

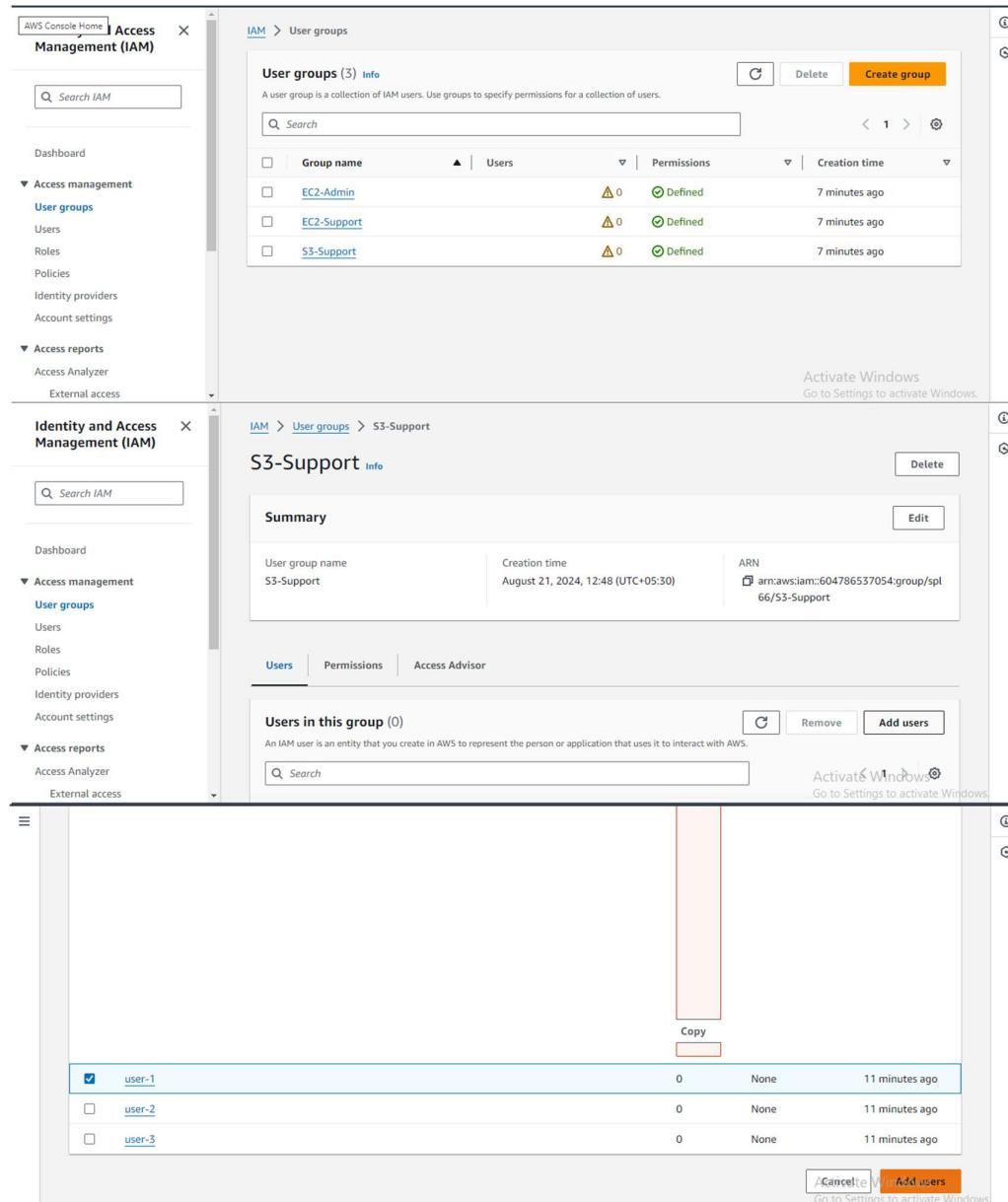
Practical-6

Aim: Introduction to AWS Identity and Access Management (IAM).

(Here we already have 3 Users Created and 3 Groups Created i.e user-1, user-2, user-3 and EC2-Admin, EC2-Support and S3-Support)

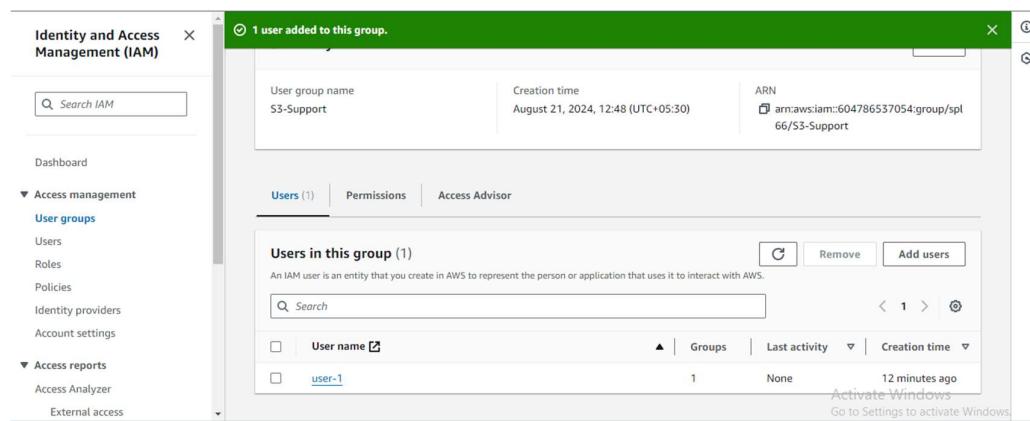
Step 1: Adding User 1 in S3 support Group.

In the left navigation pane, choose User groups. Choose the S3-Support group link. Choose the Users tab. In the Users tab, choose Add users.



The screenshot shows the AWS IAM console interface across three main sections: the left navigation pane, the top-level IAM view, and a detailed view of the S3-Support user group.

- Left Navigation Pane:** Shows the IAM and Identity and Access Management (IAM) navigation paths. Under IAM, "User groups" is selected. Under Identity and Access Management (IAM), "User groups" is also selected, and the "S3-Support" group is currently being viewed.
- Top-level IAM View:** Shows the "User groups (3) Info" page. It lists three groups: EC2-Admin, EC2-Support, and S3-Support, each with 0 users and defined permissions, created 7 minutes ago.
- Detailed S3-Support View:** Shows the "S3-Support Info" page under "User groups > S3-Support". It displays the group's summary information: User group name (S3-Support), Creation time (August 21, 2024, 12:48 (UTC+05:30)), and ARN (arn:aws:iam::604786537054:group/spl66/S3-Support). Below this, there are tabs for "Users", "Permissions", and "Access Advisor".
- Users Tab View:** Shows the "Users in this group (0)" section. A "Add users" button is visible. Below it, a table lists three users: user-1, user-2, and user-3. Each user has 0 users, None permissions, and was created 11 minutes ago. A "Copy" button is located at the bottom right of this table.



The screenshot shows the AWS Identity and Access Management (IAM) console. On the left, the navigation pane is visible with options like Dashboard, Access management (User groups, Users, Roles, Policies, Identity providers, Account settings), Access reports (Access Analyzer, External access), and a search bar for 'Search IAM'. The main content area displays a green header bar stating '1 user added to this group.' Below it, a table provides details about the user group:

User group name	Creation time	ARN
S3-Support	August 21, 2024, 12:48 (UTC+05:30)	arn:aws:iam::604786537054:group/spl66/S3-Support

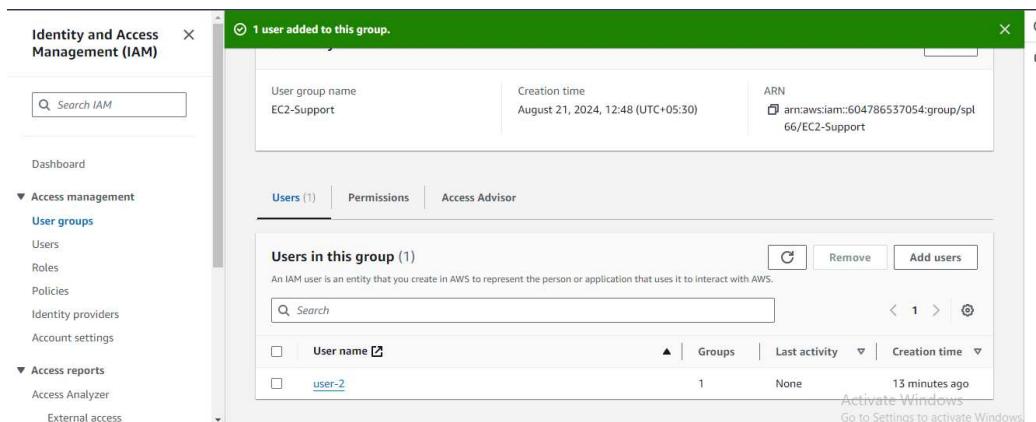
Below this, there are tabs for 'Users (1)', 'Permissions', and 'Access Advisor'. Under 'Users (1)', a table lists the user in the group:

User name	Groups	Last activity	Creation time
user-1	1	None	12 minutes ago

A message at the bottom right says 'Activate Windows' and 'Go to Settings to activate Windows.'

Step 2: Adding User 2 in the EC2 Support.

Using similar steps to the ones above, add user-2 to the EC2-Support group



The screenshot shows the AWS IAM console with the same navigation structure as the previous one. The main content area displays a green header bar stating '1 user added to this group.' Below it, a table provides details about the user group:

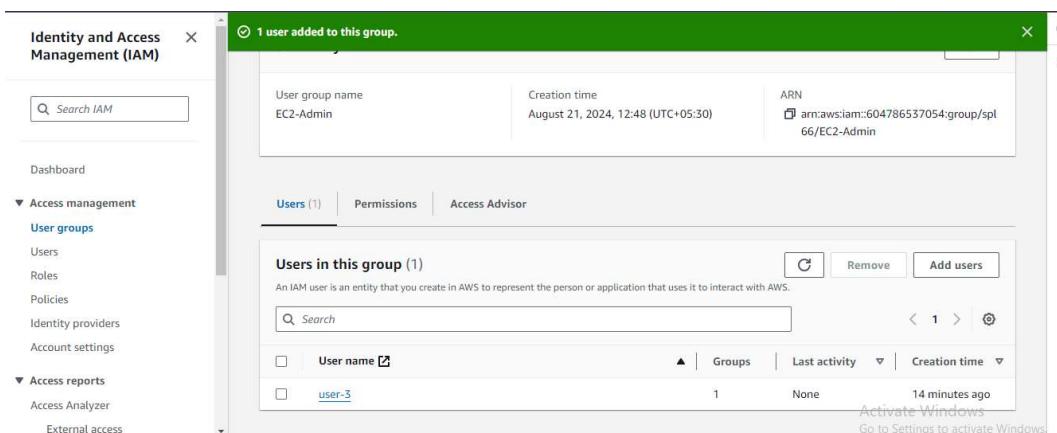
User group name	Creation time	ARN
EC2-Support	August 21, 2024, 12:48 (UTC+05:30)	arn:aws:iam::604786537054:group/spl66/EC2-Support

Below this, there are tabs for 'Users (1)', 'Permissions', and 'Access Advisor'. Under 'Users (1)', a table lists the user in the group:

User name	Groups	Last activity	Creation time
user-2	1	None	13 minutes ago

A message at the bottom right says 'Activate Windows' and 'Go to Settings to activate Windows.'

Step 3: Similarly Add User 3 in EC2-Admin.



The screenshot shows the AWS IAM console with the same navigation structure. The main content area displays a green header bar stating '1 user added to this group.' Below it, a table provides details about the user group:

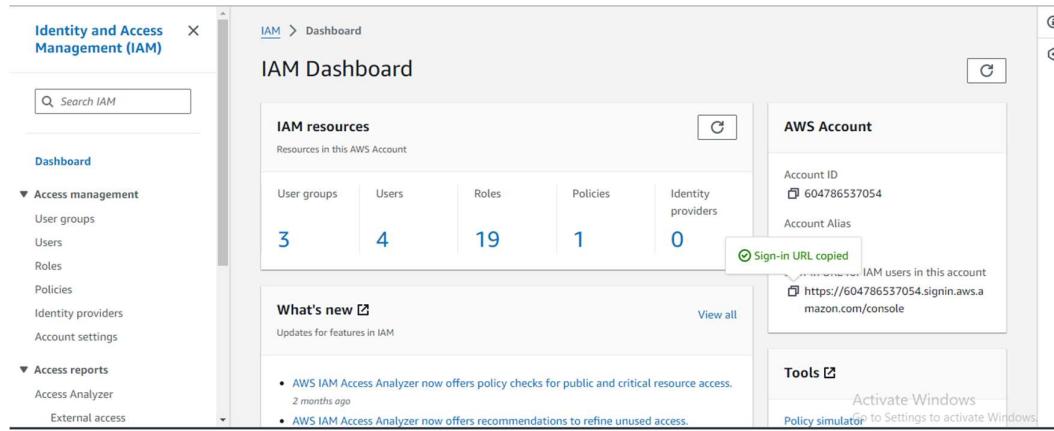
User group name	Creation time	ARN
EC2-Admin	August 21, 2024, 12:48 (UTC+05:30)	arn:aws:iam::604786537054:group/spl66/EC2-Admin

Below this, there are tabs for 'Users (1)', 'Permissions', and 'Access Advisor'. Under 'Users (1)', a table lists the user in the group:

User name	Groups	Last activity	Creation time
user-3	1	None	14 minutes ago

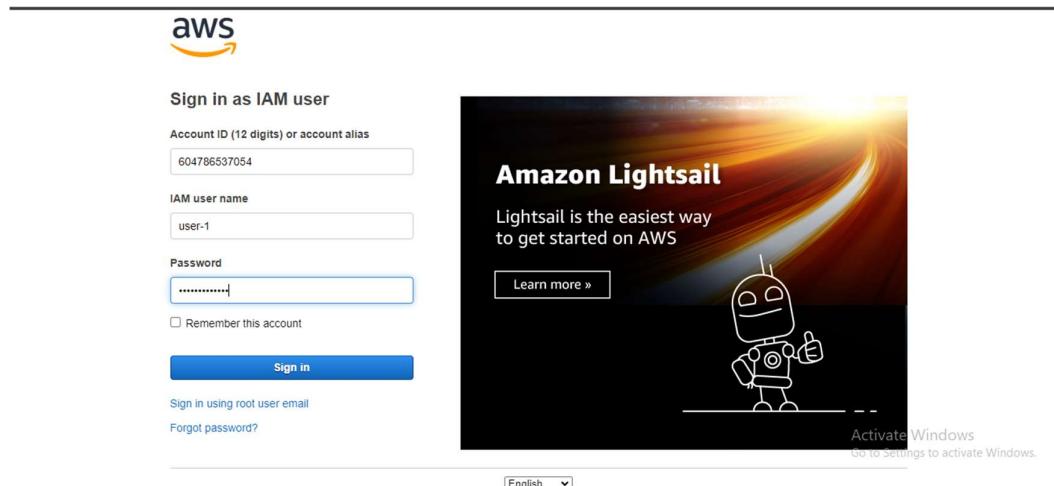
A message at the bottom right says 'Activate Windows' and 'Go to Settings to activate Windows.'

