

Aim -

To study and implement Database as a Service on SQL/ NoSQL databases like AWS RDS, Azure SQL, MongoDB or Firebase.

Theory -

What is Database as a Service(DBaaS)?

Database as a Service (DBaaS) is a cloud-based service model that provides users with access to a managed database system, eliminating the need for users to set up, configure, and maintain their own database infrastructure. In a DBaaS model, the cloud service provider handles tasks such as provisioning, scaling, backup, security, and maintenance of the database, allowing users to focus on their applications and data management tasks.

Advantages of DBaaS:

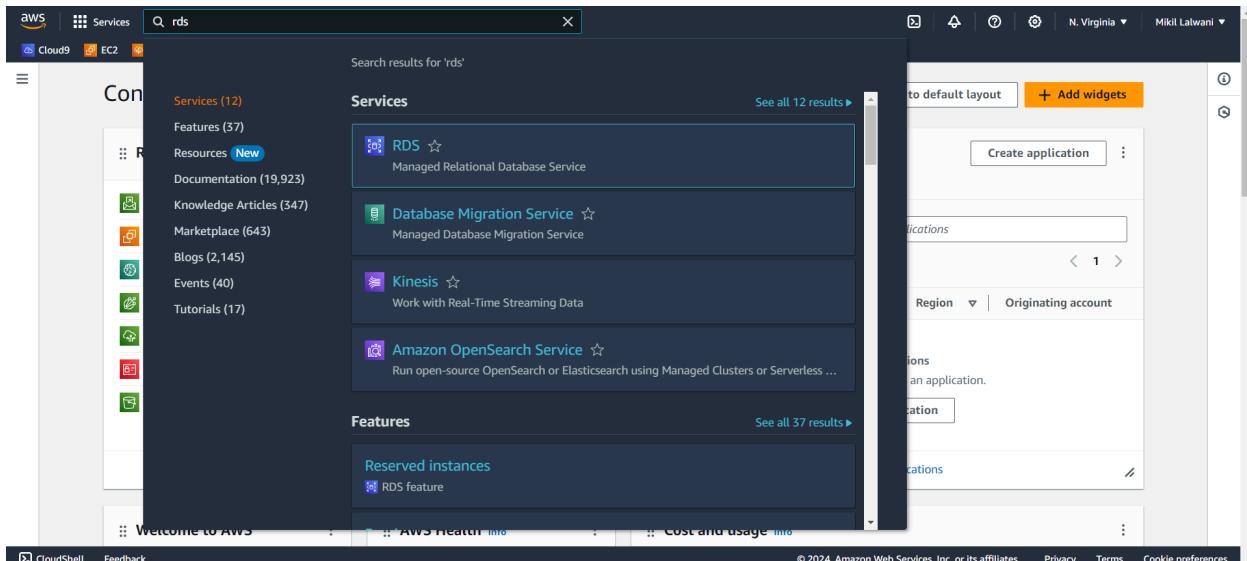
- Reduced Management Overhead: DBaaS eliminates the need for users to manage the underlying infrastructure, including hardware provisioning, software installation, patching, and maintenance, which reduces administrative overhead and allows organizations to focus on their core business activities.
- Scalability: DBaaS platforms typically offer scalability features that allow users to easily scale their database resources up or down based on demand. This elasticity enables organizations to accommodate fluctuating workloads and scale their database resources cost-effectively.
- High Availability and Fault Tolerance: Many DBaaS providers offer built-in high availability and fault tolerance features, such as automated failover, data replication, and backups, to ensure continuous availability and data protection.
- Cost Efficiency: DBaaS often follows a pay-as-you-go pricing model, where users only pay for the resources they consume. This can result in cost savings compared to traditional on-premises database deployments, as users are not required to invest in upfront hardware and infrastructure costs.
- Faster Time to Market: DBaaS platforms streamline the database provisioning process, allowing users to quickly deploy and configure databases without the need for lengthy setup and configuration tasks. This accelerates the development and deployment of applications, reducing time to market.

