

Lab 3 - GCP - Andrew Anter Gebraeel

1. Deleted subnet-a and recreated it in the same region as subnet-b

Google Cloud My First Project Search (/) for resources, docs, products, and more

VPC network details EDIT DELETE VPC NETWORK

Enable DNS API

Applying DNS server policies to the network requires DNS API. This is a one-time enablement per project and may take a few minutes to complete.

ENABLE API

None

Maximum transmission unit

1460

SUBNETS STATIC INTERNAL IP ADDRESSES FIREWALLS ROUTES VPC NETWORK PEERING PRIVATE SERVICE CONNECTION

ADD SUBNET FLOW LOGS

Private Google Access is in effect (even though it has not been enabled manually) when Cloud NAT is enabled for the primary IP range of the subnetwork. [Learn more](#)

Filter Enter property name or value

<input type="checkbox"/>	Name	Region	Stack Type	Internal IP ranges	External IP ranges	Secondary IPv4 ranges	Gateway	Private Google Access	Flow logs
<input type="checkbox"/>	subnet-a	asia-east1	IPv4	10.0.1.0/24	None	None	10.0.1.1	Off	Off
<input type="checkbox"/>	subnet-b	asia-east1	IPv4	192.168.1.0/24	None	None	192.168.1.1	Off	Off

Reserved proxy-only subnets for load balancing

<input type="checkbox"/>	Name	Region	IP address ranges	Gateway	Role	Purpose
No rows to display						

EQUIVALENT REST

Select a subnet

Please select at least one resource.

Create a nat within the region “asia-east1”

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Network services

Cloud NAT CREATE CLOUD NAT GATEWAY DELETE REFRESH

Filter Enter property name or value

<input type="checkbox"/>	Gateway name	Region	Cloud router	Status
<input type="checkbox"/>	my-nat	asia-east1	my-nat-cloud-router	Running

Load balancing

Cloud DNS

Cloud CDN

Cloud NAT

Traffic Director

Service Directory

Cloud Domains

Private Service Connect

Marketplace

Release Notes

2. Created Server-3 instance

The screenshot shows the Google Cloud console interface for VM instances. At the top, there's a search bar and navigation links for 'INSTANCES', 'OBSERVABILITY', and 'INSTANCE SCHEDULES'. Below the navigation bar, a table lists the VM instances. The table has columns for Status, Name, Zone, Recommendations, In use by, Internal IP, External IP, and Connect. One instance, 'server-3', is listed with a status of 'Running' (green checkmark), located in the 'asia-east1-b' zone, with an internal IP of '10.0.1.2 (nic0)' and an external IP of '34.80.106.166 (nic0)'. Below the table, there are several 'Related actions' cards: 'Explore Backup and DR', 'View billing report', 'Monitor VMs', 'Explore VM logs', 'Set up firewall rules', 'Patch management', and 'Load balance between VMs'.

Status	Name	Zone	Recommendations	In use by	Internal IP	External IP	Connect
Running	server-3	asia-east1-b			10.0.1.2 (nic0)	34.80.106.166 (nic0)	SSH

```
ERROR: (gcloud) Command name argument expected.
andrew@andrew-zephyrus:~$ gcloud compute ssh --zone "asia-east1-b" "server-3" --project "annular-magnet-387906"
WARNING: The private SSH key file for gcloud does not exist.
WARNING: The public SSH key file for gcloud does not exist.
WARNING: You do not have an SSH key for gcloud.
WARNING: SSH keygen will be executed to generate a key.
Generating public/private rsa key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/andrew/.ssh/google_compute_engine
Your public key has been saved in /home/andrew/.ssh/google_compute_engine.pub
The key fingerprint is:
SHA256:xyLH4zi0eCt6c4alqcUGk3V9Tvz1MoHTKmk045pMxmM andrew@andrew-zephyrus
The key's randomart image is:
+----[RSA 3072]-----+
|
|  . . o
|  . . * o .
| o . . * = +
|+ o . = S * .
| = o . * + o
| . =E o .
| +=X.o .
| |=*o..
+----[SHA256]-----+
Updating project ssh metadata...Updated [https://www.googleapis.com/compute/v1/projects/annular-magnet-387906].
Updating project ssh metadata...done.
Waiting for SSH key to propagate.
Warning: Permanently added 'compute.4884971011035545203' (ED25519) to the list of known hosts.
Linux server-3 5.10.0-22-cloud-amd64 #1 SMP Debian 5.10.178-3 (2023-04-22) x86_64

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

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
andrew@server-3:~$
```

