

STTAI - Assignment 8

Group number 25

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Docker hub images link

FastAPI 1 and 2 Images link: [23110281/fastapi - Docker Image | Docker Hub](https://hub.docker.com/repository/docker/23110281/fastapi)

ElasticSearch image link:

<https://hub.docker.com/repository/docker/23110281/elasticsearch/general>

Dockerfile public drive link

Frontend

<https://drive.google.com/file/d/1mku0khd62VT8RS07etL5O-7M-zwxhZX3/view?usp=sharing>

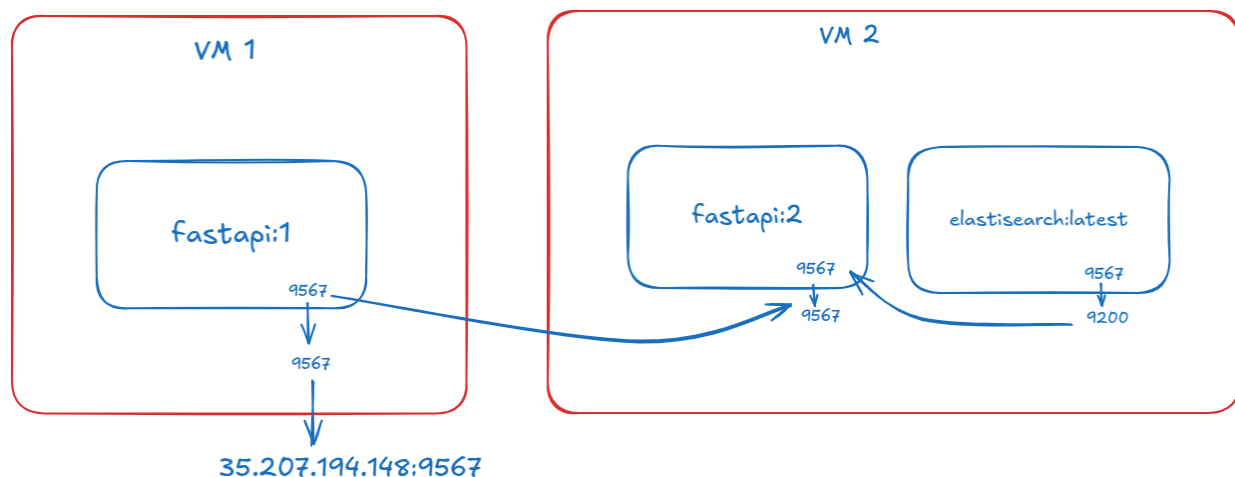
Backend

<https://drive.google.com/file/d/1ByaHYWLI5Til5PAycNTNrQTYYWk328I-/view?usp=sharing>

Elastisearch

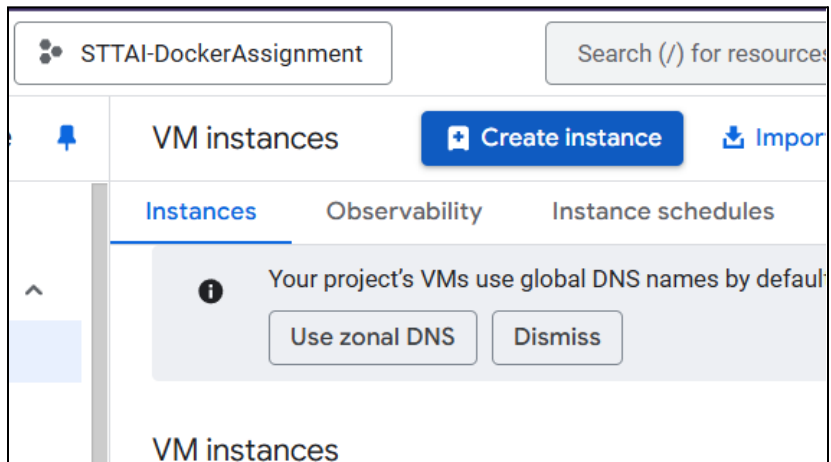
https://drive.google.com/file/d/1w1mHGhSfldvHmhdz_ZP5LwPfrjuyuxQj/view?usp=sharing

Architecture Diagram



VM Creation on GCP

Using the Create instance button,



Machine configuration

Name *
vm2

Region *
asia-south1 (Mumbai)

Zone *
Any

Region is permanent

Google will choose a zone on your behalf, maximizing VM obtainability. Zone is permanent.

