



National Textile University

Department of Computer Science

Subject:

Operating System

Submitted to:

Sir Nasir Mehmood

Submitted by:

Akasha Fatima

Reg. number:

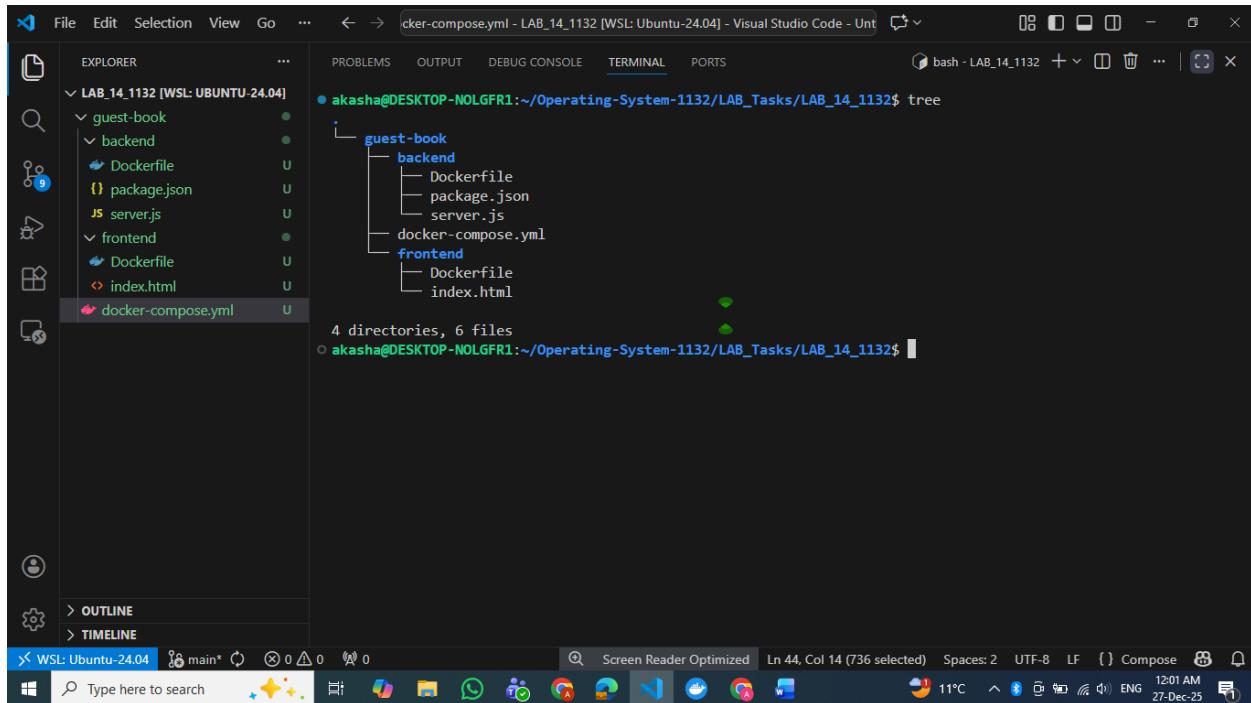
23-NTU-CS-FL-1132

Semester:

