Laboratory Goals / Objectives

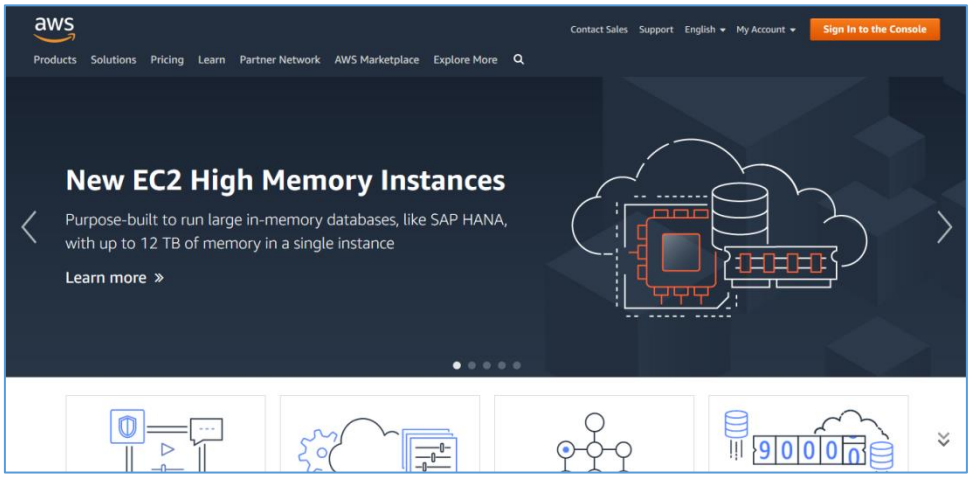
Upon completion of this lab, the students should be aware of available cloud platforms. Students will learn about using a cloud instance to host a web server, a database and t process large data.

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:

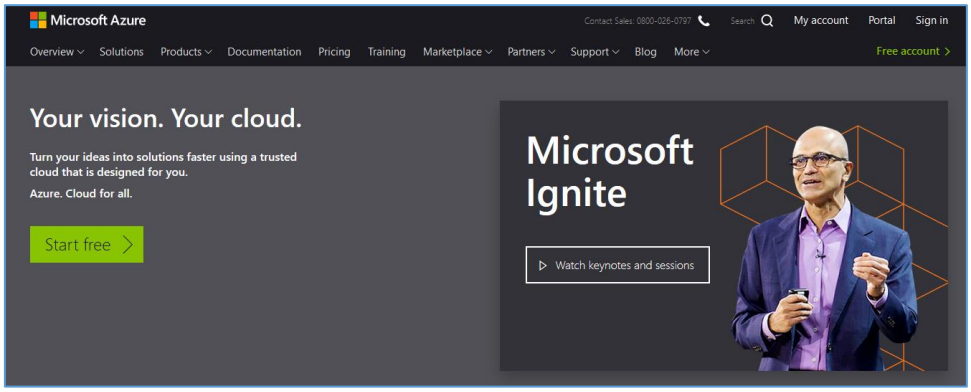
AWS

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/

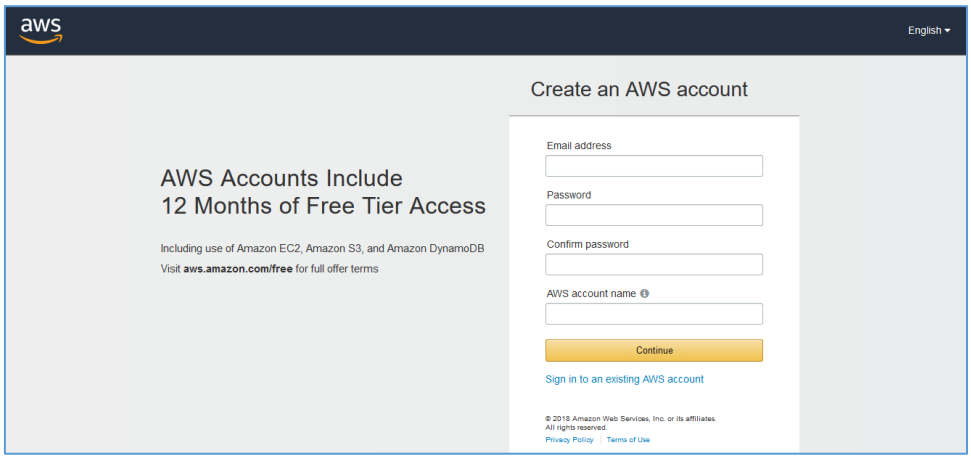
IBM Cloud

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.