☒ General purpose ☐ Compute optimized ☐ Memory optimized ☐ Storage optimized ☐ GPUs

Machine type

Choose a machine type with preset amounts of vCPUs and memory that suit most workloads. Or, you can create a custom machine for your workload's particular needs. [Learn more](#)

☐ Preset ☒ Custom

Creating a custom machine incurs additional costs

Cores
2 32

2 vCPU
(1 core)

☐ Shared core

Memory
1 16

2 GB

[Advanced configurations](#)

☒ Google-managed encryption key
Keys owned by Google

☐ Cloud KMS key
Keys owned by customers

i 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 ? Preview

On VM termination

Stop

Choose what happens to your VM when it's preempted or reaches its time limit

On host maintenance

Terminate VM instance

When Compute Engine performs periodic infrastructure maintenance it can migrate your VM instances to other hardware

Monthly estimate

\$18.55

That's about \$0.03 hourly

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

Item	Monthly est
2 vCPU + 2 GB memory	\$
10 GB balanced persistent disk	
Logging	Cost va
Monitoring	Cost va
Snapshot schedule	Cost va
Total	\$

[Compute Engine pricing ↗](#)
[Cloud Operations pricing ↗](#)
[^ Less](#)

Spot Provisioning for cheaper price

←

Firewall rule details

Edit

Delete

allow9567

Description

Allows port 9567

Logs ?

Off

[view in Logs Explorer](#)

Network

default

Priority

1000

Direction

Ingress

Action on match

Allow

Tags

—

Source filters

IP ranges	14.139.98.80
	35.207.194.148

Protocols and ports

tcp:9567

Enforcement

Enabled

Insights

None

Hit count monitoring ?

—

Firewall Rules for VM2

Virtual machine installing basics and docker

Apt

```
23110281@vm-1-frontend:~$ sudo apt-get update && sudo apt-get upgrade
Get:1 file:/etc/apt/mirrors/debian.list Mirrorlist [30 B]
Get:5 file:/etc/apt/mirrors/debian-security.list Mirrorlist [39 B]
Hit:7 https://packages.cloud.google.com/apt google-compute-engine-bookworm-stable InRelease
Hit:2 https://deb.debian.org/debian bookworm InRelease
Hit:3 https://deb.debian.org/debian bookworm-updates InRelease
Hit:4 https://deb.debian.org/debian bookworm-backports InRelease
Hit:6 https://deb.debian.org/debian-security bookworm-security InRelease
Hit:8 https://packages.cloud.google.com/apt cloud-sdk-bookworm InRelease
Hit:9 https://packages.cloud.google.com/apt google-cloud-ops-agent-bookworm-2 InRelease
Reading package lists... Done
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages have been kept back:
```

```
Setting up vim-tiny (2:9.0.1378-2+deb12u2) ...
Setting up google-cloud-cli-anthoscli (515.0.0-0) ...
Setting up systemd-timesyncd (252.36-1~deb12u1) ...
Setting up systemd-resolved (252.36-1~deb12u1) ...
Setting up systemd-sysv (252.36-1~deb12u1) ...
Setting up libpam-systemd:amd64 (252.36-1~deb12u1) ...
Processing triggers for libc-bin (2.36-9+deb12u10) ...
Processing triggers for man-db (2.11.2-2) ...
Processing triggers for dbus (1.14.10-1~deb12u1) ...
Processing triggers for initramfs-tools (0.142+deb12u1) ...
update-initramfs: Generating /boot/initrd.img-6.1.0-31-cloud-amd64
23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$
```

Installing docker in both vms

```

23110281@vm-1-frontend:~$ # Add Docker's official GPG key:
sudo apt-get update
sudo apt-get install ca-certificates curl
sudo install -m 0755 -d /etc/apt/keyrings
sudo curl -fsSL https://download.docker.com/linux/debian/gpg -o /etc/apt/keyrings/docker.asc
sudo chmod a+r /etc/apt/keyrings/docker.asc

# Add the repository to Apt sources:
echo \
  "deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/keyrings/docker.asc] https://download.docker.com/linux/debian \
    $(. /etc/os-release && echo "$VERSION_CODENAME") stable" | \
  sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
sudo apt-get update
Get:1 file:/etc/apt/mirrors/debian.list Mirrorlist [30 B]
Get:2 file:/etc/apt/mirrors/debian-security.list Mirrorlist [39 B]
Hit:7 https://packages.cloud.google.com/apt google-compute-engine-bookworm-stable InRelease
Hit:3 https://deb.debian.org/debian bookworm InRelease
Hit:4 https://deb.debian.org/debian bookworm-updates InRelease
Hit:5 https://deb.debian.org/debian bookworm-backports InRelease
Hit:6 https://deb.debian.org/debian-security bookworm-security InRelease
Hit:8 https://packages.cloud.google.com/apt cloud-sdk-bookworm InRelease
Hit:9 https://packages.cloud.google.com/apt google-cloud-ops-agent-bookworm-2 InRelease
Reading package lists... Done
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20230311).
curl is already the newest version (7.88.1-10+deb12u12).
0 upgraded, 0 newly installed, 0 to remove and 1 not upgraded.
Get:1 file:/etc/apt/mirrors/debian.list Mirrorlist [30 B]
Get:2 file:/etc/apt/mirrors/debian-security.list Mirrorlist [39 B]
Hit:7 https://packages.cloud.google.com/apt google-compute-engine-bookworm-stable InRelease
Get:8 https://download.docker.com/linux/debian bookworm InRelease [43.3 kB]
Hit:3 https://deb.debian.org/debian bookworm InRelease
Hit:4 https://deb.debian.org/debian bookworm-updates InRelease
Hit:5 https://deb.debian.org/debian bookworm-backports InRelease
Hit:9 https://packages.cloud.google.com/apt cloud-sdk-bookworm InRelease
Hit:6 https://deb.debian.org/debian-security bookworm-security InRelease
Get:10 https://download.docker.com/linux/debian bookworm/stable amd64 Packages [37.1 kB]
Hit:11 https://packages.cloud.google.com/apt google-cloud-ops-agent-bookworm-2 InRelease
Fetched 80.4 kB in 1s (91.9 kB/s)
Reading package lists... Done
23110281@vm-1-frontend:~$

