AWS re:Start

LAB

Migrating to Amazon RDS

WEEK 10

aws re/start

Overview

Migrating to Amazon RDS streamlines the transition from on-premises databases to a managed cloud environment, enhancing scalability, security, and performance. Using the AWS CLI, you can quickly set up an Amazon RDS MariaDB instance. Once the instance is created, data migration from an existing MariaDB database on an EC2 instance can be efficiently performed, allowing you to benefit from automated backups, patching, and maintenance.

Monitoring the Amazon RDS instance is essential for maintaining optimal performance. Amazon CloudWatch offers comprehensive metrics for real-time monitoring and alerting, helping to identify performance issues and manage resource utilization. By leveraging Amazon RDS and CloudWatch, organizations can ensure a reliable, scalable, and efficiently managed database solution, allowing more focus on application development and business growth.

Topics covered

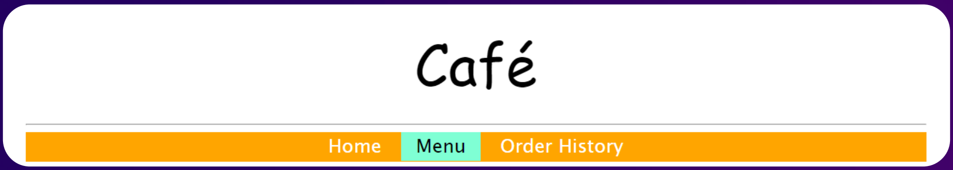
- Create an Amazon RDS MariaDB instance by using the AWS CLI.
- Migrate data from a MariaDB database on an EC2 instance to an Amazon RDS MariaDB instance.
- Monitor the Amazon RDS instance by using Amazon CloudWatch metrics.

Task 1

Generating order data on the café website

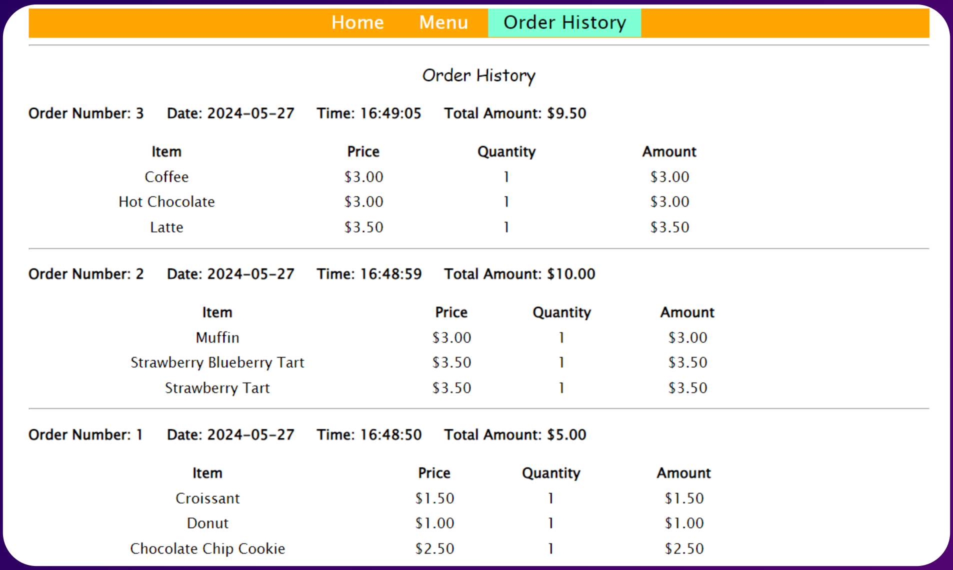
Step 1: Place some orders

Open the café web application, go to the **Menu** page, and place a few orders that are stored in the existing database.



Step 2: Review orders

Go to the **Order History** page, and record the number of orders that you placed.



Order History

Order Number: 3 **Date: 2024-05-27** **Time: 16:49:05** **Total Amount: $9.50**

Item	Price	Quantity	Amount
Coffee	$3.00	1	$3.00
Hot Chocolate	$3.00	1	$3.00
Latte	$3.50	1	$3.50

Order Number: 2 **Date: 2024-05-27** **Time: 16:48:59** **Total Amount: $10.00**

Item	Price	Quantity	Amount
Muffin	$3.00	1	$3.00
Strawberry Blueberry Tart	$3.50	1	$3.50
Strawberry Tart	$3.50	1	$3.50

Order Number: 1 **Date: 2024-05-27** **Time: 16:48:50** **Total Amount: $5.00**

Item	Price	Quantity	Amount
Croissant	$1.50	1	$1.50
Donut	$1.00	1	$1.00
Chocolate Chip Cookie	$2.50	1	$2.50

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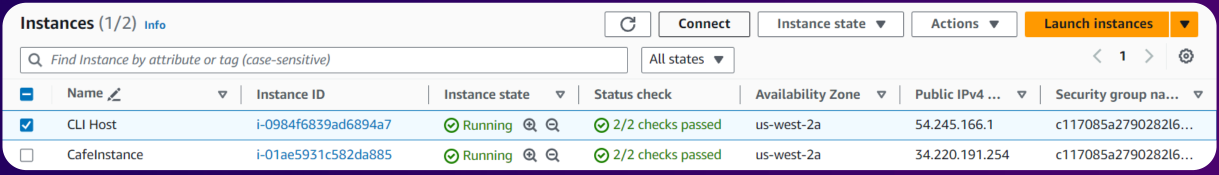
Task 2

