

STT ASSIGNMENT 8

TEAM MEMBERS -

1. DHRUV GOEL (23110098)
2. NITIN BANSAL (23110223)

Github link -

https://github.com/NitinBansa8955/STT_ASSIGNMENT_8

Images Repository link -

<https://hub.docker.com/repositories/dhruvgoel007>

Google Drive link for dockerfiles -

<https://drive.google.com/drive/folders/1stilF48ywMxPAMBQNMQ5aGr6TCncvkEA?usp=sharing>

Screenshots -

1. Screenshot when performing all the tasks. (Dockerfile code, building command and its output, running container, and its output)

```
PS C:\Users\dhruv> docker network create es-net

PS C:\Users\dhruv\Desktop\project> docker build -t fastapi:1 ./frontend
>> docker build -t fastapi:2 ./backend
>> docker build -t elasticsearch ./elasticsearch
[+] Building 2.5s (11/11) FINISHED
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 236B
=> [internal] load metadata for docker.io/library/python:3.9-slim
=> [auth] library/python:pull token for registry-1.docker.io
=> [internal] load .dockerignore
=> => transferring context: 2B
=> [1/5] FROM docker.io/library/python:3.9-slim@sha256:e52ca5f579cc58fed41efcbb55a0ed5dccf6c7a156cba76acfb4ab42fc19dd00
=> => resolve docker.io/library/python:3.9-slim@sha256:e52ca5f579cc58fed41efcbb55a0ed5dccf6c7a156cba76acfb4ab42fc19dd00
=> [internal] load build context
=> => transferring context: 163B
=> CACHED [2/5] WORKDIR /app
=> CACHED [3/5] COPY requirements.txt .
=> CACHED [4/5] RUN pip install --no-cache-dir -r requirements.txt
```

<input type="checkbox"/>	<input type="radio"/>	dhruvgoel007/fastapi	1	e2ec03fbd077	6 hours ago	222.98 MB	▶	⋮	🗑
<input type="checkbox"/>	<input type="radio"/>	dhruvgoel007/fastapi	2	717fed6d073f	14 hours ago	234.28 MB	▶	⋮	🗑
<input type="checkbox"/>	<input type="radio"/>	dhruvgoel007/elasticsearch	latest	051ea0d334c7	14 hours ago	1 GB	▶	⋮	🗑

```
PS C:\Users\dhruv\Desktop\project> docker run -d --name elasticsearch --network es-net -v esdata:/data elasticsearch
>> docker run -d --name backend --network es-net fastapi:2
>> docker run -d --name frontend --network es-net -p 9567:9567 fastapi:1
e3002922a6a49eb2f3716d294cb830c6032c53fe32ec2002c71af4addb5a01fd
d559cdaec99cb90be917201c3ef5d8f85e5e89ea10ff5277be246eb84a8a55d6
5e4b9831d3ad97f68cdf13a9761acb1eeea7f8b3475d2161b51f663de970ce22
PS C:\Users\dhruv\Desktop\project>
```

Containers [Give feedback](#)

View all your running containers and applications. [Learn more](#)

Container CPU usage ⓘ

NaN% / 800% (8 CPUs available)

Container memory usage ⓘ

0B / 7.47GB

Show charts

☰

☒ Only show running containers

<input type="checkbox"/>	Name	Container ID	Image	Port(s)	CPU (%)	Last started	Actions
<input type="checkbox"/>	● elasticsearch	e3002922a6a4	elasticsearch		0%	20 seconds ago	<input type="checkbox"/> ⋮ 🗑
<input type="checkbox"/>	● backend	d559cdaec99c	fastapi:2		0%	0 seconds ago	<input type="checkbox"/> ⋮ 🗑
<input type="checkbox"/>	● frontend	5e4b9831d3ad	fastapi:1	9567:9567 ↗	0%	15 seconds ago	<input type="checkbox"/> ⋮ 🗑

