an attribute of the object, only through square-bracket notation (which is just syntactic sugar for a function call if I recall correctly) or through calls to a couple of dictionary class functions.

6. Natural Language

- Install the language package. Create language.py from the lab material. Run the following:

```
python language.py 'homework is awful!'
python language.py 'homework is ok'
python language.py 'homework is awesome?'
python language.py 'homework is awesome!'
python language.py 'The protestors in Oregon put on gas masks and wore yellow t-shirts'
```



```
(env) amminer@cloudshell:~ (cloud-miner-amminer)$ python language.py 'homework is awful!'
python language.py 'homework is ok'
python language.py 'homework is awesome?'
python language.py 'homework is awesome!'
python language.py 'The protestors in Oregon put on gas masks and wore yellow t-shirts'
"homework is awful!" has sentiment=-0.800000011920929

Entities are:
name: homework
"homework is ok" has sentiment=0.30000001192092896

Entities are:
name: homework
"homework is awesome?" has sentiment=0.4000000059604645

Entities are:
name: homework
"homework is awesome!" has sentiment=0.8999999761581421

Entities are:
name: homework
"The protestors in Oregon put on gas masks and wore yellow t-shirts" has sentiment=-0.6000000238418579

Entities are:
name: protestors
name: gas masks
name: Oregon
name: t-shirts
(env) amminer@cloudshell:~ (cloud-miner-amminer)$
```

It might be good to mention the meaning of that floating point value here in the lab material...

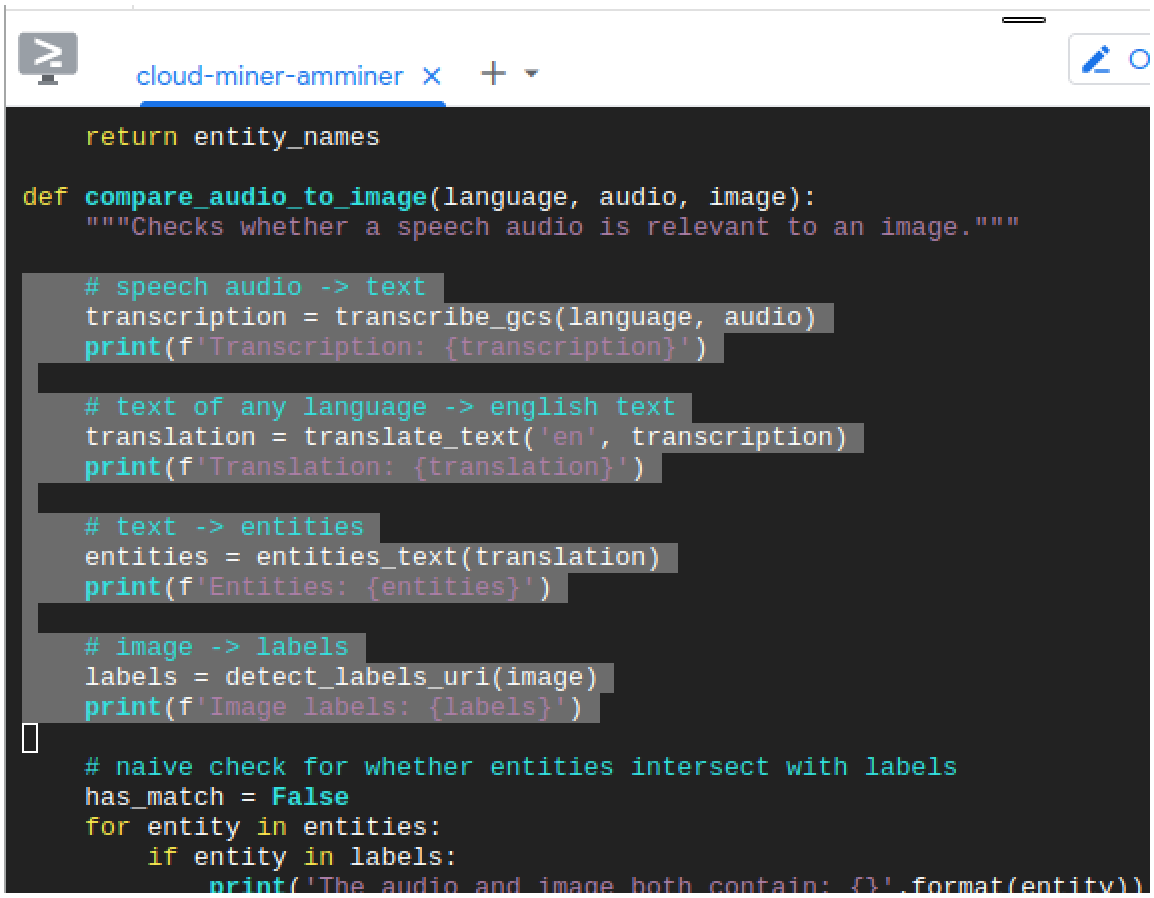
7. Integration

✅

8. Code

- Copy the code from the lab. Examine it. What is the name of the function that performs the transcription?
  transcribe_gcs

- What is the name of the function that performs the translation?
  translate_text
- What is the name of the function that performs the entity analysis on the translation?
  entities_text
- What is the name of the function that performs the entity analysis on the image?
  detect_labels_uri



```
    return entity_names

def compare_audio_to_image(language, audio, image):
    """Checks whether a speech audio is relevant to an image."""

    # speech audio -> text
    transcription = transcribe_gcs(language, audio)
    print(f'Transcription: {transcription}')

    # text of any language -> english text
    translation = translate_text('en', transcription)
    print(f'Translation: {translation}')

    # text -> entities
    entities = entities_text(translation)
    print(f'Entities: {entities}')

    # image -> labels
    labels = detect_labels_uri(image)
    print(f'Image labels: {labels}')

    # naive check for whether entities intersect with labels
    has_match = False
    for entity in entities:
        if entity in labels:
            print('The audio and image both contain: {}'.format(entity))
```

