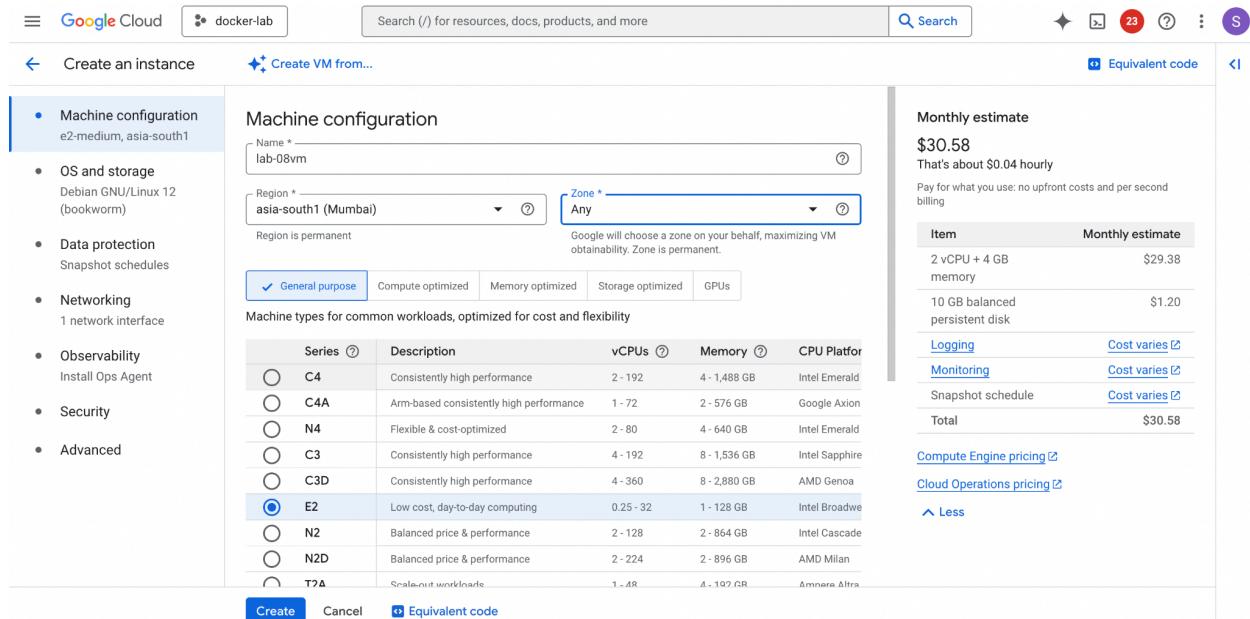


Name : Shreya Mali
Roll No.: 22110135

Setting Up the VM



The screenshot shows the Google Cloud 'Create an instance' wizard. On the left sidebar, 'Machine configuration' is selected. The main area displays the 'Machine configuration' settings:

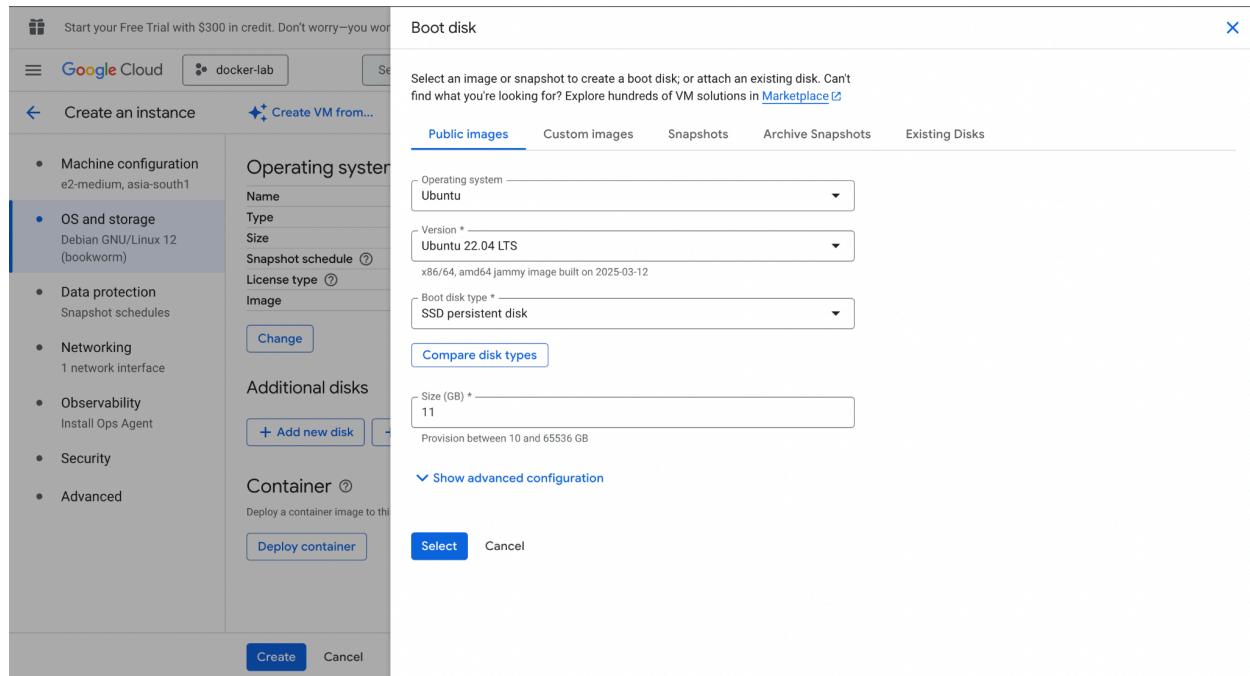
- Name:** lab-08vm
- Region:** asia-south1 (Mumbai)
- Zone:** Any
- Machine type:** E2 (selected)
- General purpose** (selected)
- Memory optimized**
- Storage optimized**
- GPUs**

Below the machine types table, there's a note: "Google will choose a zone on your behalf, maximizing VM obtainability. Zone is permanent."

Monthly estimate: \$30.58 (That's about \$0.04 hourly). Pay for what you use: no upfront costs and per second billing.