3. Updated the packages

```
+
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
andrew@server-3:~$ sudo apt-get update
Get:1 https://packages.cloud.google.com/apt google-compute-engine-bullseye-stable InRelease [5146 B]
Get:2 https://packages.cloud.google.com/apt cloud-sdk-bullseye InRelease [6403 B]
Hit:3 https://deb.debian.org/debian bullseye InRelease
Get:4 https://deb.debian.org/debian-security bullseye-security InRelease [48.4 kB]
Get:5 https://deb.debian.org/debian bullseye-updates InRelease [44.1 kB]
Get:6 https://deb.debian.org/debian bullseye-backports InRelease [49.0 kB]
Get:7 https://packages.cloud.google.com/apt google-compute-engine-bullseye-stable/main amd64 Packages [1917 B]
Get:8 https://packages.cloud.google.com/apt cloud-sdk-bullseye/main amd64 Packages [295 kB]
Get:9 https://deb.debian.org/debian-security bullseye-security/main Sources [201 kB]
Get:10 https://deb.debian.org/debian-security bullseye-security/main amd64 Packages [245 kB]
Get:11 https://deb.debian.org/debian-security bullseye-security/main Translation-en [160 kB]
Get:12 https://deb.debian.org/debian bullseye-updates/main Sources.diff/Index [18.5 kB]
Get:13 https://deb.debian.org/debian bullseye-updates/main amd64 Packages.diff/Index [18.5 kB]
Get:14 https://deb.debian.org/debian bullseye-updates/main Translation-en.diff/Index [7239 B]
Get:15 https://deb.debian.org/debian bullseye-updates/main Sources T-2023-05-24-2006.01-F-2023-05-24-2006.01.pdiff [547 B]
Get:16 https://deb.debian.org/debian bullseye-updates/main amd64 Packages T-2023-05-24-2006.01-F-2023-05-24-2006.01.pdiff [362 B]
Get:15 https://deb.debian.org/debian bullseye-updates/main Sources T-2023-05-24-2006.01-F-2023-05-24-2006.01.pdiff [547 B]
Get:16 https://deb.debian.org/debian bullseye-updates/main amd64 Packages T-2023-05-24-2006.01-F-2023-05-24-2006.01.pdiff [362 B]
Get:17 https://deb.debian.org/debian bullseye-updates/main Translation-en T-2023-05-24-2006.01-F-2023-05-24-2006.01.pdiff [355 B]
Get:17 https://deb.debian.org/debian bullseye-updates/main Translation-en T-2023-05-24-2006.01-F-2023-05-24-2006.01.pdiff [355 B]
Get:18 https://deb.debian.org/debian bullseye-backports/main Sources.diff/Index [63.3 kB]
Get:19 https://deb.debian.org/debian bullseye-backports/main amd64 Packages.diff/Index [63.3 kB]
Get:20 https://deb.debian.org/debian bullseye-backports/main Translation-en.diff/Index [63.3 kB]
Get:21 https://deb.debian.org/debian bullseye-backports/main Sources T-2023-05-30-2003.04-F-2023-05-09-2004.12.pdiff [19.7 kB]
Get:21 https://deb.debian.org/debian bullseye-backports/main Sources T-2023-05-30-2003.04-F-2023-05-09-2004.12.pdiff [19.7 kB]
Get:22 https://deb.debian.org/debian bullseye-backports/main amd64 Packages T-2023-05-30-2003.04-F-2023-05-09-2004.12.pdiff [30.0 kB]
Get:22 https://deb.debian.org/debian bullseye-backports/main amd64 Packages T-2023-05-30-2003.04-F-2023-05-09-2004.12.pdiff [30.0 kB]
Get:23 https://deb.debian.org/debian bullseye-backports/main Translation-en T-2023-05-22-0802.59-F-2023-05-22-0802.59.pdiff [871 B]
Get:23 https://deb.debian.org/debian bullseye-backports/main Translation-en T-2023-05-22-0802.59-F-2023-05-22-0802.59.pdiff [871 B]
Fetched 1342 kB in 1s (1067 kB/s)
Reading package lists... Done
andrew@server-3:~$
```

