Name : Shravan More
Batch: T13
Roll no: 62

EXPERIMENT 9

Aim:
To understand Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers.

Theory:
Docker is a popular platform that enables developers to build, package, and deploy applications as lightweight, portable, and self-sufficient containers. These containers encapsulate all the necessary dependencies and libraries required for an application to run, ensuring consistency across different environments. Here is a theoretical overview of Docker:

Containerization:
Docker utilizes containerization technology to create isolated environments for applications. Containers are lightweight, standalone, and executable packages that include everything needed to run an application, such as code, runtime, system tools, libraries, and settings. This isolation ensures that applications run consistently across different environments, from development to production.

Docker Engine:
At the core of Docker is the Docker Engine, which is responsible for building, running, and managing containers. It consists of the Docker daemon, which manages containers, images, networks, and volumes, and the Docker client, which allows users to interact with the daemon through the Docker API.

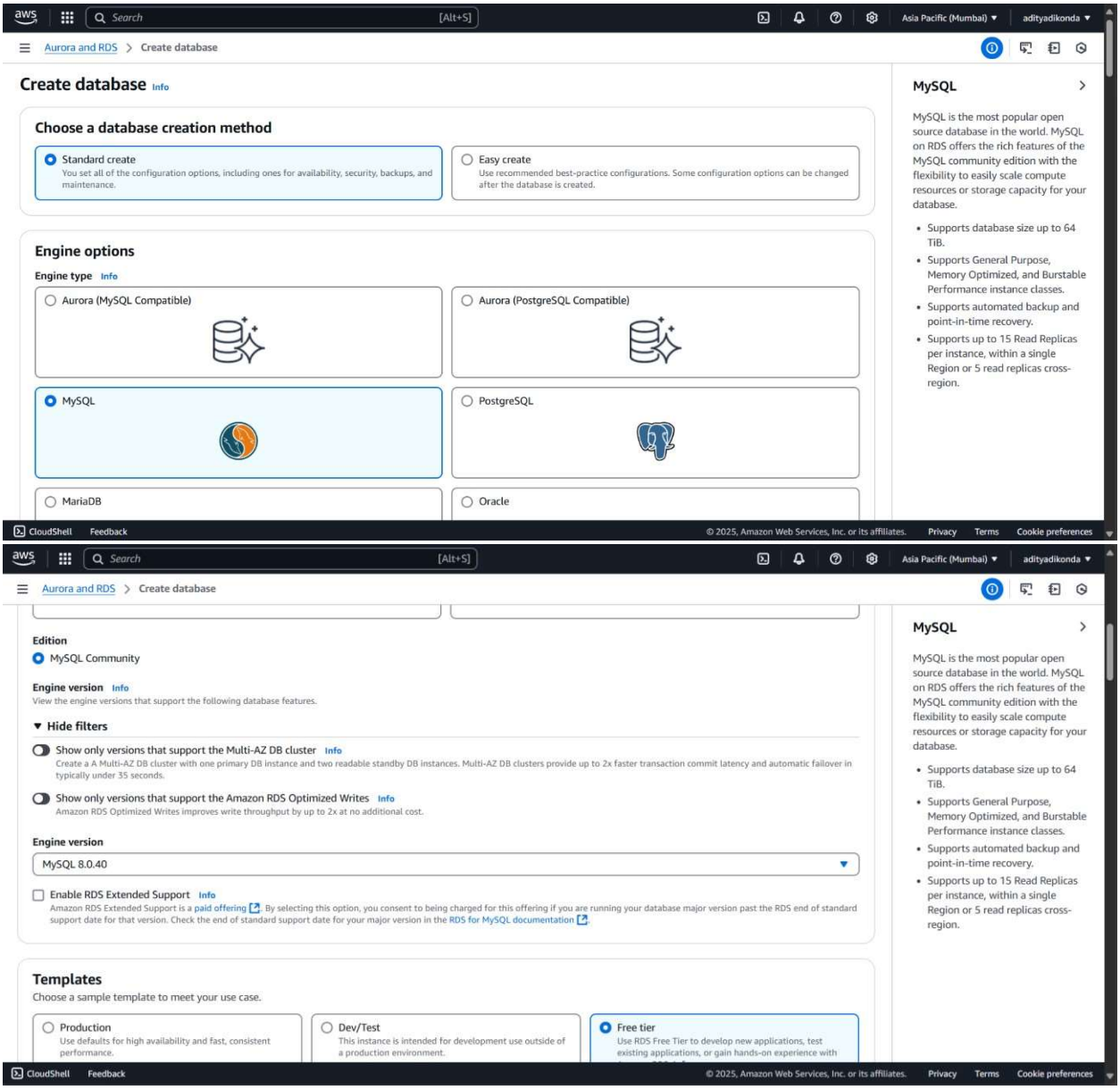
Docker Images:
Docker images are read-only templates used to create containers. They contain the application code, runtime, libraries, dependencies, and other files needed to run the application. Images are built using Dockerfiles, which are text files that define the steps needed to create the image.

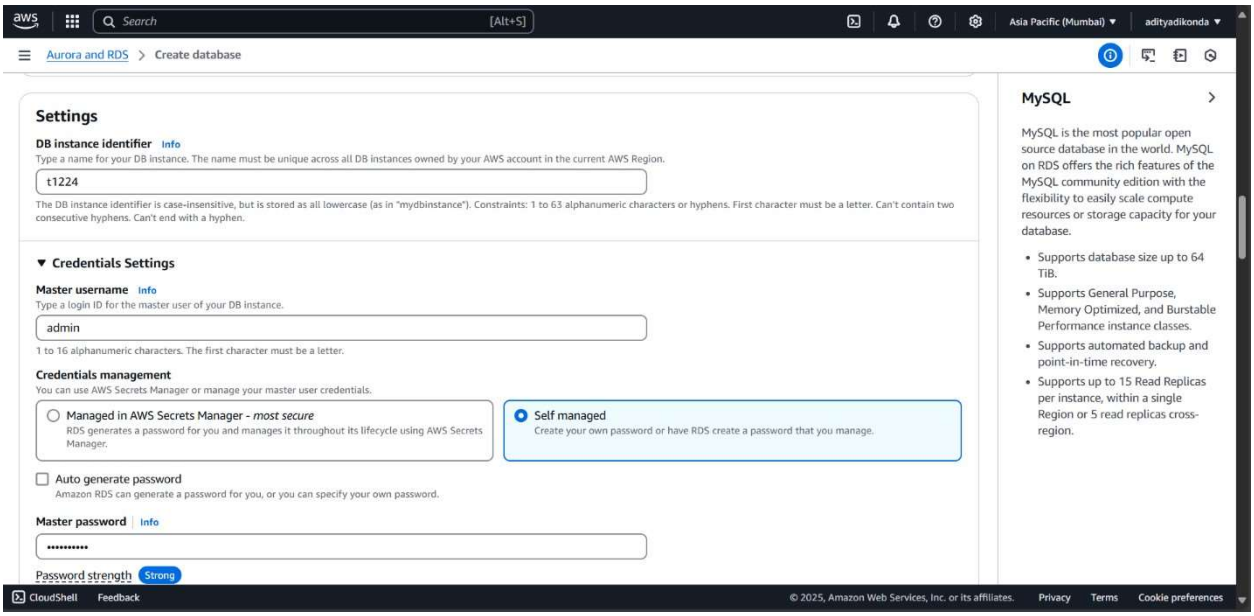
Docker Containers:
Containers are instances of Docker images that are running as isolated processes on a host machine. They are lightweight, portable, and can be easily started, stopped, moved, and deleted. Containers provide a consistent environment for applications to run, regardless of the underlying infrastructure.