Creating an Amazon RDS instance by using the AWS CLI

Step 1: Connect to the CLI Host instance

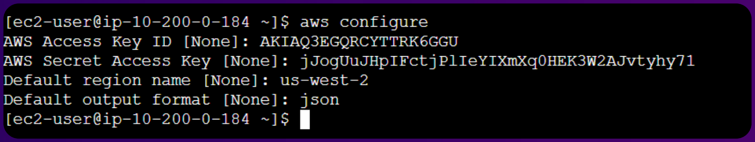
Open the EC2 Management Console, navigate to the **Instances** section, select the **CLI Host** instance, and connect to the instance using EC2 Instance Connect.



☐	Name	Instance ID	Instance state	Status check	Availability Zone	Public IPv4 ...	Security group na...
☑	CLI Host	i-0984f6839ad6894a7	Running	2/2 checks passed	us-west-2a	54.245.166.1	c117085a2790282l6...
☐	CafeInstance	i-01ae5931c582da885	Running	2/2 checks passed	us-west-2a	34.220.191.254	c117085a2790282l6...

Step 2: Configure the AWS CLI

To set up the AWS CLI profile with credentials, in the EC2 Instance Connect terminal, run the aws configure command. When prompted, enter the following information.



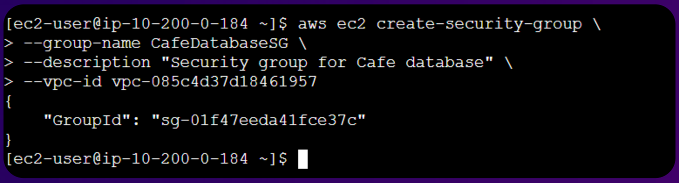
```
[ec2-user@ip-10-200-0-184 ~]$ aws configure
AWS Access Key ID [None]: AKIAQ3EGQRCYTTRK6GGU
AWS Secret Access Key [None]: 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
Default region name [None]: us-west-2
Default output format [None]: json
[ec2-user@ip-10-200-0-184 ~]$
```

Task 2

Creating an Amazon RDS instance by using the AWS CLI

Step 3: Create the Security Group

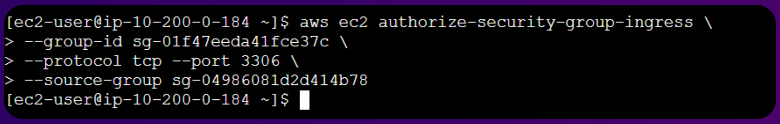
To create the **CafeDatabaseSG** security group, run the following aws ec2 create-security-group command.



```
[ec2-user@ip-10-200-0-184 ~]$ aws ec2 create-security-group \
> --group-name CafeDatabaseSG \
> --description "Security group for Cafe database" \
> --vpc-id vpc-085c4d37d18461957
{
    "GroupId": "sg-01f47eeda41fce37c"
}
[ec2-user@ip-10-200-0-184 ~]$ █
```

Step 4: Create the inbound rule

To create the inbound rule for the **CafeDatabaseSG** security group to allow MySQL requests from instances associated with the **CafeSecurityGroup**, run the following aws ec2 authorize-security-group-ingress command.



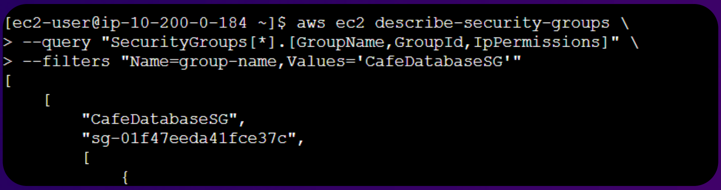
```
[ec2-user@ip-10-200-0-184 ~]$ aws ec2 authorize-security-group-ingress \
> --group-id sg-01f47eeda41fce37c \
> --protocol tcp --port 3306 \
> --source-group sg-04986081d2d414b78
[ec2-user@ip-10-200-0-184 ~]$ █
```

Task 2

Creating an Amazon RDS instance by using the AWS CLI

Step 5: Verify inbound rule

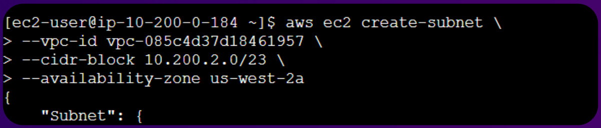
To confirm that the inbound rule was applied appropriately, run the following aws ec2 describe-security-groups command.



```
[ec2-user@ip-10-200-0-184 ~]$ aws ec2 describe-security-groups \
> --query "SecurityGroups[*].[GroupName,GroupId,IpPermissions]" \
> --filters "Name=group-name,Values='CafeDatabaseSG'"
[
    [
        "CafeDatabaseSG",
        "sg-01f47eeda41fce37c",
        [
            {
```

Step 6: Create a private subnet

To create the first private subnet, run the following aws ec2 create-subnet command.