5th - A

LAB_14

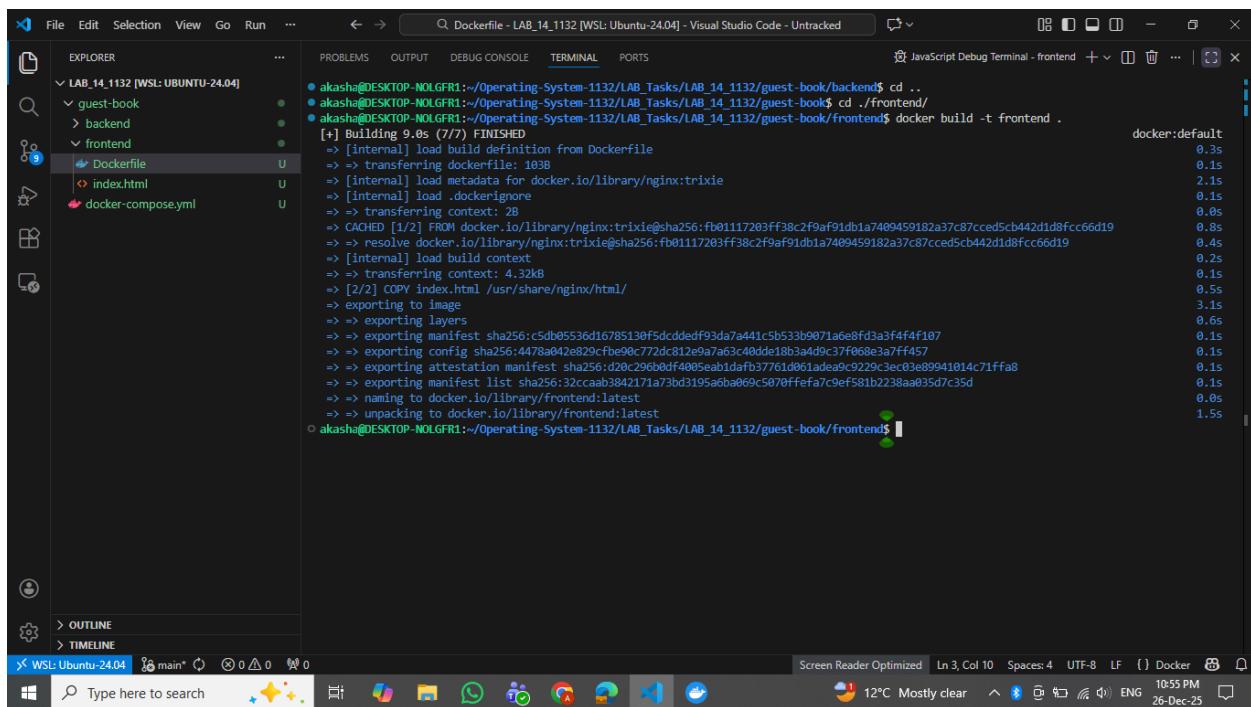
Task_01: Whole Project Structure:



```
● akasha@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132$ tree
.
+-- guest-book
|   +-- backend
|   |   +-- Dockerfile
|   |   +-- package.json
|   |   +-- server.js
|   +-- frontend
|       +-- Dockerfile
|       +-- index.html
.
.
.
4 directories, 6 files
```

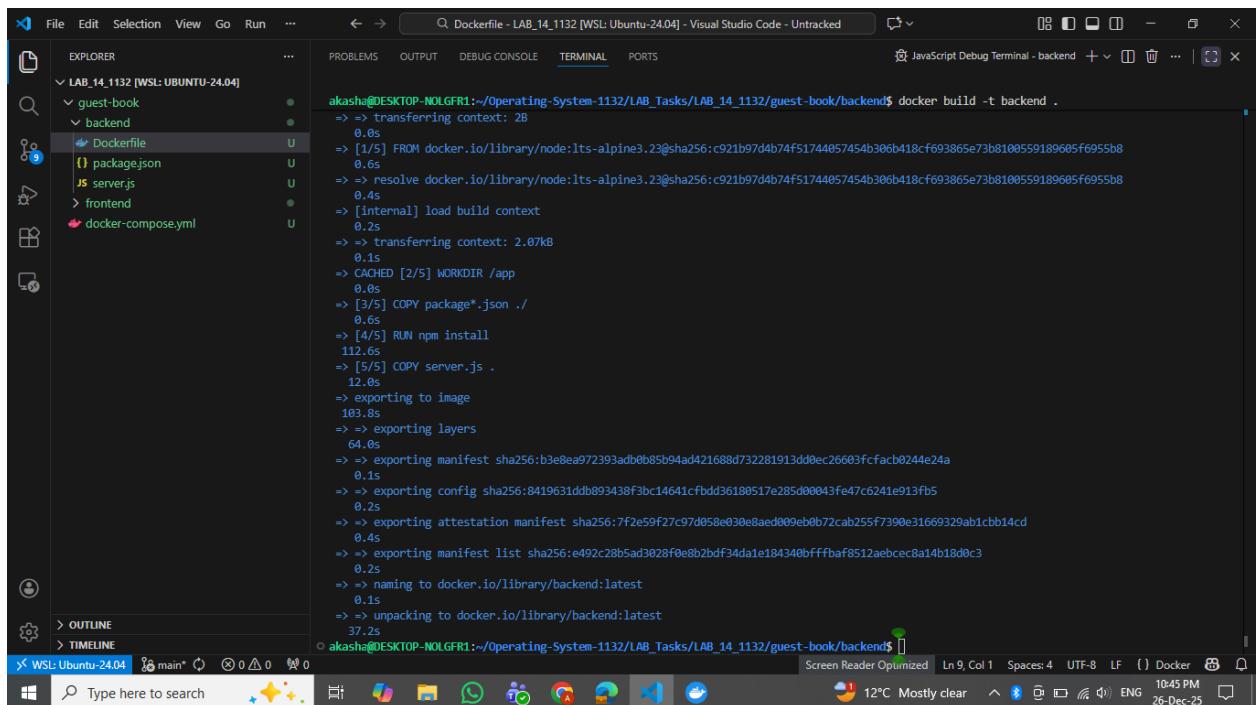
Task_02: Output of both image building commands e.g "docker build -t frontend ."

