

Lab 8

Web Service and Machine Learning in GCP

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Roll: 2022BCD0013

1. To create and deploy a basic web service on Google Cloud Platform (GCP) and make it accessible via a REST API. Students have to host a simple Python-based (Flask) or Node.js web service on a GCP virtual machine and expose it using a public API endpoint

Enable API

The screenshot shows the Google Cloud console interface for enabling the Compute Engine API. At the top, there's a search bar and navigation icons. Below the header, the 'Product details' section is visible. The main content area displays the 'Compute Engine API' with a blue gear icon. Below the icon, there's a link to 'Google Enterprise API' and the text 'Compute Engine API'. Two buttons are present: 'ENABLE' (blue) and 'TRY THIS API' (white with a link icon). Below this, there are tabs for 'OVERVIEW', 'DOCUMENTATION', 'SUPPORT', and 'RELATED PRODUCTS'. The 'OVERVIEW' tab is selected, showing the 'Overview' section with the text 'Creates and runs virtual machines on Google Cloud Platform.' To the right, the 'Additional details' section lists: 'Type: SaaS & APIs', 'Last product update: 3/24/23', 'Category: Compute, Networking, Google Enterprise APIs', and 'Service name: compute.googleapis.com'.

Create VM

← Create an instance

CREATE VM FROM...

EQUIVALENT CODE

Machine configuration

e2-medium, us-central1

OS and storage

Ubuntu 20.04 LTS

Data protection

Snapshot schedules

Networking

2 firewall rules, 1 network interface

Observability

Install Ops Agent

Security

Advanced

Machine configuration

Name *

ashliq-22bcd0013

Region *

us-central1 (Iowa)

Zone *

Any

General purpose

Compute optimized

Memory optimized

Storage optimized

GPUs

Machine types for common workloads, optimized for cost and flexibility

Series	Description	vCPUs	Memory	CPU Platform
<input type="radio"/> C4	Consistently high performance	2 - 192	4 - 1,488 GB	Intel Emerald Rapids
<input type="radio"/> C4A	Arm-based consistently high performance	1 - 72	2 - 576 GB	Google Axion
<input type="radio"/> N4	Flexible & cost-optimized	2 - 80	4 - 640 GB	Intel Emerald Rapids
<input type="radio"/> C3	Consistently high performance	4 - 192	8 - 1,536 GB	Intel Sapphire Rapids
<input type="radio"/> C3D	Consistently high performance	4 - 360	8 - 2,880 GB	AMD Genoa
<input checked="" type="radio"/> E2	Low cost, day-to-day computing	0.25 - 32	1 - 128 GB	Intel Broadwell
<input type="radio"/> N2	Balanced price & performance	2 - 128	2 - 864 GB	Intel Cascade Lake
<input type="radio"/> N2D	Balanced price & performance	2 - 224	2 - 896 GB	AMD Milan
<input type="radio"/> T2A	Scale-out workloads	1 - 48	4 - 192 GB	Amazon Graviton3

CREATE

CANCEL

EQUIVALENT CODE

VM instance stopped

Monthly estimate

\$25.46

That's about \$0.03 hourly

Pay for what you use: no upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 4 GB memory	\$24.46
10 GB balanced persistent disk	\$1.00
Logging	Cost varies
Monitoring	Cost varies
Snapshot schedule	Cost varies
Total	\$25.46

