

FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING

Department of Computer Engineering

Course, Subject & Experiment Details

Practical No:	
Title:	To study and Implement Database as a Service on SQL/NOSQL databases like AWS RDS, AZURE SQL/ MongoDB Lab/ Firebase.
Name of the Student:	Warren Fernandes
Roll No:	8940
Date of Performance:	11/04/2022
Date of Submission:	11/04/2022

Evaluation:

Sr. No.	Rubric	Grade
1	On time submission/completion (2)	
2	Preparedness (2)	
3	Skill (4)	
4	Output (2)	

Signature of the Teacher

1. Connect to AWS RDS

The screenshot shows the AWS EC2 Management Dashboard. On the left, there's a sidebar with navigation links like EC2 Dashboard, Instances, Images, and Elastic Block Store. The main area displays 'Resources' with counts for Instances (running), Dedicated Hosts, Elastic IPs, Instances, Key pairs, Load balancers, Placement groups, Security groups, Snapshots, and Volumes. To the right, the 'Account attributes' section lists supported platforms (VPC), default VPC (vpc-0f53bf202c80a165b), settings, EBS encryption, zones, EC2 Serial Console, default credit specification, and console experiments. A 'Explore AWS' sidebar on the right highlights Graviton2-powered EC2 instances for better price performance.

The screenshot shows the 'Launch instance wizard' interface. At the top, it says 'You've been invited to try an early, beta iteration of the new launch instance wizard.' Below is a step navigation bar: 1. Choose AMI, 2. Choose Instance Type, 3. Configure Instance, 4. Add Storage, 5. Add Tags, 6. Configure Security Group, 7. Review. The 'Step 1: Choose an Amazon Machine Image (AMI)' section is active. It shows a search bar with 'Search for an AMI by entering a search term e.g. "Windows"' and a 'Search by Systems Manager parameter' button. The results list includes 'Amazon Linux 2 AMI (HVM) - Kernel 5.10, SSD Volume Type' and 'Amazon Linux 2 AMI (HVM) - Kernel 4.14, SSD Volume Type'. Both entries are labeled 'Free tier eligible'. Each entry has a 'Select' button and a radio button for choosing between 64-bit (x86) and 64-bit (Arm). The bottom of the screen shows the standard Windows taskbar with icons for File Explorer, Task View, Start, Taskbar settings, and a clock.

Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. Learn more about instance types and how they can meet your computing needs.

Filter by: All instance families ▾ Current generation ▾ Show/Hide Columns

Currently selected: t2.micro (- ECUs, 1 vCPUs, 2.5 GHz, ~ 1 GiB memory. EBS only)

Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
t2	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
t2	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
t2	t2.small	1	2	EBS only	-	Low to Moderate	Yes
t2	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
t2	t2.large	2	8	EBS only	-	Low to Moderate	Yes
t2	t2.xlarge	4	16	EBS only	-	Moderate	Yes
t2	t2.2xlarge	8	32	EBS only	-	Moderate	Yes
t3	t3.nano	2	0.5	EBS only	Yes	Up to 5 Gigabit	Yes
t3	t3.micro	2	1	EBS only	Yes	Up to 5 Gigabit	Yes

Cancel Previous Review and Launch Next: Configure Instance Details Go to Settings to activate Windows

Step 3: Configure Instance Details

Configure the instance to suit your requirements. You can launch multiple instances from the same AMI, request Spot instances to take advantage of the lower pricing, assign an access management role to the instance, and more.

Number of instances: 1 Launch into Auto Scaling Group

Purchasing option: Request Spot Instances

Network: vpc-0f53bf202c80a165b (default) Create new VPC

Subnet: No preference (default subnet in any Availability Zone) Create new subnet

Auto-assign Public IP: Use subnet setting (Enable)

Hostname type: Use subnet setting (IP name)

DNS Hostname:

- Enable IP name IPv4 (A record) DNS requests
- Enable resource-based IPv4 (A record) DNS requests
- Enable resource-based IPv6 (AAAA record) DNS requests

Placement group: Add instance to placement group

Capacity Reservation: Open

Domain join directory: No directory Create new directory

IAM role: None Create new IAM role

Cancel Previous Review and Launch Next: Add Storage Go to Settings to activate Windows

Step 4: Add Storage

Your instance will be launched with the following storage device settings. You can attach additional EBS volumes and instance store volumes to your instance, or edit the settings of the root volume. You can also attach additional EBS volumes after launching an instance, but not instance store volumes. [Learn more about storage options in Amazon EC2.](#)

Volume Type	Device	Snapshot	Size (GiB)	Volume Type	IOPS	Throughput (MB/s)	Delete on Termination	Encryption
Root	/dev/xvda	snap-0e8a7a7609c630051	8	General Purpose SSD (gp2)	100 / 3000	N/A	<input checked="" type="checkbox"/>	Not Encrypted

[Add New Volume](#)

Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage. [Learn more about free usage tier eligibility and usage restrictions.](#)

▼ Shared file systems

You currently don't have any file systems on this instance. Select "Add file system" button below to add a file system.

[Add file system](#)

[Cancel](#) [Previous](#) [Review and Launch](#) [Next: Configure Security Group](#)

Step 5: Add Tags

A tag consists of a case-sensitive key-value pair. For example, you could define a tag with key = Name and value = Webserver. A copy of a tag can be applied to volumes, instances or both. Tags will be applied to all instances and volumes. [Learn more about tagging your Amazon EC2 resources.](#)

Key	(128 characters maximum)	Value	(256 characters maximum)	Instances	Volumes	Network Interfaces
xyz	42			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

[Add another tag](#) (Up to 50 tags maximum)

[Cancel](#) [Previous](#) [Review and Launch](#) [Next: Configure Security Group](#)

The screenshot shows the AWS RDS Management Console interface. At the top, there is a banner for Amazon Aurora, followed by a "Create database" button and a link to "Or, Restore Aurora DB cluster from S3". Below this, the "Resources" section displays usage statistics for various Amazon RDS resources in the US East (N. Virginia) region:

Resource Type	Count
DB Instances	0/40
Allocated storage (0 TB/100 TB)	0/100
DB Clusters	0/40
Reserved instances	0/40
Snapshots	0/100
Recent events	0
Event subscriptions	0/20

On the right side, there are "Recommended for you" links:

- Build RDS Operational Tasks**: Watch how to enable users to perform common tasks such as snapshots or restart DB instances in Amazon RDS. [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](#)
- Implementing Cross-Region DR**: Learn how to set up Cross-Region disaster recovery (DR) for Aurora PostgreSQL using an Aurora global database spanning multiple Regions. [Learn more](#)
- Test Your DR Strategy in Minutes**: Amazon Aurora Global Database now supports planned managed failover, making disaster recovery drills a breeze. [Learn more](#)

At the bottom, the Windows taskbar shows the search bar, task icons, and system status.

RDS Management Console + [Alt+S]

https://console.aws.amazon.com/rds/home?region=us-east-1#launch-dbinstance&db=false&s3-import=false

N. Virginia vandersquelle

Choose a database creation method Info

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.

Engine options

Engine type Info

Amazon Aurora 

MySQL 

MariaDB 

PostgreSQL 

Oracle 

Microsoft SQL Server 

Edition MySQL Community

Known issues/limitations Info

Feedback English (US) Type here to search

Activate Windows Go to Settings to activate Windows.

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RDS Management Console + [Alt+S]

https://console.aws.amazon.com/rds/home?region=us-east-1#launch-dbinstance&db=false&s3-import=false

N. Virginia vandersquelle

Known issues/limitations

Review the Known issues/limitations [Info](#) to learn about potential compatibility issues with specific database versions.

Version

MySQL 8.0.27

Templates

Choose a sample template to meet your use case.

Production Use defaults for high availability and fast, consistent performance.

Dev/Test This instance is intended for development use outside of a production environment.

Free tier Use RDS Free Tier to develop new applications, test existing applications, or gain hands-on experience with Amazon RDS. Info

Availability and durability

Deployment options Info

The deployment options below are limited to those supported by the engine you selected above.

Single DB instance (not supported for Multi-AZ DB cluster snapshot) Creates a single DB instance with no standby DB instances.

Multi-AZ DB instance (not supported for Multi-AZ DB cluster snapshot) Creates a primary DB instance and a standby DB instance in a different AZ. Provides high availability and data redundancy, but the standby DB instance doesn't support connections from read workloads.

Known issues/limitations Info

Feedback English (US) Type here to search

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RDS Management Console X +

https://console.aws.amazon.com/rds/home?region=us-east-1#launch-dbinstance:gdb=false;s3-import=false

aws Services Search for services, features, blogs, docs, and more [Alt+S]

N. Virginia vandersquelle

Availability Zone (AZ). Provides high availability, data redundancy and increases capacity to serve read workloads.

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.
testsqldb

The DB instance identifier is case-insensitive, but is stored as all lowercase (as in "mydbinstance"). Constraints: 1 to 60 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. First character must be a letter.

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

Master password Info Constraints: At least 8 printable ASCII characters. Can't contain any of the following: / (slash), '(single quote), "(double quote) and @ (at sign).

Confirm password Info

Feedback English (US) ▾ Type here to search

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DB instance class

RDS Management Console X +

https://console.aws.amazon.com/rds/home?region=us-east-1#launch-dbinstance:gdb=false;s3-import=false

aws Services Search for services, features, blogs, docs, and more [Alt+S]

N. Virginia vandersquelle

Virtual private cloud (VPC) Info VPC that defines the virtual networking environment for this DB instance.
Default VPC (vpc-0f53bf202c80a165b)

Only VPCs with a corresponding DB subnet group are listed.