```

```

23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$ sudo apt-get install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docker-compose-plugin
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  dbus-user-session docker-ce-rootless-extras git git-man liberror-perl libgdbm-compat4 libltdl7 libperl5.36 libsllp0 patch perl perl-modules-5.36 pigz
Suggested packages:
  cgroups-mount | cgroup-lite git-daemon-run | git-daemon-sysvinit git-doc git-email git-gui gitk gitweb git-cvs git-mediawiki git-svn ed diffutils-doc
  libtap-harness-archive-perl
The following NEW packages will be installed:
  containerd.io dbus-user-session docker-buildx-plugin docker-ce docker-ce-cli docker-ce-rootless-extras docker-compose-plugin git git-man liberror-perl
  sllrp4netns
0 upgraded, 19 newly installed, 0 to remove and 1 not upgraded.
Need to get 137 MB of archives.
After this operation, 536 MB of additional disk space will be used.

```

```

Setting up perl (5.36.0-7+deb12u1) ...
Setting up docker-ce (5:28.0.2-1~debian.12~bookworm) ...
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.
Setting up liberror-perl (0.17029-2) ...
Setting up git (1:2.39.5-0+deb12u2) ...
Processing triggers for man-db (2.11.2-2) ...
Processing triggers for libc-bin (2.36-9+deb12u10) ...
23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$

```

Docker build screenshots

Frontend

```

23110281@vm-1-frontend:~/assignment9/vm1$
23110281@vm-1-frontend:~/assignment9/vm1$ docker build -t 23110281/fastapi:1.1 /frontend
[+] Building 1.7s (11/11) FINISHED
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 228B
=> [internal] load metadata for docker.io/library/python:alpine
=> [auth] library/python:alpine token for registry-1.docker.io
=> [internal] load .dockerignore
=> => transferring context: 2B
=> [1/5] FROM docker.io/library/python:alpine@sha256:323a757dc4a810fee21e3f1ac738ee18bb485de4e7593ce242b36ee48d6b352
=> [internal] load build context
=> => transferring context: 94B
=> CACHED [2/5] WORKDIR /app
=> CACHED [3/5] COPY requirements.txt
=> CACHED [4/5] RUN pip install --no-cache-dir -r requirements.txt
=> CACHED [5/5] COPY .
=> => exporting to image
=> => exporting layers
=> => writing image sha256:7cef0d64ec12c0814153bcf197a727357b02895c3a3126d4f0a0b021b5751
=> => naming to docker.io/23110281/fastapi:1.1
23110281@vm-1-frontend:~/assignment9/vm1$
23110281@vm-1-frontend:~/assignment9/vm1$

```

Backend

```
23110281@vm-2:~/assignment8/vm2$ docker build -t 23110281/fastapi:2 ./backend
[+] Building 2.4s (12/12) FINISHED                                docker:default
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 222B
=> [internal] load metadata for docker.io/library/python:alpine
=> [auth] library/python:pull token for registry-1.docker.io
=> [internal] load .dockerignore
=> => transferring context: 2B
=> [1/5] FROM docker.io/library/python:alpine@sha256:323a717dc4a818fee21e3f1aac738ee18bb485de4e7593ce242b36ee48d6b352
=> [internal] load build context
=> => transferring context: 94B
=> CACHED [2/5] WORKDIR /app
=> CACHED [3/5] COPY requirements.txt
=> CACHED [4/5] RUN pip install --no-cache-dir -r requirements.txt
=> CACHED [5/5] COPY .
=> exporting to image
=> exporting layers
=> writing image sha256:f9a16d8a4f2ff41553711925ee0ba8f3ab9843e2c73b916d559eb9551895872e
=> naming to docker.io/23110281/fastapi:2
23110281@vm-2:~/assignment8/vm2$
```

