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CSL605 SKILL BASED LAB COURSE: CLOUD COMPUTING

Mini Project Report

➤ **Title of Project** : LAB MASTER

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Chapter 1

Abstract

“Lab Master” is a smart online website with a simple-looking interface designed to reduce manual work and automate things with just a few clicks. Basically, there are 3 types of users Admin, System Administrator & Faculty each with a separate dashboard and can perform tasks based on their assigned roles.

This website allows Admin to add/remove/view users and labs, generate monthly reports, and print them for documentation.

System administrators (technicians) can make the configuration of newly added labs by admin by providing the appropriate inputs. The second task as a system administrator is to troubleshoot lab equipment problems mentioned by the faculty members.

Faculties can view labs and report issues by selecting the PC icon and writing down the issue. When a faculty member selects a specific PC to report a problem with, that PC is flagged red to indicate that there is a problem with that PC. Good PCs are marked in green.

Chapter 2

Introduction

In Today's world, technology is rapidly pervading many fields of human endeavor. Nowadays most educational institutions are equipped with computer labs to provide training for students that qualify them for their professional life. At present, the Computer Lab becomes a more integral part of education and it became the hub of activity. Every college has a computer lab that contains a number of Computers connected to the LAN, but most of the time there is no client-server connectivity present to control the LAN. A single teacher cannot supervise the entire Lab and control students' activities each and every time. Monitoring what they are doing during practical sessions. The biggest challenge is allowing students to take advantage of learning technology while keeping the class productive and well-managed.

Previous studies show that the difficulties in teaching computer Lab sessions include losing classroom control and student attention, difficulties in the monitoring Lab exam, and teaching visually impaired students. However, most of the college Computer laboratory management methods are outdated and cause heavy work pressure for staff members. This system will be beneficial for teachers which will minimize their documentation work as well as reduce time.

This lab reporting management project aims to create a web-based reporting system for managing computer laboratories and their ancillary equipment in the modern developing world. The suggested method will enable lab administrators to add labs, after which technicians are authorized to configure the labs, arrange PCs in grids, and allow users to submit issues with a single click. When a problem is discovered, the system will notify technicians via email.

As it offers a centralized method for tracking and resolving reported issues, the saved information is a crucial part of the suggested system. Details like the date and time the issue was reported, the apparatus involved, the nature of the problem, and the technician tasked with fixing it are all included in the stored information. Lab managers and technicians will have quick access to the data because it is kept in a database.

The data will also give technicians important insights into the general condition of the lab equipment, enabling them to spot recurring problems and take preventative action to stop them from occurring again. In addition, the information will allow lab administrators to generate reports on the functionality of the lab apparatus, simplifying resource allocation and future update planning.

In summary, the information recorded is an essential part of the proposed lab report management system. It provides a centralized way to track, address and resolve reported issues and valuable insights into the performance of lab equipment. The document contains a detailed description of our project.

Chapter 3

Problem Definition

Managing computer labs and their peripherals has become increasingly complex in recent years. The current system for managing these devices, based on manual monitoring and troubleshooting, is inefficient and time-consuming. Lab technicians often have to rely on users to report equipment problems, which slows down the resolution process. This can lead to reduced productivity in the lab and can cause frustration for users.

A well-set computer laboratory needs to be smoothly run to ensure that the purpose for which it was developed is achieved. There is a need for the right kind of website or a system who will perform the management functions for the lab. It does not matter how small or big a computer lab is, there should be a system designated to perform the management functions.

In addition, existing systems are not able to store and track reported incidents, making it difficult for technicians to identify and resolve recurring problems. This can lead to the same issues being reported over and over again, wasting time and resources. Over a period of time, due to excessive use of computer equipments their functioning is effected and if left untreated It can sometime lead to inefficiency in working. In some cases, parts should be replaced or new installation must be done. To manage and report such changes a full-fledged system is required.

Therefore, there is a need for a more streamlined and automated system that can quickly identify and resolve problems with peripheral equipment in the computer lab. The proposed solution is to develop a web-based report management system that allows lab technicians to create lab layouts, place PCs in a grid, and allow users to report problems with a single click. This system will archive reported issues and provide technicians with a quick and efficient way to resolve them, increasing productivity and user satisfaction.

Chapter 4

Objective and Scope

The main objective of our web application is to make the lab handling automated by technically connecting them through our website for solving lab-related issues instead of physically reporting the technicians (System Administrators) or the Higher Authorities (like HOD, Dean). As time is an essential part of big institutes, corporates, etc. approaching the technician manually also decreases, as a user can report the issues by clicking on the PC which has the specific issue and can give a small description of the issue which the user saw by which the technician can resolve the issue instantly based on the input given by the user. After an issue is generated, technicians will be notified through email and can solve the issue and write the applied solution.

The experience of all individual users is very systematically designed by giving a separate dashboard, the color with a dot indication as “Red” are for the PCs which have issues, and the color with a dot indication as “Green” is for the PCs which are working fine.

Admin can add or delete multiple users and labs based on the institute requirements and get the lab configured by the technician according to their lab designs as the configuration of the lab is automated by just entering the value of no. of rows and columns. Admins can also view the report of any month and can also download the report in pdf format.

Chapter 5

Description

Cloud Services used in this project are as follows:

1. AWS Elastic Beanstalk -

Elastic Beanstalk is a service for deploying and scaling web applications and services. Upload your code and Elastic Beanstalk automatically handles the deployment—from capacity provisioning, load balancing, and auto-scaling to application health monitoring.

Companies/Individuals who want to deploy and manage their applications within minutes and with the AWS beanstalk-supported platforms and AWS Cloud infrastructure support don't need to have any experience with cloud computing to start. AWS Elastic Beanstalk supports Java, .NET, Python, PHP, Ruby, Go, Node.js, and Docker web applications.

AWS Elastic Beanstalk and AWS beanstalk supported platforms store your application-specific files and, optionally, server log files in the Amazon S3 bucket. Using the AWS Management Console, the AWS Toolkit for Eclipse, or Visual Studio. For your account, an Amazon S3 bucket will be created. Therefore, the files you upload will be automatically copied from your local client or machine to the Amazon S3 bucket. Optionally, you can configure Elastic Beanstalk to repeat your server log files every hour to Amazon S3. you are doing this by editing the environment configuration settings.

Steps to Elastic Beanstalk Create Environment :

1. Open and login to the AWS Elastic Beanstalk console with the below link:

<https://console.aws.amazon.com/elasticbeanstalk/home#/gettingStarted?applicationName=getting-started-app>

2. Add application tags (optional)

3. Choose a platform based on the application deployed. If deploying a Java application, select Java; if deploying an angular application, select Node.js, etc.