Step 4: Go to Dashboard and Copy the User Sign in Link and paste in Private window.

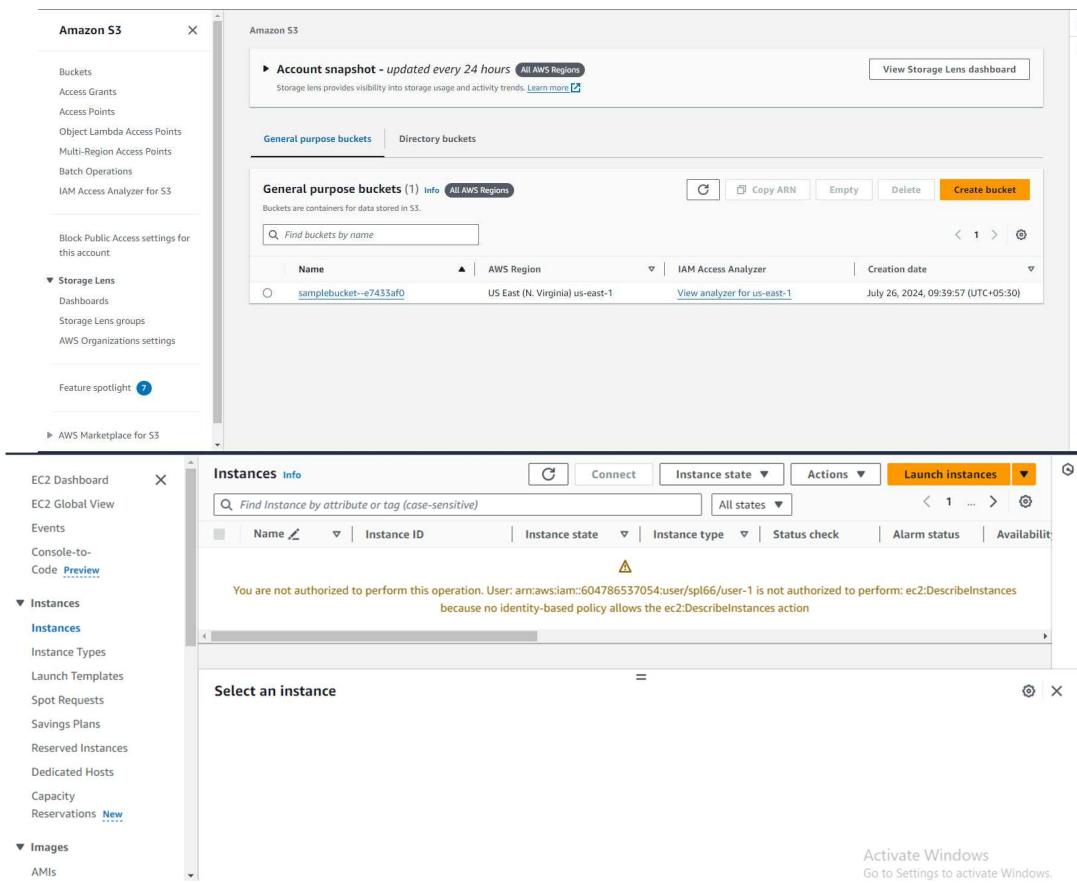


The screenshot shows the AWS IAM Dashboard. On the left, there's a sidebar with 'Identity and Access Management (IAM)' at the top, followed by sections for 'Dashboard', 'Access management', 'Access reports', and 'Tools'. The main area is titled 'IAM Dashboard' with a sub-section 'IAM resources'. It displays statistics: 3 User groups, 4 Users, 19 Roles, 1 Policies, and 0 Identity providers. Below this is a 'What's new' section with two items about the AWS IAM Access Analyzer. To the right, there's an 'AWS Account' summary with the Account ID (604786537054) and Account Alias. A green callout box highlights the 'Sign-in URL copied' message, which includes a link: <https://604786537054.signin.aws.amazon.com/console>. At the bottom right, there are 'Tools' like 'Activate Windows' and 'Policy simulator'.

Step 5: Now Enter User-1 Id and Password in the console opened in private window, to check the permissions of User-1 first check for s3 bucket it will show up then try to create an EC2 Instance, will see an error message because user-1 don't have permission to create instance as he is part of S3-Support group.

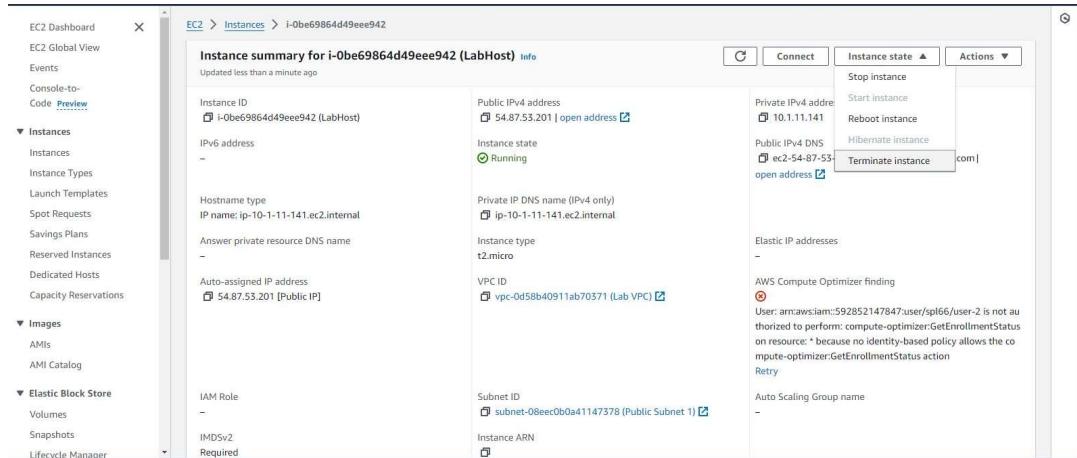


The screenshot shows a split-screen. On the left is the 'Sign in as IAM user' form. It has fields for 'Account ID (12 digits) or account alias' (604786537054), 'IAM user name' (user-1), 'Password' (redacted), and a 'Remember this account' checkbox. Below the form are links for 'Sign in using root user email' and 'Forgot password?'. A large blue 'Sign in' button is at the bottom. On the right is the 'Amazon Lightsail' landing page. It features a cartoon robot giving a thumbs-up, the text 'Amazon Lightsail' and 'Lightsail is the easiest way to get started on AWS', a 'Learn more »' button, and an 'Activate Windows' link at the bottom.



The screenshot displays two separate AWS console pages. The top page is the Amazon S3 dashboard, showing a single bucket named 'samplebucket--e7433af0' in the US East (N. Virginia) region. The bottom page is the EC2 Dashboard, showing a table of instances. A prominent error message in the EC2 table states: "You are not authorized to perform this operation. User: arn:aws:iam::604786537054:user/spl66/user-1 is not authorized to perform: ec2:DescribeInstances because no identity-based policy allows the ec2:DescribeInstances action".

Step 6: Similarly Enter the user-2 Id a password in the console opened in private window and check for EC2 support permission which refers to only reading the EC2.



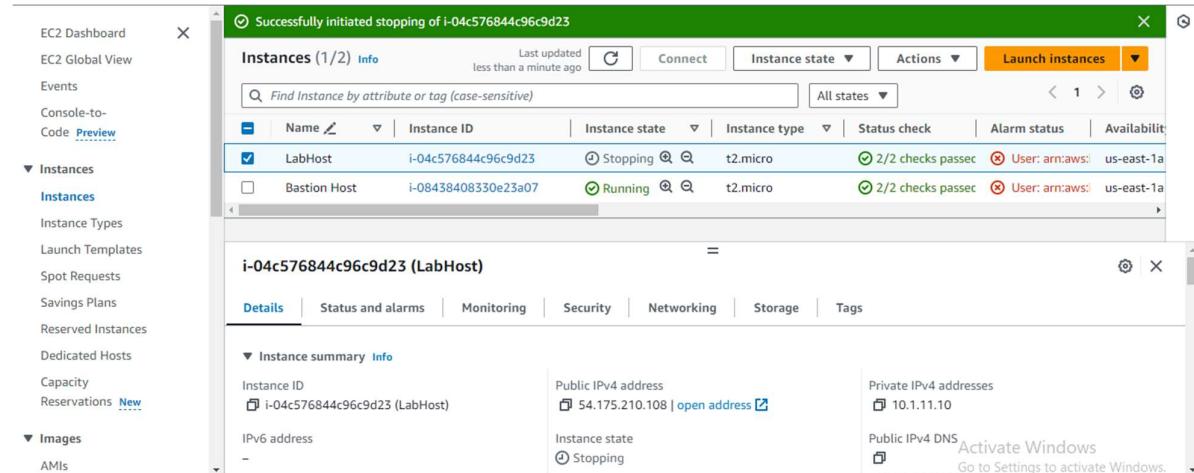
This screenshot shows the detailed view of an EC2 instance (i-0be69864d49eee942). It highlights several permission errors in the 'Actions' column of the instance details table:

- For the 'Stop instance' button: "User: arn:aws:iam::592852147847:user/spl66/user-2 is not authorized to perform: ec2:StopInstance on resource: * because no identity-based policy allows the ec2:StopInstance action"
- For the 'Start instance' button: "User: arn:aws:iam::592852147847:user/spl66/user-2 is not authorized to perform: ec2:StartInstance on resource: * because no identity-based policy allows the ec2:StartInstance action"
- For the 'Reboot instance' button: "User: arn:aws:iam::592852147847:user/spl66/user-2 is not authorized to perform: ec2:RebootInstance on resource: * because no identity-based policy allows the ec2:RebootInstance action"
- For the 'Terminate instance' button: "User: arn:aws:iam::592852147847:user/spl66/user-2 is not authorized to perform: ec2:TerminateInstance on resource: * because no identity-based policy allows the ec2:TerminateInstance action"

Step 7: Check the permission of User 2, Try to stop the instance Lab-Host, you will get an error message as the user is part of EC2-Support that only has Read Only permission.



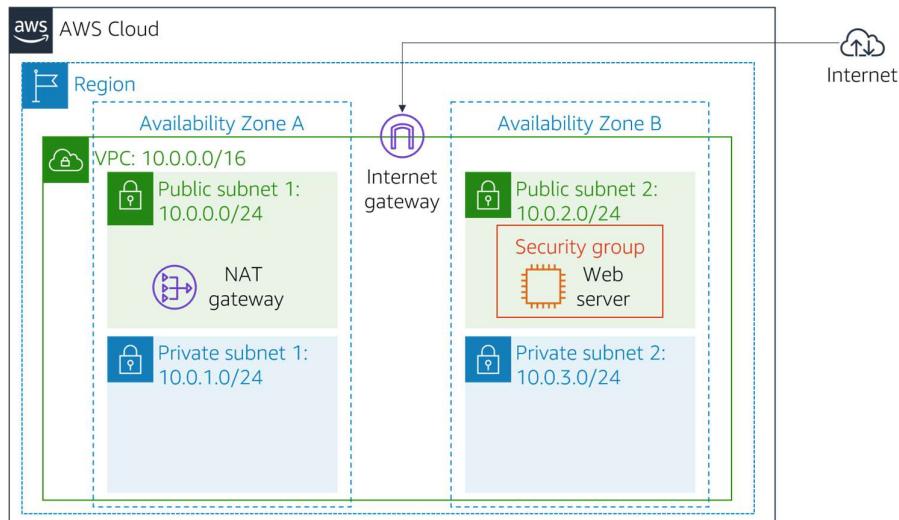
Step 8: Now enter user-3 Id and password and check the permissions for User 3 Try to stop the instance and it will be stopped because he part of EC2-Admin group and has admin privileges.



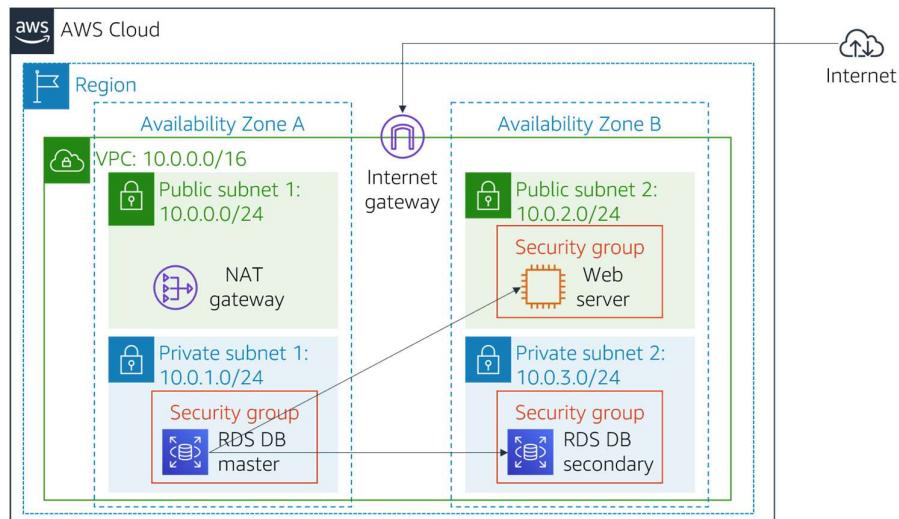
Practical-5

Aim: Build Your DB Server and Interact with Your DB Using an App.