9. Test Integration

- run `python solution.py de-DE gs://cloud-samples-data/ml-api-codelab/de-ball.wav gs://cloud-samples-data/ml-api-codelab/football.jpg`. If the program deems them unrelated, then based on the results from the APIs, what must be changed in the program to address this?
  Heads up that we're missing a pip install step here, or at least I had to perform one for the six package in my gcloud instance.
  The program does deem them unrelated. It's a case sensitivity issue. The program should compare the results in a case-insensitive way:

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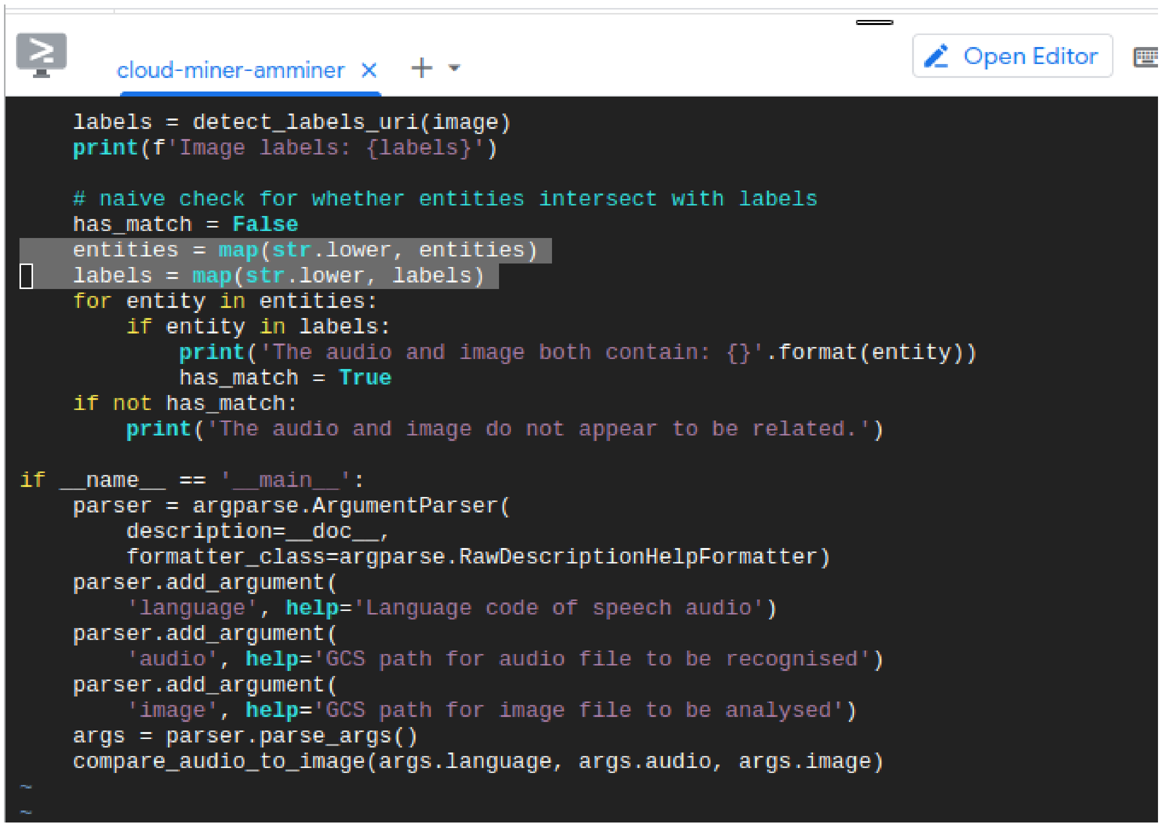
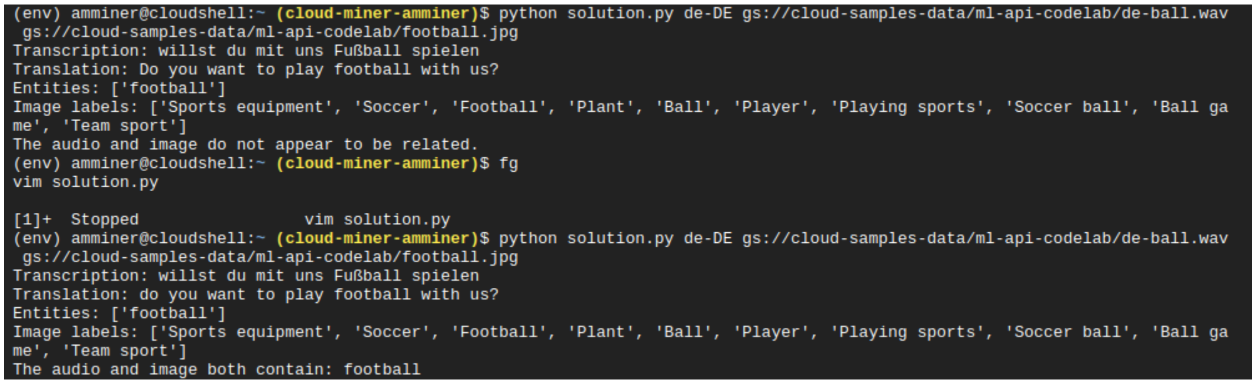


```
    labels = detect_labels_uri(image)
    print(f'Image labels: {labels}')

    # naive check for whether entities intersect with labels
    has_match = False
    entities = map(str.lower, entities)
    labels = map(str.lower, labels)
    for entity in entities:
        if entity in labels:
            print('The audio and image both contain: {}'.format(entity))
            has_match = True
    if not has_match:
        print('The audio and image do not appear to be related.')

if __name__ == '__main__':
    parser = argparse.ArgumentParser(
        description=__doc__,
        formatter_class=argparse.RawDescriptionHelpFormatter)
    parser.add_argument(
        'language', help='Language code of speech audio')
    parser.add_argument(
        'audio', help='GCS path for audio file to be recognised')
    parser.add_argument(
        'image', help='GCS path for image file to be analysed')
    args = parser.parse_args()
    compare_audio_to_image(args.language, args.audio, args.image)
~
~
```

