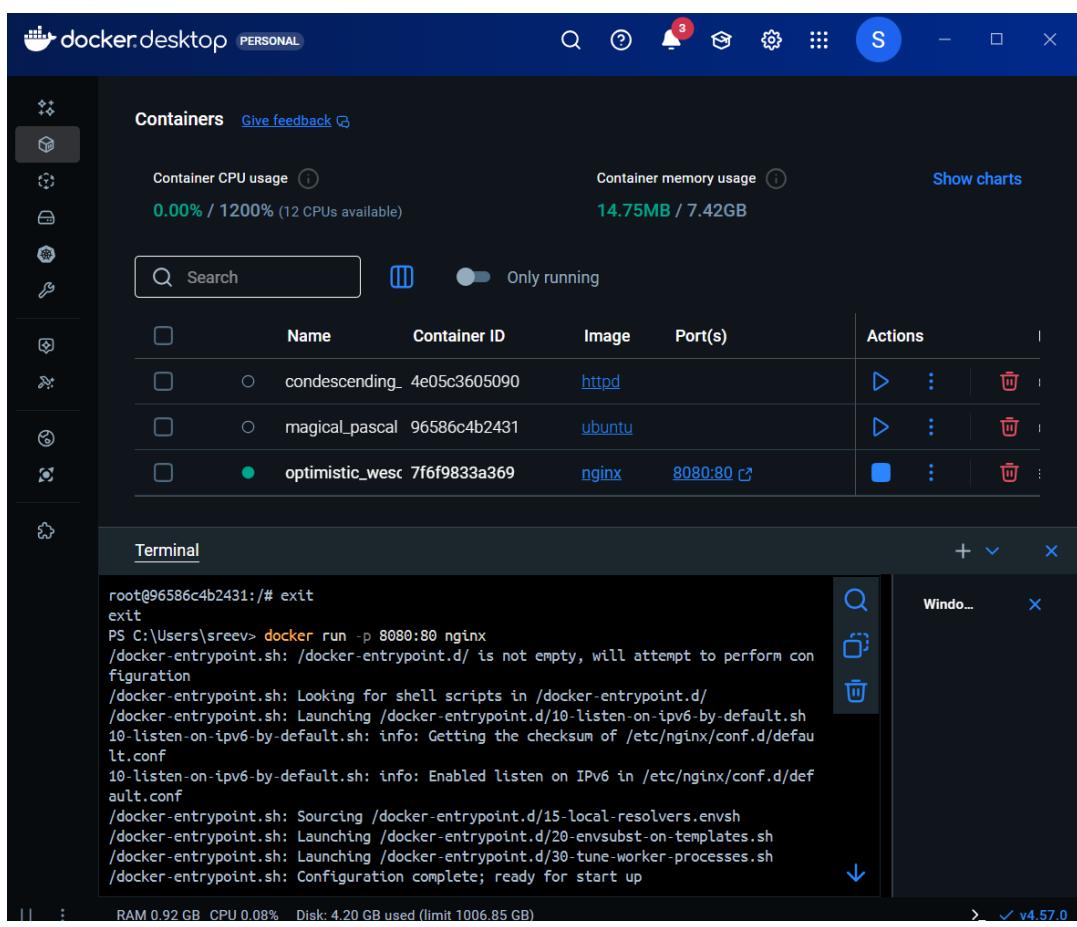


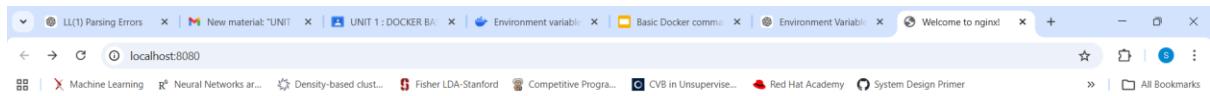
Learnings for lifetime:

1) Port publishing activity

So basically, covered publishing port mechanism, I must say it's just intricately beautiful though it might be very basic it really showed me how powerful docker is even at basic levels, so according to what I understood of it, since containers run in isolated namespaces the ports they use are inaccessible to users outside of it so we publish the port sort of exposing it to outside world by **publishing a port** which is Docker's way of intentionally breaking that isolation in a controlled manner: Docker makes the **host machine listen on a chosen port** and then **forwards all traffic arriving on that host port to the container's internal port**.

In other words, the container still thinks it is listening privately, but Docker transparently acts as a bridge between the external world and the container, exposing only what we explicitly allow.





Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

What happens internally?

Browser → localhost:8080 → Docker Host → Container:80 → Nginx

2) Some more interesting stuff ahead: started to work more on port publishing and MySQL container initialization.