After a database is created, you can't change its VPC.

Subnet group Info DB subnet group that defines which subnets and IP ranges the DB instance can use in the VPC you selected.
default

Public access Yes Amazon EC2 instances and devices outside the VPC can connect to your database. Choose one or more VPC security groups that specify which EC2 instances and devices inside the VPC can connect to the database.
No RDS will not assign a public IP address to the database. Only Amazon EC2 instances and devices inside the VPC can connect to your database.

VPC security group Choose a VPC security group to allow access to your database. Ensure that the security group rules allow the appropriate incoming traffic.
Choose existing Choose existing VPC security groups
Create new Create new VPC security group

Existing VPC security groups

Feedback English (US) ▾ Type here to search

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DB instance class

RDS Management Console X + https://console.aws.amazon.com/rds/home?region=us-east-1#launch-dbinstance:gdb=false:s3-import=false N. Virginia vandersquelle

DB subnet group that defines which subnets and IP ranges the DB instance can use in the VPC you selected.

default

Public access **Info**

Yes Amazon EC2 instances and devices outside the VPC can connect to your database. Choose one or more VPC security groups that specify which EC2 instances and devices inside the VPC can connect to the database.

No RDS will not assign a public IP address to the database. Only Amazon EC2 instances and devices inside the VPC can connect to your database.

VPC security group Choose a VPC security group to allow access to your database. Ensure that the security group rules allow the appropriate incoming traffic.

Choose existing Choose existing VPC security groups

Create new Create new VPC security group

Existing VPC security groups Choose VPC security groups default

Availability Zone **Info** No preference

▼ Additional configuration

Database port **Info** TCP/IP port that the database will use for application connections. 3306

Activate Windows Go to Settings to activate Windows.

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RDS Management Console X + https://console.aws.amazon.com/rds/home?region=us-east-1#databases: N. Virginia vandersquelle

Amazon RDS X View credential details

Creating database testsqldb Your database might take a few minutes to launch.

Dashboard Databases Query Editor Performance insights Snapshots Automated backups Reserved instances Proxies Subnet groups Parameter groups Option groups Custom Availability Zones Custom engine versions Events Event subscriptions Recommendations 0 Certificate update

RDS > Databases

Databases Group resources C Modify Actions ▾ Restore from S3 Create database

Filter by databases

DB identifier	Role	Engine	Region & AZ	Size	Status	CPU	Current act
testsqldb	Instance	MySQL Community	-	db.t2.micro	Creating	-	

Activate Windows Go to Settings to activate Windows.

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RDS Management Console X + https://console.aws.amazon.com/rds/home?region=us-east-1#databases: N. Virginia vandersquille

Amazon RDS X Successfully created database testsqldb View connection details

Dashboard
Databases
Query Editor
Performance insights
Snapshots
Automated backups
Reserved instances
Proxies

Subnet groups
Parameter groups
Option groups
Custom Availability Zones
Custom engine versions

Events
Event subscriptions

Recommendations 0
Certificate update

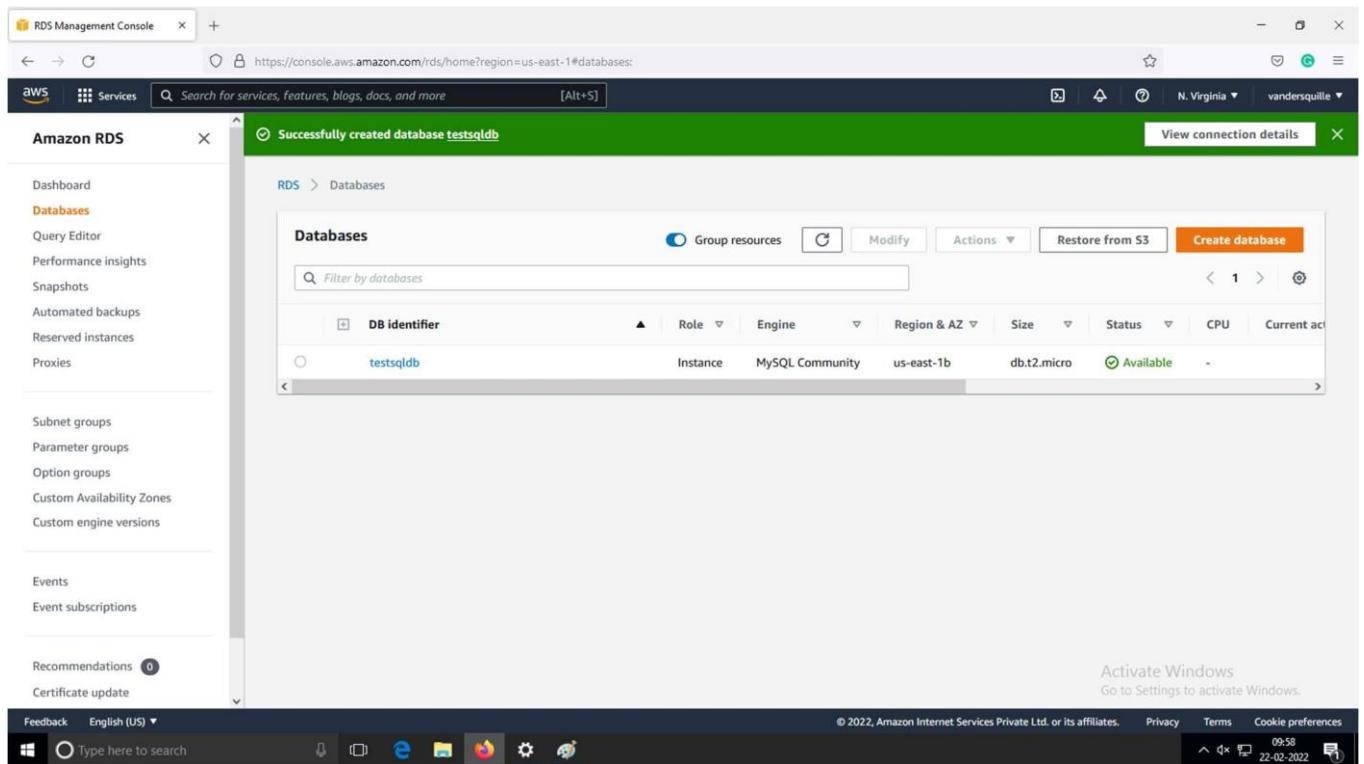
DB identifier Role Engine Region & AZ Size Status CPU Current ac

testsqldb Instance MySQL Community us-east-1b db.t2.micro Available

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Type here to search 09:58 22-02-2022



MySQL Workbench Local instance wampmysqld File Edit View Database Tools Scripting Help

Welcome to MySQL Workbench

Setup New Connection

Connection Name: testsqldb Type a name for the connection

Connection Method: Standard (TCP/IP) Method to use to connect to the RDBMS

Parameters: SSL Advanced

Hostname: ob9nfyk.us-east-1.rds.amazonaws.com Port: 3306 Name or IP address of the server host - and TCP/IP port.

Username: admin Name of the user to connect with.

Password: Store in Vault... Clear The user's password. Will be requested later if it's not set.

Default Schema: The schema to use as default schema. Leave blank to select it later.

Configure Server Management... Test Connection Cancel OK

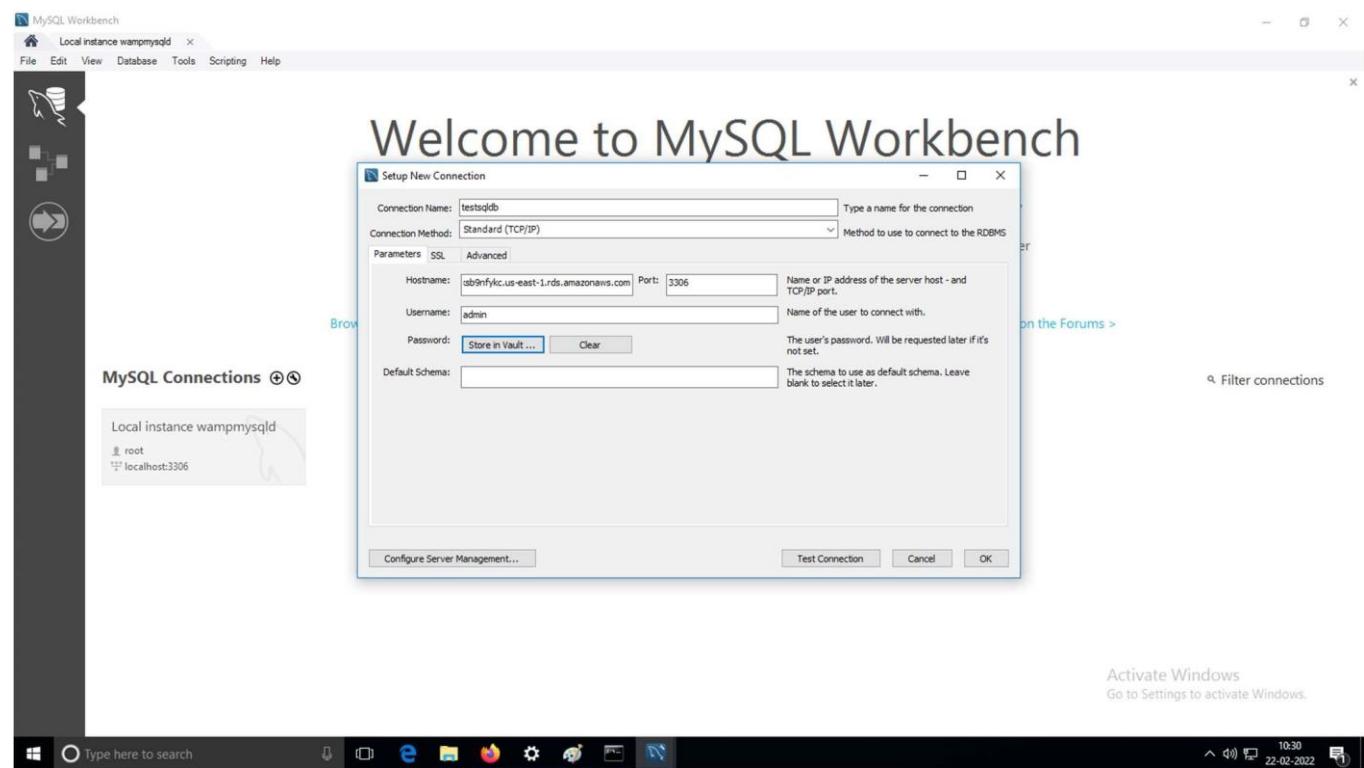
MySQL Connections +

Local instance wampmysqld

root localhost:3306

Activate Windows Go to Settings to activate Windows.