Install apache2

```
+
Enabling module mime.
Enabling module negotiation.
Enabling module setenvif.
Enabling module filter.
Enabling module deflate.
Enabling module status.
Enabling module reqtimeout.
Enabling conf charset.
Enabling conf localized-error-pages.
Enabling conf other-vhosts-access-log.
Enabling conf security.
Enabling conf serve-cgi-bin.
Enabling site 000-default.
Created symlink /etc/systemd/system/multi-user.target.wants/apache2.service → /lib/systemd/system/apache2.service.
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.service → /lib/systemd/system/apache-htcacheclean.service.
Processing triggers for man-db (2.9.4-2) ...

Processing triggers for libc-bin (2.31-13+deb11u6) ...
andrew@server-3:~$ service apache2 status
-bash: service: command not found
andrew@server-3:~$ systemctl status apache2
* apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
   Active: active (running) since Wed 2023-05-31 08:29:58 UTC; 11min ago
     Docs: https://httpd.apache.org/docs/2.4/
   Main PID: 2042 (apache2)
    Tasks: 55 (limit: 2353)
   Memory: 8.9M
      CPU: 64ms
   CGroup: /system.slice/apache2.service
           └─2042 /usr/sbin/apache2 -k start
             └─2044 /usr/sbin/apache2 -k start
               └─2045 /usr/sbin/apache2 -k start

May 31 08:29:58 server-3 systemd[1]: Starting The Apache HTTP Server...
May 31 08:29:58 server-3 systemd[1]: Started The Apache HTTP Server.
andrew@server-3:~$
```

4. Create the template from an instance using gcloud from the cloudshell

The screenshot shows the Google Cloud Platform interface. At the top, the 'Instance templates' page is displayed, showing a table with one template named 'apache2-template'. Below this, the 'CLOUD SHELL' terminal is open, showing the execution of a gcloud command to create an instance template from an existing instance. The terminal output shows the command was successful, and a confirmation message 'Instance template deleted' is visible.

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

Filter instance templates

Name	Machine type	Image	Disk type	Placement policy	In use by	Creation time	Actions
apache2-template	e2-small	debian-11-bullseye-v20230509	Balanced persistent disk	No policy		Jun 1, 2023, 7:14:38 AM UTC+03:00	

CLOUD SHELL Terminal (annular-magnet-387906) x +

```
NAME: my-template
MACHINE_TYPE: e2-small
PREEMPTIBLE:
CREATION_TIMESTAMP: 2023-05-31T20:52:34.289-07:00
andrew_artercloudshell:~$ gcloud compute instance-templates create apache2-template --source-instance-server-3 --source-instance-zone=asia-east1-b
Created [https://www.googleapis.com/compute/v1/projects/annular-magnet-387906/global/instanceTemplates/apache2-template].
NAME: apache2-template
MACHINE_TYPE: e2-small
PREEMPTIBLE:
CREATION_TIMESTAMP: 2023-05-31T21:14:38.221-07:00
andrew_artercloudshell:~$
```

Instance template deleted

MIG group with application LB

The screenshot shows the Google Cloud Platform interface for a Managed Instance Group (MIG) named 'apache2-instance-group'. The 'OVERVIEW' tab is selected, showing the group's status, creation time, and configuration. The 'Instance Group Members' table shows one instance, 'apache2-instance-group-x8j6', which is healthy and has an external IP of 35.194.165.27.

Overview

Instances by status: 1 instance (1 healthy)

Instance by health: 100% healthy

Autoscaling: On (min 1, max 2)

Status: Ready

Creation Time: Jun 1, 2023, 7:18:19 AM UTC+03:00

Description:

Number of instances: 1

Template: apache2-template

Location: asia-east1-b

Instance Group Members

Status	Name	Creation Time	Template	Per instance config	Internal IP	External IP	Health Check Status	Connect
Healthy	apache2-instance-group-x8j6	Jun 1, 2023, 7:18:36 AM UTC+03:00	apache2-template		10.0.1.7 (nic0)	35.194.165.27	Healthy	SSH

Google Cloud My First Project firewall

Load balancing

+ CREATE LOAD BALANCER REFRESH DELETE

HELP ASSISTANT LEARN

LOAD BALANCERS BACKENDS FRONTENDS

Filter Enter property name or value

Name	Load balancer type	Protocols	Region	Backends
apache2-loadbalancer	HTTP(S)	HTTP		1 backend service (1 instance group, 0 network endpoint groups)

To view or delete load balancing resources like forwarding rules and target proxies, go to the [load balancing components view](#).

