

CSE 4020/5260

Database Systems

Instructor: Fitzroy Nembhard, Ph.D.

Setting up RDS on AWS and Performing CRUD Operations



Goals

- To Provision a MySQL database on RDS using the AWS Console
- To connect to the database using MySQL Workbench



- > [Joining the AWS course on Canvas](#)
- > [Accessing AWS Academy](#)
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- > [Enter DB Details](#)
- > [Set up Connectivity](#)
- > [Turn off Enhanced Monitoring](#)
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- > [Copy Connection Parameters](#)
- > [Handling DB Security](#)
- > [Creating a Parameter Group](#)
- > [Edit Trust Function Creators](#)
- > [Test Connection](#)

Accept the invitation to join the AWS classroom

Join the class on AWS using the invitation email
that should have come to your Florida Tech inbox

AA

AWS Academy

Course Invitation

To: drfitz@fit.edu

Reply-To: reply+24e27c837fad421c-15691~7162367-1642520817@notifications.canvaslms.com

Inbox - Google

You've been invited to participate in a class at AWS Academy . The class is called AWS Academy Learner Lab - Foundation Services [12381]. Course role: Student

Name: **Fitz as Student**

Email: **drfitz@fit.edu**

Username: **none**

You'll need to register with Canvas before you can participate in the class.

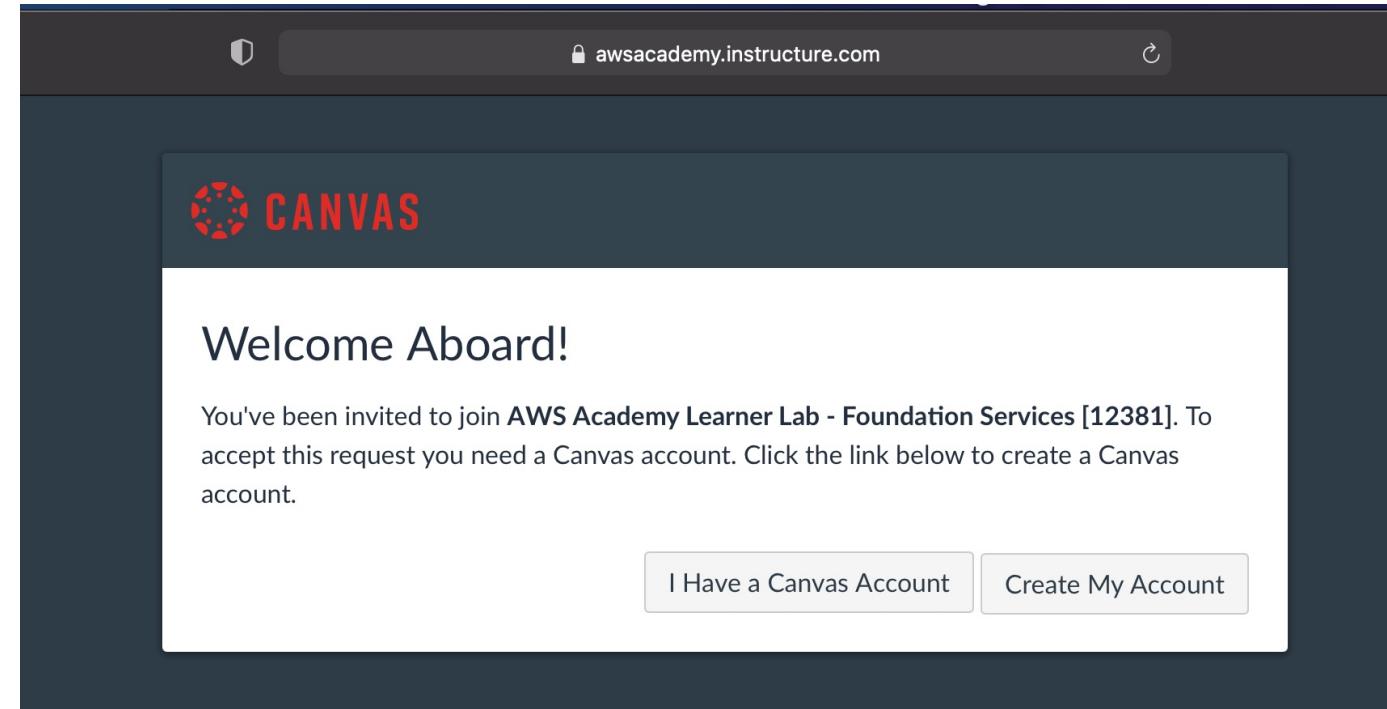
Get Started



Log in Using Canvas

Choose “I Have a Canvas Account” if you used AWS Academy before in a course such as Big Data with Dr. Fitz.

Otherwise, create an account by clicking the “Create My Account” button.

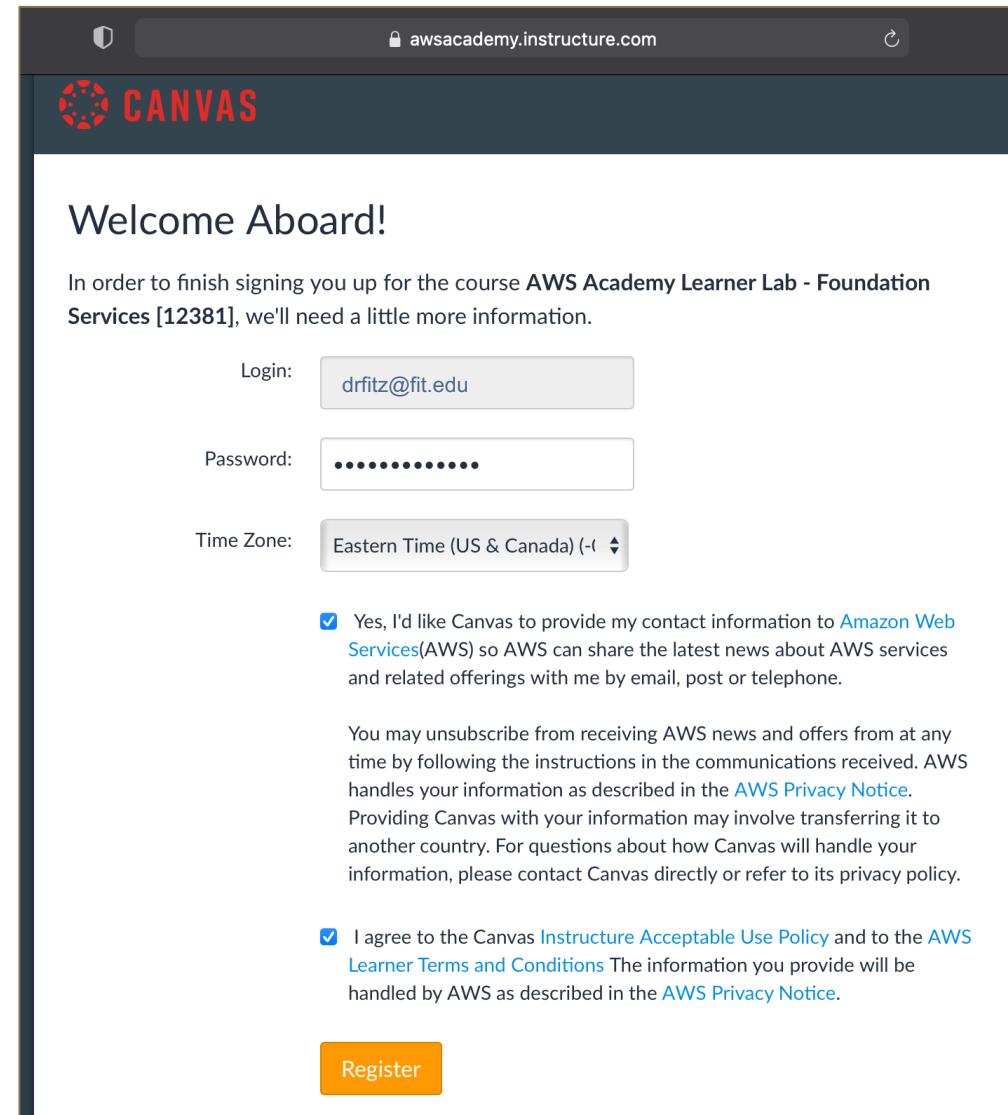


Creating a Canvas Account

This screen shows what happens when you click Create My Account.

Fill out the form using the email address at which you received the Invitation to join AWS Academy.

Click **Register**.



The screenshot shows a web browser window for awsacademy.instructure.com. The page title is "CANVAS". The main heading is "Welcome Aboard!". Below it, a message says: "In order to finish signing you up for the course AWS Academy Learner Lab - Foundation Services [12381], we'll need a little more information." There are three input fields: "Login" with the value "drfitz@fit.edu", "Password" with masked input, and "Time Zone" set to "Eastern Time (US & Canada) (-1)". Below these are two checkboxes:

- Yes, I'd like Canvas to provide my contact information to [Amazon Web Services\(AWS\)](#) so AWS can share the latest news about AWS services and related offerings with me by email, post or telephone.
- I agree to the Canvas [Instructure Acceptable Use Policy](#) and to the [AWS Learner Terms and Conditions](#) The information you provide will be handled by AWS as described in the [AWS Privacy Notice](#).

A large orange "Register" button is at the bottom.

Welcome Screen

After logging in to Canvas, you should see the following screen.

aws ALLFv1-12381

Home Modules Discussions Courses Calendar Inbox History Help

AWS Academy Learner Lab - Foundation Services [12381]



AWS Academy Learner Lab - Foundation Services provides a long-running sandbox environment for ad hoc exploration of AWS services. Within this class, students will have access to **a restricted set of AWS services**. Not all AWS documentation walk-through or sample labs that operate in an AWS Production account will work in the sandbox environment. You will retain access to the AWS resources set up in this environment for the duration of this course. We limit your budget (\$100), so you should exercise caution to prevent charges that will deplete your budget too quickly. If you exceed your budget, you will lose access to your environment and lose all of your work.

Each session lasts for 4 hours by default, although you can extend a session to run longer by pressing the start button to reset your session timer. At the end of each session, any resources you created will persist. However, we automatically shut EC2 instances down. Other resources, such as RDS instances, keep running. Keep in mind that we do not stop some AWS features, so they can still incur charges between sessions. For example, an Elastic Load Balancer or a NAT. You may wish to delete those types

[View Course Stream](#)

[View Course Calendar](#)

[View Course Notifications](#)

To Do
Nothing for now

Recent Feedback
Nothing for now

Returning to AWS

To return to AWS, go to

https://www.awsacademy.com/LMS_Login

Or

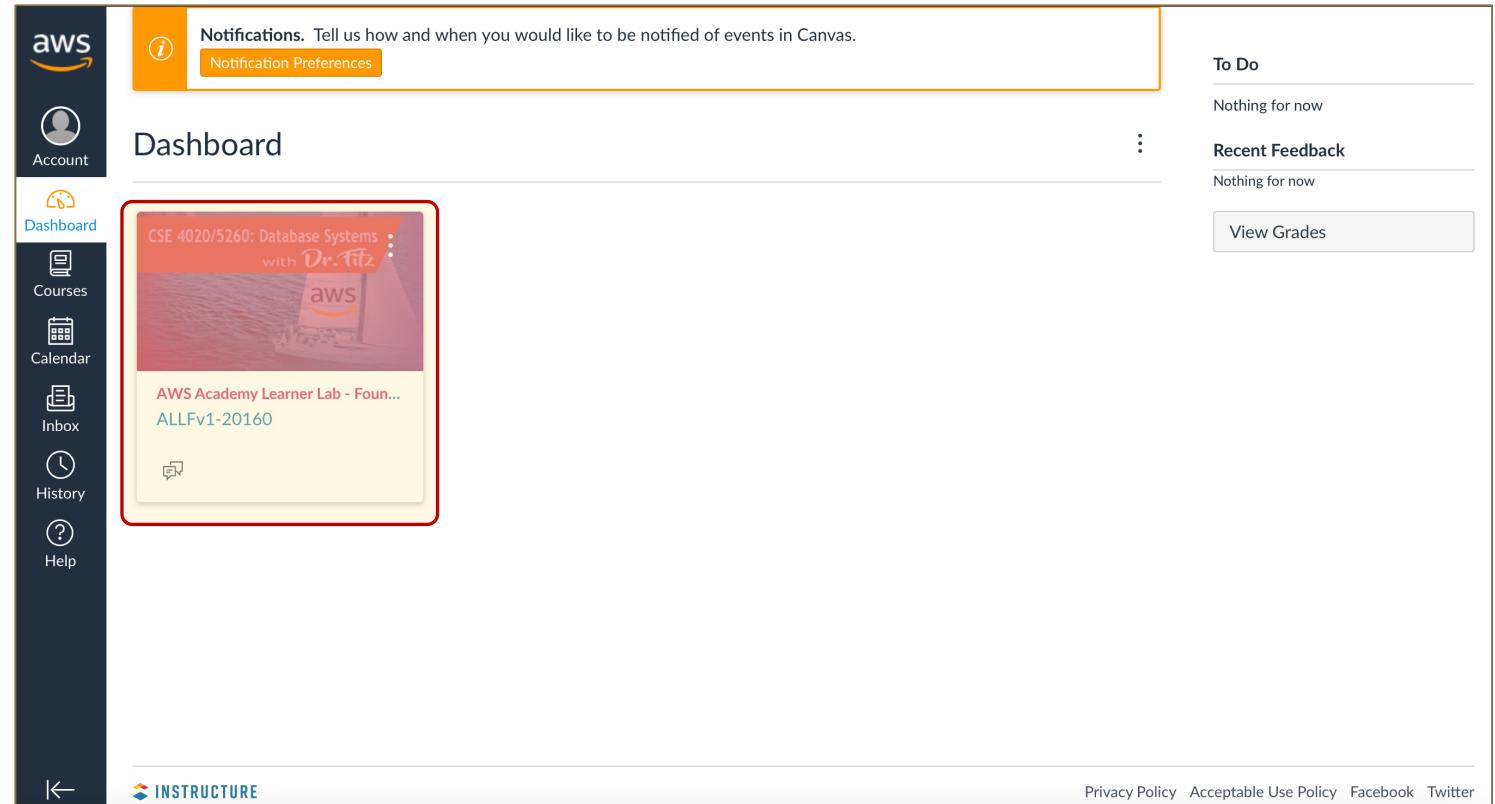
<https://awsacademy.instructure.com/>

This is a close-up view of the AWS Academy login form. It features a dark blue header with the AWS Academy logo. The main area has fields for "Email" containing "drfitz@fit.edu" and "Password" containing a masked password. There is a "Stay signed in" checkbox, a "Forgot Password?" link, and a "Log In" button. At the bottom, there are links for "Help", "Privacy Policy", "Acceptable Use Policy", "Facebook", and "Twitter". The "INSTRUCTURE" logo is also present.