4. Select "Upload your code" inside the Application code section.

5. Inside the Source code origin section, there are two options,

- Local file -> upload from your local computer (jar/war)
- Public S3 URL -> provide the S3 bucket URL where you have uploaded the artifact.

6. Click on Create application

2. AWS CodePipeline –

AWS CodePipeline is a continuous delivery service you can use to model, visualize, and automate the steps required to release your software. You can quickly model and configure the different stages of a software release process. CodePipeline automates the steps required to release your software changes continuously.

How Pipeline executions are started :

You can trigger an execution when you change your source code or manually start the pipeline. You can also trigger an execution through an Amazon CloudWatch Events rule that you schedule. For example, when a source code change is pushed to a repository configured as the pipeline's source action, the pipeline detects the change and starts an execution.

How Pipeline executions are stopped :

To use the console to stop a pipeline execution, you can choose Stop execution on the pipeline visualization page, on the execution history page, or on the detailed history page. To use the CLI to stop a pipeline execution, you use the `stop-pipeline-execution` command.

There are two ways to stop a pipeline execution:

- **Stop and wait:** All in-progress action executions are allowed to complete, and subsequent actions are not started. The pipeline execution does not continue to subsequent stages. You cannot use this option on an execution that is already in a Stopping state.
- **Stop and abandon:** All in-progress action executions are abandoned and do not complete, and subsequent actions are not started. The pipeline execution does not continue to subsequent stages. You can use this option on an execution that is already in a Stopping state.

How executions are processed in a pipeline:

Execution consists of a set of changes picked up and processed by the execution. Pipelines can process multiple executions at the same time. Each execution is run through the pipeline separately. The pipeline processes each execution in order and might supersede an earlier execution with a later one. The following rules are used to process executions in a pipeline.

Rule 1: Stages are locked when an execution is being processed -

Because each stage can process only one execution at a time, the stage is locked while in progress. When the execution completes a stage, it transitions to the next stage in the pipeline.

Rule 2: Subsequent executions wait for the stage to be unlocked -

While a stage is locked, waiting executions are held in front of the locked stage. All actions configured for a stage must be completed successfully before the stage is considered complete. A failure releases the lock on the stage. When an execution is stopped, the execution does not continue in a stage and the stage is unlocked.

The flow of pipeline executions can be controlled by:

- A transition, which controls the flow of executions into the stage. Transitions can be enabled or disabled. When a transition is disabled, pipeline executions cannot enter the stage. The pipeline execution waiting to enter a stage where the transition is disabled is called the inbound execution. After you enable the transition, an inbound execution moves into the stage and locks it.

Similar to executions awaiting a locked stage, when a transition is disabled, the execution waiting to enter the stage can still be superseded by a new execution. When a disabled transition is re-enabled, the latest execution, including any that superseded older executions while the transition was disabled, enters the stage.

- An approval action, which prevents a pipeline from transitioning to the next action until permission is granted (for example, through manual approval from an authorized identity). You might use an approval action when you want to control the time at which a pipeline transitions to a final Production stage

3. AWS S3 Bucket –

Amazon Simple Storage Service (Amazon S3) is an object storage service offering industry-leading scalability, data availability, security, and performance. Customers of all sizes and industries can store and protect any amount of data for virtually any use case, such as data lakes, cloud-native applications, and mobile apps. With cost-effective storage classes and easy-to-use management features, you can optimize costs, organize data, and configure fine-tuned access controls to meet specific business, organizational, and compliance requirements.

Working of S3 bucket –

Amazon S3 is an object storage service that stores data as objects within buckets. An object is a file and any metadata that describes the file. A bucket is a container for objects.

To store your data in Amazon S3, you first create a bucket and specify a bucket name and AWS Region. Then, you upload your data to that bucket as objects in Amazon S3. Each object has a key (or key name), which is the unique identifier for the object within the bucket.

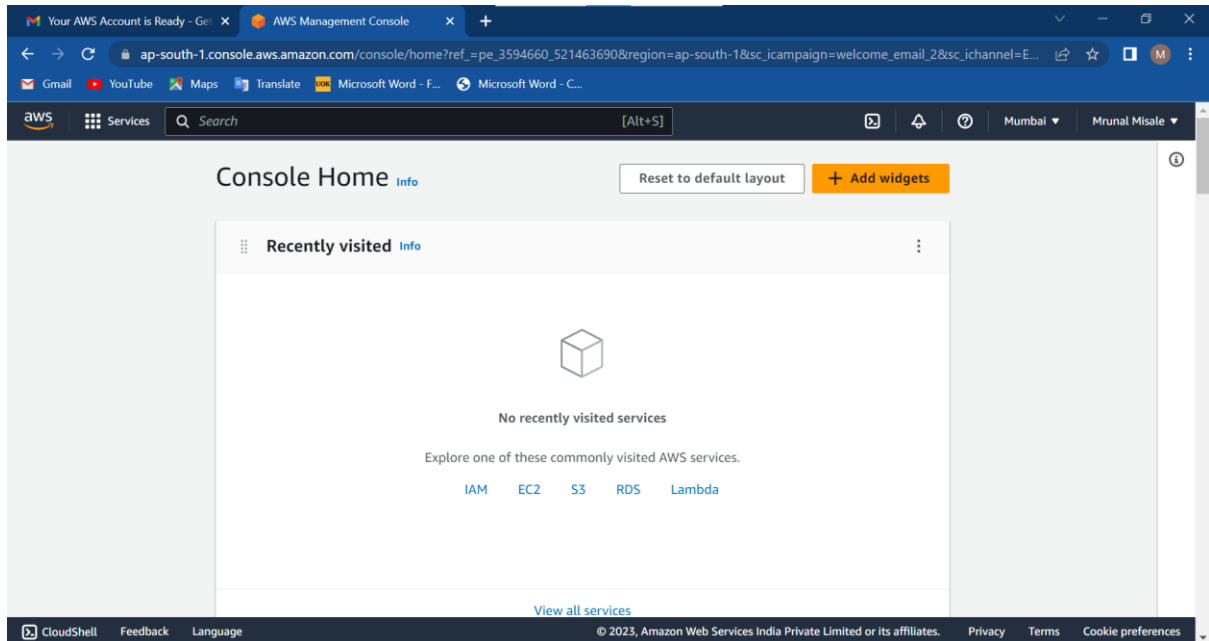
S3 provides features that you can configure to support your specific use case. For example, you can use S3 Versioning to keep multiple versions of an object in the same bucket, which allows you to restore objects that are accidentally deleted or overwritten.

Buckets and the objects in them are private and can be accessed only if you explicitly grant access permissions. You can use bucket policies, AWS Identity and Access Management (IAM) policies, access control lists (ACLs), and S3 Access Points to manage access.

