# LS Lab Assignment: Amazon EC2*

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**Abstract**

This lab will introduce you to the Amazon Cloud and EC2 in particular. You will learn about the billing model, authentication, VM instantiation, and load balancing. This document provides you guidelines as you interact with the AWS dashboard. We expect you to not only show the results/outputs of each step outlined in this document, but also share why each step is significant. Be thoughtful in your remarks and explanations!

**NOTE** Using cloud services costs money. You're kindly asked to use small AMIs and to make sure that you terminate running VM instances once you are done with the lab.

## 1 Access

Log on to the Amazon Web Services dashboard through the AWS Academy Canvas page. Once logged in, take a look at the services provided by AWS. **Make sure your current Dashboard is pointing to the** `us-east-1` **(North Virginia) zone**. Feel free to explore!

1. Create a keypair called **os3-keypair** and download the `.pem` file to a directory. Ensure you apply the appropriate permissions to the file, since you will use the keypair to connect to your instances.

   **Caution:** Creating a keypair will automatically initiate downloading the `.pem` file. You will not be able to re-download the same `.pem` file if you lose it. Keep the file safe, make a backup if you have to.

2. Create a Security Group called **os3-sec-group**. Associate the **os3-keypair** you just created to this Security Group.

## 2 Adding Instances

### Questions

3. What is the difference between EBS and instance-store for VMs?

*Based on an earlier document by Mick Pouw, N.D. Jebessa, Péter Prjevara. Version December 2, 2024.

4. Launch two (micro)instances of a free Ubuntu 24.04 distro. Attach the Security Group you created during Question 2 to those instances.

   **Reminder:** AWS will assign random public IP addresses to your instances when you start them. When you reboot the instances, your instances might be assigned a new public IP addresses.

5. Using the `.pem` file you generated in Question 1, establish `ssh` to connect to both instances, install a Web server and change the web page to display the following, where # is a unique single digit id number for each instance.

   | This page is served by instance number #. |
   |---|

6. Test each web server instance using the DNS reference provided by Amazon.

7. Measure the HTTP response time for each instance.

## 3 Optional: Load Balancing

Create a load balancer pointing to both of your servers.

8. Test the load balancing server using the DNS reference provided by Amazon. Using tools like `wget`, note the instance number responding to your request.

9. Repeat the procedure in Question 7 at least 10 times. You may use a Bash/Python script if you're feeling fancy. You will see the load balancer will point to one of the two instances. But does the load balancer respond to all requests by pointing to a random server? Make an educated guess on your load balancer's behaviour, describe how you test your theory, and elaborate on your answer.
   **Hint**: Research on "Round-Robin" load balancing technique.

Now generate a continuous request on the load balancer.

10. How does this influence the load balancer?

11. Measure the HTTP response time both on the load balancer as well as on the separate web servers.

12. Draw a conclusion from the results.

Now add a Microsoft "Microsoft Windows Server 2022 Base" image and set up an IIS web server to serve the same page as the Ubuntu servers (you can change the #, for instance)

13. What are the advantages/disadvantages of a mixed setup?

14. Repeat the procedure in Question 7. Describe if you notice any behavioural change now that the load balancer has 3 possible servers to which it can point.

## 4 Optional: Security

15. Modify the Security Group you created in Question 2 for your web servers with reasonable inbound traffic rules. For example, you might want to limit certain traffic to sources from the OS3 network only, or block

inbound requests for certain application. Explain your reasons. Do not forget to add the 10.0.0.0/8 range such that the load balancer can do health checks on your targets.

## 5 Budgeting

Now terminate all your instances and delete **your load balancer**, they are really expensive. But how expensive are they, really? To estimate your Cloud Computing expenses, AWS provides a tool which you can access at calculator.aws.

16. Consider your setup at the end of Question 14. By then, you should have the following setup:

    - The instances are hosted in `us-east-1` region
    - 2 EC2 micro instances of Ubuntu 24.04
    - 1 EC2 micro instance of Microsoft Windows Server
    - 1 EC2 instance of Load Balancer

    If you were to build these infrastructure for a small-to-medium sized enterprise, how much should the company budget for 1 year for cloud services? Assume the company will pay on a month-by-month basis (i.e. they will not pay a lump-sum upfront).

17. AWS Pricing Calculator can generate a persistent link for you to refer to in the future. Provide your estimate's public link for possible discussions with your TAs.

## 6 Virtual Data Center

A sysadmin argues that he can migrate ALL the storage, network, server (web, application, database), and security services of her company to the Amazon cloud.

18. Do you think this is feasible with the current AWS services?

19. Briefly explain how you would use each AWS service to implement the sysadmin's plan.