Started exploring Docker port publishing and MySQL container initialization in more depth. By running a MySQL container in detached mode and setting the `MYSQL_ROOT_PASSWORD` environment variable, I understood how Docker images use environment variables during initialization to configure services automatically. I also learned that publishing a port (`-p 3307:3306`) does not affect how services work *inside* the container, but instead allows the host machine to access the MySQL server running in the container. Using `docker exec`, I was able to run the MySQL client inside the container without relying on port publishing, which clarified the difference between internal container access and external host access. Overall, this showed how Docker maintains isolation by default while still allowing controlled exposure of services when needed.

1-24a32d474607

The screenshot shows the Docker Desktop application interface. The top bar includes the Docker logo, a 'PERSONAL' badge, and various icons for search, help, notifications (with 3), and settings. A message通知 "A new version of Docker Desktop is available." with a "Update" button.

Containers pane:

- Container CPU usage: No containers are running.
- Container memory usage: No containers are running.
- Show charts button.

Search bar and filter: Search, Only running.

	Name	Container ID	Image	Port(s)	Actions
<input type="checkbox"/>	optimistic_wesc	7f6f9833a369	nginx	8080:80	⋮ ⋮ trash
<input type="checkbox"/>	magical_pascal	96586c4b2431	ubuntu		⋮ ⋮ trash
<input type="checkbox"/>	condescending_	4e05c3605090	httpd		⋮ ⋮ trash
<input type="checkbox"/>	mysql-test	7f2cfbb81eb3	mysql	3307:3306	⋮ ⋮ trash

Terminal pane:

```

docker: invalid reference format
Run 'docker run --help' for more information
PS C:\Users\sreev> docker run -d --name mysql-test -e MYSQL_ROOT_PASSWORD=user123 -p 33
07:3306 mysql
7f2cfbb81eb3be155291e6d71d75e090c84d9ab57e084bf151634daf13b71848
PS C:\Users\sreev> docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS
7f2cfbb81eb3 mysql "docker-entrypoint.s..." 27 seconds ago Up 25 seconds 0.0.
0.0:3307->3306/tcp, [::]:3307->3306/tcp mysql-test
  
```

RAM: 0.83 GB CPU: 0.00% Disk: 4.40 GB used (limit 1006.85 GB)

```

PS C:\Users\sreev> docker exec -it mysql-test mysql -u root -p
Enter password:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 9
Server version: 9.6.0 MySQL Community Server - GPL

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Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql>
PS C:\Users\sreev> |
  