Disadvantages of DBaaS:

- Limited Control: With DBaaS, users relinquish some level of control over the database infrastructure to the service provider. This lack of control may be a concern for organizations with specific security, compliance, or customization requirements.
- Data Security and Privacy Risks: Storing sensitive data in a third-party cloud environment raises concerns about data security and privacy. Organizations must carefully evaluate the security measures implemented by DBaaS providers to ensure compliance with regulatory requirements and protect their data from unauthorized access and breaches.
- Vendor Lock-In: Migrating data between different DBaaS providers or transitioning from DBaaS to an on-premises deployment may be challenging and costly, leading to vendor lock-in. Organizations should consider the long-term implications of vendor lock-in and evaluate strategies to mitigate this risk.
- Performance and Latency: Performance and latency issues may arise in DBaaS environments, particularly in multi-tenant deployments where resources are shared among multiple users. Organizations should assess the performance characteristics of DBaaS offerings and ensure they meet their performance requirements before migration.
- Dependency on Internet Connectivity: DBaaS relies on internet connectivity for accessing and managing database resources, which may pose challenges in environments with limited or unreliable internet connectivity. Organizations should consider the potential impact of internet outages or disruptions on their database operations and implement contingency plans accordingly.

Procedure -

Step1 : Login to aws console and search RDS.



Step2: Click on to RDS and create database

Amazon RDS

Introducing Aurora I/O-Optimized
Aurora's I/O-Optimized is a new cluster storage configuration that offers predictable pricing for all applications and improved price-performance, with up to 40% cost savings for I/O-intensive applications.

Create database

Or, [Restore Multi-AZ DB Cluster from Snapshot](#)

Resources

You are using the following Amazon RDS resources in the US East (N. Virginia) region (used/quota)

DB Instances (0/40)	Parameter groups (0)
Allocated storage (0 TB/100 TB)	Default (0)
Increase DB instances limit	Custom (0/100)
DB Clusters (0/40)	Option groups (0)
Reserved instances (0/40)	Default (0)
Snapshots (0)	Custom (0/20)
Manual	Subnet groups (0/50)

Recommended for you

- Time-Series Tables in PostgreSQL**
Step-by-step guide to design high-performance time series data tables on Amazon RDS for PostgreSQL. [Learn more](#)
- Amazon RDS Backup and Restore using AWS Backup**
Learn how to backup and restore Amazon RDS databases using AWS Backup in just 10 minutes. [Learn more](#)

Step 3: Select standard database

RDS > Create database

Create database

Choose a database creation method

Standard create
You set all of the configuration options, including ones for availability, security, backups, and maintenance.

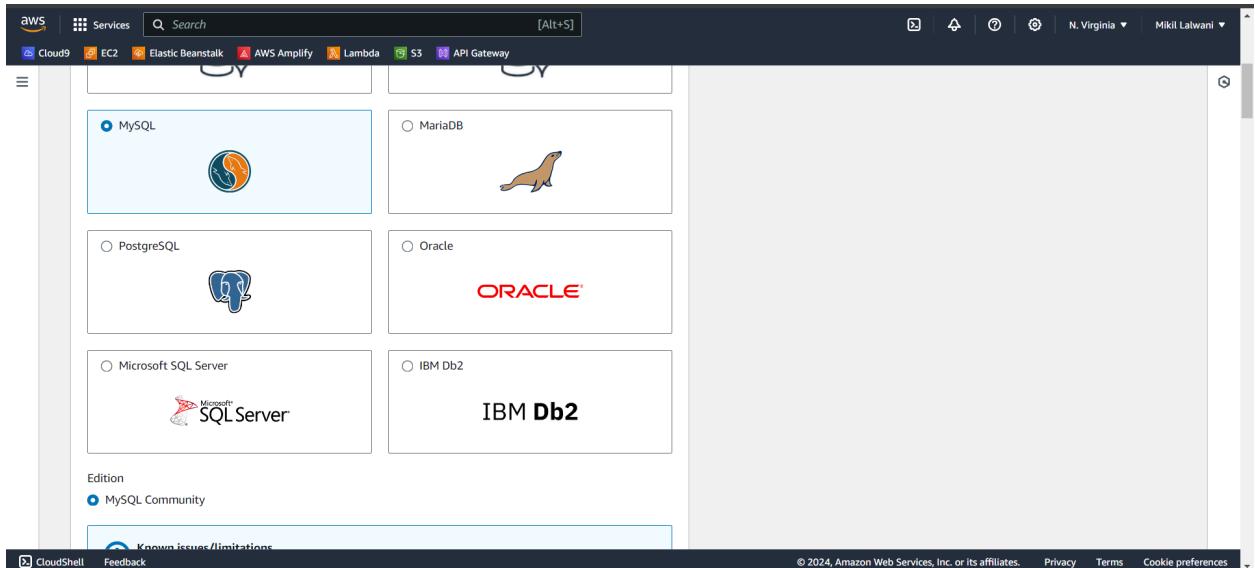
Easy create
Use recommended best-practice configurations. Some configuration options can be changed after the database is created.