Before & after this change:



```
(env) amminer@cloudshell:~ (cloud-miner-amminer)$ python solution.py de-DE gs://cloud-samples-data/ml-api-codelab/de-ball.wav
 gs://cloud-samples-data/ml-api-codelab/football.jpg
Transcription: willst du mit uns Fußball spielen
Translation: Do you want to play football with us?
Entities: ['football']
Image labels: ['Sports equipment', 'Soccer', 'Football', 'Plant', 'Ball', 'Player', 'Playing sports', 'Soccer ball', 'Ball ga
me', 'Team sport']
The audio and image do not appear to be related.
(env) amminer@cloudshell:~ (cloud-miner-amminer)$ fg
vim solution.py

[1]+  Stopped                 vim solution.py
(env) amminer@cloudshell:~ (cloud-miner-amminer)$ python solution.py de-DE gs://cloud-samples-data/ml-api-codelab/de-ball.wav
 gs://cloud-samples-data/ml-api-codelab/football.jpg
Transcription: willst du mit uns Fußball spielen
Translation: do you want to play football with us?
Entities: ['football']
Image labels: ['Sports equipment', 'Soccer', 'Football', 'Plant', 'Ball', 'Player', 'Playing sports', 'Soccer ball', 'Ball ga
me', 'Team sport']
The audio and image both contain: football
```

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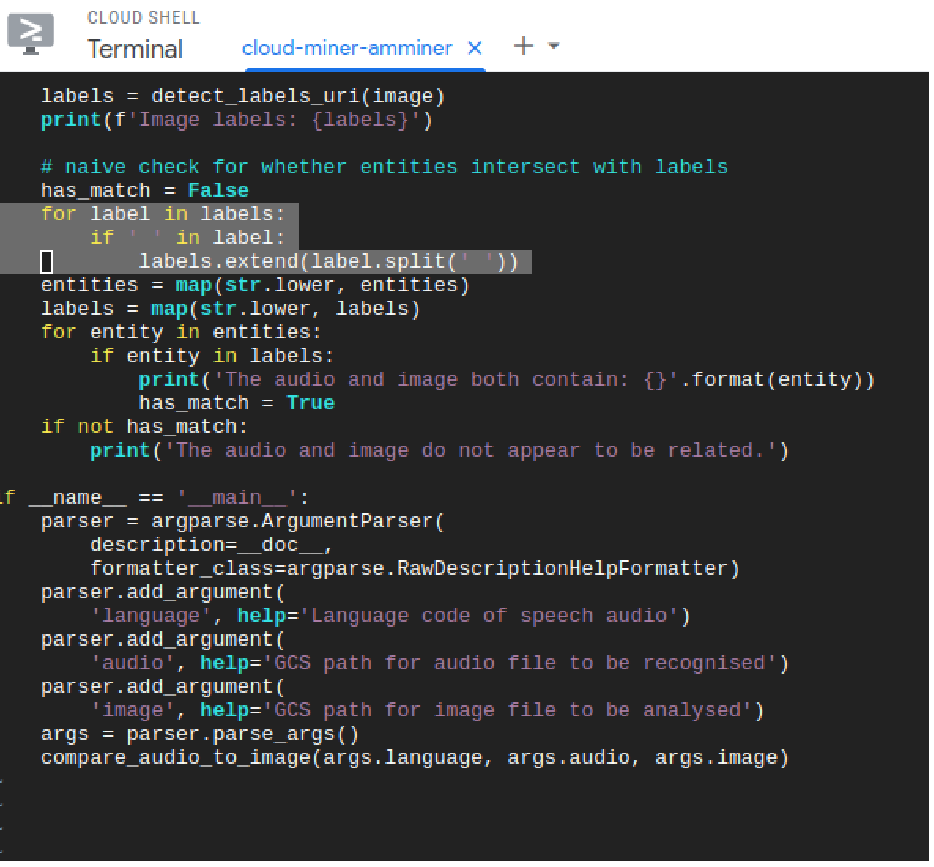
- Run `python solution.py tr-TR gs://cloud-samples-data/ml-api-codelab/tr-bike.wav gs://cloud-samples-data/ml-api-codelab/bicycle.jpg`. If the program deems them unrelated, then based on the results from the APIs, what must be changed in the program to address this?
  The program doesn't recognize that, in this situation, the words "bike" and "bicycle" likely refer to the same object or concept. Meaning is potentially blurred at the translation step but I don't know Turkish so I can't say. We have options:
  1. **Generate multiple translations and modify the code to process all of them - this is relatively complicated so I'm avoiding it.**
  2. **Take each token the APIs return and gather a list of synonyms for it, then modify our comparison loop to iterate through these synonyms - this is relatively complicated so I'm going to try to avoid it.**
  3. **Generate a lot more tokens per image and hope one of them matches - this is easy, the label_detection function takes a max_results parameter that controls how many tokens we get back. However I was not able to get it to spit out "bike" based on that image even with the maximum cranked past the number it will return, which is 66 for this image.**
  4. **Do option 3, and also modify the comparison code to search for each word within multi-word labels in addition to the whole labels themselves. This is relatively easy as well and solved the problem for me.**



```
    labels = detect_labels_uri(image)
    print(f'Image labels: {labels}')

    # naive check for whether entities intersect with labels
    has_match = False
    for label in labels:
        if ' ' in label:
            labels.extend(label.split(' '))
    entities = map(str.lower, entities)
    labels = map(str.lower, labels)
    for entity in entities:
        if entity in labels:
            print('The audio and image both contain: {}'.format(entity))
            has_match = True
    if not has_match:
        print('The audio and image do not appear to be related.')

if __name__ == '__main__':
    parser = argparse.ArgumentParser(
        description=__doc__,
        formatter_class=argparse.RawDescriptionHelpFormatter)
    parser.add_argument(
        'language', help='Language code of speech audio')
    parser.add_argument(
        'audio', help='GCS path for audio file to be recognised')
    parser.add_argument(
        'image', help='GCS path for image file to be analysed')
    args = parser.parse_args()
    compare_audio_to_image(args.language, args.audio, args.image)
~
~
~
~
```