Type here to search 10:30 22-02-2022



MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Navigator: Schemas

Schema: testsqldb

Tables: awtest

```

1 • create database testsqldb;
2 • use testsqldb;
3
4 • create table awtest(rollno int, name varchar(15));
5
6 • insert into awtest values (8934, "Betsy");
7 • insert into awtest values (8945, "Akshata");
8 • insert into awtest values (8950, "Liny");
9

```

SQL Additions

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

Administration Schemas

Information

Schema: testsqldb

Action Output

#	Time	Action	Message	Duration / Fetch
2	10:56:20	use testsqldb	0 row(s) affected	0.000 sec
3	10:56:20	create table awtest(rollno int, name varchar(15))	0 row(s) affected	0.656 sec
4	10:58:07	insert into awtest values (8934, "Betsy")	1 row(s) affected	0.094 sec
5	10:58:47	insert into awtest values (8945, "Akshata")	1 row(s) affected	0.063 sec
6	10:58:53	insert into awtest values (8950, "Liny")	1 row(s) affected	0.078 sec
7	10:58:58	SELECT * FROM testsqldb.awtest LIMIT 0, 1000	3 row(s) returned	0.000 sec / 0.000 sec

Activate Windows
Go to Settings to activate 3 rows.

Type here to search

10:59 22-02-2022

MySQL Workbench

File Edit View Query Database Server Tools Scripting Help

Navigator: Schemas

Schema: testsqldb

Tables: awtest

```

1 • SELECT * FROM testsqldb.awtest;

```

Result Grid

rollno	name
8934	Betsy
8945	Akshata
8950	Liny

SQL Additions

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

Administration Schemas

Information

Schema: testsqldb

awtest 1 x

Action Output

#	Time	Action	Message	Duration / Fetch
2	10:56:20	use testsqldb	0 row(s) affected	0.000 sec
3	10:56:20	create table awtest(rollno int, name varchar(15))	0 row(s) affected	0.656 sec
4	10:58:07	insert into awtest values (8934, "Betsy")	1 row(s) affected	0.094 sec
5	10:58:47	insert into awtest values (8945, "Akshata")	1 row(s) affected	0.063 sec
6	10:58:53	insert into awtest values (8950, "Liny")	1 row(s) affected	0.078 sec
7	10:58:58	SELECT * FROM testsqldb.awtest LIMIT 0, 1000	3 row(s) returned	0.000 sec / 0.000 sec

Activate Windows
Go to Settings to activate 3 rows.

Type here to search

10:59 22-02-2022

The screenshot shows the AWS RDS Management Console. The main view is titled 'Databases' and lists a single database named 'testsqldb'. The database details are as follows:

DB identifier	Instance	Engine	Region & AZ	Size	Status	CPU
testsqldb	MySQL Community	us-east-1b	db.t2.micro	Available	5.90%	

The left sidebar contains the following navigation links:

- Dashboard
- Databases** (selected)
- Query Editor
- Performance insights
- Snapshots
- Automated backups
- Reserved instances
- Proxies
- Subnet groups
- Parameter groups
- Option groups
- Custom Availability Zones
- Custom engine versions
- Events
- Event subscriptions

At the bottom right, there are links for 'Activate Windows', 'Feedback', 'English (US)', and system status.

A] CREATION OF EC2 INSTANCE

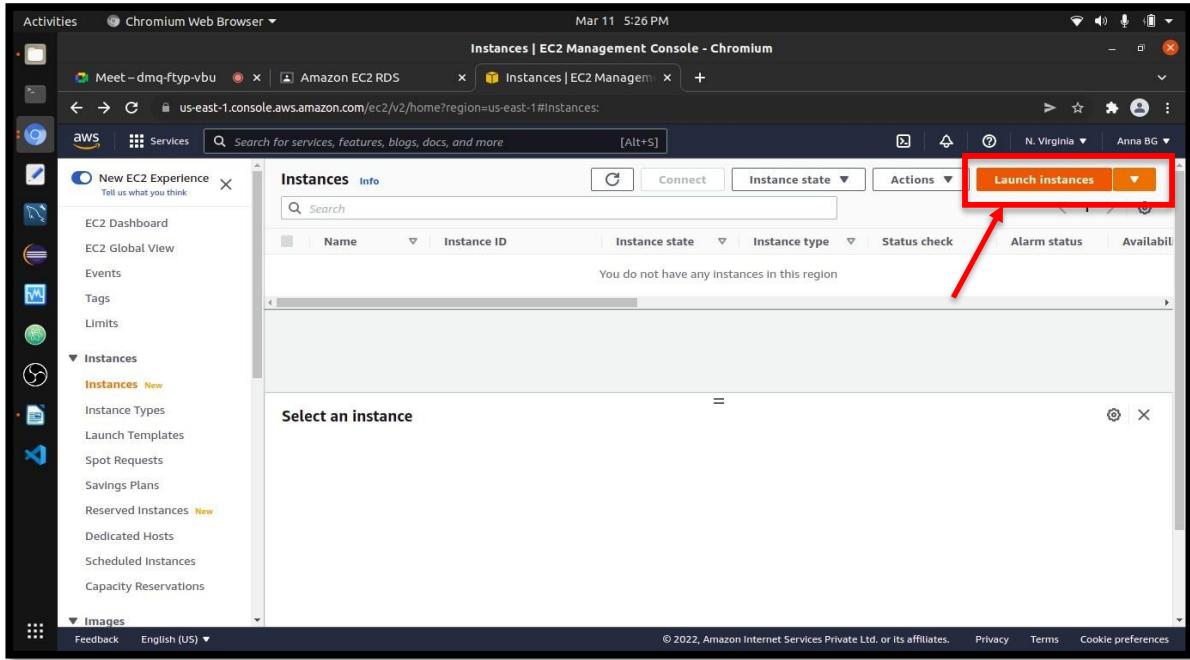
- 1) Create a security group
 - a) Go to VPC
 - b) Select Security Groups
 - c) Select the security group which you prepared for the previous practical
 - d) Edit inbound rules
 - e) Add RDP and SSH

The screenshot shows the AWS VPC Security Groups console. The current view is 'Edit inbound rules' for a security group named 'sg-05dcb155bc7706a64 - MySecurity'. The table displays two inbound rules:

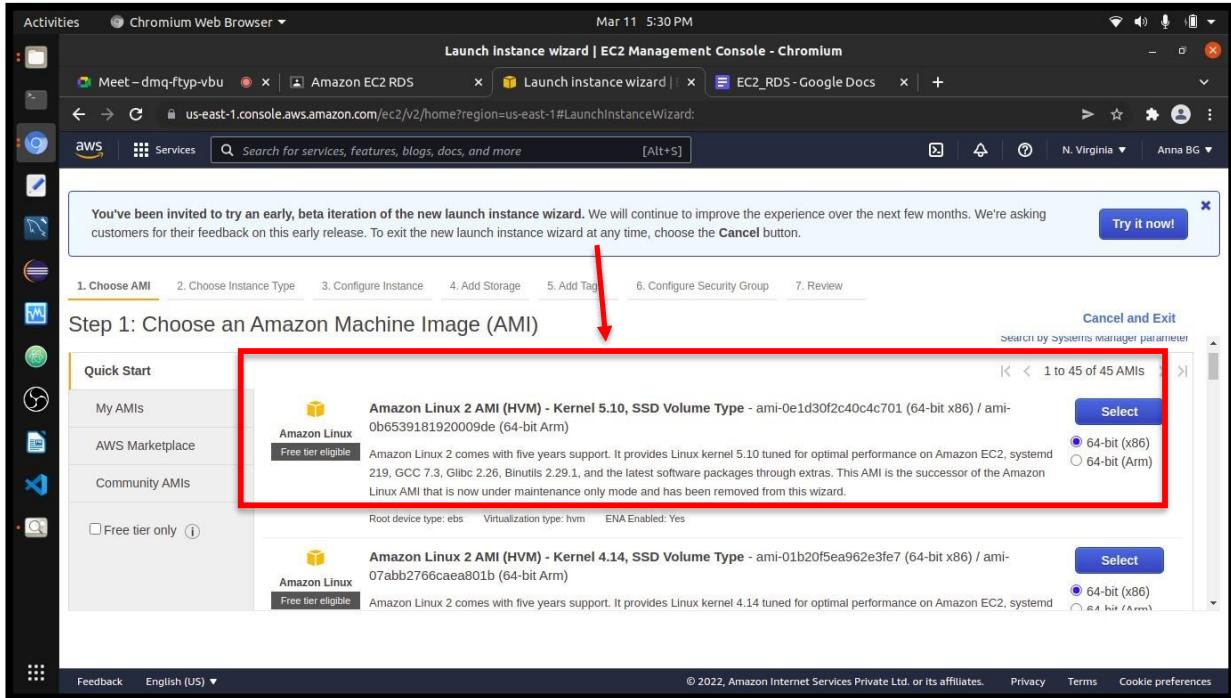
Security group rule ID	Type	Protocol	Port range	Source	Description - optional
sgr-0bbca33c5434f1c1e	RDP	TCP	3389	Custom 182.57.98.195/32	RDP Access all
sgr-09b13a793848e5e89	SSH	TCP	22	Custom 0.0.0.0/0	SSH Access all

At the bottom, there are buttons for 'Add rule', 'Cancel', 'Preview changes', and a prominent orange 'Save rules' button.