Item	Monthly estimate
2 vCPU + 4 GB memory	\$29.38
10 GB balanced persistent disk	\$1.20
Total	\$30.58

[Compute Engine pricing](#) | [Cloud Operations pricing](#) | [Less](#)



The screenshot shows the 'Create an instance' wizard with 'Boot disk' configuration selected. The sidebar shows 'OS and storage' is selected. The main area includes:

- Operating system:** Ubuntu (selected)
- Version:** Ubuntu 22.04 LTS
- Boot disk type:** SSD persistent disk
- Size (GB):** 11 (Provision between 10 and 65536 GB)

Additional disks: + Add new disk

Container: Deploy a container image to this instance

Deploy container

Create | **Cancel**

Google Cloud docker-lab Search (/) for resources, docs, products, and more Search ⓘ

Create an instance Create VM from... ⓘ Equivalent code ⌂

- Machine configuration e2-medium, asia-south1
- OS and storage Ubuntu 22.04 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 ⓘ

Set a custom hostname for this instance or leave it default. Choice is permanent

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 \$31.62 That's about \$0.04 hourly Pay for what you use: no upfront costs and per second billing

Item	Monthly estimate
2 vCPU + 4 GB memory	\$29.38
11 GB SSD persistent disk	\$2.24
Logging	Cost varies ⓘ
Monitoring	Cost varies ⓘ
Snapshot schedule	Cost varies ⓘ
Total	\$31.62

[Compute Engine pricing ⓘ](#)

[Cloud Operations pricing ⓘ](#)

▲ Less

Create Cancel ⓘ Equivalent code

Installing Docker on the VM

SSH-in-browser

Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 6.8.0-1025-gcp x86_64)

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

System information as of Fri Mar 28 15:25:52 UTC 2025

```
System load: 0.43 Processes: 117
Usage of /: 18.9% of 10.48GB Users logged in: 0
Memory usage: 7% IPv4 address for ens4: 10.160.0.3
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 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.

```
shreya_mali@lab-08vm:~$ sudo apt update
```

SSH-in-browser

```
shreya_mali@lab-08vm:~$ sudo apt install docker.io -y
Waiting for cache lock: Could not get lock /var/lib/dpkg/lock-frontend. It is held by process 1994 (apt-get)
Waiting for cache lock: Could not get lock /var/lib/dpkg/lock-frontend. It is held by process 1994 (apt-get)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
bridge-utils containerd dns-root-data dnsmasq-base pigz runc ubuntu-fan
Suggested packages:
iupdown aufs-tools cgroupsfs-mount | cgroup-lite debootstrap docker-buildx docker-compose-v2 docker-doc rinse zfs-fuse | zfsutils
The following NEW packages will be installed:
bridge-utils containerd dns-root-data dnsmasq-base docker.io pigz runc ubuntu-fan
0 upgraded, 8 newly installed, 0 to remove and 11 not upgraded.
Need to get 78.7 MB of archives.
After this operation, 301 MB of additional disk space will be used.
Get:1 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/universe amd64 pigz amd64 2.6-1 [63.6 kB]
Get:2 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/main amd64 bridge-utils 1.1.12-0ubuntu22.04.1 [8405 kB]
Get:3 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 runc amd64 1.1.12-0ubuntu22.04.1 [34.4 kB]
Get:4 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 containerd amd64 1.7.24-0ubuntu122.04.2 [37.3 kB]
Get:5 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 dnsmasq-base amd64 2.90-0ubuntu0.22.04.1 [6132 kB]
Get:6 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 dnsmasq-base amd64 2.90-0ubuntu0.22.04.1 [374 kB]
Get:7 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 docker.io amd64 26.1.3-0ubuntu122.04.1 [32.5 MB]
Get:8 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/universe amd64 ubuntu-fan all 0.12.16 [35.2 kB]
Fetched 78.7 MB in 4s (19.9 MB/s)
Preconfiguring packages ...
Selecting previously unselected package pigz.
(Reading database ... 6685+ files and directories currently installed.)
Preparing to unpack .../0-pigz_2.6-1_amd64.deb ...
Unpacking pigz (2.6-1) ...
Selecting previously unselected package bridge-utils.
Preparing to unpack .../1-bridge-utils_1.7-lubuntu3_amd64.deb ...
Unpacking bridge-utils (1.7-lubuntu3) ...
Selecting previously unselected package runc.
Preparing to unpack .../2-runc_1.1.12-0ubuntu22.04.1_amd64.deb ...
Unpacking runc (1.1.12-0ubuntu22.04.1) ...
Selecting previously unselected package containerd.
Preparing to unpack .../3-containerd_1.7.24-0ubuntu122.04.2_amd64.deb ...
Unpacking containerd (1.7.24-0ubuntu122.04.2) ...
Selecting previously unselected package dns-root-data.
Preparing to unpack .../4-dns-root-data_2024071801-ubuntu0.22.04.1_all.deb ...
Unpacking dns-root-data (2024071801-ubuntu0.22.04.1) ...
Selecting previously unselected package dnsmasq-base.
Preparing to unpack .../5-dnsmasq-base_2.90-0ubuntu0.22.04.1_amd64.deb ...
Unpacking dnsmasq-base (2.90-0ubuntu0.22.04.1) ...
Selecting previously unselected package docker.io.
Preparing to unpack .../6-docker.io_26.1.3-0ubuntu122.04.1_amd64.deb ...
Unpacking docker.io (26.1.3-0ubuntu122.04.1) ...
Selecting previously unselected package ubuntu-fan.
Unpacking ubuntu-fan (0.12.16) ...
```

SSH-in-browser