Elasticsearch

```
23110281@vm-2:~/assignment8/vm2$ docker build -t 23110281/elasticsearch:latest ./elasticsearch
[+] Building 2.1s (5/5) FINISHED                                docker:default
=> [internal] load build definition from Dockerfile
=> => transferring dockerfile: 241B
=> [internal] load metadata for docker.elastic.co/elasticsearch/elasticsearch:7.17.28
=> [internal] load .dockerignore
=> => transferring context: 2B
=> CACHED [1/1] FROM docker.elastic.co/elasticsearch/elasticsearch:7.17.28@sha256:f2ce8a4c644a357626e115c9a373c5c428d0f83c2d075c8a578811934c4dffd1
=> resolve docker.elastic.co/elasticsearch/elasticsearch:7.17.28@sha256:f2ce8a4c644a357626e115c9a373c5c428d0f83c2d075c8a578811934c4dffd1
=> exporting to image
=> exporting layers
=> writing image sha256:8a4ce287c8ed1ddfd5494e809f6b1f651125f8e28416ac526bb778f79e55a
=> naming to docker.io/23110281/elasticsearch:latest
23110281@vm-2:~/assignment8/vm2$ docker image ls
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
23110281/elasticsearch  latest             8a4ce287c8ed       4 weeks ago        651MB
23110281@vm-2:~/assignment8/vm2$ docker login

USING WEB-BASED LOGIN

Info - To sign in with credentials on the command line, use 'docker login -u <username>'

Your one-time device confirmation code is: 3PHD-8QZ7
Press ENTER to open your browser or submit your device code here: https://login.docker.com/activate
Waiting for authentication in the browser...
WARNING! Your credentials are stored unencrypted in '/root/.docker/config.json'.
Configure a credential helper to remove this warning. See
https://docs.docker.com/go/credential-store/

Login Succeeded
23110281@vm-2:~/assignment8/vm2$ docker push 23110281/elasticsearch:latest
The push refers to repository [docker.io/23110281/elasticsearch]
807e54818b10: Pushed
338128a1928c: Pushed
a3ab6d311aac: Pushed
3aba5945db4c: Pushed
1bd068c8c9d3: Pushed
4b3a978ae556: Pushed
5f70bf18a886: Pushed
cde96c2ab968: Pushed
e9c6dc9f817c: Pushed
fffa76c64ef2: Mounted from library/ubuntu
latest: digest: sha256:18fcd8db73ba2782a23a3c543275fd8835816581da5acfa4b5be8775923daa08 size: 2411
```

Running the containers (docker-compose)

Frontend

```
23110281@vm-1:frontend:~/assignment8/vm1$ sudo docker compose up --build
WARNING: /home/23110281/assignment8/vm1/docker-compose.yml: the attribute 'version' is obsolete, it will be ignored, please remove it to avoid potential confusion
Compose can now delegate builds to bake for better performance.
To do so, set COMPOSE_BAKE=true
[+] Building 8.5s (11/11) FINISHED                                docker:default
=> [frontend internal] load build definition from Dockerfile
=> => transferring dockerfile: 222B
=> [frontend internal] load metadata for docker.io/library/python:alpine
=> [frontend internal] load .dockerignore
=> => transferring context: 2B
=> [frontend 1/5] FROM docker.io/library/python:alpine@sha256:323a717dc4a818fee21e3f1aac738ee18bb485de4e7593ce242b36ee48d6b352
=> [frontend internal] load build context
=> => transferring context: 142B
=> CACHED [frontend 2/5] WORKDIR /app
=> [frontend 3/5] COPY requirements.txt
=> [frontend 4/5] RUN pip install --no-cache-dir -r requirements.txt
=> [frontend 5/5] COPY
=> [frontend] exporting to image
=> => exporting layers
=> writing image sha256:7f80dcbb9847c8863c919a1e543ae9fc42c73ebddadb9f799eb7df3d780153
=> naming to docker.io/23110281/frontend
=> [frontend] resolving provenance for metadata file
[+] Building 2/2
* frontend Built
* Container vm1-frontend-1 Recreated
Attaching to frontend-1
frontend-1 INFO: Started server process [1]
frontend-1 INFO: Waiting for application startup.
frontend-1 INFO: Application startup complete.
frontend-1 INFO: Uvicorn running on http://0.0.0.0:8080 (Press CTRL+C to quit)
frontend-1 INFO: 172.18.0.1:35388 - "GET / HTTP/1.1" 200 OK
Gracefully stopping... (Press Ctrl+C again to force)
[+] Stopping 1/1
* Container vm1-frontend-1 Stopped
23110281@vm-1:frontend:~/assignment8/vm1$
```

Backend

Fastapi

```
CMD ["uvicorn", "main:app", "--host", "0.0.0.0", "--port", "9567"]
```

elasticsearch

```
environment:  
- discovery.type=single-node  
- "http.port=9567"
```