Already Configured VPC:



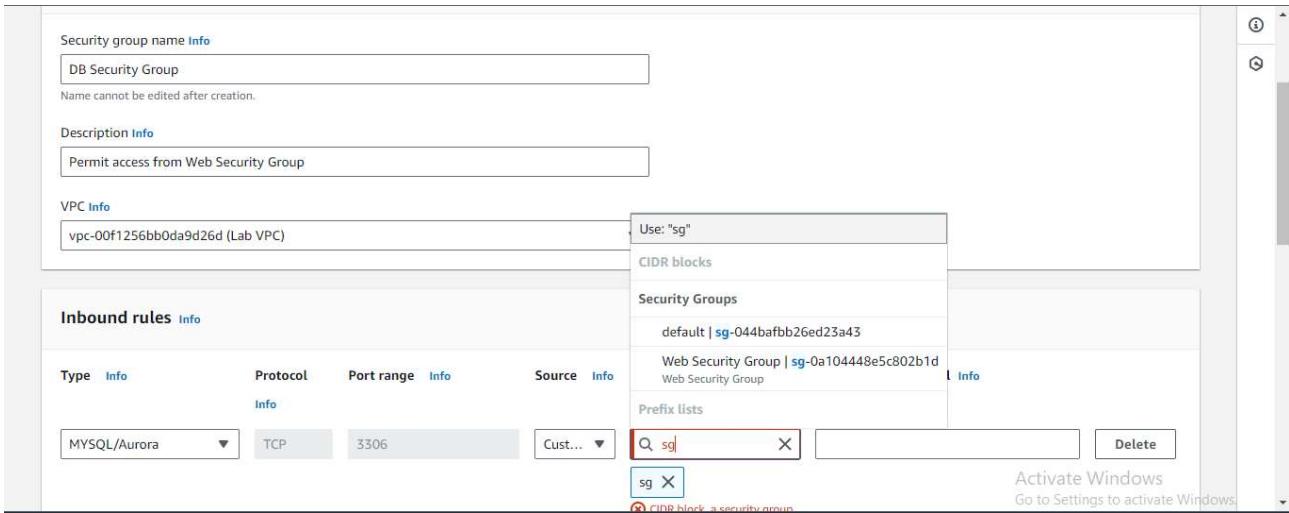
Additional Configuration We're going to Perform:



Step 1: Create security group for the RDS DB instance, go to VPC and security groups then choose create security group and provide below given specifications, and create it.

-Select the create VPC (here Lab VPC).

-Add an inbound rule which configures database security group to permit inbound traffic on port 3306 from any EC2 instance that is associated with the web security group. Here, as we are using MySQL DB engine, we will select relevant type and source as Web Security Group.



Security group name [Info](#)

Name cannot be edited after creation.

Description [Info](#)

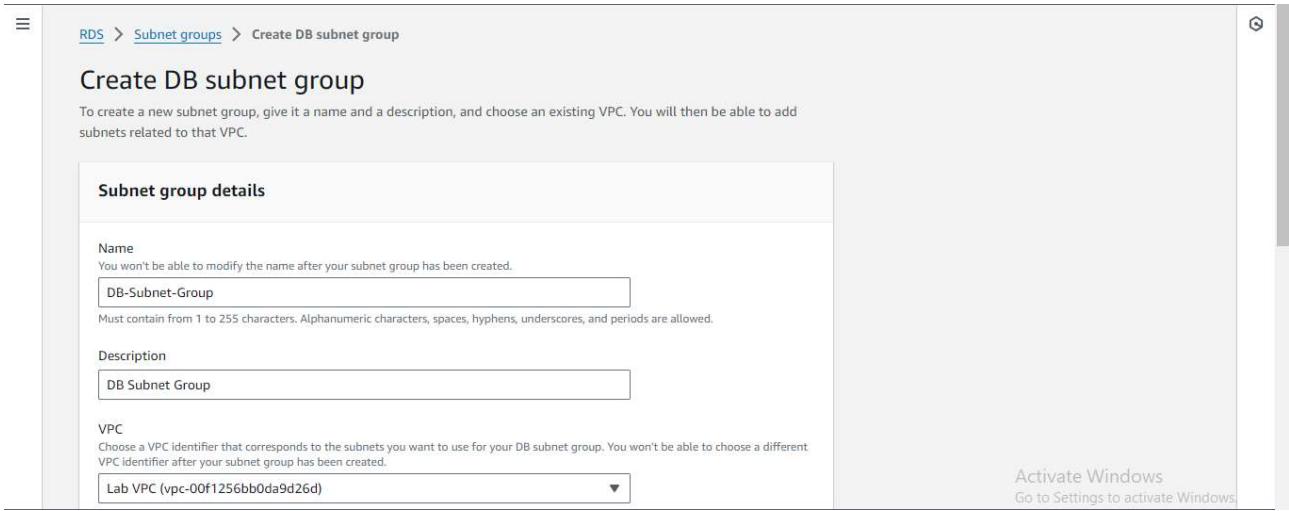
VPC [Info](#)
 Use: "sg"

Inbound rules [Info](#)

Type	Protocol	Port range	Source	Info
MySQL/Aurora	TCP	3306	Cust... <input type="button" value="sg"/>	Delete

Activate Windows
Go to Settings to activate Windows

Step 2: Create a DB subnet group, go to RDS from services then choose subnet groups from left navigation pane, click on create DB subnet group and provide specifications as shown in screenshot below.



RDS > Subnet groups > Create DB subnet group

Create DB subnet group

To create a new subnet group, give it a name and a description, and choose an existing VPC. You will then be able to add subnets related to that VPC.

Subnet group details

Name
You won't be able to modify the name after your subnet group has been created.

Must contain from 1 to 255 characters. Alphanumeric characters, spaces, hyphens, underscores, and periods are allowed.

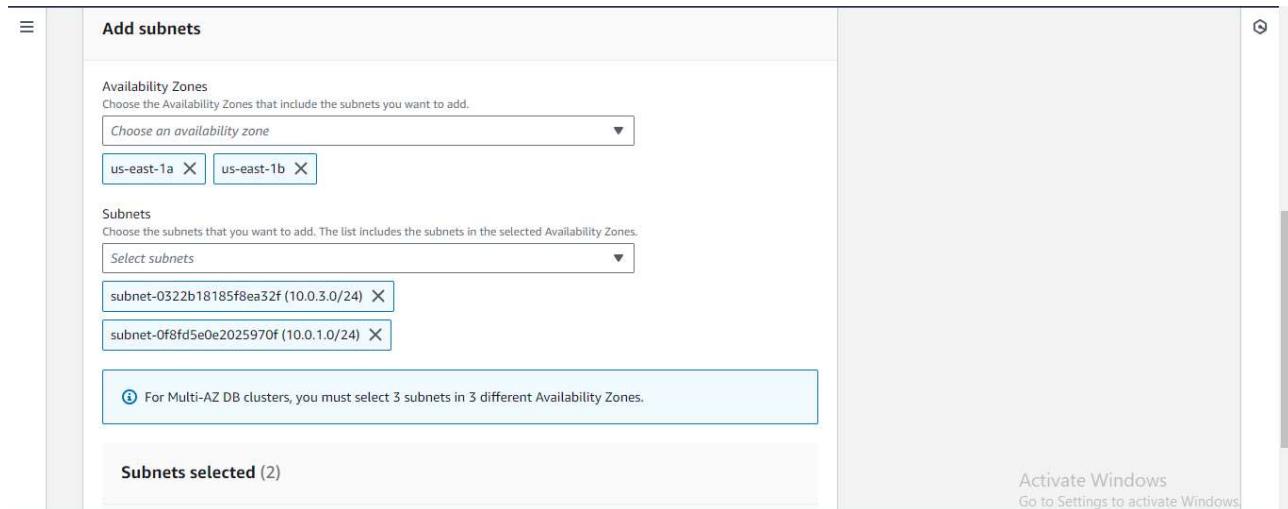
Description

VPC
Choose a VPC identifier that corresponds to the subnets you want to use for your DB subnet group. You won't be able to choose a different VPC identifier after your subnet group has been created.

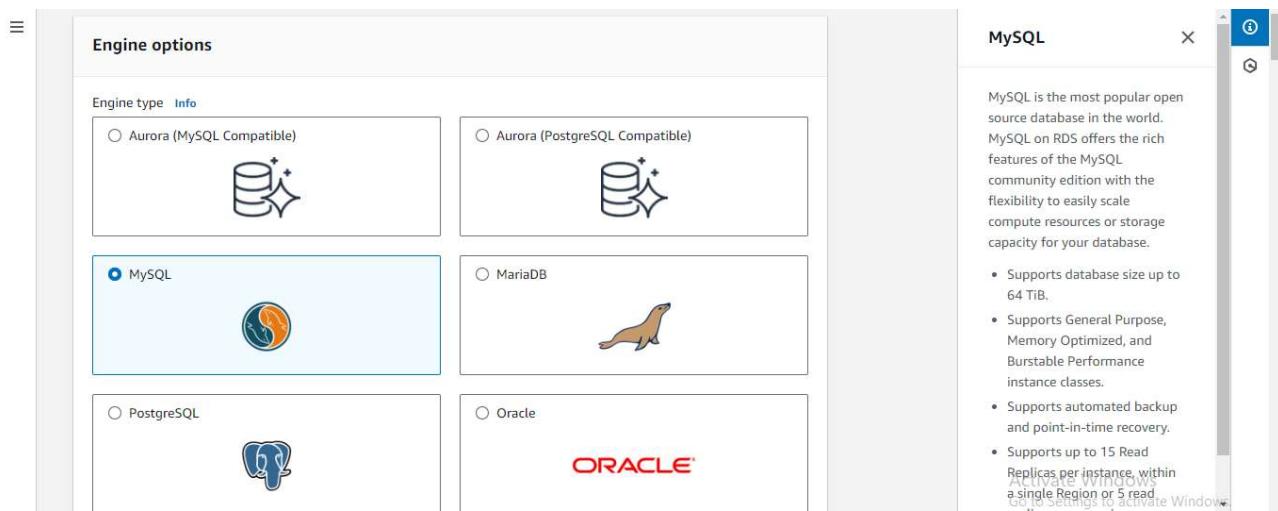
Activate Windows
Go to Settings to activate Windows

-We create DB subnet group in order to create multi availability zone deployment, amazon RDS provides facility of replication in different availability zone for availability and durability of service.

-Select AZs and Subnets in which you want to create RDS instances or to have database service as per below screenshot and click on create.



Step 3: Create an amazon RDS DB instance, select MySQL from Engine Options.



Engine type	Info
<input type="radio"/> Aurora (MySQL Compatible)	
<input type="radio"/> Aurora (PostgreSQL Compatible)	
<input checked="" type="radio"/> MySQL	
<input type="radio"/> PostgreSQL	
<input type="radio"/> MariaDB	
<input type="radio"/> Oracle	

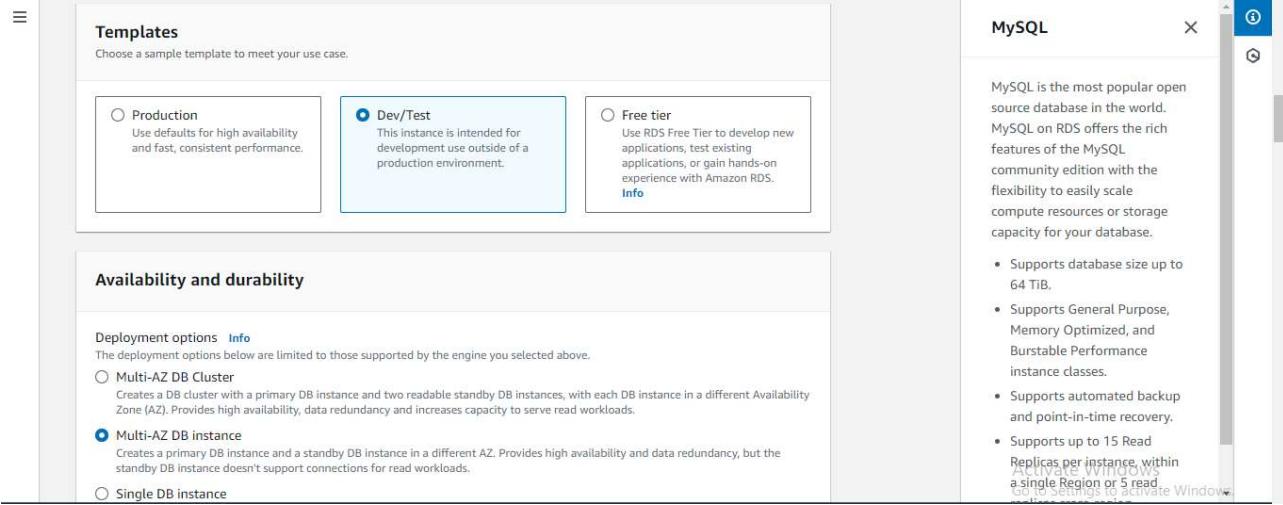
MySQL

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

- Supports database size up to 64 TiB.
- Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
- Supports automated backup and point-in-time recovery.
- Supports up to 15 Read Replicas per instance, within a single Region or 5 read replicas across Regions.

Go to Settings to activate Windows.

-Select template as Dev/Test refers to development and testing.



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.