- 2) Search EC2. Go to instances. Choose launch instances.



3) Choosing a Linux AMI



4) In Choose an Instance Type, directly go to the next step.

Activities Chromium Web Browser Mar 11 5:31 PM

Launch instance wizard | EC2 Management Console - Chromium

Meet - dmq-ftp-vbu Amazon EC2 RDS Launch instance wizard EC2_RDS - Google Docs

us-east-1.console.aws.amazon.com/ec2/v2/home?region=us-east-1#LaunchInstanceWizard:

Services Search for services, features, blogs, docs, and more [Alt+S]

N. Virginia Anna BG

1. Choose AMI 2. Choose Instance Type 3. Configure Instance 4. Add Storage 5. Add Tags 6. Configure Security Group 7. Review

Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances are virtual servers that can run applications. They have varying combinations of CPU, memory, storage, and networking capacity, and give you the flexibility to choose the appropriate mix of resources for your applications. Learn more about instance types and how they can meet your computing needs.

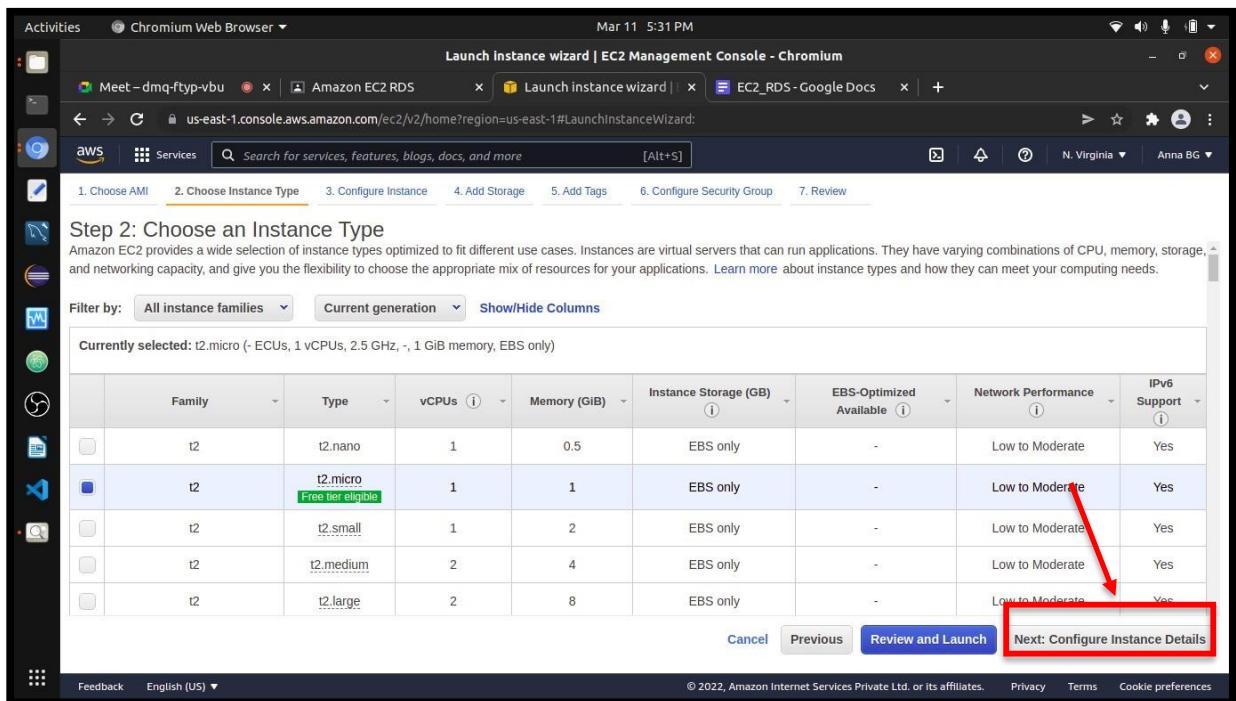
Filter by: All instance families Current generation Show/Hide Columns

Currently selected: t2.micro (- ECUs, 1 vCPUs, 2.5 GHz, ~ 1 GiB memory, EBS only)

	Family	Type	vCPUs	Memory (GiB)	Instance Storage (GB)	EBS-Optimized Available	Network Performance	IPv6 Support
<input type="checkbox"/>	t2	t2.nano	1	0.5	EBS only	-	Low to Moderate	Yes
<input checked="" type="checkbox"/>	t2	t2.micro Free tier eligible	1	1	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	t2	t2.small	1	2	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	t2	t2.medium	2	4	EBS only	-	Low to Moderate	Yes
<input type="checkbox"/>	t2	t2.large	2	8	EBS only	-	Low to Moderate	Yes

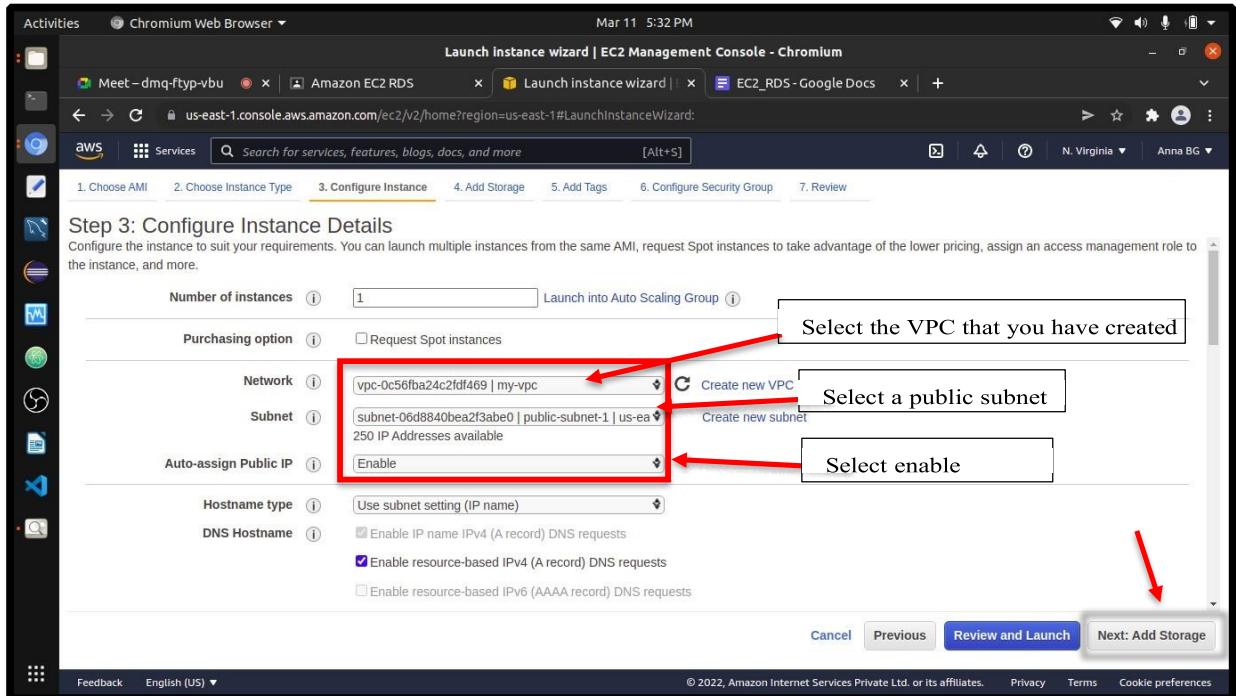
Cancel Previous Review and Launch Next: Configure Instance Details

Feedback English (US) © 2022, Amazon Internet Services Private Ltd. or its affiliates. Privacy Terms Cookie preferences