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

Frontend (vm1)

```
23110281@vm-1-frontend:~$  
23110281@vm-1-frontend:~$ netstat -antp | grep LISTEN  
(No info could be read for "-p": geteuid()=1002 but you should be root.)  
tcp        0      0 0.0.0.0:9567          0.0.0.0:*             LISTEN      -  
tcp        0      0 127.0.0.1:25         0.0.0.0:*             LISTEN      -  
tcp        0      0 0.0.0.0:22          0.0.0.0:*             LISTEN      -  
tcp        0      0 127.0.0.53:53       0.0.0.0:*             LISTEN      -  
tcp        0      0 0.0.0.0:5355        0.0.0.0:*             LISTEN      -  
tcp        0      0 0.0.0.0:20202       0.0.0.0:*             LISTEN      -  
tcp        0      0 127.0.0.54:53       0.0.0.0:*             LISTEN      -  
tcp6       0      0 :::9567             :::*                   LISTEN      -  
tcp6       0      0 :::22               :::*                   LISTEN      -  
tcp6       0      0 :::5355             :::*                   LISTEN      -  
tcp6       0      0 :::1:25             :::*                   LISTEN      -  
tcp6       0      0 :::20201            :::*                   LISTEN      -  
23110281@vm-1-frontend:~$
```

Backend (vm2)

```
23110281@vm-2:~$  
23110281@vm-2:~$ netstat -antp | grep LISTEN  
(No info could be read for "-p": geteuid()=1000 but you should be root.)  
tcp        0      0 127.0.0.53:53       0.0.0.0:*             LISTEN      -  
tcp        0      0 0.0.0.0:22          0.0.0.0:*             LISTEN      -  
tcp        0      0 127.0.0.54:53       0.0.0.0:*             LISTEN      -  
tcp        0      0 127.0.0.1:9300      0.0.0.0:*             LISTEN      -  
tcp        0      0 0.0.0.0:9567        0.0.0.0:*             LISTEN      -  
tcp        0      0 127.0.0.1:9200      0.0.0.0:*             LISTEN      -  
tcp        0      0 0.0.0.0:5355        0.0.0.0:*             LISTEN      -  
tcp        0      0 127.0.0.1:25       0.0.0.0:*             LISTEN      -  
tcp        0      0 0.0.0.0:20202       0.0.0.0:*             LISTEN      -  
tcp6       0      0 :::1:25             :::*                   LISTEN      -  
tcp6       0      0 :::22               :::*                   LISTEN      -  
tcp6       0      0 :::9567             :::*                   LISTEN      -  
tcp6       0      0 :::5355             :::*                   LISTEN      -  
tcp6       0      0 :::20201            :::*                   LISTEN      -  
23110281@vm-2:~$  
23110281@vm-2:~$
```

Docker images screenshots

Frontend (vm1)

```
23110281@vm-1-frontend:~$ docker images
REPOSITORY          TAG             IMAGE ID         CREATED          SIZE
23110281/frontend   latest          7cefd664ec12    4 days ago      72.5MB
23110281@vm-1-frontend:~$
```

Frontend (vm2)

```
23110281@vm-2:~$
23110281@vm-2:~$ docker images
REPOSITORY          TAG             IMAGE ID         CREATED          SIZE
23110281/backend    latest          f9016dba4f2f    4 days ago      71.3MB
23110281/elasticsearch latest          0a4ce287c0ed    4 weeks ago     651MB
23110281@vm-2:~$
```

Query testing

/insert

```
23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$ curl -X POST "http://0.0.0.0:9567/insert" -H "Content-Type: application/json" -d '{
{"index": "1",
"doc": {
  "name": "Sample 1",
  "value": 32000
}
}'
{"_index": "my_index", "_type": "_doc", "_id": "K9i4z5UBd4Ccn1uLgR_s", "_version": 1, "result": "created", "_shards": {"total": 2, "successful": 1, "failed": 0}, "_seq_no": 0, "_primary_term": 1}
23110281@vm-1-frontend:~$
```

/get (before inserting)

```
23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$ curl http://0.0.0.0:9567/get | jq .
% Total    % Received % Xferd  Average Speed   Time    Time     Current
                                 Dload  Upload   Total   Spent    Left     Speed
100  377  100  377    0     0  1383      0  --:--:-- --:--:-- --:--:-- 1386
{
  "error": {
    "root_cause": [
      {
        "type": "index_not_found_exception",
        "reason": "no such index [my_index]",
        "resource.type": "index_or_alias",
        "resource.id": "my_index",
        "index_uuid": "_na_",
        "index": "my_index"
      }
    ],
    "type": "index_not_found_exception",
    "reason": "no such index [my_index]",
    "resource.type": "index_or_alias",
    "resource.id": "my_index",
    "index_uuid": "_na_",
    "index": "my_index"
  },
  "status": 404
}
23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$
```