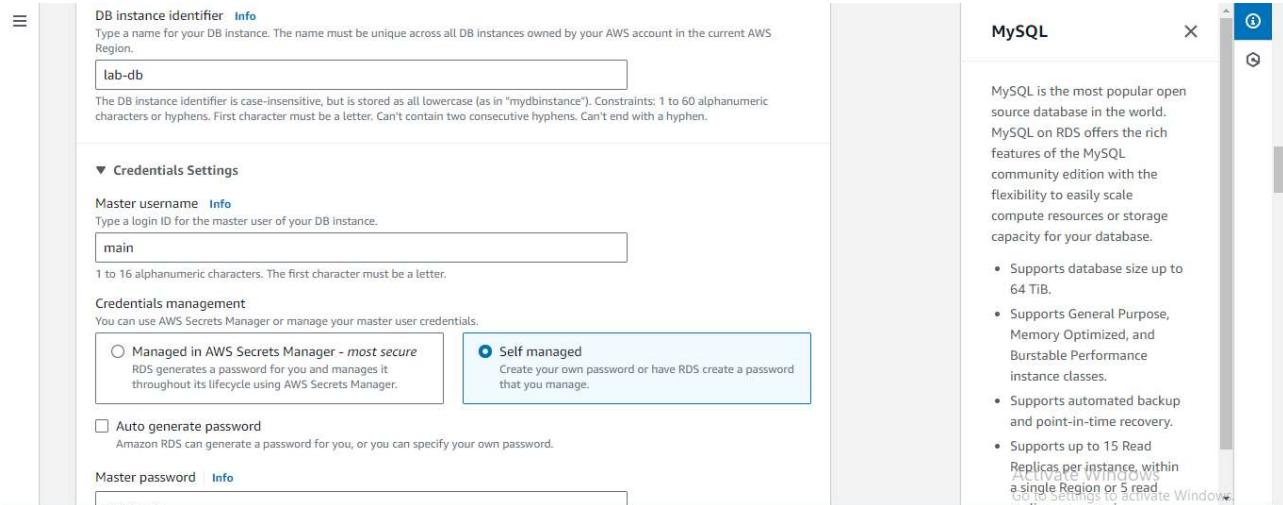
- Multi-AZ DB Cluster Creates a DB cluster with a primary DB instance and two readable standby DB instances, with each DB instance in a different Availability Zone (AZ). Provides high availability, data redundancy and increases capacity to serve read workloads.
- Multi-AZ DB instance Creates a primary 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 for read workloads.
- Single DB instance

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-Provide credentials details as given below in screenshot.



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.

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.

1 to 16 alphanumeric characters. The first character must be a letter.

Credentials management
You can use AWS Secrets Manager or manage your master user credentials.

- Managed in AWS Secrets Manager - *most secure*
RDS generates a password for you and manages it throughout its lifecycle using AWS Secrets Manager.
- Self managed
Create your own password or have RDS create a password that you manage.

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

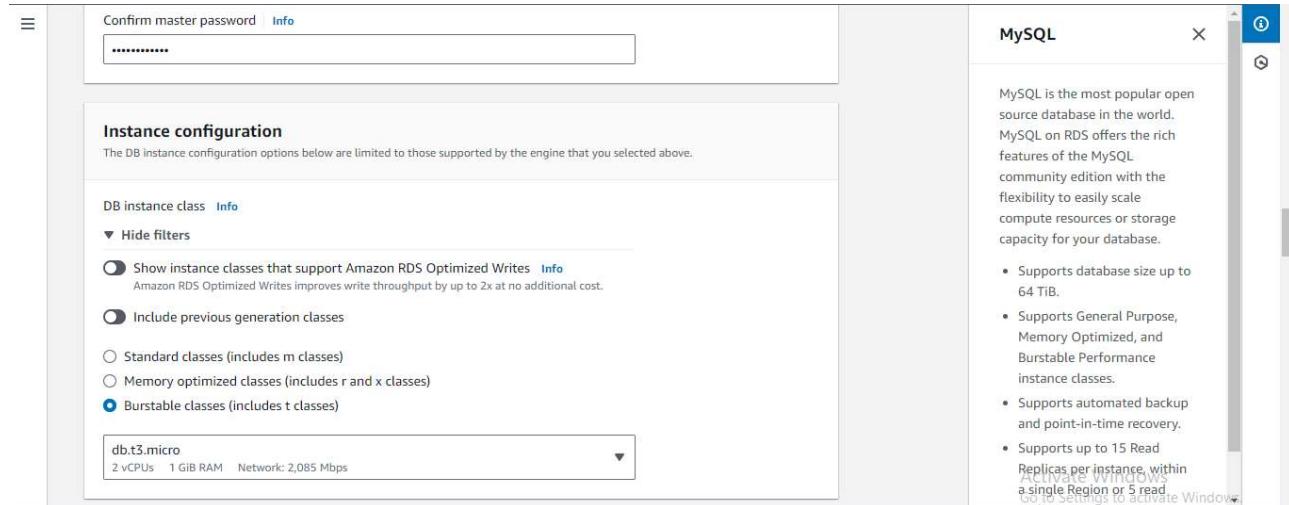
Master password [Info](#)

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-In instance configuration select burstable classes and db.t3.micro for free tier access.



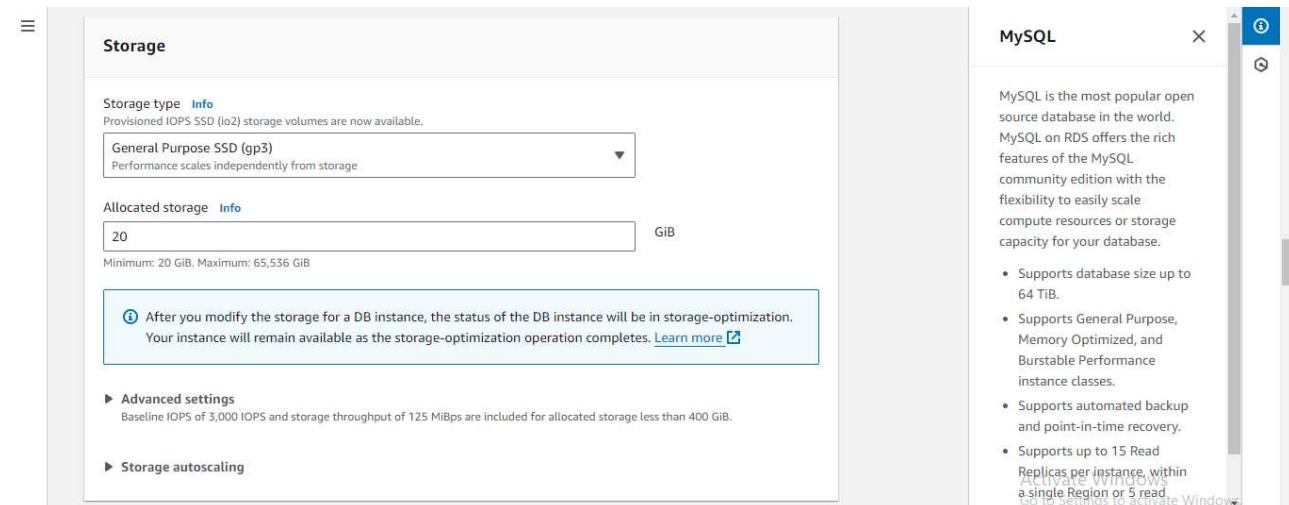
The screenshot shows the 'Instance configuration' section of the AWS RDS console. Under 'DB instance class', the 'Burstable classes (includes t classes)' option is selected. The dropdown menu shows 'db.t3.micro' as the chosen class, which is described as having 2 vCPUs, 1 GiB RAM, and Network: 2,085 Mbps.

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-In storage set general purpose storage type and allocate 20 GB of storage.



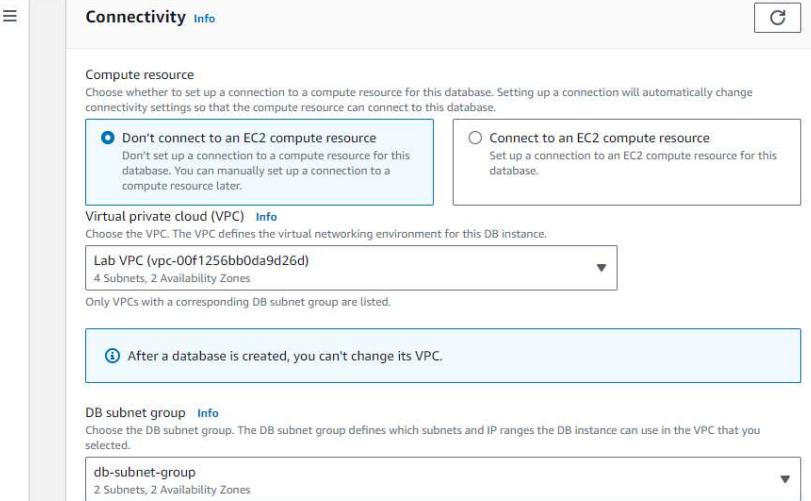
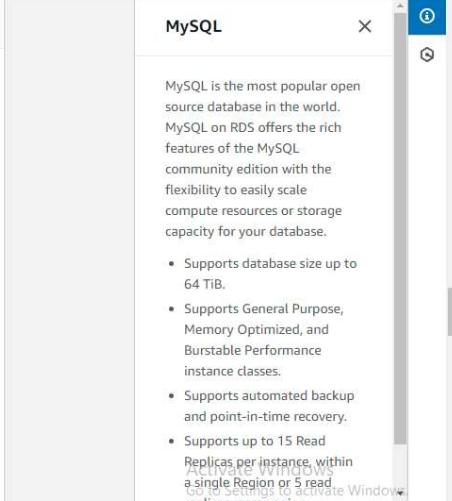
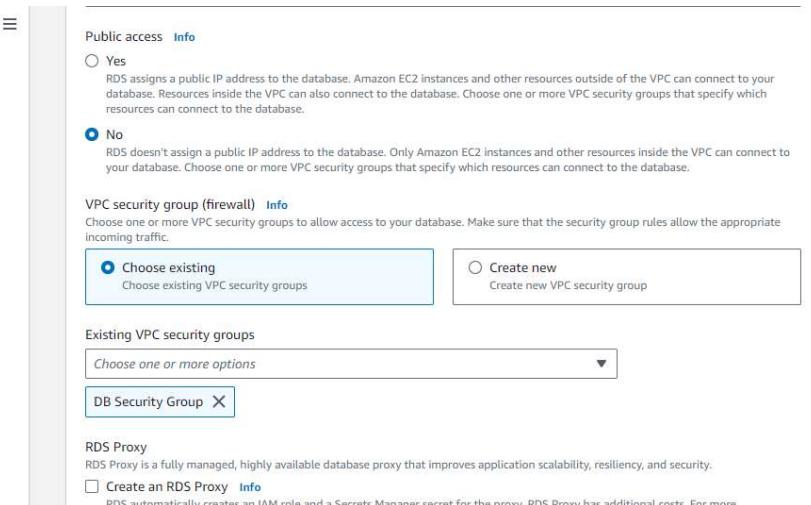
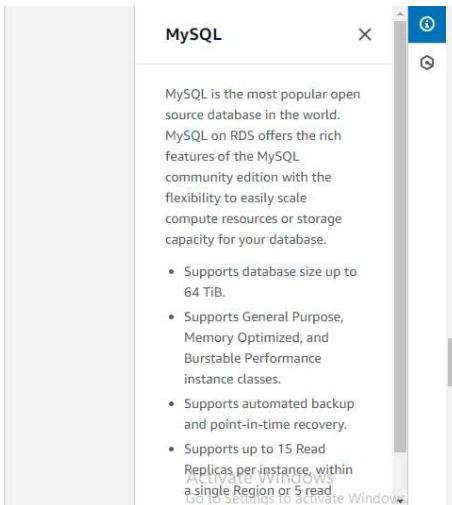
The screenshot shows the 'Storage' configuration page. Under 'Storage type', 'General Purpose SSD (gp3)' is selected. Under 'Allocated storage', '20' GiB is specified. A note indicates that after modification, the DB instance will be in storage-optimization mode. Below this, 'Advanced settings' and 'Storage autoscaling' options are shown.

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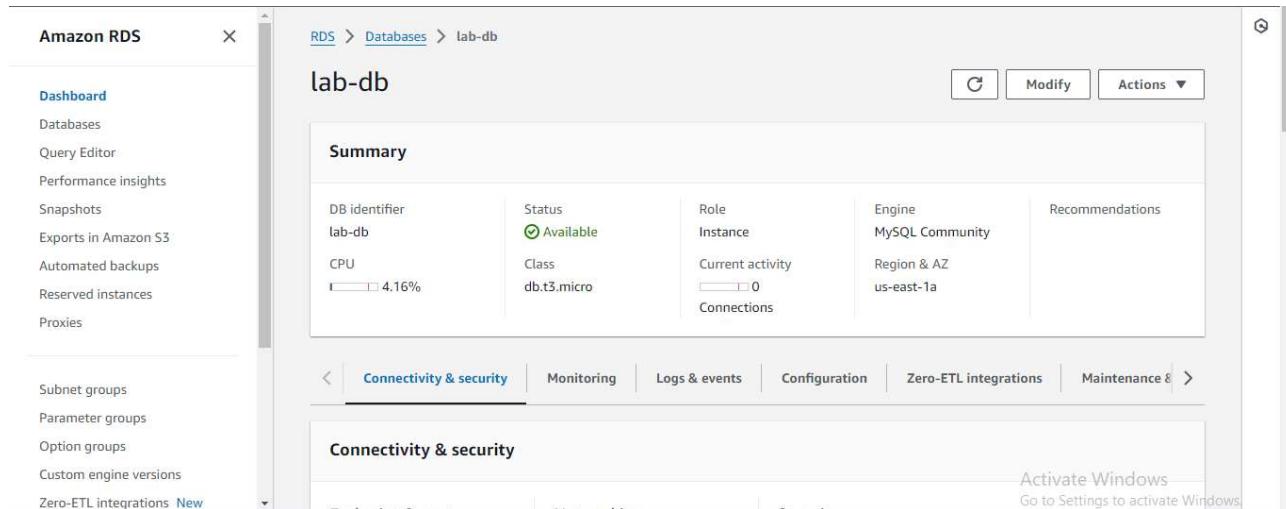
-In connectivity, select Lab VPC and db-subnet-group created above and give no to public access with configuration of db security group.

-Also uncheck all the options like Enable advanced monitoring, Enable storage backup and Enable encryption to faster instance creation.