```
Unpacking containerd (1.7.24-0ubuntu122.04.2) ...
Selecting previously unselected package dns-root-data.
Preparing to unpack .../4-dns-root-data_2024071801-ubuntu0.22.04.1_all.deb ...
Unpacking dns-root-data (2024071801-ubuntu0.22.04.1) ...
Selecting previously unselected package dnsmasq-base.
Preparing to unpack .../5-dnsmasq-base_2.90-0ubuntu0.22.04.1_amd64.deb ...
Unpacking dnsmasq-base (2.90-0ubuntu0.22.04.1) ...
Selecting previously unselected package docker.io.
Preparing to unpack .../6-docker.io_26.1.3-0ubuntu122.04.1_amd64.deb ...
Unpacking docker.io (26.1.3-0ubuntu122.04.1) ...
Selecting previously unselected package ubuntu-fan.
Preparing to unpack .../7-ubuntu-fan_0.12.16_all.deb ...
Unpacking ubuntu-fan (0.12.16) ...
Setting up dnsmasq-base (2.90-0ubuntu0.22.04.1) ...
Setting up runc (1.1.12-0ubuntu22.04.1) ...
Setting up dns-root-data (2024071801-ubuntu0.22.04.1) ...
Setting up bridge-utils (1.7-lubuntu3) ...
Setting up containerd (1.7.24-0ubuntu122.04.2) ...
Setting up containerd (1.7.24-0ubuntu122.04.2) ...
Created symlink /etc/systemd/system/multi-user.target.wants/containerd.service → /lib/systemd/system/containerd.service.
Setting up ubuntu-fan (0.12.16) ...
Created symlink /etc/systemd/system/multi-user.target.wants/ubuntu-fan.service → /lib/systemd/system/ubuntu-fan.service.
Setting up docker.io (26.1.3-0ubuntu122.04.1) ...
Adding group 'docker' (GID 122) ...
Done.
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.
Processing triggers for dbus (1.12.20-0ubuntu4.1) ...
Processing triggers for man-db (2.10.2-1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
shreya_mali@lab-08vm:~$ sudo systemctl start docker
shreya_mali@lab-08vm:~$ sudo systemctl enable docker
shreya_mali@lab-08vm:~$ sudo usermod -aG docker $USER
shreya_mali@lab-08vm:~$ docker --version
Docker version 26.1.3, build 26.1.3-0ubuntu122.04.1
shreya_mali@lab-08vm:~$
```

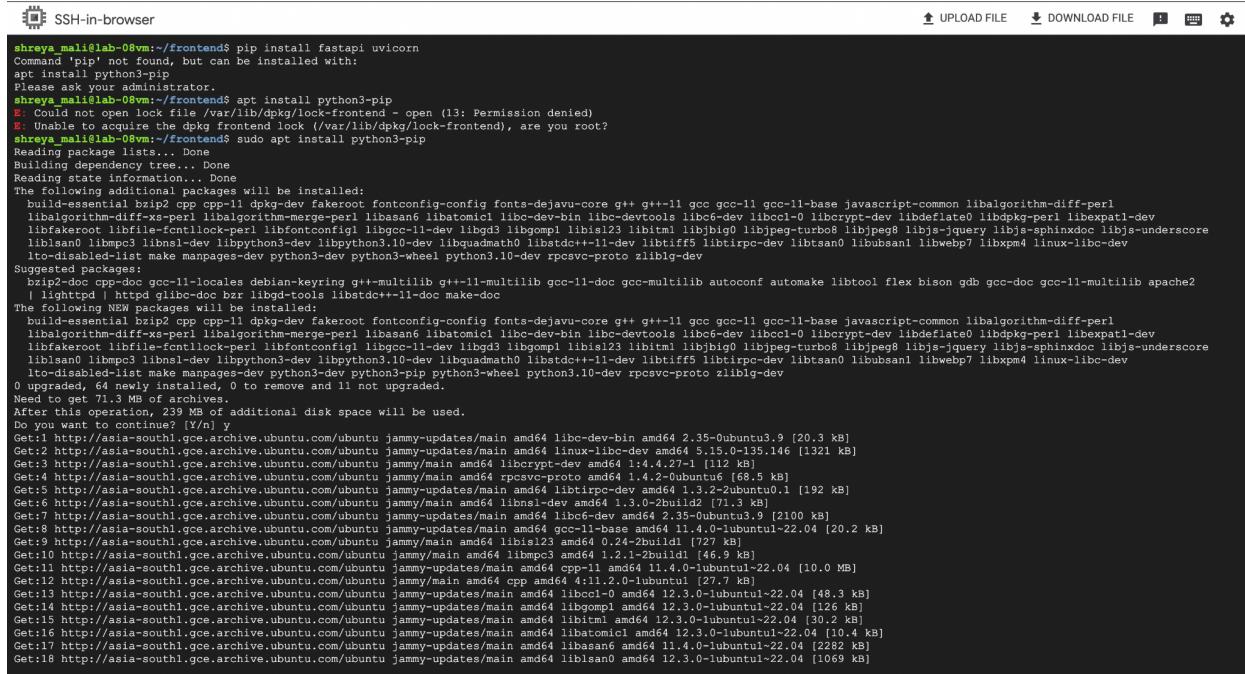
Setting Up Frontend with FastAPI

Creating a directory for frontend

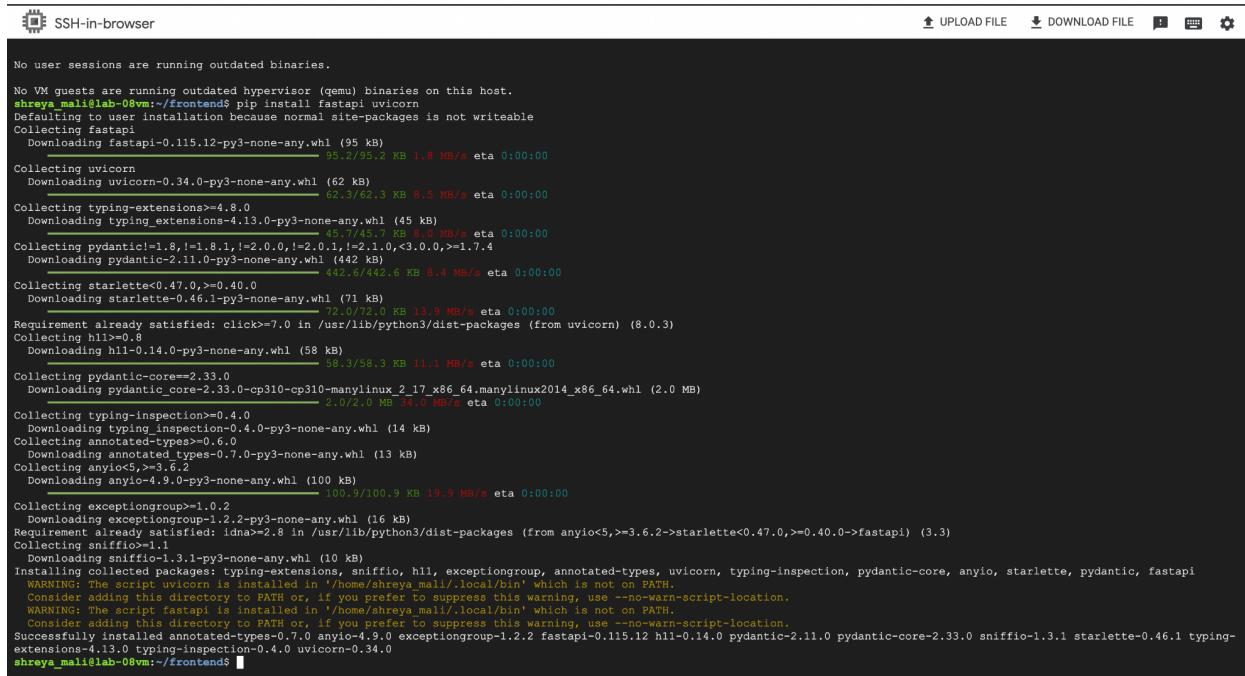
SSH-in-browser

```
shreya_mali@lab-08vm:~$ mkdir frontend
shreya_mali@lab-08vm:~$ cd frontend
shreya_mali@lab-08vm:~/frontend$
```

Installing FastAPI and Uvicorn