```

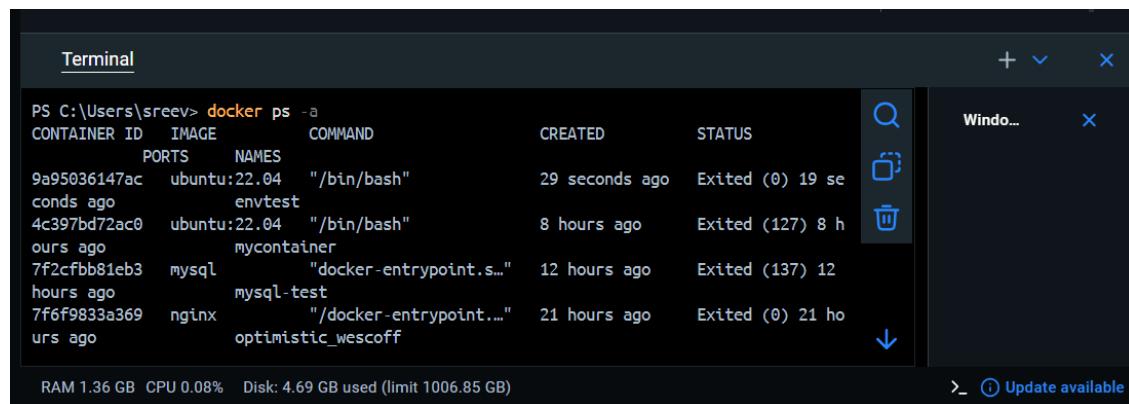
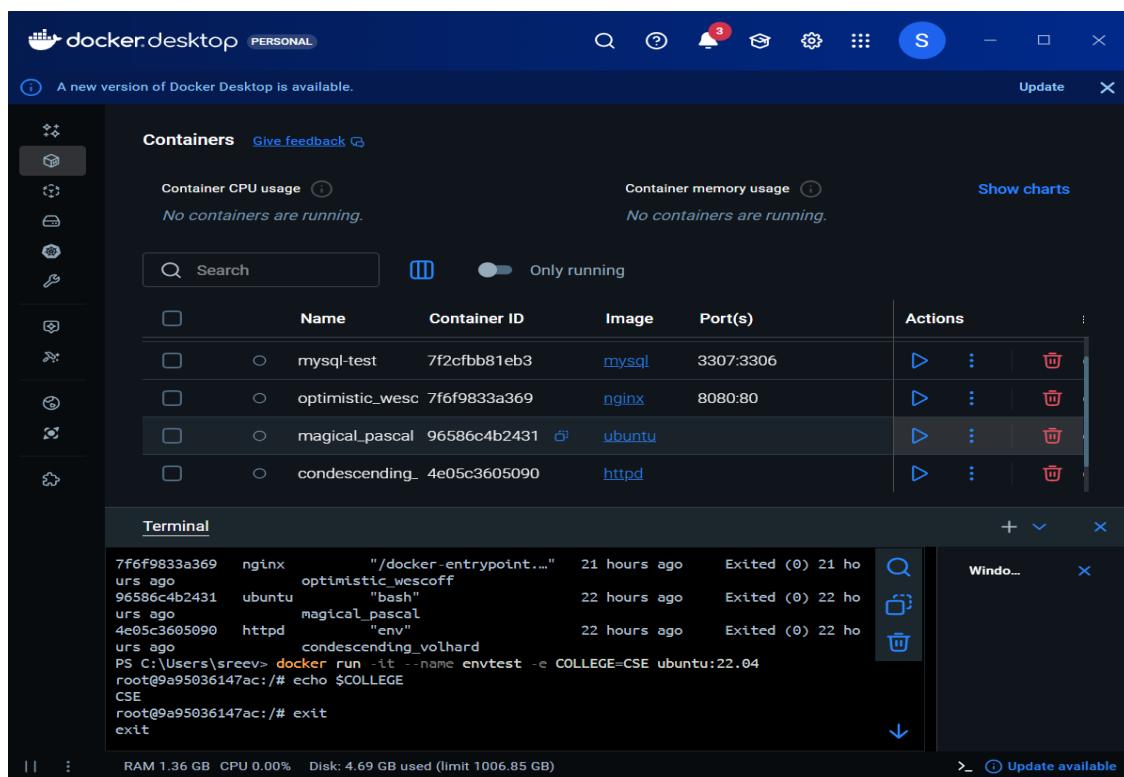
When I publish a port in Docker, I'm not “opening a port inside the container.” I'm asking Docker to stand at the host's door, listen on my behalf, and quietly forward anything it hears into the container's private world. Behind the scenes, Docker sets up all the low-level networking machinery—NAT rules, packet forwarding, and bridge connections—so the container

remains isolated, yet reachable, without me ever touching iptables or firewall configurations.

Let's go for our task-1:

Task: Environment Variable Test in Docker

- Run Ubuntu container
- Pass -e COLLEGE=CSE
- SHOW echo \$COLLEGE
- Stop container, then check what happened



3)Here we go, exec on the way:

docker exec is a Docker command used to run a new command inside an already running container. It allows users to interact with a container without stopping or restarting it.

This command is commonly used for:

- Debugging running containers
- Inspecting files and logs
- Checking environment variables
- Running administrative commands inside containers

Unlike docker run, which creates a new container, docker exec works only with existing and running containers.

```
PS C:\Users\sreev> docker pull httpd
Using default tag: latest
latest: Pulling from library/httpd
Digest: sha256:b89c19a390514d6767e8c62f29375d0577190be448f63b24f5f11d6b03f7bf18
Status: Image is up to date for httpd:latest
docker.io/library/httpd:latest
PS C:\Users\sreev> docker run -d -name apache-test httpd
9f58d7a3f15ee89a1f74335bb3fedcd7595f599591a6a0bcdac8e6cf9fb192b
PS C:\Users\sreev> docker ps -a
CONTAINER ID        IMAGE               COMMAND             CREATED            STATUS              PORTS
NAMES

```

RAM 0.90 GB CPU 0.33% Disk: 4.69 GB used (limit 1006.85 GB)

```
7f6f9833a369    nginx      "/docker-entrypoint..."   21 hours ago   Exited (0) 21 ho
urs ago          optimistic_wescoff
96586c4b2431    ubuntu     "bash"                  22 hours ago   Exited (0) 22 ho
urs ago          magical_pascal
4e05c3605090    httpd      "env"                  22 hours ago   Exited (0) 22 ho
urs ago          condescending_volhard
PS C:\Users\sreev> docker exec -it 9f58d7a3f15ee89a1f74335bb3fedcd7595f599591a6a0bcdac8e
6cf9fb192b bash
root@9f58d7a3f15e:/usr/local/apache2# ls
bin build cgi-bin conf error htdocs icons include logs modules
root@9f58d7a3f15e:/usr/local/apache2#
```