-As well as provide initial database name as lab.

-As soon as status of DB instance gets available goto connectivity and security and copy the endpoint for further use



DB identifier	Status	Role	Engine	Recommendations
lab-db	Available	Instance	MySQL Community	

Subnet groups: Subnet group: db-subnet-group

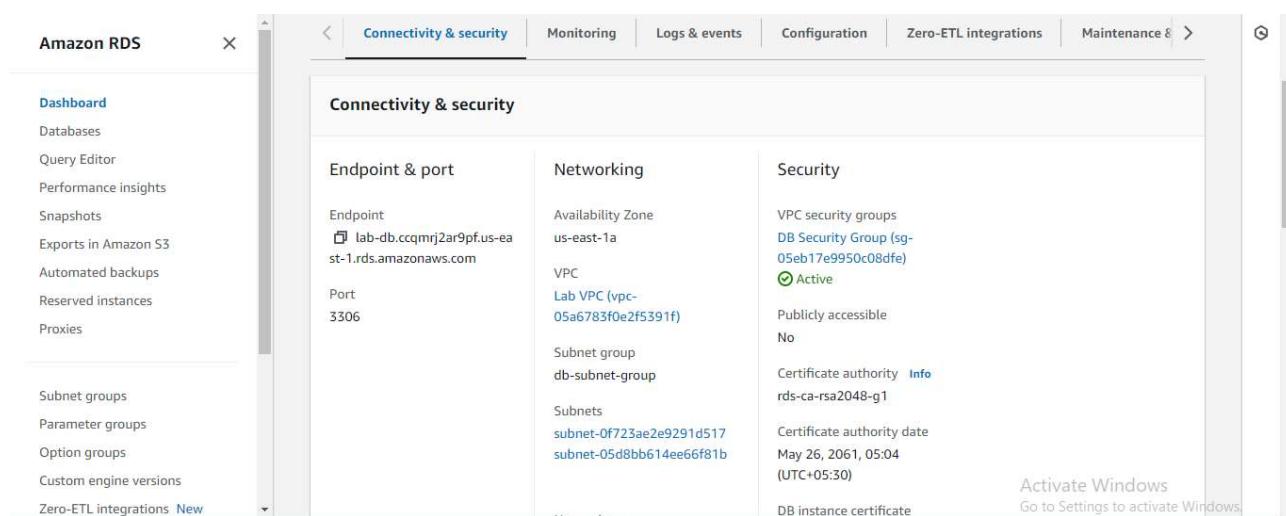
Parameter groups: Parameter group: Lab VPC (vpc-05a6783f0e2f5391f)

Option groups: Option group: Lab VPC (vpc-05a6783f0e2f5391f)

Custom engine versions: MySQL 5.7 (Community)

Zero-ETL integrations: New

Maintenance: Activate Windows

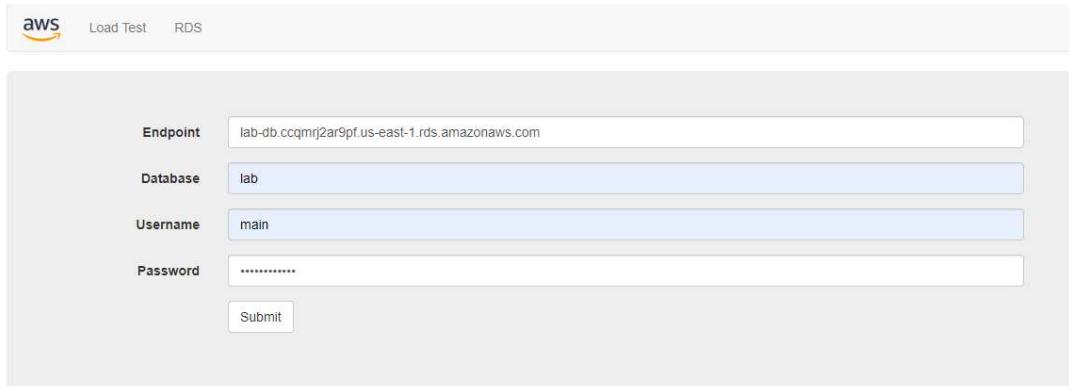


Endpoint & port	Networking	Security
Endpoint: lab-db.ccqmrj2ar9pf.us-east-1.rds.amazonaws.com	Availability Zone: us-east-1a	VPC security groups: rds-ca-rsa2048-g1
Port: 3306	VPC: Lab VPC (vpc-05a6783f0e2f5391f)	DB Security Group (sg-05eb17e9950c08dfe) Active
	Subnet group: db-subnet-group	Publicly accessible: No
	Subnets: subnet-0f723ae2e9291d51b, subnet-05d8bb614ee66f81b	Certificate authority: rds-ca-rsa2048-g1
		Certificate authority date: May 26, 2061, 05:04 (UTC+05:30)
		DB instance certificate

Activate Windows

Go to Settings to activate Windows

Step 4: Interact with your database, copy the ip address of web server and paste it to the browser's new tab and click on RDS link and then it will ask for an endpoint and other credentials so provide it and then click on submit, you will find a page which prompts regarding command execution for database access.



aws Load Test RDS

Endpoint: lab-db.ccqmrj2ar9pf.us-east-1.rds.amazonaws.com

Database: lab

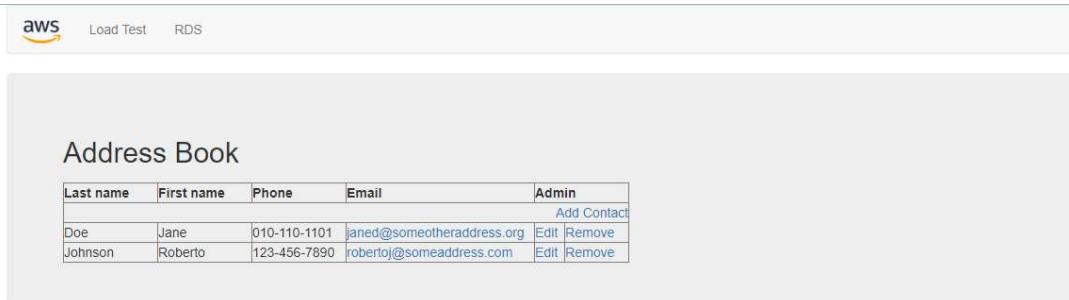
Username: main

Password:

Submit

Activate Windows
Go to Settings to activate Windows.

-Address book will be displayed and we can add, edit or remove contact from database via web server.



aws Load Test RDS

Address Book

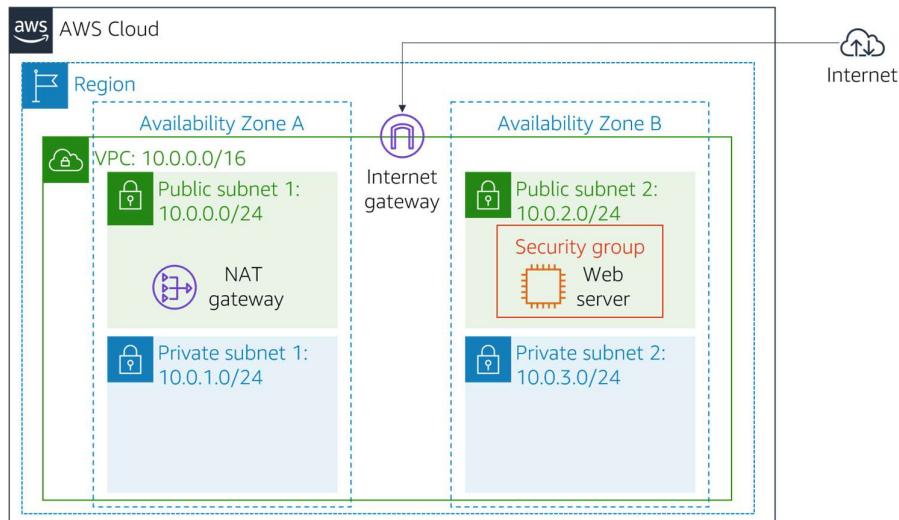
Last name	First name	Phone	Email	Admin
Doe	Jane	010-110-1101	janed@someotheraddress.org	Edit Remove
Johnson	Roberto	123-456-7890	robertoj@someaddress.com	Edit Remove

Activate Windows
Go to Settings to activate Windows.

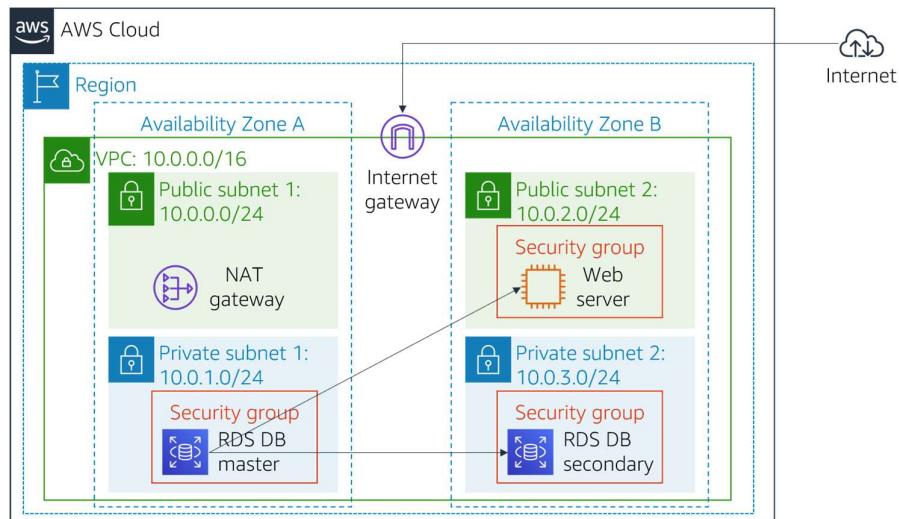
Practical-5

Aim: Build Your DB Server and Interact with Your DB Using an App.

Already Configured VPC:



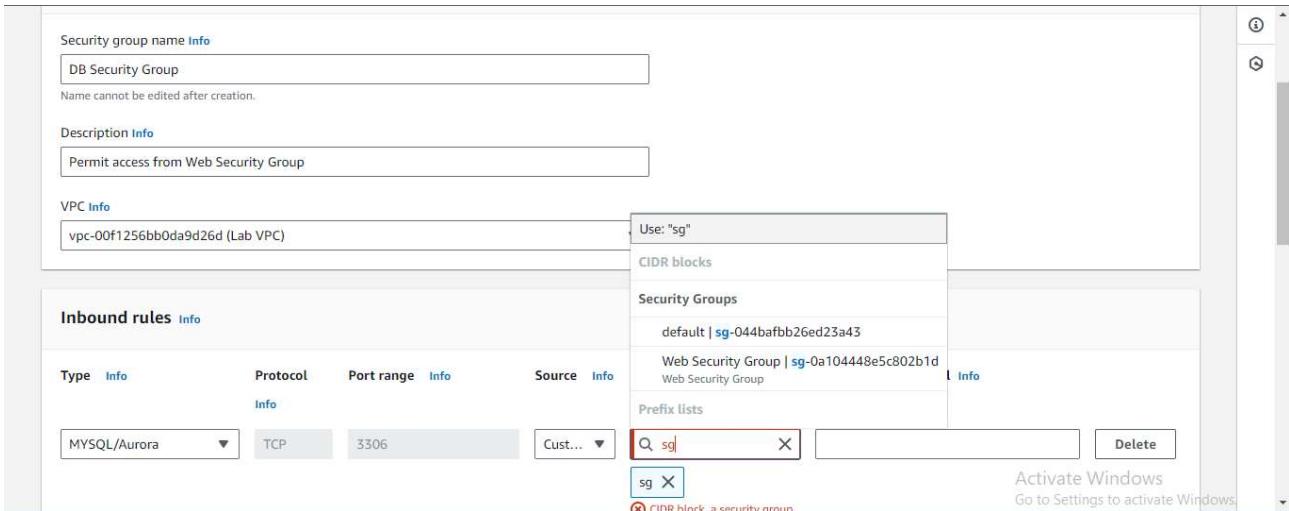
Additional Configuration We're going to Perform:



Step 1: Create security group for the RDS DB instance, go to VPC and security groups then choose create security group and provide below given specifications, and create it.

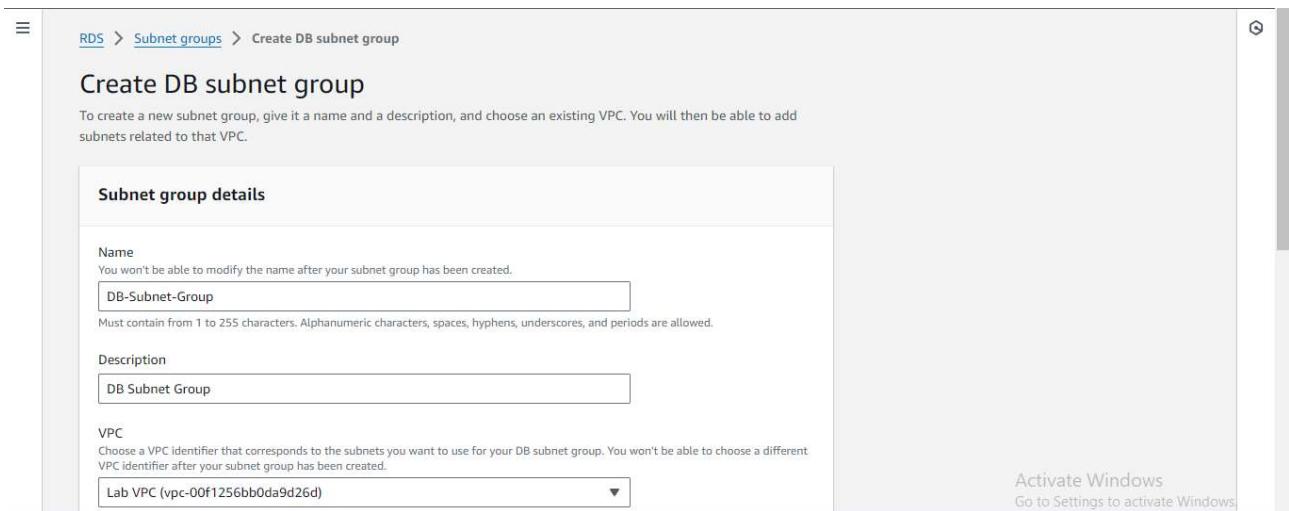
-Select the create VPC (here Lab VPC).