Benefits of Docker:
Portability: Docker containers can run on any platform that supports Docker, making it easy to deploy applications across different environments.
Efficiency: Containers share the host OS kernel, reducing overhead and improving resource utilization.
Isolation: Containers provide a level of isolation that helps prevent conflicts between applications and dependencies.
Scalability: Docker enables easy scaling of applications by quickly spinning up additional containers.

Consistency: Docker ensures that applications run the same way in development, testing, and production environments.

Output:




Search [Alt+S]
Asia Pacific (Mumbai)
adityadikonda
Aurora and RDS > Create database
Settings
DB instance identifier Info
Type a name for your DB instance. The name must be unique across all DB instances owned by your AWS account in the current AWS Region.
t1224
The DB instance identifier is case-insensitive, but is stored as all lowercase (as in "mydbinstance"). Constraints: 1 to 63 alphanumeric characters or hyphens. First character must be a letter. Can't contain two consecutive hyphens. Can't end with a hyphen.
▼ Credentials Settings
Master username Info
Type a login ID for the master user of your DB instance.
admin
1 to 16 alphanumeric characters. The first character must be a letter.
Credentials management
You can use AWS Secrets Manager or manage your master user credentials.
Managed in AWS Secrets Manager - most secure
RDS generates a password for you and manages it throughout its lifecycle using AWS Secrets Manager.
Self managed
Create your own password or have RDS create a password that you manage.
Auto generate password
Amazon RDS can generate a password for you, or you can specify your own password.
Master password Info
Password strength Strong
MySQL
MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.
Supports database size up to 64 TiB.
Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
Supports automated backup and point-in-time recovery.
Supports up to 15 Read Replicas per instance, within a single Region or 5 read replicas cross-region.
CloudShell Feedback
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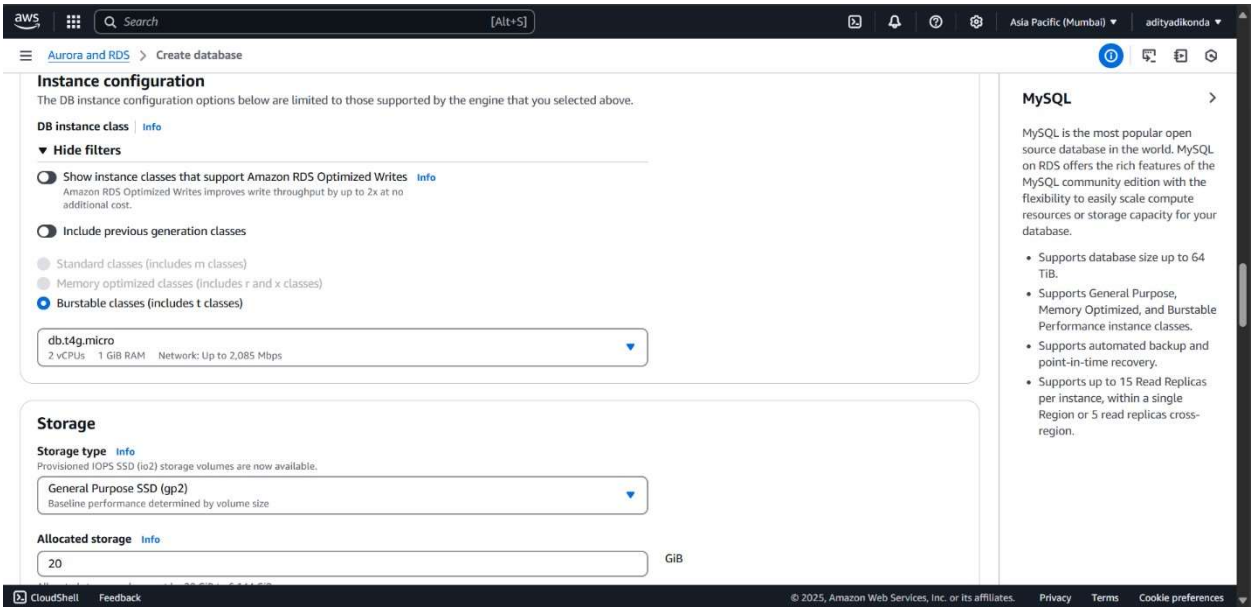
Search [Alt+S]
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Aurora and RDS > Create database
Instance configuration
The DB instance configuration options below are limited to those supported by the engine that you selected above.
DB instance class Info
▼ Hide filters
Show instance classes that support Amazon RDS Optimized Writes Info
Amazon RDS Optimized Writes improves write throughput by up to 2x at no additional cost.
Include previous generation classes
Standard classes (includes m classes)
Memory optimized classes (includes r and x classes)
Burstable classes (includes t classes)
db.t4g.micro
2 vCPUs 1 GiB RAM Network: Up to 2,085 Mbps
Storage
Storage type Info
Provisioned IOPS SSD (io2) storage volumes are now available.