Get started with Cloud Load Balancing

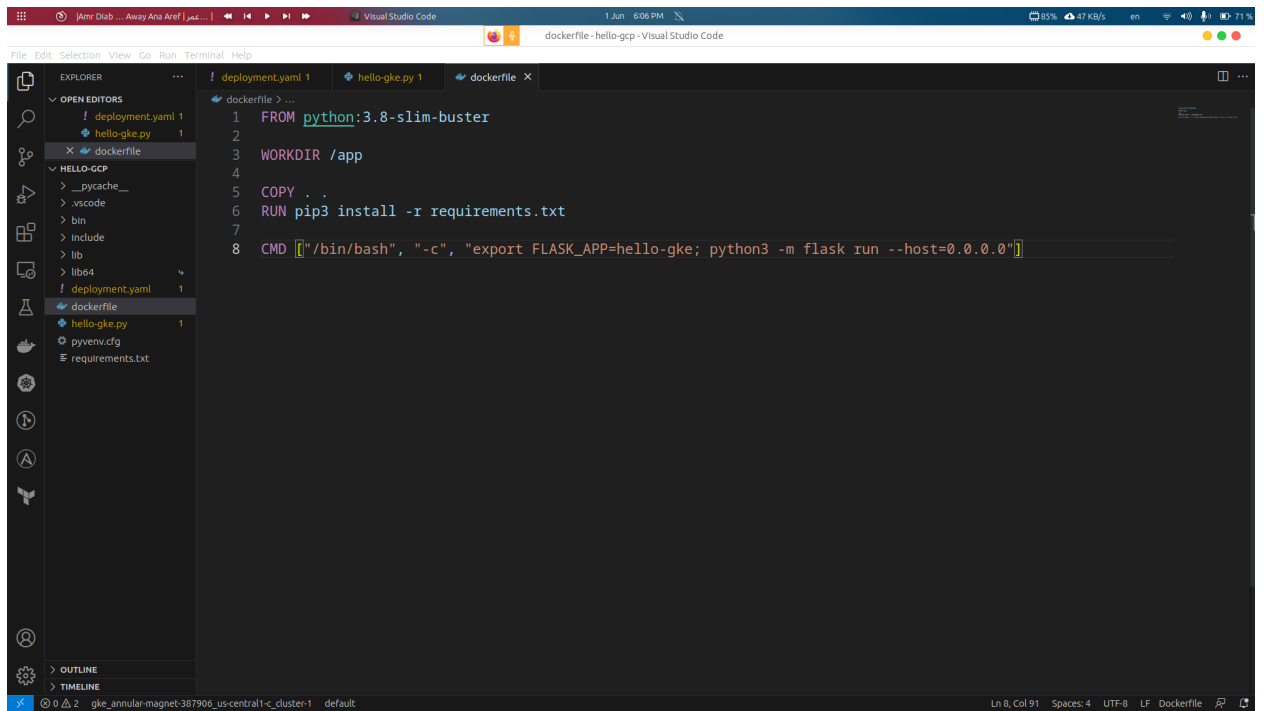
- Cloud Load Balancing overview
- Choose a load balancer
- Set up a global external HTTP(S) load balancer
- Set up an external HTTP(S) load balancer by using Ingress
- Serve static content from Cloud Storage buckets
- Set up an internal TCP/UDP load balancer

5.

```
hello-gke.py x
home > andrew > Desktop > hello-gke.py
1 print("Hello From GKE!!")
```

