

Experiment No. 09**AIM: To study and implement Docker basics****THEORY:****Theory:**

Containerization is a lightweight virtualization technique that allows applications to run in isolated environments called containers. Unlike traditional virtual machines, containers share the host operating system's kernel, making them more efficient and faster to start. Docker is one of the most popular platforms for containerization.

Docker allows developers to package an application along with all its dependencies, libraries, and configuration files into a single unit called a Docker container. This ensures the application runs consistently across different environments—whether it's development, testing, or production. Docker uses a file called a *Dockerfile* to automate the creation of images, which are then used to spin up containers.

With Docker, scaling applications becomes simpler, and deployment is faster and more reliable. It also helps in reducing conflicts between environments and improves CI/CD pipelines.

In this experiment, we aim to understand how Docker works, how to build Docker images, and how to run and manage containers. Through hands-on implementation, we'll explore Docker commands and learn how containerization can streamline development workflows.

IMPLEMENTATION:

```
docker run nginx:1.23
/d/MiscRepos/sepm_lab/files git:(master)±9 (0.675s)
docker -v
Docker version 28.0.1, build 068a01e

/d/MiscRepos/sepm_lab/files git:(master)±9 (40.969s)
docker pull nginx:1.23
1.23: Pulling from library/nginx
9989f7b33228: Pull complete
f03b40093957: Pull complete
6c1a86118ade: Pull complete
a85095acb896: Pull complete
d24b987aa74e: Pull complete
0972072e0e8a: Pull complete
Digest: sha256:f5747a42e3adcb3168049d63278d7251d91185bb5111d2563d58729a5c9179b0
Status: Downloaded newer image for nginx:1.23
docker.io/library/nginx:1.23

/d/MiscRepos/sepm_lab/files git:(master)±9 (0.721s)
docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
nginx 1.23 f5747a42e3ad 22 months ago 214MB
```

```
/d/MiscRepos/sepm_lab/files git:(master)±9 (16.855s)
docker pull nginx
Using default tag: latest
latest: Pulling from library/nginx
6e909acdb790: Pull complete
97f5c0f51d43: Pull complete
5eaa34f5b9c2: Pull complete
417c4bccf534: Pull complete
e7e0ca015e55: Pull complete
c22eb46e871a: Pull complete
373fe654e984: Pull complete
Digest: sha256:124b44bfc9ccd1f3cedf4b592d4d1e8bddb78b51ec2ed5056c52d3692baebc19
Status: Downloaded newer image for nginx:latest
docker.io/library/nginx:latest

/d/MiscRepos/sepm_lab/files git:(master)±9 (1.127s)
docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
nginx latest 124b44bfc9cc 7 weeks ago 279MB
nginx 1.23 f5747a42e3ad 22 months ago 214MB
```

```
/d/MiscRepos/sepm_lab/files git:(master)±9
docker run nginx:1.23
/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
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/04/02 13:34:51 [notice] 1#1: using the "epoll" event method
2025/04/02 13:34:51 [notice] 1#1: nginx/1.23.4
2025/04/02 13:34:51 [notice] 1#1: built by gcc 10.2.1 20210110 (Debian 10.2.1-6)
2025/04/02 13:34:51 [notice] 1#1: OS: Linux 5.15.167.4-microsoft-standard-WSL2
2025/04/02 13:34:51 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/04/02 13:34:51 [notice] 1#1: start worker processes
2025/04/02 13:34:51 [notice] 1#1: start worker process 29