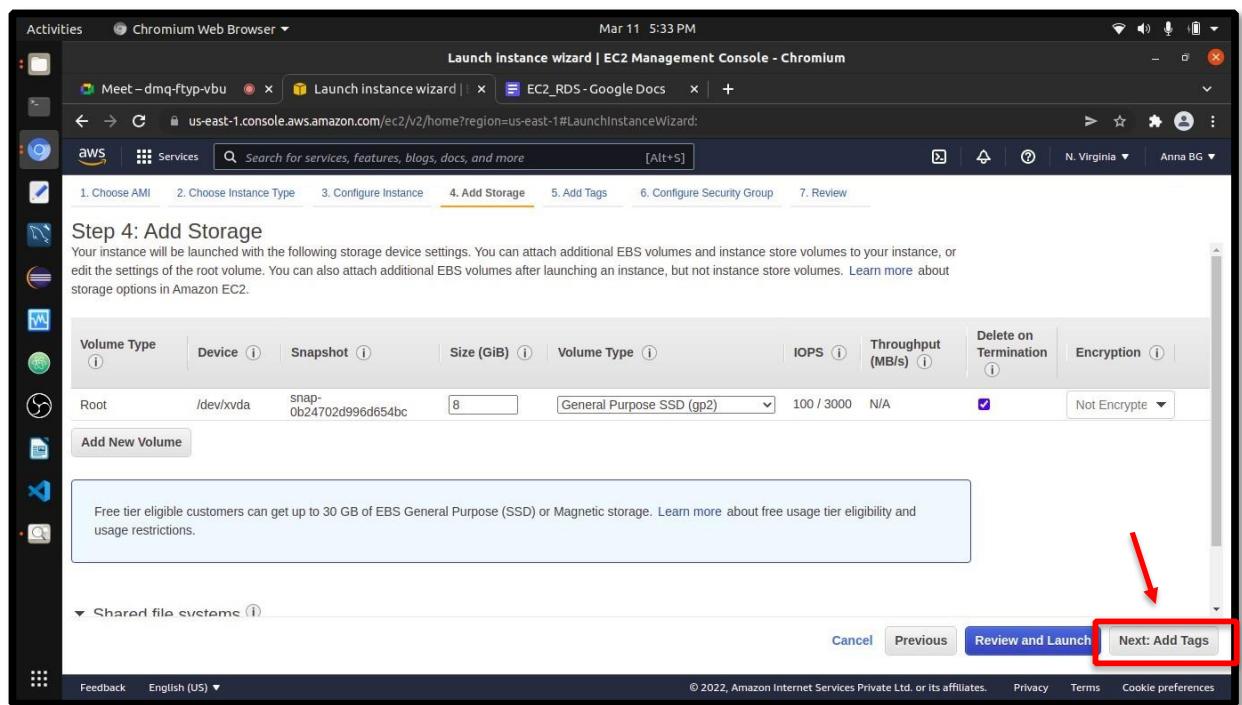


The screenshot shows the 'Launch instance wizard' interface on the AWS Management Console. It's Step 2: Choose an Instance Type. A red arrow points from the 'Next: Configure Instance Details' button at the bottom right to the 'Configure Instance Details' link in the tooltip of the same button. The 't2.micro' instance is selected and highlighted with a green 'Free tier eligible' badge. The table lists various t2 instance types with their details like vCPUs, memory, and storage.

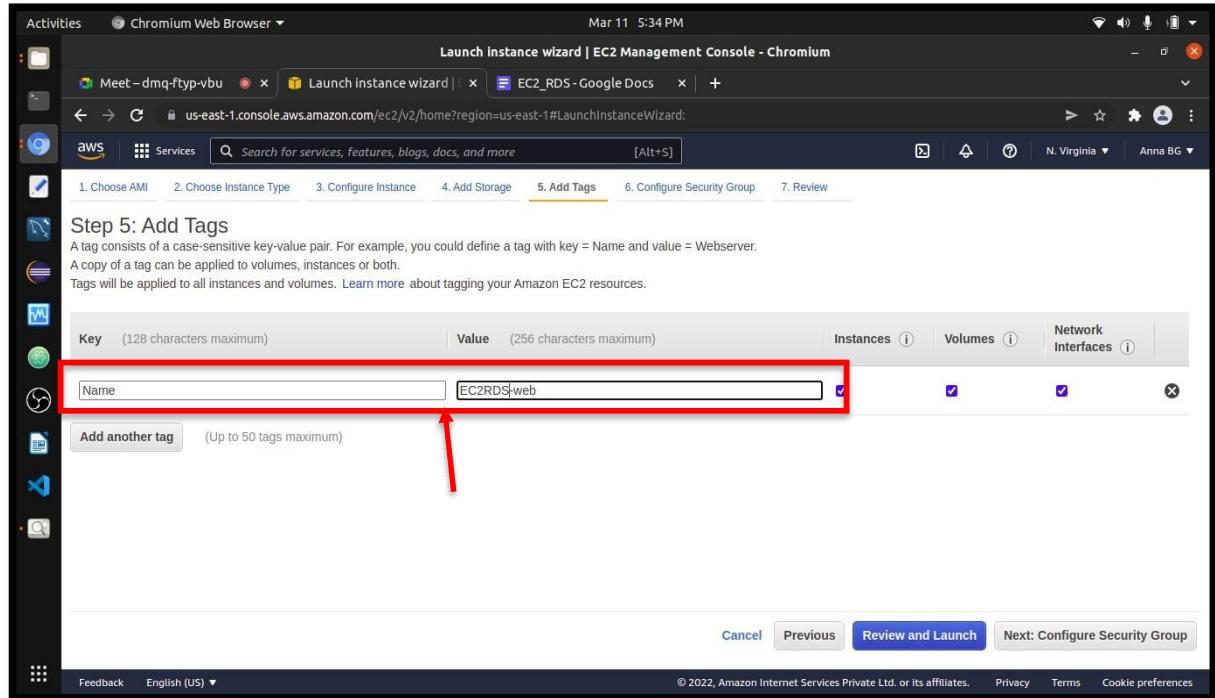
5) Configuring Instance Details



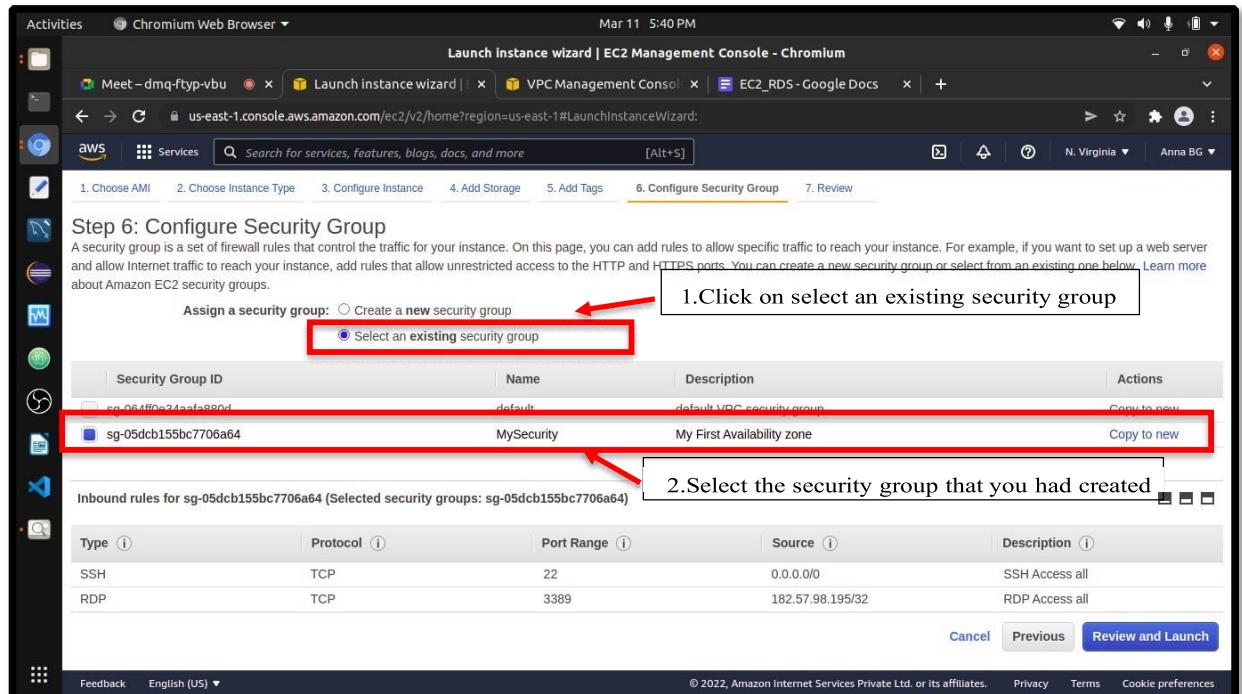
6) Add Storage



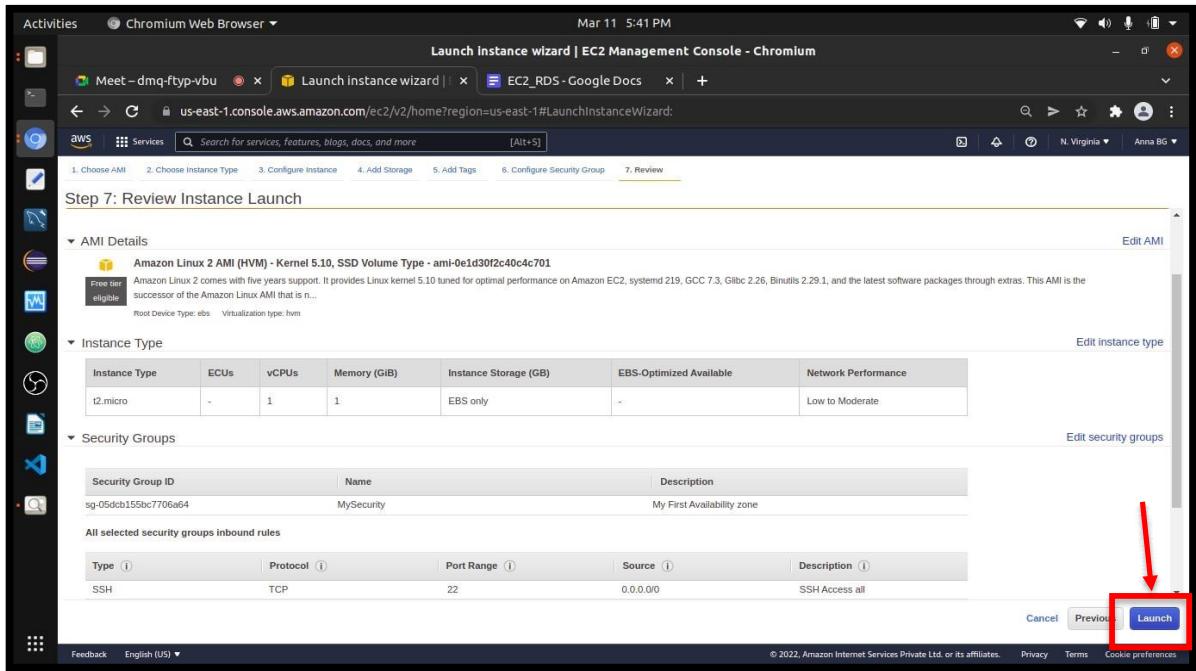
7) Add Tags (Key = Name & Value = EC2RDSlab-web)