Compute Engine pricing

Cloud Operations pricing

LESS

Enable HTTP and HTTPS

Machine configuration

e2-medium, us-central1

OS and storage

Ubuntu 20.04 LTS

Data protection

Snapshot schedules

Networking

2 firewall rules, 1 network interface

Observability

Install Ops Agent

Security

Advanced

Networking

Firewall

Add tags and firewall rules to allow specific network traffic from the Internet

☒ Allow HTTP traffic

☒ Allow HTTPS traffic

☐ Allow Load Balancer Health Checks

Network tags

Hostname

IP forwarding

☒ Enable

Network performance configuration

Network bandwidth

☐ Enable per VM Tier_1 networking performance

Maximum outbound network bandwidth: 2Gbps

VM to Public IP: 2Gbps

Monthly estimate

\$25.46

That's about \$0.03 hourly

Pay for what you use: no upfront costs and per second billing

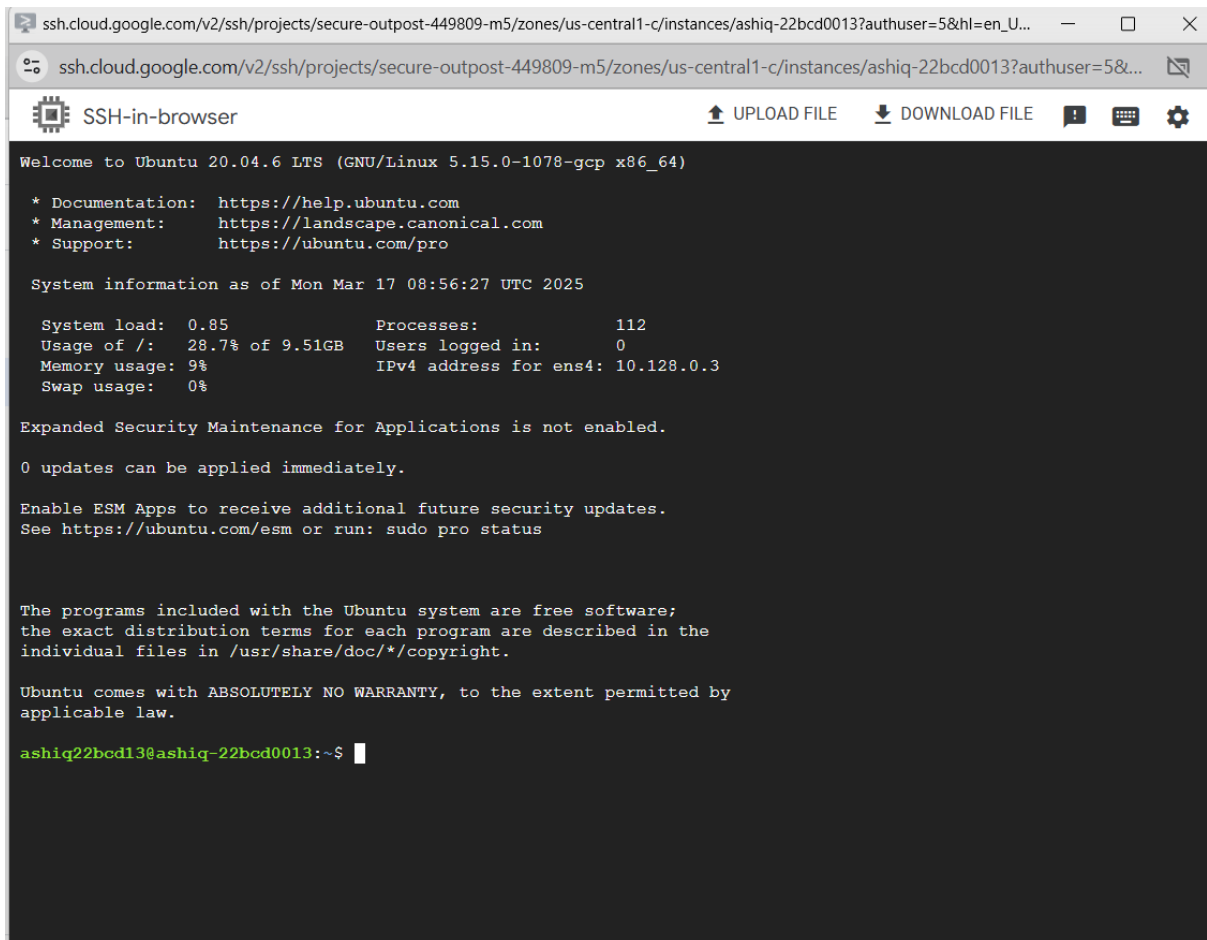
Item	Monthly estimate
2 vCPU + 4 GB memory	\$24.46
10 GB balanced persistent disk	\$1.00
Logging	Cost varies
Monitoring	Cost varies
Snapshot schedule	Cost varies
Total	\$25.46