Returning to AWS

After returning to AWS, your screen should resemble the following.

Select the AWS Academy Learner Lab course.

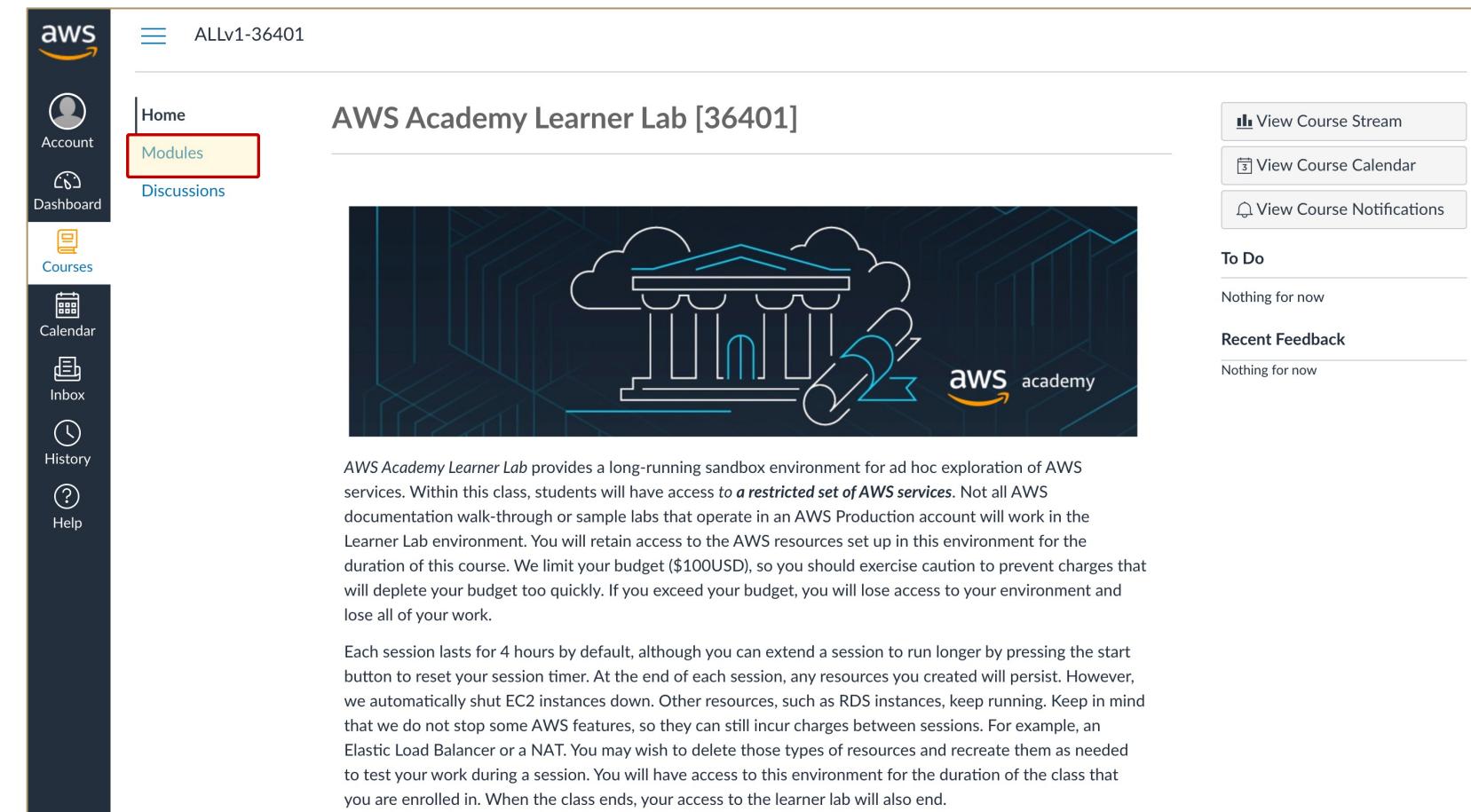


The screenshot shows the Canvas LMS dashboard. On the left is a sidebar with icons for Account, Dashboard, Courses, Calendar, Inbox, History, Help, and a back arrow. The main area is titled "Dashboard" and features a course card for "CSE 4020/5260: Database Systems with Dr. Fitz". Below it is another card for "AWS Academy Learner Lab - Foun... ALLFv1-20160". At the top, there's a notification bar with an "i" icon and the text "Notifications. Tell us how and when you would like to be notified of events in Canvas." and a "Notification Preferences" button. To the right, there are sections for "To Do" (Nothing for now), "Recent Feedback" (Nothing for now), and a "View Grades" button. At the bottom, there are links for Privacy Policy, Acceptable Use Policy, Facebook, and Twitter, along with the Instructure logo.

Accessing Learner Labs

Click **Modules** to access Learner Labs

AWS Academy Learner Lab [36401]



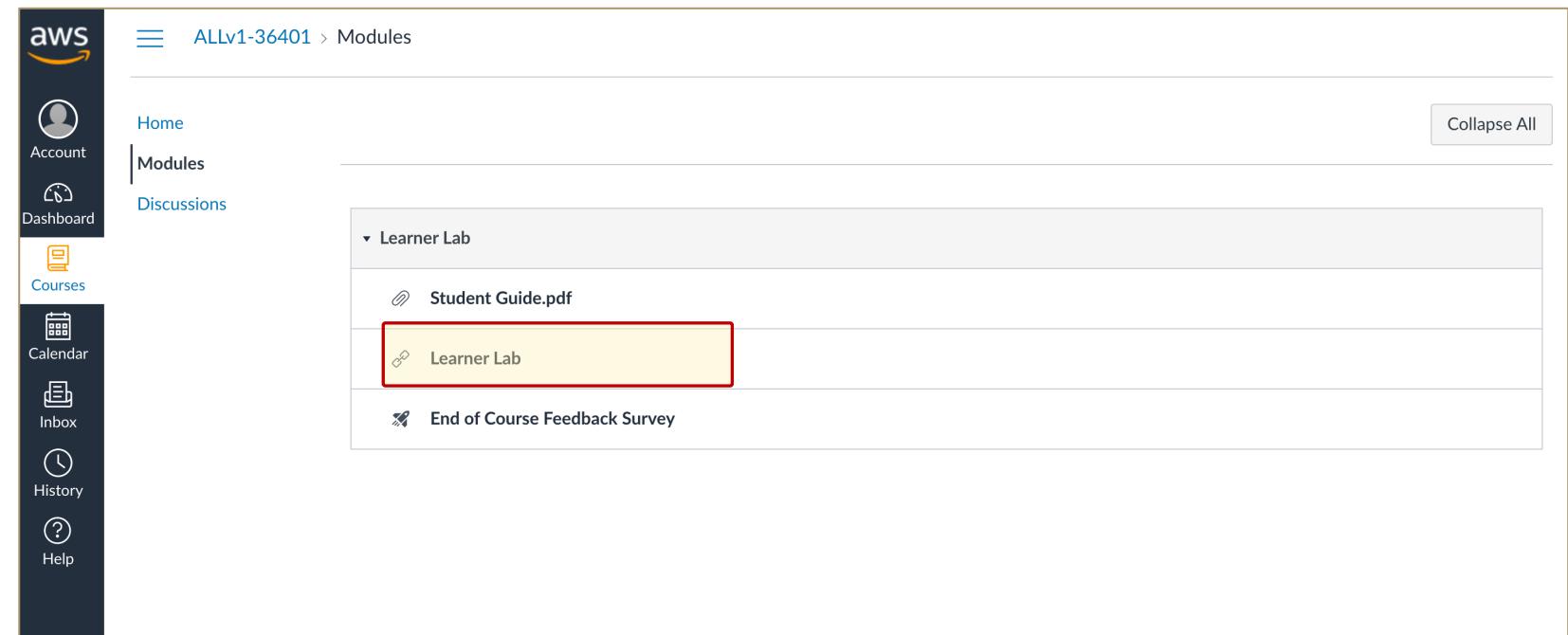
The screenshot shows the AWS Academy Learner Lab interface for course ALLv1-36401. On the left is a dark sidebar with icons for Account, Dashboard, Courses, Calendar, Inbox, History, and Help. The 'Modules' icon is highlighted with a red box. The main content area has a title 'AWS Academy Learner Lab [36401]' and a large graphic of a cloud with a circuit board pattern underneath. To the right are three grey boxes: 'View Course Stream', 'View Course Calendar', and 'View Course Notifications'. Below these are sections for 'To Do' (Nothing for now) and 'Recent Feedback' (Nothing for now).

AWS Academy Learner Lab provides a long-running sandbox environment for ad hoc exploration of AWS services. Within this class, students will have access to **a restricted set of AWS services**. Not all AWS documentation walk-through or sample labs that operate in an AWS Production account will work in the Learner Lab environment. You will retain access to the AWS resources set up in this environment for the duration of this course. We limit your budget (\$100USD), so you should exercise caution to prevent charges that will deplete your budget too quickly. If you exceed your budget, you will lose access to your environment and lose all of your work.

Each session lasts for 4 hours by default, although you can extend a session to run longer by pressing the start button to reset your session timer. At the end of each session, any resources you created will persist. However, we automatically shut EC2 instances down. Other resources, such as RDS instances, keep running. Keep in mind that we do not stop some AWS features, so they can still incur charges between sessions. For example, an Elastic Load Balancer or a NAT. You may wish to delete those types of resources and recreate them as needed to test your work during a session. You will have access to this environment for the duration of the class that you are enrolled in. When the class ends, your access to the learner lab will also end.

Accessing Learner Labs

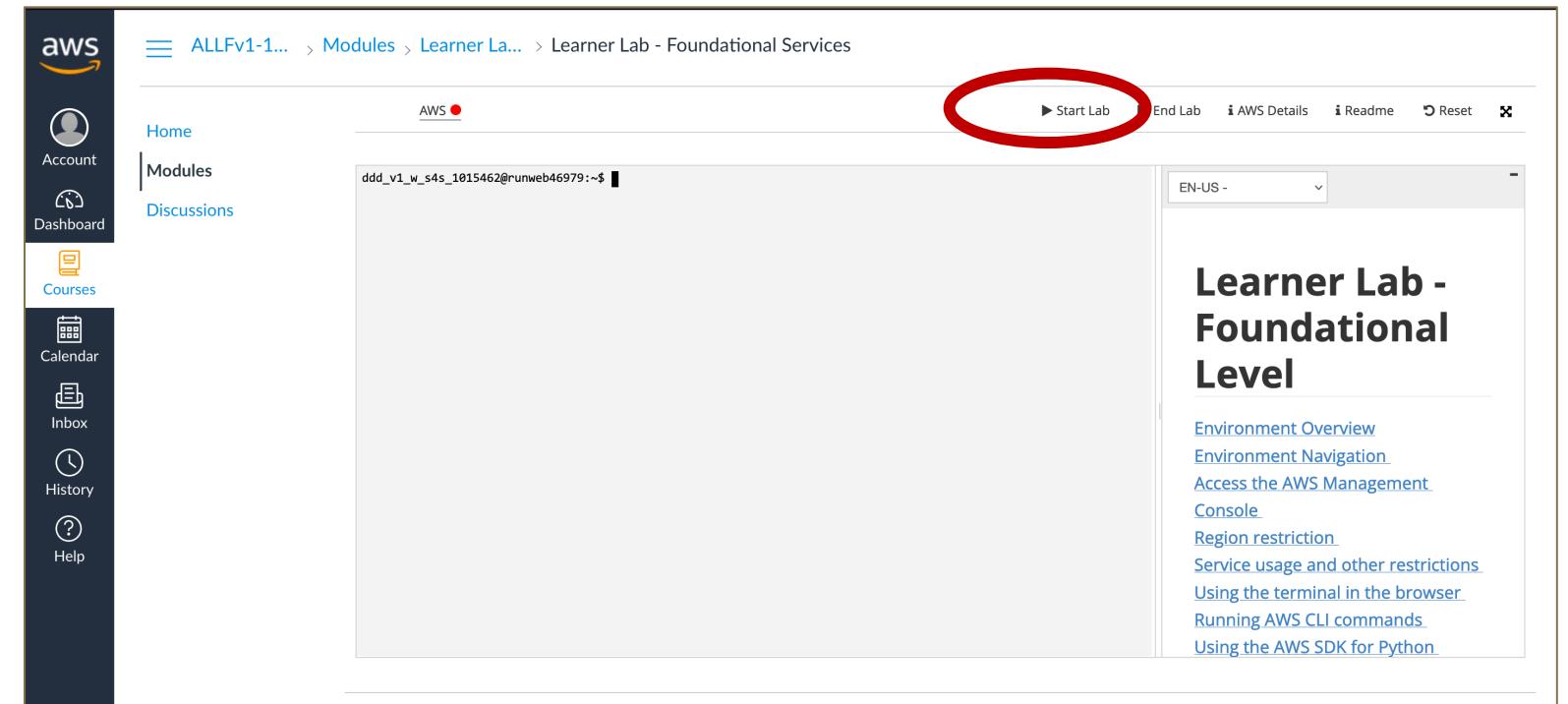
Click **Learner Lab**.



The screenshot shows the AWS Learning Experience Platform interface. At the top, there's a navigation bar with the AWS logo and the course identifier "ALLv1-36401 > Modules". On the left, a dark sidebar menu lists several options: Account, Dashboard, Courses (which is currently selected), Calendar, Inbox, History, and Help. The main content area displays a "Learner Lab" module. Inside this module, there are three items: "Student Guide.pdf", "Learner Lab" (which is highlighted with a red box), and "End of Course Feedback Survey". A "Collapse All" button is located in the top right corner of the main content area.

Starting Learner Labs

Click **Start Lab** to start a lab session.



The screenshot shows the AWS Learner Lab interface. On the left is a dark sidebar with icons for Account, Dashboard, Courses, Calendar, Inbox, History, and Help. The main area has a breadcrumb navigation path: ALLFv1-1... > Modules > Learner La... > Learner Lab - Foundational Services. At the top right are buttons for Start Lab (circled in red), End Lab, AWS Details, Readme, Reset, and a close button. Below these buttons is a dropdown menu set to EN-US. The central part of the screen is a terminal window titled "ddd_v1_w_s4s_1015462@runweb46979:~\$". To the right of the terminal is a sidebar with the title "Learner Lab - Foundational Level" and links to Environment Overview, Environment Navigation, Access the AWS Management Console, Region restriction, Service usage and other restrictions, Using the terminal in the browser, Running AWS CLI commands, and Using the AWS SDK for Python.

