

Project Question:

here are the details of demo Project assessment:

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Question:

Create a solution to migrate data from an on-premises database to AWS:

1. Use AWS DMS to replicate a MySQL database into an RDS MySQL instance.
2. Write a Python script to monitor the replication process and log the status into CloudWatch.
3. After migration, ensure that the RDS instance is encrypted and publicly inaccessible.

Answers:

1. Use AWS DMS to replicate a MySQL database into an RDS MySQL instance.

Here's a detailed **step-by-step guide** to migrate your on-premises MySQL database to an Amazon RDS MySQL instance using **AWS Database Migration Service (DMS)**.

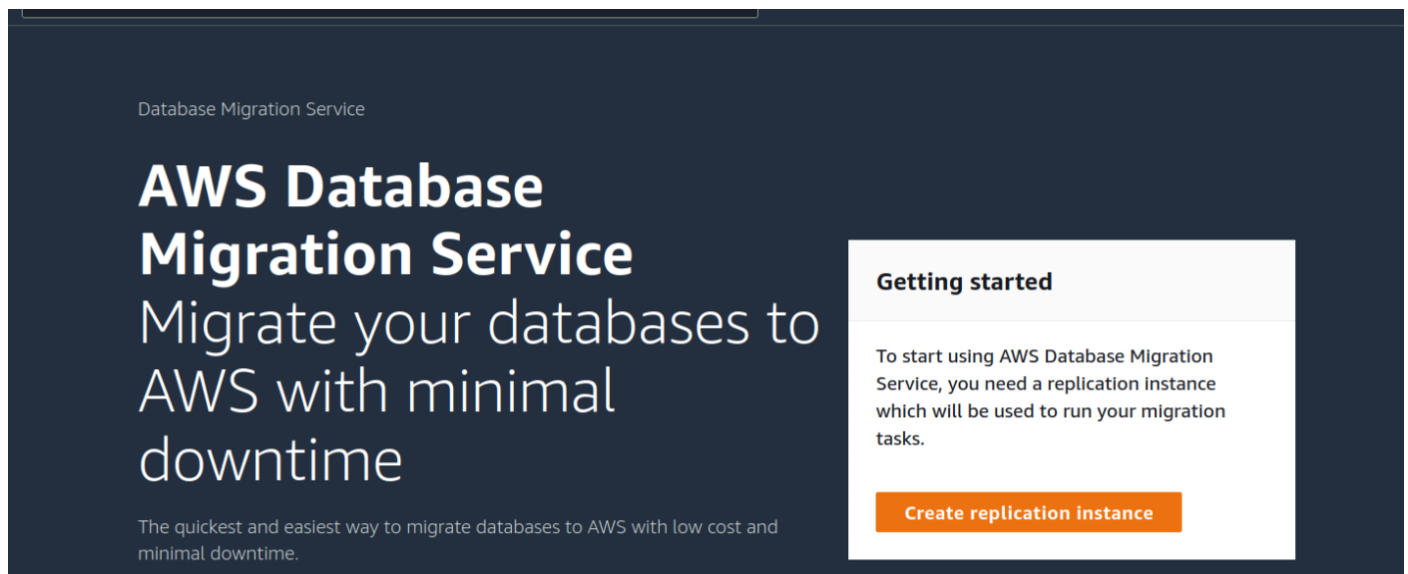
- **Step 1: Prepare the Target (RDS MySQL) Database**
- Log in to the **AWS Management Console**
- Go to **RDS > Databases > Create Database**.
- **Select Database Engine:** Choose **MySQL**.
- **Instance Settings:**
 - Select the version compatible with your source MySQL database.
 - Choose the instance type and storage based on your data requirements.
- **Networking:**
 - ❖ Ensure your RDS instance is in a VPC that can communicate with your on-premises database.

- ❖ Allow **public access** if needed, or configure private connectivity via **AWS Direct Connect** or **VPN**.
- **Security:**
 - ❖ Set up a security group to allow inbound traffic from your on-premises database server on port **3306**.
- **Create the Database** and note the endpoint, username, and password.