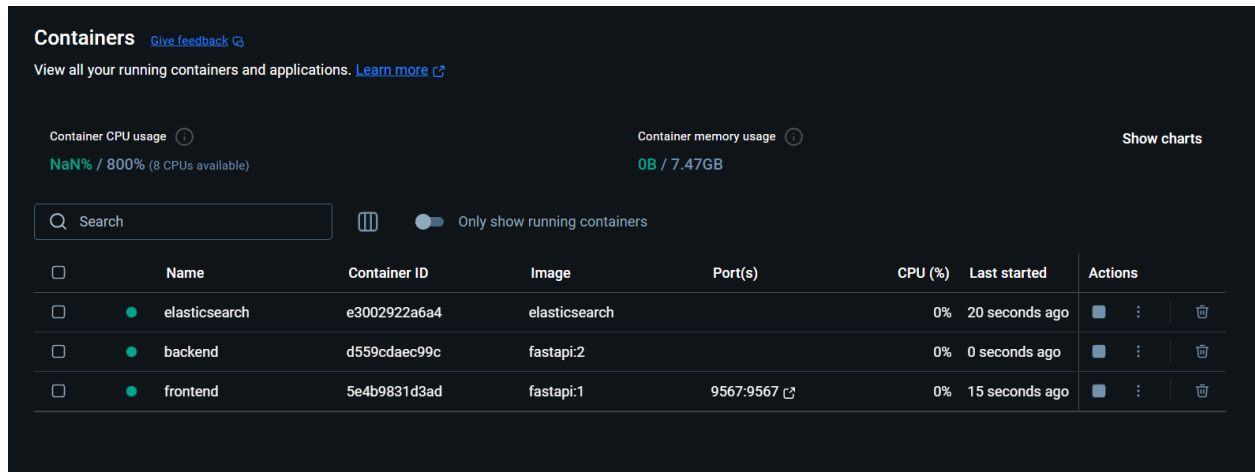
```
PS C:\Users\dhruv\Desktop\project> docker stop elasticsearch backend frontend
>> docker rm elasticsearch backend frontend
elasticsearch
backend
frontend
elasticsearch
backend
frontend
```

```
PS C:\Users\dhruv\Desktop\project> docker push dhruvgoel007/elasticsearch
Using default tag: latest
The push refers to repository [docker.io/dhruvgoel007/elasticsearch]
a84640b8c73b: Pushing [=====>] 67.11MB/337.7MB
4ae96ea178e6: Pushed
aa5eef34e4ab: Pushed
3da29f6b4fb5: Pushed
75dda725ba6b: Pushed
ece583f2db06: Pushed
c661c71060f1: Pushed
65f516cc091e: Pushed
9958bb1703a1: Pushed
c5ab29b15431: Pushed
cdbcad67ce350: Pushed
9b97d3778e89: Pushed
```

```
PS C:\Users\dhruv\Desktop\project> docker push dhruvgoel007/fastapi:2
The push refers to repository [docker.io/dhruvgoel007/fastapi]
17dd0a708519: Pushed
da1cbe0d584f: Layer already exists
be7c04db7737: Layer already exists
cec49b84de9d: Layer already exists
2457c8582de4: Pushed
6e909acdb790: Layer already exists
4abff0c486f6: Pushed
9a95d1744747: Layer already exists
2f75f720480b: Pushed
2: digest: sha256:717fed6d073fb5d577a32f240cac71b777907fa8306f421421eec674f3af91e7 size: 856
```

```
PS C:\Users\dhruv\Desktop\project> docker push dhruvgoel007/fastapi:1
The push refers to repository [docker.io/dhruvgoel007/fastapi]
16dda8980b0c: Pushed
cec49b84de9d: Pushed
be7c04db7737: Pushed
6e909acdb790: Mounted from dhruvgoel007/temp
b8b0087daa70: Pushed
252db9314fa9: Pushed
da1cbe0d584f: Pushed
7f553e092872: Pushed
9a95d1744747: Pushed
1: digest: sha256:e2ec03fbd077740b32930079d6d78231c6cba898652ac3e0e914736c163ab76d size: 856
```