Ln 1, Col 26 Spaces: 4 UTF-8 LF Python 3.11.2 64-bit

6. Created a docker image and pushed it to the artifact registry

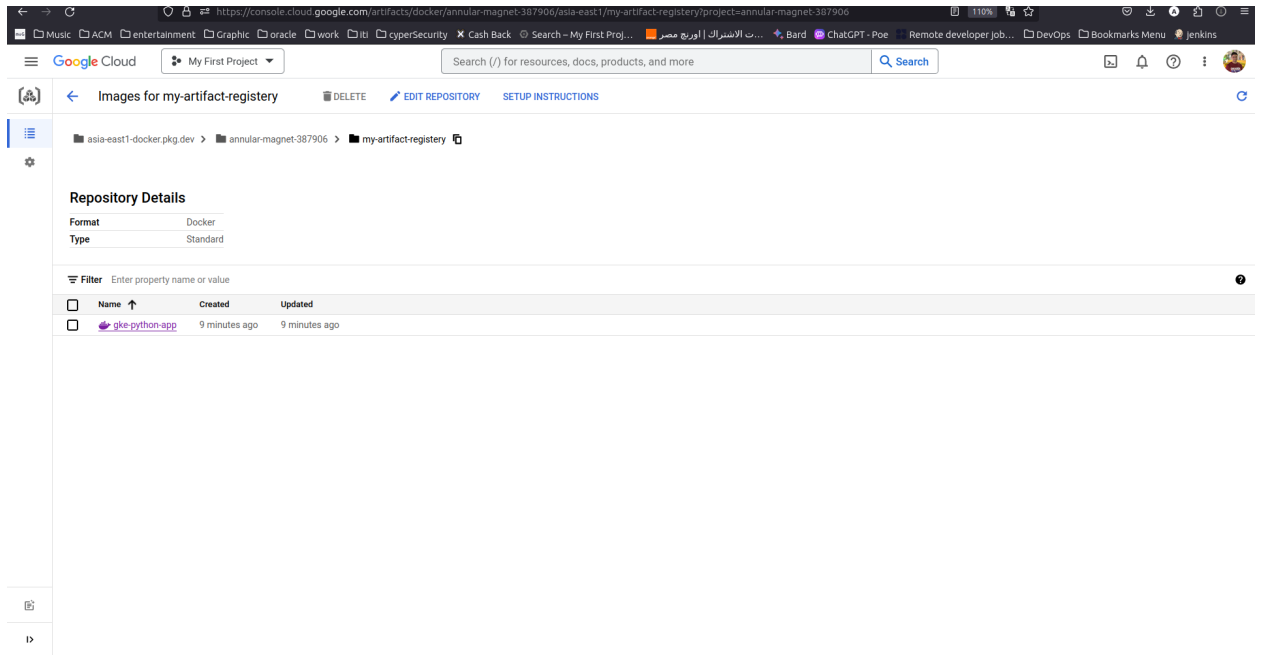


The screenshot shows the Visual Studio Code interface with a Dockerfile open in the editor. The Dockerfile contains the following instructions:

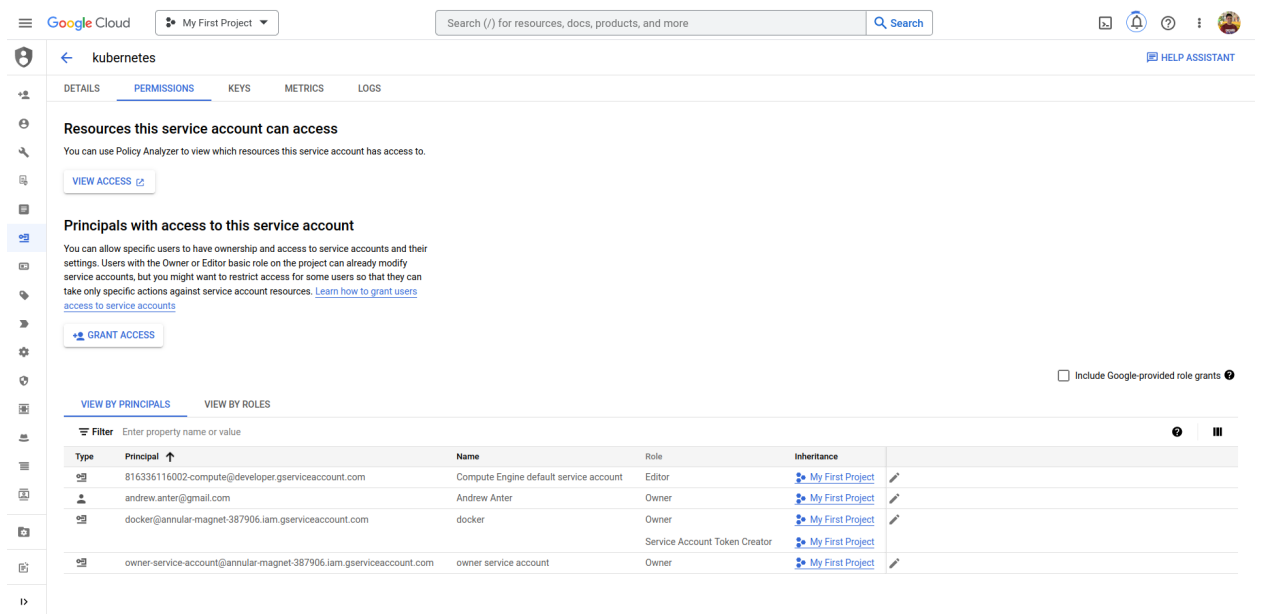
```
1 FROM python:3.8-slim-buster
2
3 WORKDIR /app
4
5 COPY . .
6 RUN pip3 install -r requirements.txt
7
8 CMD ["bin/bash", "-c", "export FLASK_APP=hello-gke; python3 -m flask run --host=0.0.0.0"]
```