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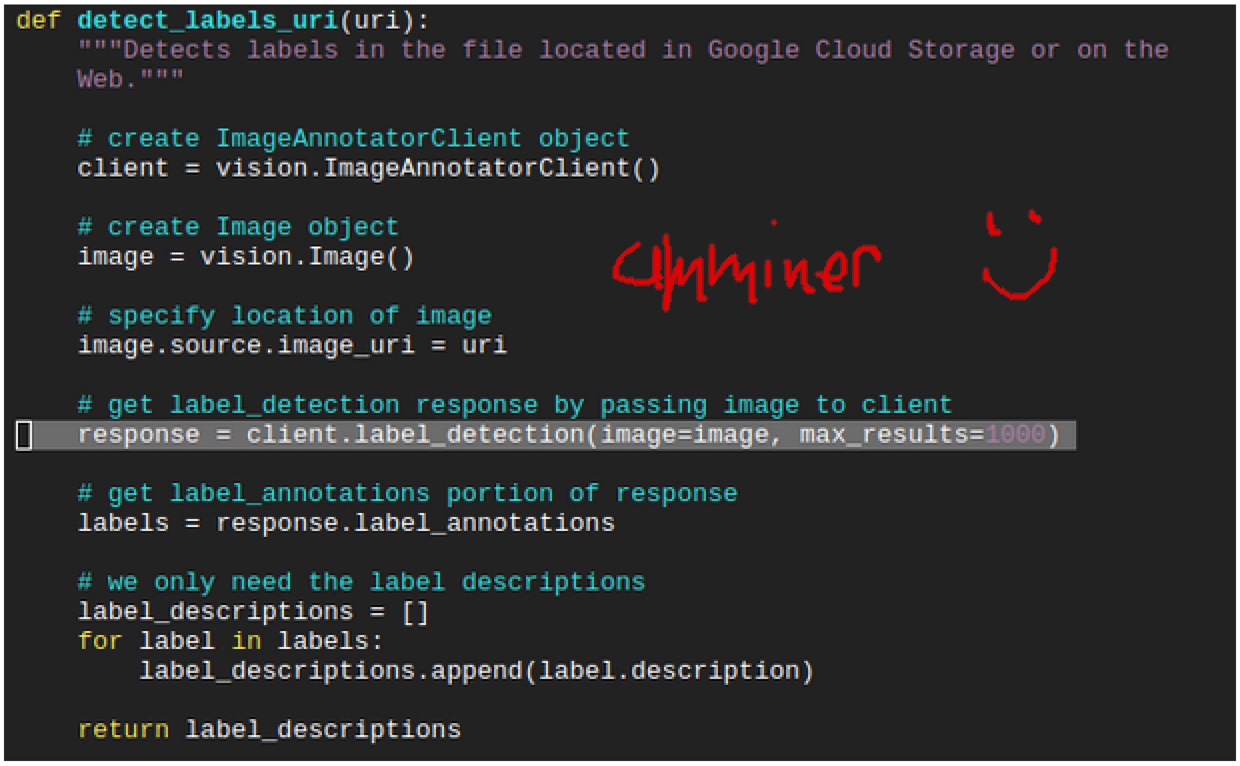
Note that we only split on spaces here,
while a more thorough implementation might consider other separator characters.



```python
def detect_labels_uri(uri):
    """Detects labels in the file located in Google Cloud Storage or on the
    Web."""

    # create ImageAnnotatorClient object
    client = vision.ImageAnnotatorClient()

    # create Image object
    image = vision.Image()

    # specify location of image
    image.source.image_uri = uri

    # get label_detection response by passing image to client
    response = client.label_detection(image=image, max_results=1000)

    # get label_annotations portion of response
    labels = response.label_annotations

    # we only need the label descriptions
    label_descriptions = []
    for label in labels:
        label_descriptions.append(label.description)

    return label_descriptions
```