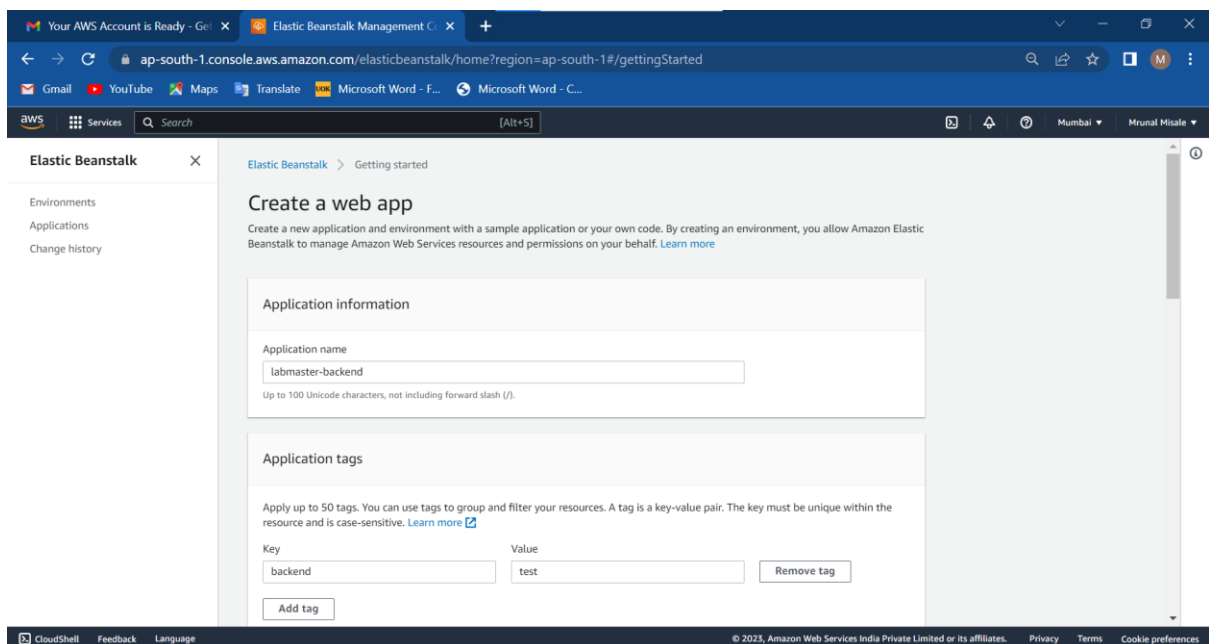
Chapter 6

Implementation

Step 1: Login to the AWS Console.



Step 2: Search for the Elastic Beanstalk in Services tab to deploy the server side.
Click on Create Application. Fill the information related project deployment.



Step 3: Choose the platform as Node.js with latest platform branch and recommended version
Select Upload your code.

The screenshot shows the AWS Elastic Beanstalk console in the 'ap-south-1' region. The 'Platform' section is active, showing the following configuration:

- Platform: Node.js
- Platform branch: Node.js 18 running on 64bit Amazon Linux 2
- Platform version: 5.8.0 (Recommended)

The 'Application code' section shows two options:

- ☐ Sample application: Get started right away with sample code.
- ☒ Upload your code: Upload a source bundle from your computer or copy one from Amazon S3.

The 'Source code origin' section is partially visible, showing a 'Version label' field with the value 'labmaster-backend-source'.

Step 4: Select the source code from your local pc and upload.

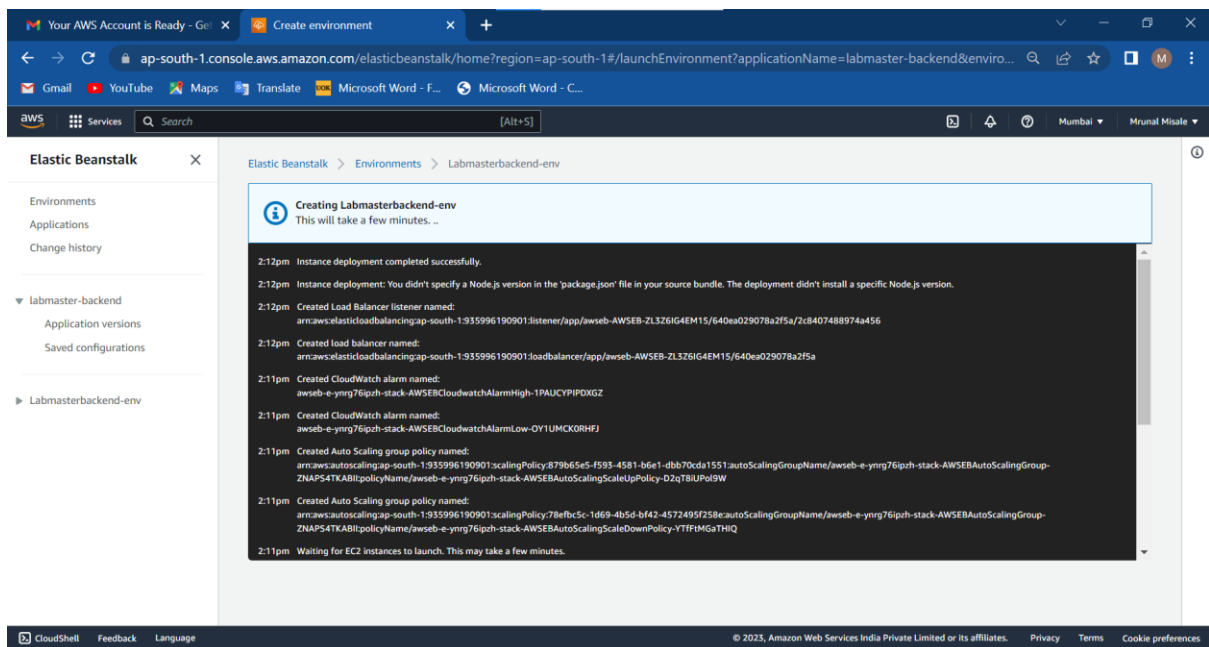
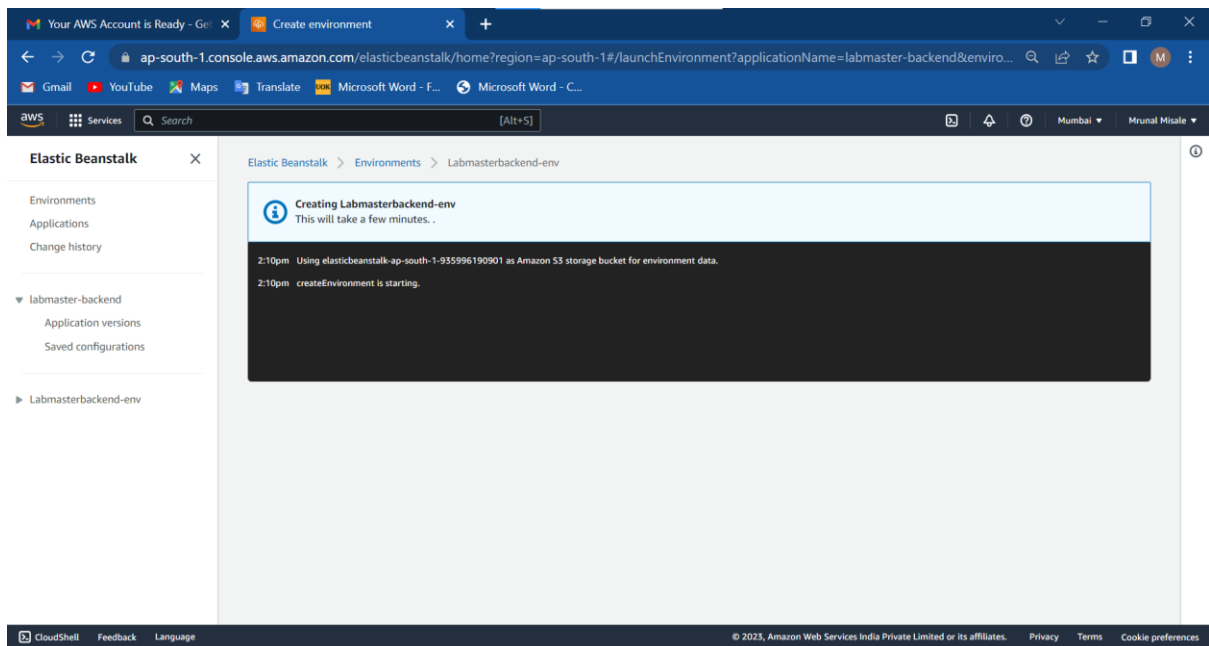
The screenshot shows the AWS Elastic Beanstalk console in the 'ap-south-1' region. The 'Source code origin' section is active, showing the following configuration:

- Version label: labmaster-backend-source
- Source code origin: Local file (selected)
- Choose file button: Choose file
- File name: package.zip
- Status: File successfully uploaded

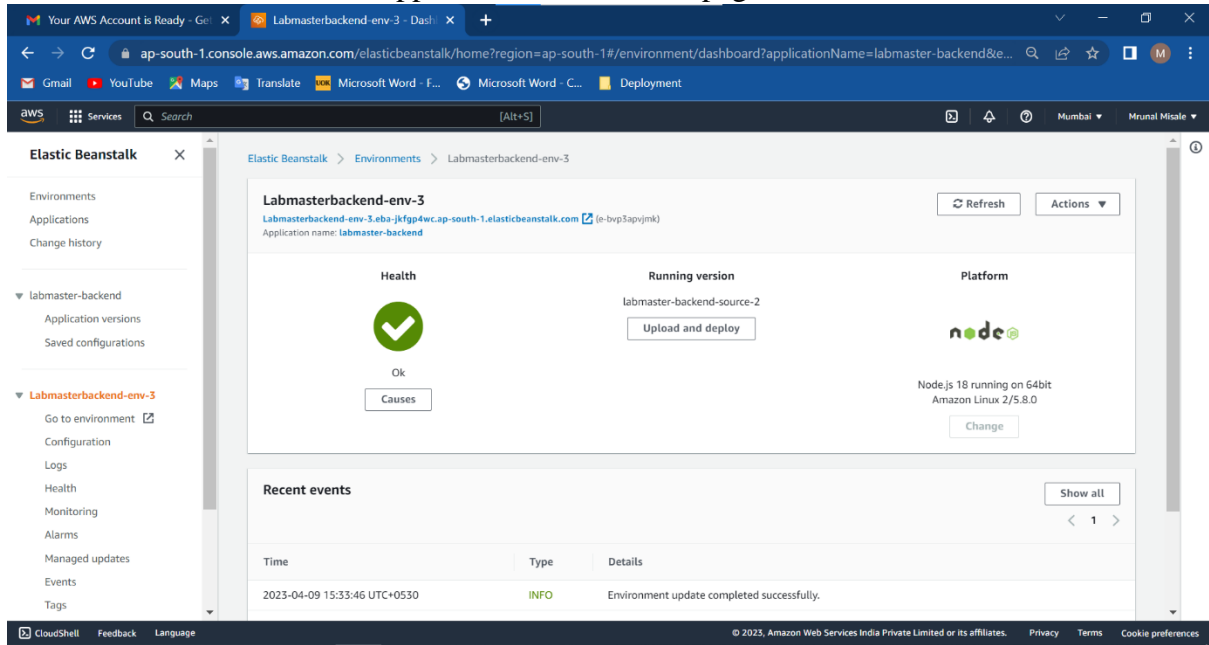
The 'Application code tags' section is partially visible.

At the bottom, there are three buttons: Cancel, Configure more options, and Create application.

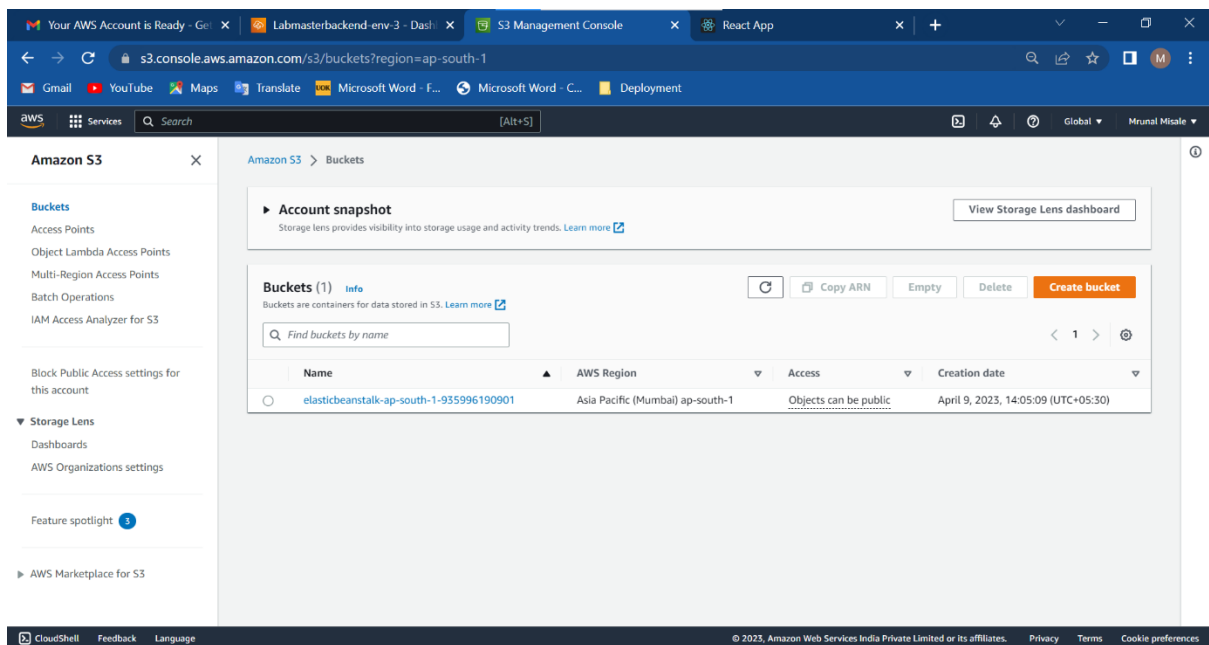
Step 5: Click the create application and wait for the server to get deployed.