```
shreya maliblab-08vm:~/frontend$ pip install fastapi uvicorn
Command 'pip' not found, but can be installed with:
apt install python3-pip
Please ask your administrator.
shreya maliblab-08vm:~/frontend$ apt install python3-pip
E: Could not open lock file /var/lib/dpkg/lock-frontend - open (13: Permission denied)
E: Unable to acquire the dpkg frontend lock (/var/lib/dpkg/lock-frontend), are you root?
shreya maliblab-08vm:~/frontend$ sudo apt install python3-pip
Reading package lists... Done
Building dependency tree... Done
Building state information... Done
Reading the following additional packages will be installed:
build-essential bzip2 cpp cpp-11 dpkg-dev fakeroot fontconfig-config fonts-dejavu-core g++ g++-11 gcc gcc-11 gcc-11-base javascript-common libalgorithm-diff-perl
libalgorithm-diff-xs-perl libalgorithm-merge-perl libassuan libatomic1 libc-dev-bin libbc-devtools libbc6-dev libcc1-0 libcrypt-dev libdeflate0 libdpkg-perl libexpat1-dev
libfakeroot libfile-fcntllock-perl libfontconfig1 libgcc-11-dev libgb3 libgomp1 libis123 libl1ml libjbig0 libjpeg-turbo8 libjpegs libjs-jquery libjs-sphinxdoc libjs-underscore
libisand libmpc3 libisl1-dev libpython3-3-dev libpython3.10-dev libquadmath0 libstdc++-11-dev libtiff5 libtirpc-dev libtsan0 libubsan1 libwebp7 libxpm4 linux-libc-dev
lto-disabled-list make mapnames-dev python3-dev python3-wheel python3.10-dev rpcsvc-proto zlib1g-dev
Suggested packages:
bz2-doc doc-base gcc-11-locales debian-keyring g++-multilib gcc-11-doc gcc-multilib autoconf automake libtool flex bison gdb gcc-doc gcc-11-multilib apache2
lighttpd | httpd glibc-doc bzr libgd-tools libstdc++-11-doc make-doc
The following NEW packages will be installed:
build-essential bzip2 cpp cpp-11 dpkg-dev fakeroot fontconfig-config fonts-dejavu-core g++ g++-11 gcc gcc-11 gcc-11-base javascript-common libalgorithm-diff-perl
libalgorithm-diff-xs-perl libalgorithm-merge-perl libassuan libatomic1 libc-dev-bin libbc-devtools libbc6-dev libcc1-0 libcrypt-dev libdeflate0 libdpkg-perl libexpat1-dev
libfakeroot libfile-fcntllock-perl libfontconfig1 libgcc-11-dev libgb3 libgomp1 libis123 libl1ml libjbig0 libjpeg-turbo8 libjpegs libjs-jquery libjs-sphinxdoc libjs-underscore
libisand libmpc3 libisl1-dev libpython3-3-dev libpython3.10-dev libquadmath0 libstdc++-11-dev libtiff5 libtirpc-dev libtsan0 libubsan1 libwebp7 libxpm4 linux-libc-dev
lto-disabled-list make mapnames-dev python3-dev python3-wheel python3.10-dev rpcsvc-proto zlib1g-dev
0 upgraded, 64 newly installed, 0 to remove and 11 not upgraded.
Need to get 71.3 MB of archives.
After this operation, 239 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libc-dev-bin amd64 2.35-0ubuntu3.9 [20.3 kB]
Get:2 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 linux-libc-dev amd64 5.15.0-135.146 [1321 kB]
Get:3 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/main amd64 libcrypt-dev amd64 1:4.4.27-1 [112 kB]
Get:4 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/main amd64 rpcsvc-proto amd64 1:4.2-1 [68.5 kB]
Get:5 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/main amd64 libtirpc-dev amd64 1:3.2-2+ubuntu0.1 [192 kB]
Get:6 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libtsan0 libtsan0 amd64 1:3.0-2+build2 [71.3 kB]
Get:7 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libtiff5 libtiff5 amd64 4.1.0-2+build1 [2100 kB]
Get:8 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 gcc-11-base amd64 11.4.0-0ubuntu1-22.04 [20.2 kB]
Get:9 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/main amd64 libis123 amd64 0.24-2build1 [727 kB]
Get:10 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/main amd64 libmpc3 amd64 1.2.1-2build1 [46.9 kB]
Get:11 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 cpp-11 amd64 11.4.0-1ubuntu1-22.04 [10.0 MB]
Get:12 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/main amd64 cpp-11 amd64 4:11.2.0-1ubuntu1 [27.7 kB]
Get:13 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libbcc0-0 amd64 12.3.0-1ubuntu1-22.04 [48.3 kB]
Get:14 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libgomp1 amd64 12.3.0-1ubuntu1-22.04 [126 kB]
Get:15 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libl1ml amd64 12.3.0-1ubuntu1-22.04 [30.2 kB]
Get:16 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libbatomic1 amd64 12.3.0-1ubuntu1-22.04 [10.4 kB]
Get:17 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libisand amd64 11.4.0-1ubuntu1-22.04 [282 kB]
Get:18 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libisan0 amd64 12.3.0-1ubuntu1-22.04 [1069 kB]
```