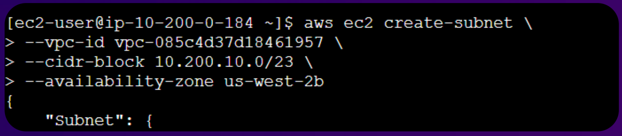
```
[ec2-user@ip-10-200-0-184 ~]$ aws ec2 create-subnet \
> --vpc-id vpc-085c4d37d18461957 \
> --cidr-block 10.200.2.0/23 \
> --availability-zone us-west-2a
{
    "Subnet": {
```

Task 2

Creating an Amazon RDS instance by using the AWS CLI

Step 7: Create another private subnet

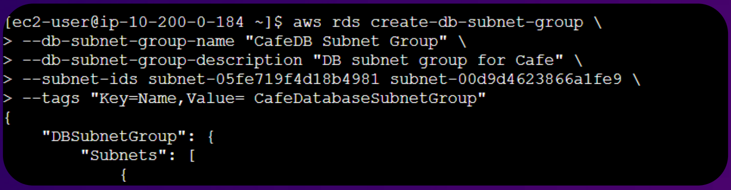
To create the second private subnet in a different availability zone, run the following aws ec2 create-subnet command.



```
[ec2-user@ip-10-200-0-184 ~]$ aws ec2 create-subnet \
> --vpc-id vpc-085c4d37d18461957 \
> --cidr-block 10.200.10.0/23 \
> --availability-zone us-west-2b
{
    "Subnet": {
```

Step 8: Create a subnet group

To create the DB subnet group consisting of the two private subnets that you created in the previous steps, run the following aws rds create-db-subnet-group command.



```
[ec2-user@ip-10-200-0-184 ~]$ aws rds create-db-subnet-group \
> --db-subnet-group-name "CafeDB Subnet Group" \
> --db-subnet-group-description "DB subnet group for Cafe" \
> --subnet-ids subnet-05fe719f4d18b4981 subnet-00d9d4623866a1fe9 \
> --tags "Key=Name,Value= CafeDatabaseSubnetGroup"
{
    "DBSubnetGroup": {
        "Subnets": [
            {
```

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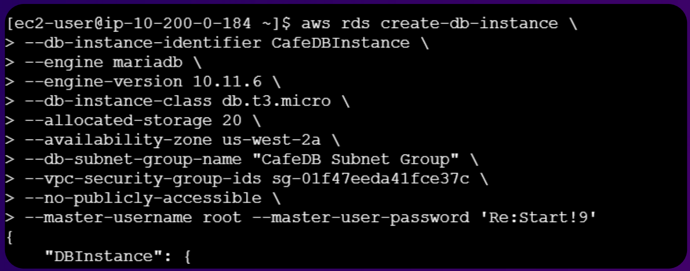
Task 2

Creating an Amazon RDS instance by using the AWS CLI

Step 9: Create the Amazon RDS instance

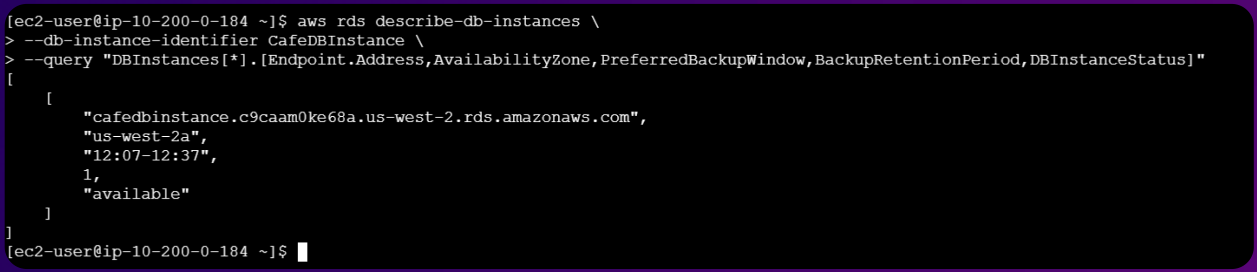
To create the Amazon RDS MariaDB instance, run the following aws rds create-db-instance command.



```
[ec2-user@ip-10-200-0-184 ~]$ aws rds create-db-instance \
> --db-instance-identifier CafeDBInstance \
> --engine mariadb \
> --engine-version 10.11.6 \
> --db-instance-class db.t3.micro \
> --allocated-storage 20 \
> --availability-zone us-west-2a \
> --db-subnet-group-name "CafeDB Subnet Group" \
> --vpc-security-group-ids sg-01f47eeda41fce37c \
> --no-publicly-accessible \
> --master-username root --master-user-password 'Re:Start!9'
{
    "DBInstance": {
```

Step 10: Verify DB instance status

To check the status of the database, run the following aws rds describe-db-instance command. Wait until the status shows available. Make note of the database instance endpoint address.