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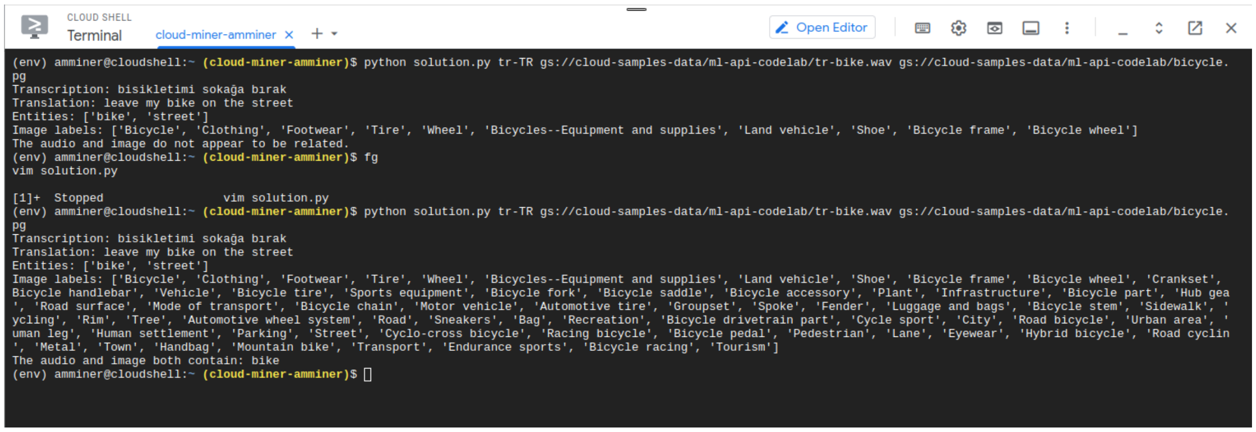
Before and after:



```
(env) amminer@cloudshell:~ (cloud-miner-amminer)$ python solution.py tr-TR gs://cloud-samples-data/ml-api-codelab/tr-bike.wav gs://cloud-samples-data/ml-api-codelab/bicycle.
pg
Transcription: bisikletimi sokağa bırak
Translation: leave my bike on the street
Entities: ['bike', 'street']
Image labels: ['Bicycle', 'Clothing', 'Footwear', 'Tire', 'Wheel', 'Bicycles--Equipment and supplies', 'Land vehicle', 'Shoe', 'Bicycle frame', 'Bicycle wheel']
The audio and image do not appear to be related.
(env) amminer@cloudshell:~ (cloud-miner-amminer)$ fg
vim solution.py

[1]+  Stopped                 vim solution.py
(env) amminer@cloudshell:~ (cloud-miner-amminer)$ python solution.py tr-TR gs://cloud-samples-data/ml-api-codelab/tr-bike.wav gs://cloud-samples-data/ml-api-codelab/bicycle.
pg
Transcription: bisikletimi sokağa bırak
Translation: leave my bike on the street
Entities: ['bike', 'street']
Image labels: ['Bicycle', 'Clothing', 'Footwear', 'Tire', 'Wheel', 'Bicycles--Equipment and supplies', 'Land vehicle', 'Shoe', 'Bicycle frame', 'Bicycle wheel', 'Crankset', '
Bicycle handlebar', 'Vehicle', 'Bicycle tire', 'Sports equipment', 'Bicycle fork', 'Bicycle saddle', 'Bicycle accessory', 'Plant', 'Infrastructure', 'Bicycle part', 'Hub gea
', 'Road surface', 'Mode of transport', 'Bicycle chain', 'Motor vehicle', 'Automotive tire', 'Groupset', 'Spoke', 'Fender', 'Luggage and bags', 'Bicycle stem', 'Sidewalk', '
ycling', 'Rim', 'Tree', 'Automotive wheel system', 'Road', 'Sneakers', 'Bag', 'Recreation', 'Bicycle drivetrain part', 'Cycle sport', 'City', 'Road bicycle', 'Urban area', '
uman leg', 'Human settlement', 'Parking', 'Street', 'Cyclo-cross bicycle', 'Racing bicycle', 'Bicycle pedal', 'Pedestrian', 'Lane', 'Eyewear', 'Hybrid bicycle', 'Road cyclin
', 'Metal', 'Town', 'Handbag', 'Mountain bike', 'Transport', 'Endurance sports', 'Bicycle racing', 'Tourism']
The audio and image both contain: bike
(env) amminer@cloudshell:~ (cloud-miner-amminer)$ 
```

- Run the following:
  `python solution.py tr-TR`
  `gs://cloud-samples-data/ml-api-codelab/tr-ostrich.wav`
  `gs://cloud-samples-data/ml-api-codelab/birds.jpg`
  If the program deems them unrelated, then based on the results from the APIs, what must be changed in the program to address this?
  The most straightfoward solution I can think of is to use a library like inflect to include both plural and singular forms for each entity the google API returns. I would like to demonstrate this if I had time, as I'm confident that it would work, but I just don't have time, and the lab strictly only asks what must be changed, not to demonstrate the solution.