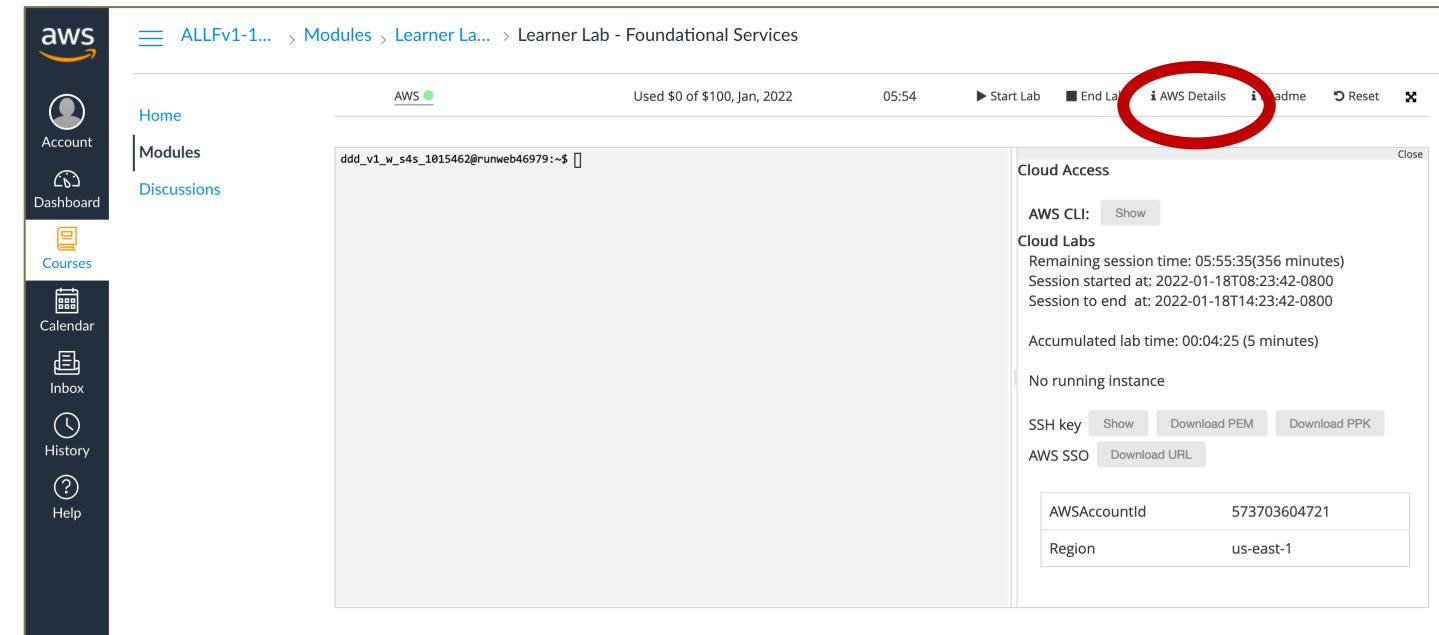
Access AWS Details

Click **AWS details** to access AWS information such as keys for accessing resources using SSH, etc.

If you are a windows user, download the PPK file to your computer.

MacOS and Linux users: Download the PEM file.

You will need these keys to access AWS Console later

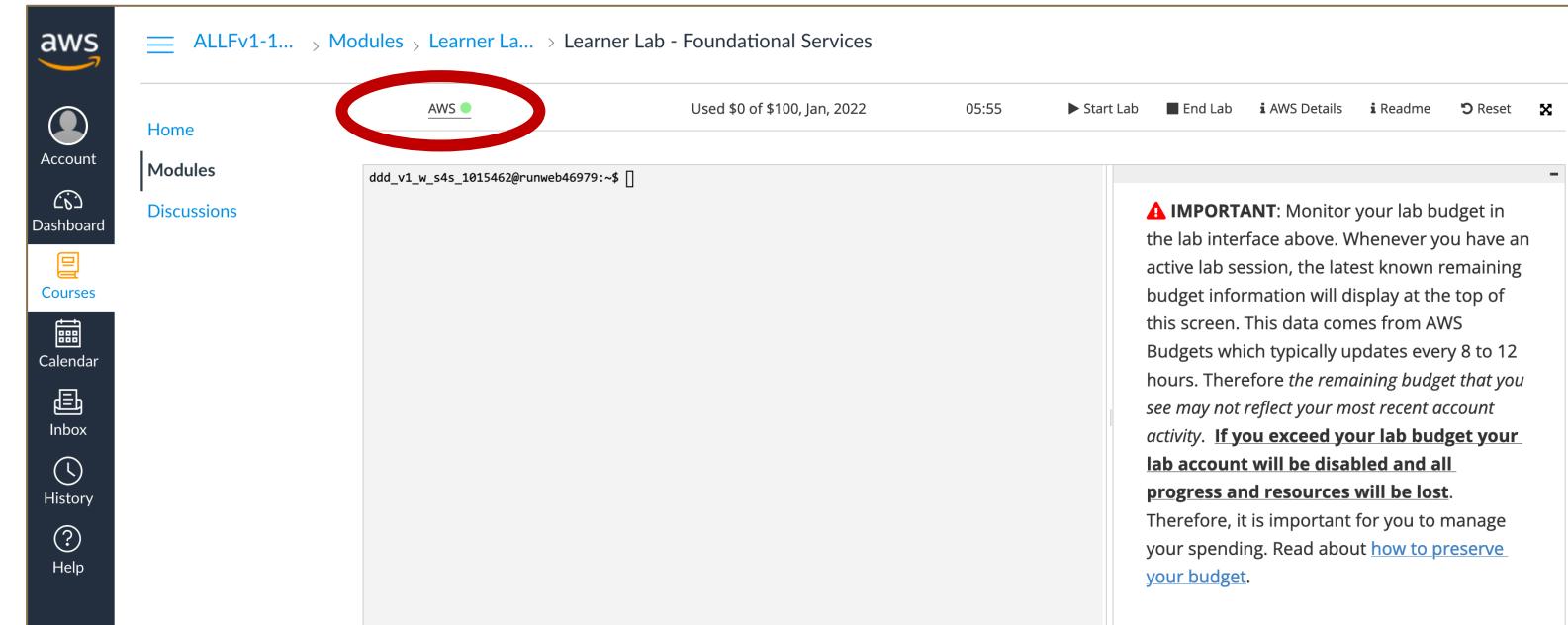


The screenshot shows the AWS Learner Lab interface. On the left is a sidebar with icons for Account, Dashboard, Courses (which is selected), Calendar, Inbox, History, and Help. The main content area shows the path: ALLFv1-1... > Modules > Learner La... > Learner Lab - Foundational Services. At the top right, there are buttons for Start Lab, End Lab, AWS Details (which is circled in red), Admin, Reset, and Close. Below these buttons, there's a section titled "Cloud Access" with "AWS CLI" and "Cloud Labs" sections. The "Cloud Labs" section displays session details: Remaining session time: 05:55:35(356 minutes), Session started at: 2022-01-18T08:23:42-0800, Session to end at: 2022-01-18T14:23:42-0800. It also shows accumulated lab time: 00:04:25 (5 minutes) and that no running instance exists. At the bottom, there are buttons for "SSH key Show", "Download PEM", "Download PPK", "AWS SSO Download URL", "AWSAccountid 573703604721", and "Region us-east-1".

Starting Learner Labs

After the session has started successfully, the icon should turn green.

Click AWS to access AWS console.



The screenshot shows the AWS Learner Lab interface. On the left is a sidebar with icons for Account, Dashboard, Courses, Calendar, Inbox, History, and Help. The main area shows the path: ALLFv1-1... > Modules > Learner La... > Learner Lab - Foundational Services. At the top right, there are buttons for Start Lab, End Lab, AWS Details, Readme, and Reset. A red circle highlights the 'AWS' button. Below it, the status bar shows 'Used \$0 of \$100, Jan, 2022' and the time '05:55'. To the right, there's a terminal window with the command 'ddd_v1_w_s4s_1015462@runweb46979:~\$' and an important message about monitoring the lab budget.

ALLFv1-1... > Modules > Learner La... > Learner Lab - Foundational Services

AWS

Used \$0 of \$100, Jan, 2022

05:55

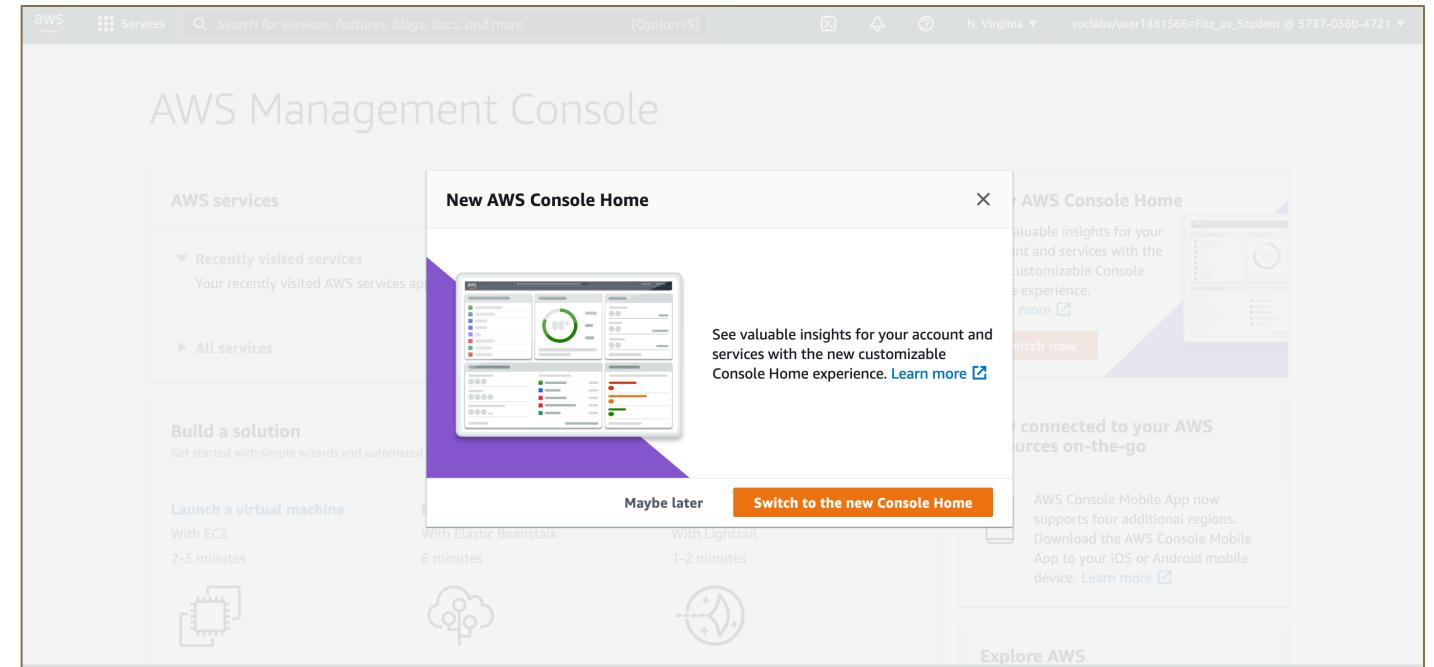
► Start Lab ■ End Lab AWS Details Readme Reset

ddd_v1_w_s4s_1015462@runweb46979:~\$

IMPORTANT: Monitor your lab budget in the lab interface above. Whenever you have an active lab session, the latest known remaining budget information will display at the top of this screen. This data comes from AWS Budgets which typically updates every 8 to 12 hours. Therefore *the remaining budget that you see may not reflect your most recent account activity*. **If you exceed your lab budget your lab account will be disabled and all progress and resources will be lost.** Therefore, it is important for you to manage your spending. Read about [how to preserve your budget](#).

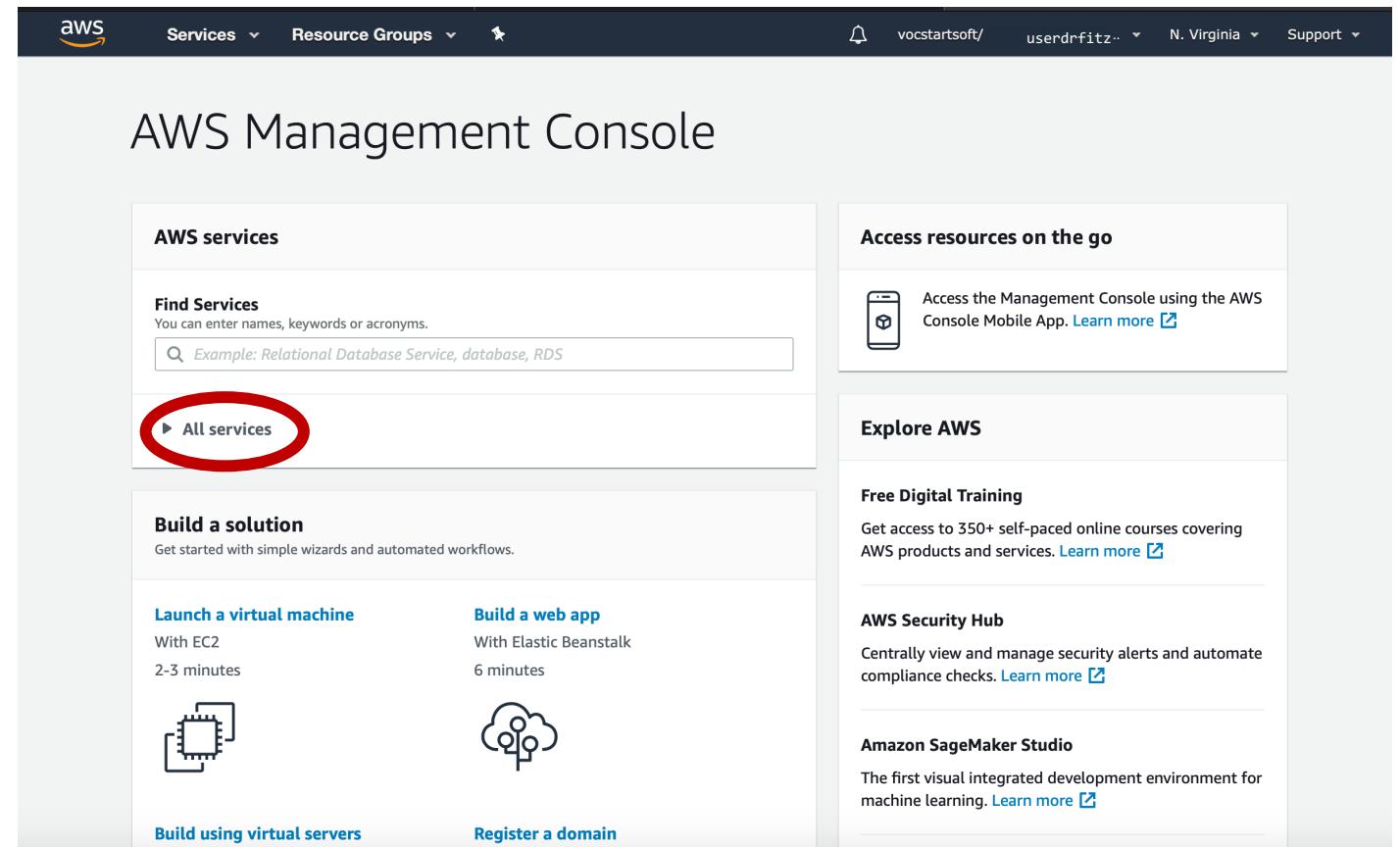
Access AWS Console

If you see an alert such as the following, I recommend using the New Console Home.