MySQL

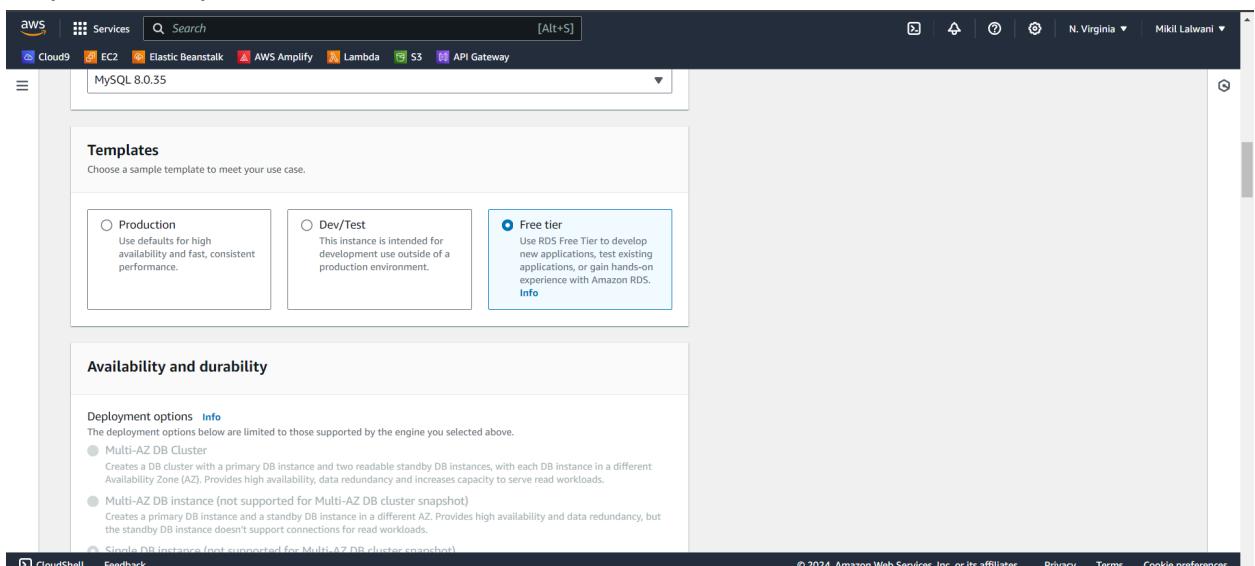
MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.

- Supports database size up to 64 TiB.
- Supports General Purpose, Memory Optimized, and

Step 4: Select MySQL and MySQL Community edition



Step 5: In Templates select Free tier.



Step 6: Mention database name (default is database1) and username and password

Screenshot of the AWS RDS instance creation wizard, Step 6: Set instance identifier.

DB instance identifier: 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.

Credentials Settings

Master username: Type a login ID for the master user of your DB instance.

Manage master credentials in AWS Secrets Manager Manage master user credentials in Secrets Manager. RDS can generate a password for you and manage it throughout its lifecycle.

If you manage the master user credentials in Secrets Manager, some RDS features aren't supported. [Learn more](#)

Auto generate a password Amazon RDS can generate a password for you, or you can specify your own password.

Master password:

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Step 7: Instance is t2.micro

Screenshot of the AWS RDS instance configuration page, Step 7: Instance configuration.

Instance configuration

The DB instance configuration options below are limited to those supported by the engine that you selected above.