-Add an inbound rule which configures database security group to permit inbound traffic on port 3306 from any EC2 instance that is associated with the web security group. Here, as we are using MySQL DB engine, we will select relevant type and source as Web Security Group.



The screenshot shows the AWS VPC Security Groups console. A new security group named "DB Security Group" is being created. In the "Inbound rules" section, a new rule is being configured for MySQL/Aurora (TCP, Port 3306) from the "Web Security Group". The "Source" dropdown shows "Web Security Group" selected. The "CIDR blocks" section shows "Use: "sg"" and "CIDR blocks" with "sg" entered. The "Security Groups" section shows "default | sg-044bafbb26ed23a43" and "Web Security Group | sg-0a104448e5c802b1d". The "Prefix lists" section shows "sg". A search bar at the bottom has "sg" entered. A tooltip "Activate Windows Go to Settings to activate Windows" is visible.

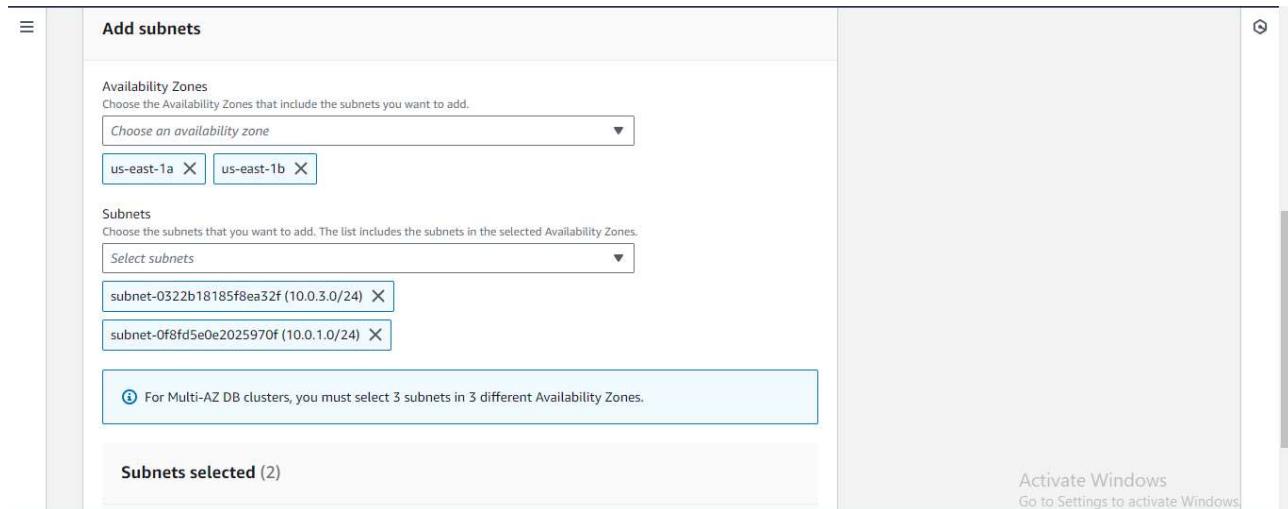
Step 2: Create a DB subnet group, go to RDS from services then choose subnet groups from left navigation pane, click on create DB subnet group and provide specifications as shown in screenshot below.



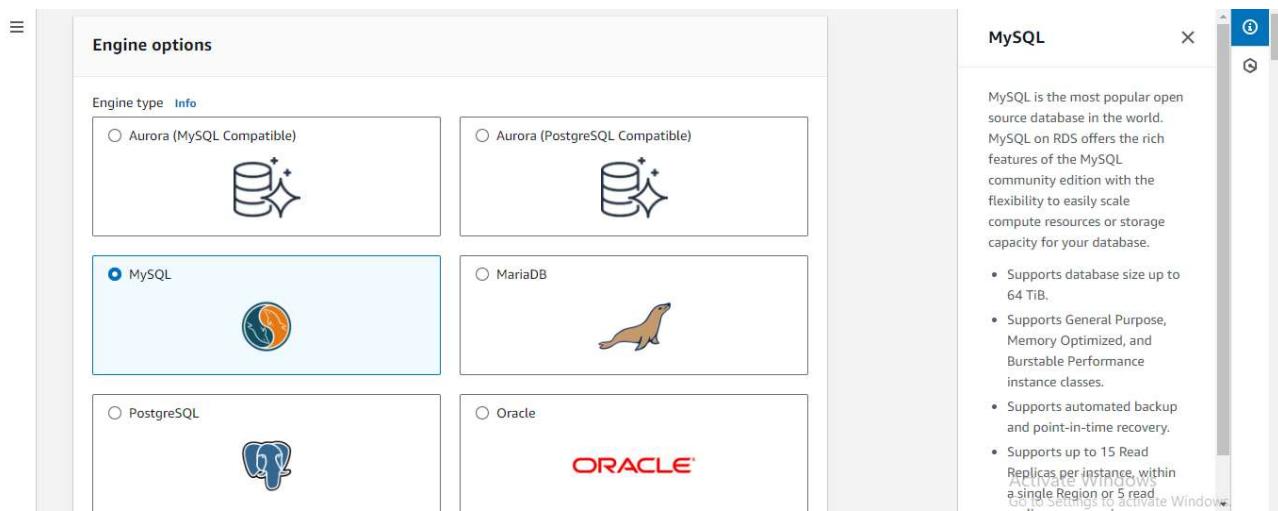
The screenshot shows the AWS RDS Subnet Groups console. A new DB subnet group named "DB-Subnet-Group" is being created. The "Subnet group details" section includes fields for "Name" (DB-Subnet-Group), "Description" (DB Subnet Group), and "VPC" (Lab VPC (vpc-00f1256bb0da9d26d)). A tooltip "Activate Windows Go to Settings to activate Windows" is visible.

-We create DB subnet group in order to create multi availability zone deployment, amazon RDS provides facility of replication in different availability zone for availability and durability of service.

-Select AZs and Subnets in which you want to create RDS instances or to have database service as per below screenshot and click on create.



Step 3: Create an amazon RDS DB instance, select MySQL from Engine Options.



Engine options

Engine type [Info](#)

- Aurora (MySQL Compatible)
- Aurora (PostgreSQL Compatible)
- MySQL
- MariaDB
- PostgreSQL
- Oracle

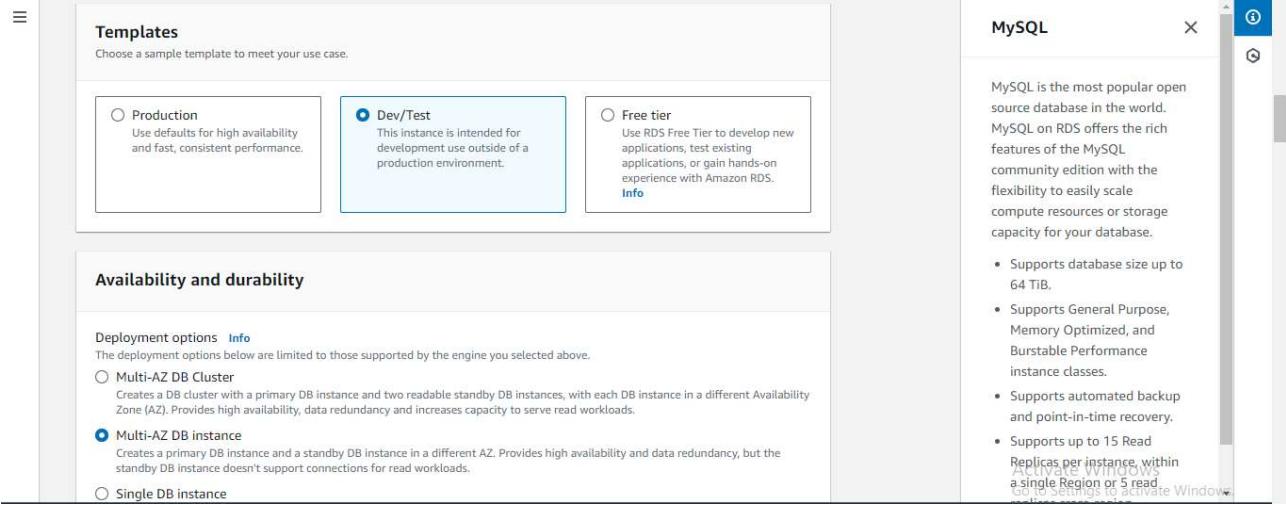
MySQL

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

- Supports database size up to 64 TiB.
- Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
- Supports automated backup and point-in-time recovery.
- Supports up to 15 Read Replicas per instance, within a single Region or 5 read replicas per instance across Regions.

Go to Settings to activate Windows.

-Select template as Dev/Test refers to development and testing.



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.

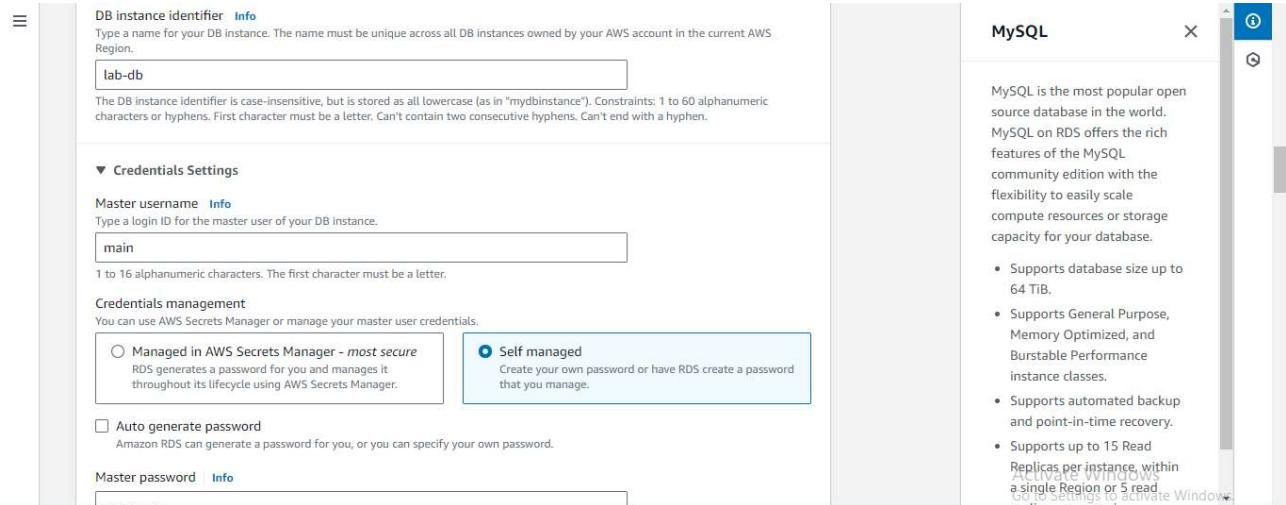
- Multi-AZ DB Cluster Creates a DB cluster with a primary DB instance and two readable standby DB instances, with each DB instance in a different Availability Zone (AZ). Provides high availability, data redundancy and increases capacity to serve read workloads.
- Multi-AZ DB instance Creates a primary 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 for read workloads.
- Single DB instance

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-Provide credentials details as given below in screenshot.



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.

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.

1 to 16 alphanumeric characters. The first character must be a letter.

Credentials management
You can use AWS Secrets Manager or manage your master user credentials.

- Managed in AWS Secrets Manager - *most secure*
RDS generates a password for you and manages it throughout its lifecycle using AWS Secrets Manager.
- Self managed
Create your own password or have RDS create a password that you manage.

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

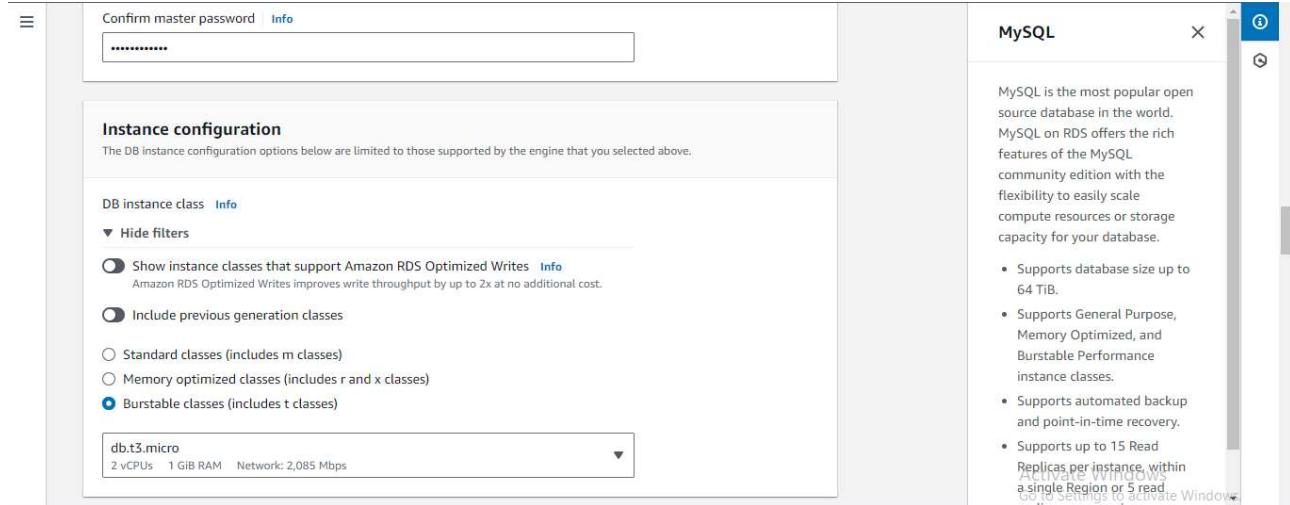
Master password [Info](#)

