

Laboratory Goals / Objectives

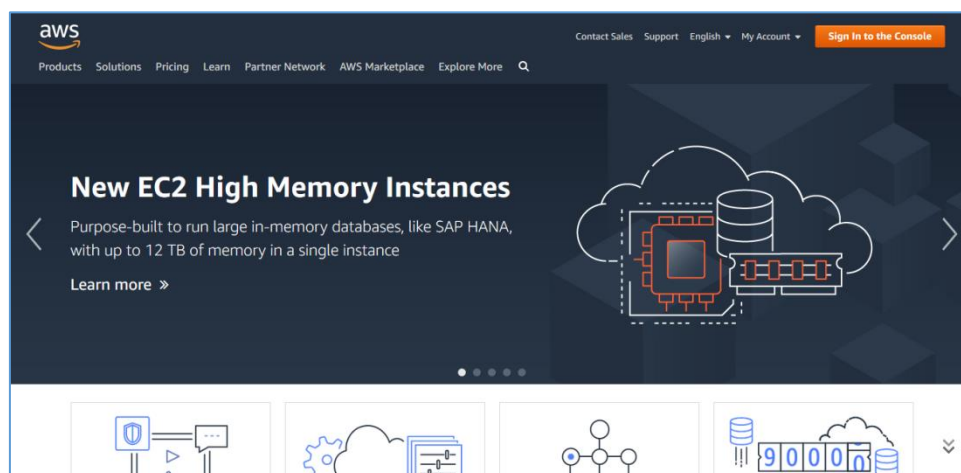
Upon completion of this lab, the students should be aware of available cloud platforms. Students will learn about using a cloud instance to host a web server, a database and to process large data.

1. Introduction

Cloud Computing is the delivery of on-demand computing resources (computer power, database storage, applications as well as other IT resources) over the Internet. This is achieved by using a network of remote servers hosted by data centres. The types of services include Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). Developers can avail of the pay-as-you-use feature where the price is based on the amount of resources used. In practice, there are four main cloud providers:

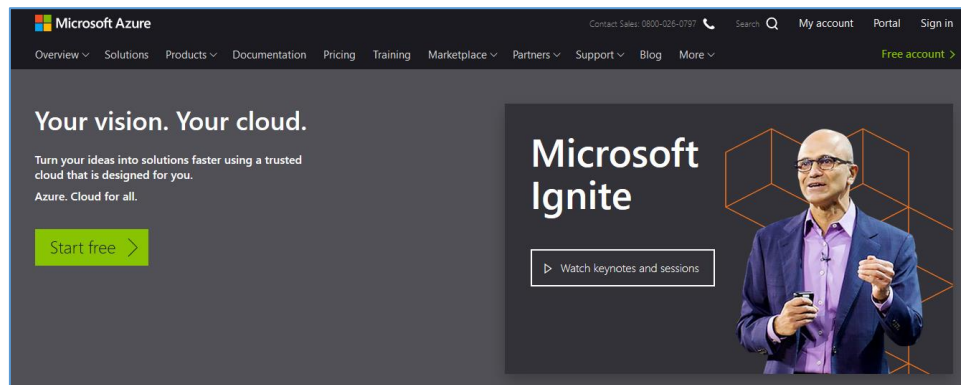
AWS

This is a comprehensive, evolving cloud-computing platform provided by Amazon. It offers the ability to create IaaS, PaaS, and SaaS services. Link: <https://aws.amazon.com/>



Windows Azure

It is Microsoft's public cloud computing platform that provides a range of cloud services through a global network of Microsoft managed data centres. Link: <https://azure.microsoft.com/en-us/>



Google Cloud

It is the suite of public cloud computing services offered by Google. It runs on the same infrastructure Google uses for end-user products such as Google Search. Google cloud provides a range of hosted services to compute, storage and application development that run on Google hardware. Link: <https://cloud.google.com/>