2. Screenshot of what has been done to make FastAPI and ElasticSearch run on specific ports.



3. Screenshot of “netstat -antp | grep LISTEN” on Base Linux OS, where the container is running.

```
PS C:\Users\dhruv\Desktop\project> netstat -antp

Active Connections

Proto Local Address           Foreign Address         State                   Offload State
-----
TCP   0.0.0.0:80                0.0.0.0:0               LISTENING               ...
TCP   0.0.0.0:443               0.0.0.0:0               LISTENING               ...
TCP   0.0.0.0:9567              0.0.0.0:0               LISTENING               ...
```

4. Screenshot of “docker images”

<input type="checkbox"/>	<input type="radio"/>	dhruvgoel007/fastapi	1	e2ec03fbd077	6 hours ago	222.98 MB	▶ ⋮ 🗑️
<input type="checkbox"/>	<input type="radio"/>	dhruvgoel007/fastapi	2	717fed6d073f	14 hours ago	234.28 MB	▶ ⋮ 🗑️
<input type="checkbox"/>	<input type="radio"/>	dhruvgoel007/elasticsearch	latest	051ea0d334c7	14 hours ago	1 GB	▶ ⋮ 🗑️

5. Screenshot when testing both get and insert query. Then stop and delete all three 3 containers and run it again, showing that the inserted query still exists. (It must been shown clearly before that the get query output is different compared to when it has been inserted later)