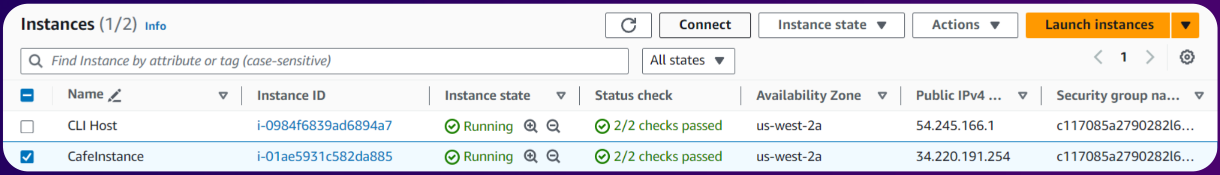
```
[ec2-user@ip-10-200-0-184 ~]$ aws rds describe-db-instances \
> --db-instance-identifier CafeDBInstance \
> --query "DBInstances[*].[Endpoint.Address,AvailabilityZone,PreferredBackupWindow,BackupRetentionPeriod,DBInstanceStatus]"
[
    [
        "cafedbinstance.c9caam0ke68a.us-west-2.rds.amazonaws.com",
        "us-west-2a",
        "12:07-12:37",
        1,
        "available"
    ]
]
[ec2-user@ip-10-200-0-184 ~]$ 
```

Task 3

Migrating application data to the Amazon RDS instance

Step 1: Connect to the CafeInstance

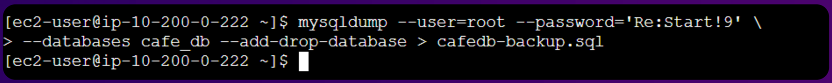
Open the EC2 Management Console, navigate to the **Instances** section, select the **CafeInstance**, and connect to the instance using EC2 Instance Connect.



☐	Name	Instance ID	Instance state	Status check	Availability Zone	Public IPv4 ...	Security group na...
☐	CLI Host	i-0984f6839ad6894a7	✓ Running	✓ 2/2 checks passed	us-west-2a	54.245.166.1	c117085a2790282l6...
☑	CafeInstance	i-01ae5931c582da885	✓ Running	✓ 2/2 checks passed	us-west-2a	34.220.191.254	c117085a2790282l6...

Step 2: Create a database backup

To use the mysqldump utility to create a backup of the local **cafe_db** database, run the following mysqldump command. This command generates SQL statements in a file named **cafedb-backup.sql**, which can be run to reproduce the schema and data of the original **cafe_db** database.



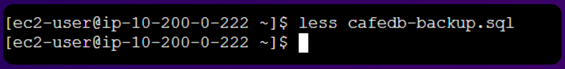
```
[ec2-user@ip-10-200-0-222 ~]$ mysqldump --user=root --password='Re:Start!9' \
> --databases cafe_db --add-drop-database > cafedb-backup.sql
[ec2-user@ip-10-200-0-222 ~]$ █
```

Task 3

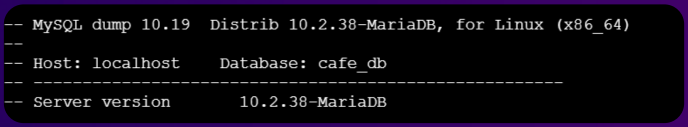
Migrating application data to the Amazon RDS instance

Step 3: Review the backup file

To review the contents of the backup file, open the **cafedb-backup.sql** file in your preferred text editor. Notice the various SQL commands that create the database, create its tables and indexes, and populate the database with its original data.



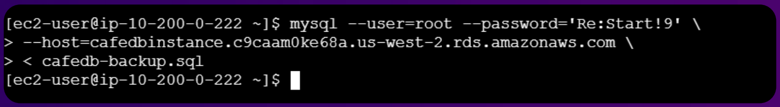
```
[ec2-user@ip-10-200-0-222 ~]$ less cafedb-backup.sql
[ec2-user@ip-10-200-0-222 ~]$ █
```



```
-- MySQL dump 10.19  Distrib 10.2.38-MariaDB, for Linux (x86_64)
--
-- Host: localhost    Database: cafe_db
-- ------------------------------------------------------
-- Server version       10.2.38-MariaDB
```

Step 4: Restore the backup to RDS

To restore the backup to the Amazon RDS database, run the following mysql command. This command creates a MySQL connection to the Amazon RDS instance and runs the SQL statements in the **cafedb-backup.sql** file.



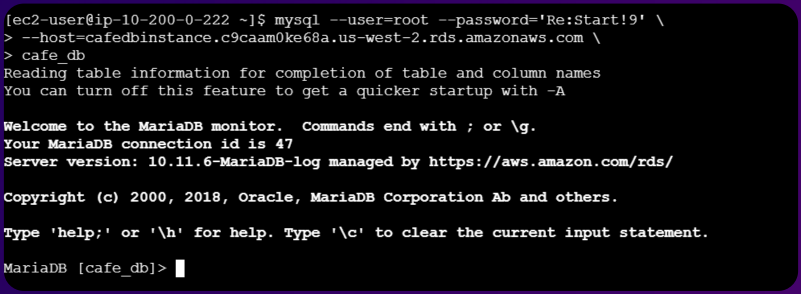
```
[ec2-user@ip-10-200-0-222 ~]$ mysql --user=root --password='Re:Start!9' \
> --host=cafedbinstance.c9caam0ke68a.us-west-2.rds.amazonaws.com \
> < cafedb-backup.sql
[ec2-user@ip-10-200-0-222 ~]$ █
```