DB instance class: 1 vCPUs 1 GiB RAM Not EBS Optimized

Show instance classes that support Amazon RDS Optimized Writes 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)

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The screenshot shows the 'Storage' configuration section of the AWS RDS setup. It includes fields for 'Allocated storage' (set to 20 GiB) and a note about storage optimization. A warning box states: 'After you modify the storage for a DB instance, the status of the DB instance will be in storage-optimization. Your instance will remain available as the storage-optimization operation completes.' Below this is the 'Storage autoscaling' section, which is currently disabled. A note says: 'Provides dynamic scaling support for your database's storage based on your application's needs.' A checked checkbox for 'Enable storage autoscaling' has a note: 'Enabling this feature will allow the storage to increase after the specified threshold is exceeded.' At the bottom are 'Maximum storage threshold' and other standard AWS footer links.

Step 8: Select Public Access - Yes

The screenshot shows the 'Virtual private cloud (VPC)' configuration section. It lists the 'Default VPC' (vpc-06f870b50074eb753) with 6 subnets and 6 availability zones. A note says: 'After a database is created, you can't change its VPC.' Below this is the 'DB subnet group' section, which is set to 'default'. Under 'Public access', the 'Yes' radio button is selected, with a note explaining that RDS assigns a public IP address and allows external connections. The 'No' option is also shown. At the bottom is the 'VPC security group (firewall)' section, with a note about choosing security groups for incoming traffic. The 'Choose existing' radio button is selected. The AWS footer links are visible at the bottom.

The screenshot shows the 'Database authentication' section of the AWS RDS configuration interface. It includes options for Password authentication (selected), Password and IAM database authentication, and Password and Kerberos authentication. Below this is a 'Monitoring' section with an unchecked checkbox for 'Enable Enhanced Monitoring'. A 'Additional configuration' section contains a note about database options like backup turned on, backtrack turned off, maintenance, CloudWatch Logs, and delete protection. At the bottom is an 'Estimated Monthly costs' section.

Step 9: Click on to create Database

The screenshot shows the 'Estimated monthly costs' section of the AWS RDS configuration interface. It provides information about the Amazon RDS Free Tier and lists free usage tiers: 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), and 20 GB for automated backup storage and any user-initiated DB Snapshots. A note states that billing estimates are based on standard usage of the service in Amazon RDS Pricing. A warning box notes that users are responsible for ensuring necessary rights for third-party products or services. At the bottom are 'Cancel' and 'Create database' buttons.

Step 10: It will take some time

Step 11: Go to google type mysql workbench

Step 12: Click on to download. MySQL community download – Microsoft Windows

④ MySQL Community Downloads

◀ MySQL Workbench

The screenshot shows the MySQL Community Downloads page. At the top, there are tabs for "General Availability (GA) Releases" (which is selected), "Archives", and a search icon. Below the tabs, it says "MySQL Workbench 8.0.36". A dropdown menu for "Select Operating System" is set to "Microsoft Windows". A "Recommended Download" section features a thumbnail for the "MySQL Installer for Windows" which includes "All MySQL Products. For All Windows Platforms. In One Package." and a "Windows (x86, 32 & 64-bit), MySQL Installer MSI" link with a "Go to Download Page" button. There is also a "Go to MySQL Workbench Download Page" link.

Step 13: Click on to – No thanks , just download

④ MySQL Community Downloads

Login Now or Sign Up for a free account.

An Oracle Web Account provides you with the following advantages:

- Fast access to MySQL software downloads
- Download technical White Papers and Presentations
- Post messages in the MySQL Discussion Forums
- Report and track bugs in the MySQL bug system

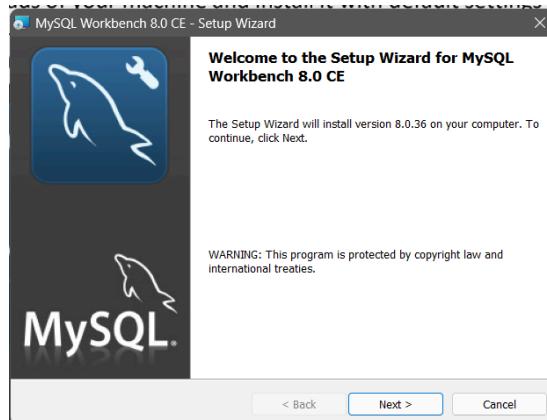
The screenshot shows the MySQL login/signup page. It has two main buttons: "Login » using my Oracle Web account" (blue background) and "Sign Up » for an Oracle Web account" (green background). Below the buttons, a note states: "MySQL.com is using Oracle SSO for authentication. If you already have an Oracle Web account, click the Login link. Otherwise, you can signup for a free account by clicking the Sign Up link and following the instructions."