Docker build -t frontend .



```
● akasha@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book/backend$ cd ..
● akasha@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book$ cd ./frontend
● akasha@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book/frontend$ docker build -t frontend .
[+] Building 9.0s (77) FINISHED
-> [internal] load build definition from Dockerfile
-> [internal] transfer Dockerfile: 103B
-> [internal] load metadata for docker.io/library/nginx:trixie
-> [internal] load .dockerignore
-> [internal] transfer context: 28
-> [internal] CACHED [1/2] FROM docker.io/library/nginx:trixie@sha256:fb01117203ff38c2f9af91db1a7409459182a37c87cced5cb442d1d8fcc66d19
-> [internal] resolve docker.io/library/nginx:trixie@sha256:fb01117203ff38c2f9af91db1a7409459182a37c87cced5cb442d1d8fcc66d19
-> [internal] load build context
-> [internal] load build context
-> [internal] transfer context: 4.32kB
-> [2/2] COPY index.html /usr/share/nginx/html/
-> exporting to image
-> exporting layers
-> exporting manifest sha256:c5db05536d16785130f5cddef93da7a41c5b533b9871a6e8fd3a3f4f4f187
-> exporting config sha256:4478a042e829cfbe90c772dc812e9a7a63c48dde18b3a4d9c37f068e3a7f4f457
-> exporting attestation manifest sha256:d2bc296bb0df4005eab1dafb37761d061ade9c9229c3ec03e89941014c71ffa8
-> exporting manifest list sha256:32ccaa8842171a73bd3195a6ba069c5070ffef7c79ef581b2238aa035d7c35d
-> naming to docker.io/library/frontend:latest
-> unpacking to docker.io/library/frontend:latest
.
.
.
● akasha@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book/frontend$
```

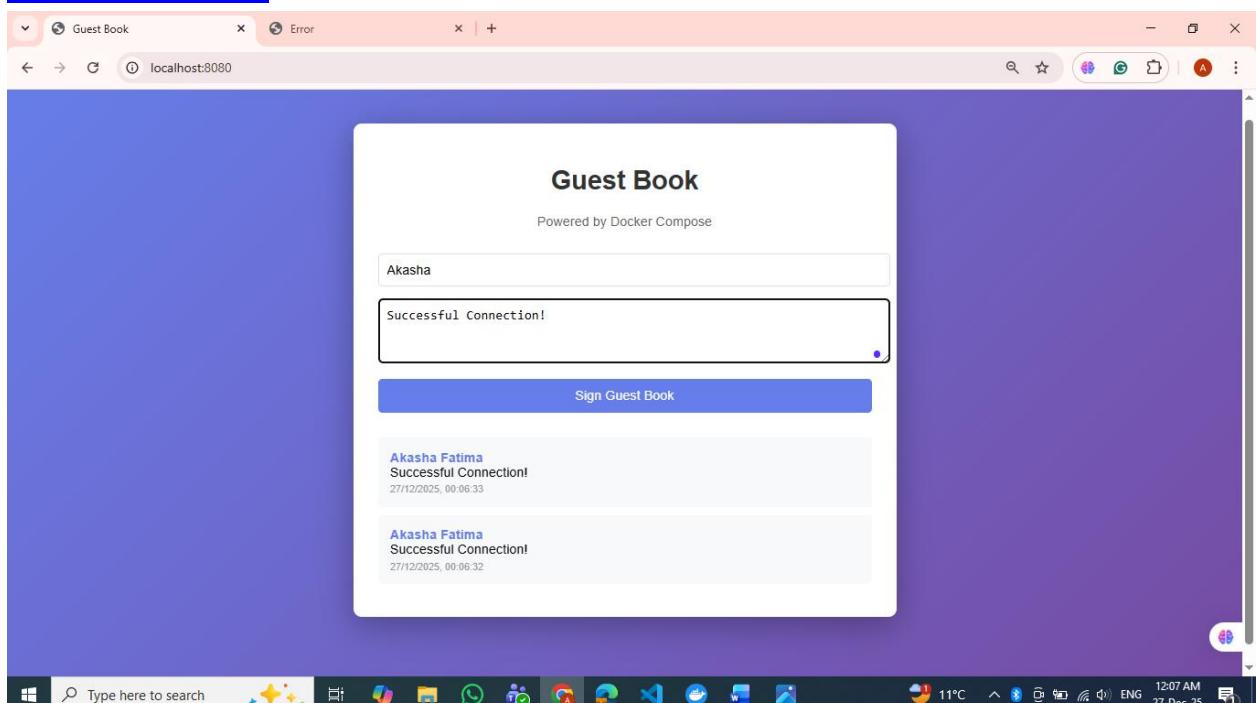
Docker build -t backend .