RAM 0.90 GB CPU 0.25% Disk: 4.69 GB used (limit 1006.85 GB)

A screenshot of a terminal window titled "Terminal". The window shows the following command and its output:

```
root@9f58d7a3f15e:/usr/local/apache2# exit  
exit  
PS C:\Users\sreev> docker exec apache-test env  
PATH=/usr/local/apache2/bin:/usr/local/sbin:/usr/bin:/usr/sbin:/bin  
HOSTNAME=9f58d7a3f15e  
HTTPD_PREFIX=/usr/local/apache2  
HTTPD_VERSION=2.4.66  
HTTPD_SHA256=94d7ff2b42acbb828e870ba29e4cbad48e558a79c623ad3596e4116efcfea25a  
HTTPD_PATCHES=  
HOME=/root  
PS C:\Users\sreev>
```

The terminal also displays system status at the bottom:

RAM 0.90 GB CPU 0.17% Disk: 4.69 GB used (limit 1006.85 GB) >_ ⓘ Update available

Practice Question 1:

Run a Docker container named DB-app based on the mongodb image, and expose port 80 on the host to port 8082 on the container.

A screenshot of a terminal window titled "Terminal". The window shows the following command and its output:

```
HOSTNAME=9f58d7a3f15e  
HTTPD_PREFIX=/usr/local/apache2  
HTTPD_VERSION=2.4.66  
HTTPD_SHA256=94d7ff2b42acbb828e870ba29e4cbad48e558a79c623ad3596e4116efcfea25a  
HTTPD_PATCHES=  
HOME=/root  
PS C:\Users\sreev> docker stop apache-test  
apache-test  
PS C:\Users\sreev> docker run -d --name DB-app -p 80:8082 mongo  
72d0bb17c193ec0f0816118bf7d9e021f9717f4efcade0cf899d1c1ca96623e9  
PS C:\Users\sreev>
```

The terminal also displays system status at the bottom:

RAM 1.00 GB CPU 0.25% Disk: 4.89 GB used (limit 1006.85 GB) >_ ⓘ Update available

Practice Question 2:

Run a Docker container based on the nginx image, exposing port 8080 on the host to port 80 on the container. Set an environment variable `NGINX_PORT=8080` inside the container and start the container interactively.

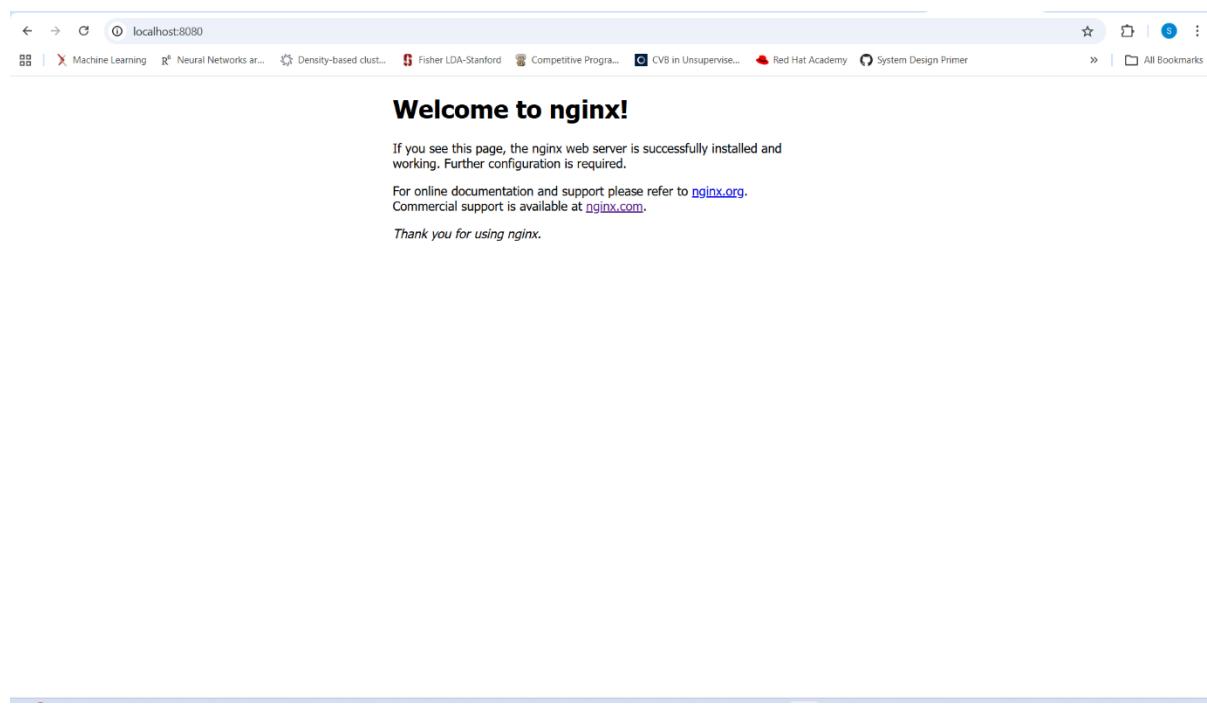
A screenshot of a terminal window titled "Terminal". The window shows the following command and its output:

```
DB-app  
PS C:\Users\sreev> docker run -it --name nginx-portpublishing -p 8080:80 -e NGINX_PORT=80 nginx  
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration  
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/  
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh  
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf  
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
```