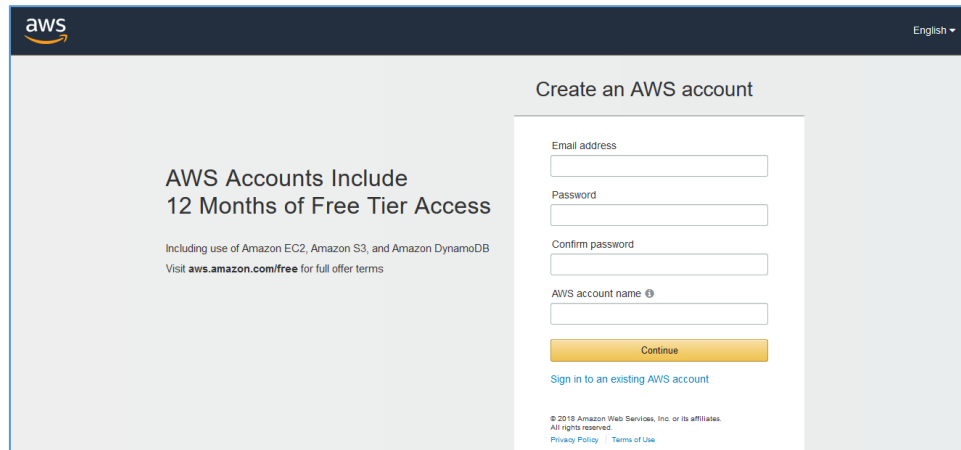
IBM Cloud

Cloud computing services offered by IBM that provides the ability of creating PaaS, SaaS, and IaaS services. With IBM Cloud IaaS, you can deploy and access virtualized IT resources such as compute power, storage and networking over the internet. For compute, this platform helps you to choose between bare-metal or virtual servers. Link: <https://www.ibm.com/uk-en/cloud>.

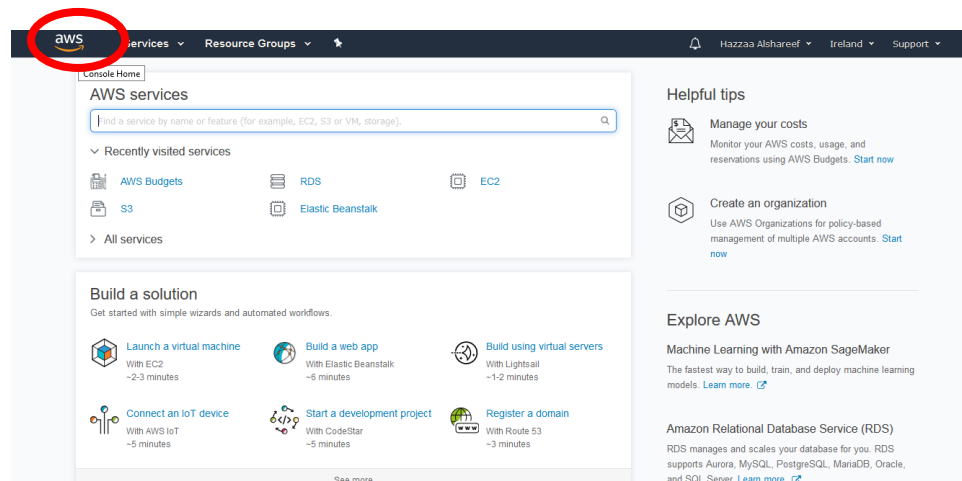
2. Hosting a web server on AWS

We will use AWS for the lab work. First, head to the following link and create a new personal account <https://portal.aws.amazon.com/billing/signup#/start>

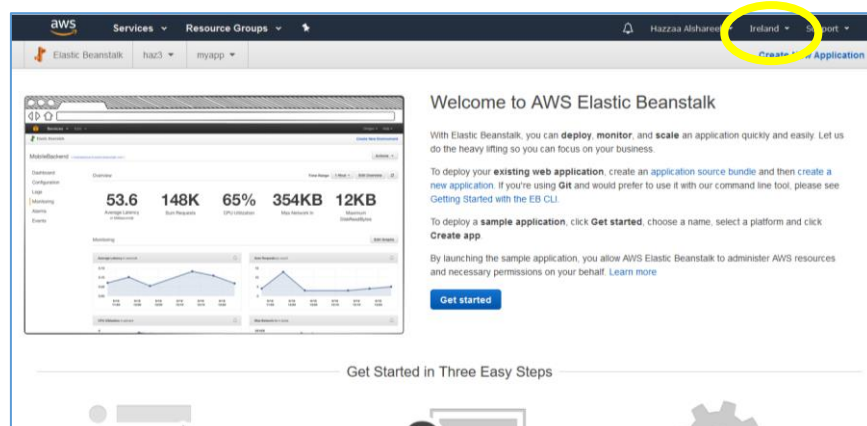
To create the account, you have to provide valid card details. Do not worry, you will not be charged unless you exceeded the AWS Free Tier Limits. However, it is recommended to use a prepaid credit card (i.e. [3 money](#) card)