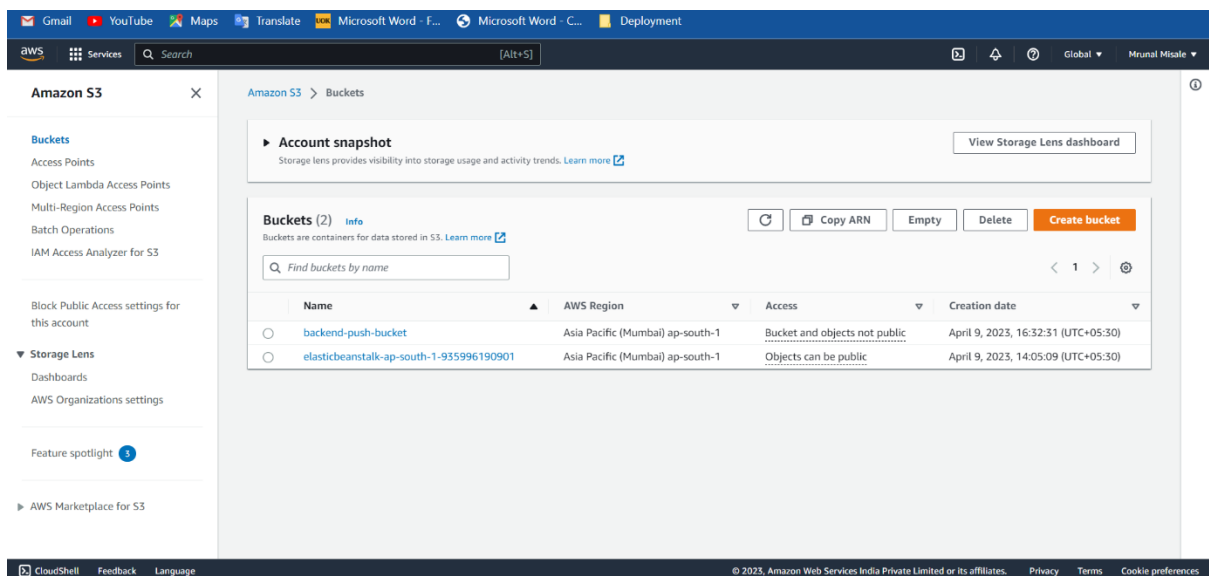
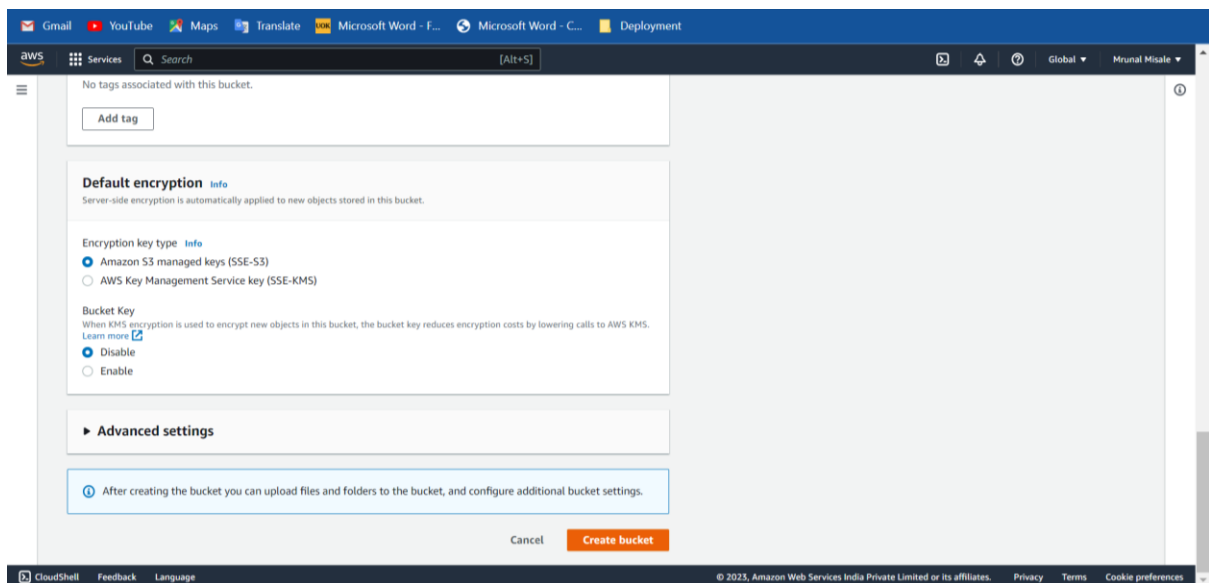
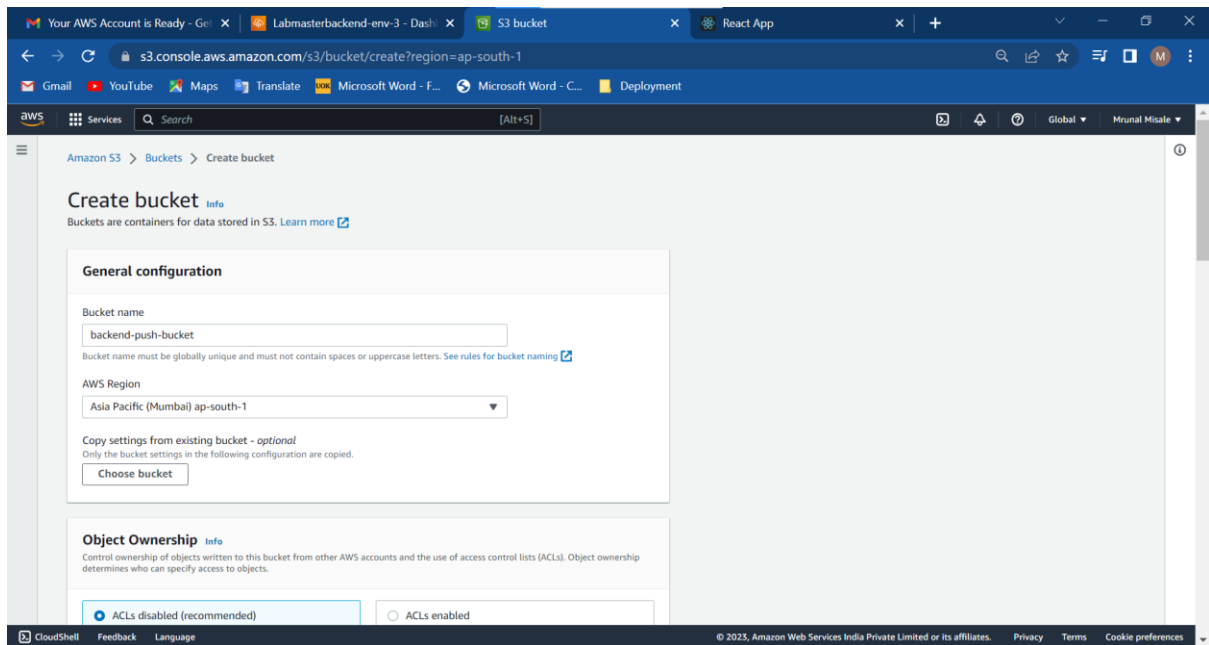