General Purpose SSD (gp2)
Baseline performance determined by volume size
Allocated storage Info
20
GiB
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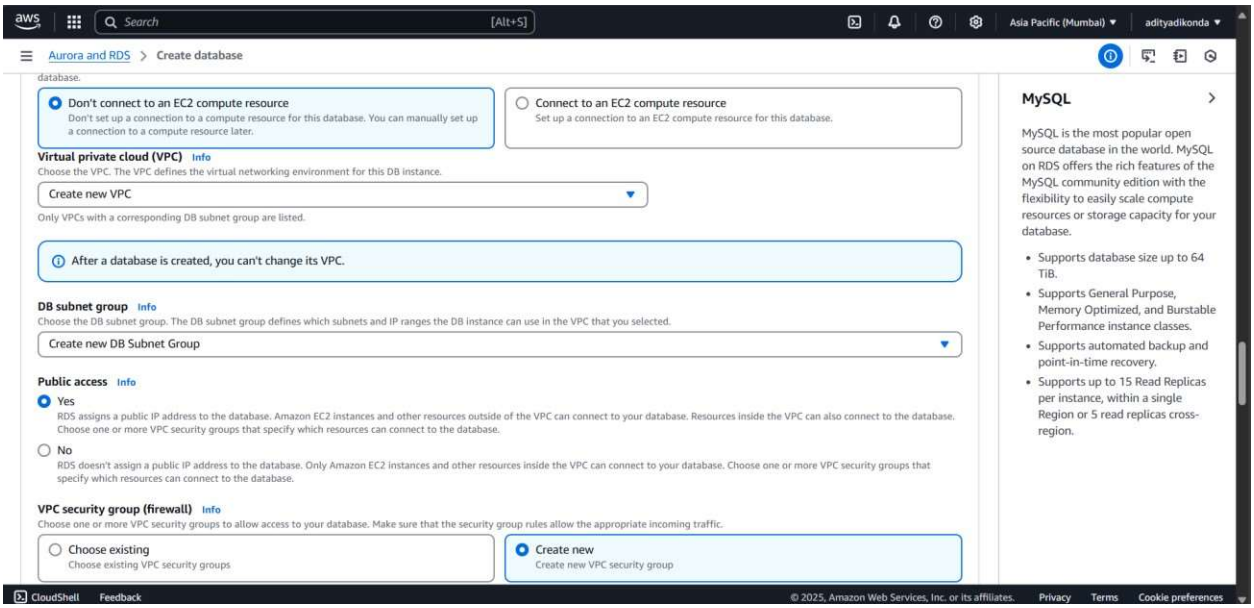
Search [Alt+S]
Asia Pacific (Mumbai)
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Aurora and RDS > Create database
database.
Don't connect to an EC2 compute resource
Don't set up a connection to a compute resource for this database. You can manually set up a connection to a compute resource later.
Connect to an EC2 compute resource
Set up a connection to an EC2 compute resource for this database.
Virtual private cloud (VPC) Info
Choose the VPC. The VPC defines the virtual networking environment for this DB instance.
Create new VPC
Only VPCs with a corresponding DB subnet group are listed.
After a database is created, you can't change its VPC.
DB subnet group Info
Choose the DB subnet group. The DB subnet group defines which subnets and IP ranges the DB instance can use in the VPC that you selected.
Create new DB Subnet Group
Public access Info
Yes
RDS assigns a public IP address to the database. Amazon EC2 instances and other resources outside of the VPC can connect to your database. Resources inside the VPC can also connect to the database. Choose one or more VPC security groups that specify which resources can connect to the database.
No
RDS doesn't assign a public IP address to the database. Only Amazon EC2 instances and other resources inside the VPC can connect to your database. Choose one or more VPC security groups that specify which resources can connect to the database.
VPC security group (firewall) Info
Choose one or more VPC security groups to allow access to your database. Make sure that the security group rules allow the appropriate incoming traffic.
Choose existing
Choose existing VPC security groups
Create new
Create new VPC security group
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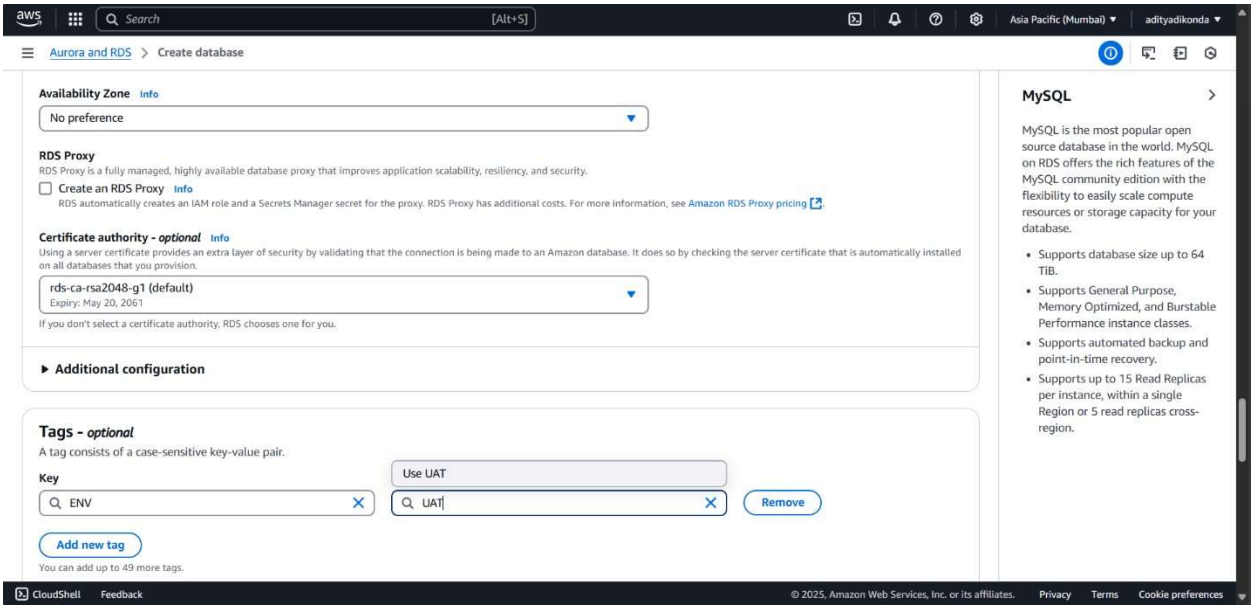
Search [Alt+S]
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Aurora and RDS > Create database
Availability Zone Info
No preference
RDS Proxy
RDS Proxy is a fully managed, highly available database proxy that improves application scalability, resiliency, and security.
Create an RDS Proxy Info
RDS automatically creates an IAM role and a Secrets Manager secret for the proxy. RDS Proxy has additional costs. For more information, see Amazon RDS Proxy pricing
Certificate authority - optional Info
Using a server certificate provides an extra layer of security by validating that the connection is being made to an Amazon database. It does so by checking the server certificate that is automatically installed on all databases that you provision.
rds-ca-rsa2048-g1 (default)
Expiry: May 20, 2061
If you don't select a certificate authority, RDS chooses one for you.
Additional configuration
Tags - optional
A tag consists of a case-sensitive key-value pair.
Key
Use UAT
ENV
UAT
Remove
Add new tag