2025/04/02 13:34:51 [notice] 1#1: start worker process 30
2025/04/02 13:34:51 [notice] 1#1: start worker process 31
2025/04/02 13:34:51 [notice] 1#1: start worker process 32
```

```
/d/MiscRepos/sepm_lab/files git:(master)±9 (2.813s)
docker run -d nginx:1.23
a8c8bd4b3b4912b37e3d407427e975a56fd722df027f0012e2c03c4199f77291

/d/MiscRepos/sepm_lab/files git:(master)±9 (0.784s)
docker ps
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS        NAMES
a8c8bd4b3b49   nginx:1.23 "/docker-entrypoint. ..." 8 seconds ago  Up 6 seconds  80/tcp       amazing_jepsen

/d/MiscRepos/sepm_lab/files git:(master)±9 (0.647s)
docker logs a8c8bd4b3b49
/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
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/04/02 13:40:12 [notice] 1#1: using the "epoll" event method
2025/04/02 13:40:12 [notice] 1#1: nginx/1.23.4
2025/04/02 13:40:12 [notice] 1#1: built by gcc 10.2.1 202110110 (Debian 10.2.1-6)
2025/04/02 13:40:12 [notice] 1#1: OS: Linux 5.15.167.4-microsoft-standard-WSL2
2025/04/02 13:40:12 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/04/02 13:40:12 [notice] 1#1: start worker processes
2025/04/02 13:40:12 [notice] 1#1: start worker process 29
2025/04/02 13:40:12 [notice] 1#1: start worker process 30
2025/04/02 13:40:12 [notice] 1#1: start worker process 31
2025/04/02 13:40:12 [notice] 1#1: start worker process 32

/d/MiscRepos/sepm_lab/files git:(master) ~ ±9
|
```

```
/d/MiscRepos/sepm_lab/files git:(master)±9
docker run nginx:latest

/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
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/04/02 13:43:21 [notice] 1#1: using the "epoll" event method
2025/04/02 13:43:21 [notice] 1#1: nginx/1.27.4
2025/04/02 13:43:21 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2025/04/02 13:43:21 [notice] 1#1: OS: Linux 5.15.167.4-microsoft-standard-WSL2
2025/04/02 13:43:21 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/04/02 13:43:21 [notice] 1#1: start worker processes
2025/04/02 13:43:21 [notice] 1#1: start worker process 29
2025/04/02 13:43:21 [notice] 1#1: start worker process 30
2025/04/02 13:43:21 [notice] 1#1: start worker process 31
2025/04/02 13:43:21 [notice] 1#1: start worker process 32
|
```

```
/d/MiscRepos/sepm_lab/files git:(master)±9 (0.668s)
docker ps
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS        NAMES
b59d07d59184   nginx:latest "/docker-entrypoint. ..." 11 seconds ago  Up 10 seconds  80/tcp       intelligent_beaver
a8c8bd4b3b49   nginx:1.23 "/docker-entrypoint. ..." 3 minutes ago   Up 3 minutes   80/tcp       amazing_jepsen

/d/MiscRepos/sepm_lab/files git:(master) ~ ±9
```

```
/d/MiscRepos/sepm_lab/files git:(master)±9 (0.775s)
docker ps
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS        NAMES
a8c8bd4b3b49   nginx:1.23 "/docker-entrypoint. ..." 6 minutes ago   Up 6 minutes   80/tcp       amazing_jepsen

/d/MiscRepos/sepm_lab/files git:(master)±9 (1.199s)
docker stop a8c8bd4b3b49
a8c8bd4b3b49

/d/MiscRepos/sepm_lab/files git:(master)±9 (0.668s)
docker ps
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS        NAMES

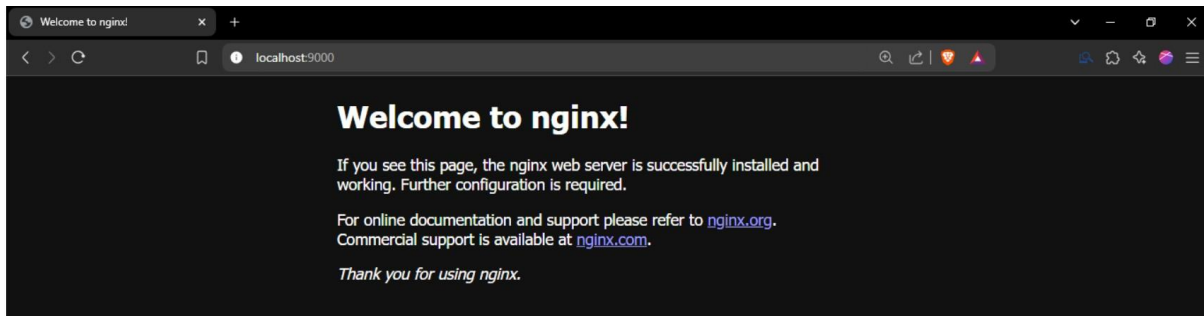
/d/MiscRepos/sepm_lab/files git:(master) ~ ±9
|
```

```
/d/MiscRepos/sepm_lab/files git:(master)±9 (1.164s)
docker images
REPOSITORY    TAG       IMAGE ID       CREATED        SIZE