You will be redirected to the application environment page.



Step 5: Go to S3 Bucket for deploying Backend and click on Create Bucket and fill the required information. Choose appropriate AWS Region. Click on Create Bucket. Follow the steps.





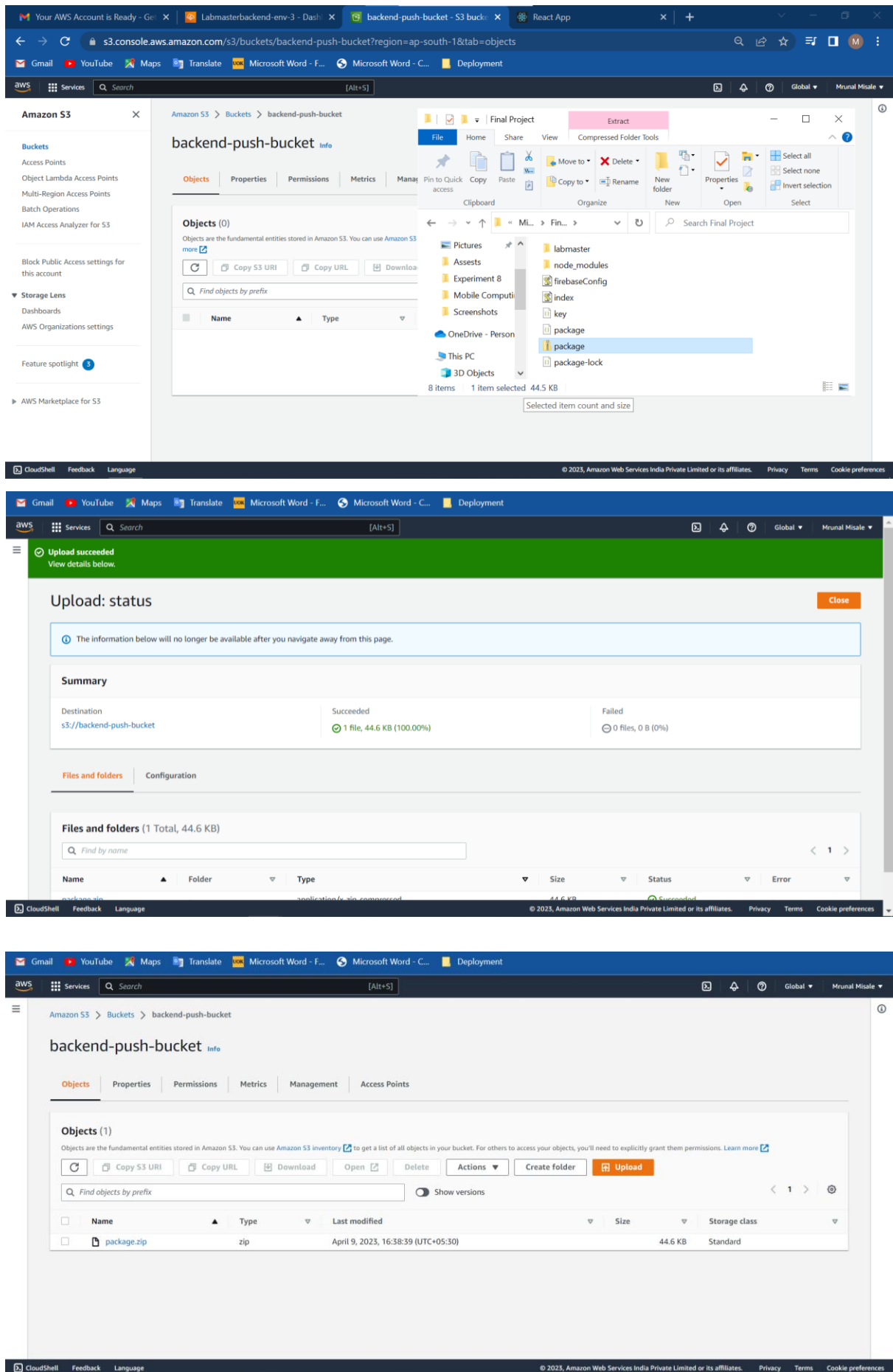
Amazon S3 console view for bucket **backend-push-bucket**. The **Objects** tab is selected, showing 0 objects. The interface includes a sidebar with navigation options like Buckets, Access Points, and Storage Lens. The main content area shows a table for objects with columns: Name, Type, Last modified, Size, and Storage class. A message states: "No objects. You don't have any objects in this bucket." with an **Upload** button.