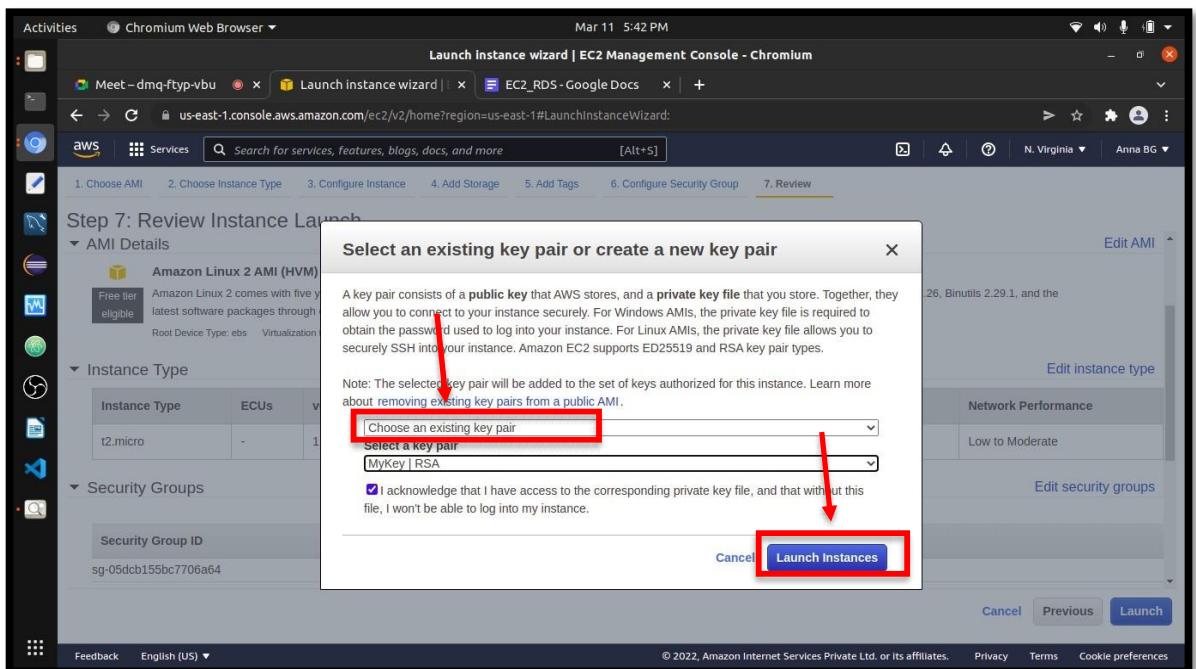
8) Configure Security Group

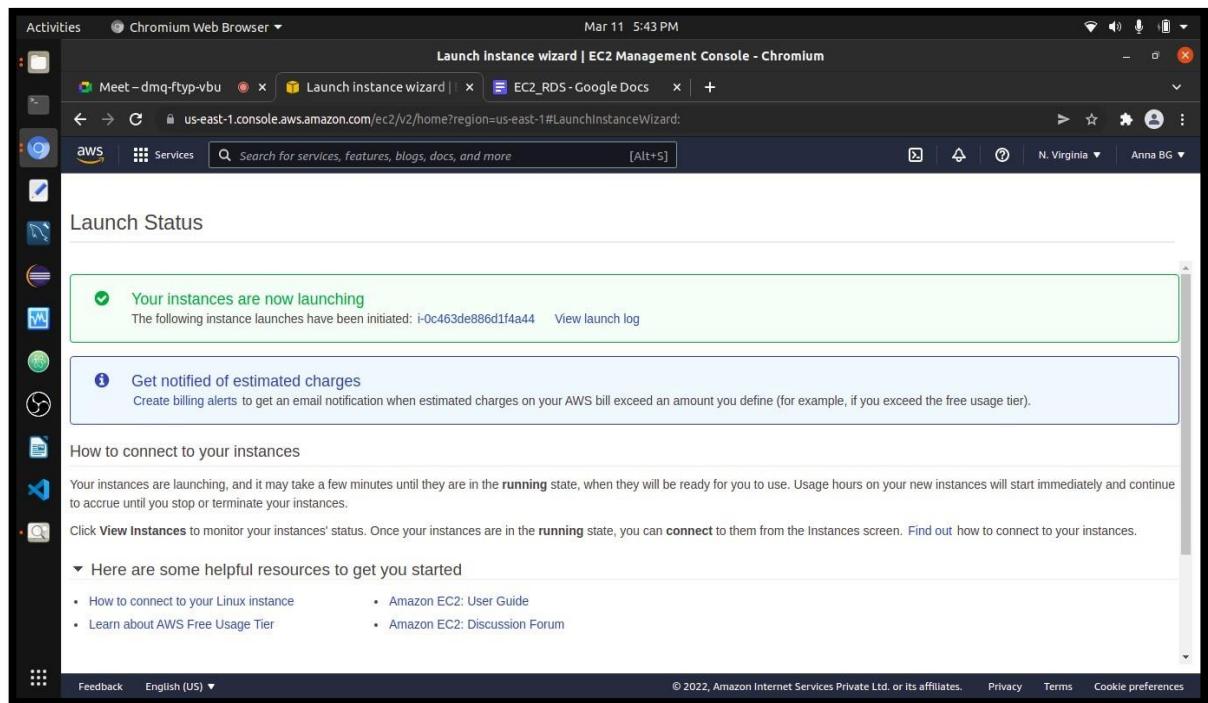


9) Review and Launch

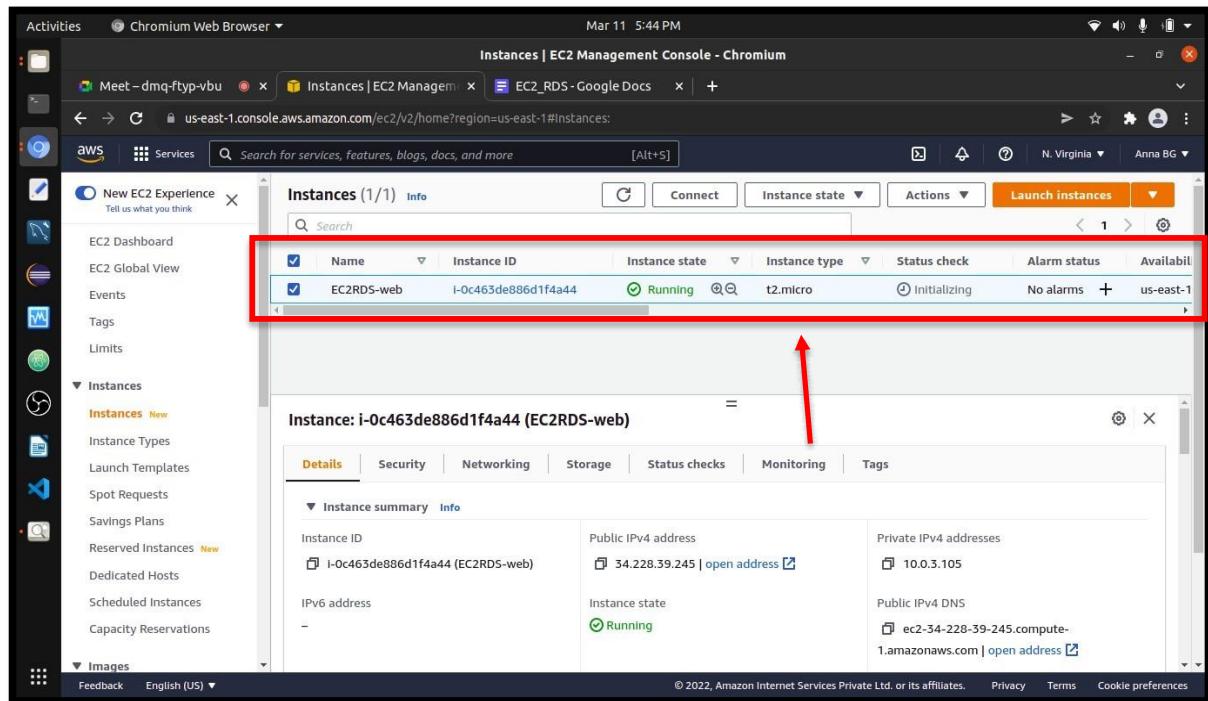


- 10) Launching the Instance (Select Choose an existing key pair, and select the key pair that you have created in the previous lab - EC2 VPC, else create a new key pair)





11) EC2 Instance Created



B] Creation of RDS

1) Creating Database

The screenshot shows the 'Create database' page in the AWS RDS console. At the top, a message says 'We listened to your feedback! Now, create a database with a single click using our pre-built configurations! Or choose your own configurations.' Below this, a red arrow points to the 'Standard create' option under 'Choose a database creation method'. The 'Standard create' box is highlighted with a red border. The 'Easy create' option is also visible. Further down, another red arrow points to the 'MySQL' engine type under 'Engine options', which is also highlighted with a red border. Other engine options shown include Amazon Aurora, MariaDB, PostgreSQL, Oracle, and Microsoft SQL Server.