Once you finished, click on AWS icon on the top right to get the following page:

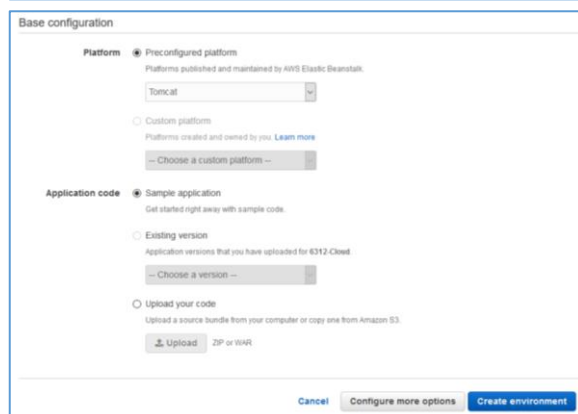
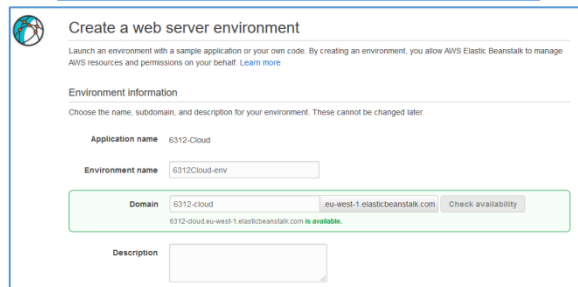
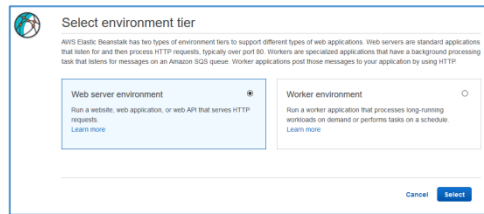


Next, let start creating a web server. Click on **Elastic Beanstalk** to get the following page:



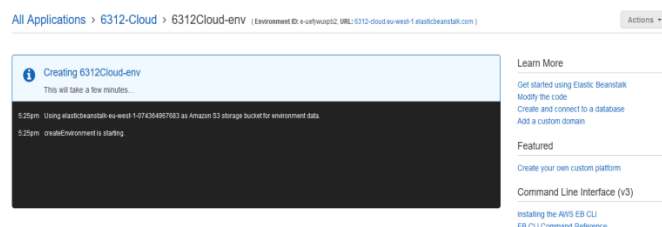
NB: make sure that your service is located at Ireland servers. See the yellow circle!

Now, click on Get started and do the following:



- Select a Web server environment.
 - Chose a name for your application
 - Pick up a domain name and check if it is available.
 - Select your web server platform.
- In this practice, we will select **Tomcat**.
- Keep the application code on **Sample application** option.
 - Click on **Create environment**.

Wait until the new environment is created for you. Once done, the following page will be shown →

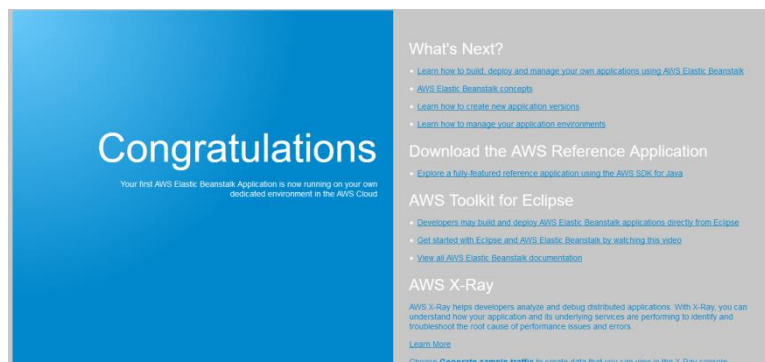


The screenshot shows the AWS Elastic Beanstalk console. The breadcrumb navigation at the top reads: **All Applications > 6312-Cloud > 6312Cloud-env**. The environment ID is `e-uefywuxpb2` and the URL is `6312-cloud.eu-west-1.elasticbeanstalk.com`. The **Overview** section shows a green checkmark for **Health** (Ok), the **Running Version** is `Sample Application`, and the **Configuration** is `Tomcat 8.5 with Java 8 running on 64bit Amazon Linux/3.0.4`. The **Recent Events** table shows three events:

Time	Type	Details
2018-09-28 17:29:01 UTC+0300	INFO	Environment health has transitioned from Pending to Ok. Initialization completed 15 seconds ago and took 3 minutes.
2018-09-28 17:28:55 UTC+0300	INFO	Successfully launched environment: 6312Cloud-env
2018-09-28 17:28:55 UTC+0300	INFO	Application available at 6312-cloud.eu-west-1.elasticbeanstalk.com.

Congratulation your environment has been created successfully. Here there are:

- 1- The environment ID or a URL to the index page of this web server. If you click on this link you should get the following page ☺



- 2- The overview that includes the status of your environment, the running application version, and the configuration of this environment.
- 3- Logs or events: here you can track the changes on your environment.

Uploading a web application

You can create an application using HTML5 and then upload that application on the cloud.

Click on **Upload and Deploy** button then navigate to your zip file.

The screenshot shows the 'Upload and Deploy' dialog box. It has a title bar 'Upload and Deploy' and a close button. Inside, there is a link: 'To deploy a previous version, go to the [Application Versions](#) page.' Below this, there is a section for 'Upload application:' with a 'Browse...' button and the filename 'todo.zip'. There is also a 'Version label:' field with the value 'todo'. At the bottom right, there are 'Cancel' and 'Deploy' buttons.

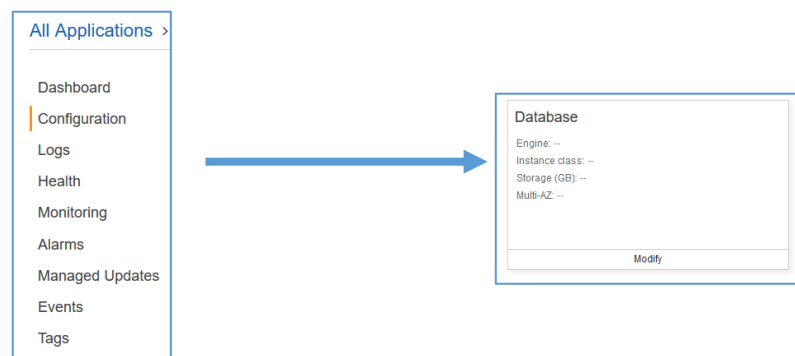
If you click on the environment URL, you should see the index page of your web app.

3. Database on AWS

Since in the previous lab we have created a web server using the Amazon platform, we will continue using this platform in hosting our storage service. Amazon provides Amazon Relational Database Service (Amazon RDS) to set up, operate, and scale a relational database in the cloud. Several types of databases are supported such as MySQL and Oracle.

Let us create a new database and attach it to our previously created application (web server).

- Login to your AWS account then go to your application.
- Click on “Configuration” from the left list then look for “Database”



- Click on “Modify” to get the following screen:

A screenshot of the 'Database settings' form in the AWS Management Console. The form is titled 'Database settings' and has a subtitle 'Choose an engine and instance type for your environment's database.' It contains several configuration options: 'Engine' is set to 'mysql'; 'Engine version' is set to '5.7.23'; 'Instance class' is set to 'db.t2.micro'; 'Storage' is set to '5 GB' with a note 'Choose a number between 5 GB and 1024 GB.'; 'Username' is 'root'; 'Password' is masked with '****'; 'Retention' is set to 'Create snapshot' with a note 'When you terminate your environment, your database instance is also terminated. Choose Create snapshot to save a snapshot of the database prior to termination. Snapshots incur standard storage charges.'; and 'Availability' is set to 'Low (one AZ)'. At the bottom right of the form are three buttons: 'Cancel', 'Continue', and 'Apply'.