Setup a Replication Instance

To setup a replication instance, go to AWS DMS console

Click create replication instance



We have to configure the replication instance

Enter the name for the replication instance.

Create replication instance

Replication instance configuration

Name
The name must be unique among all of your replication instances in the current AWS region.

Replication instance name must not start with a numeric value

For the Instance class, choose the preferred instance type and the Engine Version be a default.

Instance class [Info](#)

Choose an appropriate instance class for your replication needs. Each instance class provides differing levels of compute, network and memory capacity. [DMS pricing](#)

dms.t3.medium
2 vCPUs 4 GiB Memory

☐ Include previous-generation instance classes

Engine version

Choose an AWS DMS version to run on your replication instance. [DMS versions](#)

3.4.4

☐ Include Beta DMS versions

Enter the size of the storage required for the replication instance.

Allocated storage (GiB) [Info](#)

Choose the amount of storage space you want for your replication instance. AWS DMS uses this storage for log files and cached transactions while replication tasks are in progress.

50

Choose the VPC where the replication instance should be created.

If you want the replication instance to be deployed in Multi AZ mode, select it.

VPC

Choose an Amazon Virtual Private Cloud (VPC) where your replication instance should run.

vpc-089fb4e8acddc309b - workfall-vpc

☐ Multi AZ

If you choose this option, AWS DMS will perform a multi-AZ deployment, with a primary instance in one availability zone (AZ) and a standby instance in another AZ. This configuration provides a highly available, fault-tolerant replication environment. Billing is based on [DMS pricing](#)

☒ Publicly accessible

If you choose this option, AWS DMS will assign a public IP address to your replication instance, and you'll be able to connect to databases outside of your Amazon VPC.

Under advanced security and network configuration,

Select the default VPC subnet group.

For the VPC security group(s), choose the default security group.

The default KMS master key will be used.

▼ Advanced security and network configuration

Replication subnet group

Choose a subnet group for your replication instance. The subnet group defines the IP ranges and subnets that your replication instance can use within the Amazon VPC you've chosen.

default-vpc-089fb4e8acddc309b ▼

Availability zone

Choose an availability zone (AZ) where you want your replication instance to run. The default is "No preference", meaning that AWS DMS will determine which AZ to use.

No Preference ▼

VPC security group(s)

Choose one or more security groups for your replication instances. The security group(s) specify inbound and outbound rules to control network access to your replication instance.

Use default ▼

default ✕

KMS master key [Info](#)


(Default) aws/dms ▼

And finally click create.

The Replication instance has been created.

C workfall-replica-instance creation in progress.

DMS > Replication instances

Replication instances (1)  **Actions** ▼ **Create replication instance**

<input type="checkbox"/>	Name ▼	Class ▼	Status ▼	Engine version ▼	Availability zone ▼	VPC
<input type="checkbox"/>	workfall-replica-instance	dms.t3.medium	Creating	3.4.4	ap-southeast-1a	vpc-089fb4e8acddc

The Replication instance is successfully created and is available.

Creating Endpoint for Source Database (MySQL)

In the navigation pane, click endpoints and then choose Create endpoint.

For the endpoint type, choose Source endpoint.

Check, select RDS DB Instance and then choose the Source RDS DB Instance which is MySQL.

Create endpoint

Endpoint type [Info](#)



Source endpoint

A source endpoint allows AWS DMS to read data from a database (on-premises or in the cloud), or from other data source such as Amazon S3.



Target endpoint

A target endpoint allows AWS DMS to write data to a database, or to other data source.



Select RDS DB instance

RDS Instance

Instances available only for current user and region

mysql-db



For the Endpoint configuration, enter the Endpoint identifier (It is fetched by default after choosing the RDS DB instance).

Endpoint configuration

Endpoint identifier [Info](#)

A label for the endpoint to help you identify it.

mysql-db

For Source Engine, choose MySQL.

Source engine

The type of database engine this endpoint is connected to.

MySQL



For access to the endpoint database, select Provide access information manually.

Which will automatically fetch the source DB endpoint, Port, and the User name.