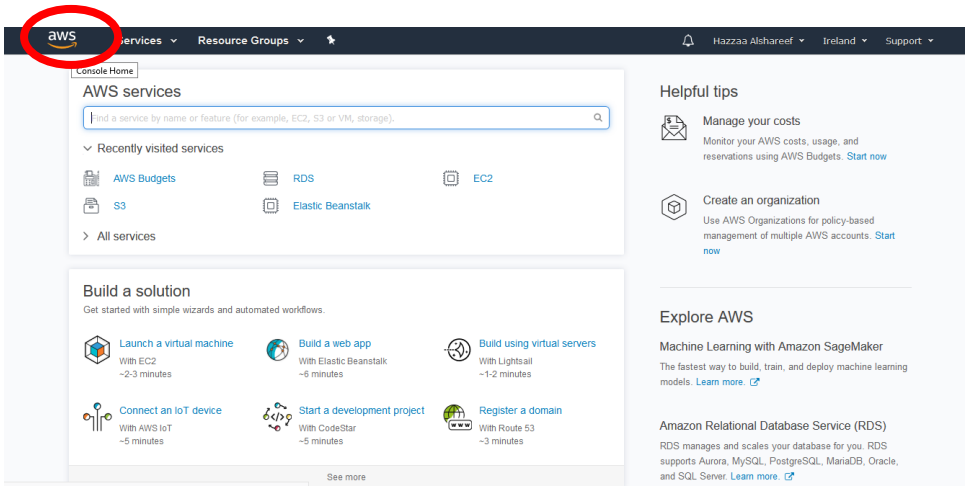
2. Hosting a web server on AWS

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

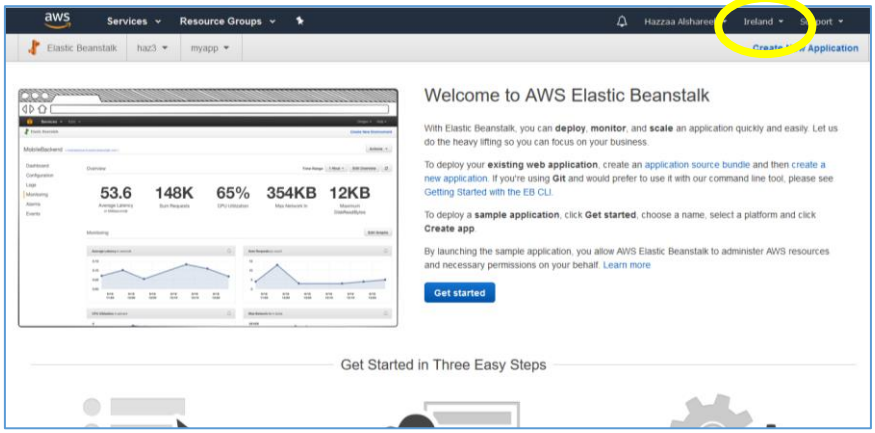
To create the account, you have to provide valid card details. Do not worry, you will not be charged unless you excessed the AWS Free Tier Limits. However, it is recommended to use a prepaid credit card (i.e. 3 money card)



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

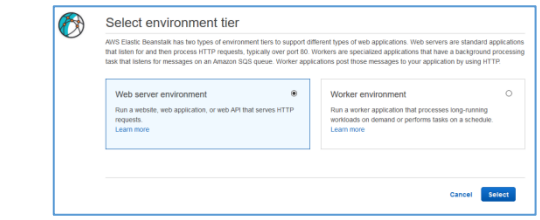


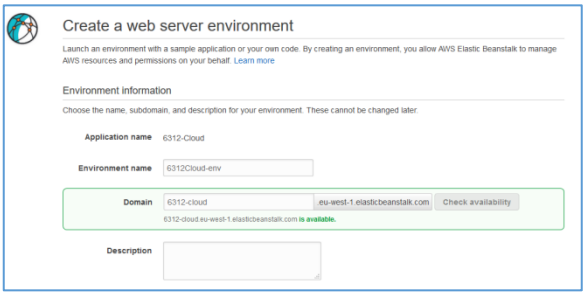
Next, let start creating a web server. Click on **Elastic Beanstalk** to get the following page:

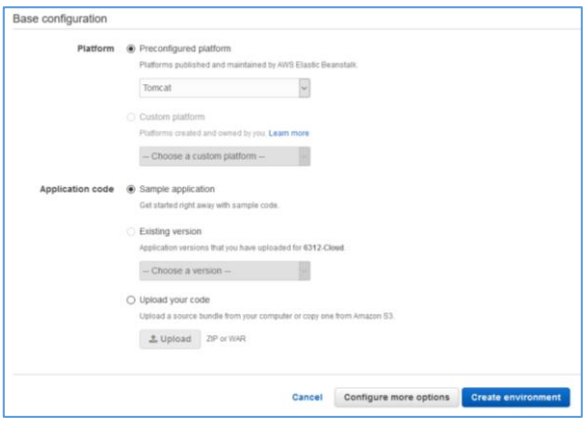


NB: make sure that your service is located at Ireland servers. See the yellow circle!

Now, click on Get started and do the following:

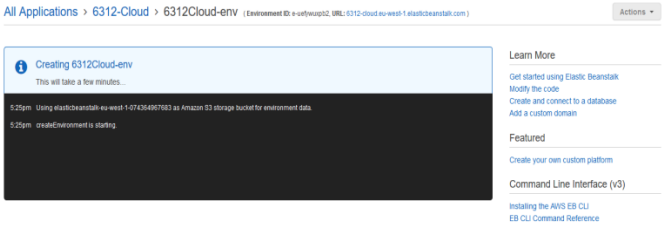


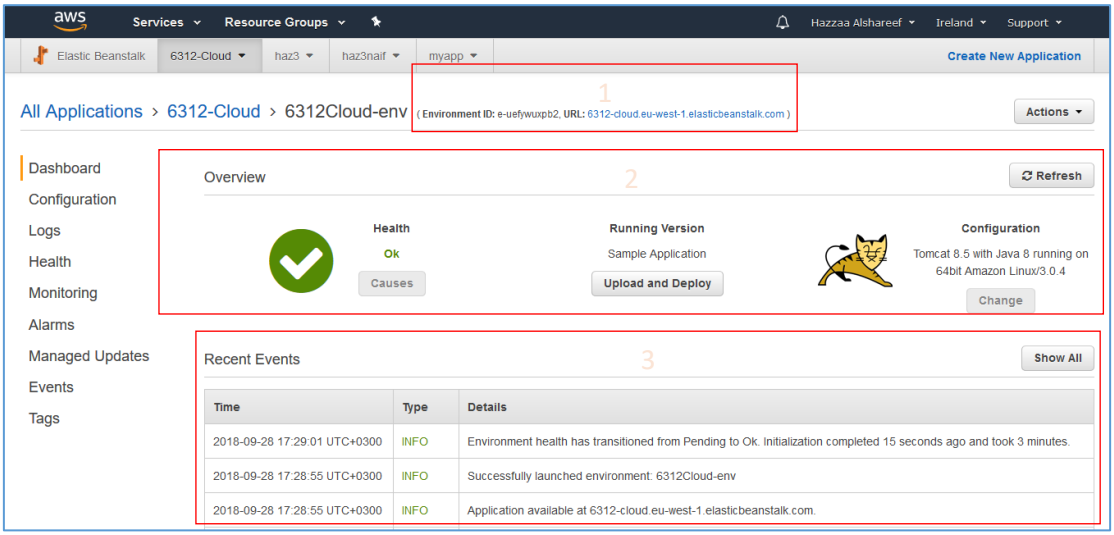




- Select a Web server environment.
- Chose a name for your application
- Pick up a domain name and check if it is available.
- Select your web server platform. In this practice, we will select **Tomcat**.
- Keep the application code on **Sample application** option.
- Click on **Create environment**.

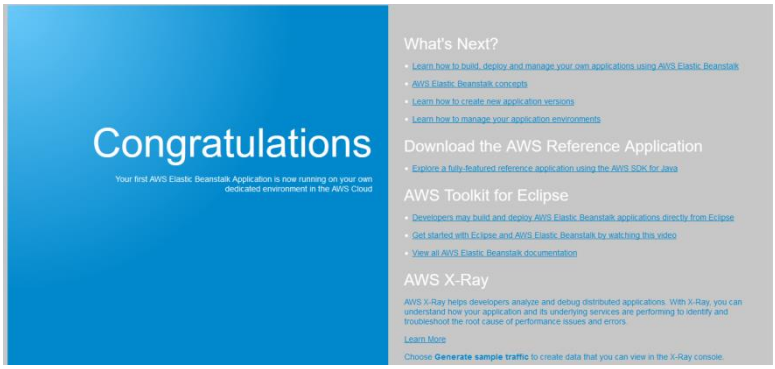
Wait until the new environment is created for you. Once done, the following page will be shown →