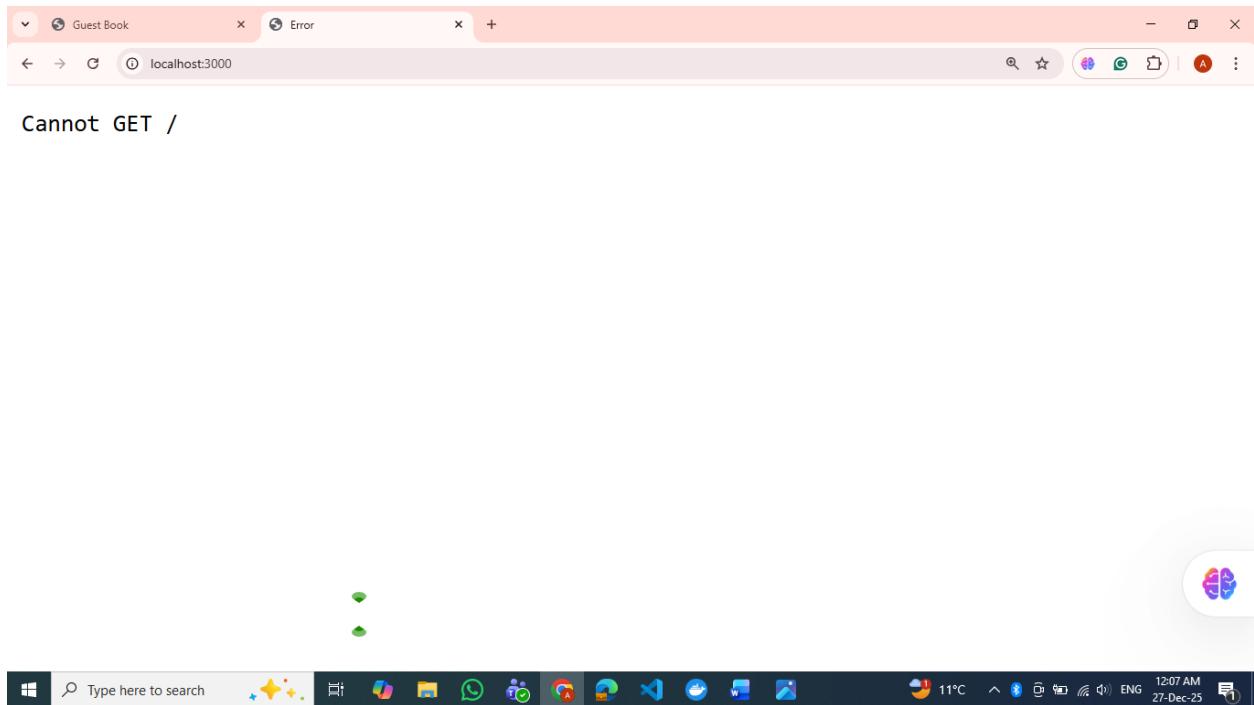
A screenshot of Visual Studio Code showing the terminal output of a Docker build. The terminal window shows the command `docker build -t backend .` and its progress. The output includes various Docker build steps like transferring context, resolving dependencies, and copying files. The status bar at the bottom indicates the environment is WSL: Ubuntu-24.04.

```
akash@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book/backend$ docker build -t backend .
=> => transferring context: 2B
  0.0s
=> [1/5] FROM docker.io/library/node:lts-alpine3.23@sha256:c921b97d4b74f51744057454b306b418cf693865e73b8100559189605f6955b8
  0.6s
=> => resolve docker.io/library/node:lts-alpine3.23@sha256:c921b97d4b74f51744057454b306b418cf693865e73b8100559189605f6955b8
  0.4s
=> [internal] load build context
  0.2s
=> => transferring context: 2.07kB
  0.1s
=> CACHED [2/5] WORKDIR /app
  0.0s
=> [3/5] COPY package*.json .
  0.6s
=> [4/5] RUN npm install
  112.6s
=> [5/5] COPY server.js .
  12.0s
=> exporting to image
  103.8s
=> => exporting layers
  64.0s
=> => exporting manifest sha256:b3e8ea972393adb0b85b94ad421688d732281913dd0ec26603fcfacb024ae24a
  0.1s
=> => exporting config sha256:8419631ddb893438f3bc14641cfbdd36100517e285d00043fe47c6241e913fb5
  0.2s
=> => exporting attestation manifest sha256:7f2e59f27c97d058e030e8aed009eb0b72cab255f7390e31669329ab1cbb14cd
  0.4s
=> => exporting manifest list sha256:e492c28b5ad3028f0e8b2bdf34da1e184340bffffba8512aebcec8a14b18d0c3
  0.2s
=> => naming to docker.io/library/backend:latest
  0.1s
=> => unpacking to docker.io/library/backend:latest
  37.2s
```