The screenshot shows the 'Create database' page in the AWS RDS console, specifically for the MySQL engine. Under 'Edition', 'MySQL Community' is selected. A red arrow points to the 'Free tier' template under 'Templates', which is highlighted with a red border. The 'Free tier' box contains the text: 'Use RDS Free Tier to develop new applications, test existing applications, or gain hands-on experience with Amazon RDS.' Other templates shown include 'Production' and 'Dev/Test'. Below the template section, there's a 'Availability and durability' section with deployment options like 'Multi-AZ DB Cluster - new'. The bottom of the page includes standard AWS footer links for Feedback, English (US), Privacy, Terms, and Cookie preferences.

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.
 mydatabase

This DB instance identifier is case-insensitive, but is stored as all lowercase (as in "mydbinstance"). Constraints: 1 to 60 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. First character must be a letter.

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

Master password Info

Constraints: At least 8 printable ASCII characters. Can't contain any of the following: / (slash), '(single quote)', "(double quote)" and @ (at sign).

Confirm password Info

DB instance class

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DB instance class

DB instance class Info
 Burstable classes (includes t classes)
 Standard classes (includes m classes)
 Memory optimized classes (includes r and x classes)

db.t2.micro
1 vCPUs 1 GiB RAM Not EBS Optimized

include previous generation classes

Storage

Storage type Info
 General Purpose SSD (gp2)
Baseline performance determined by volume size

Allocated storage
 20 GiB
(Minimum: 20 GiB. Maximum: 16,384 GiB) Higher allocated storage **may improve** IOPS performance.

Storage autoscaling Info
Provides dynamic scaling support for your database's storage based on your application's needs.

Enable storage autoscaling
Enabling this feature will allow the storage to increase once the specified threshold is exceeded.

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Screenshot of the AWS RDS 'Create DB Instance' configuration page under the 'Connectivity' section.

Virtual private cloud (VPC) Info: my-vpc (vpc-0c56fba24c2fd469) Choose the VPC that you have selected while creating the EC2 instance

Subnet group Info: Create new DB Subnet Group

Public access Info: Yes Amazon EC2 instances and devices outside the VPC can connect to your database. Choose one or more VPC security groups that specify which EC2 instances and devices inside the VPC can connect to the database.

No RDS will not assign a public IP address to the database. Only Amazon EC2 instances and devices inside the VPC can connect to your database.

VPC security group: Choose existing VPC security groups Choose existing Choose existing VPC security groups Create new Create new VPC security group

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Screenshot of the AWS RDS 'Create DB Instance' configuration page under the 'Additional configuration' section.

Initial database name: mydatabase mydatabase

DB parameter group: default.mysql8.0

Option group: default:mysql-8-0

Backup: Enable automated backups Creates a point-in-time snapshot of your database.

Backup retention period: 7 days Please note that automated backups are currently supported for InnoDB storage engine only. If you are using MyISAM, refer to details here.

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The screenshot shows the AWS RDS configuration page for a database instance. It includes sections for:

- Backup window**: Set to "No preference". Options include "Select window" and "No preference". A checked checkbox "Copy tags to snapshots" is present.
- Monitoring**: An unchecked checkbox "Enable Enhanced monitoring". A note states: "Enabling Enhanced monitoring metrics are useful when you want to see how different processes or threads use the CPU."
- Log exports**: Unchecked checkboxes for "Audit log", "Error log", "General log", and "Slow query log".
- IAM role**: A note: "The following service-linked role is used for publishing logs to CloudWatch Logs." A button "RDS service-linked role". A callout box contains the instruction: "Ensure that general, slow query, and audit logs are turned on. Error logs are enabled by default. [Learn more](#)".
- Maintenance**: A note: "Auto minor version upgrade [Info](#)". A checked checkbox "Enable auto minor version upgrade". A note: "Enabling auto minor version upgrade will automatically upgrade to new minor versions as they are released. This automatically does not consider the update source available for the instance."

The screenshot shows the AWS RDS configuration page for a database instance. It includes sections for:

- Maintenance window**: Set to "No preference". Options include "Select window" and "No preference".
- Deletion protection**: An unchecked checkbox "Enable deletion protection". A note: "Protects the database from being deleted accidentally. While this option is enabled, you can't delete the database."
- Estimated monthly costs**: A note: "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 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. [\[?\]](#)"
- A note: "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](#). [\[?\]](#)"
- A callout box contains the instruction: "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." A red arrow points to the "Create database" button.

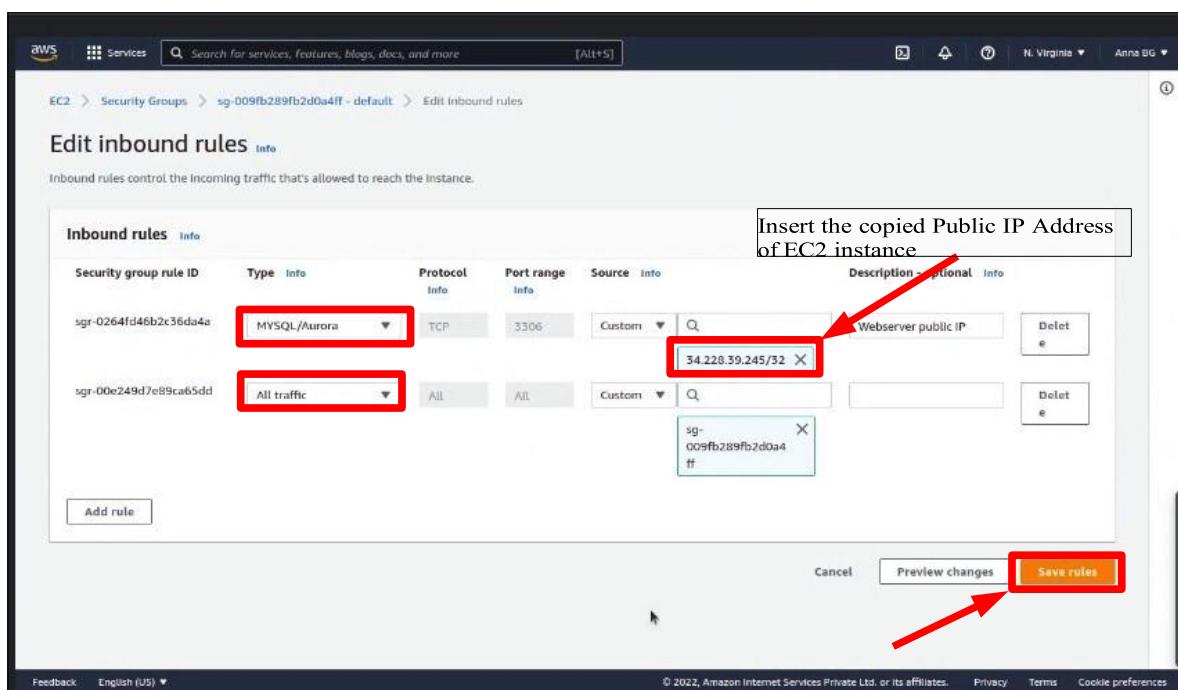
Screenshot of the AWS RDS console showing the list of databases. The 'mydatabase' row is selected and highlighted with a red box. An arrow points from the bottom right towards the 'mydatabase' row.

2) Click on mydatabase -> Connectivity & Security -> VPC Security groups -> Click on that link

Screenshot of the AWS RDS console for the 'mydatabase' database. The 'Connectivity & security' tab is selected. A red box highlights the 'VPC security groups' section, and an arrow points from the bottom right towards it.

3) By going to the EC2 instance, copy the public IP address of the EC2 instance that you had created previously.

- a) Click on Add rule
- b) Select type MySQL/Aurora
- c) Protocol -> TCP
- d) Port Range -> 3306
- e) Service -> Custom
- f) Insert the copied public IP address of the EC2 instance
- g) Save rules.