You can add up to 49 more tags.
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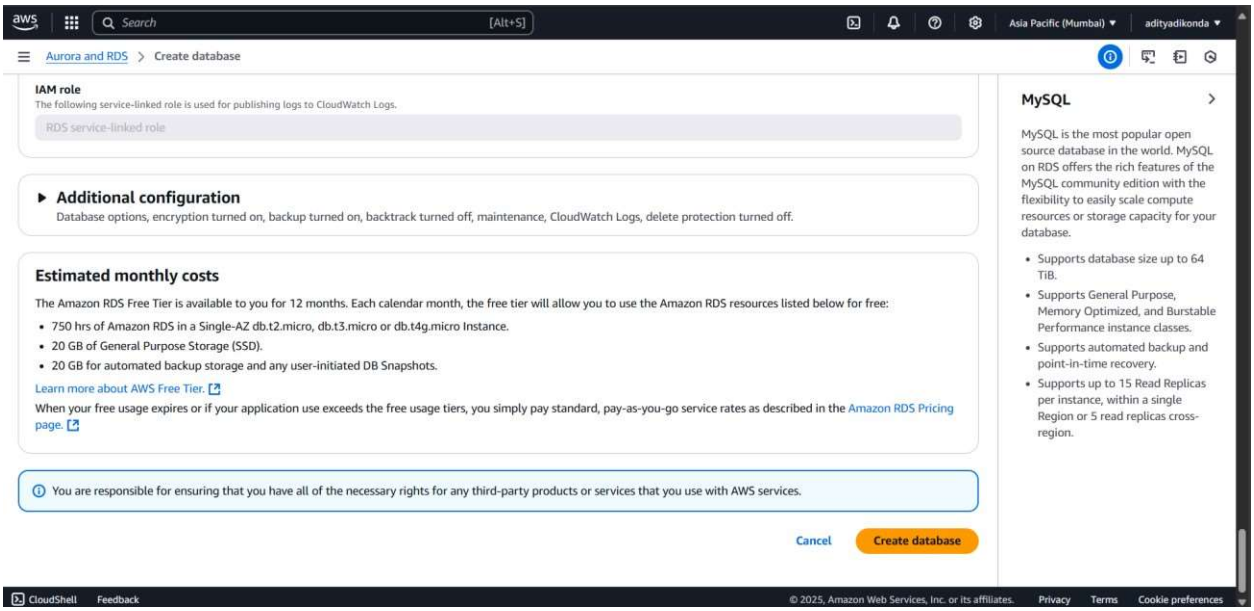
Search [Alt+S]
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Aurora and RDS > Create database
IAM role
The following service-linked role is used for publishing logs to CloudWatch Logs.
RDS service-linked role
Additional configuration
Database options, encryption turned on, backup turned on, backtrack turned off, maintenance, CloudWatch Logs, delete protection turned off.
Estimated monthly costs
The Amazon RDS Free Tier is available to you for 12 months. Each calendar month, the free tier will allow you to use the Amazon RDS resources listed below for free:
750 hrs of Amazon RDS in a Single-AZ db.t2.micro, db.t3.micro or db.t4g.micro Instance.
20 GB of General Purpose Storage (SSD).
20 GB for automated backup storage and any user-initiated DB Snapshots.
Learn more about AWS Free Tier.
When your free usage expires or if your application use exceeds the free usage tiers, you simply pay standard, pay-as-you-go service rates as described in the Amazon RDS Pricing page.
You are responsible for ensuring that you have all of the necessary rights for any third-party products or services that you use with AWS services.
Cancel
Create database
MySQL
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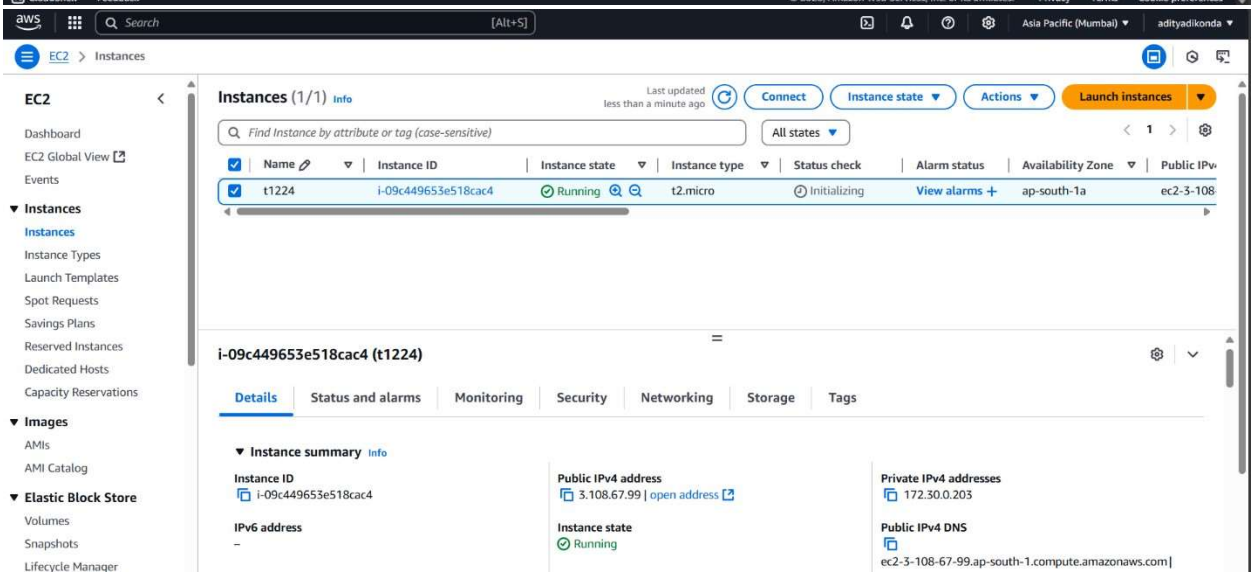
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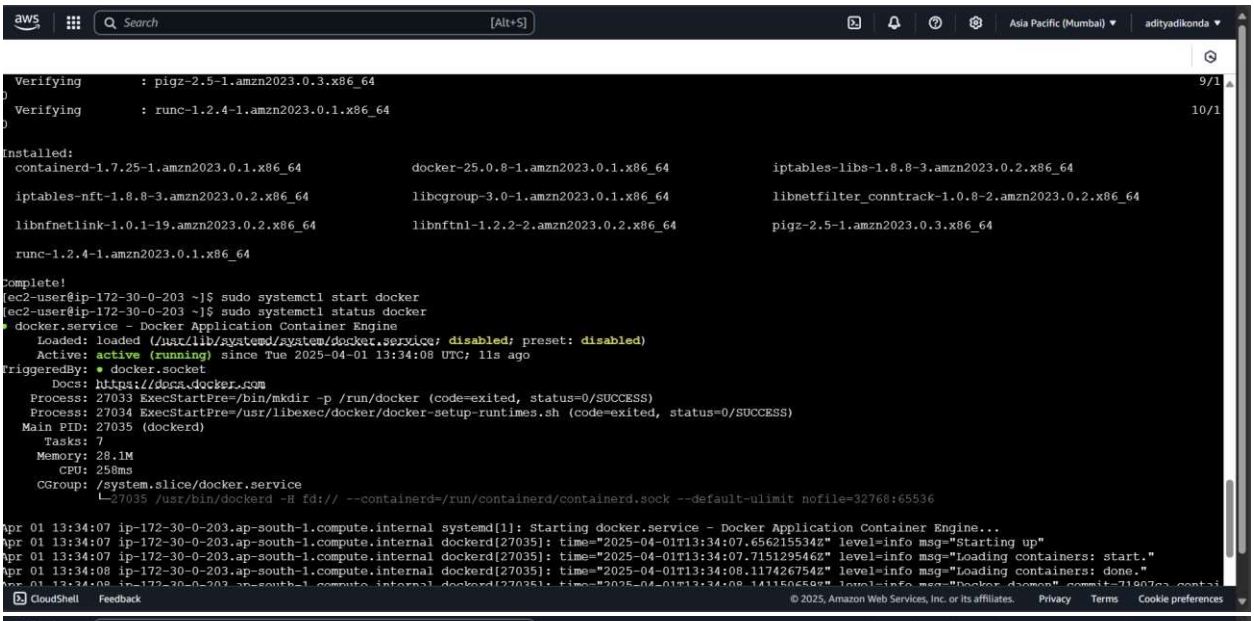
EC2 > Instances
EC2
Dashboard
EC2 Global View
Events
Instances
Instances
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts
Capacity Reservations
Images
AMIs
AMI Catalog
Elastic Block Store
Volumes
Snapshots
Lifecycle Manager
Instances (1/1) Info
Last updated less than a minute ago
Connect
Instance state
Actions
Launch instances
Find Instance by attribute or tag (case-sensitive)
All states
Name
Instance ID
Instance state
Instance type
Status check
Alarm status
Availability Zone
t1224
i-09c449653e518cac4
Running
t2.micro
Initializing
View alarms
ap-south-1a
i-09c449653e518cac4 (t1224)
Details
Status and alarms
Monitoring
Security
Networking
Storage
Tags
Instance summary Info
Instance ID
i-09c449653e518cac4
Public IPv4 address
3.108.67.99 | open address
Private IPv4 addresses
172.30.0.203
IPv6 address
–
Instance state
Running
Public IPv4 DNS
ec2-3-108-67-99.ap-south-1.compute.amazonaws.com

```
[ec2-user@ip-172-30-0-203 ~]$ sudo yum install -y docker
Amazon Linux 2023 Kernel Livepatch repository                                    115 kB/s |  15 kB     00:00

Dependencies resolved.
================================================================================================================
==
 Package                         Architecture          Version                        Repository            Siz
e
================================================================================================================
==
Installing:
 docker                          x86_64                25.0.8-1.amzn2023.0.1          amazonlinux            44
M
Installing dependencies:
 containerd                      x86_64                1.7.25-1.amzn2023.0.1          amazonlinux            36
M
 iptables-libs                   x86_64                1.8.8-3.amzn2023.0.2           amazonlinux           401
k
 iptables-nft                    x86_64                1.8.8-3.amzn2023.0.2           amazonlinux           183
k
 libcgroup                       x86_64                3.0-1.amzn2023.0.1             amazonlinux            75
k
 libnetfilter_conntrack          x86_64                1.0.8-2.amzn2023.0.2           amazonlinux            58
k
 libnfnetlink                    x86_64                1.0.1-19.amzn2023.0.2          amazonlinux            30
k
 libnftnl                        x86_64                1.2.2-2.amzn2023.0.2           amazonlinux            84
k
 pigz                            x86_64                2.5-1.amzn2023.0.3             amazonlinux            83
k
 runc                            x86_64                1.2.4-1.amzn2023.0.1           amazonlinux           3.4
M

Transaction Summary
================================================================================================================
```

```
 runc                            x86_64                1.2.4-1.amzn2023.0.1           amazonlinux           3.4
M

Transaction Summary
================================================================================================================
==
Install  10 Packages

Total download size: 84 M
Installed size: 319 M
Downloading Packages:
(1/10): iptables-libs-1.8.8-3.amzn2023.0.2.x86_64.rpm                            7.3 MB/s | 401 kB     00:00

(2/10): iptables-nft-1.8.8-3.amzn2023.0.2.x86_64.rpm                             7.0 MB/s | 183 kB     00:00

(3/10): libcgroup-3.0-1.amzn2023.0.1.x86_64.rpm                                  3.4 MB/s |  75 kB     00:00

(4/10): libnetfilter_conntrack-1.0.8-2.amzn2023.0.2.x86_64.rpm                   1.3 MB/s |  58 kB     00:00

(5/10): libnfnetlink-1.0.1-19.amzn2023.0.2.x86_64.rpm                            1.3 MB/s |  30 kB     00:00

(6/10): libnftnl-1.2.2-2.amzn2023.0.2.x86_64.rpm                                 3.8 MB/s |  84 kB     00:00

(7/10): pigz-2.5-1.amzn2023.0.3.x86_64.rpm                                       2.7 MB/s |  83 kB     00:00

(8/10): runc-1.2.4-1.amzn2023.0.1.x86_64.rpm                                      24 MB/s | 3.4 MB     00:00

(9/10): containerd-1.7.25-1.amzn2023.0.1.x86_64.rpm                               44 MB/s |  36 MB     00:00

(10/10): docker-25.0.8-1.amzn2023.0.1.x86_64.rpm                                  40 MB/s |  44 MB     00:01

----------------------------------------------------------------------------------------------------------------
--
Total                                                                             74 MB/s |  84 MB     00:01
Running transaction check
```