MySQL

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

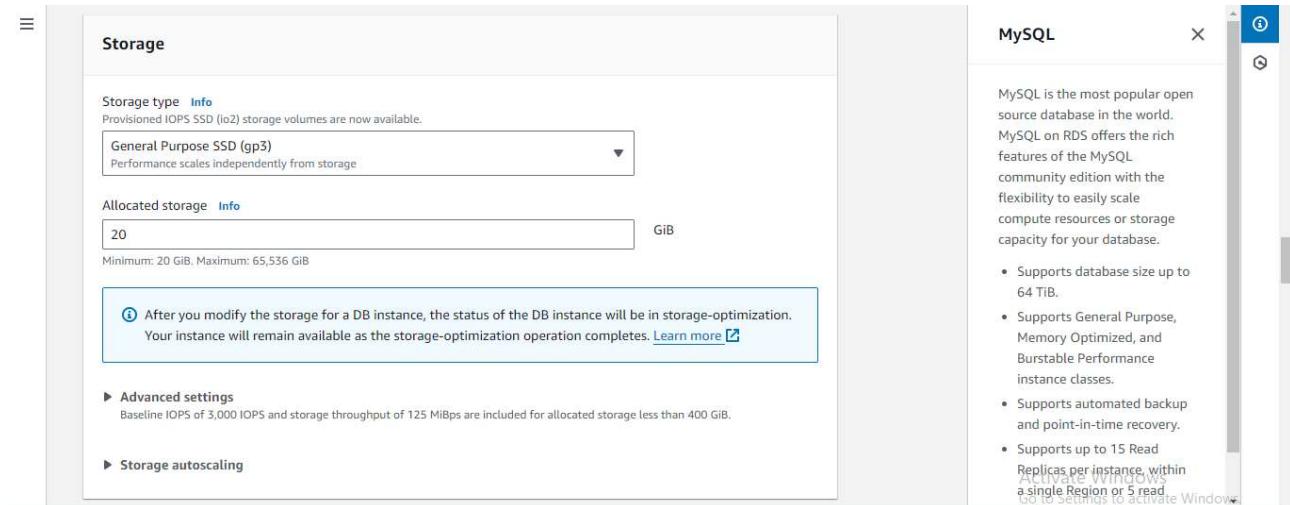
- Supports database size up to 64 TiB.
- Supports General Purpose, Memory Optimized, and Burstable Performance instance classes.
- Supports automated backup and point-in-time recovery.
- Supports up to 15 Read Replicas per instance, within Active/Standby pairs, within a single Region or 5 read replicas across multiple Regions.

-In instance configuration select burstable classes and db.t3.micro for free tier access.



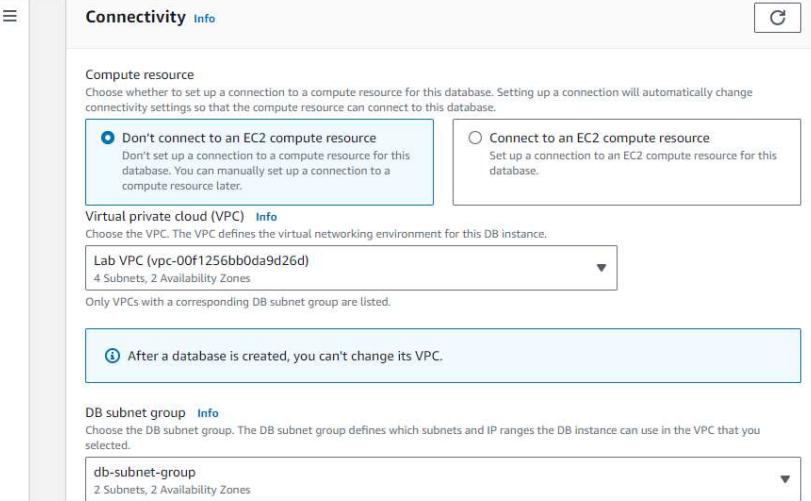
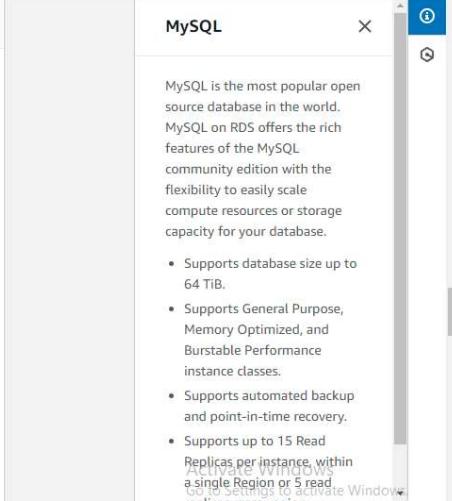
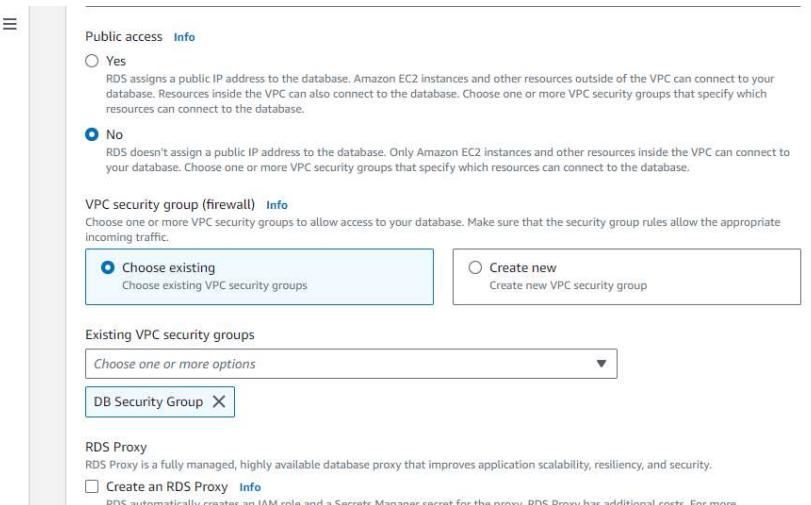
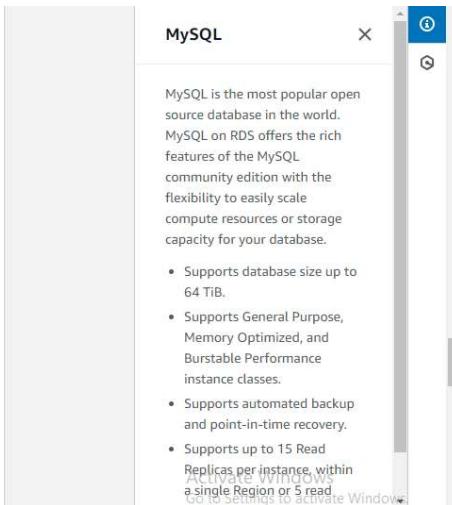
The screenshot shows the 'Instance configuration' section of the AWS RDS console. Under 'DB instance class', the 'Burstable classes (includes t classes)' option is selected. Below it, the 'db.t3.micro' class is chosen from a dropdown menu, which displays '2 vCPUs', '1 GiB RAM', and 'Network: 2,085 Mbps'. To the right, a sidebar provides information about MySQL, stating it's the most popular open source database and listing its features.

-In storage set general purpose storage type and allocate 20 GB of storage.



The screenshot shows the 'Storage' configuration page. Under 'Storage type', 'General Purpose SSD (gp3)' is selected. In the 'Allocated storage' field, '20' is entered in GiB. A note below states: 'After you modify the storage for a DB instance, the status of the DB instance will be in storage-optimization. Your instance will remain available as the storage-optimization operation completes.' To the right, a sidebar provides information about MySQL, stating it's the most popular open source database and listing its features.

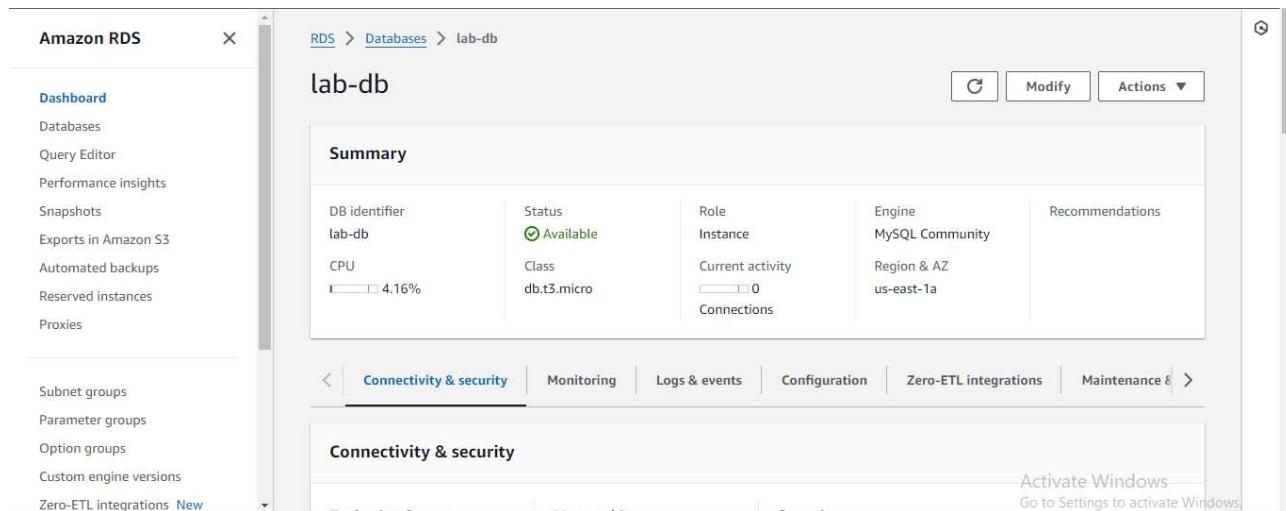
-In connectivity, select Lab VPC and db-subnet-group created above and give no to public access with configuration of db security group.

-Also uncheck all the options like Enable advanced monitoring, Enable storage backup and Enable encryption to faster instance creation.

-As well as provide initial database name as lab.

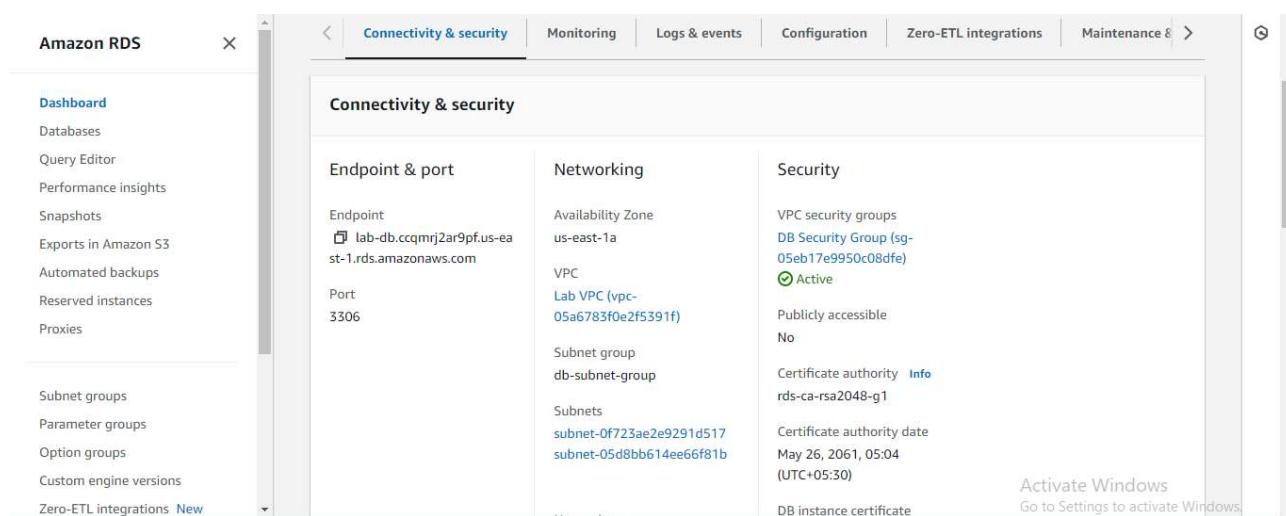
-As soon as status of DB instance gets available goto connectivity and security and copy the endpoint for further use



Summary

DB identifier	Status	Role	Engine	Recommendations
lab-db	Available	Instance	MySQL Community	
CPU	Class	Current activity	Region & AZ	
	db.t3.micro	0	us-east-1a	
		Connections		

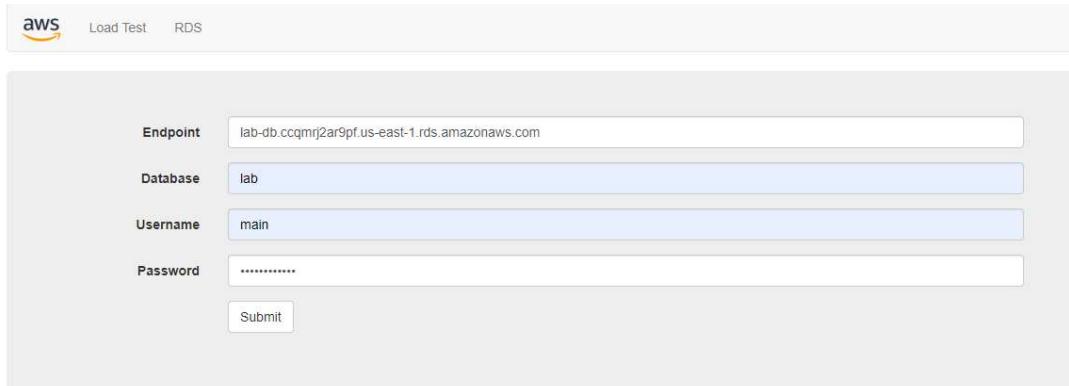
Connectivity & security



Connectivity & security

Endpoint & port	Networking	Security
Endpoint lab-db.ccqmrj2ar9pf.us-east-1.rds.amazonaws.com	Availability Zone us-east-1a VPC Lab VPC (vpc-05a6783f0e2f5391f) Subnet group db-subnet-group Subnets subnet-0f723ae2e9291d51b subnet-05d8bb614ee66f81b	VPC security groups rds-ca-rsa2048-g1 DB Security Group (sg-05eb17e9950c08dfe) Active Publicly accessible No Certificate authority Info rds-ca-rsa2048-g1 Certificate authority date May 26, 2061, 05:04 (UTC+05:30) DB instance certificate

Step 4: Interact with your database, copy the ip address of web server and paste it to the browser's new tab and click on RDS link and then it will ask for an endpoint and other credentials so provide it and then click on submit, you will find a page which prompts regarding command execution for database access.



aws Load Test RDS

Endpoint: lab-db.ccqmrj2ar9pf.us-east-1.rds.amazonaws.com

Database: lab

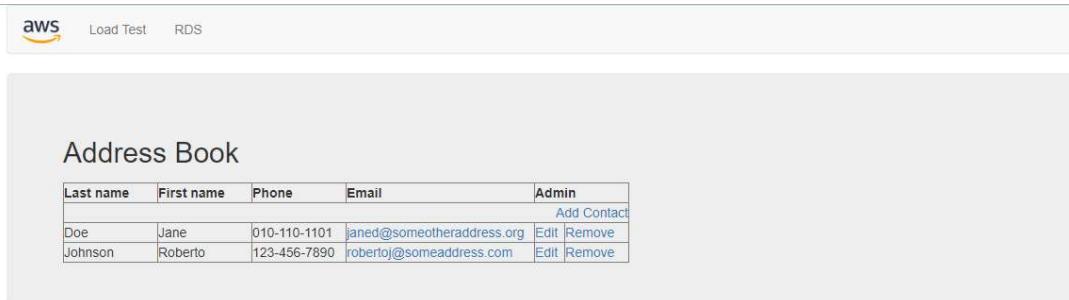
Username: main

Password:

Submit

Activate Windows
Go to Settings to activate Windows.