```
No user sessions are running outdated binaries.
No VM guests are running outdated hypervisor (qemu) binaries on this host.
shreya maliblab-08vm:~/frontend$ pip install fastapi uvicorn
Defaultering to user installation because normal site-packages is not writeable
Collecting fastapi
  Downloading fastapi-0.115.12-py3-none-any.whl (95 kB)
Collecting uvicorn
  Downloading uvicorn-0.34.0-py3-none-any.whl (62 kB)
Collecting typing-extensions>=4.8.0
  Downloading typing_extensions-4.13.0-py3-none-any.whl (45 kB)
Collecting pydantic!=1.8,!1.8.1,!2.0.0,!2.0.1,!2.1.0,<3.0.0,>1.7.4
  Downloading pydantic-2.11.0-py3-none-any.whl (442 kB)
Collecting starlette<0.47.0,>=0.40.0
  Downloading starlette-0.46.1-py3-none-any.whl (71 kB)
Requirement already satisfied: click>=7.0 in /usr/lib/python3/dist-packages (from uvicorn) (8.0.3)
Collecting h11>0.8
  Downloading h11-0.14.0-py3-none-any.whl (58 kB)
Collecting pydantic-core==2.33.0
  Downloading pydantic_core-2.33.0-cp310-cp310-manylinux_2_17_x86_64_manylinux2014_x86_64.whl (2.0 MB)
Collecting typing-inspection=0.4.0
  Downloading typing_inspection-0.4.0-py3-none-any.whl (14 kB)
Collecting annotated-types>=0.6.0
  Downloading annotated_types-0.7.0-py3-none-any.whl (13 kB)
Collecting aioio<5,>=3.6.2
  Downloading aioio-4.9.0-py3-none-any.whl (100 kB)
Collecting exceptiongroup>=1.0.2
  Downloading exceptiongroup-1.2.2-py3-none-any.whl (16 kB)
Requirement already satisfied: idna>=2.8 in /usr/lib/python3/dist-packages (from uvicorn) (3.3)
Collecting sniffio>1.1
  Downloading sniffio-1.3.1-py3-none-any.whl (10 kB)
Installing collected packages: typing-extensions, sniffio, h11, exceptiongroup, annotated-types, uvicorn, typing-inspection, pydantic-core, aioio, starlette, pydantic, fastapi
WARNING: The script uvicorn is installed in '/home/shreya.mali/.local/bin' which is not on PATH.
Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
WARNING: The script fastapi is installed in '/home/shreya.mali/.local/bin' which is not on PATH.
Consider adding this directory to PATH or, if you prefer to suppress this warning, use --no-warn-script-location.
Successfully installed annotated-types-0.7.0 aioio-4.9.0 exceptiongroup-1.2.2 fastapi-0.115.12 h11-0.14.0 pydantic-2.11.0 pydantic-core-2.33.0 sniffio-1.3.1 starlette-0.46.1 typing-inspections-4.13.0 typing-inspection-0.4.0 uvicorn-0.34.0
shreya maliblab-08vm:~/frontend$
```

Creating app.py

SSH-in-browser

```
GNU nano 6.2
from fastapi import FastAPI
from fastapi.responses import HTMLResponse

app = FastAPI()

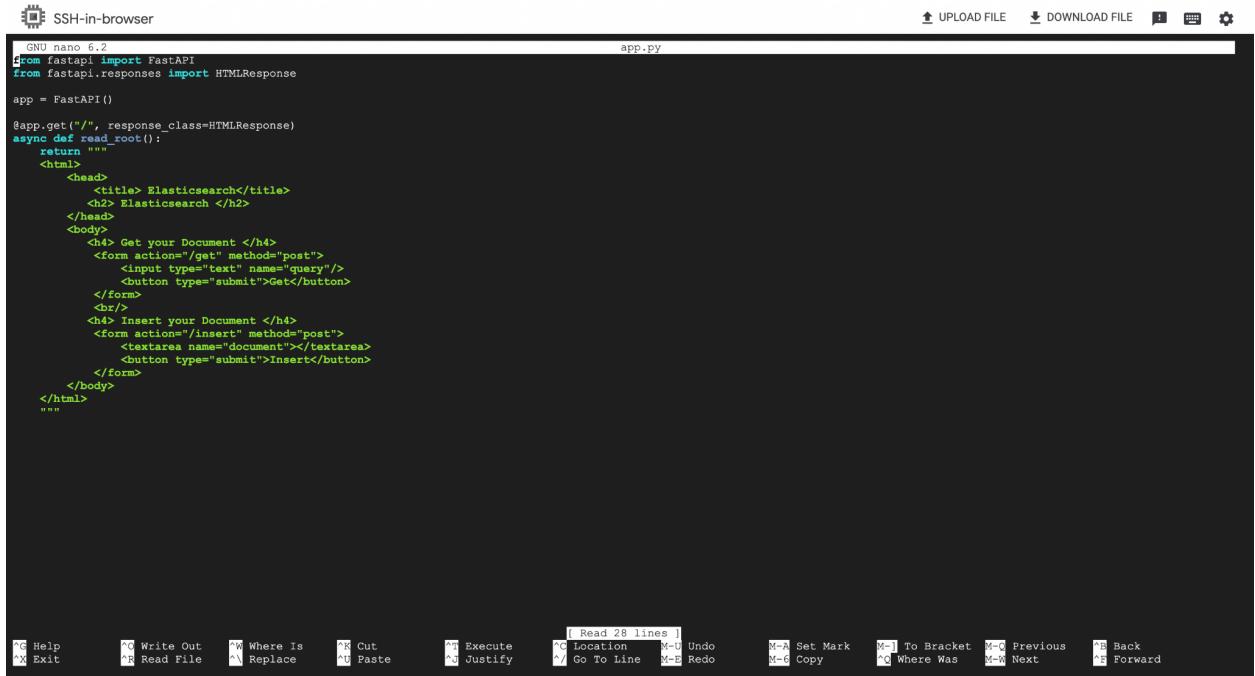
@app.get("/")
async def read_root():
    return """
<html>
    <head>
        <title> Elasticsearch</title>
    </head>
    <body>
        <form action="/get" method="post">
            <input type="text" name="query"/>
            <button type="submit">Get</button>
        </form>
        <br/>
        <form action="/insert" method="post">
            <textarea name="document"/></textarea>
            <button type="submit">Insert</button>
        </form>
    </body>
</html>
"""

app.py *
```

^C Help ^Q Write Out ^W Where Is ^X Cut ^Z Execute ^C Location M-U Undo M-A Set Mark M-I To Bracket M-Q Previous ^B Back
^X Exit ^R Read File ^V Replace ^U Paste ^J Justify ^Y Go To Line M-E Redo M-C Copy ^C Where Was M-W Next ^S Forward

```
No VM guests are running outdated hypervisor (qemu) binaries on this host.
shruya_malilab-08vm:~/frontends$ uvicorn app:app --host 0.0.0.0 --port 9567
INFO: Started server process [5336]
INFO: Waiting for application startup.
INFO: Application startup complete.
INFO: Uvicorn running on http://0.0.0.0:9567 (Press CTRL+C to quit)
INFO: 14.139.98.80:10401 - "GET / HTTP/1.1" 200 OK
INFO: 14.139.98.80:10401 - "GET /favicon.ico HTTP/1.1" 404 Not Found
```

Adding more clarity to the frontend page



The screenshot shows a terminal window titled "SSH-in-browser" with the file "app.py" open. The code defines a FastAPI application with two endpoints: a GET endpoint for reading documents and a POST endpoint for inserting documents. The terminal interface includes a toolbar at the top with "UPLOAD FILE" and "DOWNLOAD FILE" buttons, and a status bar at the bottom with various keyboard shortcuts.