10. APIS #2 (Video Intelligence API)

- gcloud services enable videointelligence.googleapis.com
  ✅

11. Video Setup

- install the google-cloud-videointelligence package. Create a storage bucket for a video and save its name to an environment variable. set the bucket and its contents to be publicly readable. Download the video from the lab and put it in the bucket.
  ✅

12. Video Intelligence Labeling Script

- Copy the script into cloud shell.
  ✅

13. Video Intelligence

- Run `python labels.py gs://${CLOUD_STORAGE_BUCKET}/SportsBloopers2016.mp4`.
  What are the 3 labels with the highest confidence that the Video Intelligence API associates with the video and what are the confidences for each?
  sports, basketball, player
- Open labels.py. What is the name of the client class in the package that is used?
  VideoIntelligenceServiceClient
- What method is used in that class to perform the annotation?
  annotate_video

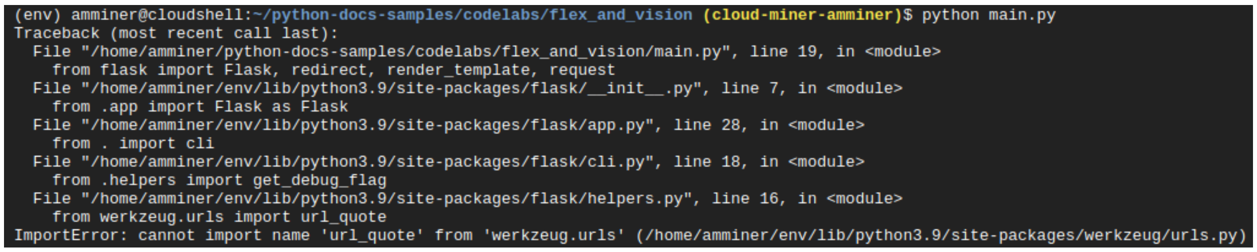
14. APIS #3 (Web Site Integration)

- Check out the specified revision and change into the specified directory.
  ✅

15. IAM Service Account Setup

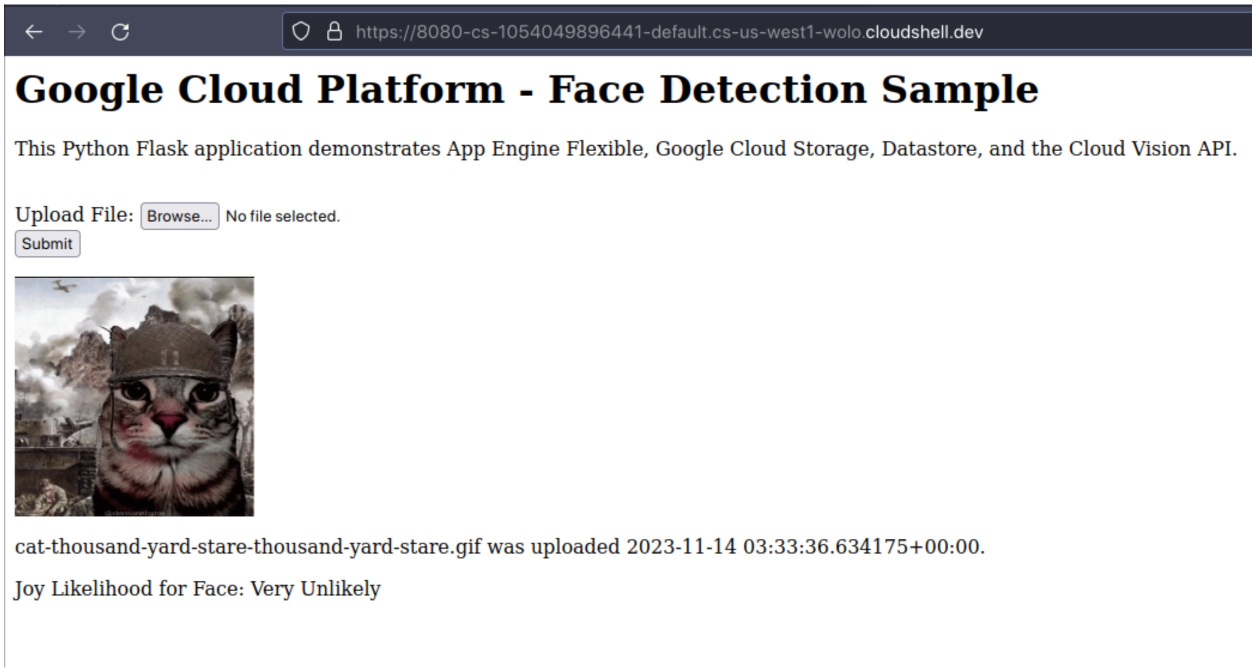
- Set up a new service account. Bind the storage.admin, datastore.user, and serviceusage.serviceUsageConsumer roles to it. Issue a key for the service account, download it, and set an environment variable to its path (GOOGLE_APPLICATION_CREDENTIALS).
  ✅

16. Application



```
(env) amminer@cloudshell:~/python-docs-samples/codelabs/flex_and_vision (cloud-miner-amminer)$ python main.py
Traceback (most recent call last):
  File "/home/amminer/python-docs-samples/codelabs/flex_and_vision/main.py", line 19, in <module>
    from flask import Flask, redirect, render_template, request
  File "/home/amminer/env/lib/python3.9/site-packages/flask/__init__.py", line 7, in <module>
    from .app import Flask as Flask
  File "/home/amminer/env/lib/python3.9/site-packages/flask/app.py", line 28, in <module>
    from . import cli
  File "/home/amminer/env/lib/python3.9/site-packages/flask/cli.py", line 18, in <module>
    from .helpers import get_debug_flag
  File "/home/amminer/env/lib/python3.9/site-packages/flask/helpers.py", line 16, in <module>
    from werkzeug.urls import url_quote
ImportError: cannot import name 'url_quote' from 'werkzeug.urls' (/home/amminer/env/lib/python3.9/site-packages/werkzeug/urls.py)
```

Looks like there is a dependency issue :(Indeed: https://stackoverflow.com/questions/77213053/importerror-cannot-import-name-url-quote-from-werkzeug-urls
Specifying Werkzeug==2.2.2 works.



https://8080-cs-1054049896441-default.cs-us-west1-wolo.cloudshell.dev

Google Cloud Platform - Face Detection Sample

This Python Flask application demonstrates App Engine Flexible, Google Cloud Storage, Datastore, and the Cloud Vision API.