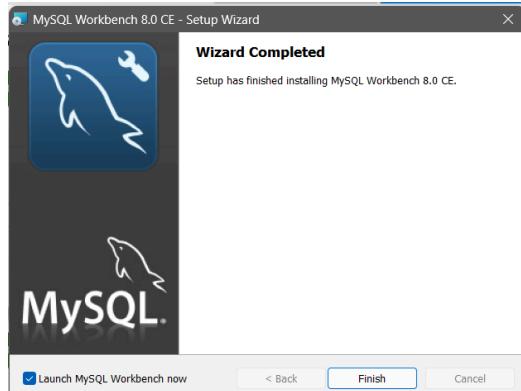
No thanks, just start my download.

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Step 14: Go to downloads of your machine and install it with default settings





Check your database is created and status is available

A screenshot of the AWS RDS Databases page. A green success message at the top states "Successfully created database database-1" and "You can use settings from database-1 to simplify configuration of suggested database add-ons while we finish creating your DB for you." Below this, the "Databases (1)" table shows one entry: "database-1" (Available, Instance: MySQL Community, Region & AZ: us-east-1b, Engine: db.t2.micro). There are buttons for "View connection details", "Modify", "Actions", "Restore from S3", and "Create database".

Step 16: Click on to database

A screenshot of the AWS RDS Databases page, identical to the previous one but with the row for "database-1" highlighted in blue. This indicates that the user has clicked on the database to view its details.

Step 17: Copy Endpoint

The screenshot shows the 'Amazon RDS' service in the AWS Management Console. On the left, there's a sidebar with options like 'Dashboard', 'Databases', 'Query Editor', etc. The main panel is titled 'Connectivity & security'. It has three tabs: 'Endpoint & port', 'Networking', and 'Security'. Under 'Endpoint & port', the endpoint is listed as 'database-1.cfsyycuobzo.us-east-1.rds.amazonaws.com' and the port as '3306'. Under 'Networking', it shows the VPC 'vpc-06f870b50074eb753' and subnet group 'default-vpc-06f870b50074eb753'. Under 'Security', it lists VPC security groups ('default sg-054158c5a4acffe43 Active'), public accessibility ('Yes'), certificate authority ('rds-ca-rsa2048-g1'), and DB instance certificate expiration date ('March 14, 2025, 17:48 (UTC+05:30)').

Step 18: Go back to workbench

Step 19: Click on to mysql connection

Step 20: Paste copied endpoint in Hostname

Connection Name : database-1

Username : admin

Click on to Test Connection

The screenshot shows the MySQL Workbench interface. On the left, there's a sidebar with 'MySQL Connections' and a list of local instances. The main area is titled 'Welcome to MySQL Workbench' and shows the 'Setup New Connection' dialog. The 'Connection Name' is set to 'database-1'. The 'Connection Method' is 'Standard (TCP/IP)'. The 'Parameters' tab is selected, showing 'Hostname: 127.0.0.1', 'Port: 3306', 'Username: root', and 'Password:'. There are buttons for 'Store in Vault...', 'Clear', and 'OK'. At the bottom right of the dialog are 'Test Connection', 'Cancel', and 'OK' buttons.