Task 3

Migrating application data to the Amazon RDS instance

Step 5: Open a MySQL session

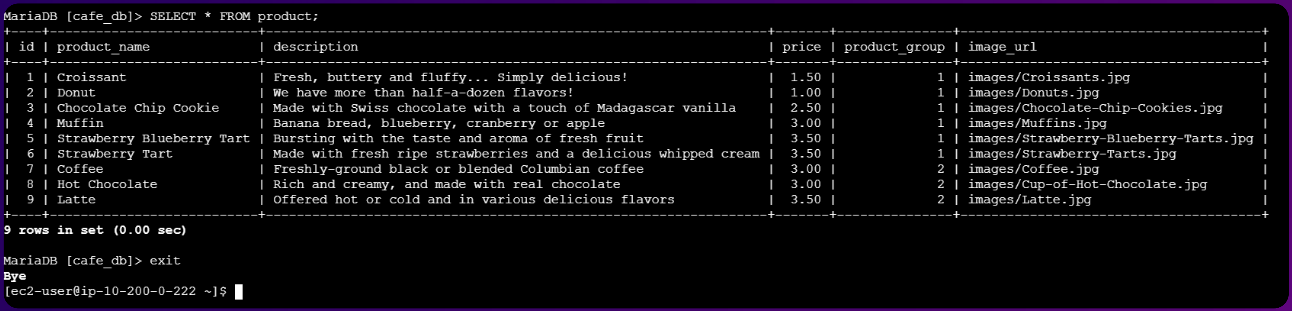
To verify that the **cafe_db** was successfully created and populated in the Amazon RDS instance, run the following mysql command to open an interactive MySQL session to the instance.



```
[ec2-user@ip-10-200-0-222 ~]$ mysql --user=root --password='Re:Start!9' \
> --host=cafedbinstance.c9caam0ke68a.us-west-2.rds.amazonaws.com \
> cafe_db
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 47
Server version: 10.11.6-MariaDB-log managed by https://aws.amazon.com/rds/

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

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

MariaDB [cafe_db]> 
```

Step 6: Execute an SQL statement

Run the following SQL statement to retrieve the data in the product table of the **cafe_db** database. The query should return rows from the table. Exit the interactive SQL session.



```
MariaDB [cafe_db]> SELECT * FROM product;
+----+---------------------------+-----------------------------------------------------------------+-------+---------------+---------------------------------------+
| id | product_name              | description                                                     | price | product_group | image_url                             |
+----+---------------------------+-----------------------------------------------------------------+-------+---------------+---------------------------------------+
|  1 | Croissant                 | Fresh, buttery and fluffy... Simply delicious!                  |  1.50 |             1 | images/Croissants.jpg                 |
|  2 | Donut                     | We have more than half-a-dozen flavors!                         |  1.00 |             1 | images/Donuts.jpg                     |
|  3 | Chocolate Chip Cookie     | Made with Swiss chocolate with a touch of Madagascar vanilla    |  2.50 |             1 | images/Chocolate-Chip-Cookies.jpg     |
|  4 | Muffin                    | Banana bread, blueberry, cranberry or apple                     |  3.00 |             1 | images/Muffins.jpg                    |
|  5 | Strawberry Blueberry Tart | Bursting with the taste and aroma of fresh fruit                |  3.50 |             1 | images/Strawberry-Blueberry-Tarts.jpg |
|  6 | Strawberry Tart           | Made with fresh ripe strawberries and a delicious whipped cream |  3.50 |             1 | images/Strawberry-Tarts.jpg           |
|  7 | Coffee                    | Freshly-ground black or blended Columbian coffee                |  3.00 |             2 | images/Coffee.jpg                     |
|  8 | Hot Chocolate             | Rich and creamy, and made with real chocolate                   |  3.00 |             2 | images/Cup-of-Hot-Chocolate.jpg       |
|  9 | Latte                     | Offered hot or cold and in various delicious flavors            |  3.50 |             2 | images/Latte.jpg                      |
+----+---------------------------+-----------------------------------------------------------------+-------+---------------+---------------------------------------+
9 rows in set (0.00 sec)

MariaDB [cafe_db]> exit
Bye
[ec2-user@ip-10-200-0-222 ~]$ 
```

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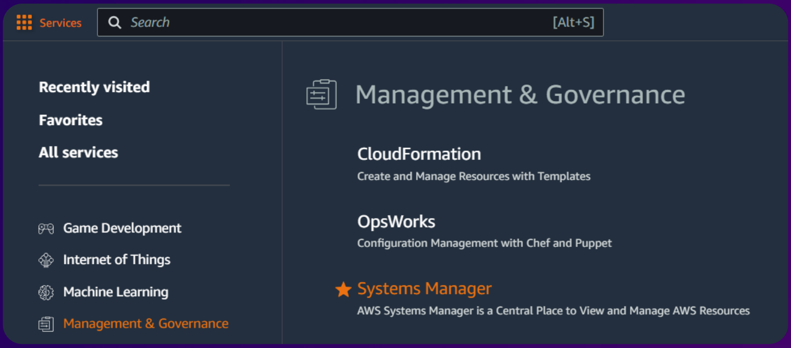
Task 4