The terminal also displays system status at the bottom:

RAM 0.98 GB CPU 0.00% Disk: 4.89 GB used (limit 1006.85 GB)

```
2026/02/10 15:24:05 [notice] 1#1: start worker process 31
2026/02/10 15:24:05 [notice] 1#1: start worker process 32
2026/02/10 15:24:05 [notice] 1#1: start worker process 33
2026/02/10 15:24:05 [notice] 1#1: start worker process 34
2026/02/10 15:24:05 [notice] 1#1: start worker process 35
2026/02/10 15:24:05 [notice] 1#1: start worker process 36
2026/02/10 15:24:05 [notice] 1#1: start worker process 37
2026/02/10 15:24:05 [notice] 1#1: start worker process 38
2026/02/10 15:24:05 [notice] 1#1: start worker process 39
2026/02/10 15:24:05 [notice] 1#1: start worker process 40
```

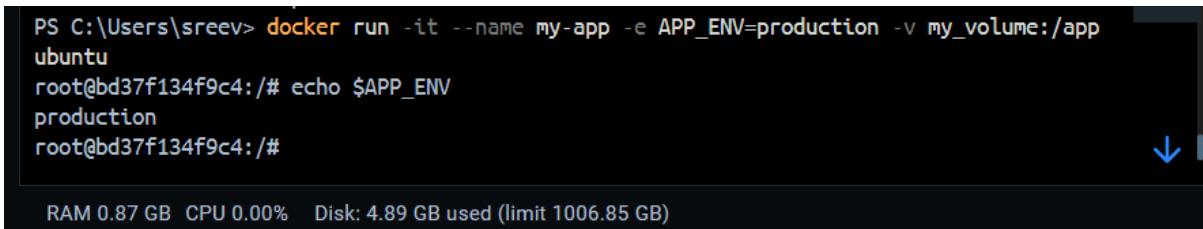


NOTE: EXPOSE documents container ports for internal use, while -p publishes container ports to the host for external access.

Task 1:

How would you use the docker run command with -it, -e, -v, and --name to:

- Set an environment variable APP_ENV=production
- Name the container my_app
- Start an interactive terminal
- Use an image called my_image



```
PS C:\Users\sreev> docker run -it --name my-app -e APP_ENV=production -v my_volume:/app
ubuntu
root@bd37f134f9c4:/# echo $APP_ENV
production
root@bd37f134f9c4:/#
```

RAM 0.87 GB CPU 0.00% Disk: 4.89 GB used (limit 1006.85 GB)

The command- **docker run -it --name my_app -e APP_ENV=production -v my_volume:/app ubuntu**

creates and starts an interactive Docker container named **my_app** from the **ubuntu** image. It sets the environment variable **APP_ENV** to **production** at runtime.

The **-v my_volume:/app** option mounts a Docker-managed volume named **my_volume** into the container at the **path /app**. This volume is stored on the host system and exists independently of the container. Any files created or modified inside **/app** are written to the volume and persist even after the container is stopped or deleted, while all other container files remain temporary.

Task-2: Copy files between container and host

Docker cp is used to **copy files or directories between a Docker container and the host system**.

- **Syntax**

Container → Host

```
docker cp <container_id|name>:<container_path> <host_path>
```

Host → Container

```
docker cp <host_path> <container_id|name>:<container_path>
```

- **Key Characteristics**

- Works with **running and stopped containers**
- Copies data **one time only** (no live sync)
- Does **not require volumes**
- Container filesystem must exist (container must not be removed)
- Files are copied, not mounted

- **Permissions Note**

- Destination path must be **writable**

- `/root/` is commonly used because it avoids permission issues
- Any valid container path can be used