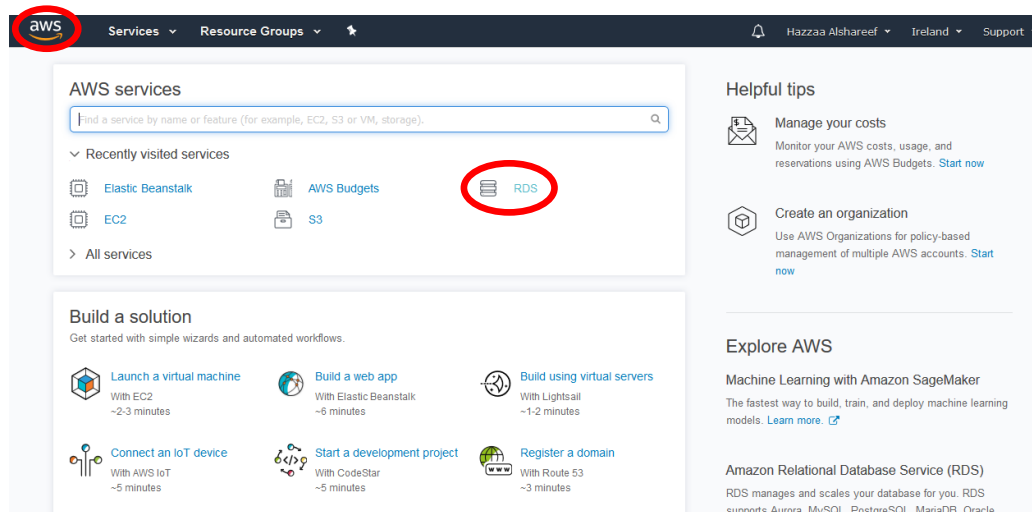
- Select “mysql” as an engine with the latest version.
- **Leave the instance class as it is and storage size (5 GB) as it is to avoid extra payment.**
- Choose a username and password (minimum length: 8) to access your database remotely.
- Then click on “Apply”
- Wait until your environment is updated.

Once done, you should see in the event box that the RDS database is created successfully:

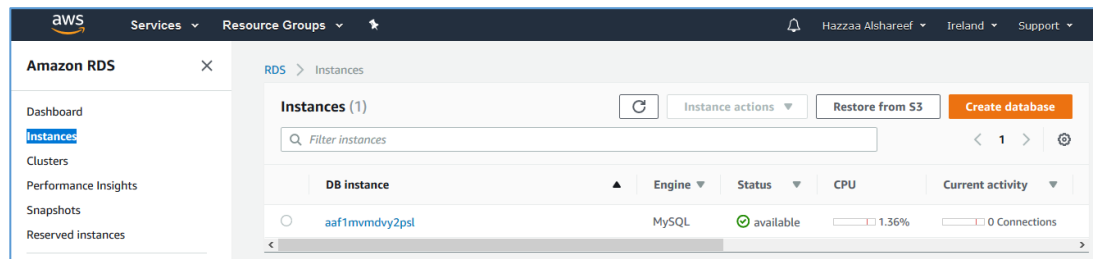
Recent Events			Show All
Time	Type	Details	
2018-10-05 17:46:32 UTC+0300	INFO	Environment health has transitioned from Info to Ok. Configuration update completed 23 seconds ago and took 10 minutes.	
2018-10-05 17:45:30 UTC+0300	INFO	Environment update completed successfully.	
2018-10-05 17:45:30 UTC+0300	INFO	Successfully deployed new configuration to environment.	
2018-10-05 17:44:36 UTC+0300	INFO	Created RDS database named: aaf1mmvdy2psi	
2018-10-05 17:36:33 UTC+0300	INFO	Environment health has transitioned from Ok to Info. Configuration update in progress (running for 19 seconds).	

Now, let us see our new database:

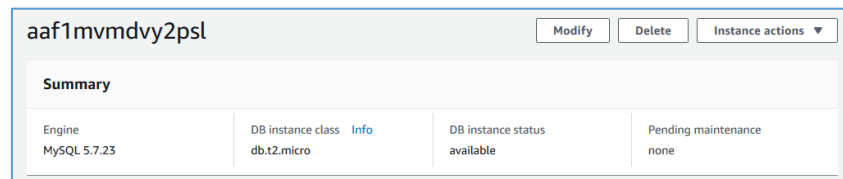
- Click on the AWS icon on the top left and search for RDS