-Address book will be displayed and we can add, edit or remove contact from database via web server.



aws Load Test RDS

Address Book

Last name	First name	Phone	Email	Admin
Doe	Jane	010-110-1101	janed@someotheraddress.org	Edit Remove
Johnson	Roberto	123-456-7890	robertoj@someaddress.com	Edit Remove

Activate Windows
Go to Settings to activate Windows.



Practical:7

AIM : Study on custom control and operational control their working and tools used.

Introduction:

Custom control and operational control are essential aspects of UI/UX design that enhance user interactions and provide tailored functionality. Understanding these controls, how they work, and the tools used to create them is crucial for designers aiming to create effective and user-friendly interfaces.

Custom Control:

Definition and Importance:

- **Custom Controls:** These are unique, tailor-made UI elements designed to fulfill specific requirements not covered by standard controls. They are created to provide a distinctive user experience and meet the unique needs of a project.
- **Importance:** Custom controls allow designers to offer unique functionalities and interactions that standard UI elements cannot provide. They enable a brand to stand out by offering a more engaging and personalized user experience.

Working of Custom Controls:

- **Design and Conceptualization:** The process begins with identifying the need for a custom control, followed by conceptualizing its design and functionality. This involves sketching, wireframing, and defining the control's behavior.
- **Development:** Custom controls are typically developed using front-end technologies like HTML, CSS, and JavaScript. Advanced custom controls may involve frameworks like React, Angular, or Vue.js.
- **Integration:** Once developed, custom controls are integrated into the application. This step includes ensuring compatibility with the existing design system and making necessary adjustments.
- **Testing:** Custom controls undergo rigorous testing to ensure they function as intended and provide a seamless user experience. This involves usability testing, accessibility checks, and performance optimization.



Tools Used for Custom Controls:

- **Design Tools:** Adobe XD, Sketch, and Figma for designing and prototyping custom controls.
- **Development Tools:** Visual Studio Code, Sublime Text, and Atom for coding custom controls. Frameworks like React, Angular, and Vue.js for building dynamic and interactive custom elements.
- **Testing Tools:** Browser Developer Tools for debugging, and tools like Lighthouse for performance and accessibility testing.

Examples of Custom Controls:

- **Custom Date Picker:** A date picker tailored to a specific application's needs, with unique styling and additional features like range selection and custom date formats.
- **Interactive Maps:** Maps with custom markers, tooltips, and interactions tailored to provide specific functionalities such as route planning or location-based services.

Operational Control:

Definition and Importance:

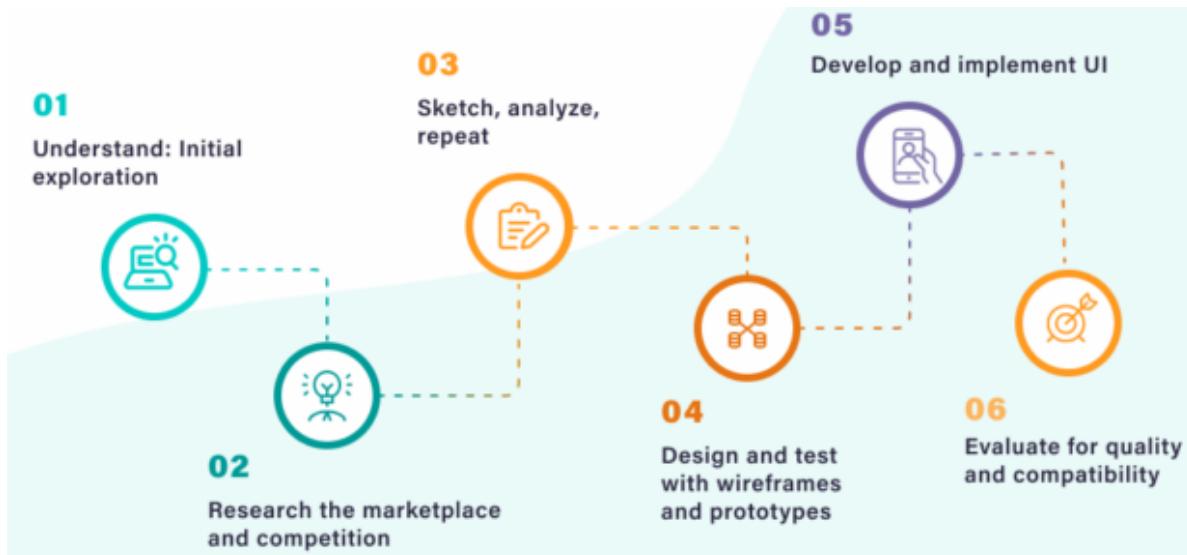
- **Operational Controls:** These are standard UI elements that handle common interactions and operations within an application, such as buttons, sliders, checkboxes, and dropdown menus.
- **Importance:** Operational controls are essential for providing basic functionality and enabling users to perform tasks efficiently. They are foundational elements of any user interface and are crucial for ensuring usability and accessibility.

Working of Operational Controls:

- **Design and Implementation:** Operational controls are designed following established UI guidelines and best practices. They are implemented using standard front-end technologies and often follow design patterns to ensure consistency and usability.
- **Customization:** While operational controls are standard, they can be customized to fit the visual style and branding of the application. Customization involves styling changes and minor functional adjustments without altering the core behavior.



- **Interaction Handling:** These controls are equipped with event listeners and handlers to manage user interactions, such as clicks, selections, and inputs. This ensures that the application responds appropriately to user actions.
- **Accessibility and Usability:** Ensuring that operational controls are accessible and usable by all users, including those with disabilities, is a critical aspect of their design and implementation. This involves adhering to accessibility standards and guidelines.



Tools Used for Operational Controls:

- **UI Frameworks:** Bootstrap, Material-UI, and Foundation provide pre-designed operational controls that can be customized and integrated into applications.
- **Component Libraries:** Libraries like React Bootstrap, Vuetify, and Angular Material offer ready-to-use operational controls tailored for specific frameworks.
- **Design Systems:** Tools like Storybook and Pattern Lab help in building, managing, and documenting reusable operational controls within a design system.

Examples of Operational Controls:

- **Buttons:** Standard buttons for submitting forms, initiating actions, and navigating through the application.
- **Sliders:** Range sliders for selecting values within a specified range, commonly used in settings and filters.
- **Dropdown Menus:** Dropdowns for presenting a list of options, allowing users to make a selection from predefined choices.



Practical:8

AIM : Study about implementation of information search module using UI/UX.

Implementing an information search module using UI/UX principles involves several key considerations to ensure an effective and user-friendly experience.

1. User Research and Understanding:

- Conduct thorough user research to understand the target audience, their needs, preferences, and pain points related to information search.
- Create user personas to represent different user segments and their goals.

2. Information Architecture:

- Design a clear and intuitive information architecture (IA) that organizes information logically.
- Use categorization and hierarchy to help users navigate and find information easily.

3. Search Interface Design:

- Design a prominent and easily accessible search bar or search field that is consistently visible across all pages.
- Provide autocomplete suggestions and filters to assist users in refining their search queries.

4. Visual Design:

- Ensure a visually appealing and consistent design that aligns with the overall branding and theme of the application or website.
- Use clear typography, color schemes, and visual elements to guide users' attention and enhance readability.

5. Usability Testing:

- Conduct usability testing sessions to gather feedback on the search module prototype.
- Test different aspects such as search speed, accuracy of results, user comprehension of filters, and overall ease of use.

6. Feedback Mechanism:

- Implement a feedback mechanism to allow users to provide input on their search experience.
- Use this feedback to continuously improve the search module based on user insights and preferences.

7. Mobile Responsiveness:

- Ensure that the search module is responsive and works seamlessly across different devices and screen sizes, including smartphones and tablets.

8. Accessibility Considerations:

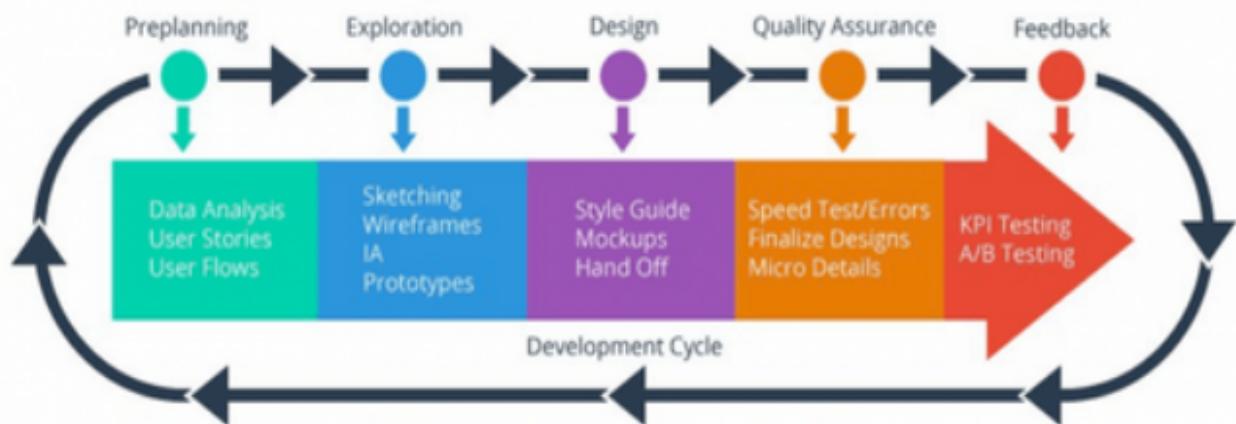
- Follow accessibility guidelines (e.g., WCAG) to ensure that the search module is accessible to users with disabilities.
- Provide alternative text for images, keyboard navigation options, and other accessibility features.

9. Integration with Analytics:

- Integrate analytics tools to track user behaviour related to search queries.
- Analyse search patterns and metrics to identify areas for improvement and optimization.

10. Continuous Iteration:

- Implement a process for continuous iteration and improvement based on user feedback, analytics data, and evolving user needs.





Practical:9

AIM : Study and analysis of navigation design and its implementation.

Studying and analysing navigation design in UI/UX involves understanding how users navigate through an application or website to achieve their goals efficiently and intuitively.

1. User Research and Contextual Inquiry:

- Conduct user research to understand the target audience, their behaviours, goals, and typical tasks within the application or website.
- Use methods such as contextual inquiry, interviews, and surveys to gather insights into how users expect to navigate through the interface.

2. Information Architecture (IA) Development:

- Design a clear and structured information architecture that organizes content and features logically.
- Use techniques like card sorting to determine the best grouping and hierarchy of navigation elements based on user mental models.

3. Navigation Patterns and Types:

- Identify suitable navigation patterns (e.g., top navigation bar, sidebar menu, tab navigation) based on the content complexity and user preferences.
- Balance between simplicity and providing access to deeper levels of content through hierarchical navigation.

4. Visual Hierarchy and Design Consistency:

- Establish a visual hierarchy that guides users through the interface, emphasizing primary actions and important content.
- Maintain design consistency across navigation elements (icons, labels, colors) to ensure familiarity and usability.

5. Mobile Responsiveness and Adaptability:

- Design navigation that is responsive and adapts seamlessly across different devices and screen sizes.



- Prioritize key navigation elements and consider mobile-specific patterns like collapsible menus or bottom navigation bars.

6. Usability Testing and Iterative Design:

- Conduct usability testing sessions to evaluate the effectiveness of navigation design.
- Test navigation pathways, menu structures, and user comprehension of navigation labels.
- Gather feedback to identify pain points and areas for improvement, iterating based on user insights.



7. Accessibility and Navigation:

- Ensure navigation elements are accessible to all users, including those with disabilities.
- Follow accessibility guidelines (e.g., WCAG) for keyboard navigation, focus states, and alternative text for icons.

8. Performance and Speed Optimization:

- Optimize navigation design for speed and performance, minimizing load times and ensuring smooth transitions between pages or sections.

9. Feedback and Analytics Integration:

- Implement mechanisms for users to provide feedback on navigation usability.
- Use analytics tools to track user behavior, navigation patterns, and drop-off points to continuously refine navigation design.

10. Collaboration with Development Team:

- Collaborate closely with developers to ensure smooth implementation of navigation design, addressing technical constraints and optimizations.