Accessing RDS

Click **All services**.



The screenshot shows the AWS Management Console homepage. At the top, there's a navigation bar with the AWS logo, a "Services" dropdown, a "Resource Groups" dropdown, a bell icon, and user information ("vocstartsoft/", "userdrfritz..", "N. Virginia", "Support"). The main title "AWS Management Console" is centered above a grid of service cards.

AWS services

Find Services
You can enter names, keywords or acronyms.

All services (highlighted with a red circle)

Build a solution
Get started with simple wizards and automated workflows.

Launch a virtual machine
With EC2
2-3 minutes

[Build using virtual servers](#)

Build a web app
With Elastic Beanstalk
6 minutes

[Register a domain](#)

Access resources on the go
 Access the Management Console using the AWS Console Mobile App. [Learn more](#)

Explore AWS

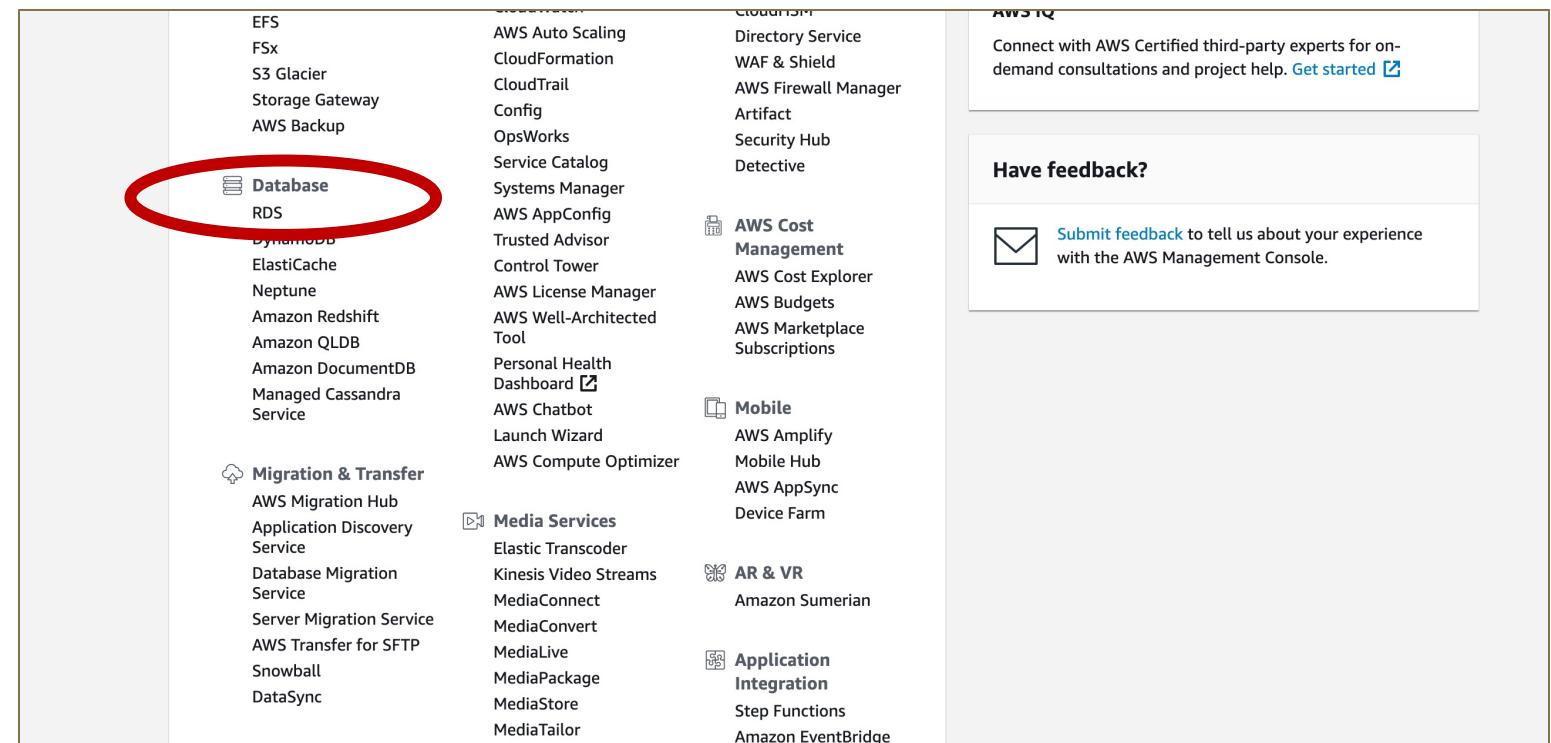
Free Digital Training
Get access to 350+ self-paced online courses covering AWS products and services. [Learn more](#)

AWS Security Hub
Centrally view and manage security alerts and automate compliance checks. [Learn more](#)

Amazon SageMaker Studio
The first visual integrated development environment for machine learning. [Learn more](#)

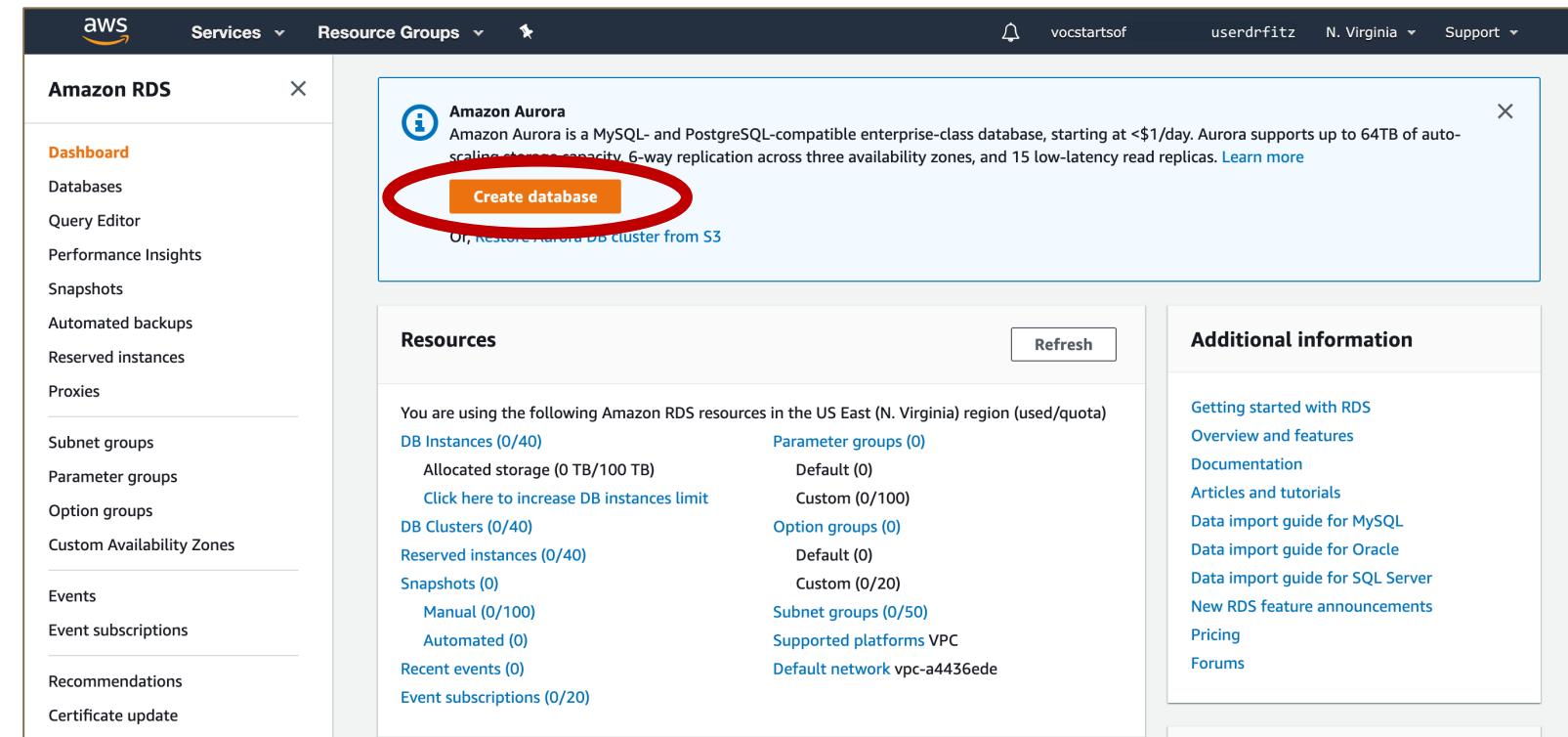
Select RDS

Select RDS from the list of services on the dashboard.



Create Database

Click **Create Database**



The screenshot shows the AWS Amazon RDS dashboard. On the left, there's a sidebar with links like Dashboard, Databases, Query Editor, etc. The main area features a callout for 'Amazon Aurora' with a 'Create database' button, which is circled in red. Below this, there's a 'Resources' section listing various RDS resources and their counts, and an 'Additional information' sidebar with links to documentation and forums.

Amazon Aurora
Amazon Aurora is a MySQL- and PostgreSQL-compatible enterprise-class database, starting at <\$1/day. Aurora supports up to 64TB of auto-scaling storage capacity, 6-way replication across three availability zones, and 15 low-latency read replicas. [Learn more](#)

Create database

Or, [RESTORE Aurora DB cluster from S3](#)

Resources

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

DB Instances (0/40)	Parameter groups (0)
Allocated storage (0 TB/100 TB)	Default (0)
Click here to increase DB instances limit	Custom (0/100)
DB Clusters (0/40)	Option groups (0)
Reserved instances (0/40)	Default (0)
Snapshots (0)	Custom (0/20)
Manual (0/100)	Subnet groups (0/50)
Automated (0)	Supported platforms VPC
Recent events (0)	Default network vpc-a4436ede
Event subscriptions (0/20)	

Additional information

- [Getting started with RDS](#)
- [Overview and features](#)
- [Documentation](#)
- [Articles and tutorials](#)
- [Data import guide for MySQL](#)
- [Data import guide for Oracle](#)
- [Data import guide for SQL Server](#)
- [New RDS feature announcements](#)
- [Pricing](#)
- [Forums](#)

Select MySQL

Click on Standard Create and choose MySQL from the list.

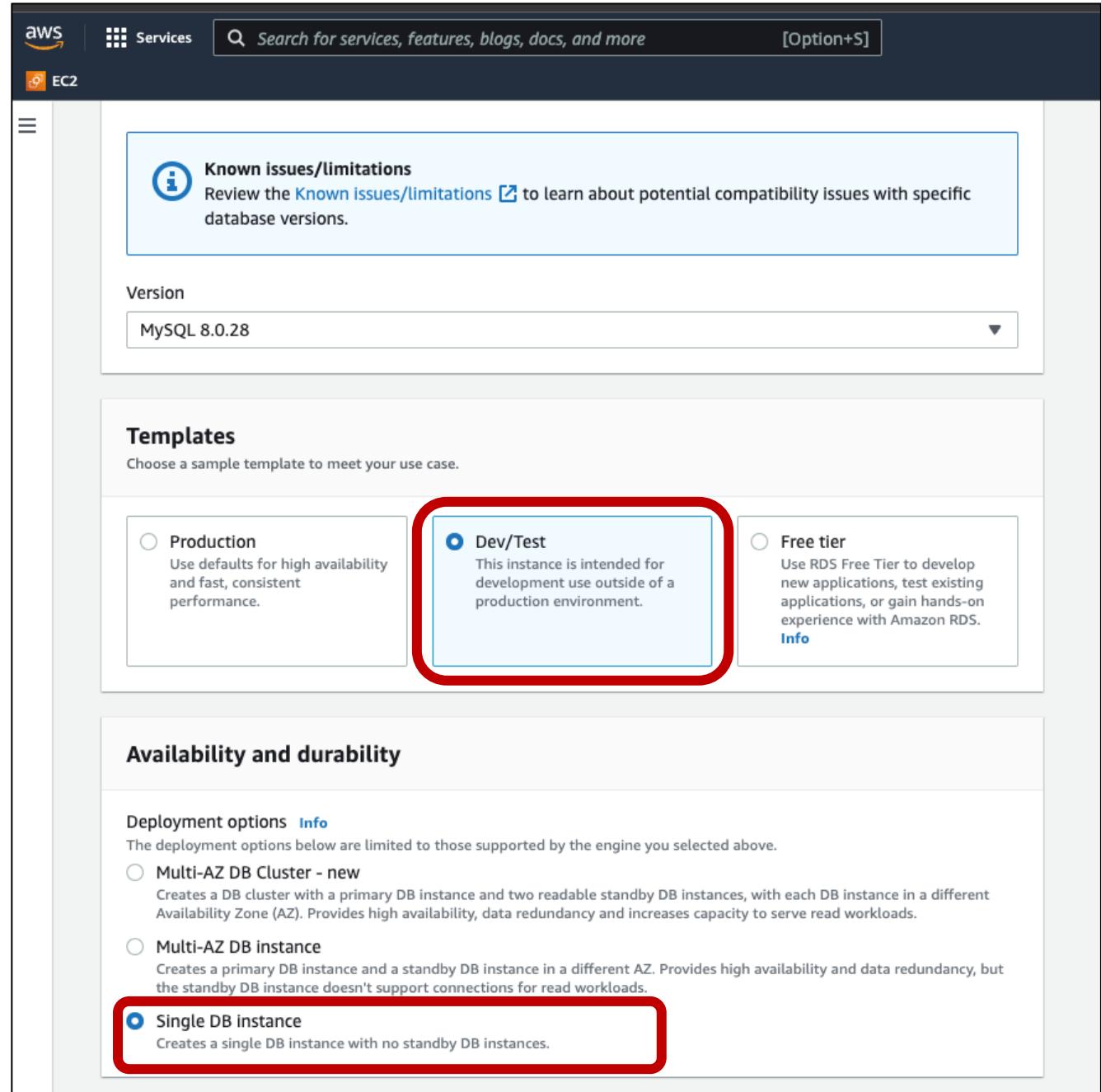
Then, choose the latest version of MySQL from the list or leave the default selected option.

The screenshot shows the 'Create database' wizard in the AWS Management Console. The first step, 'Choose a database creation method', has 'Standard Create' selected. The second step, 'Engine options', shows various database engines: Amazon Aurora, MySQL, MariaDB, PostgreSQL, Oracle, and Microsoft SQL Server. The 'MySQL' option is selected and highlighted with a red box. Below it, the 'Edition' is set to 'MySQL Community' and the 'Version' is set to 'MySQL 8.0.17'. The Oracle and Microsoft SQL Server options are also visible.