C] Connection of EC2 instance to RDS

- 1) Go to the location where the .pem file is located (You might have got the .pem file from the last EC2 VPC practical or else create a new Key pair and use that .pem file)
- 2) Go to your cmd/Terminal
- 3) In Terminal, type the following command:

```
ssh -i <<Key pair file name (.pem file)>> ec2-user@<<Public IP4 Address of EC2 Instance>>
```
- 4) Once the above command is executed, you will enter into the Amazon Machine Image (Linux AMI) (the one which you had chosen while creating the EC2 instance (step A3))
- 5) Now enter the below command for accessing mysql:

```
mysql -h <<Endpoint of Created RDS Server>> -u <<master_username>> -p
```
- 6) Enter the password for mysql which you had given while creating the RDS.

```

anna@george:~/sem6/CC$ ssh -i MyKey.pem ec2-user@34.228.39.245
Last login: Fri Mar 11 16:52:14 2022 from 106.193.135.3

      _\|_(_-|_) /   Amazon Linux 2 AMI
     __|\_\_\_\_|

https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-10-0-3-105 ~]$
[ec2-user@ip-10-0-3-105 ~]$
[ec2-user@ip-10-0-3-105 ~]$ mysql -h mydatabase.czahtztimfem.us-east-1.rds.amazonaws.com -u admin -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 45
Server version: 8.0.27 Source distribution

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

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

MySQL [(none)]> show databases;
+-----+
| Database |
+-----+
| information_schema |
| mysql |
| performance_schema |
| sys |
+-----+
4 rows in set (0.00 sec)

MySQL [(none)]> █

```

7) Now run these SQL commands

- SHOW DATABASES;
- CREATE DATABASE BOOKS;
- SHOW DATABASES;
- USE BOOKS;
- CREATE TABLE BOOK (
 - BID INT NOT NULL,
 - TITLE VARCHAR(255) NOT NULL,
 - AUTHOR VARCHAR(255)
 -);
)
- INSERT INTO BOOK(BID, TITLE, AUTHOR) VALUES (1, 'BECOMING', 'MICHELLE OBAMA');
- SELECT * FROM BOOK;

```
MySQL [(none)]> create database Books;
Query OK, 1 row affected (0.02 sec)

MySQL [(none)]> show databases;
+-----+
| Database      |
+-----+
| Books          |
| information_schema |
| mysql          |
| performance_schema |
| sys            |
+-----+
5 rows in set (0.00 sec)

MySQL [(none)]> Use Books;
Database changed
MySQL [Books]> CREATE TABLE BOOK (
    -> BID INT NOT NULL,
    -> TITLE VARCHAR(255) NOT NULL,
    -> AUTHOR VARCHAR(255)
    -> );
Query OK, 0 rows affected (0.04 sec)

MySQL [Books]> INSERT INTO BOOK(BID, TITLE, AUTHOR)
    -> VALUES (1, 'BECOMING', 'MICHELLE OBAMA');
Query OK, 1 row affected (0.01 sec)

MySQL [Books]> SELECT * FROM BOOK;
+---+---+---+
| BID | TITLE      | AUTHOR      |
+---+---+---+
| 1  | BECOMING   | MICHELLE OBAMA |
+---+---+---+
1 row in set (0.00 sec)

MySQL [Books]> █
```

Experiment 6: Amazon Web Services RDS Post Lab Questions

Q1. What are the benefits of using Amazon AWS RDS system?

The most important benefits for using Amazon RDS.

Availability

AWS RDS is a highly available relational database that offers a feature called Multi-AZ, which provides a SLA up-time of 99.95%. With the Multi-AZ feature enabled in a production database, AWS provides a synchronous “standby” replica of every database in another “zone.” Since both the database and its replica are in sync, there is no chance of data loss.

AWS also offers a domain name server (DNS) to access RDS, so even if the master database instance goes down, an RDS automatic failover mechanism will change the master DNS to a replica in order to achieve high availability.

Scalability

Database scalability can prove to be a real challenge if you try to scale your own, self-hosted database. Handling mandatory downtimes due to upgrades or infrastructure requirements can be quite tricky and is just the beginning of your scalability responsibilities. That is why one of AWS RDS key advantages is its scaling service. Moreover, MySQL RDS offers two levels of scalability features: vertical and horizontal. Vertical Scalability /Scaling Up – With RDS, Amazon enables push-button vertical scaling. This means that you can scale the size of an RDS instance [memory, CPU, PIOPS etc] or disk, either up or down, with the click of a button. AWS may need to stop the instance for vertical scaling, but if you have enabled the Multi-AZ feature, AWS will apply any scaling to your replicas first to ensure that they are available for use when the master is being scaled. AWS also offers the option to either configure immediate scaling or scale during weekly maintenance during non-peak hours.

Horizontal Scalability /Scaling Out –

Horizontal scalability is an approach that distributes the total database across many RDS instances that will work together. RDS MySQL offers read replica functionality using MySQL’s built-in replication feature, offering read-only database instances to serve read traffic. In order to achieve true database elasticity, a database needs to scale out beyond a simple master-slave setup. Amazon recommends that data be distributed across multiple RDS instances. This way, each RDS contains a portion of the complete database. By utilizing ScaleBase’s AWS AMI, you can create a real distributed relational database with many RDS instances working together as one, and without making modifications to your application. This brings you massive horizontal scaling, and after scaling out to a distributed RDS database, all AWS value-added services continue to work.

Performance

AWS RDS offers PIOPS (Provisioned IOPS) in order to achieve fast, consistent and predictable Input/Output (I/O) performance. This is ideal for online transaction processing (OLTP) databases or high I/O centric applications. With MySQL RDS, you can set up as many as 30,000 IOPS. The more IOPS you have set up, the more concurrent request processes increase, which in turn increases throughput and decreases latency to achieve higher database performance.

Backup

AWS RDS provides two types of backup mechanisms which are both very easy to setup:

Automated backup – This functionality automatically performs a full daily snapshot of a database’s data (during a preferred window of time set up by the user). It also captures your transaction logs as well as any updates to your RDS database.

Point-in-Time snapshots – RDS database snapshots are user initiated. Unlike automated backup, which is performed once a day, point-in-time snapshots can be performed as many times as desired.

Q2. Explain any use case for AWS RDS system

Amazon Relational Database Service (RDS) allows users to set up, operate, and scale a database in the cloud. The vendor states it provides cost-efficient and resizable capacity while automating timeconsuming administration tasks such as hardware provisioning, setup, patching, and backups. This frees users to focus on applications so they can give them the fast performance, high availability, security, and compatibility they need.

Amazon RDS is available on several database instance types - optimized for memory, performance or I/O - and provides you with six familiar database engines to choose from including Amazon Aurora, MySQL, PostgreSQL, MariaDB, Oracle Database, and SQL Server.

Q3. What are instances in Amazon EC2?

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instance types comprise varying combinations of CPU, memory, storage, and networking capacity and give you the flexibility to choose the appropriate mix of resources for your applications. Each instance type includes one or more instance sizes, allowing you to scale your resources to the requirements of your target workload.

Types of EC2 Instances -

Current Generation

- Amazon EC2 M6g instances are powered by Arm-based Amazon Web Services Graviton2 processors. They deliver up to 40% better price/performance over current generation M5 instances and offer a balance of compute, memory, and networking resources for a broad set of workloads.
- Amazon EC2 T4g instances are powered by Arm-based Amazon Graviton2 processors and deliver up to 40% better price performance over T3 instances for a broad set of burstable general purpose workloads.
- Amazon EC2 M5 Instances are powered by Intel Xeon® Platinum 8175 3.1GHz processors. With M5d instances, local NVMe-based SSDs are physically connected to the host server and provide block-level storage that is coupled to the lifetime of the M5 instance.

Q4. What are AMIs in Amazon EC2?

An Amazon Machine Image (AMI) provides the information required to launch an instance. You must specify an AMI when you launch an instance. You can launch multiple instances from a single AMI when you need multiple instances with the same configuration. You can use different AMIs to launch instances when you need instances with different configurations.

An AMI includes the following:

- One or more Amazon Elastic Block Store (Amazon EBS) snapshots, or, for instance-store-backed AMIs, a template for the root volume of the instance (for example, an operating system, an application server, and applications).
- Launch permissions that control which AWS accounts can use the AMI to launch instances.
- A block device mapping that specifies the volumes to attach to the instance when it's launched.

Q5. What are the features of Amazon Database?

Easy to Administer

AWS RDS makes it simple to travel from project conception to deployment. Use the AWS Management Console, the AWS RDs Command-Line Interface, or easy API calls to access the capabilities of a production-ready relational database in minutes.

No need for infrastructure provisioning and no need for putting in and maintaining information software package.

Available and Durable

AWS RDs runs on a similar extremely reliable infrastructure employed by alternative Amazon Web Services. After the surveillance of a Multi-AZ decibel Instance, Amazon RDs replicates the data to a standby instance in a different Availability Zone (AZ).

Amazon RDs has several alternative options that enhance dependability for vital production databases, as well as automated backups, info snapshots, and automatic host replacement.

Security Features

Amazon RDS makes it simple to manage network access to your database.

AWS RDs conjointly helps you to run your database instances in Amazon Virtual Private Cloud that allows you to isolate your database instances associated to attach to your existing IT infrastructure through an industry-standard encrypted IPsec VPN.

Several Amazon RDs engine sorts supply secret writing at rest and secret writing in transit.

Fast Processing

Amazon RDS supports the foremost exacting database applications. The user has to choose from 2 SSD-backed storage options. The first one is optimized for high-performance OLTP applications and the second for different cost-efficient general use.

Additionally, Amazon Aurora provides performance on par with industrial databases at 1/10th the price.

Q6. Which of the AWS DB services is a NoSQL database and server-less, and delivers consistent single-digit millisecond latency at any scale?

1. Amazon Aurora
2. MariaDB
3. DynamoDB
4. Amazon Redshift

Q7. What is DynamoDB?

Amazon DynamoDB is a fully managed NoSQL database service that provides fast and predictable performance with seamless scalability. DynamoDB lets you offload the administrative burdens of operating and scaling a distributed database so that you don't have to worry about hardware provisioning, setup and configuration, replication, software patching, or cluster scaling. DynamoDB also offers encryption at rest, which eliminates the operational burden and complexity involved in protecting sensitive data.

Q8. How is Security implemented in Amazon RDS?

Amazon RDS encrypts your databases using keys you manage with the AWS Key Management Service (KMS). On a database instance running with Amazon RDS encryption, data stored at rest in the underlying storage is encrypted, as are its automated backups, read replicas, and snapshots. RDS encryption uses the industry standard AES-256 encryption algorithm to encrypt your data on the server that hosts your RDS instance.