```
GNU nano 6.2
from fastapi import FastAPI
from fastapi.responses import HTMLResponse

app = FastAPI()

@app.get("/", response_class=HTMLResponse)
async def read_root():
    return """
<html>
    <head>
        <title> Elasticsearch</title>
        <h2> Elasticsearch </h2>
    </head>
    <body>
        <h4> Get your Document </h4>
        <form actions="/get" method="post">
            <input type="text" name="query"/>
            <button type="submit">Get</button>
        </form>
        <br/>
        <h4> Insert your Document </h4>
        <form actions="/insert" method="post">
            <textarea name="document"></textarea>
            <button type="submit">Insert</button>
        </form>
    </body>
</html>
"""

HELPFUL_SHORTCUTS = [
    ("Help", "\u26aa"), ("Write Out", "\u26ab"), ("Where Is", "\u26ac"),
    ("Cut", "\u26ad"), ("Paste", "\u26ae"), ("Execute", "\u26af"),
    ("Justify", "\u26b0"), ("Read 28 lines", "\u26b1"),
    ("Location", "\u26b2"), ("Undo", "\u26b3"), ("Redo", "\u26b4"),
    ("Set Mark", "\u26b5"), ("To Bracket", "\u26b6"),
    ("Where Was", "\u26b7"), ("Previous", "\u26b8"),
    ("Copy", "\u26b9"), ("Next", "\u26b0"), ("Back", "\u26b1"),
    ("Forward", "\u26b2")
]
```

Updated frontend page

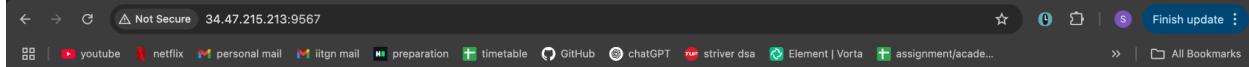
Elasticsearch

Get your Document

Insert your Document

Containerizing with docker

```
SSH-in-browser
shreya_mali@lab-08vm:~$ cd frontend
shreya_mali@lab-08vm:~/frontend$ docker build -t fastapi:1 .
DEPRECATION: The legacy builder is deprecated and will be removed in a future release.
Install the buildx component to build images with Buildkit:
https://docs.docker.com/go/buildx/
Sending build context to Docker daemon 5.632kB
Step 1/6 : FROM python:3.9-slim
3.9-slim: Pulling from library/python
6e909acdb790: Pull complete
ceci4984de9d: Pull complete
da1cbe0d584f: Pull complete
9a95d1744747: Pull complete
Digest: sha256:e52ca5579cc58fed41efcbb55a0ed5dccf6c7a156cba76acf4ab42fc19dd00
Status: Downloaded newer image for python:3.9-slim
--> bea1dea87178
Step 2/6 : WORKDIR /app
--> Running in 1dd09f82626e
--> Removed intermediate container 1dd09f82626e
--> bfcce266e406f
Step 3/6 : APP /app.py /app/app.py
--> f5390daa0ec5
Step 4/6 : RUN pip install fastapi uvicorn
--> Running in 6780ccf6329b
Collecting fastapi
  Downloading fastapi-0.115.12-py3-none-any.whl (95 kB)
Collecting uvicorn
  Downloading uvicorn-0.34.0-py3-none-any.whl (62 kB)
Collecting typing_extensions==4.8.0
  Downloading typing_extensions-4.13.0-py3-none-any.whl (45 kB)
Collecting starlette<0.47.0,>=0.40.0
  Downloading starlette-0.46.1-py3-none-any.whl (71 kB)
Collecting pydantic<1.8,!<1.8.1,!<2.0.0,!<2.0.1,!<2.1.0,<3.0.0,>=1.7.4
  Downloading pydantic-2.11.0-py3-none-any.whl (442.6/442.6 kB 6.6 MB/s eta 0:00:00)
Collecting click>=7.0
  Downloading click-8.1.8-py3-none-any.whl (98 kB)
Collecting h11>=0.8
  Downloading h11-0.14.0-py3-none-any.whl (58 kB)
Collecting pydantic_core==2.33.0
  Downloading pydantic_core-2.33.0-cp39-cp39-manylinux_2_17_x86_64_manylinux2014_x86_64.whl (2.0 MB)
--> Removed intermediate container 3583946b2a0b
--> b2e2541d9af3
Step 6/6 : CMD ["uvicorn", "app:app", "--host", "0.0.0.0", "--port", "9567"]
--> Running in fb0b22c733ec
--> Removed intermediate container fb0b22c733ec
--> 7c935e2cda45
Successfully built 7c935e2cda45
Successfully tagged fastapi:1
shreya_mali@lab-08vm:~/frontend$ docker run -d -p 9567:9567 fastapi:1
shreya_mali@lab-08vm:~/frontend$ docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
3ac6f9390cab fastapi:1 "uvicorn app:app --h" 44 seconds ago Up 43 seconds 0.0.0.0:9567->9567/tcp, :::9567->9567/tcp busy_bass1
shreya_mali@lab-08vm:~/frontend$
```



Elasticsearch

Get your Document

Insert your Document

Task 2 and Task 3

SSH-in-browser

```
shreya_mali@lab-08vm:~$ mkdir ~/backend
shreya_mali@lab-08vm:~$ cd backend
shreya_mali@lab-08vm:~/backend$ nano backend.py
```

UPLOAD FILE DOWNLOAD FILE ⚙️ 📱⚙️

app.py

SSH-in-browser

```
GNU nano 6.2
from fastapi import FastAPI, Form
from elasticsearch import Elasticsearch

app = FastAPI()

es = Elasticsearch(hosts=["http://elasticsearch:9200"])

@app.post("/get")
async def get_best_document(query: str = Form(...)):
    response = es.search(index="india", body={"query": {"match": {"text": query}}})
    best_doc = response['hits'][0]['_source']['text']
    return {"result": best_doc}

@app.post("/insert")
async def insert_document(document: str = Form(...)):
    es.index(index="india", document={"text": document})
    return {"message": "Document Inserted"}
```

backend.py *

UPLOAD FILE DOWNLOAD FILE ⚙️ 📱⚙️

Help Write Out Where Is Cut Execute Location Undo Set Mark To Bracket Previous Back Exit Read File Replace Paste Justify Go To Line Redo Copy Where Was Next Forward

SSH-in-browser

```
shreya_mali@lab-08vm:~$ mkdir ~/backend
shreya_mali@lab-08vm:~$ cd backend
shreya_mali@lab-08vm:~/backend$ nano backend.py
shreya_mali@lab-08vm:~/backend$ nano Dockerfile
shreya_mali@lab-08vm:~/backend$ cd ..
shreya_mali@lab-08vm:~$ mkdir nginx
shreya_mali@lab-08vm:~$ nano nginx.conf
shreya_mali@lab-08vm:~$
```

SSH-in-browser