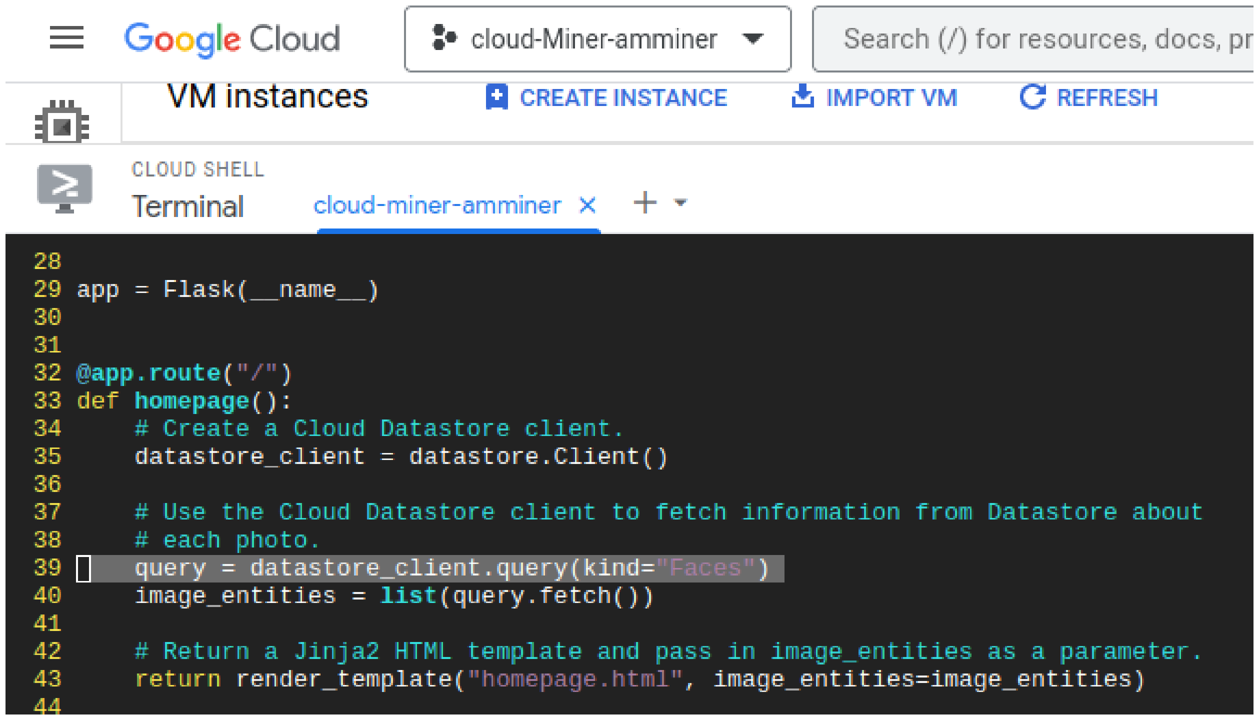
Upload File: Browse... No file selected.
Submit

cat-thousand-yard-stare-thousand-yard-stare.gif was uploaded 2023-11-14 03:33:36.634175+00:00.

Joy Likelihood for Face: Very Unlikely

17. Code

- Open main.py and view the code for the default route. What line of code creates the query for previous detections?
  39



```
28
29 app = Flask(__name__)
30
31
32 @app.route("/")
33 def homepage():
34     # Create a Cloud Datastore client.
35     datastore_client = datastore.Client()
36
37     # Use the Cloud Datastore client to fetch information from Datastore about
38     # each photo.
39     query = datastore_client.query(kind="Faces")
40     image_entities = list(query.fetch())
41
42     # Return a Jinja2 HTML template and pass in image_entities as a parameter.
43     return render_template("homepage.html", image_entities=image_entities)
44
```

- What line of code sends the query to Cloud Datastore?
  40 (see above)