Choose Dev/Test

Choose **Dev/Test** from the database templates and select **Single DB Instance** for the Deployment options.

AWS Academy allows us up to a t2.small instance, which is available in the Dev/Test environment.



The screenshot shows the AWS RDS MySQL setup page. At the top, there's a "Known issues/limitations" section with a blue info icon and text: "Review the Known issues/limitations [link](#) to learn about potential compatibility issues with specific database versions." Below this is a "Version" dropdown set to "MySQL 8.0.28".

The next section is titled "Templates" with the sub-instruction "Choose a sample template to meet your use case." It contains three options:

- Production**: Use defaults for high availability and fast, consistent performance.
- Dev/Test**: This instance is intended for development use outside of a production environment. This option is highlighted with a red box.
- Free tier**: Use RDS Free Tier to develop new applications, test existing applications, or gain hands-on experience with Amazon RDS. [Info](#)

Below the templates is a "Availability and durability" section. Under "Deployment options" (with a link to "Info"), it says: "The deployment options below are limited to those supported by the engine you selected above." It lists three options:

- Multi-AZ DB Cluster - new**: 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**: Creates a single DB instance with no standby DB instances. This option is highlighted with a red box.

Enter DB Details

Enter **bankdb** for the DB instance identifier.

Choose a **username**. You may leave it as **admin** if you like.

Create a **password** to access your database.

The screenshot shows the AWS RDS Settings page. The DB instance identifier is set to "bankdb". The Master username is "admin". The Master password field contains a masked password. The "Auto generate a password" checkbox is unchecked. A sidebar on the right provides information about the Free Tier, including usage limits and a link to learn more.

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.

Credentials Settings

Master username [Info](#)
Type a login ID for the master user of your DB instance.

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

Master password [Info](#)
1 to 16 alphanumeric characters. First character must be a letter

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

Confirm password [Info](#)

Free Tier

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.](#)

When your free usage expires or if your application usage exceeds the free usage tiers, you simply pay standard, pay-as-you-go service rates as described in the [Amazon RDS Pricing page](#).

Hey, Mr. DB Here.
Make sure to
remember your
username and
password! This is
important.



Enter DB Details

Choose db.t2.small for the instance class. Larger classes may not be allowed in AWS Academy. To turn on db.t2 instance sizes, first, enable “Include previous generation classes”

Instance configuration

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

DB instance class [Info](#)

- Standard classes (includes m classes)
- Memory optimized classes (includes r and x classes)
- Burstable classes (includes t classes)

db.t2.small

1 vCPUs 2 GiB RAM Not EBS Optimized

Include previous generation classes

Enter DB Details

Set the storage to General Purpose(SSD) and the allocated storage to 20 GB

Uncheck Enable storage autoscaling.

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 can improve IOPS performance.

i Provisioning less than 100 GiB of General Purpose (SSD) storage for high throughput workloads could result in higher latencies upon exhaustion of the initial General Purpose (SSD) IO credit balance. [Learn more](#)

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 after the specified threshold is exceeded.

Set up Connectivity

Leave the **Virtual Private Cloud** in **default** mode.

Expand the dropdown for **Additional connectivity configuration** and select **default** for the subnet group.

Make the database publicly accessible.

Connectivity [Info](#) C

Compute resource
Choose whether to set up a connection to a compute resource for this database. Setting up a connection will automatically change connectivity settings so that the compute resource can connect to this database.

Don't connect to an EC2 compute resource
Don't set up a connection to a compute resource for this database. You can manually set up a connection to a compute resource later.

Connect to an EC2 compute resource
Set up a connection to an EC2 compute resource for this database.

Virtual private cloud (VPC) [Info](#)
Choose the VPC. The VPC defines the virtual networking environment for this DB instance.

Default VPC (vpc-0e034da68be10d12e) ▾

Only VPCs with a corresponding DB subnet group are listed.

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

DB Subnet group [Info](#)
Choose the DB subnet group. The DB subnet group defines which subnets and IP ranges the DB instance can use in the VPC that you selected.

default-vpc-0e034da68be10d12e ▾

Public access [Info](#)

Yes
RDS assigns a public IP address to the database. Amazon EC2 instances and other resources outside of the VPC can connect to your database. Resources inside the VPC can also connect to the database. Choose one or more VPC security groups that specify which resources can connect to the database.

No
RDS doesn't assign a public IP address to the database. Only Amazon EC2 instances and other resources inside the VPC can connect to your database. Choose one or more VPC security groups that specify which resources can connect to the database.

VPC security group (firewall) [Info](#)
Choose one or more VPC security groups to allow access to your database. Make sure that the security group rules allow the appropriate incoming traffic.

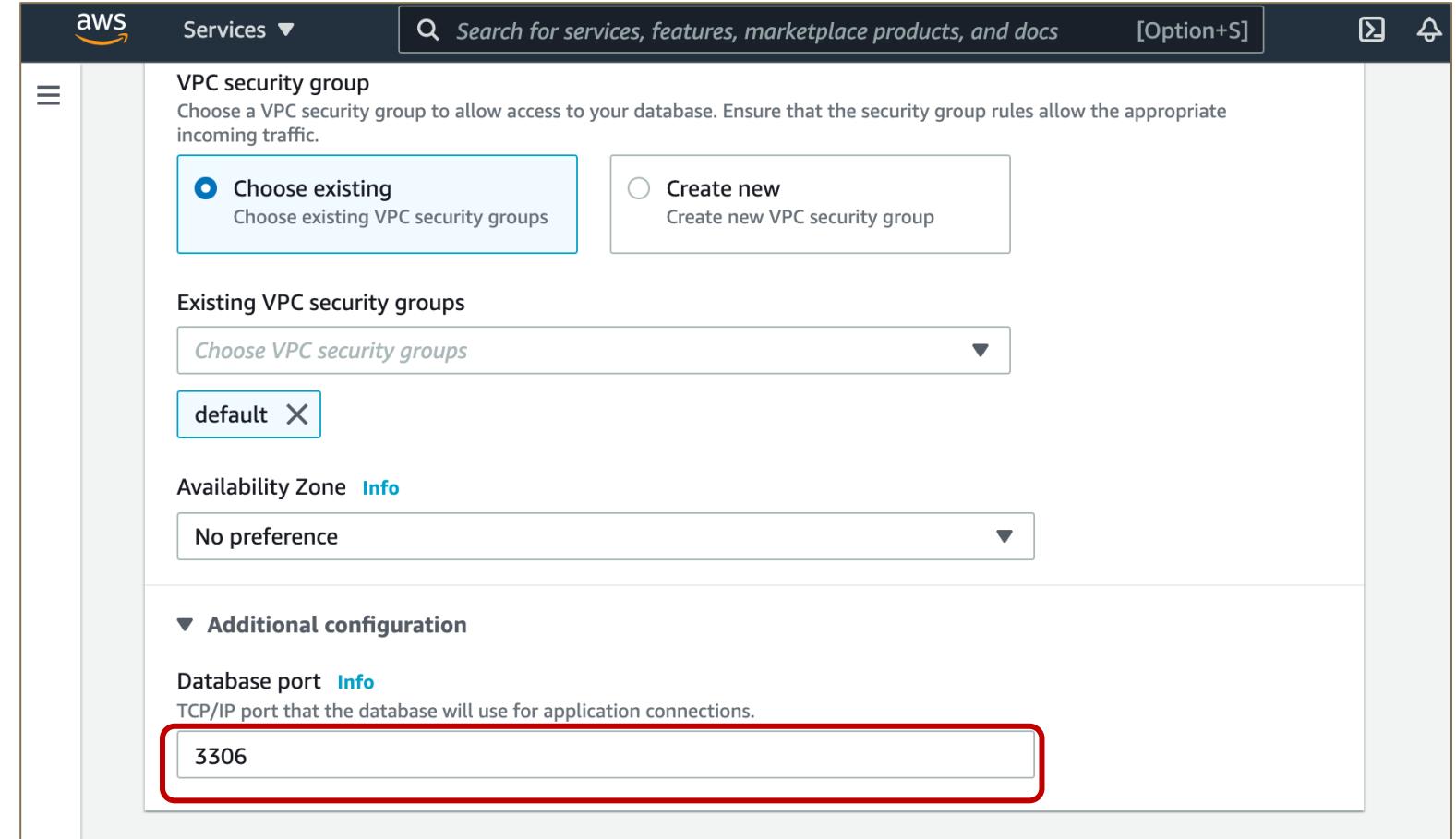
Choose existing
Choose existing VPC security groups

Create new
Create new VPC security group

Set up Connectivity

Use the **default VPC security group**. You may also choose an availability zone if you like. Here I am not specifying a preference.

Ensure that the port is set to the default **3306**.



Turn off Enhanced Monitoring

For database authentication, use Password authentication.

AWS Academy does not allow Enhanced Monitoring, especially in an educational setting.

For Monitoring, **uncheck** Enable Enhanced monitoring

Database authentication

Database authentication options [Info](#)

Password authentication

Authenticates using database passwords.

Password and IAM database authentication

Authenticates using the database password and user credentials through AWS IAM users and roles.

Password and Kerberos authentication

Choose a directory in which you want to allow authorized users to authenticate with this DB instance using Kerberos Authentication.

Monitoring

Monitoring

Enable Enhanced monitoring

Enabling Enhanced monitoring metrics are useful when you want to see how different processes or threads use the CPU.

Set up Connectivity

Enter **cse4020** or **cse5260** for your database name. You may enter another name but be sure to remember it.

This is the name you will use to access the database remotely.

The screenshot shows the AWS RDS console with the 'Additional configuration' section open. Under 'Database options', the 'Initial database name' is set to 'cse4020'. A note below states: 'If you do not specify a database name, Amazon RDS does not create a database.' Under 'DB parameter group', the selection is 'default.mysql8.0'. Under 'Option group', the selection is 'default:mysql-8-0'. In the 'Backup' section, there is a checked checkbox for 'Enable automatic backups' with a note: 'Enabling backups will automatically create backups of your database during a certain time window.' A warning message at the bottom left of the configuration area states: '⚠ Please note that automated backups are currently supported for InnoDB storage engine only. If you are using MyISAM, refer to details [here](#).'

Create Database

You may leave the other settings unchanged.

Click **Create database**.

Estimated monthly costs

DB instance	24.82 USD
Storage	2.30 USD
Total	27.12 USD

This billing estimate is based on on-demand usage as described in [Amazon RDS Pricing](#). Estimate does not include costs for backup storage, IOs (if applicable), or data transfer.

Estimate your monthly costs for the DB Instance using the [AWS Simple Monthly Calculator](#).

 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.

Cancel

Create database

Create Database

It may take a few minutes for the database to be created.

You may take a bathroom break while it is being provisioned.

You may view your username and password if you forgot them by clicking view credential details.

The screenshot shows the AWS RDS Databases page. A modal at the top left says 'Creating database labdb. Your database might take a few minutes to launch.' The main table lists one database:

DB identifier	Role	Engine	Region & AZ	Size	Status
bankdb	Instance	MySQL Community	us-east-1d	db.t2.micro	Creating

A modal window titled 'Password for your database labdb' is open. It contains the following information:

This is the only time you will be able to view this password. Copy and save the password for your reference, otherwise you will need to modify the database to change it.

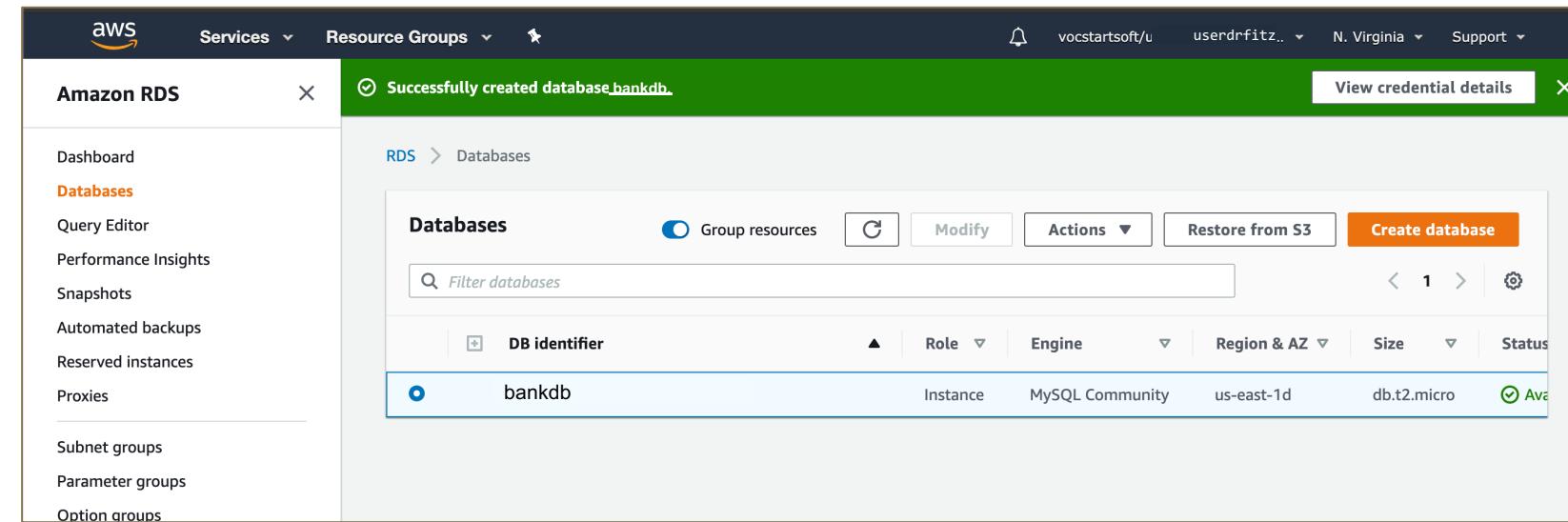
Master username: admin
Master password: IsanLetYou ThrowYourself Away

Buttons: Close, View credential details

Create Database

After your bathroom break, the database should be successfully created, and the light changed to green.

Next, click on the database identifier.



The screenshot shows the AWS RDS Databases page. The top navigation bar includes the AWS logo, Services dropdown, Resource Groups dropdown, and user information (vocstartsoft/u, userdrfitz.., N. Virginia, Support). A green banner at the top right indicates "Successfully created database bankdb." with a "View credential details" button. The left sidebar menu for Amazon RDS includes options like Dashboard, Databases (which is selected and highlighted in orange), Query Editor, Performance Insights, Snapshots, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, and Option groups. The main content area displays the "Databases" table with one row for "bankdb". The table columns are DB identifier, Instance, Role, Engine, Region & AZ, Size, and Status. The "bankdb" row is selected, indicated by a blue border. The status column shows a green checkmark icon followed by the word "Available".