/get


```

23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$ curl http://0.0.0.0:9567/get | jq .
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left   Speed
100    301    100    301     0     0   7851      0  --:--:-- --:--:-- --:--:--   7921
{
  "took": 8,
  "timed_out": false,
  "_shards": {
    "total": 1,
    "successful": 1,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": {
      "value": 1,
      "relation": "eq"
    },
    "max_score": 1,
    "hits": [
      {
        "_index": "my_index",
        "_type": "_doc",
        "_id": "K9i4z5UBd4Ccn1uLgR_s",
        "_score": 1,
        "_source": {
          "index": "1",
          "doc": {
            "name": "Sample 1",
            "value": 32000
          }
        }
      }
    ]
  }
}
23110281@vm-1-frontend:~$

```

Stopped all containers

```

23110281@vm-1-frontend:~$ docker ps -a
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS   NAMES
23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$
23110281@vm-2:~$ docker ps -a
CONTAINER ID   IMAGE     COMMAND   CREATED   STATUS    PORTS   NAMES
23110281@vm-2:~$

```

/get request when containers are stopped

```

23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$ curl http://0.0.0.0:9567/get | jq .
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left   Speed
  0     0     0     0     0     0      0      0  --:--:-- --:--:-- --:--:--     0
curl: (7) Failed to connect to 0.0.0.0 port 9567 after 1 ms: Couldn't connect to server
23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$

```

After restarting all the containers we do a /get request and the data is still preserved

```

23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$ curl http://0.0.0.0:9567/get | jq .
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           %             Dload  Upload    Total   Spent    Left   Speed
100  301  100   301    0     0   2425      0  --:--:-- --:--:-- --:--:--   2408
{
  "took": 5,
  "timed_out": false,
  "_shards": {
    "total": 1,
    "successful": 1,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": {
      "value": 1,
      "relation": "eq"
    },
    "max_score": 1,
    "hits": [
      {
        "_index": "my_index",
        "_type": "_doc",
        "_id": "K9i4z5UBd4Ccn1uLgR_s",
        "_score": 1,
        "_source": {
          "index": "1",
          "doc": {
            "name": "Sample 1",
            "value": 32000
          }
        }
      }
    ]
  }
}
23110281@vm-1-frontend:~$
23110281@vm-1-frontend:~$

```

Docker inspect

Frontend image and container

<https://drive.google.com/file/d/1Bd6juOgZ6rhEwgWS1iLHdgAggDA2hdc7/view?usp=sharing>

Backend (backend + elasticsearch) image and container

<https://drive.google.com/file/d/1mumLS727W0LtcLyt6nztBGJJVlqL-Ucq/view?usp=sharing>