Task_03: Webpage at localhost:8080 localhost:8080



localhost:3000



Task_04: Copy contents of docker-compose and both Dockerfiles in the pdf.

Docker-compose.yml:

```
services:  
  # MongoDB Database  
  mongodb:  
    image: mongo:7-jammy  
    container_name: guestbook-db  
    networks:  
      - backend-network  
    volumes:  
      - mongo_data:/data/db  
  
  # Backend API  
  api:  
    # build: ./backend  
    image: backend  
    container_name: guestbook-api  
    environment:  
      - MONGO_URL=mongodb://mongodb:27017  
    ports:
```

```
- "3000:3000"
depends_on:
- mongodb
networks:
- backend-network
- frontend-network

# Frontend
web:
# build: ./frontend
image: frontend
container_name: guestbook-web
ports:
- "8080:80"
depends_on:
- api
networks:
- frontend-network

networks:
backend-network:
frontend-network:

volumes:
mongo_data:
```

frontend/Dockerfile

```
FROM nginx:trixie
COPY index.html /usr/share/nginx/html/
EXPOSE 80
```

backend/Dockerfile

```
FROM node:lts-alpine3.23
WORKDIR /app
```

```
COPY package*.json ./
```

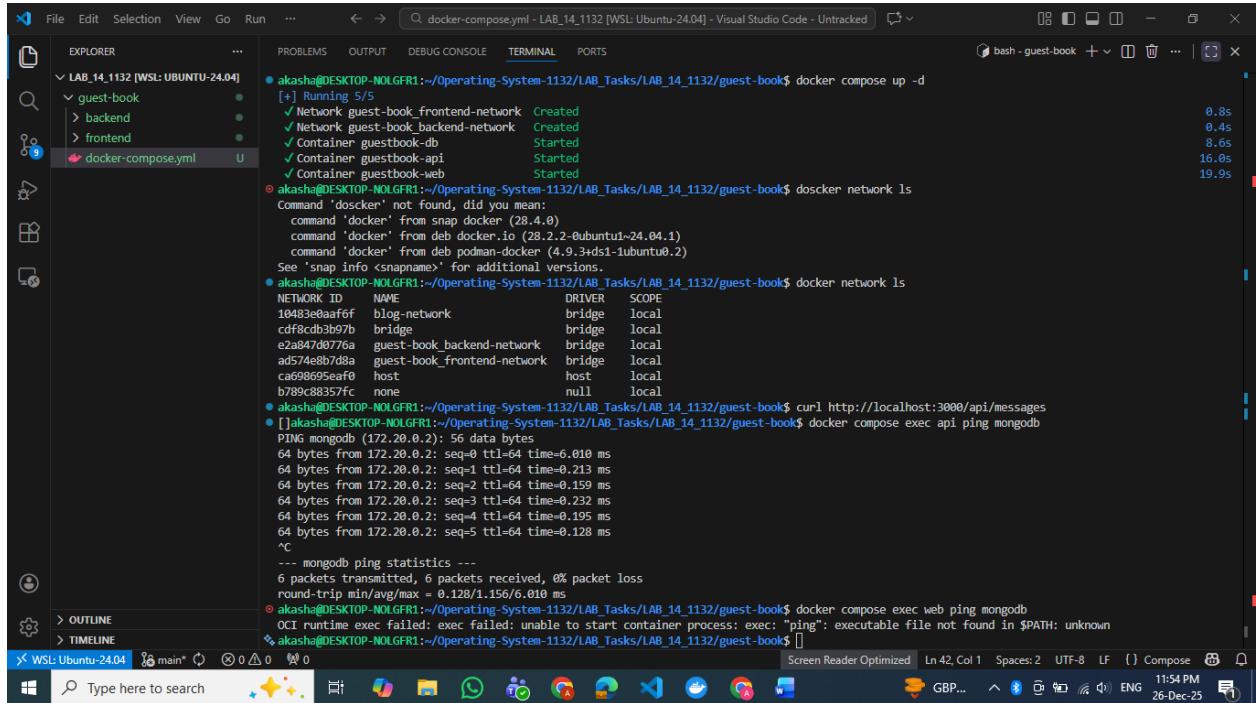
```
RUN npm install
```

```
COPY server.js .
```

```
EXPOSE 3000
```

```
CMD ["npm", "start"]
```

Task_05: Output of the instruction's verification:



The screenshot shows the Visual Studio Code interface with the terminal tab active. The terminal window displays the following command and its execution:

```
● akashai@DESKTOP-NOLGR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book$ docker compose up -d
[+] Running 5/5
  ✓ Network guest-book_frontend-network Created
  ✓ Network guest-book_backend-network Created
  ✓ Container guestbook-db Started
  ✓ Container guestbook-api Started
  ✓ Container guestbook-web Started
● akashai@DESKTOP-NOLGR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book$ docker network ls