nginx         latest    124b44bfc9cc   7 weeks ago    279MB
nginx         1.23     f5747a42e3ad   22 months ago  214MB

/d/MiscRepos/sepm_lab/files git:(master)±9 (2.851s)
docker run -d -p 9000:80 nginx:1.23
e84b49b3ac88f8be69f82ce3fc6032c1294c29506389674099762f43d0c0fe93

/d/MiscRepos/sepm_lab/files git:(master)±9 (0.729s)
docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS                   NAMES
e84b49b3ac88   nginx:1.23 "/docker-entrypoint..." 17 seconds ago Up 15 seconds    0.0.0.0:9000->80/tcp    happy_torvalds

/d/MiscRepos/sepm_lab/files git:(master)±9
```



```
/d/MiscRepos/sepm_lab/files git:(master)±9 (1.145s)
docker logs e84b49b3ac88
/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
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/04/02 13:48:40 [notice] 1#1: using the "epoll" event method
2025/04/02 13:48:40 [notice] 1#1: nginx/1.23.4
2025/04/02 13:48:40 [notice] 1#1: built by gcc 10.2.1 20210110 (Debian 10.2.1-6)
2025/04/02 13:48:40 [notice] 1#1: OS: Linux 5.15.167.4-microsoft-standard-WSL2
2025/04/02 13:48:40 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/04/02 13:48:40 [notice] 1#1: start worker processes
2025/04/02 13:48:40 [notice] 1#1: start worker process 30
2025/04/02 13:48:40 [notice] 1#1: start worker process 31
2025/04/02 13:48:40 [notice] 1#1: start worker process 32
2025/04/02 13:48:40 [notice] 1#1: start worker process 33
172.17.0.1 - - [02/Apr/2025:13:49:09 +0000] "GET / HTTP/1.1" 200 615 "-" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/134.0.0.0 Safari/537.36"
2025/04/02 13:49:09 [error] 31#31: *1 open() "/usr/share/nginx/html/favicon.ico" failed (2: No such file or directory), client: 172.17.0.1, server: localhost, request: "GET /favicon.ico HTTP/1.1", host: "localhost:9000", referer: "http://localhost:9000/"
172.17.0.1 - - [02/Apr/2025:13:49:09 +0000] "GET /favicon.ico HTTP/1.1" 404 555 "http://localhost:9000/" "Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/134.0.0.0 Safari/537.36"

/d/MiscRepos/sepm_lab/files git:(master)±9
```

```
/d/MiscRepos/sepm_lab/files git:(master)±9 (0.728s)
docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS                   NAMES
e84b49b3ac88   nginx:1.23 "/docker-entrypoint..." 4 minutes ago Up 4 minutes    0.0.0.0:9000->80/tcp    happy_torvalds
b59d07d59184   nginx:latest "/docker-entrypoint..." 10 minutes ago Exited (0) 7 minutes ago intelligent_beaver
a8c8bd4b3b49   nginx:1.23 "/docker-entrypoint..." 13 minutes ago Exited (0) 6 minutes ago amazing_jepsen
4ede9b099710   nginx:1.23 "/docker-entrypoint..." 18 minutes ago Exited (0) 13 minutes ago epic_mirzakhani

/d/MiscRepos/sepm_lab/files git:(master)±9 (3.44s)
docker stop happy_torvalds
happy_torvalds

/d/MiscRepos/sepm_lab/files git:(master)±9 (2.124s)
docker run --name web_app -d -p 9000:80 nginx:1.23
7427673945ec2a4857141364b221bd3042ecec05d0ebd96141161e79aa81ee35

/d/MiscRepos/sepm_lab/files git:(master)±9 (0.789s)
docker ps
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS                   NAMES
7427673945ec   nginx:1.23 "/docker-entrypoint..." 5 seconds ago Up 4 seconds    0.0.0.0:9000->80/tcp    web_app

/d/MiscRepos/sepm_lab/files git:(master)±9
```

```
Complete!
[ec2-user@ip-172-31-4-25 ~]$ sudo systemctl start docker
[ec2-user@ip-172-31-4-25 ~]$ sudo systemctl status docker