Amazon S3 console view for bucket **backend-push-bucket**. The **Properties** tab is selected. The **Bucket overview** section displays:

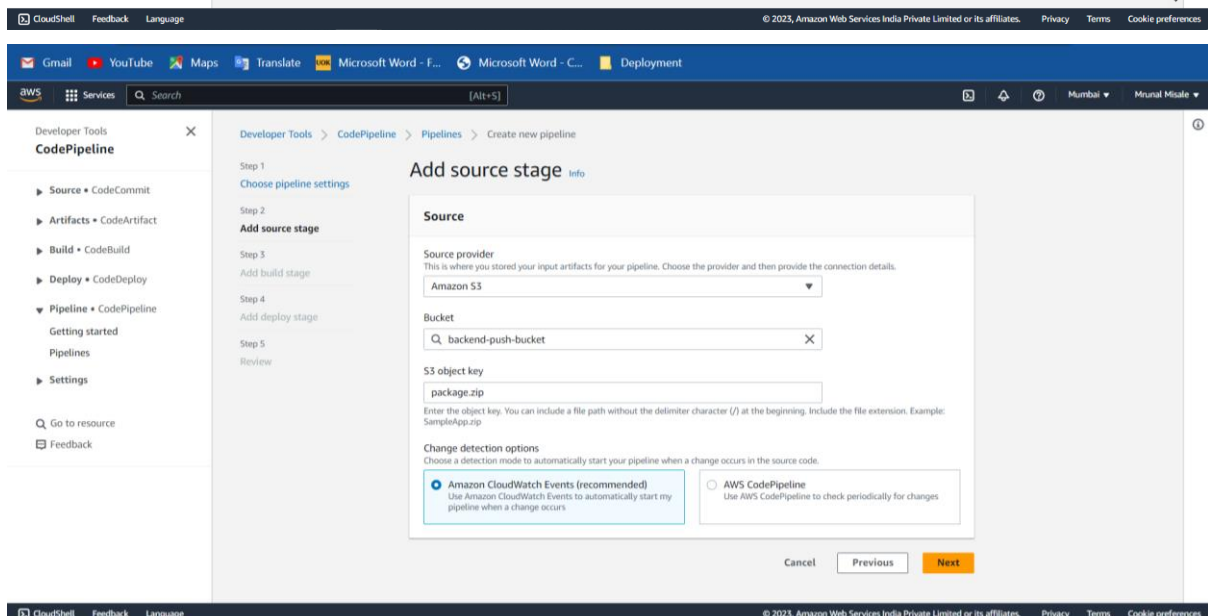
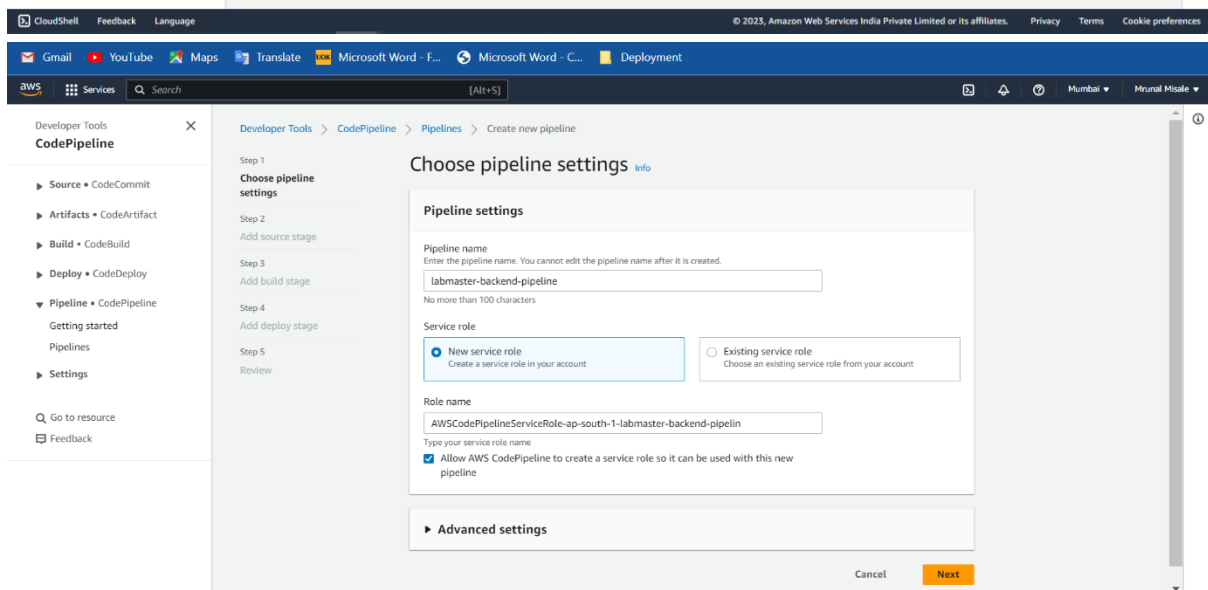
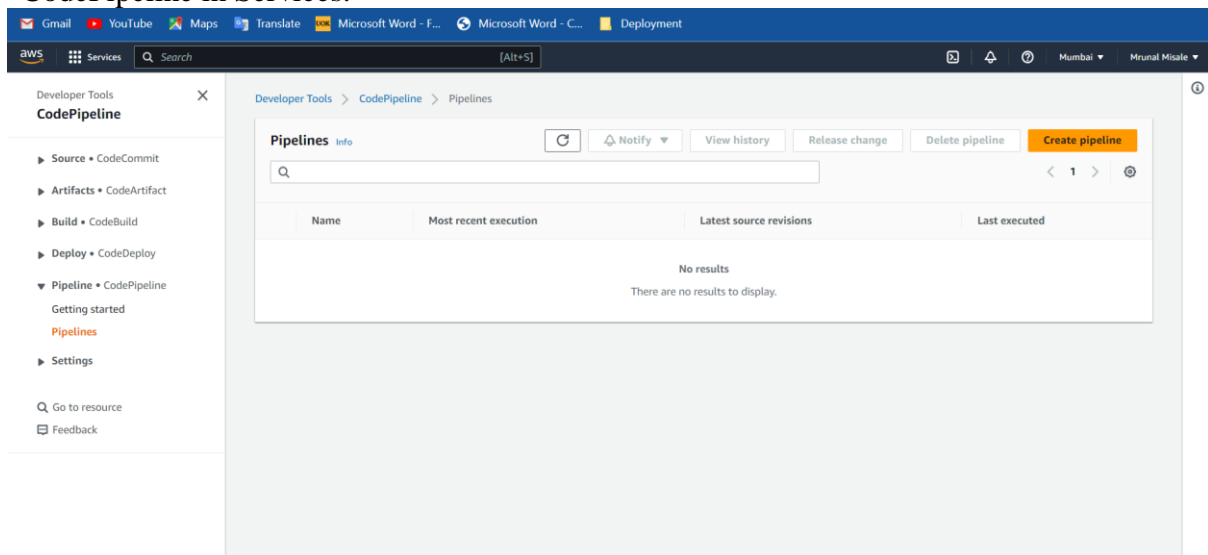
- AWS Region:** Asia Pacific (Mumbai) ap-south-1
- Amazon Resource Name (ARN):** arn:aws:s3:::backend-push-bucket
- Creation date:** April 9, 2023, 16:32:31 (UTC+05:30)

