

## Lab 01: Compute and Storage

**AWS Cloud Foundations Modules:** Module 6 and Module 7

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1. You are the AWS consultant tasked with deploying a static website for a client. The website consists of HTML, JS, and CSS files, and the client has requested the use of Amazon Simple Storage Service for hosting. Additionally, whenever new content is uploaded to the website, the page [/lastupdate.html](#) must automatically be updated with the latest update timestamp. This update cannot be done manually; you need to use an AWS service/component that triggers this update whenever a new file is added/updated.

You can find the website HTML, JS, and CSS files [here](#).

2. You are the AWS consultant tasked with deploying a shared file system for an organization. The organization provides EC2 instances to all employees, and each EC2 instance must have read-write access to a shared directory, [/mnt/cloud](#). You may start by launching an initial EC2 instance and uploading the necessary cloud documents to the shared directory. Subsequent EC2 instances must be configured to access this shared directory, ensuring that all users can interact with the same files from the same location. Additionally, if a user on any EC2 instance updates a file in [/mnt/cloud](#), the changes should immediately be reflected and accessible to users on all other EC2 instances, maintaining data consistency across the environment.

You can find the cloud files [here](#).

3. Imagine you are a college professor planning to evaluate your students through a practical exam using AWS. For this exam, you will provide 5 EC2 instances, allowing students to connect, complete the exam, submit their work, and then shut down the instances. Since your class has 10 students, you will first have 5 students take the exam. Once they finish, they will close their sessions and shut off the EC2 instances. You will then restart the instances for the remaining 5 students to complete their exams. The exam will be preloaded at [/mnt/exam](#) on each EC2 instance. Upon logging in, students will edit this file to add their responses. However, the contents of [/mnt/exam](#) should not persist between instance reboots to prevent the second group of students from accessing the responses of the first group. Implement a solution that ensures exam data is isolated between student groups.

This script can be used to automate the setup of the exam environment on each EC2 instance. It should be executed on the first boot of the instance to configure the necessary

mechanisms for obtaining or generating the exam. Ideally, the entire process should be automated and require no human intervention.

```
#!/bin/bash
mkfs.ext4 /dev/sdb # Format the volume
mkdir /mnt/exam # Create a mount point
mount /dev/sdb /mnt/exam # Mount the volume
echo "/dev/sdb /mnt/exam ext4 defaults,nofail 0 2" >> /etc/fstab #
Ensure it mounts on reboot

# Create a script to generate a text file on boot
cat << 'EOT' > /etc/systemd/system/get-exam.service
[Unit]
Description=Create a text file on boot

[Service]
ExecStart=/bin/bash -c 'echo -e "This is the exam!\nThis file was created at
$(date)" > /mnt/exam/exam.txt'
Type=oneshot
RemainAfterExit=yes

[Install]
WantedBy=multi-user.target
EOT

# Enable the service to run at boot
systemctl enable get-exam.service
systemctl start get-exam.service
```

4. The University of Aveiro is implementing a Digital Preservation System to store video and image archives that must be preserved for many years. The system should have a minimal footprint and be as cost-effective as possible. Additionally, the university has stated that immediate access to the archived artifacts is not required; they only need the ability to retrieve them within 48 hours. Which AWS service would you recommend for storing these artifacts, and how would you configure it? Please implement and configure the AWS storage solution that the Preservation System will rely on and upload some example files to demonstrate its functionality.

You can find the Digital Preservation archives [here](#).

5. As a college professor, you will evaluate your students through a practical exam where each student is assigned an individual EC2 instance. Students will connect to their EC2 instances, access `/mnt/exam`, and update `/mnt/exam/implementation` with their custom implementations. At the end of the exam, to reduce costs, you plan to

terminate all EC2 instances. However, for grading purposes, you still need access to the contents of the `/mnt/exam` directories from all instances after they have been terminated. How would you design a solution on AWS to meet these requirements? Please deploy a system that ensures the professor can access the exam directories even after the EC2 instances are terminated, while fulfilling all cost-saving and functionality conditions.

You can find the Exam files [here](#).

6. You have been hired as an AWS expert, and your company has tasked you with deploying their website. They have provided a Docker image (`nginxdemos/hello`) and instructed that it can be run using the command: `docker run --rm -it -p 80:80 nginxdemos/hello`. Your goal is to deploy the website using ECS with at least 2 replicas of the container and configure a load balancer to manage traffic to the containers hosting the website. Please implement the solution in AWS, ensuring that the website is deployed correctly with ECS and that the load balancer efficiently distributes incoming traffic across the replicas.
7. You have been hired as an AWS expert, and your company now requires you to deploy their website, which is built as a web application running on Tomcat. The company manager has provided a ZIP file with the Tomcat Java server: <https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/samples/tomcat.zip>. Which AWS service would you use to deploy this web application? Implement a solution based on the manager's requirements, ensuring the Tomcat web application is deployed and running smoothly.

## Helpers

### [1] Volume Formatting

```
#!/bin/bash
```

```
mkfs.ext4 /dev/sdb
```

# This command formats the disk (in this case, `/dev/sdb`) with the ext4 filesystem, preparing it for use. The `ext4` is a widely used filesystem in Linux, offering good performance and reliability. Before running this command, please check the device where the volume is accessible.

```
mkdir /mnt/exam
```

# This command creates a directory (`/mnt/exam`) where the formatted volume will be mounted. A mount point is essentially a directory where the contents of the disk can be accessed.

```
mount /dev/sdb /mnt/exam
```

# This command mounts the disk `/dev/sdb` to the directory (`/mnt/exam`, making its contents accessible under that directory. From this point on, any files you create or view in `/mnt/exam` will be stored on the volume.

```
echo "/dev/sdb /mnt/exam ext4 defaults,nofail 0 2" >> /etc/fstab
```

#This appends an entry to the `/etc/fstab` file, which is used to define how disks are mounted automatically when the system starts up. The parameters:

- `/dev/sdb` is the device to mount.
- `/mnt/exam` is the directory where it will be mounted.
- `ext4` specifies the filesystem type.
- `defaults` provides default mounting options (like read-write, allowing executable files, etc.).
- `nofail` ensures that the system will still boot even if the device is not present.
- The `0` disables dumping of the file system.
- The `2` is used to indicate the order in which filesystem checks are done at boot time (root filesystems get a 1, while others usually get a 2).

### [2] Terraform

A Terraform Module to Set Up A VPC with 2 Availability Zones is available at:

[https://github.com/rafael-direito/es\\_2024\\_2025\\_helpers\\_public/tree/main/Terraform](https://github.com/rafael-direito/es_2024_2025_helpers_public/tree/main/Terraform)