● docker.service - Docker Application Container Engine
   Loaded: loaded (/usr/lib/systemd/system/docker.service; disabled; preset: disabled)
   Active: active (running) since Sun 2025-04-13 07:04:54 UTC; 11s ago
TriggeredBy: ● docker.socket
   Docs: https://docs.docker.com
   Process: 27208 ExecStartPre=/bin/mkdir -p /run/docker (code=exited, status=0/SUCCESS)
   Process: 27209 ExecStartPre=/usr/libexec/docker/docker-setup-runtimes.sh (code=exited, status=0/SUCCESS)
  Main PID: 27210 (dockerd)
    Tasks: 8
   Memory: 29.7M
      CPU: 264ms
   CGroup: /system.slice/docker.service
           └─27210 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock --default-ulimit nofile=32768:65536

Apr 13 07:04:54 ip-172-31-4-25.ap-south-1.compute.internal systemd[1]: Starting docker.service - Docker Application Container Engine...
Apr 13 07:04:54 ip-172-31-4-25.ap-south-1.compute.internal dockerd[27210]: time="2025-04-13T07:04:54.243553265Z" level=info msg="Starting up"
Apr 13 07:04:54 ip-172-31-4-25.ap-south-1.compute.internal dockerd[27210]: time="2025-04-13T07:04:54.299559512Z" level=info msg="Loading co
Apr 13 07:04:54 ip-172-31-4-25.ap-south-1.compute.internal dockerd[27210]: time="2025-04-13T07:04:54.680891728Z" level=info msg="Loading co
Apr 13 07:04:54 ip-172-31-4-25.ap-south-1.compute.internal dockerd[27210]: time="2025-04-13T07:04:54.702039972Z" level=info msg="Docker dae
Apr 13 07:04:54 ip-172-31-4-25.ap-south-1.compute.internal dockerd[27210]: time="2025-04-13T07:04:54.702260732Z" level=info msg="Daemon has
Apr 13 07:04:54 ip-172-31-4-25.ap-south-1.compute.internal dockerd[27210]: time="2025-04-13T07:04:54.750954608Z" level=info msg="API listen
Apr 13 07:04:54 ip-172-31-4-25.ap-south-1.compute.internal systemd[1]: Started docker.service - Docker Application Container Engine.

lines 1-22/22 (END)
```



```
aws [Option+S] Asia Pacific (Mumbai) shreezy

5f32ed3c3f27: Pull complete
0c8cc2f24a4d: Pull complete
0d27a8e86132: Pull complete
b35ca9a95db0: Pull complete
46a182df3db1: Pull complete
f5b1a7ebee97: Pull complete
ff7978b844b1: Pull complete
Digest: sha256:f7c1cffb42a2f4a40b626b0d03f8b83bbc8ef3f88d0682cd43f395bf9e42966b
Status: Downloaded newer image for philippaul/node-mysql-app:02
docker.io/philippaul/node-mysql-app:02
[ec2-user@ip-172-31-4-25 ~]$ docker run --rm -p 80:3000 -e DB_HOST="database-shreezy.clsak8qycavh.ap-south-1.rds.amazonaws.com" -e DB_USER="admin" -e DB_PASSWORD="123456789" -d philippaul/node-mysql-app:02
docker: permission denied while trying to connect to the Docker daemon socket at unix:///var/run/docker.sock: Head "http://%2Fvar%2Frun%2Fdocker.sock/ping": dial unix /var/run/docker.sock: connect: permission denied.
See 'docker run --help'.
[ec2-user@ip-172-31-4-25 ~]$ sudo docker run --rm -p 80:3000 \
-e DB_HOST="database-shreezy.clsak8qycavh.ap-south-1.rds.amazonaws.com" \
-e DB_USER="admin" \
-e DB_PASSWORD="123456789" \
-d philippaul/node-mysql-app:02
3239e6a22b7d227d1e17ee326f7ddeec4016da731f84fe187681fa2b5aa30a58
[ec2-user@ip-172-31-4-25 ~]$ sudo docker ps
CONTAINER ID   IMAGE                                COMMAND                  CREATED        STATUS        PORTS
3239e6a22b7d   philippaul/node-mysql-app:02        "docker-entrypoint.s..." About a minute ago Up 58 seconds  0.0.0.0:80->3000/tcp, :::80->3000/tcp
blissful-joliot

[ec2-user@ip-172-31-4-25 ~]$
```