DB identifier	Instance	Role	Engine	Region & AZ	Size	Status
bankdb	MySQL Community		us-east-1d	db.t2.micro		Available

Copy Connection Parameters

In order to connect to the RDS database instance you will need:

1. Endpoint (also known as the host)
2. Port
3. Username
4. Password
5. Database name

Make sure to save these somewhere.

The screenshot shows the AWS RDS console with the 'bankdb' database selected. The left sidebar lists various options: Dashboard, Databases (which is highlighted in orange), Query Editor, Performance Insights, Snapshots, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, Option groups, Custom Availability Zones, Events, Event subscriptions, Recommendations, and Certificate update. The main content area is titled 'Summary' for the 'bankdb' instance. It displays the following information:

DB identifier	CPU	Info	Class
bankdb	2.20%	Available	db.t2.micro
Role	Current activity	Engine	Region & AZ
Instance	0 Connections	MySQL Community	us-east-1d

Below the summary, there are tabs for Connectivity & security, Monitoring, Logs & events, Configuration, Maintenance & backups, and Tags. The 'Connectivity & security' tab is active. It contains sections for Endpoint & port, Networking, and Security. The Endpoint section shows the endpoint as 'IcantLetYouThrowYourselfAway'. The Networking section shows the availability zone as 'us-east-1d' and the VPC as 'vpc-a4436ede'. The Security section shows the VPC security group as 'default (sg-6824273e) (active)' and public accessibility as 'Yes'.

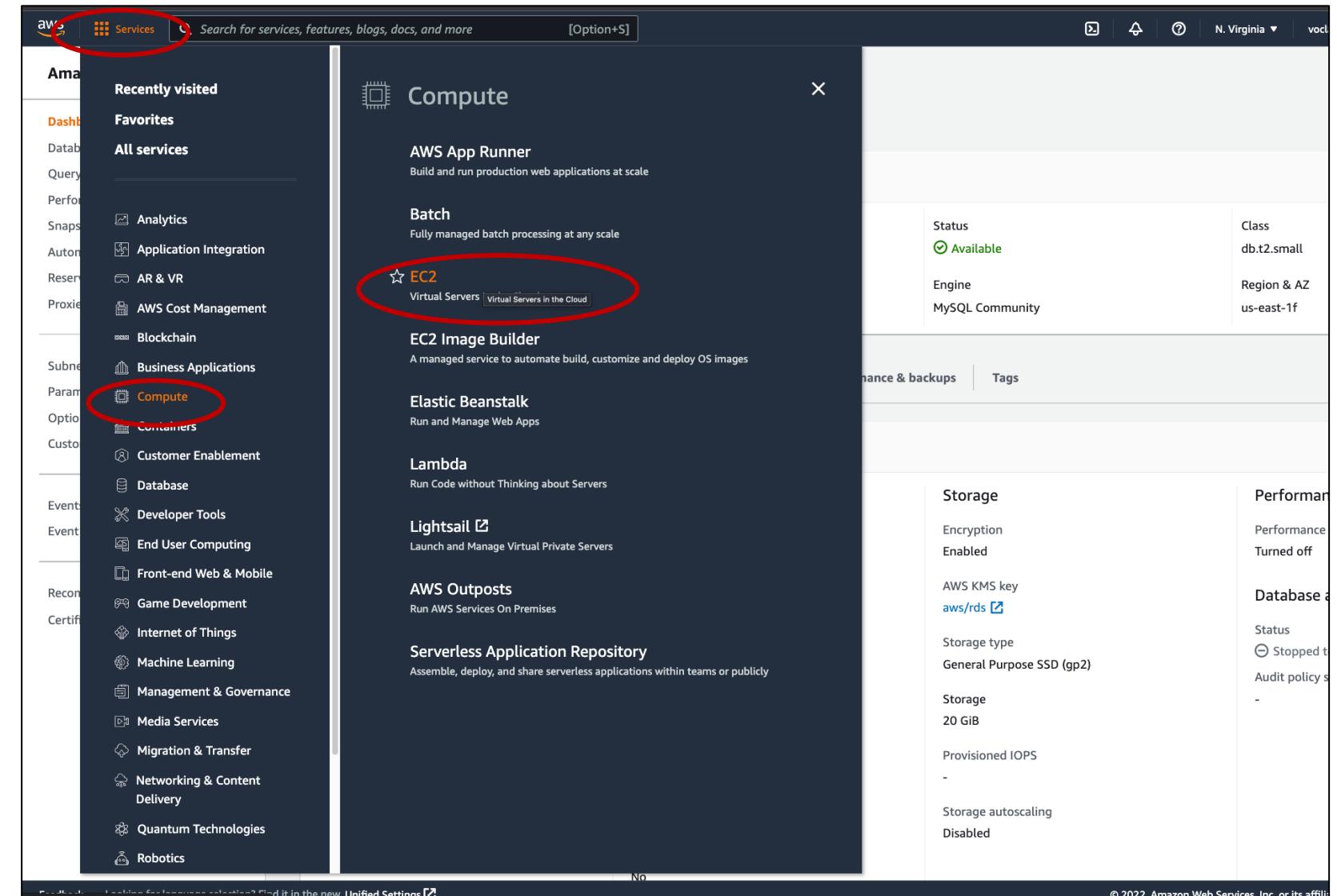
Verify DB Details

Review the Instance details by clicking Configuration.

Instance				
Amazon RDS	Configuration	Instance class	Storage	Performance Insights
Dashboard	DB instance id bankdb	Instance class db.t2.micro	Encryption Not Enabled	Performance Insights enabled No
Databases	Engine version 8.0.17	vCPU 1	Storage type General Purpose (SSD)	
Query Editor	DB name cis5400	RAM 1 GB	IOPS	
Performance Insights	License model General Public License	Availability	Storage 20 GiB	
Snapshots	Option groups default:mysql-8-0		Master username admin	Storage autoscaling Enabled
Automated backups	Custom Availability Zones	ARN IcantLetYou ThrowYourselfAway	IAM db authentication Not Enabled	Maximum storage threshold 1000 GiB
Reserved instances	Events	Resource id IcantLetYou ThrowYourselfAway	Multi AZ No	
Proxies	Event subscriptions		Secondary Zone -	
	Recommendations	Created time		
	Certificate update			

Handling DB Security

Click on Services then Compute and choose EC2.



Security Groups

Click on Security groups

Welcome to the new EC2 console!
We're redesigning the EC2 console to make it easier to use and improve performance. We'll release new screens periodically. We encourage you to provide feedback so we can make improvements. To switch between the old console and the new console, use the New EC2 Experience toggle.

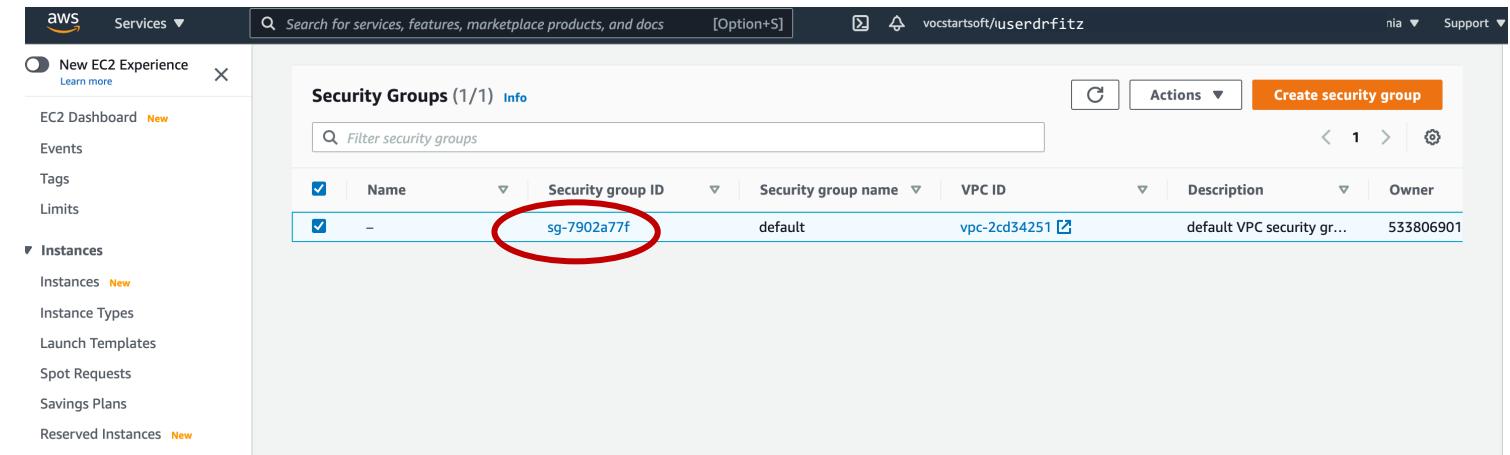
Resource	Count
Instances (running)	0
Dedicated Hosts	0
Elastic IPs	0
Instances	0
Key pairs	0
Load balancers	0
Placement groups	0
Security groups	1
Snapshots	0
Volumes	0

Easily size, configure, and deploy Microsoft SQL Server Always On availability groups on AWS using the AWS Launch Wizard for SQL Server. [Learn more](#)

Accessing/Creating a Security Group

There should be a default security group already created. If there is none, click **Create Security Group** to create one.

Click on the ID of the existing Security Group.



The screenshot shows the AWS EC2 Security Groups page. The URL in the browser is `vocstartsoft/userdrfritz`. The page displays a table titled "Security Groups (1/1)". The table has columns: Name, Security group ID, Security group name, VPC ID, Description, and Owner. A red circle highlights the "Security group ID" column for the first row, which contains the value "sg-7902a77f".

Name	Security group ID	Security group name	VPC ID	Description	Owner
-	sg-7902a77f	default	vpc-2cd34251	default VPC security gr...	533806901

Editing a Security Group

The current security group allows all inbound traffic to our instance. This is not safe. We will limit traffic to MySQL through port **3306**. We will allow all outgoing traffic.

Click “**Inbound**” to edit the security group.

Click on “Edit inbound rules”

The screenshot shows the AWS EC2 Security Groups console. On the left, a sidebar lists various services: EC2 Dashboard, EC2 Global View, Events, Tags, Limits, Instances (with sub-options like Instances, Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Scheduled Instances, Capacity Reservations), Images (AMIs, AMI Catalog), and Elastic Block Store (Volumes). The main pane displays the details for the security group 'sg-072687385e94d2dc0 - default'. The 'Details' section shows the security group name is 'default', owner is '768723614324', and it has 1 inbound rule and 1 outbound rule. Below this, there are tabs for 'Inbound rules' (which is highlighted with a red circle), 'Outbound rules', and 'Tags'. A message at the bottom says 'You can now check network connectivity with Reachability Analyzer' with a 'Run Reachability Analyzer' button. At the bottom of the main pane, there is a table titled 'Inbound rules (1/1)' with one entry: a rule named '-' allowing all traffic (Protocol All, Port range All) from the source 'sg-072687385e94d2dc0'. There are 'Manage tags' and 'Edit inbound rules' buttons at the top of this table, also circled in red.

Name	Security group rule...	IP version	Type	Protocol	Port range	Source	Description
-	sgr-03d75a232a9f58464	-	All traffic	All	All	sg-072687385e94d2dc0...	-

Modify Your Security Group

Add a rule to open port **3306** to incoming traffic from **anywhere**, so you can connect to your database remotely. That is, if rules currently exist, click **Edit inbound rules**. If no rules exist, click **Add rule**.

Choose **Custom TCP** from the **Type** dropdown, enter **3306** for the port range and **Everywhere** for the **Source**. Next, Click **Save rules**.

If you get errors while editing the rule, delete it and create a new rule. Choose **Anywhere-IPv4** if there is no general “anywhere” option.

Inbound rules [Info](#)

Type Info	Protocol Info	Port range Info	Source Info	Description - optional Info
Custom TCP	TCP	3306	Anywh... ▲ Custom Anywhere My IP	0.0.0.0/0 X ::/0 X

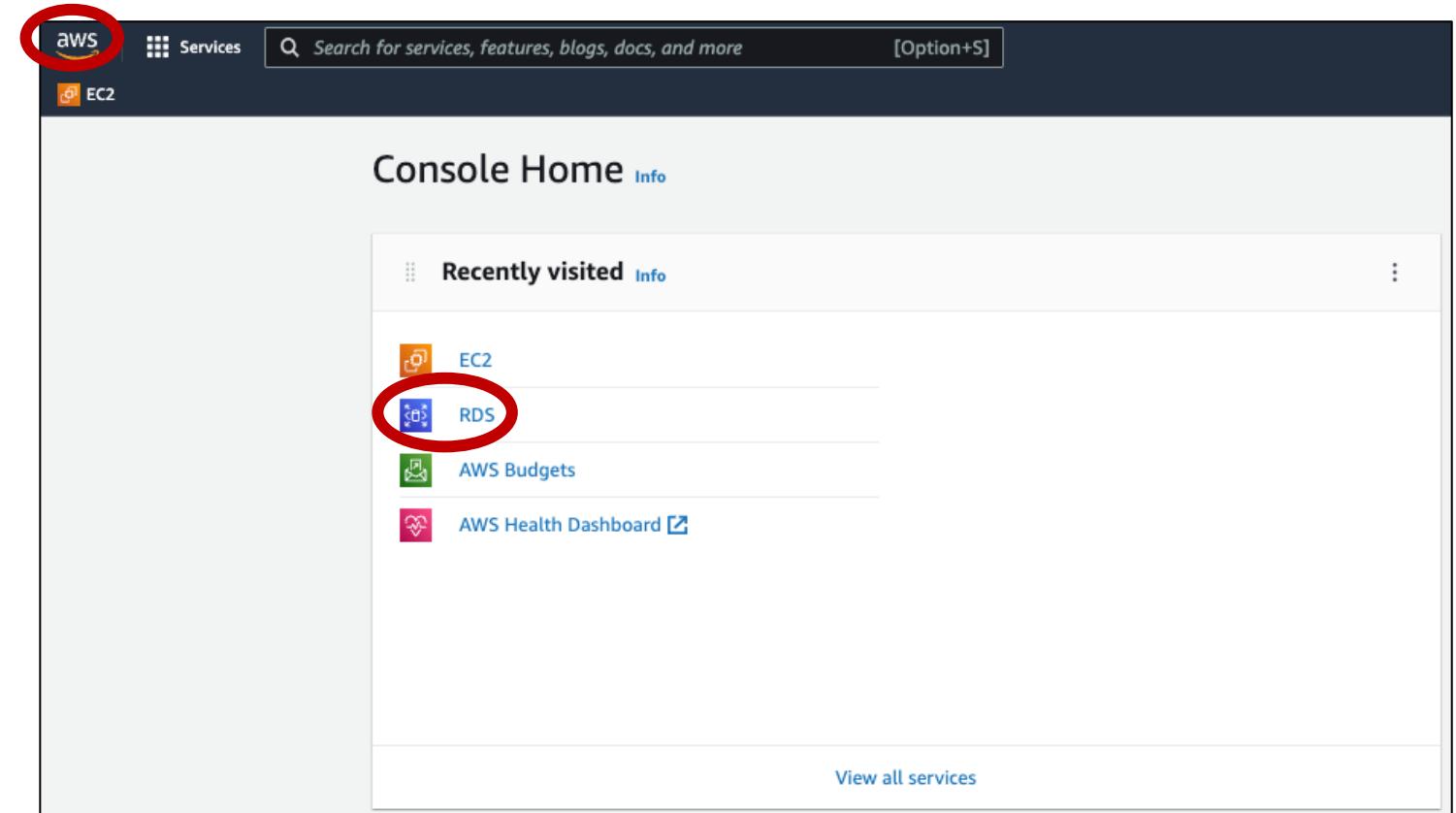
Add rule

NOTE: Any edits made on existing rules will result in the edited rule being deleted and a new rule created with the new details. This will cause traffic that depends on that rule to be dropped for a very brief period of time until the new rule can be created.