Insert wikipedia content

```
23110281@w-1-frontend:~$
23110281@w-1-frontend:~$ curl -X POST "http://0.0.0.0:9567/insert" -H "Content-Type: application/json" -d @- << 'EOF'
{
  "index": "1",
  "doc": {
    "title": "Introduction",
    "content": "India, officially the Republic of India, is a country in South Asia. It is the seventh-largest country by area; the most populous country from June 2023 onwards; and since its independence in 1947, the world's most populous democracy. Bounded by the Indian Ocean on the south, the Arabian Sea on the southwest, and the Bay of Bengal on the southeast, it shares land borders with Pakistan to the west; China, Nepal, and Bhutan to the north; and Bangladesh and Myanmar to the east. In the Indian Ocean, India is near Sri Lanka and the Maldives; its Andaman and Nicobar Islands share a maritime border with Thailand, Myanmar, and Indonesia."
  }
}
EOF
{"_index":"my_index","_type":"_doc","_id":"Xlw40ZUBQ7aSU8gCq5x","_version":1,"result":"created","_shards":{"total":2,"successful":1,"failed":0},"_seq_no":0,"_primary_term":1}23110281@w-1-frontend:~$
23110281@w-1-frontend:~$

23110281@w-1-frontend:~$ curl -X POST "http://0.0.0.0:9567/insert" -H "Content-Type: application/json" -d @- << 'EOF'
{
  "index": "2",
  "doc": {
    "title": "Ancient History",
    "content": "Modern humans arrived on the Indian subcontinent from Africa no later than 55,000 years ago. Their long occupation, predominantly in isolation as hunter-gatherers, has made the region highly diverse, second only to Africa in human genetic diversity. Settled life emerged on the subcontinent in the western margins of the Indus river basin 9,000 years ago, evolving gradually into the Indus Valley Civilisation of the third millennium BCE. By 1200 BCE, an archaic form of Sanskrit, an Indo-European language, had diffused into India from the northwest. Its hymns recorded the dawning of Hinduism in India. India's pre-existing Dravidian languages were supplanted in the northern regions. By 400 BCE, caste had emerged within Hinduism, and Buddhism and Jainism had arisen, proclaiming social orders unlinked to heredity. Early political consolidations gave rise to the loose-knit Maurya and Gupta Empires. Widespread creativity suffused this era, but the status of women declined, and untouchability became an organized belief. In South India, the Middle Kingdoms exported Dravidian language scripts and religious cultures to the kingdoms of Southeast Asia."
  }
}
EOF
{"_index":"my_index","_type":"_doc","_id":"Xlw40ZUBQ7aSU8gCq65x","_version":1,"result":"created","_shards":{"total":2,"successful":1,"failed":0},"_seq_no":1,"_primary_term":1}23110281@w-1-frontend:~$
23110281@w-1-frontend:~$
23110281@w-1-frontend:~$ curl -X POST "http://0.0.0.0:9567/insert" -H "Content-Type: application/json" -d @- << 'EOF'
{
  "index": "3",
  "doc": {
    "title": "Medieval History",
    "content": "In the early mediaeval era, Christianity, Islam, Judaism, and Zoroastrianism became established on India's southern and western coasts. Muslim armies from Central Asia intermittently overran India's northern plains. The resulting Delhi Sultanate drew northern India into the cosmopolitan networks of mediaeval Islam. In south India, the Vijayanagara Empire created a long-lasting composite Hindu culture. In the Punjab, Sikhism emerged, rejecting institutionalised religion. The Mughal Empire, in 1526, ushered in two centuries of relative peace, leaving a legacy of luminous architecture. Gradually expanding rule of the British East India Company turned India into a colonial economy but consolidated its sovereignty. British Crown rule began in 1858. The rights promised to Indians were granted slowly, but technological changes were introduced, and modern ideas of education and public life took root. A pioneering and influential nationalist movement, noted for nonviolent resistance, became the major factor in ending British rule. In 1947, the British Indian Empire was partitioned into two independent dominions, a Hindu-majority dominion of India and a Muslim-majority dominion of Pakistan. A large-scale loss of life and an unprecedented migration accompanied the partition."
  }
}
EOF
{"_index":"my_index","_type":"_doc","_id":"YVw50ZUBQ7aSU8gCoaRx","_version":1,"result":"created","_shards":{"total":2,"successful":1,"failed":0},"_seq_no":2,"_primary_term":1}23110281@w-1-frontend:~$
23110281@w-1-frontend:~$
23110281@w-1-frontend:~$ curl -X POST "http://0.0.0.0:9567/insert" -H "Content-Type: application/json" -d @- << 'EOF'
{
  "index": "4",
  "doc": {
    "title": "Modern India",
    "content": "India has been a federal republic since 1950, governed through a democratic parliamentary system. It is a pluralistic, multilingual and multi-ethnic society. India's population grew from 361 million in 1951 to over 1.4 billion in 2023. During this time, its nominal per capita income increased from US$64 annually to US$2,681, and its literacy rate from 16.6% to 74%. A comparatively destitute country in 1951, India has become a fast-growing major economy and hub for information technology services; it has an expanding middle class. Indian movies and music increasingly influence global culture. India has reduced its poverty rate, though at the cost of increasing economic inequality. It is a nuclear-weapon state that ranks high in military expenditure. It has disputes over Kashmir with its neighbours, Pakistan and China, unresolved since the mid-20th century. Among the socio-economic challenges India faces are gender inequality, child malnutrition, and rising levels of air pollution. India's land is megadiverse with four biodiversity hotspots. India's wildlife, which has traditionally been viewed with tolerance in its culture, is supported in protected habitats."
  }
}
EOF
{"_index":"my_index","_type":"_doc","_id":"YVw50ZUBQ7aSU8gCoaQ0","_version":1,"result":"created","_shards":{"total":2,"successful":1,"failed":0},"_seq_no":3,"_primary_term":1}23110281@w-1-frontend:~$
23110281@w-1-frontend:~$
```