i-0789a83885455376f (RDS-Experiment)

PublicIPs: 3.110.163.1 PrivateIPs: 172.31.4.25

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```
aws Services [Option+S] Stockholm Paul Philip

[ec2-user@ip-172-31-36-167 ~]$
[ec2-user@ip-172-31-36-167 ~]$ sudo docker run -it --rm mysql:8.0 mysql -h database-1.cls848ms4r8r.eu-north-1.rds.amazonaws.com -u admin -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 181
Server version: 8.0.39 Source distribution

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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>
```

```
aws Services [Option+S] Stockholm Paul Philip

Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 181
Server version: 8.0.39 Source distribution

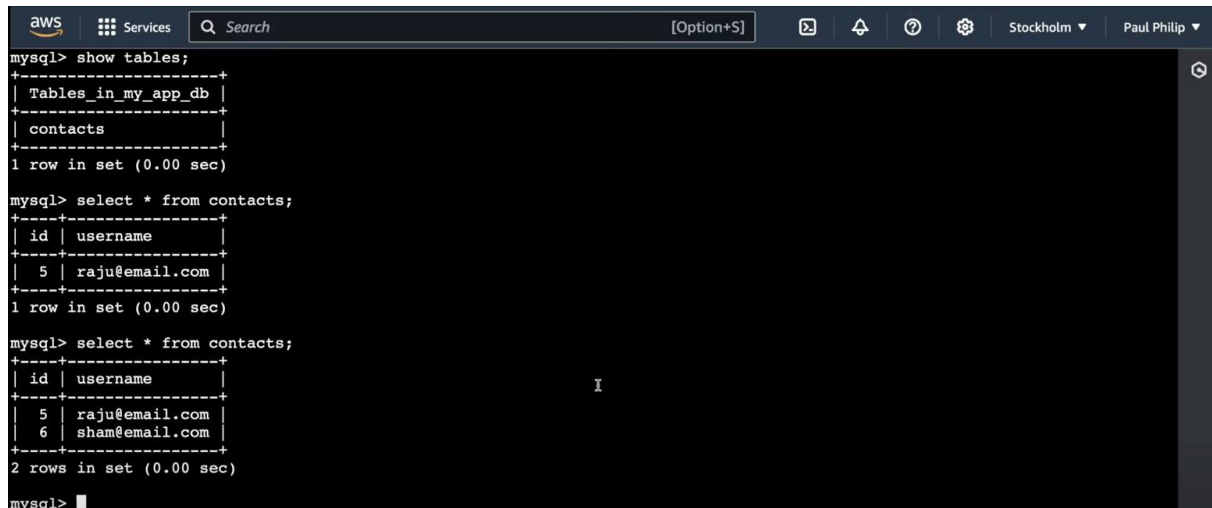
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affiliates. Other names may be trademarks of their respective
owners.