Command 'doscker' not found, did you mean:
  command 'docker' from snap docker (28.4.0)
  command 'docker' from deb docker.io (28.2.2-0ubuntu1~24.04.1)
  command 'docker' from deb podman-docker (4.9.3+ds1-1ubuntu0.2)
See 'snap info <snapname>' for additional versions.
● akashai@DESKTOP-NOLGR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book$ docker network ls
NETWORK ID      NAME          DRIVER    SCOPE
10483e0af6f    blog-network   bridge    local
cdf8cd3b97b    bridge        bridge    local
e2a847d0776a   guest-book_backend-network bridge    local
ad574e8b7d8a   guest-book_frontend-network bridge    local
ca698695eaef0  host          host     local
b789c88357fc   none          null     local
● akashai@DESKTOP-NOLGR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book$ curl http://localhost:3000/api/messages
[]akashai@DESKTOP-NOLGR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book$ docker compose exec api ping mongodb
PING mongodb (172.20.0.2): 56 data bytes
64 bytes from 172.20.0.2: seq=0 ttl=64 time=6.010 ms
64 bytes from 172.20.0.2: seq=1 ttl=64 time=0.213 ms
64 bytes from 172.20.0.2: seq=2 ttl=64 time=0.159 ms
64 bytes from 172.20.0.2: seq=3 ttl=64 time=0.232 ms
64 bytes from 172.20.0.2: seq=4 ttl=64 time=0.195 ms
64 bytes from 172.20.0.2: seq=5 ttl=64 time=0.128 ms
^C
--- mongodb ping statistics ---
6 packets transmitted, 6 packets received, 0% packet loss
round-trip min/avg/max = 0.128/1.156/6.010 ms
● akashai@DESKTOP-NOLGR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book$ docker compose exec web ping mongodb
OCI runtime exec failed: exec failed: unable to start container process: exec: "ping": executable file not found in $PATH: unknown
● akashai@DESKTOP-NOLGR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book$ [ ]
```