Make the changes if required and Enter the Password of the MySQL RDS DB instance.

Access to endpoint database

- ☐ Choose AWS Secrets Manager
- ☒ Provide access information manually

Server name

mysql-db.cpwh4tcmgzd7.ap-southeast-1.rds.amazonaws.com

Port

The port the database runs on for this endpoint.

3306

Secure Socket Layer (SSL) mode

The type of Secure Socket Layer enforcement

none

User name [Info](#)

admin

Password [Info](#)

.....

We can test the connectivity to the RDS MySQL DB instance, by doing so.

Expand test endpoint connection (optional)

Choose the VPC and select the Replication instance then click Run test.

If all the provided information is correct, then the status should be successful.

▼ Test endpoint connection (optional)

VPC

vpc-089fb4e8acddc309b - workfall-vpc

Replication instance

A replication instance performs the database migration

workfall-replica-instance



Your endpoint will always be created even if the connection fails



After clicking 'Run test', DMS creates the endpoint with the details you provided and attempts to connect to it. If the connection fails, you can edit the endpoint definition and test the connection again. You can also delete the endpoint manually.

Run test

Endpoint identifier	Replication instance	Status	Message
mysql-db	workfall-replica-instance	successful	

And finally click create Endpoint.

The Endpoint for the RDS MySQL instance is created and is Active.

Endpoints (1)							<div> <div> <div></div> <div>Actions</div> </div> <div>Create endpoint</div> </div>	
<div> <div>Find endpoint</div> </div>							<div> <div><</div> <div>1</div> <div>></div> <div>⚙</div> </div>	
<input type="checkbox"/>	Name	Type	Status	Engine	Server name	Port		
<input type="checkbox"/>	mysql-db	Source	Active	MySQL	mysql-db.cpwh4tcmgzd7.ap-southeast-1.rds.amazonaws.com	3306		

Creating Endpoint for Target Database (PostgreSQL)

Click Create endpoint.

For the Endpoint type, choose Target endpoint.

Select RDS DB Instance and then select the Target RDS DB Instance which is PostgreSQL.

Create endpoint

Endpoint type [Info](#)

☐

Source endpoint

A source endpoint allows AWS DMS to read data from a database (on-premises or in the cloud), or from other data source such as Amazon S3.

☒

Target endpoint

A target endpoint allows AWS DMS to write data to a database, or to other data source.

☒ Select RDS DB instance

RDS Instance

Instances available only for current user and region

postgresql-db

For the Endpoint configuration, enter the Endpoint identifier (It is fetched by default after choosing the RDS DB instance).

Endpoint configuration

Endpoint identifier [Info](#)

A label for the endpoint to help you identify it.

postgresql-db

For the Target engine, choose PostgreSQL.

Target engine

The type of database engine this endpoint is connected to.

PostgreSQL

Access to endpoint database

Access to the endpoint database, choose to provide access information manually.

It automatically fetches the Target DB endpoint, Port, and User name.

Make the required changes if any and Enter the Password of the PostgreSQL RDS DB instance.

Access to endpoint database

☐ Choose AWS Secrets Manager

☒ Provide access information manually

Server name

mysql-db.cpwh4tcmgzd7.ap-southeast-1.rds.amazonaws.com

Port

The port the database runs on for this endpoint.

3306

Secure Socket Layer (SSL) mode

The type of Secure Socket Layer enforcement

none

User name

Info

admin

Password

Info

.....

And Enter the Target Database name.

We can test the connectivity to the RDS PostgreSQL DB instance, to expand test endpoint connection (optional).

Choose the VPC and the Replication instance and then click Run test.

If the provided information is correct, the connectivity test should be successful.

▼ Test endpoint connection (optional)



VPC

vpc-089fb4e8acddc309b - workfall-vpc

Replication instance

A replication instance performs the database migration

workfall-replica-instance

 **Your endpoint will always be created even if the connection fails** 

After clicking 'Run test', DMS creates the endpoint with the details you provided and attempts to connect to it. If the connection fails, you can edit the endpoint definition and test the connection again. You can also delete the endpoint manually.