Configuring the website to use the Amazon RDS instance

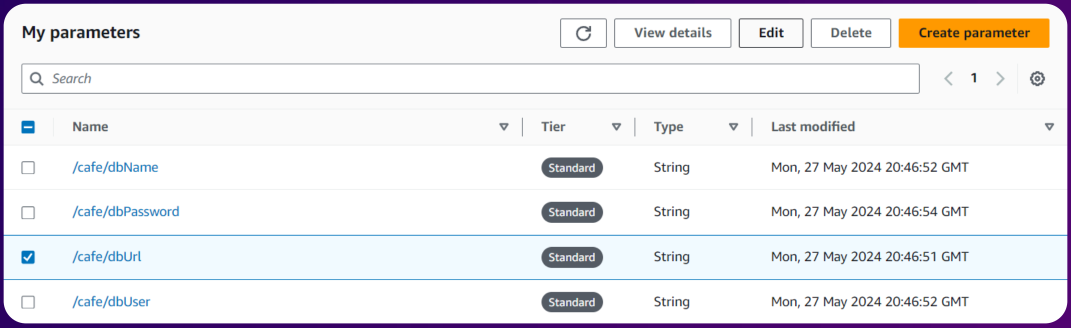
Step 1: Access the Systems Manager service

In the AWS Management Console, select Systems Manager.



Step 2: Edit parameter

Navigate to the **Parameter Store** section. From the **My parameters** list, choose **/cafe/dbUrl**, and select Edit.



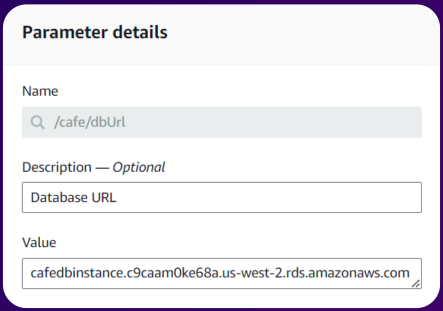
	Name	Tier	Type	Last modified
□	/cafe/dbName	Standard	String	Mon, 27 May 2024 20:46:52 GMT
□	/cafe/dbPassword	Standard	String	Mon, 27 May 2024 20:46:54 GMT
☑	/cafe/dbUrl	Standard	String	Mon, 27 May 2024 20:46:51 GMT
□	/cafe/dbUser	Standard	String	Mon, 27 May 2024 20:46:52 GMT

Task 4

Configuring the website to use the Amazon RDS instance

Step 3: Replace Database Endpoint

In the **Parameter details** section, replace the text in the Value box with the RDS Instance Database Endpoint Address.



Parameter details

Name

/cafe/dbUrl

Description — *Optional*

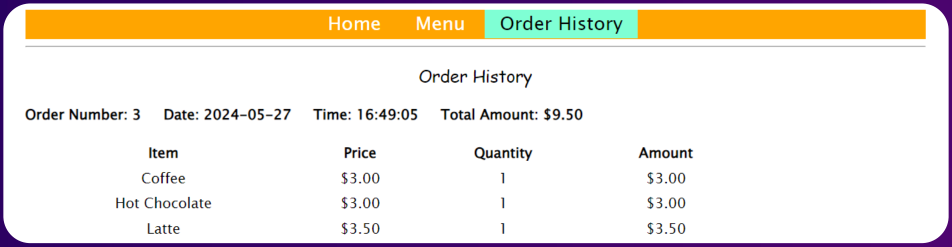
Database URL

Value

cafedbinstance.c9caam0ke68a.us-west-2.rds.amazonaws.com

Step 4: Verify Order History

The **dbUrl** parameter now references the RDS DB instance instead of the local database. Open the café website, go to the **Order History** page, and review the number of orders.



Order History

Order Number: 3 **Date: 2024-05-27** **Time: 16:49:05** **Total Amount: $9.50**

Item	Price	Quantity	Amount
Coffee	$3.00	1	$3.00
Hot Chocolate	$3.00	1	$3.00
Latte	$3.50	1	$3.50

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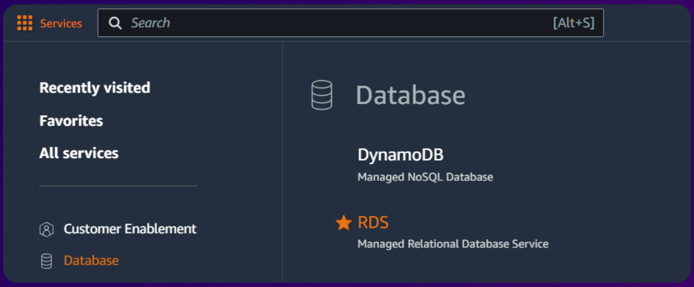
Task 5

Monitoring the Amazon RDS database

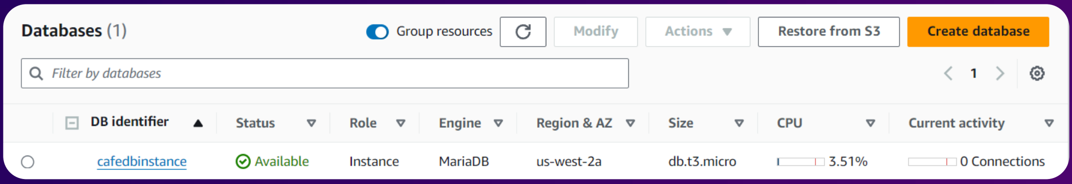
Step 1: Access the RDS Management Console

In the AWS Management Console, select RDS.