Elasticsearch Operations

Output:

```
{'id': 'dcf521d0c68148e7970f29d7acc2cfc2', 'result': 'created'}
```

Elasticsearch Operations

Output:

```
{'id': 'e65b91f9b3664c69b694bf7cc0bfce45', 'result': 'created'}
```

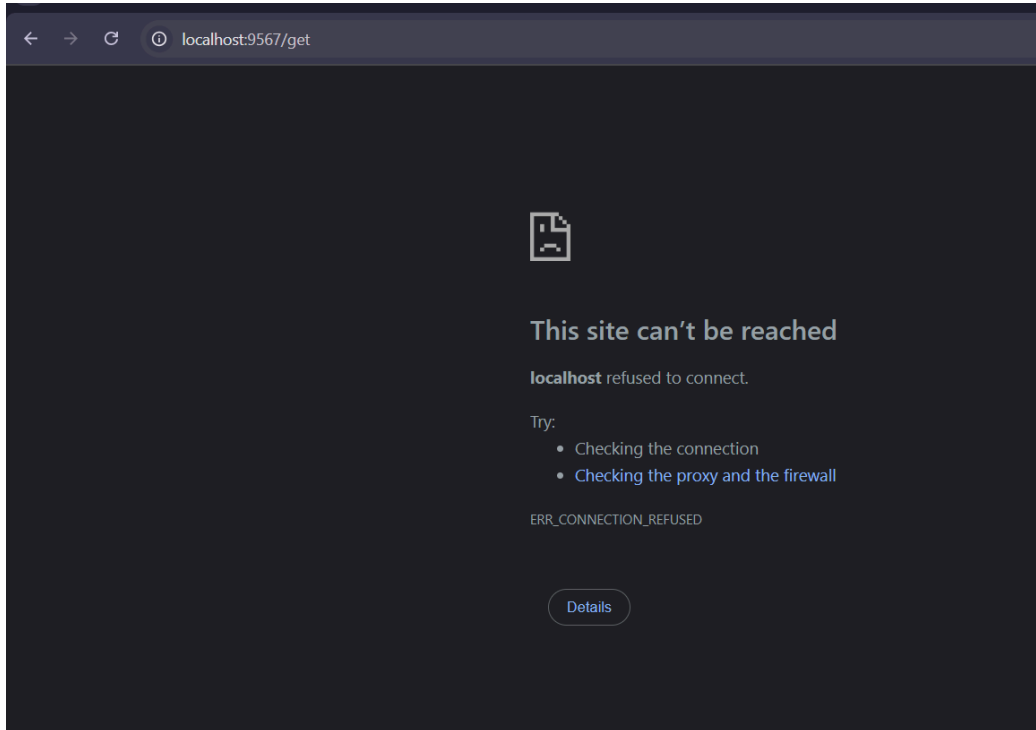
Elasticsearch Operations

Output:

```
{'id': 'bc372d85a96a41dd8b8718a4e2729038', 'text': 'hi'}
```

Search command above

After stopping the containers



Saved in volumes-

Volumes / esdata

esdata
Not in use

Created 14 hours ago

Import

Stored data Container in-use Exports

Name	Size	Last modified	Mode
nodes	37.2 MB	14 hours ago	drwxrwxr-x
0	37.2 MB	3 minutes ago	drwxrwxr-x
state	22.2 kB	5 minutes ago	drwxrwxr-x
state/.3f.cfe	278 Bytes	5 minutes ago	-rw-rw-r--
state/.3f.cfs	4.4 kB	5 minutes ago	-rw-rw-r--
state/.3f.si	395 Bytes	5 minutes ago	-rw-rw-r--
state/.3i.cfe	278 Bytes	5 minutes ago	-rw-rw-r--
state/.3i.cfs	16 kB	5 minutes ago	-rw-rw-r--
state/.3i.si	395 Bytes	5 minutes ago	-rw-rw-r--
state/manifest-8.st	109 Bytes	5 minutes ago	-rw-rw-r--
state/node-8.st	115 Bytes	5 minutes ago	-rw-rw-r--
state/segments_4a	361 Bytes	5 minutes ago	-rw-rw-r--
state/write.lock	0 Bytes	14 hours ago	-rw-rw-r--
indices	37.2 MB	14 hours ago	drwxrwxr-x