Cancel **Preview changes** **Save rules**

Set up Permissions for Advanced Options

Click on **aws** on the top left corner, then go to your RDS Instance from the dashboard and click Parameter Groups.



Set up Permissions for Advanced Options

From the RDS Instance dashboard click Parameter Groups.

The screenshot shows the AWS RDS Instance dashboard for a MySQL Community instance named 'bankdb'. The instance is currently available and has a db.t2.small class. The 'Connectivity & security' tab is selected, displaying configuration details such as the endpoint, port, VPC, subnet group, and security groups. A red box highlights the 'Parameter groups' link in the left sidebar, which is the target for the 'Set up Permissions for Advanced Options' step.

DB identifier	CPU	Status	Class
bankdb	2.88%	Available	db.t2.small

Role	Current activity	Engine	Region & AZ
Instance	0 Connections	MySQL Community	us-east-1a

Connectivity & security			
Endpoint & port	Networking	Security	
Endpoint IcantLetYou ThrowYourselfAway	Availability zone us-east-1a	VPC security groups default (sg-7902a77f) (active)	
Port 3306	VPC vpc-2cd34251	Public accessibility Yes	
	Subnet group default-vpc-2cd34251	Certificate authority rds-ca-2019	
	Subnets subnet-b9122db7 subnet-907f39cf subnet-15ebab34	Certificate authority date August 22, 2024, 01:08 (UTC±1:08)	

Create Parameter Group

Click **Create parameter group**.

The screenshot shows the AWS RDS Parameter Groups page. On the left, there's a sidebar with links like Dashboard, Databases, Query Editor, etc., and a section specifically for Parameter groups, which is currently selected. The main area displays a table of Parameter groups. The first row in the table is for a group named "default.mysql8.0", which belongs to the "mysql8.0" family and is a "Parameter groups" type. A red box highlights the "Create parameter group" button at the top right of the table header.

<input type="checkbox"/>	Name	Family	Type	Description
<input type="checkbox"/>	default.mysql8.0	mysql8.0	Parameter groups	Default parameter group fo

Describe your Parameter Group

Enter a memorable parameter group name and a description. I am naming mine **TriggerPlus** because I want to be able to create Triggers and Stored Procedures on this database.

Click **Create**.

The screenshot shows the AWS RDS Parameter Groups creation interface. The left sidebar lists various RDS services: Dashboard, Databases, Query Editor, Performance insights, Snapshots, Exports in Amazon S3, Automated backups, Reserved instances, Proxies, Subnet groups, **Parameter groups** (which is selected), Option groups, Custom engine versions, Events, Event subscriptions, Recommendations (with a notification count of 1), and Certificate update. The main panel is titled "Create parameter group" under "Parameter group details". It includes fields for "Parameter group family" (set to "mysql8.0"), "Type" (set to "DB Parameter Group"), "Group name" (set to "TriggerPlus"), and "Description" (set to "To allow triggers and procedures on this database"). A red box highlights the "Create" button at the bottom right of the form.

Access the Parameter Group

Click on the name of the Parameter group you just created to edit it.

The screenshot shows the AWS RDS Parameter Groups page. The left sidebar lists various RDS services: Dashboard, Databases, Query Editor, Performance Insights, Snapshots, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups (which is highlighted in orange), Option groups, Custom Availability Zones, Events, Event subscriptions, Recommendations, and Certificate update. The main content area is titled "Parameter groups (2)". It includes a search bar, a "Create parameter group" button, and a table with columns: Name, Family, Type, and Description. The table contains two rows: "default.mysql8.0" (Family: mysql8.0, Type: Parameter groups, Description: Default parameter group for...) and "triggersplus" (Family: mysql8.0, Type: Parameter groups, Description: To allow triggers and proced...). The row for "triggersplus" is highlighted with a red box.

<input type="checkbox"/>	Name	Family	Type	Description
<input type="checkbox"/>	default.mysql8.0	mysql8.0	Parameter groups	Default parameter group for...
<input type="checkbox"/>	triggersplus	mysql8.0	Parameter groups	To allow triggers and proced...

Edit Parameters

Click the checkbox beside the name of the Parameter group. Then click **Edit Parameters**.

The screenshot shows the AWS RDS Parameter Groups interface. On the left, a sidebar lists various RDS features: Dashboard, Databases, Query Editor, Performance Insights, Snapshots, Automated backups, Reserved instances, Proxies, Subnet groups, **Parameter groups**, Option groups, and Custom Availability Zones. Below these are Events, Event subscriptions, Recommendations, and Certificate update. The main content area is titled "triggersplus". It displays a table of parameters under the heading "Parameters". The first row, "log_bin_trust_function_creators", has its checkbox checked and is highlighted with a blue border. To the right of the table are columns for "Values", "Allowed values", "Modifiable", and "Source". At the top right of the main area is an orange "Edit parameters" button, which is also highlighted with a red box. Below the table is a section titled "Recent events" with a search bar and a message stating "No events found."

Edit Trust Function Creators

Enter “trust” in the Parameter Search to quickly find the `log_bin_trust_function_creators` parameter. Click **Edit Parameter** and change the value to **1**. Then save the changes.

The screenshot shows the AWS RDS Parameter Groups interface. On the left, there's a sidebar with options like Dashboard, Databases, Query Editor, etc. The main area shows a parameter group named "triggersplus". A search bar at the top has "trust" typed into it. Below the search bar, a table lists parameters. One row for "log_bin_trust_function_creators" is highlighted with a red box around its value field, which contains the number "1". The table columns include Name, Values, Allowed values, Modifiable, and Source. At the bottom, there's a section for "Recent events" and a note saying "No events found.".

Name	Values	Allowed values	Modifiable	Source
log_bin_trust_function_creators	1	0, 1	true	engine-default

Access your Instance

Click on **Databases** and then click your instance name.

The screenshot shows the AWS RDS (Amazon Relational Database Service) interface. On the left, there is a sidebar with the following menu items:

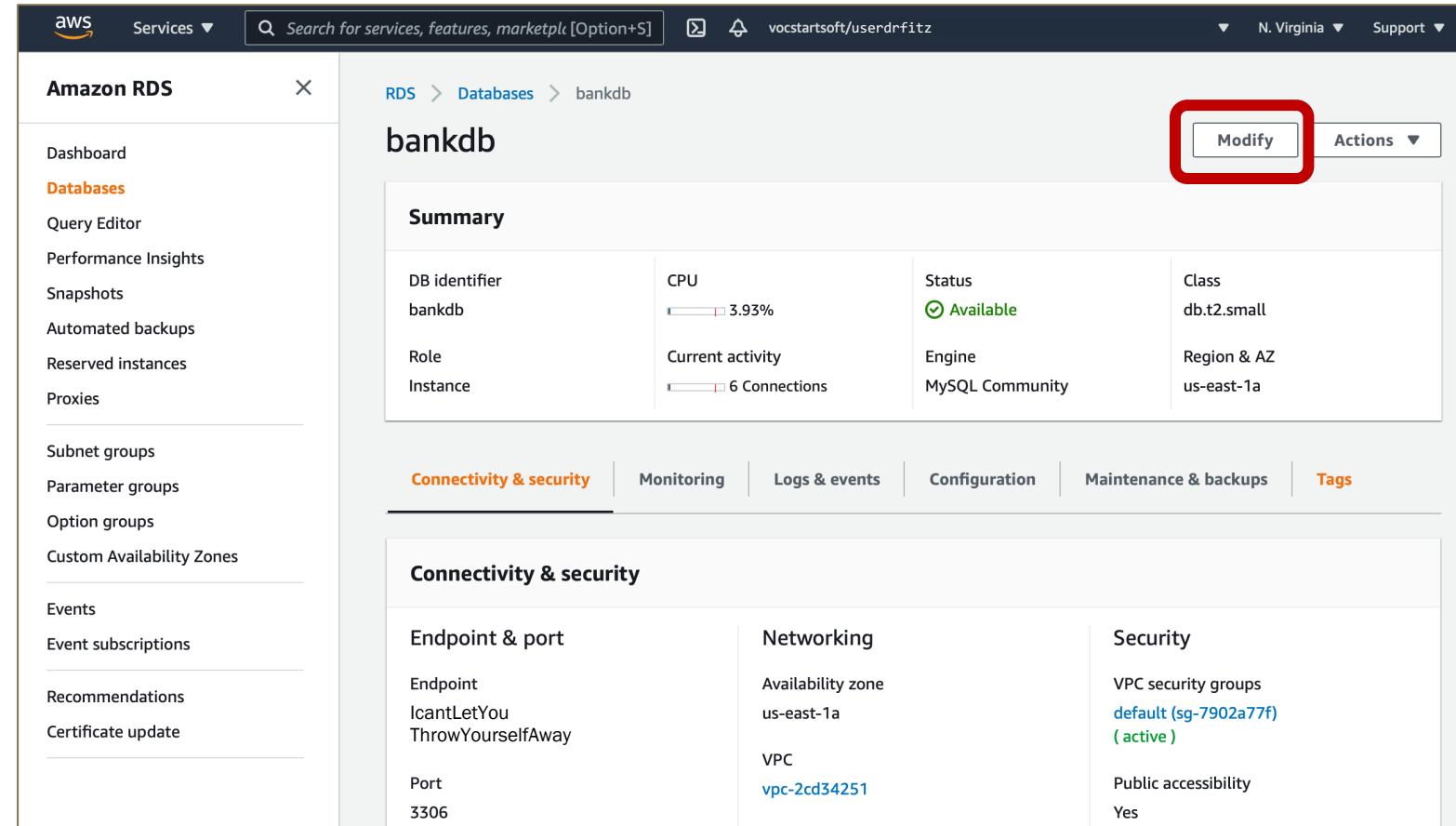
- Dashboard
- Databases** (highlighted in orange)
- Query Editor
- Performance Insights
- Snapshots
- Automated backups
- Reserved instances
- Proxies
- Subnet groups
- Parameter groups
- Option groups
- Custom Availability Zones
- Events
- Event subscriptions
- Recommendations
- Certificate update

The main content area is titled "Databases" and shows a list of databases. The first database, "bankdb", is highlighted with a red rectangle. The table columns include:

DB identifier	Instance	Role	Engine	Region & AZ	Size
bankdb	MySQL Community		us-east-1a	db.t2.	

Modify your Instance

Click **Modify**.



The screenshot shows the AWS RDS (Amazon Relational Database Service) console. In the top left, the AWS logo and 'Services' dropdown are visible. The search bar contains 'Search for services, features, marketplace [Option+S]'. The top right includes account information ('vocstartsoft/userdrfritz'), region ('N. Virginia'), and support links. The main navigation bar has 'Amazon RDS' selected, with 'Databases' highlighted. Below the navigation, the database name 'bankdb' is shown. On the left, a sidebar lists various database management options: Dashboard, Databases (highlighted), Query Editor, Performance Insights, Snapshots, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, Option groups, Custom Availability Zones, Events, Event subscriptions, Recommendations, and Certificate update. The main content area is titled 'Summary' and displays the following data:

DB identifier	CPU	Status	Class
bankdb	3.93%	Available	db.t2.small
Role	Current activity	Engine	Region & AZ
Instance	6 Connections	MySQL Community	us-east-1a

Below the summary, there are tabs for Connectivity & security, Monitoring, Logs & events, Configuration, Maintenance & backups, and Tags. The 'Connectivity & security' tab is active. It contains sections for Endpoint & port, Networking, and Security. The Endpoint section shows 'Endpoint' as 'IcantLetYouThrowYourselfAway' and 'Port' as '3306'. The Networking section shows 'Availability zone' as 'us-east-1a' and 'VPC' as 'vpc-2cd34251'. The Security section shows 'VPC security groups' as 'default (sg-7902a77f) (active)' and 'Public accessibility' as 'Yes'.

Choose your Parameter Group

Scroll down to the Additional Configuration section and select the parameter group you just created.

Next, click Continue.

RDS > Databases > Modify DB instance: db-inst

Modify DB instance: db-inst

Settings

DB engine version: 8.0.28

DB instance identifier: db-inst

New master password:

Instance configuration

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

DB instance class: db.t2.small

Standard classes (includes m classes)

Memory optimized classes (includes r and x classes)

Burstable classes (includes t classes)

1 vCPUs 2 GiB RAM Not EBS Optimized

Include previous generation classes

aws Services ▾ Search for services, features, marketplace [Option+S] vocstartsoft/userdrfitz

Amazon RDS

Additional configuration

Database options, failover, backup enabled, backtrack disabled, Performance Insights disabled, Enhanced Monitoring enabled, maintenance, CloudWatch Logs, delete protection disabled

Database options

DB parameter group: triggersplus

Option group: default:mysql-8-0

Apply Immediately

Observe the summary of modifications.

Check **Apply Immediately** and click **Modify DB Instance**.

Next, click **Continue**.

The screenshot shows the AWS RDS Modify DB instance interface. On the left is a sidebar with links like Dashboard, Databases, Query Editor, etc. The main area shows a summary of modifications for a DB instance named 'bankdb'. A red box highlights the 'Summary of modifications' section, which lists the attribute 'DB parameter group' changing from 'default.mysql8.0' to 'triggersplus'. Another red box highlights the 'Scheduling of modifications' section, where the 'Apply immediately' option is selected. The 'Modify DB instance' button at the bottom right is also highlighted with a red box.

RDS > Databases > Modify DB instance: bankdb

Modify DB instance: bankdb

Summary of modifications

You are about to submit the following modifications. Only values that will change are displayed. Carefully verify your changes and click Modify DB Instance.

Attribute	Current value	New value
DB parameter group	default.mysql8.0	triggersplus

Scheduling of modifications

When to apply modifications

Apply during the next scheduled maintenance window
Current maintenance window: June 22, 2021 06:10 - 06:40 UTC-4

Apply immediately
The modifications in this request and any pending modifications will be asynchronously applied as soon as possible, regardless of the maintenance window setting for this database instance.