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 ☺

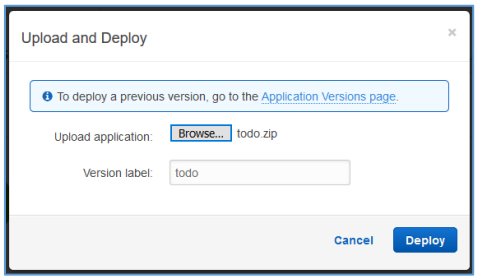


2- The overview that includes the status of your environment, the running application version, and the configuration of this environment.
3- Logs or events: here you can track the changes on your environment.

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.



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

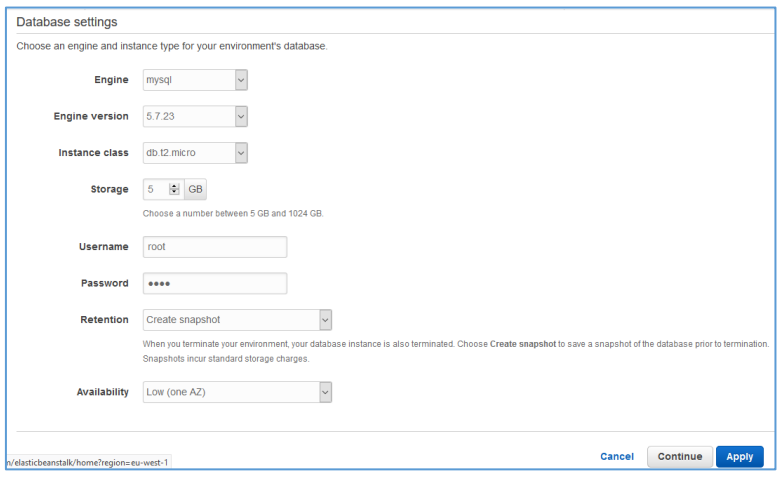
3. Database on AWS

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).

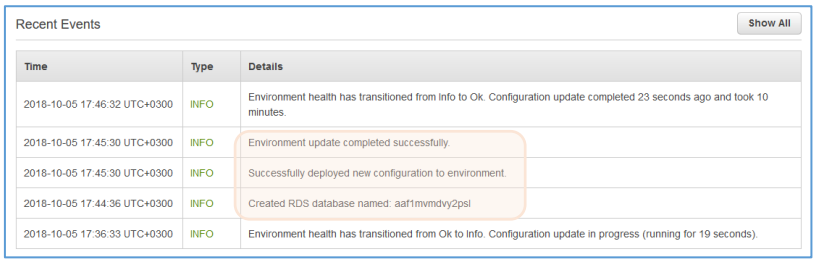
- Login to your AWS account then go to your application.
- Click on "Configuration" from the left list then look for "Database"

- Click on "Modify" to get the following screen:



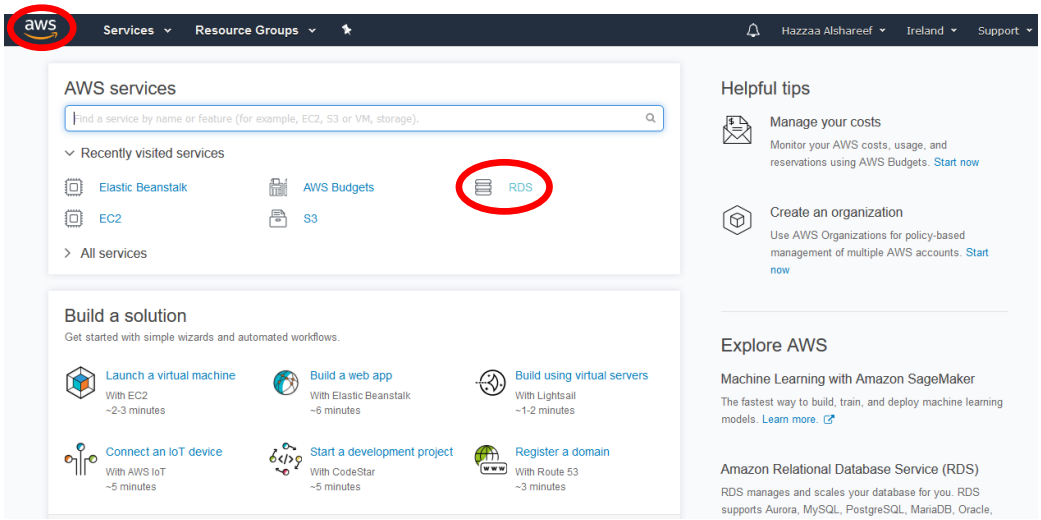
- Select “mysql” as an engine with the latest version.
- **Leave the instance class as it is and storage size (5 GB) as it is to avoid extra payment.**
- Choose a username and password (minimum length: 8) to access your database remotely.
- Then click on “Apply”
- Wait until your environment is updated.