Run test

Endpoint identifier	Replication instance	Status	Message
postgresql-db	workfall-replica-instance	successful	

And at last click Create endpoint.

The Endpoint for the RDS PostgreSQL instance is created successfully and is Active.

Endpoints (2)						Actions ▼	Create endpoint
<input type="text" value="Find endpoint"/>						< 1 >	
<input type="checkbox"/>	Name ▼	Type ▼	Status ▼	Engine ▼	Server name ▼		
<input type="checkbox"/>	mysql-db	Source	Active	MySQL	mysql-db.cpwh4tcmgzd7.ap-southeast-1.rds.amazonaws.com		
<input type="checkbox"/>	postgresql-db	Target	Active	PostgreSQL	postgresql-db.cpwh4tcmgzd7.ap-southeast-1.rds.amazonaws.com		

Set Up AWS DMS

1. Create a Replication Instance

1. Go to the AWS DMS Console.
2. Navigate to Replication Instances > Create Replication Instance.
3. Configure:
 - o Name: Provide a unique name.
 - o Instance Class: Choose based on database size (e.g., dms.r5.large).
 - o VPC: Select the same VPC as your RDS instance.
4. Click Create and wait for the replication instance to become available.

2. Create Endpoints

Source Endpoint (On-Premises MySQL):

1. In the DMS Console, navigate to Endpoints > Create Endpoint.
2. Configure:
 - o Endpoint Type: Source.
 - o Database Engine: MySQL.
 - o Endpoint Identifier: Provide a unique name.
 - o Server Name: Enter the IP or hostname of your on-premises database.
 - o Port: 3306.
 - o Username: dms_user (created earlier).
 - o Password: The password for dms_user.
3. Test the connection.

Target Endpoint (RDS MySQL):

1. Repeat the process, selecting Target as the endpoint type.
2. Use the RDS endpoint details (host, username, password).
3. Test the connection.

3. Create a Migration Task

1. Navigate to Tasks > Create Task.

2. Configure:

- **Name:** Provide a task name.
- **Replication Instance:** Select the instance created earlier.
- **Source Endpoint:** Choose the on-premises MySQL endpoint.
- **Target Endpoint:** Choose the RDS MySQL endpoint.
- **Migration Type:**
 - **Full Load: For one-time migration.**
 - **Full Load + Ongoing Replication: For minimal downtime migration.**

3. Table Mappings:

- Use the default to migrate all tables.
- Or customize using the Table Mapping Editor.

4. Start Task on Create: Check this option to start the migration immediately.

5. Click Create Task.

Step 4: Monitor and Validate the Migration

1. Monitor the Task:

- Go to Tasks > Task Monitoring.
- Check progress and logs for any errors.

2. Validate Data:

- Compare row counts and sample queries between source and target databases to ensure consistency.
-

Step 5: Finalize the Migration

1. Switch Applications:

- Once all data is migrated and validated, redirect your application to the RDS MySQL instance.

2. Stop Ongoing Replication:

- If using ongoing replication, stop the DMS task after completing the final sync.

3. Optimize the RDS Database:

- Review and adjust database parameters.
- Enable backups, monitoring, and performance insights.

Creating Database Migration Task

To create a migration task, in the navigation pane, click Database migration tasks.

Click create task, enter the name for the task.

Select the Replication instance that you have created.

Task configuration

Task identifier

Descriptive Amazon Resource Name (ARN) - *optional*
A friendly name to override the default DMS ARN. You cannot modify it after creation.

Replication instance

Select the Source database endpoint and the target database endpoint.

For the Migration type, select Migrate existing data.

Source database endpoint

Target database endpoint

Migration type [Info](#)

As we perform migration from MySQL to PostgreSQL engine, the AWS schema conversion tool will automatically convert the database scheme.

Under Task settings,

For the Target table preparation mode, choose Do nothing

To Include LOB columns in replication, choose Limited LOB mode and the Maximum LOB size be 32KB.

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Task settings

Editing mode [Info](#)

☒ Wizard

You can enter only a subset of the available task settings.