Task_06: Additional Executions:

The screenshot shows a Visual Studio Code interface with the following details:

- Terminal Content:**

```
akash@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132$ cd ./guest-book/frontend/
akash@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book/frontend$ docker
  mongo:7-jammy
  7-jammy: Pulling from library/mongo
  Digest: sha256:8ddd3db4d2638eb914cce56284e2f0d6daf140bba31679b2af86f7d790a4c77e
  Status: Image is up to date for mongo:7-jammy
  docker.io/library/mongo:7-jammy
  akash@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book/frontend$
```
- Explorer:** Shows a project structure for "LAB_14_1132 [WSL: UBUNTU-24.04]" with "guest-book" containing "backend" and "frontend", and a "docker-compose.yml" file.
- Bottom Bar:** Includes icons for file operations, search, and system status (temperature, battery, network).

The screenshot shows a Visual Studio Code interface with the following details:

- Terminal Content:**

```
akash@DESKTOP-NOLGFR1:~/Operating-System-1132/LAB_Tasks/LAB_14_1132/guest-book$ docker compose up --build
49968", "uid": "sbinary", "base64": "AT0EPj8hBS+o/TImh5JCeQekm5MpzWZGshSuU=", "subType": "0"}, {"set": [{"lastUse": "$$NOW"}]}, "multi": false, "upsert": true}, {"planSummary": "ID(HACK)", "planningTimeMicros": 4326941, "keysExamined": 0, "docsExamined": 0, "wWatched": 0, "wModified": 0, "wInserted": 1, "keysInserted": 2, "numYields": 1, "locks": {"ParallelBatchWriterMode": {"acquireCount": "0", "2"}, "FeatureCompatibilityVersion": {"acquireCount": "0", "2"}, "ReplicationStateTransition": {"acquireCount": "0", "2"}, "Global": {"acquireCount": "0", "2"}, "Database": {"acquireCount": "0", "2"}, "Collection": {"acquireCount": "0", "2"}, "flowControl": {"acquireCount": 0}, "storage": {"cpuNanos": 1612213880, "durationMillis": 5598}}}, {"guestbook-db": [{"t": {"$date": "2025-12-26T18:09:53.017+00:00"}, "s": "I", "c": "COMMAND", "id": 51803, "ctx": "LogicalSessionCacheRefresh", "msg": "Slow query", "attr": {"type": "command", "ns": "config.$cmd", "command": "update", "system.sessions", "ordered": false, "writeConcern": "0", "majority": "60000", "sdbName": "config", "numYields": 1, "reslen": 171, "locks": {"ParallelBatchWriterMode": {"acquireCount": "0", "2"}, "FeatureCompatibilityVersion": {"acquireCount": "0", "2"}, "ReplicationStateTransition": {"acquireCount": "0", "2"}, "Global": {"acquireCount": "0", "2"}, "Database": {"acquireCount": "0", "2"}, "Collection": {"acquireCount": "0", "2"}, "flowControl": {"acquireCount": 2}, "writeConcern": "0", "majority": "60000", "provenance": "clientSupplied", "waitForWriteConcernDurationMillis": 7, "storage": {"cpuNanos": 1749188500, "protocol": "op_msg", "durationMillis": 5953}}}, {"guestbook-db": [{"t": {"$date": "2025-12-26T18:10:47.951+00:00"}, "s": "I", "c": "WTCKPT", "id": 22430, "ctx": "Checkpointer", "msg": "WiredTiger message", "attr": {"message": "ts_sec": 1766772647, "ts_usec": 826885, "thread": "1:0x72f4c485640", "session_name": "WT_SESSION.checkpoint", "category": "WT_Verb_CHECKPOINT_PROGRESS", "category_id": 6, "verbose_level": "DEBUG_1", "verbose_level_id": 1, "msg": "saving checkpoint snapshot min: 48, snapshot max: 48 snapshot count: 0, oldest timestamp: (0, 0) , meta checkpoint timestamp: (0, 0) base write gen: 1'}}}, {"guestbook-db": [{"t": {"$date": "2025-12-26T18:10:54.371+00:00"}, "s": "I", "c": "INDEX", "id": 5479280, "ctx": "ITIMonitor", "msg": "Deleted expired documents using index", "attr": {"namespace": "config.system.sessions", "index": "lsidIndex", "numDeleted": 0, "durationMillis": 933}}, {"guestbook-db": [{"t": {"$date": "2025-12-26T18:11:58.482+00:00"}, "s": "I", "c": "WTCKPT", "id": 22430, "ctx": "Checkpointer", "msg": "WiredTiger message", "attr": {"message": "ts_sec": 1766772710, "ts_usec": 463159, "thread": "1:0x72f4c485640", "session_name": "WT_SESSION.checkpoint", "category": "WT_Verb_CHECKPOINT_PROGRESS", "category_id": 6, "verbose_level": "DEBUG_1", "verbose_level_id": 1, "msg": "saving checkpoint snapshot min: 49, snapshot max: 49 snapshot count: 0, oldest timestamp: (0, 0) , meta checkpoint timestamp: (0, 0) base write gen: 1'}}}, {"guestbook-db": [{"t": {"$date": "2025-12-26T18:12:58.070+00:00"}, "s": "I", "c": "WTCKPT", "id": 22430, "ctx": "Checkpointer", "msg": "WiredTiger message", "attr": {"message": "ts_sec": 1766772770, "ts_usec": 595346, "thread": "1:0x72f4c485640", "session_name": "WT_SESSION.checkpoint", "category": "WT_Verb_CHECKPOINT_PROGRESS", "category_id": 6, "verbose_level": "DEBUG_1", "verbose_level_id": 1, "msg": "saving checkpoint snapshot min: 50, snapshot max: 50 snapshot count: 0, oldest timestamp: (0, 0) , meta checkpoint timestamp: (0, 0) base write gen: 1'}}}], "View in Docker Desktop", "View Config", "Enable Watch
```
- Bottom Bar:** Includes icons for file operations, search, and system status (temperature, battery, network).