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

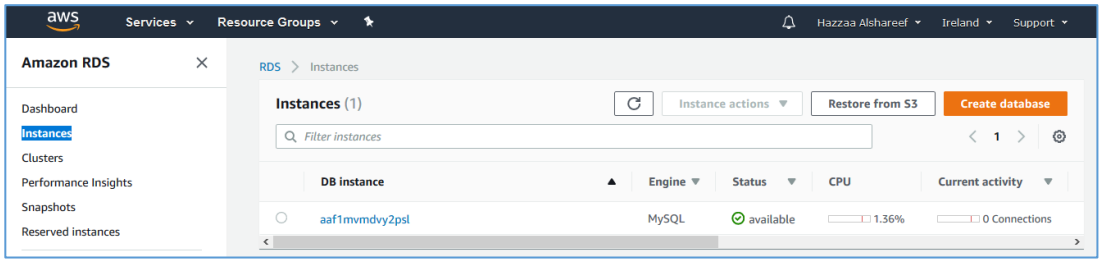


Now, let us see our new database:

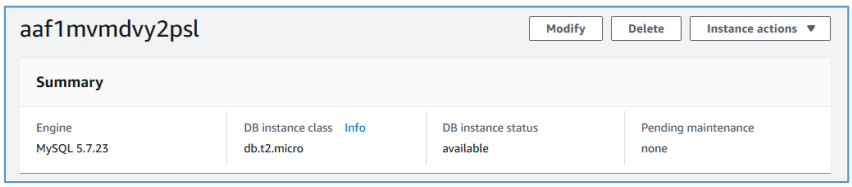
- Click on the AWS icon on the top left and search for RDS



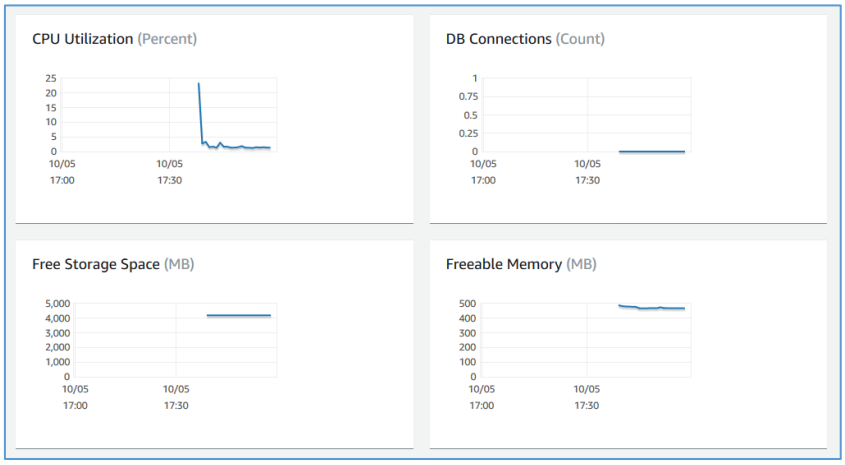
Click on “RDS” then on “Instances” to get the following screen, which will list up all previously, created database instead. It should be only one instance listed there:



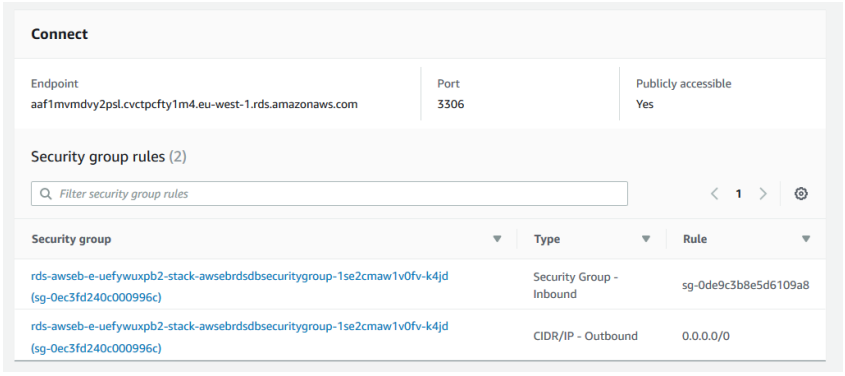
Now let us see what we have by clicking on the DB instance name:



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

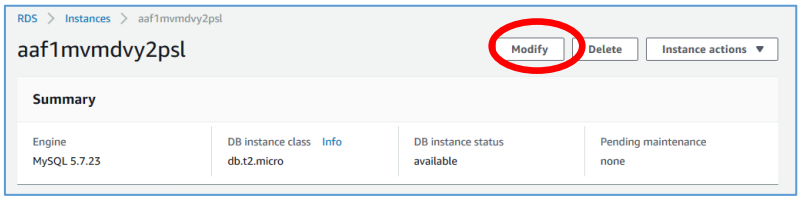


- Here we can get some statistics about our DB instance such as CPU, connections and so on. It helps in testing to show behaviour of the database.

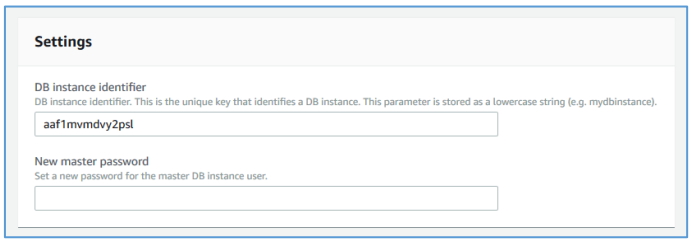


- This is the most important part where you can learn how to interact with this instance using its endpoint and port.

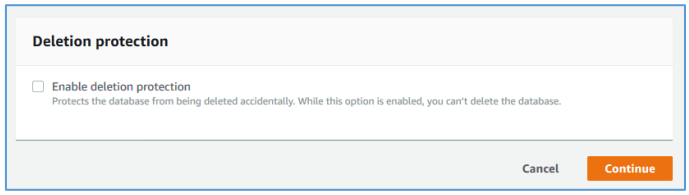
Now let us make some changes! Click on “Modify”.



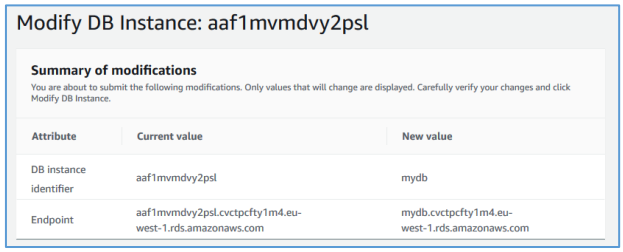
- Then, go down to settings to see if you can change the DB instance name:

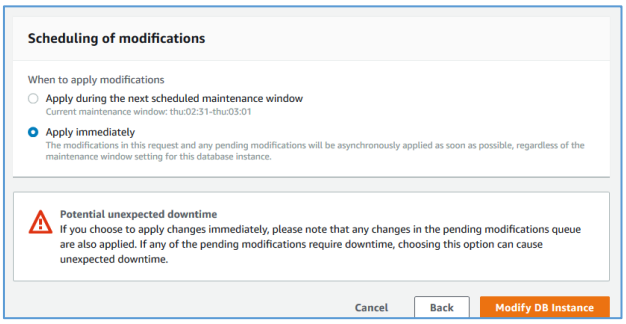


- Change the default name to something more readable such as **mydb** then click on “continue”.



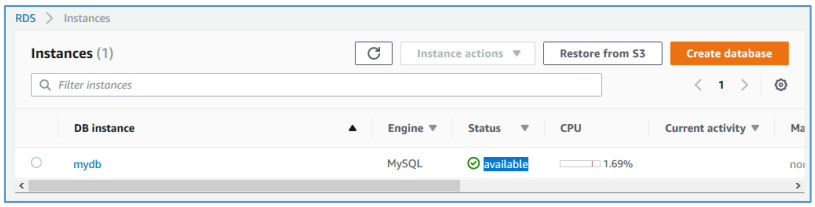
The next page will show you the summary of your modification.





- 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.