☐ JSON editor

You can enter all available task settings directly in JSON format.

Target table preparation mode [Info](#)

☐ Do nothing

☒ Drop tables on target

☐ Truncate

Include LOB columns in replication [Info](#)

☐ Don't include LOB columns

☐ Full LOB mode

☒ Limited LOB mode

Maximum LOB size (KB) [Info](#)

32

For Table mappings, add a new selection rule.

▼ Selection rules

Choose the schema and/or tables you want to include with, or exclude from, your migration task. [Info](#)

Add new selection rule

▼ where **schema name** is like '%' and **table name** is like '%', include

Schema

Enter a schema

Schema name

Use the % character as a wildcard

%

Table name

Use the % character as a wildcard

%

Action

Choose "Include" to migrate your selected objects, or "Exclude" to ignore them during the migration.

Include

For Migration task startup configuration, choose Automatically on create.

And finally click create task which will start the migration process immediately.

Migration task startup configuration

Start migration task

- ☒ **Automatically on create**
Available only if the premigration assessment is not enabled.
- ☐ **Manually later**

The Database migration task creation is in progress.

workfall-dms creation in progress.

DMS > Database migration tasks

Database migration tasks (1) **Actions** **Quick view and compare** **Create task**

< 1 >

<input type="checkbox"/>	Identifier ▾	Status ▾	Progress ▾	Type ▾	Source ▾	Target ▾	Replication instance ▾	Start
<input type="checkbox"/>	workfall-dms	Creating		Full load	mysql-db	postgresql-db	workfall-replica-instance	-

The Migration task is ready now.

Database migration tasks (1) **Actions** **Quick view and compare** **Create task**

< 1 >

<input type="checkbox"/>	Identifier ▾	Status ▾	Progress ▾	Type ▾	Source ▾	Target ▾	Replication instance ▾	Start
<input type="checkbox"/>	workfall-dms	Ready		Full load	mysql-db	postgresql-db	workfall-replica-instance	-

And you can see the migration process has started immediately.

Overview details

Basic configuration

Task ARN
 arn:aws:dms:ap-southeast-1:422463290198:task:7YK5MFJJEEEXPRU7M7JMSKXIYSZYH6BB6GIRPPCA

Progress
 100%

Created
July 31, 2021, 18:24:53 (UTC+05:30)

Stopped
July 31, 2021, 18:26:43 (UTC+05:30)

Replication instance
[workfall-replica-instance](#)

Last failure message
-

Started
July 31, 2021, 18:25:53 (UTC+05:30)

Migration task logs [Info](#)

Not enabled

2. Write a Python script to monitor the replication process and log the status into CloudWatch.

1. Set Up Prerequisites

a. AWS CLI Configuration

Make sure you have AWS CLI installed and configured with credentials that have the necessary permissions:

- Install AWS CLI: [AWS CLI Installation Guide](#)
- Configure AWS credentials: bash

```
aws configure
```

Provide your access key, secret key, region, and output format when prompted.

b. IAM Permissions

Ensure the AWS credentials or IAM role used have the following permissions:

- logs:CreateLogGroup
- logs:CreateLogStream
- logs:PutLogEvents
- logs:DescribeLogStreams

c. Install Required Libraries

Install the required Python library boto3:

```
bash
```

```
pip install boto3
```

2. Prepare the Script

a. Save the Script

Save the provided Python script into a file, for example, replication_monitor.py.

b. Modify the Script

1. Update the AWS region:

```
python
```

```
REGION_NAME = "us-east-1" # Replace with your AWS region
```

2. Replace the check_replication_status function with logic to check your actual replication process. For example:
 - Query a database.
 - Call an API that tracks replication progress.
 - Parse a file or logs.