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

mysql> show databases;
+-----+
| Database |
+-----+
| information_schema |
| my_app_db |
| mysql |
| performance_schema |
| sys |
+-----+
5 rows in set (0.01 sec)

mysql>
```



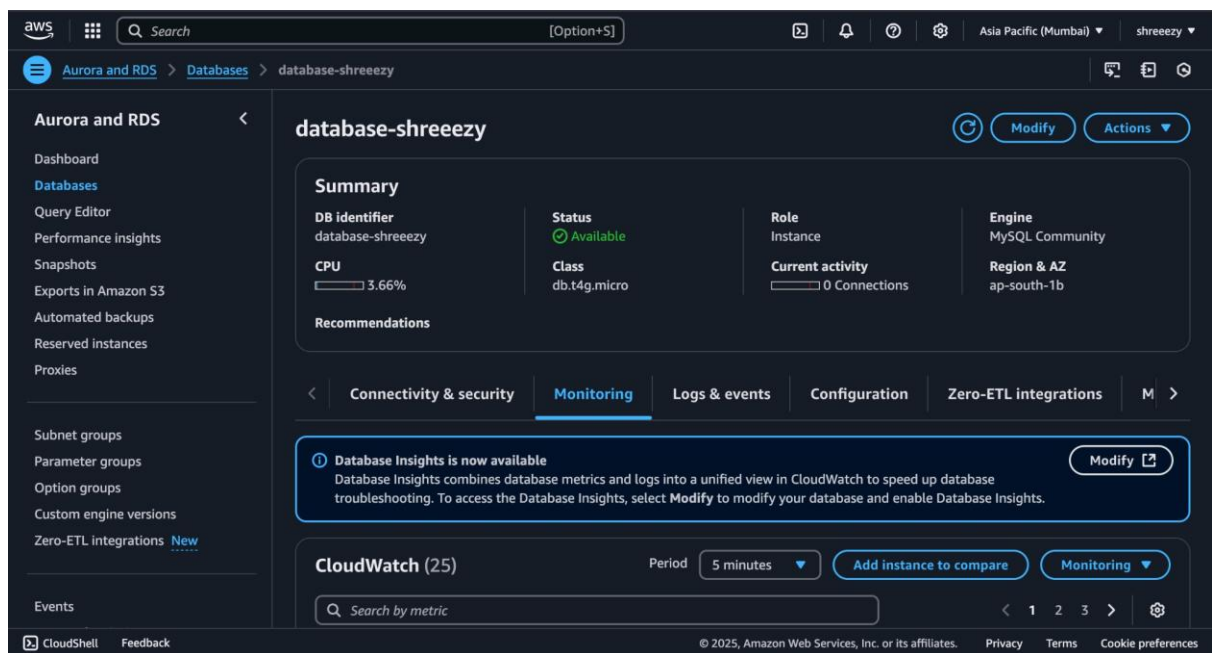
```
aws
Services
Search
[Option+S]
Stockholm
Paul Philip

mysql> show tables;
+-----+
| Tables_in_my_app_db |
+-----+
| contacts              |
+-----+
1 row in set (0.00 sec)

mysql> select * from contacts;
+-----+
| id | username      |
+-----+
| 5  | raj@email.com |
+-----+
1 row in set (0.00 sec)

mysql> select * from contacts;
+-----+
| id | username      |
+-----+
| 5  | raj@email.com |
| 6  | sham@email.com |
+-----+
2 rows in set (0.00 sec)

mysql>
```



The screenshot displays the AWS Management Console for an Amazon RDS database instance named 'database-shreezy'. The left sidebar shows the navigation menu with 'Aurora and RDS' selected. The main content area shows the instance details under the 'Monitoring' tab.

database-shreezy

Summary

DB identifier	Status	Role	Engine
database-shreezy	Available	Instance	MySQL Community

CPU	Class	Current activity	Region & AZ
3.66%	db.t4g.micro	0 Connections	ap-south-1b

Recommendations

Database Insights is now available
Database Insights combines database metrics and logs into a unified view in CloudWatch to speed up database troubleshooting. To access the Database Insights, select **Modify** to modify your database and enable Database Insights.

CloudWatch (25)
Period: 5 minutes
Add instance to compare
Monitoring

CONCLUSION: Hence, we have successfully studied and implemented the basics of Docker.