- **Persistence Clarification**

- Files copied **into a container** persist only until the container is deleted
- Files copied **from a container** are permanently saved on the host
- `docker cp` does **not** provide persistent storage like volumes.

```
PS C:\Users\sreev> docker run -it --name cp-practice ubuntu
root@fcd3b9b311f0:/# echo "hello from container">>/root/container.txt
root@fcd3b9b311f0:/# ls/root
bash: ls/root: No such file or directory
root@fcd3b9b311f0:/# ls /root
container.txt
root@fcd3b9b311f0:/# exit
exit
PS C:\Users\sreev>

RAM 0.87 GB CPU 2.92% Disk: 4.89 GB used (limit 1006.85 GB)
```

```
PS C:\Users\sreev> docker run -it --name cp-practice ubuntu
root@fcd3b9b311f0:/# echo "hello from container">>/root/container.txt
root@fcd3b9b311f0:/# ls/root
bash: ls/root: No such file or directory
root@fcd3b9b311f0:/# ls /root
container.txt
root@fcd3b9b311f0:/# exit
exit
PS C:\Users\sreev> docker cp cp-practice:/root/container.txt C:\Users\sreev
Successfully copied 2.05kB to C:\Users\sreev
PS C:\Users\sreev>
```

```
RAM 0.80 GB CPU 0.00% Disk: 4.89 GB used (limit 1006.85 GB)

Windows PowerShell
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PS C:\Users\sreev> echo "hello from host">>hello.txt
PS C:\Users\sreev> docker cp hello.txt cp-practice:/root/
Successfully copied 2.05kB to cp-practice:/root/
PS C:\Users\sreev>
```

A screenshot of a terminal window titled "Terminal". The window shows a command-line session where a Docker container is created, files are copied from it, and then deleted. The session ends with an exit command. The terminal interface includes a status bar at the bottom showing RAM, CPU, and disk usage.

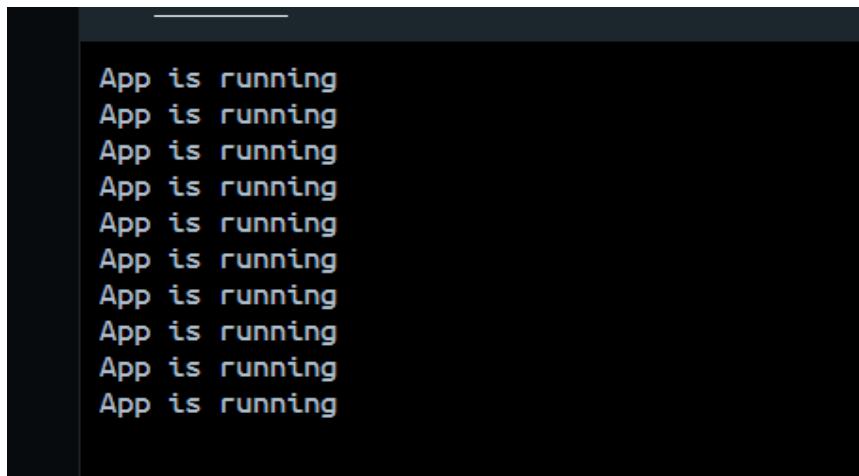
```
container.txt
root@fcd3b9b311f0:/# exit
exit
PS C:\Users\sreev> docker cp cp-practice:/root/container.txt C:\Users\sreev
Successfully copied 2.05kB to C:\Users\sreev
PS C:\Users\sreev> docker start -ai cp-practice
root@fcd3b9b311f0:/# ls /root/
container.txt  hello.txt
root@fcd3b9b311f0:/# cat /root/hello.txt
*hello from host
root@fcd3b9b311f0:/#
RAM 0.86 GB CPU 6.72% Disk: 4.89 GB used (limit 1006.85 GB) >_ ⓘ Update available
```

Practice question 3:

You have a running container named my_app, but it is not behaving as expected. You want to check its logs to debug errors and follow new log entries in real time. Write the command to view its logs and continuously monitor them.

```
harity

Run 'docker run --help' for more information
PS C:\Users\sreev> docker run -d --name my_app ubuntu sh -c "while true;do echo App is
running;sleep 2;done"
3dd172be10cfb826d2c6d8e018c9fd3aca7461bf09e6b44ca5c70232f8b79d70
PS C:\Users\sreev> docker logs -f my_app
App is running
App is running
```



Note: Docker logs are generated only while the container's main process is running, and docker logs -f streams them in real time.

When the container is stopped, the process ends and no new logs are produced, though previous logs remain accessible.