Search [Alt+S]
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Verifying : pigz-2.5-1.amzn2023.0.3.x86_64 9/1
Verifying : runc-1.2.4-1.amzn2023.0.1.x86_64 10/1
Installed:
containerd-1.7.25-1.amzn2023.0.1.x86_64 docker-25.0.8-1.amzn2023.0.1.x86_64 iptables-libs-1.8.8-3.amzn2023.0.2.x86_64
iptables-nft-1.8.8-3.amzn2023.0.2.x86_64 libcgroup-3.0-1.amzn2023.0.1.x86_64 libnetfilter_conntrack-1.0.8-2.amzn2023.0.2.x86_64
libnfnetlink-1.0.1-19.amzn2023.0.2.x86_64 libnftnl-1.2.2-2.amzn2023.0.2.x86_64 pigz-2.5-1.amzn2023.0.3.x86_64
runc-1.2.4-1.amzn2023.0.1.x86_64
Complete!
[ec2-user@ip-172-30-0-203 ~]$ sudo systemctl start docker
[ec2-user@ip-172-30-0-203 ~]$ 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 Tue 2025-04-01 13:34:08 UTC; 11s ago
TriggeredBy: docker.socket
Docs: https://docs.docker.com
Process: 27033 ExecStartPre=/bin/mkdir -p /run/docker (code=exited, status=0/SUCCESS)
Process: 27034 ExecStartPre=/usr/libexec/docker/docker-setup-runtimes.sh (code=exited, status=0/SUCCESS)
Main PID: 27035 (dockerd)
Tasks: 7
Memory: 28.1M
CPU: 258ms
CGroup: /system.slice/docker.service
└─27035 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock --default-ulimit nofile=32768:65536
Apr 01 13:34:07 ip-172-30-0-203.ap-south-1.compute.internal systemd[1]: Starting docker.service - Docker Application Container Engine...
Apr 01 13:34:07 ip-172-30-0-203.ap-south-1.compute.internal dockerd[27035]: time="2025-04-01T13:34:07.656215534Z" level=info msg="Starting up"
Apr 01 13:34:07 ip-172-30-0-203.ap-south-1.compute.internal dockerd[27035]: time="2025-04-01T13:34:07.715129546Z" level=info msg="Loading containers: start."
Apr 01 13:34:08 ip-172-30-0-203.ap-south-1.compute.internal dockerd[27035]: time="2025-04-01T13:34:08.117426754Z" level=info msg="Loading containers: done."
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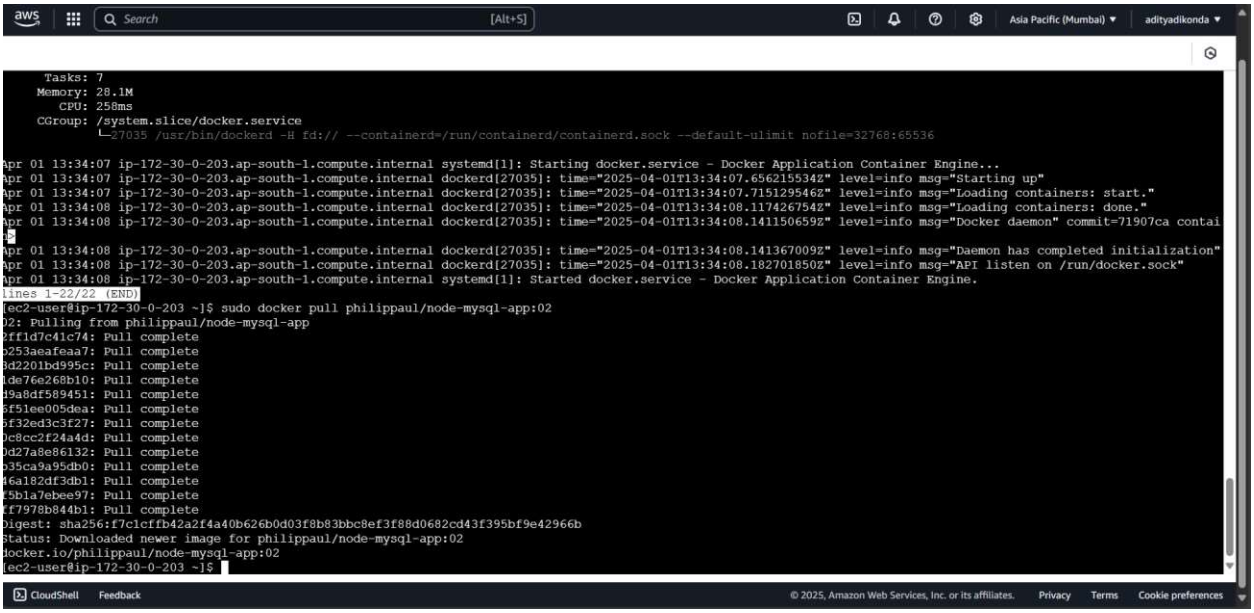
Search [Alt+S]
Asia Pacific (Mumbai)
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Tasks: 7
Memory: 28.1M
CPU: 258ms