The Explorer sidebar on the left shows the project structure with files like deployment.yaml, hello-gke.py, pyvenv.cfg, requirements.txt, and the Dockerfile. The Dockerfile is currently selected and its content is displayed in the editor.

```
andrew@andrew-zephyrus:~/Desktop/hello-gcp$ docker push asia-east1-docker.pkg.dev/annular-magnet-387906/my-artifact-registry/gke-python-app
Using default tag: latest
The push refers to repository [asia-east1-docker.pkg.dev/annular-magnet-387906/my-artifact-registry/gke-python-app]
6baa1dc17c39: Pushed
1b018354c96a: Pushed
20f37d3563b9: Pushed
c0212dc63007: Pushed
d8b06e4bca9a: Pushed
5f87a6d48234: Pushed
37b14643f733: Pushed
d85b356ec3b5: Pushed
latest: digest: sha256:52cd118d87a307b53d19b8e57f704b3032b9739e279064b8084bc60559038299 size: 1998
andrew@andrew-zephyrus:~/Desktop/hello-gcp$
```



7. Create a new SV called kubernetes with the required permissions([Kubernetes Engine Node Service Account](#))



Create a private cluster

Google Cloud

My First Project

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Search

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← Clusters

EDIT

DELETE

ADD NODE POOL

DEPLOY

CONNECT

DUPLICATE

OPERATIONS

HELP ASSISTANT

cluster-1

DETAILS

NODES

STORAGE

OBSERVABILITY

LOGS

Cluster basics

Name	cluster-1	🔒
Location type	Zonal	🔒
Control plane zone	us-central1-c	🔒
Default node zones	us-central1-c	✎
Release channel	Regular channel	UPGRADE AVAILABLE
Version	1.25.8-gke.500	
Total size	1	①
External endpoint	34.72.223.130	🔒
Internal endpoint	172.16.0.34	🔒

Show cluster certificate

Show cluster certificate

Automation

Maintenance window	Any time	✎
Maintenance exclusions	None	
Notifications	Disabled	✎
Vertical Pod Autoscaling	Disabled	✎
Node auto-provisioning	Disabled	✎
Auto-provisioning network tags		✎
Autoscaling profile	Balanced	✎

Networking

Private cluster	Enabled	🔒
Default SNAT	Enabled	✎
Control plane address range	172.16.0.32/28	🔒
Control plane global access	Disabled	✎
VPC peering	gke-n5e3e53b29633b31e137-074a-0e9d-peer	🔒
Network	default	🔒
Subnet	default	🔒
Stack type	IPv4	✎
VPC-native traffic routing	Enabled	🔒
Cluster Pod IPv4 range (default)	10.4.0.0/14	🔒
Cluster Pod IPv4 ranges (additional)	None	✎
Maximum pods per node	50	🔒
IPv4 service range	10.8.0.0/20	🔒
Intranode visibility	Disabled	✎
HTTP Load Balancing	Enabled	✎
Subsetting for L4 Internal Load Balancers	Disabled	✎
Control plane authorized networks	Disabled	✎
Calico Kubernetes Network policy	Disabled	✎
Dataplane V2	Disabled	🔒
DNS provider	Kube-dns	✎
NodeLocal DNSCache	Disabled	

Security

Binary authorization	Disabled	✎
----------------------	----------	---

Recommended for you

Overview of node pools

Help document

Understand how node pools work in GKE.