Practical on Bind Mount:

```
Command Prompt

Microsoft Windows [Version 10.0.26200.7705]
(c) Microsoft Corporation. All rights reserved.

C:\Users\sreev>mkdir C:\docker-volume-demo

C:\Users\sreev>echo "Hello from host" > C:\docker-volume-demo\hostfile.txt

C:\Users\sreev>type C:\docker-volume-demo\hostfile.txt
"Hello from host"
```

```
Terminal

cv1
PS C:\Users\sreev> docker run -it --name cv1 -v C:\docker-volume-demo:/data ubuntu bash

root@decc5f3ade6c:/# cd /data
bash: cd: /data: No such file or directory
root@decc5f3ade6c:/# cd \data
bash: cd: data: No such file or directory
root@decc5f3ade6c:/# ls
'\data'  boot  etc   lib    media  opt   root  sbin  sys   usr
      bin   dev   home  lib64  mnt   proc  run   srv  tmp   var
root@decc5f3ade6c:/# cd '\data'

RAM 0.86 GB CPU 7.53% Disk: 4.89 GB used (limit 1006.85 GB)
```

```
root@decc5f3ade6c:/# cd \data
bash: cd: data: No such file or directory
root@decc5f3ade6c:/# ls
'\data'  boot  etc   lib    media  opt   root  sbin  sys   usr
      bin   dev   home  lib64  mnt   proc  run   srv  tmp   var
root@decc5f3ade6c:/# cd '\data'
root@decc5f3ade6c:/\data# ls
hostfile.txt
root@decc5f3ade6c:/\data# cat hostfile.txt
"Hello from host"
root@decc5f3ade6c:/\data#
```

RAM 0.86 GB CPU 6.36% Disk: 4.89 GB used (limit 1006.85 GB)

Note:

What is bind mount?

A **bind mount** directly maps a specific directory from the host system into a container.

The container and host share the same files, and changes are reflected in real time on both sides.

Bind mounts are commonly used in development but are not managed by Docker for data safety.

Practice Question 4:

- Create a Docker volume named studentdata.
- Run an Ubuntu container and mount studentdata at /student.
- Create a file inside the container and verify it persists after container deletion.
- Attach the same volume to another container and verify the file exists.
- Demonstrate data sharing between two containers using a shared volume.
- Show that deleting a container does NOT delete the volume data.

```
Terminal
# exit
PS C:\Users\sreev> docker volume create studentdata
studentdata
PS C:\Users\sreev> docker volume ls
DRIVER      VOLUME NAME
local      292d36e61a3fbc725b68a1c41f1ed5f8d959552e31e01c755764dea00fd01883
local      a06a9de2a6c86004aec5446f449cf76bf91ebd327650368478c0443fe8cc1eaa
local      a2277fd67f2d4a253809ed020c54ba48196a7cd8a2e2b530c1ed977d0abeece0
local      data
local      my_volume
local      studentdata
RAM 0.92 GB CPU 0.00% Disk: 4.89 GB used (limit 1006.85 GB) >_ ⓘ Update av
```

```
local      studentdata
PS C:\Users\sreev> docker run -it --name container1 -v studentdata:/student ubuntu sh
# cd /student
# echo "hi from stud">>filestud.txt
# exit
PS C:\Users\sreev> delete rm container1
```

```
Terminal
PS C:\Users\sreev> docker rm container1
container1
PS C:\Users\sreev> docker volum els
docker: unknown command: docker volum
Run 'docker --help' for more information
PS C:\Users\sreev> docker volume ls
DRIVER      VOLUME NAME
local      292d36e61a3fbc725b68a1c41f1ed5f8d959552e31e01c755764dea00fd01883
local      a06a9de2a6c86004aec5446f449cf76bf91ebd327650368478c0443fe8cc1eaa
local      a2277fd67f2d4a253809ed020c54ba48196a7cd8a2e2b530c1ed977d0abeece0
RAM 0.93 GB CPU 0.33% Disk: 4.89 GB used (limit 1006.85 GB) >_ ⓘ Update av
local      studentdata
PS C:\Users\sreev> docker run -it --name container2 -v studentdata:/student ubuntu sh
# ls /student
filestud.txt
# cat /student/filestud.txt
hi from stud
# |
```

RAM 0.94 GB CPU 0.42% Disk: 4.89 GB used (limit 1006.85 GB) >_ ⓘ Update av

```
PS C:\Users\sreev> docker run -it --name writer -v studentdata:/student ubuntu sh
# cd /student
# echo "sharing practice"
sharing practice
# echo "sharing practice" > fileprac.txt
#
```

```
Terminal + ▾
You have to remove (or rename) that container to be able to reuse that name.
Run 'docker run --help' for more information
PS C:\Users\sreev> docker run -it --name reader1 -v studentdata:/student ubuntu sh
# ls /student
fileprac.txt filestud.txt
# cd /student/fileprac.txt
sh: 2: cd: can't cd to /student/fileprac.txt
# cat /student/fileprac.txt
sharing practice
#
```