CGroup: /system.slice/docker.service
└─27035 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock --default-ulimit nofile=32768:65536
Apr 01 13:34:07 ip-172-30-0-203.ap-south-1.compute.internal systemd[1]: Starting docker.service - Docker Application Container Engine...
Apr 01 13:34:07 ip-172-30-0-203.ap-south-1.compute.internal dockerd[27035]: time="2025-04-01T13:34:07.656215534Z" level=info msg="Starting up"
Apr 01 13:34:07 ip-172-30-0-203.ap-south-1.compute.internal dockerd[27035]: time="2025-04-01T13:34:07.715129546Z" level=info msg="Loading containers: start."
Apr 01 13:34:08 ip-172-30-0-203.ap-south-1.compute.internal dockerd[27035]: time="2025-04-01T13:34:08.117426754Z" level=info msg="Loading containers: done."
Apr 01 13:34:08 ip-172-30-0-203.ap-south-1.compute.internal dockerd[27035]: time="2025-04-01T13:34:08.141150659Z" level=info msg="Docker daemon" commit=71907ca contai
Apr 01 13:34:08 ip-172-30-0-203.ap-south-1.compute.internal dockerd[27035]: time="2025-04-01T13:34:08.141367009Z" level=info msg="Daemon has completed initialization"
Apr 01 13:34:08 ip-172-30-0-203.ap-south-1.compute.internal dockerd[27035]: time="2025-04-01T13:34:08.182701850Z" level=info msg="API listen on /run/docker.sock"
Apr 01 13:34:08 ip-172-30-0-203.ap-south-1.compute.internal systemd[1]: Started docker.service - Docker Application Container Engine.
lines 1-22/22 (END)
[ec2-user@ip-172-30-0-203 ~]$ sudo docker pull philippaul/node-mysql-app:02
02: Pulling from philippaul/node-mysql-app
2ff1d7c41c74: Pull complete
6253aeafeaa7: Pull complete
8d2201bd995c: Pull complete
1de76e268b10: Pull complete
19a8df589451: Pull complete
6f51ee005dea: Pull complete
6f32ed3c3f27: Pull complete
0c8cc2f24a4d: Pull complete
0d27a8e86132: Pull complete
035ca9a95db0: 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-172-30-0-203 ~]$
CloudShell Feedback
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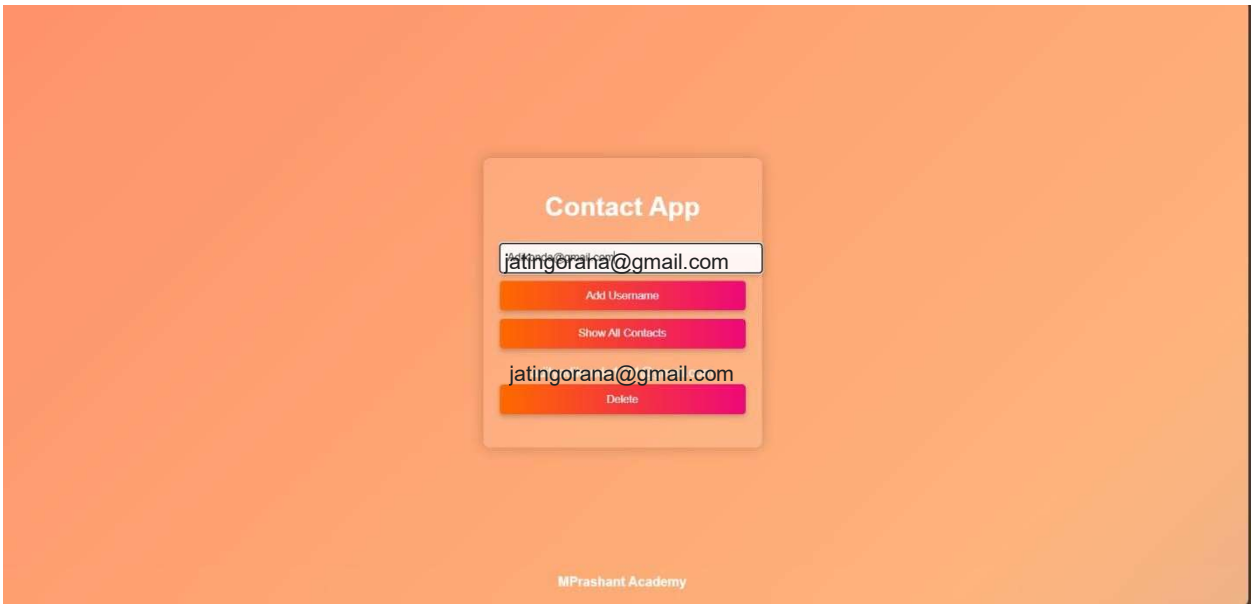
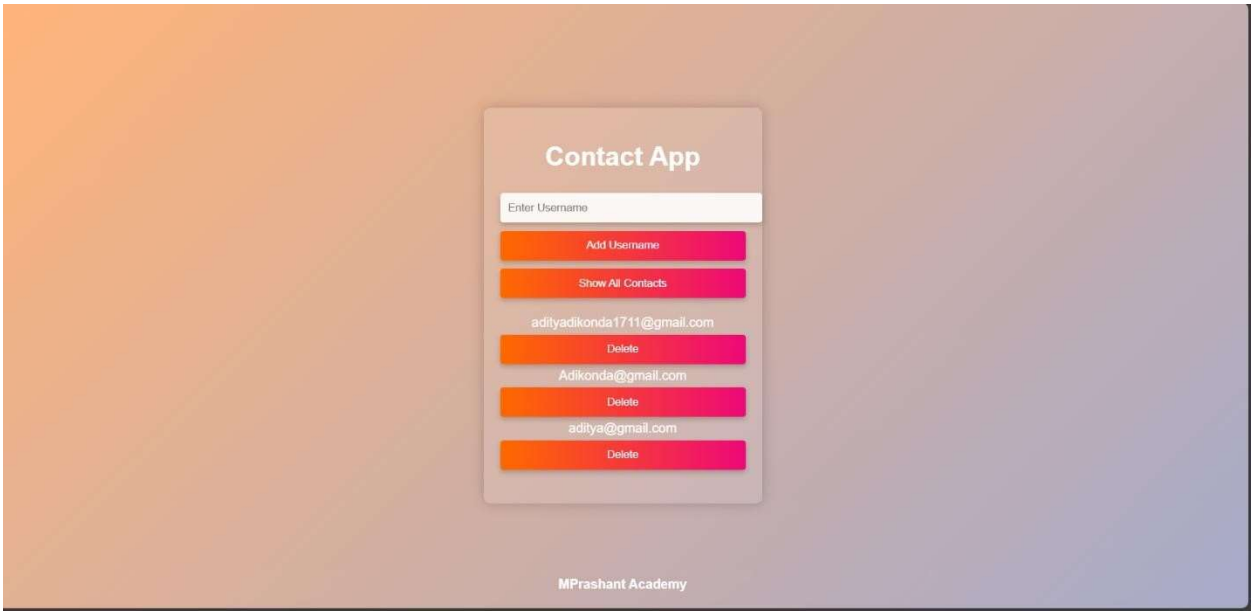
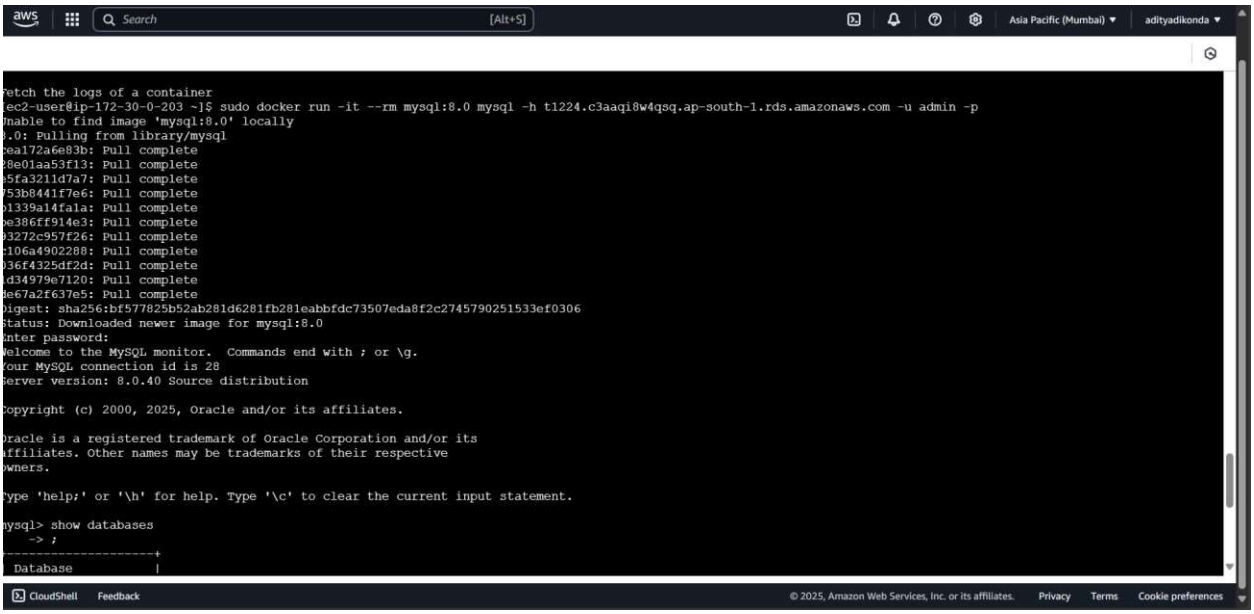