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Containers [Give feedback](#)

Container CPU usage: 1.18% / 400% (4 CPUs available)

Container memory usage: 166.14MB / 1.77GB

Show charts

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Only show running containers

	Name	Container ID	Image	Port(s)	CPU (%)	Last started	Actions
<input type="checkbox"/>	cool_torvalds	4b6316c7695a	my-first-ser	3000:3000	0%	7 days ago	
<input type="checkbox"/>	test-container	e8f4862dda56	ubuntu:resc		0%	7 days ago	
<input type="checkbox"/>	goofy_lehmann	dd93e2a23d81	node:its-alic		0%	7 hours ago	
<input type="checkbox"/>	guest-book	-	-	-	1.18%	29 minutes ago	
<input type="checkbox"/>	guestbook-db	b085bf0fb794	mongo:7-jia		0.89%	29 minutes ago	
<input type="checkbox"/>	guestbook-ap	ca1bcf9e7da0	backend	3000:3000 ↗	0.29%	29 minutes ago	
<input type="checkbox"/>	guestbook-wi	6202dc27ab1b	frontend	8080:80 ↗	0%	29 minutes ago	

Showing 7 items

Engine running | RAM 1.72 GB CPU 4.72% Disk: 3.94 GB used (limit 1006.85 GB) | Terminal | Update available

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Local My Hub

1.35 GB / 1.27 GB in use 9 images

Last refresh: 9 hours ago

Search

	Name	Tag	Image ID	Created	Size	Actions
<input type="checkbox"/>	node	its-alpine3.23	c921b97d4b74	9 days ago	225.95 MB	
<input type="checkbox"/>	nginx	trixie	fb01117203ff	17 days ago	224.94 MB	
<input type="checkbox"/>	postgres	15.15-trixie	697ff7029514	18 days ago	626.86 MB	
<input type="checkbox"/>	ubuntu	resolute-20251130	901617b8bedb	27 days ago	132.74 MB	
<input type="checkbox"/>	ubuntu	latest	c35e29c94501	2 months ago	117.31 MB	
<input type="checkbox"/>	backend	latest	e492c28b5ad3	2 hours ago	280.36 MB	
<input type="checkbox"/>	frontend	latest	32ccaab38421	1 hour ago	224.98 MB	
<input type="checkbox"/>	mongo	7-jammy	8dd23db4d263	7 days ago	1.14 GB	

Showing 9 items

Engine running | RAM 1.72 GB CPU 4.77% Disk: 3.94 GB used (limit 1006.85 GB) | Terminal | Update available