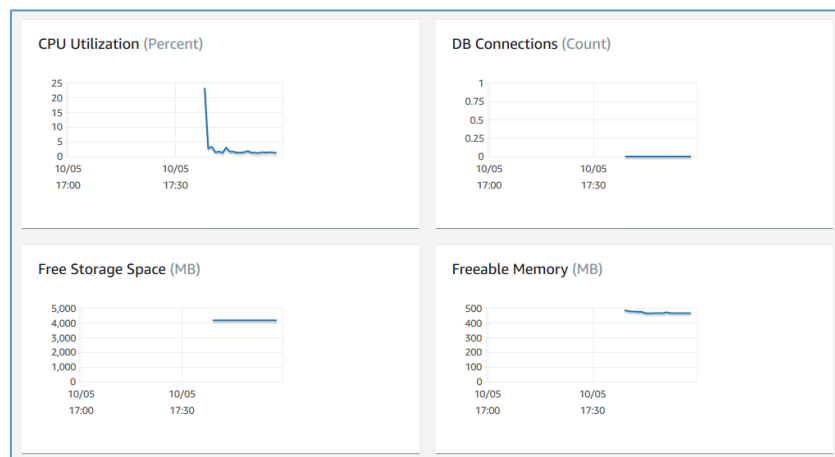
Click on “RDS” then on “Instances” to get the following screen, which will list up all previously, created database instead. It should be only one instance listed there:



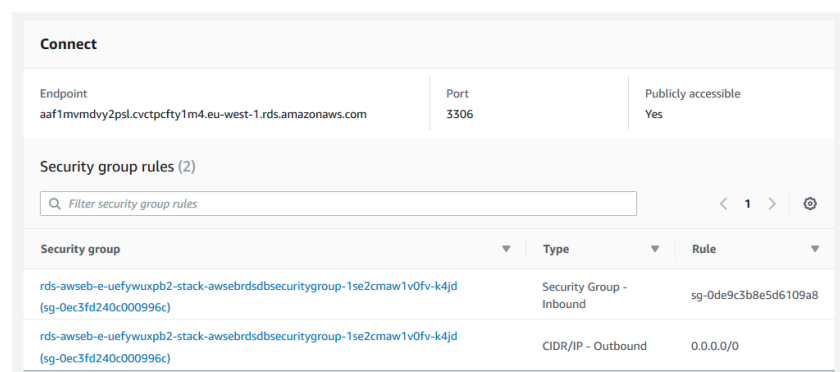
Now let us see what we have by clicking on the DB instance name:



- This is a summary of our DB instance with ability to modify it or even delete it.

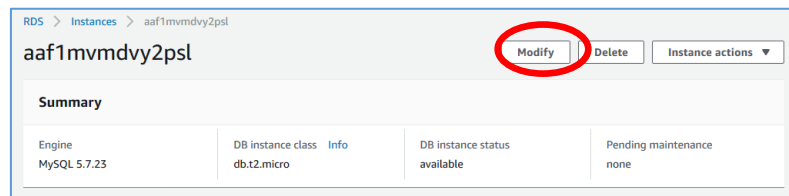


- Here we can get some statistics about our DB instance such as CPU, connections and so on. It helps in testing to show behaviour of the database.



- This is the most important part where you can learn how to interact with this instance using its endpoint and port.

Now let us make some changes! Click on “Modify”.



RDS > Instances > aaf1mvmvdy2psl

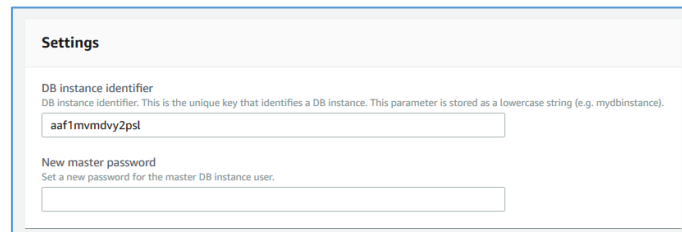
aaf1mvmvdy2psl

Modify Delete Instance actions

Summary

Engine MySQL 5.7.23	DB instance class db.t2.micro	DB instance status available	Pending maintenance none
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- Then, go down to settings to see if you can change the DB instance name:



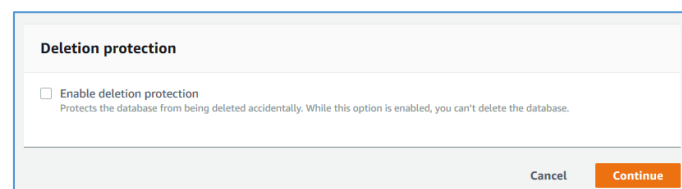
Settings

DB instance identifier
DB instance identifier. This is the unique key that identifies a DB instance. This parameter is stored as a lowercase string (e.g. mydbinstance).

aaf1mvmvdy2psl

New master password
Set a new password for the master DB instance user.