Step 21: Go to vpc security group

The screenshot shows the 'Amazon RDS' service in the AWS Management Console. The left sidebar has 'Databases' selected. The main pane is titled 'Connectivity & security'. It displays the following details:

Endpoint & port	Networking	Security
Endpoint database-1.cfsyycuobzo.us-east-1.rds.amazonaws.com	Availability Zone us-east-1b	VPC security groups default (sg-054158c3a4acffe43) Active
Port 3306	VPC	Publicly accessible Yes
	Subnet group default-vpc-06f870b50074eb753	Certificate authority Info rds-ca-rsa2048-g1
	Subnets subnet-007d7dc04e028299b subnet-0f107aa4b29230a12 subnet-0b250d7d437dafcba subnet-010cd9e6109642126 subnet-08c7b710e5ed8910b subnet-03106f49858dff013	Certificate authority date May 26, 2061, 05:04 (UTC+05:30)
	Network type IPv4	DB instance certificate expiration date March 14, 2025, 17:48 (UTC+05:30)

Step 22: Click on to inbound rules

The screenshot shows the 'EC2 Dashboard' service in the AWS Management Console. The left sidebar has 'Instances' selected. The main pane is titled 'Security Groups (1/1)'. It shows one security group named 'default' with the ID 'sg-054158c3a4acffe43'. Below it, the 'Inbound rules (2)' section is shown:

Name	Security group rule...	IP version	Type	Protocol	Port range
sgr-0e7e0181bdb24ee8c	IPv4	MySQL/Aurora	TCP	3306	

Step 23: First select Click on to Edit inbound rule add rule select ipv4 --all traffic (add 0.0.0.0/0) and save Rules
(important step to add inbound rule)

The screenshot shows the AWS Management Console with the URL [https://console.aws.amazon.com/ec2/v2/home?#SecurityGroups:sg-054158c3a4acffe43/EditInboundRules](#). The page title is "Edit inbound rules". It displays two inbound rules for a security group:

- Rule 1: Type: MySQL/Aurora, Protocol: TCP, Port range: 3306, Source: Custom (120.88.42.237/32), Description: optional.
- Rule 2: Type: All traffic, Protocol: All, Port range: All, Source: Anywhere (0.0.0.0/0), Description: optional.

A warning message at the bottom states: "⚠️ Rules with source of 0.0.0.0/0 or ::/0 allow all IP addresses to access your instance. We recommend setting security group rules to allow access from known IP addresses only." The footer includes links for CloudShell, Feedback, and cookie preferences.

Step 24: Goto workbench (after giving details click on to Test Connection)

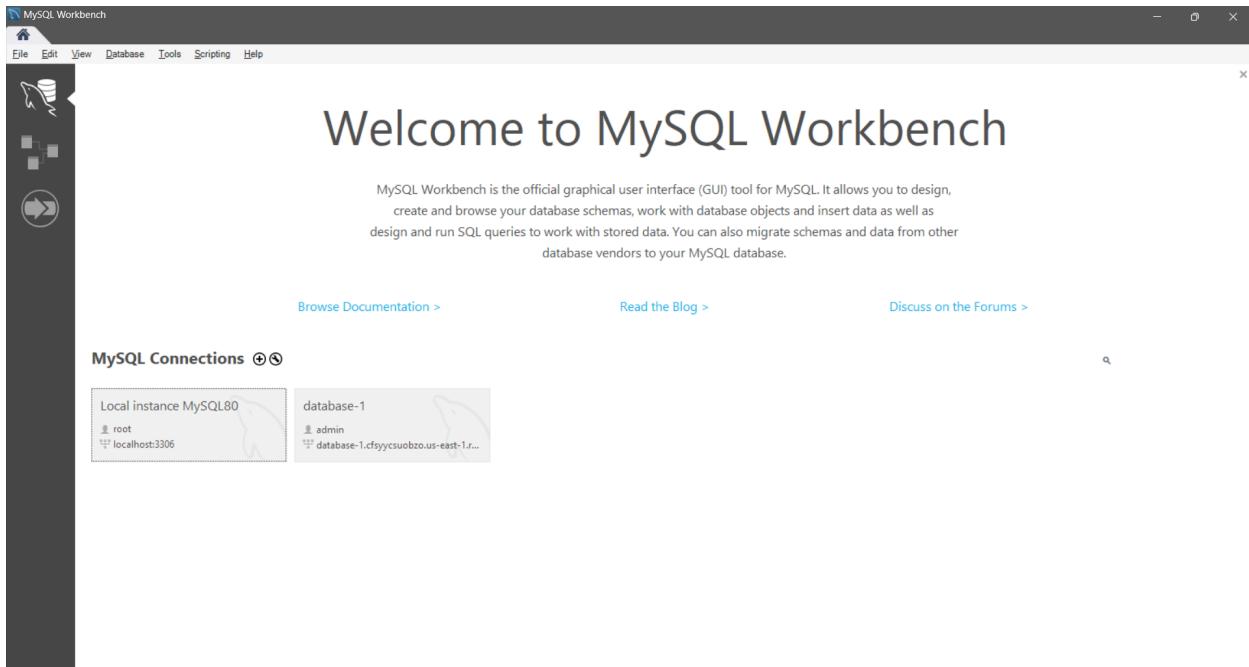
The screenshot shows the MySQL Workbench interface. A modal dialog titled "Setup New Connection" is open, displaying the following connection details:

- Connection Name: database-1
- Connection Method: Standard (TCP)
- Parameters: SSL Advanced
- Hostname: database-1.cfssyccsubzo.us-east-1.rds.amazonaws.com
- Username: admin
- Password: Store in Vault
- Default Schema:

The modal also shows a success message: "Successfully made the MySQL connection" and "Information related to this connection: Host: database-1.cfssyccsubzo.us-east-1.rds.amazonaws.com, Port: 3306, User: admin, SSL enabled with TLS_AES_128_GCM_SHA256". At the bottom right of the modal are "OK" and "Cancel" buttons.

Click on Ok button

Go to workbench double click on connection(database-1)



Step 25: Write query and execute
Create a database, and perform CRUD operations.

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Schemas

No object selected

Administration Schemas

No object selected

Object Info Session

Query 1 -

1

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Schemas

No object selected

Administration Schemas

No object selected

Object Info Session

Query 1 -

```
1 • create database mikil;
2 • use mikil;
```

Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Output:

Action Output	Time	Action	Message	Duration / Fetch
1 18:13:02	create database mikil	1 row(s) affected	0.203 sec	
2 18:13:02	use mikil	0 row(s) affected	0.203 sec	

Context Help Snippets

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Navigator: SCHEMAS Filter objects sys

Query 1 x

```
1 create table student( roll int, name varchar(10), city varchar(10));
```

SQLAdditions... Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Administration Schemas

No object selected

Object Info Session

Action Output

#	Time	Action	Message	Duration / Fetch
1	18:13:02	create database mkl	1 row(s) affected	0.203 sec
2	18:13:02	use mkl	0 row(s) affected	0.203 sec
3	18:13:28	create table student(roll int, name varchar(10), city varchar(10))	0 row(s) affected	0.219 sec

Context Help Snippets

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Navigator: SCHEMAS Filter objects sys

Query 1 x

```
1 • desc student;
```

SQLAdditions... Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Administration Schemas

No object selected

Result Grid

Field	Type	Null	Key	Default	Extra
roll	int	YES	NO		
name	varchar(10)	YES	NO		
city	varchar(10)	YES	NO		

Form Editor

Field Types

Result 1 x

Output:

#	Time	Action	Message	Duration / Fetch
1	18:13:02	use mkl	0 row(s) affected	0.203 sec
2	18:13:28	create table student(roll int, name varchar(10), city varchar(10))	0 row(s) affected	0.219 sec
3	18:13:41	desc student	3 row(s) returned	0.203 sec / 0.000 sec

Object Info Session

Read Only Context Help Snippets

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Navigator: SCHEMAS Filter objects sys

Query 1

```
1   1 Execute the selected portion of the script or everything, if there is no selection
2 • insert into student values(2,'ram','mumbai');
3 • insert into student values(3,'suresh','navi mumbai');
4 • show tables;
```

SQLAdditions: Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

No object selected

Object Info Session

Action Output

#	Time	Action	Message	Duration / Fetch
5	18:14:31	insert into student values(1,'john','thane')	1 row(s) affected	0.203 sec
6	18:14:31	insert into student values(2,'ram','mumbai')	1 row(s) affected	0.203 sec
7	18:14:31	insert into student values(3,'suresh','navi mumbai')	1 row(s) affected. 1 warning(s): 1265 Data truncated for column 'city' at row 1	0.203 sec