Compute Engine pricing

Cloud Operations pricing

LESS

Open SSH on the VM



```
ssh.cloud.google.com/v2/ssh/projects/secure-outpost-449809-m5/zones/us-central1-c/instances/ashiq-22bcd0013?authuser=5&hl=en_U...
SSH-in-browser
Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1078-gcp x86_64)

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

System information as of Mon Mar 17 08:56:27 UTC 2025

System load:  0.85               Processes:    112
Usage of /:   28.7% of 9.51GB    Users logged in: 0
Memory usage: 9%                IPv4 address for ens4: 10.128.0.3
Swap usage:  0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

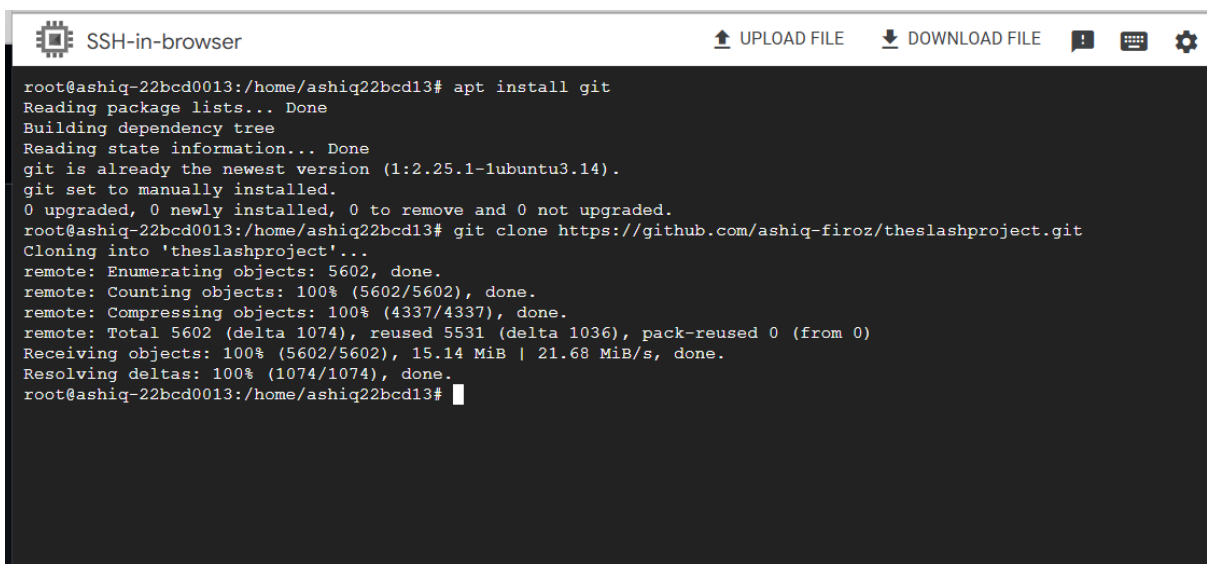
Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status

The 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.

ashiq22bcd13@ashiq-22bcd0013:~$
```

Install Git



```
SSH-in-browser
root@ashiq-22bcd0013:/home/ashiq22bcd13# apt install git
Reading package lists... Done
Building dependency tree
Reading state information... Done
git is already the newest version (1:2.25.1-1ubuntu3.14).
git set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
root@ashiq-22bcd0013:/home/ashiq22bcd13# git clone https://github.com/ashiq-firoz/theslashproject.git
Cloning into 'theslashproject'...
remote: Enumerating objects: 5602, done.
remote: Counting objects: 100% (5602/5602), done.
remote: Compressing objects: 100% (4337/4337), done.
remote: Total 5602 (delta 1074), reused 5531 (delta 1036), pack-reused 0 (from 0)
Receiving objects: 100% (5602/5602), 15.14 MiB | 21.68 MiB/s, done.
Resolving deltas: 100% (1074/1074), done.
root@ashiq-22bcd0013:/home/ashiq22bcd13#
```

Install NodeJS

ssh.cloud.google.com/v2/ssh/projects/secure-outpost-449809-m5/zones/us-central1-c/instances/ashiq-22bcd0013?authuser=5&...