Step 2: Review Databases

Navigate to the **Databases** section, and select the cafedbinstance database instance.



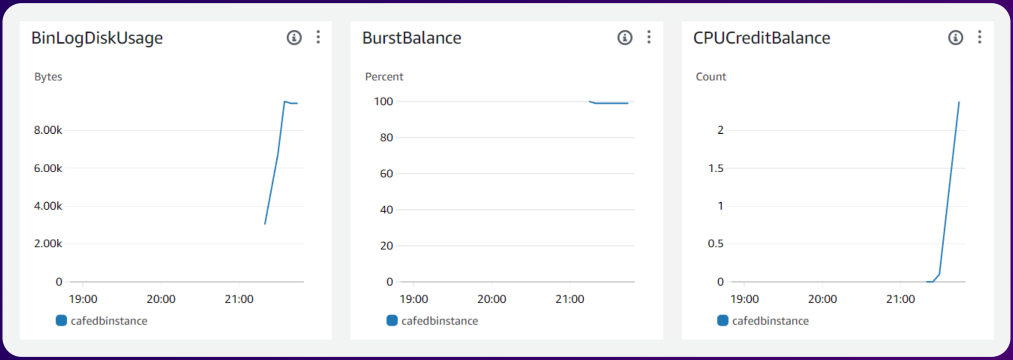
	DB identifier	Status	Role	Engine	Region & AZ	Size	CPU	Current activity
○	cafedbinstance	✓ Available	Instance	MariaDB	us-west-2a	db.t3.micro	3.51%	0 Connections

Task 5

Monitoring the Amazon RDS database

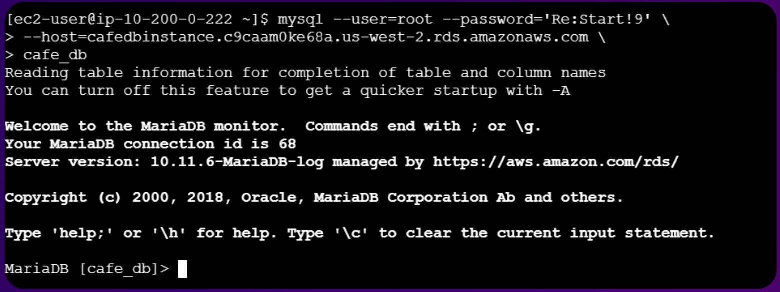
Step 3: Review CloudWatch metrics

Choose the **Monitoring** tab. By default, this tab displays a number of key database instance metrics that are available from CloudWatch.



Step 4: Open an SQL session

To open an interactive SQL session to the RDS **cafe_db** instance, run the following mysql command.



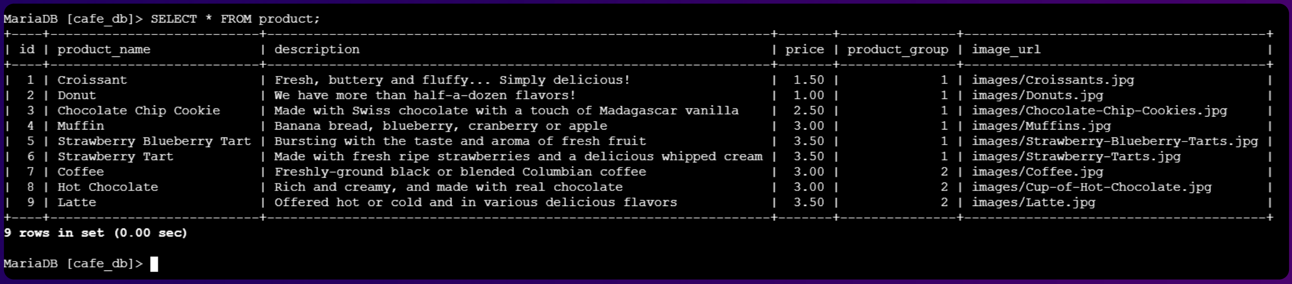
```
[ec2-user@ip-10-200-0-222 ~]$ mysql --user=root --password='Re:Start!9' \
> --host=cafedbinstance.c9caam0ke68a.us-west-2.rds.amazonaws.com \
> cafe_db
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 68
Server version: 10.11.6-MariaDB-log managed by https://aws.amazon.com/rds/

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

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

MariaDB [cafe_db]> 
```

Task 5

Monitoring the Amazon RDS database

Step 5: Run an SQL statement.