Running search without inserting anything

Elasticsearch Operations

Output:

```
{'id': 'bc372d85a96a41dd8b8718a4e2729038', 'text': 'hi'}
```

6. Screenshot of “docker inspect” for all the 3 tasks, both container and images. (Give the whole output in the screenshot it is essential to verify whether the task was done properly or not)

```
PS C:\Users\dhruv\Desktop\project> docker inspect frontend
[
  {
    "Id": "ba0fe6e60d042b3b920a2f3bb13f7b07b0da56e8705fb820c6148140ef3f15ec",
    "Created": "2025-03-27T17:49:02.600774078Z",
    "Path": "uvicorn",
    "Args": [
      "main:app",
      "--host",
      "0.0.0.0",
      "--port",
      "9567"
    ],
    "State": {
      "Status": "running",
      "Running": true,
      "Paused": false,
      "Restarting": false,
      "OOMKilled": false,
      "Dead": false,
      "Pid": 5804,
      "ExitCode": 0,
      "Error": "",
      "StartedAt": "2025-03-27T17:49:02.742515264Z",
      "FinishedAt": "0001-01-01T00:00:00Z"
    },
    "Image": "sha256:8bd0f9d3a57c7c599733dc32379439b185f79451c402a5f579af684289b8e939",
    "ResolvConfPath": "/var/lib/docker/containers/ba0fe6e60d042b3b920a2f3bb13f7b07b0da56e8705fb820c6148140ef3f15ec/resolv.conf",
    "HostnamePath": "/var/lib/docker/containers/ba0fe6e60d042b3b920a2f3bb13f7b07b0da56e8705fb820c6148140ef3f15ec/hostname",
    "HostsPath": "/var/lib/docker/containers/ba0fe6e60d042b3b920a2f3bb13f7b07b0da56e8705fb820c6148140ef3f15ec/hosts",
  }
]
```

```
PS C:\Users\dhruv\Desktop\project> docker inspect backend
[
  {
    "Id": "8a02d59799205bd7a97920fe9f80d9f25d254f5c7b7ce05c9aa222d8af33975c",
    "Created": "2025-03-27T17:49:02.191678294Z",
    "Path": "uvicorn",
    "Args": [
      "main:app",
      "--host",
      "0.0.0.0",
      "--port",
      "9567"
    ],
    "State": {
      "Status": "running",
      "Running": true,
      "Paused": false,
      "Restarting": false,
      "OOMKilled": false,
      "Dead": false,
      "Pid": 6158,
      "ExitCode": 0,
      "Error": "",
      "StartedAt": "2025-03-27T17:49:15.673008529Z",
      "FinishedAt": "2025-03-27T17:49:13.916160302Z"
    },
    "Image": "sha256:e2253fba856cd9ed552b8c78d50c1ac2827c9d41aec1c47de95165344e5a32c9",
    "ResolvConfPath": "/var/lib/docker/containers/8a02d59799205bd7a97920fe9f80d9f25d254f5c7b7ce05c9aa222d8af33975c/resolv.conf",
    "HostnamePath": "/var/lib/docker/containers/8a02d59799205bd7a97920fe9f80d9f25d254f5c7b7ce05c9aa222d8af33975c/hostname",
    "HostsPath": "/var/lib/docker/containers/8a02d59799205bd7a97920fe9f80d9f25d254f5c7b7ce05c9aa222d8af33975c/hosts",
    "LogPath": "/var/lib/docker/containers/8a02d59799205bd7a97920fe9f80d9f25d254f5c7b7ce05c9aa222d8af33975c/8a02d59799205bd7a97920fe9f80d9f25d254f5c7b7ce05c9aa222d8af33975c-json.log",
    "Name": "/backend",
  }
]
```

```
PS C:\Users\dhruv\Desktop\project> docker inspect elasticsearch
[
  {
    "Id": "cb510453587d65255d9ec423821bd60cf4a74a4be7b2407ab73171aa092b0697",
    "Created": "2025-03-27T17:49:01.778744607Z",
    "Path": "/bin/tini",
    "Args": [
      "--",
      "/usr/local/bin/docker-entrypoint.sh",
      "elasticsearch",
      "-Epath.data=/data"
    ],
    "State": {
      "Status": "running",
      "Running": true,
      "Paused": false,
      "Restarting": false,
      "OOMKilled": false,
      "Dead": false,
      "Pid": 5531,
      "ExitCode": 0,
      "Error": "",
      "StartedAt": "2025-03-27T17:49:01.857148961Z",
      "FinishedAt": "0001-01-01T00:00:00Z"
    },
    "Image": "sha256:2be5529a137d8115c26f632177940009a84eff680e0ef71985d4d5498cc447d6",
    "ResolvConfPath": "/var/lib/docker/containers/cb510453587d65255d9ec423821bd60cf4a74a4be7b2407ab73171aa092b0697/resolv.conf",
    "HostnamePath": "/var/lib/docker/containers/cb510453587d65255d9ec423821bd60cf4a74a4be7b2407ab73171aa092b0697/hostname",
    "HostsPath": "/var/lib/docker/containers/cb510453587d65255d9ec423821bd60cf4a74a4be7b2407ab73171aa092b0697/hosts",
    "LogPath": "/var/lib/docker/containers/cb510453587d65255d9ec423821bd60cf4a74a4be7b2407ab73171aa092b0697/cb510453587d65255d9ec423821bd60cf4a74a4be7b2407ab73171aa092b0697-json.log",
    "Name": "/elasticsearch",
    "RestartCount": 0,
  }
]
```


7. VM creation steps are taken, and screenshots are on Google Cloud or Kutrim.

Machine configuration

Name *

stt-dhru

?

Region *

asia-south1 (Mumbai)

?

Zone *

asia-south1-a

?

Region is permanent

Zone is permanent

☒ 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
<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
<input type="radio"/>	C3	Consistently high performance	4 - 192	8 - 1,536 GB	Intel Sapphire
<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 Broadwe
<input type="radio"/>	N2	Balanced price & performance	2 - 128	2 - 864 GB	Intel Cascade
<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	Ampere Altra

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

+ Add item

Data encryption

☒ Google-managed encryption key
Keys owned by Google

☐ Cloud KMS key
Keys owned by customers

! You can now automate creation of Cloud KMS keys using Autokey.
 Dismiss
 Learn more