SSH-in-browser

UPLOAD FILE

DOWNLOAD FILE

```
root@ashiq-22bcd0013:/home/ashiq22bcd13# curl -fsSL https://deb.nodesource.com/setup_20.x | sudo -E bash -
2025-03-17 08:58:49 - Installing pre-requisites
Hit:1 http://us-central1.gce.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:3 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:4 https://packages.cloud.google.com/apt google-cloud-ops-agent-focal-2 InRelease
Hit:5 http://security.ubuntu.com/ubuntu focal-security InRelease
Reading package lists... Done
Reading package lists... Done
Building dependency tree
Reading state information... Done
ca-certificates is already the newest version (20240203~20.04.1).
ca-certificates set to manually installed.
curl is already the newest version (7.68.0-1ubuntu2.25).
curl set to manually installed.
gnupg is already the newest version (2.2.19-3ubuntu2.2).
gnupg set to manually installed.
The following NEW packages will be installed:
  apt-transport-https
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 1704 B of archives.
After this operation, 162 kB of additional disk space will be used.
Get:1 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates/universe amd64 apt-transport-https all 2.0.1
0 [1704 B]
Fetched 1704 B in 0s (90.0 kB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 62486 files and directories currently installed.)
Preparing to unpack .../apt-transport-https_2.0.10_all.deb ...
Unpacking apt-transport-https (2.0.10) ...
Setting up apt-transport-https (2.0.10) ...
Hit:1 http://us-central1.gce.archive.ubuntu.com/ubuntu focal InRelease
Hit:2 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:3 http://us-central1.gce.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu focal-security InRelease
Hit:5 https://packages.cloud.google.com/apt google-cloud-ops-agent-focal-2 InRelease
Get:6 https://deb.nodesource.com/node_20.x nodistro InRelease [12.1 kB]
Get:7 https://deb.nodesource.com/node_20.x nodistro/main amd64 Packages [10.9 kB]
Fetched 23.0 kB in 1s (20.7 kB/s)
Reading package lists... Done
```

```
root@ashiq-22bcd0013:/home/ashiq22bcd13# nodejs --version
v20.19.0
root@ashiq-22bcd0013:/home/ashiq22bcd13# npm --version
10.8.2
root@ashiq-22bcd0013:/home/ashiq22bcd13#
```

Install PM2

```
root@ashiq-22bcd0013:/home/ashiq22bcd13# npm install pm2 -g

added 134 packages in 9s

13 packages are looking for funding
  run `npm fund` for details
npm notice
npm notice New major version of npm available! 10.8.2 -> 11.2.0
npm notice Changelog: https://github.com/npm/cli/releases/tag/v11.2.0
npm notice To update run: npm install -g npm@11.2.0
npm notice
root@ashiq-22bcd0013:/home/ashiq22bcd13#
```