Retrieving the content

```

23110281@w-1-frontend:~$ curl http://0.0.0.0:9567/get | jq .
{
  "took": 524,
  "timed_out": false,
  "_shards": {
    "total": 1,
    "successful": 1,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": {
      "value": 4,
      "relation": "eq"
    },
    "max_score": 1,
    "hits": [
      {
        "_index": "my_index",
        "_type": "_doc",
        "_id": "x1w4ZuBQTASUbgCtGxk",
        "_score": 1,
        "_ignored": {
          "doc.content.keyword": "India, officially the Republic of India, is a country in South Asia. It is the seventh-largest country by area; the most populous country from June 2023 onwards; and since its independence in 1947, the world's most populous democracy. Bounded by the Indian Ocean on the south, the Arabian Sea on the southwest, and the Bay of Bengal on the southeast, it shares land borders with Pakistan to the west; China, Nepal, and Bhutan to the north; and Bangladesh and Myanmar to the east. In the Indian Ocean, India is near Sri Lanka and the Maldives; its Andaman and Nicobar Islands share a maritime border with Thailand, Myanmar, and Indonesia."
        }
      },
      {
        "_index": "my_index",
        "_type": "_doc",
        "_id": "x1w4ZuBQTASUbgCg655",
        "_score": 1,
        "_ignored": {
          "doc.content.keyword": "Modern humans arrived on the Indian subcontinent from Africa no later than 55,000 years ago. Their long occupation, predominantly in isolation as hunter-gatherers, has made the region highly diverse, second only to Africa in human genetic diversity. Settled life emerged on the subcontinent in the western margins of the Indus river basin 9,000 years ago, evolving gradually into the Indus Valley Civilisation of the third millennium BCE. By 1200 BCE, an Indic form of Sanskrit, an Indo-European language, had diffused into India from the northwest. Its hymns recorded the dawning of Hinduism in India. India's pre-existing Dravidian languages were supplanted in the northern region s. By 400 BCE, caste had emerged within Hinduism, and Buddhism and Jainism had arisen, proclaiming social orders unlinked to heredity. Early political consolidations gave rise to the loose-knit Maurya and Gupta Empires. Widespread creativity suffused this era, but the status of women declined, and untouchability became an organized belief. In South India, the Middle Kingdoms exported Dravidian language scripts and religious cultures to the Kingdoms of Southeast Asia."
        }
      },
      {
        "_index": "my_index",
        "_type": "_doc",
        "_id": "YFw4ZuBQTASUbgC0a8x",
        "_score": 1,
        "_ignored": {
          "doc.content.keyword": "In the early mediaeval era, Christianity, Islam, Judaism, and Zoroastrianism became established on India's southern and western coasts. Muslim armies from Central Asia intermittently overran India's northern plains. The resulting Delhi Sultanate drew northern India into the cosmopolitan networks of mediaeval Islam. In south India, the Vijayanagara Empire created a long-lasting composite Hindu culture. In the Punjab, Sikhs emerged, rejecting institutionalised religion. The Mughal Empire, in 1526, ushered in two centuries of relative peace, leaving a legacy of luminous architecture. Gradually expanding rule of the British East India Company turned India into a colonial economy but consolidated its sovereignty. British Crown rule began in 1858. The rights promised to Indians were granted slowly, but technological changes were introduced, and modern ideas of education and public life took root. A pioneering and influential nationalist movement, noted for nonviolent resistance, became the major factor in ending British rule. In 1947, the British Indian Empire was partitioned into two independent dominions, a Hindu-majority dominion of India and a Muslim-majority dominion of Pakistan. A large-scale loss of life and an unprecedented migration accompanied the partition."
        }
      },
      {
        "_index": "my_index",
        "_type": "_doc",
        "_id": "YVw4ZuBQTASUbgCwQ08",
        "_score": 1,
        "_ignored": {
          "doc.content.keyword": "India has been a federal republic since 1950, governed through a democratic parliamentary system. It is a pluralistic, multilingual and multi-ethnic society. India's population grew from 361 million in 1951 to over 1.4 billion in 2023. During this time, its nominal per capita income increased from US$64 annually to US$2,681, and its literacy rate from 16.6% to 74%. A comparatively destitute country in 1951, India has become a fast-growing major economy using modern technology services; it has an expanding middle class. Indian movies and music increasingly influence global culture. India has reduced its poverty rate, though at the cost of increasing economic inequality. It is a nuclear-weapon state that ranks high in military expenditure. It has disputes over Kashmir with its neighbours, Pakistan and China, unresolved since the mid-20th century. Among the socio-economic challenges India faces are gender inequality, child malnutrition, and rising levels of air pollution. India's land is megadiverse with four biodiversity hotspots. India's wildlife, which has traditionally been viewed with tolerance in its culture, is supported in protected habitats."
        }
      }
    ]
  }
}
23110281@w-1-frontend:~$

```

Task 1: Frontend

UI accessed from VM's URL (BaseOS)

Docker + ElasticSearch App Interface

Search Document

Enter search query

Insert Document

Enter document content

Result:

None

Inserting to the backend db

Docker + ElasticSearch App Interface

Search Document

Enter search query

Insert Document

Enter title

Enter index number

Enter document content

Result:

```
{ '_index': 'my_index', '_type': '_doc', '_id': '0X5R2JU815bjsV84KChJ', '_version': 1, 'result': 'created', '_shards': { 'total': 2, 'successful': 1, 'failed': 0 }, '_seq_no': 5, '_primary_term': 3 }
```

We get the response from the server on successful insertion.

Querying from the backend

← → ↻ 🏠 ⚠ Not secure 35.207.194.148:9567/get

Docker + Elasticsearch App Interface

Search Document

Insert Document

Result:

```
[{'index': '5', 'content': 'rudra is nice'}]
```

The response is parsed and displayed using jinja2 template.