- Change the default name to something more readable such as **mydb** then click on “continue”.

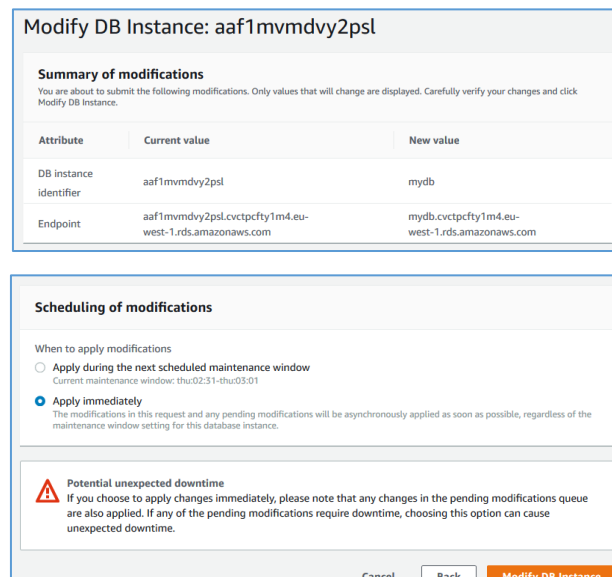


Deletion protection

☐ Enable deletion protection
Protects the database from being deleted accidentally. While this option is enabled, you can't delete the database.

Cancel Continue

The next page will show you the summary of your modification.



Modify DB Instance: aaf1mvmvdy2psl

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 instance identifier	aaf1mvmvdy2psl	mydb
Endpoint	aaf1mvmvdy2psl.cvctpcft1m4.eu-west-1.rds.amazonaws.com	mydb.cvctpcft1m4.eu-west-1.rds.amazonaws.com

Scheduling of modifications

When to apply modifications

☐ Apply during the next scheduled maintenance window
Current maintenance window: thu:02:31-thu:03:01

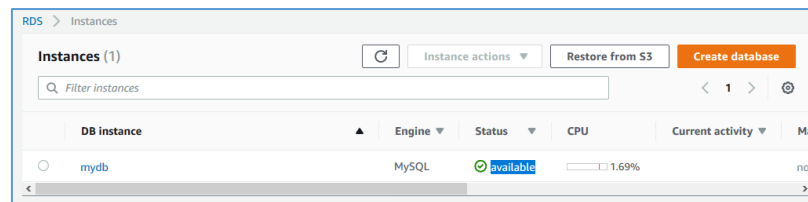
☒ Apply immediately
The modifications in this request and any pending modifications will be asynchronously applied as soon as possible, regardless of the maintenance window setting for this database instance.

Potential unexpected downtime
If you choose to apply changes immediately, please note that any changes in the pending modifications queue are also applied. If any of the pending modifications require downtime, choosing this option can cause unexpected downtime.

Cancel Back Modify DB Instance

- Change when the modifications should be implemented to “Apply immediately” then click on “Modify DB Instance”. If you go back to “Instances”, you should see that the status of the DB is changed to “renaming” and to “available” when completed.

- The operation is completed!



Be careful!!

Do not change or enable any extra features that will add cost to your account such as “replication” or “CloudWatch alarms” and always make sure that your instance is deployed on Ireland servers.

Resources

https://docs.aws.amazon.com/index.html#lang/en_us

https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/RelatedResources.html?icmpid=docs_elasticbeanstalk_console

<https://aws.amazon.com/rds/> and <https://aws.amazon.com/rds/mysql/>

Tasks

Task 1: to create an AWS cloud instance and then upload and run a web application.

Task 2: use the database for storing data produced by your application, such as statistics results computed on big data from a public repository or random data created by your application. A good source of data is the Central Statistics Office.

Central Statistics Office API - <https://statbank.cso.ie/webserviceclient/>

A simple example can be a table with 12 rows (corresponding to months) and 31 columns for an environment variable (temperature, or humidity, ...).

Submit by the deadline the following:

- (1) A report with **Screenshots** of the created app showing all the above interactions.
- (2) A **zip file** of your code.

Each of the two tasks is worth 5 marks. 10 marks is the total for this lab.