Install NGINX

```
root@ashiq-22bcd0013:/home/ashiq22bcd13/theshlashproject# sudo apt-get install nginx -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  fontconfig-config fonts-dejavu-core libfontconfig1 libgd3 libjpeg-turbo8 libjpeg8
  libnginx-mod-http-image-filter libnginx-mod-http-xslt-filter libnginx-mod-mail libnginx-mod-stream libtiff5
  libwebp6 libxpm4 nginx-common nginx-core
Suggested packages:
  libgd-tools fcgiwrap nginx-doc ssl-cert
The following NEW packages will be installed:
  fontconfig-config fonts-dejavu-core libfontconfig1 libgd3 libjpeg-turbo8 libjpeg8
  libnginx-mod-http-image-filter libnginx-mod-http-xslt-filter libnginx-mod-mail libnginx-mod-stream libtiff5
  libwebp6 libxpm4 nginx nginx-common nginx-core
0 upgraded, 17 newly installed, 0 to remove and 0 not upgraded.
Need to get 2438 kB of archives.
root@ashiq-22bcd0013:/home/ashiq22bcd13/theshlashproject# sudo systemctl status nginx
● nginx.service - A high performance web server and a reverse proxy server
   Loaded: loaded (/lib/systemd/system/nginx.service; enabled; vendor preset: enabled)
   Active: active (running) since Mon 2025-03-17 09:08:57 UTC; 11s ago
     Docs: man:nginx(8)
   Main PID: 5423 (nginx)
    Tasks: 3 (limit: 4680)
   Memory: 5.6M
   CGroup: /system.slice/nginx.service
           └─5423 nginx: master process /usr/sbin/nginx -g daemon on; master_process on;
             └─5424 nginx: worker process
               └─5425 nginx: worker process
```

Config NGINX

```
root@ashiq-22bcd0013:/home/ashiq22bcd13/theshlashproject# sudo nano /etc/nginx/sites-available/default
root@ashiq-22bcd0013:/home/ashiq22bcd13/theshlashproject# sudo nano /etc/nginx/sites-available/default
root@ashiq-22bcd0013:/home/ashiq22bcd13/theshlashproject# sudo systemctl restart nginx
root@ashiq-22bcd0013:/home/ashiq22bcd13/theshlashproject# sudo systemctl start nginx
root@ashiq-22bcd0013:/home/ashiq22bcd13/theshlashproject# sudo systemctl status nginx
● nginx.service - A high performance web server and a reverse proxy server
   Loaded: loaded (/lib/systemd/system/nginx.service; enabled; vendor preset: enabled)
   Active: active (running) since Mon 2025-03-17 09:14:35 UTC; 11s ago
     Docs: man:nginx(8)
   Process: 5617 ExecStartPre=/usr/sbin/nginx -t -q -g daemon on; master_process on; (code=exited, status=0/SUCCESS)
   Process: 5618 ExecStart=/usr/sbin/nginx -g daemon on; master_process on; (code=exited, status=0/SUCCESS)
   Main PID: 5619 (nginx)
    Tasks: 3 (limit: 4680)
   Memory: 3.0M
   CGroup: /system.slice/nginx.service
           └─5619 nginx: master process /usr/sbin/nginx -g daemon on; master_process on;
             └─5620 nginx: worker process
               └─5621 nginx: worker process

Mar 17 09:14:35 ashq-22bcd0013 systemd[1]: Starting A high performance web server and a reverse proxy server...
Mar 17 09:14:35 ashq-22bcd0013 systemd[1]: Started A high performance web server and a reverse proxy server.

root@ashiq-22bcd0013:/home/ashiq22bcd13/theshlashproject# npm start

> project1@0.0.0 start
> node ./bin/www

express-session deprecated undefined resave option; provide resave option app.js:22:9
express-session deprecated undefined saveUninitialized option; provide saveUninitialized option app.js:22:9
(node:5640) Warning: Accessing non-existent property 'use' of module exports inside circular dependency
(Use `node --trace-warnings ...` to show where the warning was created)
(node:5640) [MONGODB DRIVER] Warning: Current Server Discovery and Monitoring engine is deprecated, and will be removed in a future version. To use the new Server Discovery and Monitoring engine, pass option { useUnifiedTopology: true } to the MongoClient constructor.
connection success
GET / 200 109.124 ms - 102202
GET /stylesheets/style.css 200 10.378 ms - 190308
GET /javascripts/scripts.js 200 2.125 ms - 12359
GET /images/favicon.ico 200 4.220 ms - 23462
```

View the Web Service on External IP