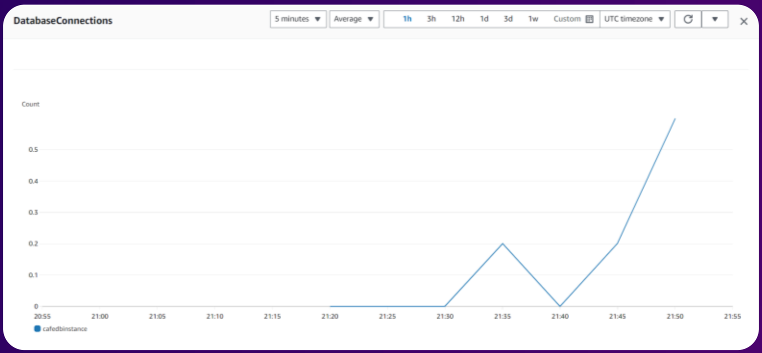
To retrieve the data in the product table, enter the following SQL statement.



```
MariaDB [cafe_db]> SELECT * FROM product;
+----+---------------------------+-----------------------------------------------------------------+-------+---------------+---------------------------------------+
| id | product_name              | description                                                     | price | product_group | image_url                             |
+----+---------------------------+-----------------------------------------------------------------+-------+---------------+---------------------------------------+
|  1 | Croissant                 | Fresh, buttery and fluffy... Simply delicious!                  |  1.50 |             1 | images/Croissants.jpg                 |
|  2 | Donut                     | We have more than half-a-dozen flavors!                         |  1.00 |             1 | images/Donuts.jpg                     |
|  3 | Chocolate Chip Cookie     | Made with Swiss chocolate with a touch of Madagascar vanilla    |  2.50 |             1 | images/Chocolate-Chip-Cookies.jpg     |
|  4 | Muffin                    | Banana bread, blueberry, cranberry or apple                     |  3.00 |             1 | images/Muffins.jpg                    |
|  5 | Strawberry Blueberry Tart | Bursting with the taste and aroma of fresh fruit                |  3.50 |             1 | images/Strawberry-Blueberry-Tarts.jpg |
|  6 | Strawberry Tart           | Made with fresh ripe strawberries and a delicious whipped cream |  3.50 |             1 | images/Strawberry-Tarts.jpg           |
|  7 | Coffee                    | Freshly-ground black or blended Columbian coffee                |  3.00 |             2 | images/Coffee.jpg                     |
|  8 | Hot Chocolate             | Rich and creamy, and made with real chocolate                   |  3.00 |             2 | images/Cup-of-Hot-Chocolate.jpg       |
|  9 | Latte                     | Offered hot or cold and in various delicious flavors            |  3.50 |             2 | images/Latte.jpg                      |
+----+---------------------------+-----------------------------------------------------------------+-------+---------------+---------------------------------------+
9 rows in set (0.00 sec)

MariaDB [cafe_db]>
```

Step 6: Monitor Database Connections

The **DatabaseConnections** graph shows a line that indicates that 1 connection is in use. This connection was established by the interactive SQL session from the **CafeInstance**.

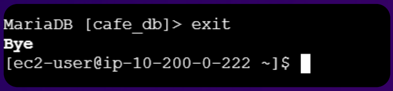


Task 5

Monitoring the Amazon RDS database

Step 7: Exit the SQL session

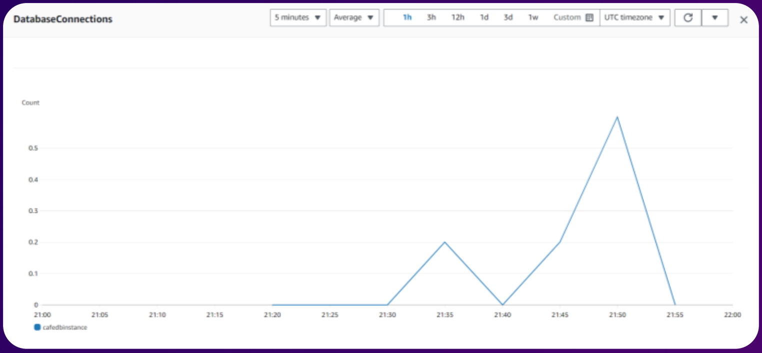
To close the connection from the interactive SQL session, enter the exit command.



```
MariaDB [cafe_db]> exit
Bye
[ec2-user@ip-10-200-0-222 ~]$ █
```

Step 8: Monitor Database Connections

The **DatabaseConnections** graph shows that the number of connections in use is now 0.



Conclusions

Creating an Amazon RDS instance

Creating an Amazon RDS instance using the AWS CLI streamlines the setup process, allowing for quick and efficient provisioning of managed database services.

Migrating to Amazon RDS

Migrating to Amazon RDS enhances database scalability and security, reducing the operational burden with automated maintenance and backups.

The mysqldump utility

The mysqldump utility is a powerful tool for exporting and importing databases, facilitating seamless data migration between on-premises and cloud environments.

Database Endpoints

Database Endpoints provide a consistent connection point for applications, simplifying access to databases across different environments.

Monitoring Database Metrics

Monitoring Database Metrics using CloudWatch enables real-time tracking of database performance, resource usage, and health, allowing for proactive issue resolution and optimization.

aws re/start

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aws re/start