Provisioning model

VM provisioning model

Spot

Determines how long your VMs will run. Choice is permanent

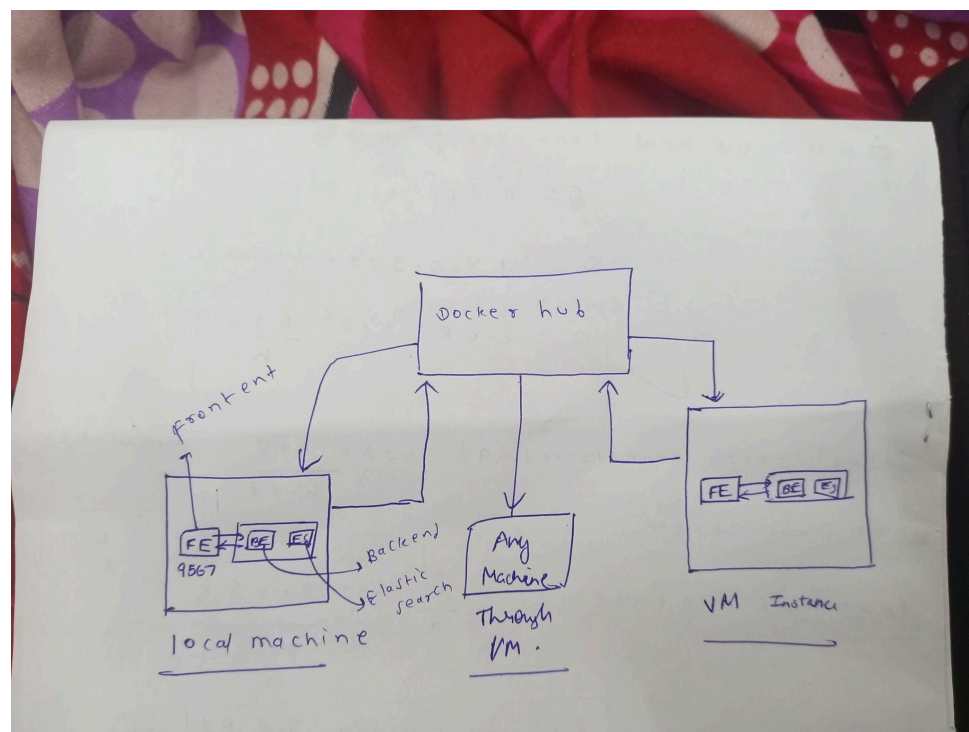
☐ Set a time limit for the VM

☐ Gracefully shut down the VM

Filter
Enter property name or value

<input type="checkbox"/> Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input checked="" type="checkbox"/>	stt-dhruv	asia-south1-a			10.160.0.6 (nic0)	34.47.243.3 (nic0)	SSH

8. Give a detailed architectural diagram.



Other screenshots - To make the key-

```
PS C:\Users\dhruv\Desktop\project> ssh-keygen -t ed25519 -f "$env:USERPROFILE\Desktop\project\key" -N "" -C "stt-dhruv@34.47.243.3"
Generating public/private ed25519 key pair.
Your identification has been saved in C:\Users\dhruv\Desktop\project\key
Your public key has been saved in C:\Users\dhruv\Desktop\project\key.pub
The key fingerprint is:
SHA256:PhDqDwg6eBBkX7L1KhSSNeQtNuBcJj3uWwkZXjTEetw stt-dhruv@34.47.243.3
The key's randomart image is:
+--[ED25519 256]--+
|  *=O+*          |
|  =.O+Ooo        |
|  .ooOB.o.       |
|  .o*o+.E        |
|  o ..+.o S      |
| oo +.o o        |
| + o = o         |
+-----+

```

On the other machine -

```
PS C:\Users\dhruv\Desktop\project> ssh -i key stt-dhruv@34.47.243.3
Linux stt-dhruv 6.1.0-31-cloud-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.1.128-1 (2025-02-07) 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.
stt-dhruv@stt-dhruv:~$ ls
stt-dhruv@stt-dhruv:~$ docker login
-bash: docker: command not found
stt-dhruv@stt-dhruv:~$ sudo apt update && sudo apt install -y docker.io
Get:1 file:/etc/apt/mirrors/debian.list Mirrorlist [30 B]
Get:2 file:/etc/apt/mirrors/debian-security.list Mirrorlist [39 B]
Hit:3 https://deb.debian.org/debian bookworm InRelease