```
GNU nano 6.2
server {
    listen 80;
    location / {
        proxy_pass http://frontend:9567;
    }
    location /api/ {
        proxy_pass http://backend:8500; █
    }
}
```

nginx.conf *

File Edit View Insert Block Text Help

^G Help ^O Write Out ^W Where Is ^X Cut ^T Execute ^C Location ^U Undo ^A Set Mark ^- To Bracket ^Q Where Was ^C Previous ^B Back ^X Exit ^R Read File ^\ Replace ^J Paste ^D Justify ^Y Go To Line ^E Redo ^- Copy ^W Next ^S Forward

SSH-in-browser

```
shreya.mali@lab-08vm:~$ docker-compose up --build
Command 'docker-compose' not found; try: sudo apt install docker-compose
sudo apt install docker-compose
shreya.mali@lab-08vm:~$ sudo apt install docker-compose
```

```
shreya.mali@lab-08vm:~$ ls
backend docker-compose.yml frontend nginx
shreya.mali@lab-08vm:~$ cd backend
shreya.mali@lab-08vm:~/backend$ docker build -t backend:1 .
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
           Install the buildx component to build images with Buildkit.
           https://docs.docker.com/go/buildx/
Sending build context to Docker daemon 3.584kB
Step 1/5 : FROM python:3.9-slim
Step 2/5 : WORKDIR /app
--> bae3de9a7178
Step 3/5 : COPY backend.py .
--> 9717c5ff37a0
Step 4/5 : RUN pip install fastapi[all] elasticsearch
--> Running in e0999de91ede
Collecting fastapi[all]
  Downloading fastapi-0.115.12-py3-none-any.whl (95 kB)
                                           95.2/95.2 kB 2.2 MB/s eta 0:00:00
Collecting elasticsearch
  Downloading elasticsearch-8.17.2-py3-none-any.whl (717 kB)
                                           718.0/718.0 kB 11.6 MB/s eta 0:00:00
Collecting typing-extensions>=4.8.0
  Downloading typing_extensions-4.13.0-py3-none-any.whl (45 kB)
                                           45.7/45.7 kB 8.0 MB/s eta 0:00:00
Collecting pydantic!=1.8,!1.8.1,!2.0.0,!2.0.1,!2.1.0,<3.0.0,>=1.7.4
  Downloading pydantic-2.11.0-py3-none-any.whl (442 kB)
                                           442.6/442.6 kB 45.7 MB/s eta 0:00:00
Collecting starlette>0.47.0,>0.40.0
  Downloading starlette-0.46.1-py3-none-any.whl (71 kB)
                                           72.0/72.0 kB 13.6 MB/s eta 0:00:00
Collecting pydantic-extra-types>=2.0.0
  Downloading pydantic_extra_types-2.10.3-py3-none-any.whl (37 kB)
Collecting jinja2>=3.1.5
  Downloading jinja2-3.1.6-py3-none-any.whl (134 kB)
                                           134.9/134.9 kB 22.1 MB/s eta 0:00:00
Collecting orjson>=3.2.1
  Downloading orjson-3.10.16-cp39-cp39-manylinux2014_x86_64.whl (132 kB)
                                           132.6/132.6 kB 22.2 MB/s eta 0:00:00
Collecting uvicorn[standard]>=0.12.0
  Downloading uvicorn-0.34.0-py3-none-any.whl (62 kB)
                                           62.3/62.3 kB 11.3 MB/s eta 0:00:00
Collecting python-multipart>=0.0.18
  Downloading python_multipart-0.0.20-py3-none-any.whl (24 kB)
Collecting itsdangerous>=1.1.0
  Downloading itsdangerous-2.2.0-py3-none-any.whl (16 kB)
```

SSH-in-browser

```
shreya.mali@lab-08vm:~$ nano docker-compose.yml
shreya.mali@lab-08vm:~$ ls -l nginx/nginx.conf
-rw-rw-r-- 1 shreya mali shreya.mali 162 Mar 28 16:09 nginx/nginx.conf
shreya.mali@lab-08vm:~$ docker-compose down
docker-compose up --build
Stopping backend-container ... done
Stopping frontend-container ... done
Removing nginx-container ... done
Removing backend-container ... done
Removing frontend-container ... done
Removing network shreya.mali_app.network
Creating network "shreya.mali_app.network" with driver "bridge"
Creating frontend-container ... done
Creating backend-container ... done
Creating nginx-container ... done
Attaching to frontend-container, backend-container, nginx-container
nginx-container | /docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration
nginx-container | /docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
nginx-container | /docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
nginx-container | 10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
nginx-container | 10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
nginx-container | /docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
nginx-container | /docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
```

```

shreya_mali@lab-08vm:~$ netstat -anpt | grep LISTEN
Command 'netstat' not found, but can be installed with:
apt install net-tools
shreya_mali@lab-08vm:~$ sudo apt install net-tools
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  net-tools
0 upgraded, 1 newly installed, 0 to remove and 11 not upgraded.
Need to get 204 kB of archives.
After this operation, 819 kB of additional disk space will be used.
Get:1 http://asia-south1.gce.archive.ubuntu.com/ubuntu jammy/main amd64 net-tools amd64 1.60+git20181103.0eebece-1ubuntu5 [204 kB]
Fetched 204 kB in 1s (366 kB/s)
Selecting previously unselected package net-tools.
(Reading database ... 74413 files and directories currently installed.)
Preparing to unpack .../net-tools_1.60+git20181103.0eebece-1ubuntu5_amd64.deb ...
Unpacking net-tools (1.60+git20181103.0eebece-1ubuntu5) ...
Setting up net-tools (1.60+git20181103.0eebece-1ubuntu5) ...
Processing triggers for man-db (2.10.2-1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