Contact App
jatingorana@gmail.com
Add Username
Show All Contacts
jatingorana@gmail.com
Delete
MPrashant Academy


Contact App
Enter Username
Add Username
Show All Contacts
adityadikonda1711@gmail.com
Delete
Adikonda@gmail.com
Delete
aditya@gmail.com
Delete
MPrashant Academy


aws
Search
[Alt+S]
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fetch the logs of a container
[ec2-user@ip-172-30-0-203 ~]$ sudo docker run -it --rm mysql:8.0 mysql -h t1224.c3aaqi8w4qsq.ap-south-1.rds.amazonaws.com -u admin -p
Unable to find image 'mysql:8.0' locally
8.0: Pulling from library/mysql
ea172a6e83b: Pull complete
28e01aa53f13: Pull complete
95fa3211d7a7: Pull complete
753b8441f7e6: Pull complete
51339a14fa1a: Pull complete
3e386ff914e3: Pull complete
93272c957f26: Pull complete
2106a4902288: Pull complete
036f4325df2d: Pull complete
1d34979e7120: Pull complete
de67a2f637e5: Pull complete
Digest: sha256:bf577825b52ab281d6281fb281eabbfdc73507eda8f2c2745790251533ef0306
Status: Downloaded newer image for mysql:8.0
Enter password:
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 28
Server version: 8.0.40 Source distribution
Copyright (c) 2000, 2025, Oracle and/or its affiliates.
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> show databases
-> ;
+--------------------+
| Database |
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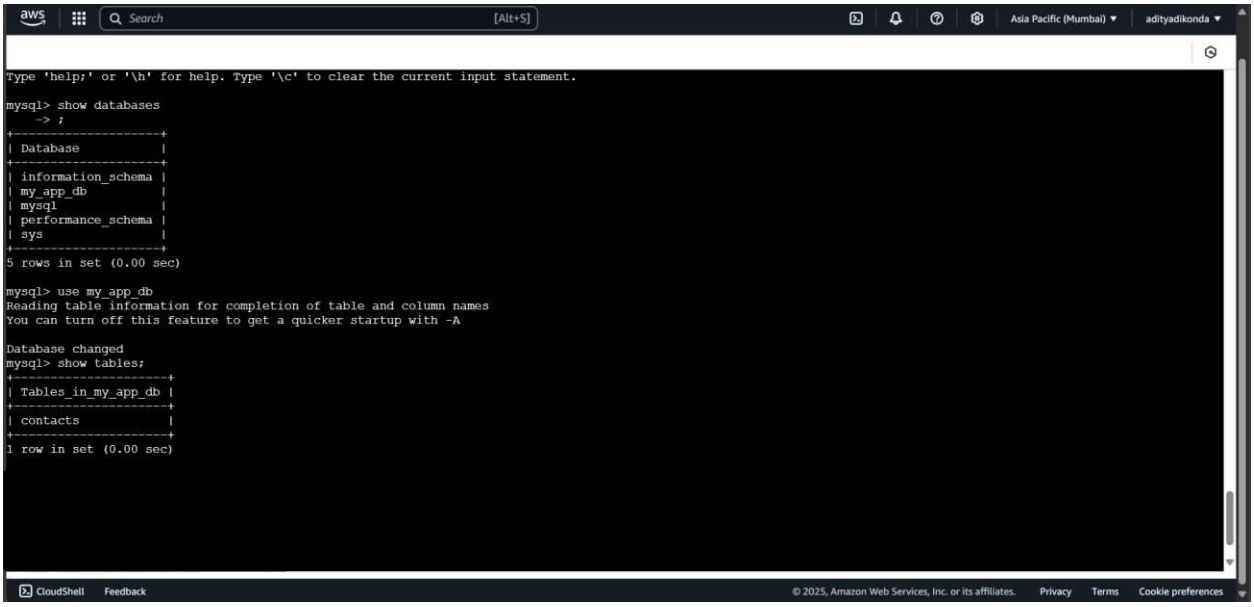
aws
Search
[Alt+S]
Asia Pacific (Mumbai)
adityadikonda
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.
mysql> show databases
-> ;
+--------------------+
| Database |
+--------------------+
| information_schema |
| my_app_db |
| mysql |
| performance_schema |
| sys |
+--------------------+
5 rows in set (0.00 sec)
mysql> use my_app_db
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A
Database changed
mysql> show tables;
+----------------------+
| Tables_in_my_app_db |
+----------------------+
| contacts |
+----------------------+
1 row in set (0.00 sec)
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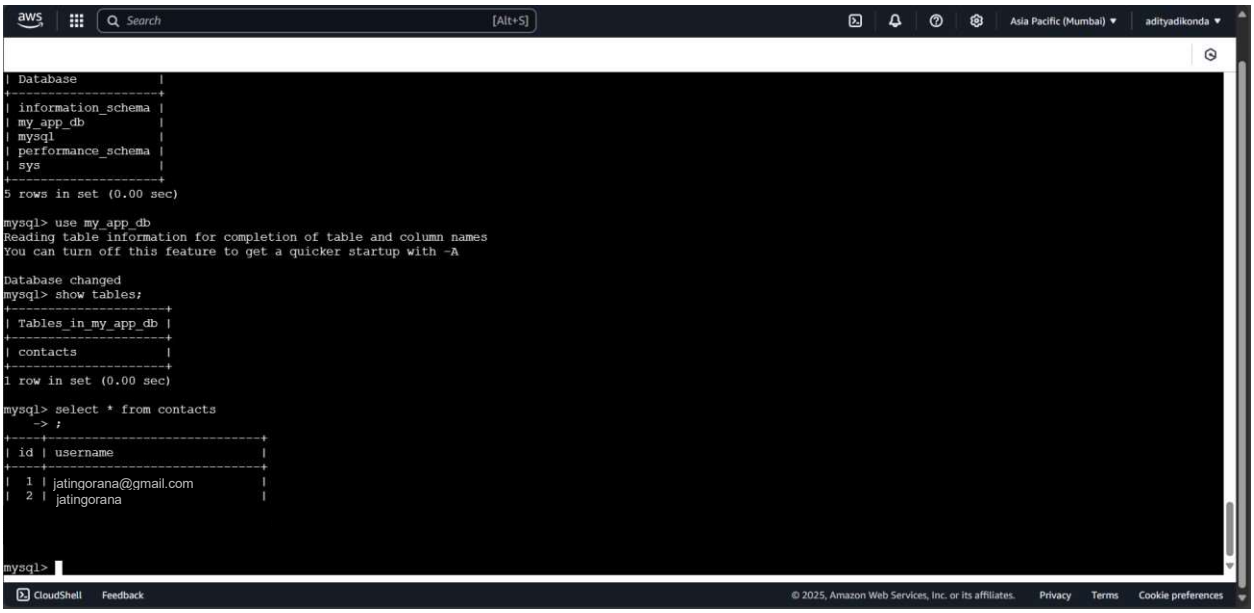

Conclusion:

Docker revolutionizes the software development and deployment process by providing a powerful platform for containerization. By encapsulating applications and their dependencies into lightweight, portable containers,