RAM 0.91 GB CPU 2.59% Disk: 4.89 GB used (limit 1006.85 GB) >_ ⓘ Update a

```
Terminal + ▾
PS C:\Users\sreev> docker rm writer
writer
PS C:\Users\sreev> docker rm reader
reader
PS C:\Users\sreev> docker rm container2
container2
PS C:\Users\sreev> docker volume ls
DRIVER      VOLUME NAME
local      292d36e61a3fbc725b68a1c41f1ed5f8d959552e31e01c755764dea00fd01883
local      a06a9de2a6c86004aec5446f449cf76bf91ebd327650368478c0443fe8cc1eaa
local      a2277fd67f2d4a253809ed020c54ba48196a7cd8a2e2b530c1ed977d0abeece0
```

RAM 0.99 GB CPU 0.00% Disk: 4.89 GB used (limit 1006.85 GB) >_ ⓘ Update a

```
Terminal + ▾
container2
PS C:\Users\sreev> docker volume ls
DRIVER      VOLUME NAME
local      292d36e61a3fbc725b68a1c41f1ed5f8d959552e31e01c755764dea00fd01883
local      a06a9de2a6c86004aec5446f449cf76bf91ebd327650368478c0443fe8cc1eaa
local      a2277fd67f2d4a253809ed020c54ba48196a7cd8a2e2b530c1ed977d0abeece0
local      data
local      my_volume
local      student
local      studentdata
PS C:\Users\sreev>
```

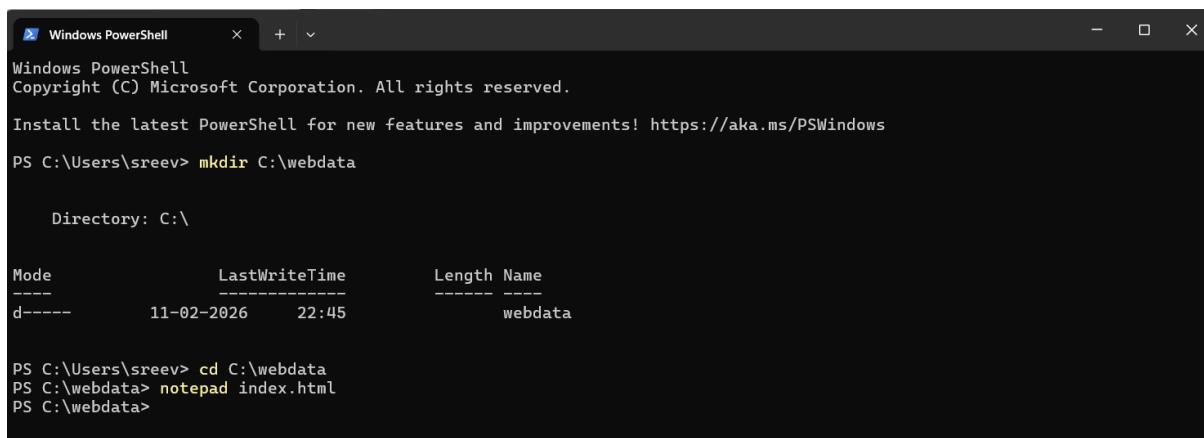
RAM 0.99 GB CPU 0.08% Disk: 4.89 GB used (limit 1006.85 GB) >_ ⓘ Update a

Practice Question-5:

1. On the **host system**, create a directory named **webdata**.
2. Inside it, create a file **index.html** with the content:

```
<h1>Welcome from Host</h1>
```

3. Run a **Nginx container** and bind mount the host directory to **/usr/share/nginx/html** using **--mount**.
4. Expose the container on port **8080**.
5. Open a browser and verify the page loads.
6. Modify index.html on the host to:
7. <h1>Updated from Host</h1>
8. Refresh the browser and observe the change.



```

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PS C:\Users\sreev> mkdir C:\webdata

Directory: C:\

Mode          LastWriteTime      Length Name
----          -----          -----      Length Name
d---          11-02-2026    22:45                  webdata

PS C:\Users\sreev> cd C:\webdata
PS C:\webdata> notepad index.html
PS C:\webdata>

```



```

local  studentdata
PS C:\Users\sreev> docker run -d --name mynginx --mount type=bind,source="C:\webdata",t
arget=/usr/share/nginx/html -p 8080:80 nginx
3ad189382cb1ef6e4dc54ecc2b4307216646deda6f19c5cbe43ad62b97c9714c
PS C:\Users\sreev>

```

RAM 0.93 GB CPU 0.00% Disk: 4.89 GB used (limit 1006.85 GB)