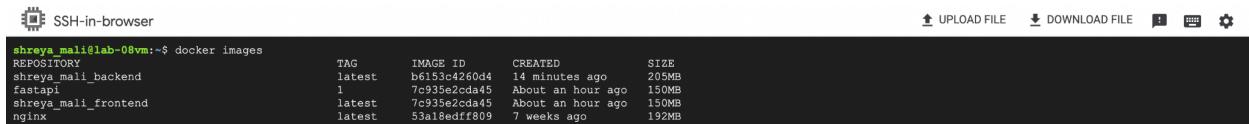
No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
shreya_mali@lab-08vm:~$ netstat -anpt | grep LISTEN
(Not all processes could be identified, non-owned process info
will not be shown. You would have to be root to see it all.)
tcp        0      0 0.0.0.0:14520    0.0.0.0:*          LISTEN      -
tcp        0      0 0.0.0.0:20202    0.0.0.0:*          LISTEN      -
tcp        0      0 0.0.0.0:9567    0.0.0.0:*          LISTEN      -
tcp        0      0 127.0.0.53:53   0.0.0.0:*          LISTEN      -
tcp        0      0 0.0.0.0:9200    0.0.0.0:*          LISTEN      -
tcp        0      0 0.0.0.0:22     0.0.0.0:*          LISTEN      -
tcp6       0      0 :::20201     ::::*           LISTEN      -
tcp6       0      0 ::::9567     ::::*           LISTEN      -
tcp6       0      0 ::::9200     ::::*           LISTEN      -
tcp6       0      0 ::::22      ::::*           LISTEN      -
shreya_mali@lab-08vm:~$ 

```

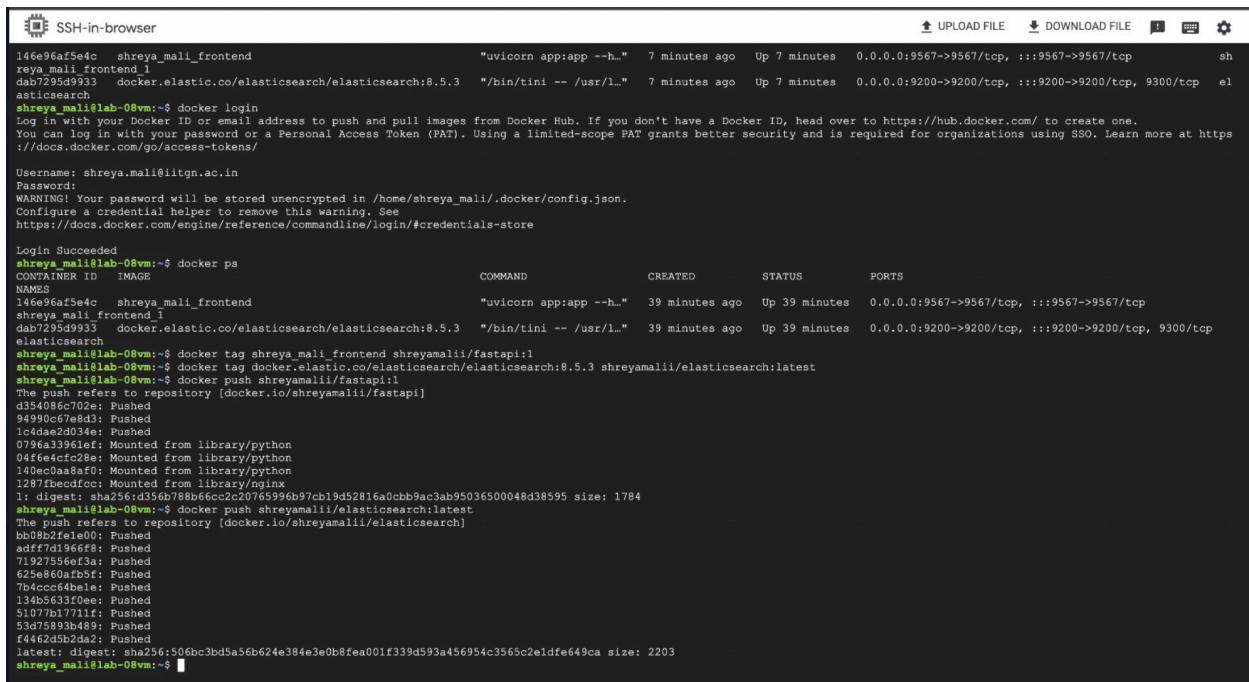
Screenshot of docker images



```

shreya_mali@lab-08vm:~$ docker images
REPOSITORY          TAG      IMAGE ID      CREATED       SIZE
shreya_mali_backend          b6153c4260d4  14 minutes ago  205MB
fastapi              1        7c935e2cda45  About an hour ago  150MB
shreya_mali_frontend          7c935e2cda45  About an hour ago  150MB
nginx                latest   53a18edff809  7 weeks ago   192MB

```



```

shreya_mali@lab-08vm:~$ docker login
Log in with your Docker ID or email address to push and pull images from Docker Hub. If you don't have a Docker ID, head over to https://hub.docker.com/ to create one.
You can log in with your password or a Personal Access Token (PAT). Using a limited-scope PAT grants better security and is required for organizations using SSO. Learn more at https://docs.docker.com/go-access-tokens/
Username: shreya.mali@iitgn.ac.in
Password:
WARNING! Your password will be stored unencrypted in /home/shreya_mali/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
shreya_mali@lab-08vm:~$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED            STATUS              PORTS
146e9af5e4c        shreya_mali_frontend   "uvicorn app:app --h..."   7 minutes ago     Up 7 minutes      0.0.0.0:9567->9567/tcp, ::::9567->9567/tcp      sh
shreya_mali_frontend_1          dahr7295d9933  docker.elastic.co/elasticsearch/elasticsearch:8.5.3   "/bin/tini -- /usr/l..."   7 minutes ago     Up 7 minutes      0.0.0.0:9200->9200/tcp, ::::9200->9200/tcp, 9300/tcp      el
asticsearch
shreya_mali@lab-08vm:~$ docker tag shreya_mali_frontend shreymalii/fastapi:1
shreya_mali@lab-08vm:~$ docker tag docker.elastic.co/elasticsearch/elasticsearch:8.5.3 shreymalii/elasticsearch:latest
shreya_mali@lab-08vm:~$ docker push shreymalii/fastapi:1
The push refers to repository [docker.io/shreymalii/fastapi]
d354086c702e: Pushed
94990c67e8d3: Pushed
l0cdae2d034e: Pushed
0793f3a0aef3: Pulled from library/python
0446a4fc28e: Mounted from library/python
140ec0aa8af0: Mounted from library/python
12877becdfcc: Mounted from library/nginx
1: digest: sha256:d356b788b66cc2c20765996b97ch19d52816a0bbb9ac3ab95036500048d38595 size: 1784
shreya_mali@lab-08vm:~$ docker push shreymalii/elasticsearch:latest
The push refers to repository [docker.io/shreymalii/elasticsearch]
bb08b2fe1e00: Pushed
adff7d1966f8: Pushed
71927556ef3a: Pushed
6259e60aaf5f: Pushed
7b5cccd4b4e: Pushed
154e5830e0f4: Pushed
51077b17711f: Pushed
53d75893b489: Pushed
f4462d5b2da2: Pushed
latest: digest: sha256:506bc3bd5a56b624e384e3e0b8fea001f339d593a456954c3565c2e1dfe649ca size: 2203
shreya_mali@lab-08vm:~$ 

```

Docker Image Links

<https://hub.docker.com/r/shreyamalii/fastapi>

<https://hub.docker.com/r/shreyamalii/elasticsearch>