```

```
stt-dhruv@stt-dhruv:~$ sudo docker login
Login with your Docker ID to push and pull images from Docker Hub. If you don't have a Docker ID, head over to https://
ate one.
Username: dhruvgoel007
Password:
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded

```

```
stt-dhruv@stt-dhruv:~$ sudo docker pull dhruvgoel007/fastapi:1
1: Pulling from dhruvgoel007/fastapi
6e909acdb790: Pull complete
cec49b84de9d: Pull complete
da1cbe0d584f: Pull complete
9a95d1744747: Pull complete
be7c04db7737: Pull complete
252db9314fa9: Pull complete
7f553e092872: Pull complete
b8b0087daa70: Pull complete
Digest: sha256:e2ec03fbd077740b32930079d6d78231c6cba898652ac3e0e914736c163ab76d
Status: Downloaded newer image for dhruvgoel007/fastapi:1
docker.io/dhruvgoel007/fastapi:1
```

```
stt-dhruv@stt-dhruv:~$ sudo docker pull dhruvgoel007/fastapi:2
2: Pulling from dhruvgoel007/fastapi
6e909acdb790: Already exists
cec49b84de9d: Already exists
da1cbe0d584f: Already exists
9a95d1744747: Already exists
be7c04db7737: Already exists
4abff0c486f6: Pull complete
2f75f720480b: Pull complete
17dd0a708519: Pull complete
Digest: sha256:717fed6d073fb5d577a32f240cac71b777907fa8306f421421eec674f3af91e7
Status: Downloaded newer image for dhruvgoel007/fastapi:2
docker.io/dhruvgoel007/fastapi:2
```

```
stt-dhruv@stt-dhruv:~$ sudo docker pull dhruvgoel007/elasticsearch
Using default tag: latest
latest: Pulling from dhruvgoel007/elasticsearch
c661c71060f1: Pull complete
cdbad67ce350: Pull complete
9b97d3778e89: Pull complete
a84640b8c73b: Pull complete
75dda725ba6b: Pull complete
65f516cc091e: Pull complete
aa5eef34e4ab: Pull complete
4ae96ea178e6: Pull complete
aa5eef34e4ab: Pull complete
4ae96ea178e6: Pull complete
3da29f6b4fb5: Pull complete
Digest: sha256:051ea0d334c7f909ed93297c78bb55071411a8f0e054fb86189b977a933adfdf
Status: Downloaded newer image for dhruvgoel007/elasticsearch:latest
docker.io/dhruvgoel007/elasticsearch:latest
```

```
stt-dhruv@stt-dhruv:~$ sudo docker images
```

REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
dhruvgoel007/fastapi	1	e5c2c6028c62	6 hours ago	147MB
dhruvgoel007/elasticsearch	latest	a9cdc58a7d25	14 hours ago	612MB
dhruvgoel007/fastapi	2	08a5a9a34a7c	14 hours ago	156MB

```
stt-dhruv@stt-dhruv:~$ sudo docker run -d --name frontend --network es-net -p 9567:9567 dhruvgoel007/fastapi:1
d4bd5422e27721080d1cb2614c80f558f36fbdaf6bca5d9355c612bf40512739
stt-dhruv@stt-dhruv:~$ sudo docker run -d --name backend --network es-net dhruvgoel007/fastapi:2
b19aae1f84eb0132e23b7974805ee85a4210b1866dca63b62dcb441dcdce10d8
stt-dhruv@stt-dhruv:~$ sudo docker run -d --name elasticsearch --network es-net -v esdata:/data dhruvgoel007/elasticsearch
ce4d7fd0d543a7bfe9bef74c07efdd6e1542f71b049e4501d8e8a29e1e92a7aa
stt-dhruv@stt-dhruv:~$
```

- Images should take the least possible space.
- The container should start as quickly as possible.

We have used python:3.9-slim for least possible space taking for making docker image and it also helps in quick start of the container