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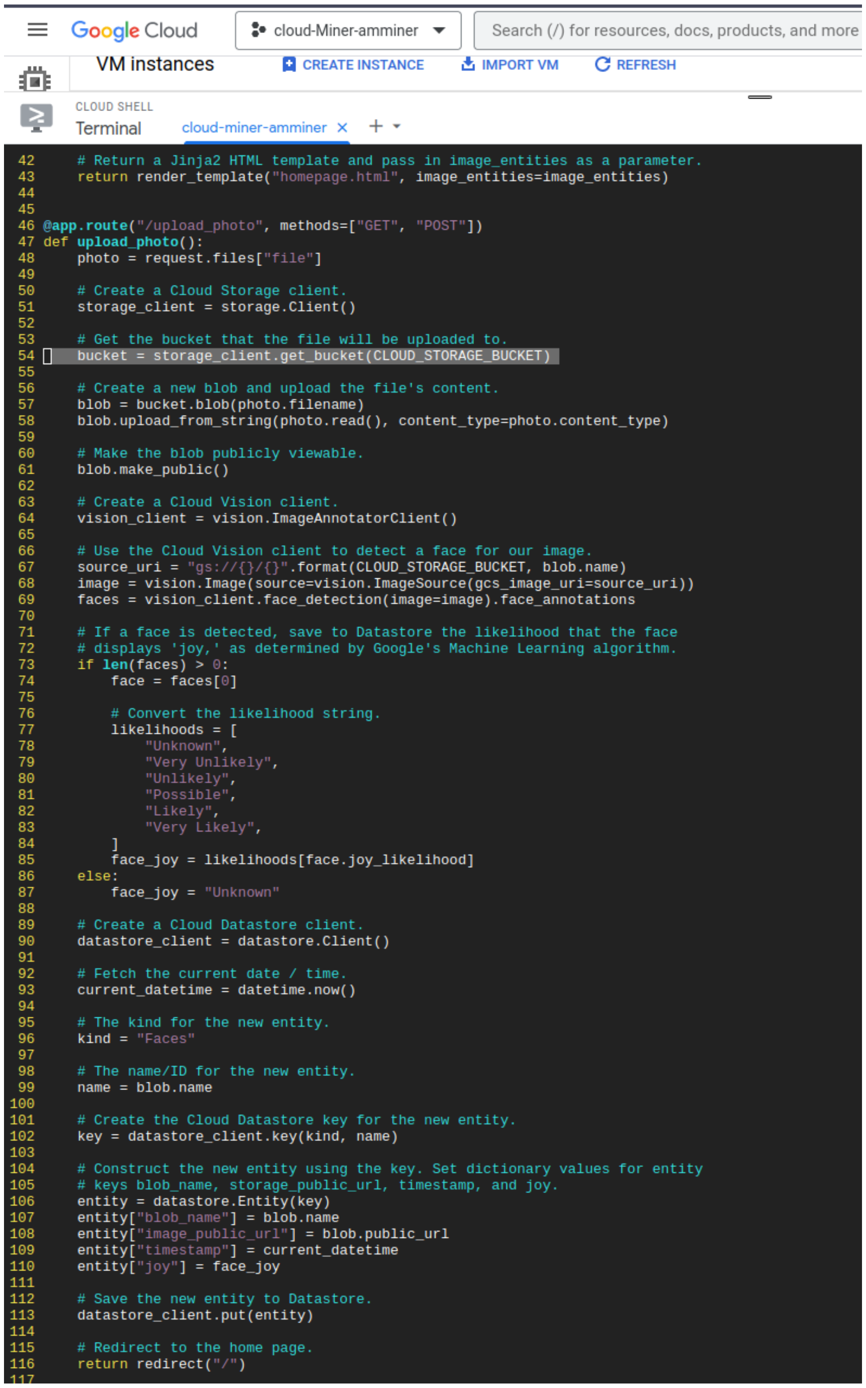
- View the upload_photo route. Show the line that retrieves the name of the storage bucket to use.
  54



```
42     # Return a Jinja2 HTML template and pass in image_entities as a parameter.
43     return render_template("homepage.html", image_entities=image_entities)
44
45
46 @app.route("/upload_photo", methods=["GET", "POST"])
47 def upload_photo():
48     photo = request.files["file"]
49
50     # Create a Cloud Storage client.
51     storage_client = storage.Client()
52
53     # Get the bucket that the file will be uploaded to.
54     bucket = storage_client.get_bucket(CLOUD_STORAGE_BUCKET)
55
56     # Create a new blob and upload the file's content.
57     blob = bucket.blob(photo.filename)
58     blob.upload_from_string(photo.read(), content_type=photo.content_type)
59
60     # Make the blob publicly viewable.
61     blob.make_public()
62
63     # Create a Cloud Vision client.
64     vision_client = vision.ImageAnnotatorClient()
65
66     # Use the Cloud Vision client to detect a face for our image.
67     source_uri = "gs://{}/{}".format(CLOUD_STORAGE_BUCKET, blob.name)
68     image = vision.Image(source=vision.ImageSource(gcs_image_uri=source_uri))
69     faces = vision_client.face_detection(image=image).face_annotations
70
71     # If a face is detected, save to Datastore the likelihood that the face
72     # displays 'joy,' as determined by Google's Machine Learning algorithm.
73     if len(faces) > 0:
74         face = faces[0]
75
76         # Convert the likelihood string.
77         likelihoods = [
78             "Unknown",
79             "Very Unlikely",
80             "Unlikely",
81             "Possible",
82             "Likely",
83             "Very Likely",
84         ]
85         face_joy = likelihoods[face.joy_likelihood]
86     else:
87         face_joy = "Unknown"
88
89     # Create a Cloud Datastore client.
90     datastore_client = datastore.Client()
91
92     # Fetch the current date / time.
93     current_datetime = datetime.now()
94
95     # The kind for the new entity.
96     kind = "Faces"
97
98     # The name/ID for the new entity.
99     name = blob.name
100
101     # Create the Cloud Datastore key for the new entity.
102     key = datastore_client.key(kind, name)
103
104     # Construct the new entity using the key. Set dictionary values for entity
105     # keys blob_name, storage_public_url, timestamp, and joy.
106     entity = datastore.Entity(key)
107     entity["blob_name"] = blob.name
108     entity["image_public_url"] = blob.public_url
109     entity["timestamp"] = current_datetime
110     entity["joy"] = face_joy
111
112     # Save the new entity to Datastore.
113     datastore_client.put(entity)
114
115     # Redirect to the home page.
116     return redirect("/")
117
```

- What form field is used to specify the uploaded photo?
  file (line 48 above).
- Show the line that copies the photo's contents to the storage bucket.
  Line 58 above.

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- What method in Vision's annotation client is used to perform the analysis?
  face_detection (line 69 above).
- What fields are stored in Cloud Datastore for each image?
  blob_name, image_public_url, timestamp, and joy (lines 107 through 110)
- What happens at the end of the upload_photo route?
  The application redirects the browser to the home page (line 116)

18. Clean Up

- Delete the service accounts, keys, and bucket.
  ✅