Quickstart

Tutorial

Deploy a containerized web application on a GKE cluster, using Cloud console.

Add and manage node pools

Help document

Add and manage the node pools that are running in your GKE clusters.

Cluster architecture

Help document

Understand the architecture of GKE clusters, including cluster masters, nodes, and node-allocatable resources.

Create a private cluster

Help document

Create a private GKE cluster with internal IP addresses only to ensure that network traffic remains private.

Plan storage for clusters

Help document

Choose from the Google Cloud managed storage options or Kubernetes storage abstractions for your GKE clusters.

Google Cloud

My First Project

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Search

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LEARN Tutorial

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← Clusters

EDIT

DELETE

ADD NODE POOL

DEPLOY

CONNECT

DUPLICATE

OPERATIONS

HELP ASSISTANT

Networking

Private cluster	Enabled	🔒
Default SNAT	Enabled	✎
Control plane address range	172.16.0.32/28	🔒
Control plane global access	Disabled	✎
VPC peering	gke-n5e3e53b29633b31e137-074a-0e9d-peer	🔒
Network	default	🔒
Subnet	default	🔒
Stack type	IPv4	✎
VPC-native traffic routing	Enabled	🔒
Cluster Pod IPv4 range (default)	10.4.0.0/14	🔒
Cluster Pod IPv4 ranges (additional)	None	✎
Maximum pods per node	50	🔒
IPv4 service range	10.8.0.0/20	🔒
Intranode visibility	Disabled	✎
HTTP Load Balancing	Enabled	✎
Subsetting for L4 Internal Load Balancers	Disabled	✎
Control plane authorized networks	Disabled	✎
Calico Kubernetes Network policy	Disabled	✎
Dataplane V2	Disabled	🔒
DNS provider	Kube-dns	✎
NodeLocal DNSCache	Disabled	

Security

Binary authorization	Disabled	✎
----------------------	----------	---

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Help document

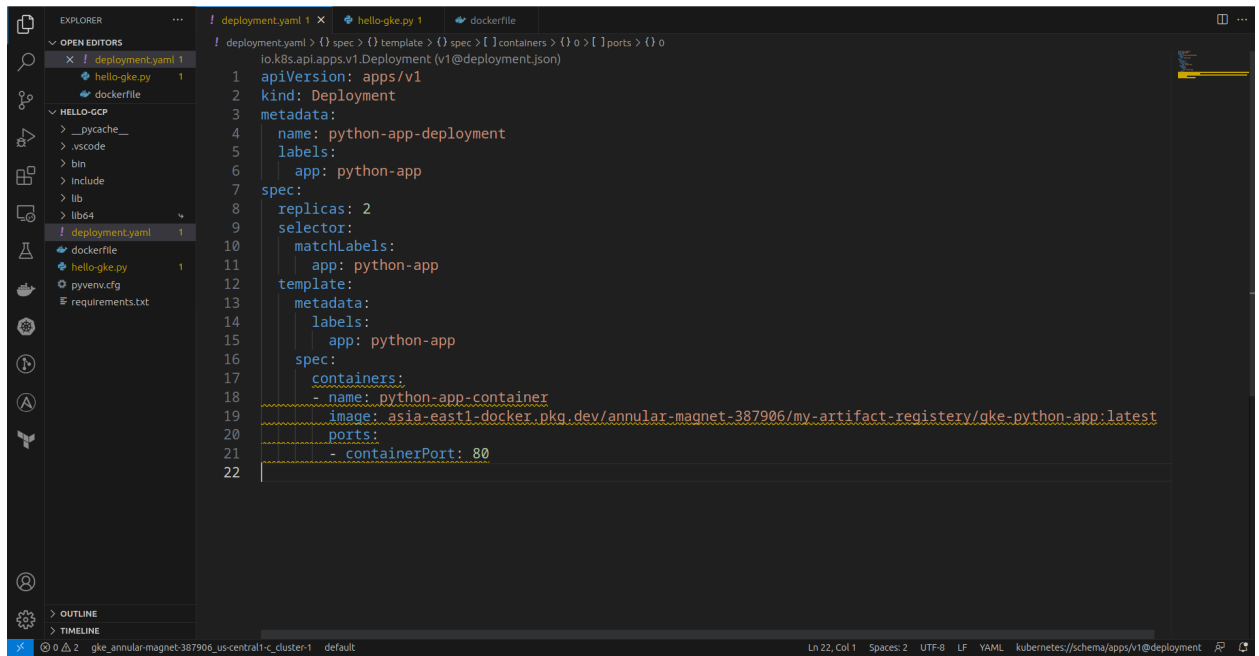
Create a private GKE cluster with internal IP addresses only to ensure that network traffic remains private.