Example for a database:

```
python
```

```
import psycopg2

def check_replication_status():
    # Example for PostgreSQL
    conn = psycopg2.connect("host=mydbhost dbname=mydb user=myuser password=mypassword")
    cursor = conn.cursor()
    cursor.execute("SELECT status FROM replication_status_table WHERE id=1;")
    status = cursor.fetchone()[0]
    conn.close()
    return status
```

3. Run the Script

a. Execute the Script

Run the script from the command line:

```
bash
```

```
python replication_monitor.py
```

b. Monitor the Output

The script will:

1. Check the replication status every CHECK_INTERVAL seconds (default is 60 seconds).
2. Log status updates to the console.
3. Send logs to AWS CloudWatch under the specified log group and stream.

4. Verify in CloudWatch

a. Log Group

1. Go to the [CloudWatch Console](#).
2. Navigate to **Logs > Log Groups**.
3. Find the log group named ReplicationMonitorLogs.

b. Log Stream

1. Click on the log group.
2. Select the log stream named ReplicationStatusStream.
3. View the logs with timestamps and replication status updates.

5. Adjust and Deploy

a. Deployment Options

- **Local Monitoring:** Run the script on your local machine.
- **Cloud/Server Monitoring:** Deploy the script on a server (e.g., EC2, ECS, or Lambda).
 - For AWS Lambda, ensure the script is event-driven.
 - For EC2, use a scheduler like cron for periodic execution.

b. Adjust Check Interval

Modify the CHECK_INTERVAL variable in the script to suit your replication process needs:

python

CHECK_INTERVAL = 60 # Interval in seconds

c. Add Alerts (Optional)

Set up CloudWatch Alarms to trigger notifications (via SNS) if replication fails:

1. Navigate to CloudWatch **Alarms**.
2. Create an alarm for specific log patterns (e.g., "Replication failed").
3. Associate the alarm with an SNS topic for notifications

3. After migration, ensure that the RDS instance is encrypted and publicly inaccessible.

Steps:

1. **Verify Encryption:**
 - Navigate to the **Amazon RDS Console**.
 - Select the instance and check the **Encryption** field in the instance details.
 - If not encrypted, proceed to create a new instance.
2. **Create a New Encrypted RDS Instance:**
 - In the RDS Console, choose **Create database**.
 - Enable **Encryption** under the "Additional configuration" section.
 - Select the desired KMS key for encryption.
3. **Migrate Data:**
 - Use tools like **AWS Database Migration Service (DMS)** or manual export/import methods to migrate data from the source to the new encrypted instance.

Summary			
DB identifier rds-test	CPU 3.17%	Status Available	Class db.t2.micro
Role Instance	Current activity 0 Sessions	Engine PostgreSQL	Region & AZ us-east-1a
Connectivity & security Monitoring Logs & events Configuration Maintenance & backups Tags			
Instance			
Configuration	Instance class	Storage	Performance Insights
DB instance id rds-test	Instance class db.t2.micro	Encryption Not Enabled	Performance Insights enabled Yes

Ensure the RDS instance is not exposed to the public internet.

Steps:

1. Verify Public Accessibility:

- In the RDS Console, check the **Publicly Accessible** field in the instance details.
- It should be **No**.

2. Modify the Instance (if necessary):

- In the RDS Console, select your instance and click **Modify**.
- Set **Public access** to **No** under "Connectivity".
- Apply changes.

3. Update Security Groups:

- Go to the **EC2 Console > Security Groups**.
- Identify the security group attached to your RDS instance.
- Ensure there are no **0.0.0.0/0** or **::/0** inbound rules.
- Restrict access to specific IPs or VPCs as needed.

4. Use Private Subnets:

- Confirm the RDS instance is deployed in private subnets within your VPC.
- Ensure that the associated **subnet group** contains only private subnets.

Verification

1. Test database connectivity to ensure encryption and private accessibility.
2. Validate with the **AWS Config Rules**:
 - Use predefined rules like:
 - **rds-instance-public-access-check**: Ensures RDS instances are not publicly accessible.
 - **rds-storage-encrypted**: Checks if RDS instances have encryption enabled.

Optional Enhancements

- Use **AWS CloudWatch** to monitor DMS and RDS performance.
- Enable **SSL Encryption** for secure communication between the source and target databases.
- Use **AWS Backup** to create automatic backups of your RDS instance.