Cancel Back Modify DB instance

Voilà

The database instance should be successfully modified.

The screenshot shows the AWS RDS (Amazon Relational Database Service) interface. The left sidebar lists various options: Dashboard, Databases (which is selected and highlighted in orange), Query Editor, Performance Insights, Snapshots, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, Option groups, Custom Availability Zones, Events, Event subscriptions, Recommendations, and Certificate update. The main content area is titled "Successfully modified instance **bankdb**". Below this, the "Databases" section shows a table with one row for "bankdb". The table columns are: DB identifier, Role, Engine, Region & AZ, and Size. The "bankdb" row has "MySQL Community" in the Engine column, "us-east-1a" in the Region & AZ column, and "db.t2." in the Size column. The "Actions" button in the top right of the table header is highlighted in orange.

DB identifier	Role	Engine	Region & AZ	Size
bankdb	Instance	MySQL Community	us-east-1a	db.t2.

Reboot

Select your database identifier and click the Actions dropdown and then click Reboot.

Confirm the Reboot.

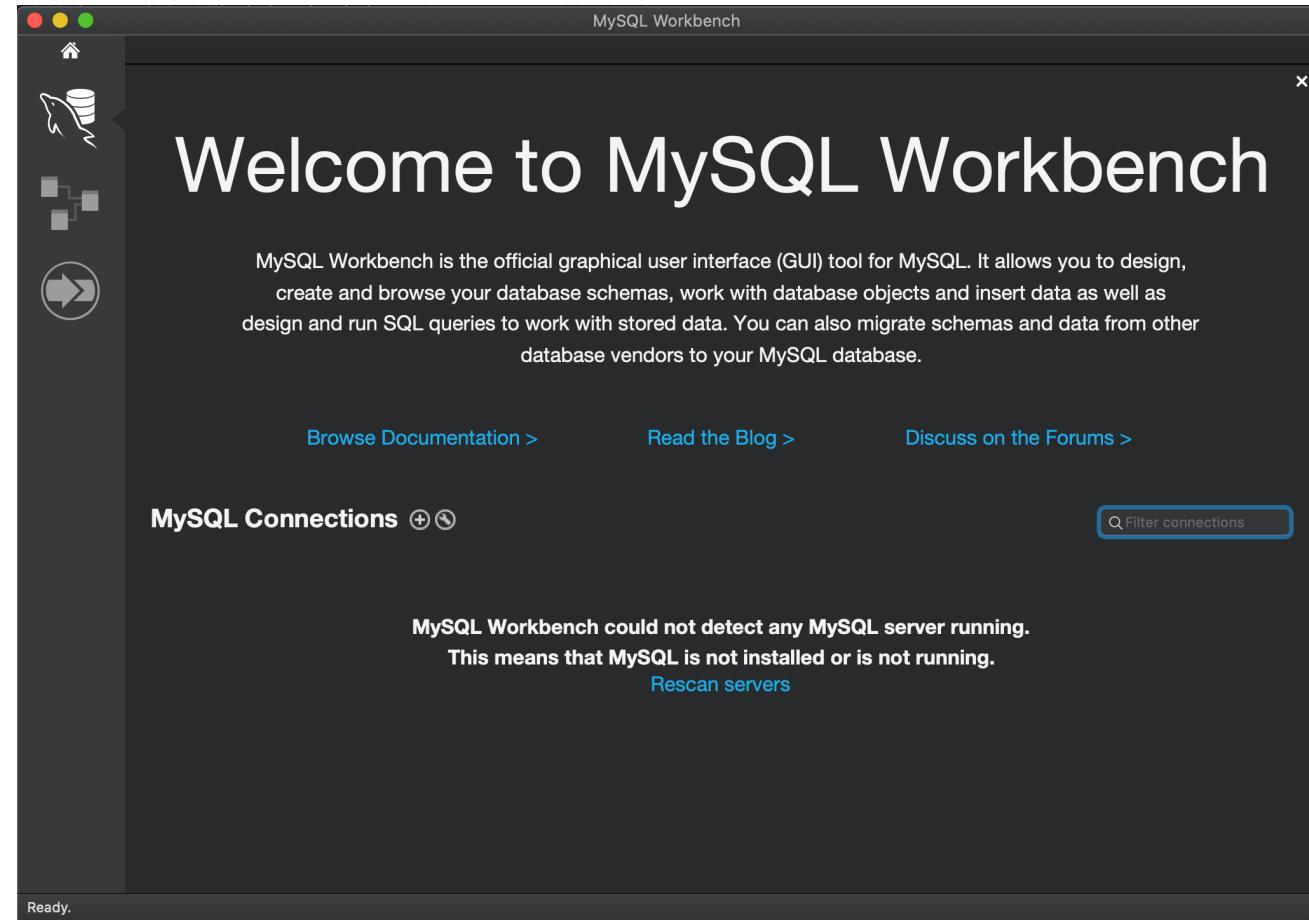
Note that it may take a while to reboot.

Go enjoy a granola bar while it's doing its thing.

The screenshot shows the AWS RDS (Amazon Relational Database Service) console. On the left is a sidebar with various navigation options: Dashboard, Databases (which is selected), Query Editor, Performance Insights, Snapshots, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, Option groups, Custom Availability Zones, Events, Event subscriptions, Recommendations, and Certificate update. The main content area shows a list of databases under the 'Databases' tab. One database, 'bankdb', is selected and highlighted with a blue circle. To the right of the database list is a horizontal toolbar with buttons for 'Group resources' (a toggle switch), 'Modify', 'Actions' (a dropdown menu), 'Restore from S3', and 'Create database'. A red box highlights the 'Actions' button. A dropdown menu is open from the 'Actions' button, showing several options: 'Stop', 'Reboot' (which is highlighted with a red box), 'Create read replica', 'Promote', 'Take snapshot', and 'Restore to point in time'. Below this, another modal window titled 'Successfully modified instance bankdb' is displayed, showing the path 'RDS > Databases > Reboot' and the title 'Reboot DB Instance'. It contains a section titled 'DB Instances' with the sub-instruction 'Are you sure you want to reboot these DB Instance(s)?' followed by a list '• bankdb'. At the bottom of this modal are 'Cancel' and 'Confirm' buttons, with 'Confirm' also highlighted with a red box.

Open MySQL Workbench

Open [MySQL workbench](#). You should have already downloaded the latest version of MySQL Workbench. If not, you may download it from the following webpage:
<https://dev.mysql.com/downloads/workbench/>

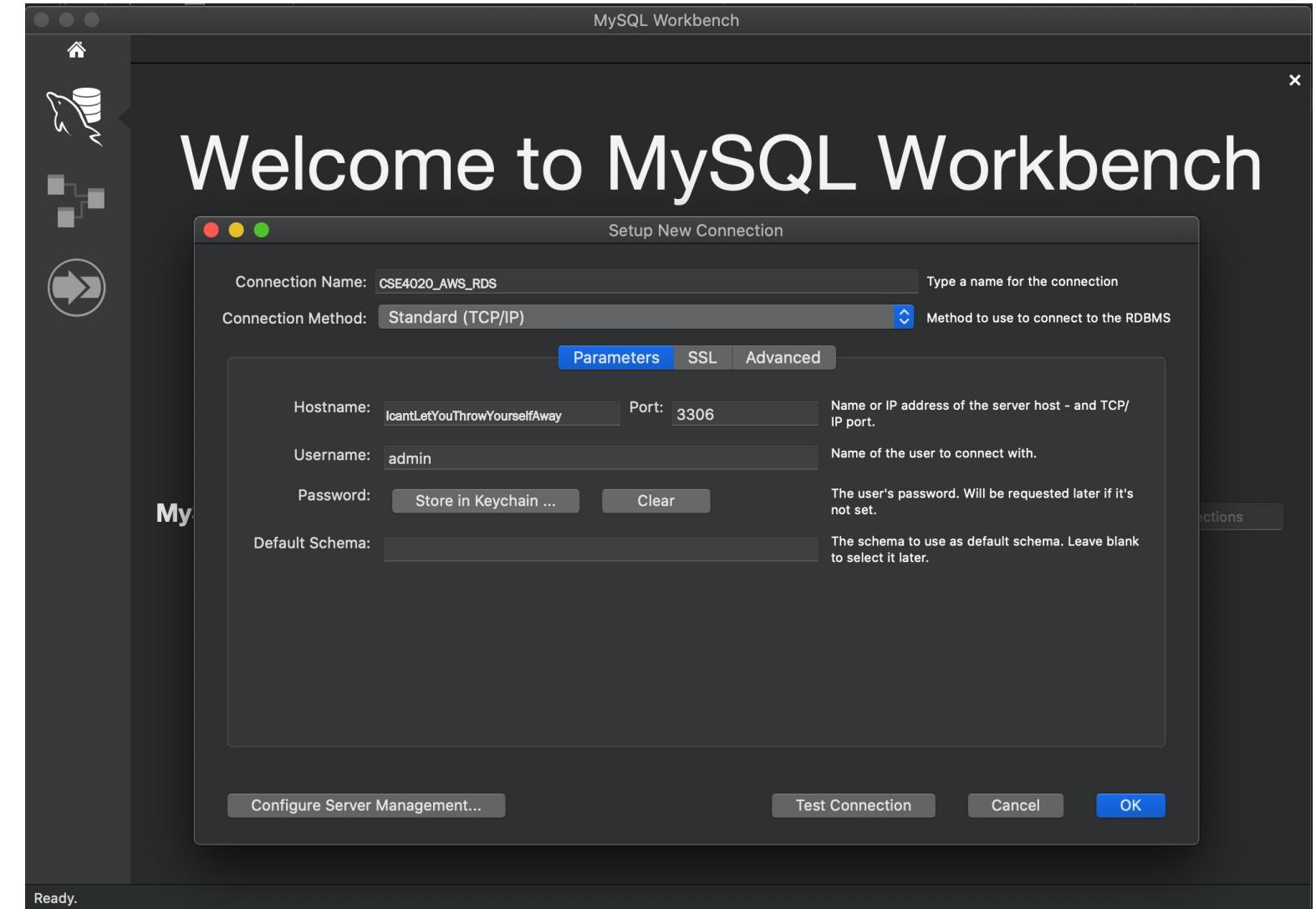


Connect to Your Database Using MySQL Workbench

MySQL Workbench provides us with a GUI to perform CRUD operations on a database.

Click on the + sign beside MySQL Connections to create a connection to the database.

Enter your endpoint in the host field, fill in your port number, your username and password and click test connection.



Connect to Your Database Using MySQL Workbench

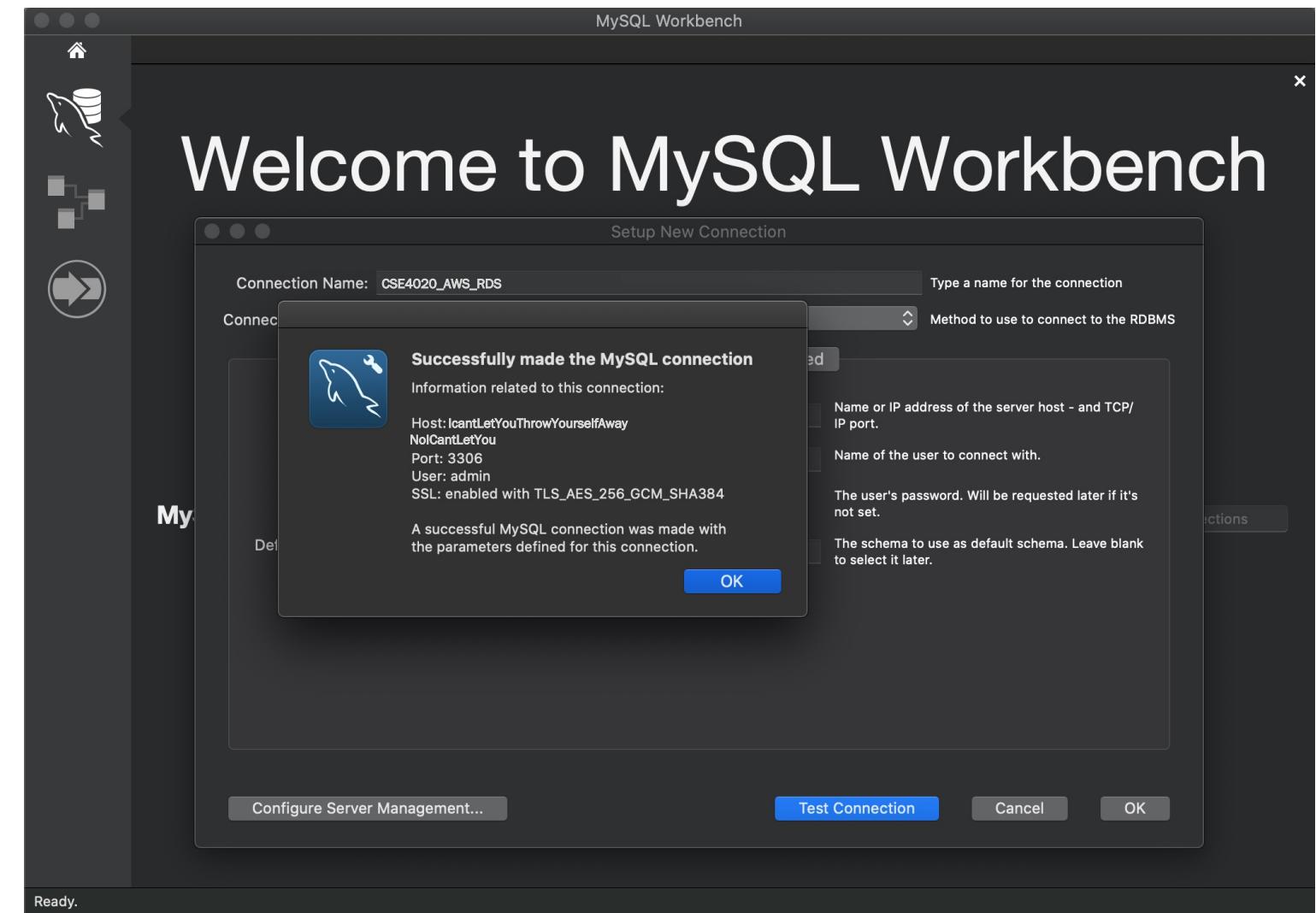
You should get a message that you successfully connected to the database.

Do your happy dance!

Don't forget to shutdown your AWS Academy when you are finished.

Rest well, keep growing and working to make the world a better place.

I second that! Rest is important. Scale back on the caffeine though.



References

The following reference(s) were used to create this tutorial.

https://youtu.be/fgKpDyM_1y0

<https://techtavern.wordpress.com/2013/06/17/mysql-triggers-and-amazon-rds/>