Context Help Snippets

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Navigator: SCHEMAS Filter objects sys

Query 1

```
1 insert into student values(1,'john','thane');
2 • insert into student values(2,'ram','mumbai');
3 • insert into student values(3,'suresh','navi mumbai');
4 • show tables;
```

SQLAdditions: Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

No object selected

Result Grid | Filter Rows: Export: Wrap Cell Content: Result 2

Tables_in_mkl
student

Form Editor

Field Types

Administration Schemas

Information: No object selected

Object Info Session

Action Output

#	Time	Action	Message	Duration / Fetch
6	18:14:31	insert into student values(2,'ram','mumbai')	1 row(s) affected	0.203 sec
7	18:14:31	insert into student values(3,'suresh','navi mumbai')	1 row(s) affected. 1 warning(s): 1265 Data truncated for column 'city' at row 1	0.203 sec
8	18:15:26	show tables	1 row(s) returned	0.203 sec / 0.000 sec

Read Only Context Help Snippets

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Navigator: database-1

Schemas: Filter objects sys

Query 1:

```
1 • select * from student;
```

Result Grid:

roll	name	city
1	john	thane
2	ram	mumbai
3	suresh	navi mumba

SQLAdditions: Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.

Administration Schemas

No object selected

student 3:

Output:

#	Time	Action	Message	Duration / Fetch
7	18:14:31	insert into student values(3,'suresh','navi mumba')	1 row(s) affected, 1 warning(s): 1265 Data truncated for column 'city' at row 1	0.203 sec
8	18:15:26	show tables	1 row(s) returned	0.203 sec / 0.000 sec
9	18:16:15	select * from student LIMIT 0,1000	3 row(s) returned	0.188 sec / 0.000 sec

Object Info Session

```

MySQL Workbench
File Edit View Query Database Server Tools Scripting Help
Navigator: database-1
SCHEMAS
Filter objects sys
Query 1 x
1 • update student set City = 'pune' WHERE roll = 3;
2 • select * from student;

Result Grid | Filter Rows: Edit: Export/Import: Wrap Cell Content:
roll name city
1 john thane
2 ram mumbai
3 suresh pune
NULL NULL NULL

```

No object selected

student 5 x

Action Output

Time	Action	Message	Duration / Fetch
3 18:19:27	select * from student LIMIT 0, 1000	3 row(s) returned	0.203 sec / 0.000 sec
4 18:19:49	update student set City = 'pune' WHERE roll = 3	0 row(s) affected Rows matched: 1 Changed: 0 Warnings: 0	0.203 sec
5 18:19:50	select * from student LIMIT 0, 1000	3 row(s) returned	0.203 sec / 0.000 sec

Object Info Session

```

MySQL Workbench
File Edit View Query Database Server Tools Scripting Help
Navigator: database-1
SCHEMAS
Filter objects sys
Query 1 x
1 • delete from student where roll=2;
2 • select * from student;

Result Grid | Filter Rows: Edit: Export/Import: Wrap Cell Content:
roll name city
1 john thane
3 suresh pune
NULL NULL NULL

```

No object selected

student 6 x

Action Output

Time	Action	Message	Duration / Fetch
6 18:20:49	delete from student where city='mumbai'	Error Code: 1175. You are using safe update mode and you tried to update a table without a WHERE that...	0.203 sec
7 18:21:01	delete from student where roll=2	1 row(s) affected	0.219 sec
8 18:21:01	select * from student LIMIT 0, 1000	2 row(s) returned	0.203 sec / 0.000 sec

Object Info Session

Step 26: Now delete the instance (once you have done with it)

Select instance go to action stop instance and then delete instance

The screenshot shows the AWS RDS console with the 'Databases' page. A context menu is open over a database named 'database-1'. The menu includes options like 'Stop temporarily', 'Reboot', and 'Delete'. Below the main table, a detailed 'Delete database-1 instance' dialog box is displayed, warning about the不可逆性 of the action and asking for confirmation via a text input field.

Conclusion -

Thus we have successfully learned about DBaaS and implemented it on AWS.