Plan storage for clusters

Help document

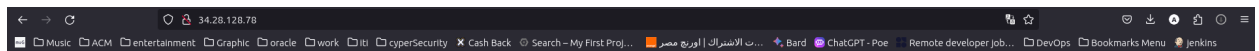
Choose from the Google Cloud managed storage options or Kubernetes storage abstractions for your GKE clusters.

Create a deployment with 2 replicas and exposed it by creating a loadbalancer service



The screenshot shows a VS Code editor with a file explorer on the left and a code editor in the center. The file explorer shows a project named 'HELLO-GCP' with files like 'deployment.yaml', 'dockerfile', 'hello-gke.py', 'pyvenv.cfg', and 'requirements.txt'. The code editor displays the content of 'deployment.yaml', which is a Kubernetes Deployment manifest. The manifest specifies 2 replicas, a selector matching labels 'app: python-app', and a template with a container named 'python-app-container' using the image 'asia-east1-docker.pkg.dev/annular-magnet-387906/my-artifact-registry/gke-python-app:latest' and exposing port 80. The status bar at the bottom indicates the current context is 'gke_annular-magnet-387906_us-central1-c_cluster1_default'.

```
1 apiVersion: apps/v1
2 kind: Deployment
3 metadata:
4   name: python-app-deployment
5   labels:
6     app: python-app
7 spec:
8   replicas: 2
9   selector:
10    matchLabels:
11      app: python-app
12   template:
13     metadata:
14       labels:
15         app: python-app
16     spec:
17       containers:
18       - name: python-app-container
19         image: asia-east1-docker.pkg.dev/annular-magnet-387906/my-artifact-registry/gke-python-app:latest
20         ports:
21         - containerPort: 80
```



8. Deployment file

```
! automated-deployment.yaml 1 x
! automated-deployment.yaml > {} spec > {} selector > {} matchLabels
2 kind: Deployment
3 metadata:
4   name: nginx-deployment
5   labels:
6     app: nginx
7 spec:
8   replicas: 2
9   selector:
10    matchLabels:
11      app: nginx
12   template:
13     metadata:
14       labels:
15         app: nginx
16     spec:
17       containers:
18         - name: nginx
19           image: nginx:latest
20           ports:
21             - containerPort: 80
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL bash - hello-gcp

andrew@andrew-zephyrus: ~/Desktop/hello-gcp

7906_us-central1_automated-cluster default Ln 10, Col 12 Spaces: 2 UTF-8 LF YAML kubernetes://schema/apps/v1@deployment

andrew@andrew-zephyrus: ~/Desktop\$ kubectl apply -f automated-deployment.yaml

Warning: Autopilot set default resource requests for Deployment default/nginx-deployment, as resource requests were not specified. See <http://g.co/gke/autopilot-defaults>

deployment.apps/nginx-deployment created

andrew@andrew-zephyrus: ~/Desktop\$ kubectl expose deployment nginx-deployment --type LoadBalancer --port 80 --target-port 80

service/nginx-deployment exposed

andrew@andrew-zephyrus: ~/Desktop\$ kubectl get svc

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
kubernetes	ClusterIP	10.79.0.1	<none>	443/TCP	26m
nginx-deployment	LoadBalancer	10.79.1.12	<pending>	80:30459/TCP	7s

andrew@andrew-zephyrus: ~/Desktop\$ kubectl get svc

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
kubernetes	ClusterIP	10.79.0.1	<none>	443/TCP	27m
nginx-deployment	LoadBalancer	10.79.1.12	146.148.74.218	80:30459/TCP	55s

Nginx running from the server by exposing it using loadbalancer service