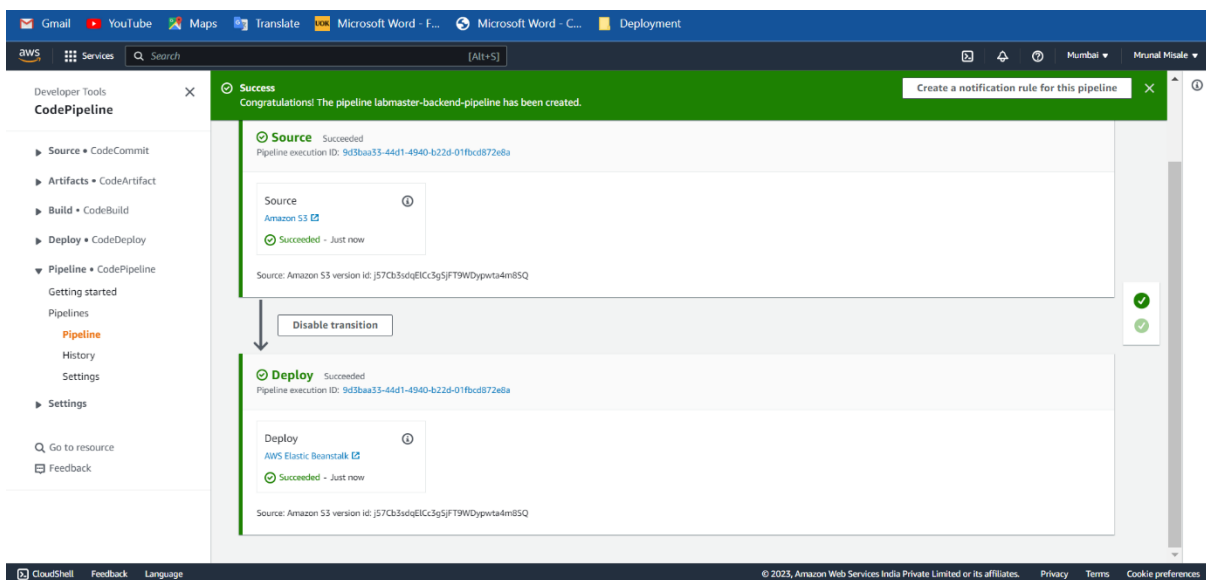
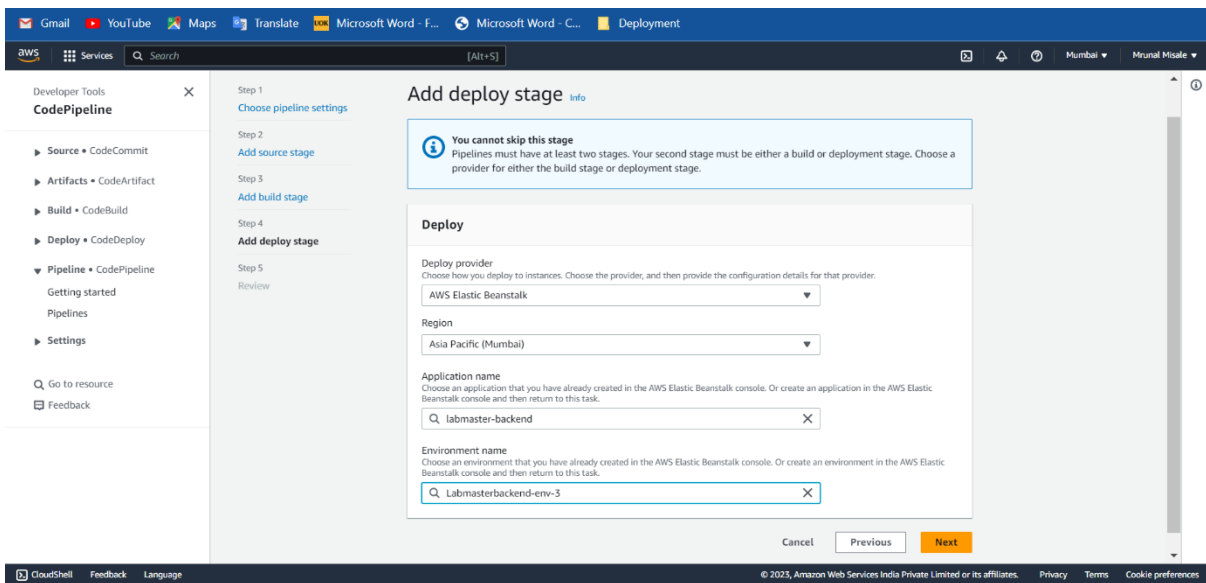
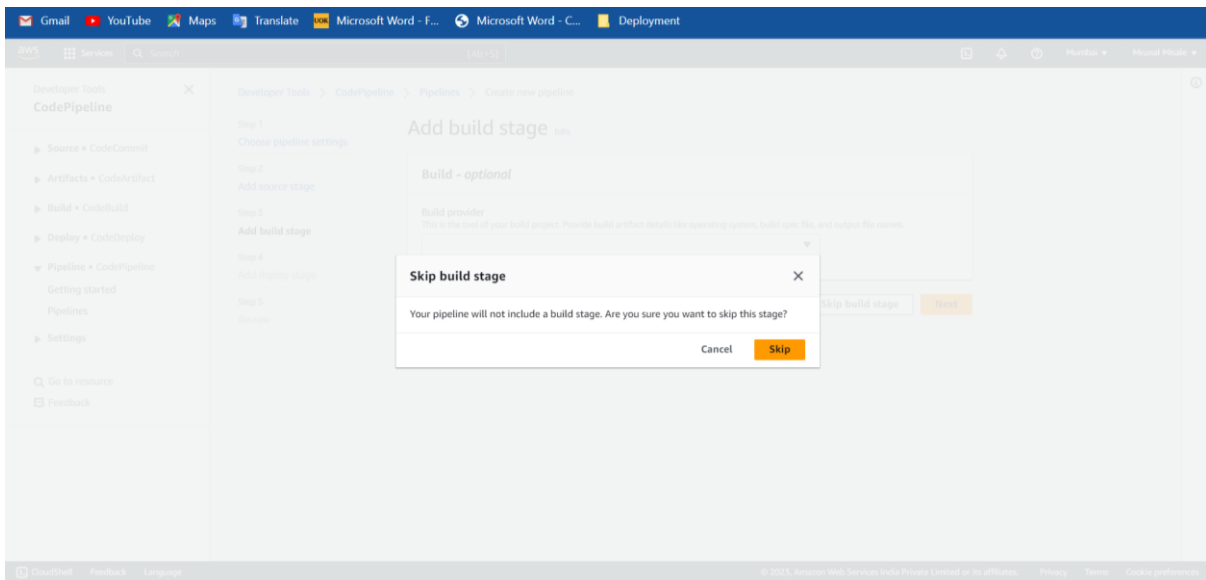
The **Bucket Versioning** section shows that versioning is **Disabled**. A note mentions Multi-factor authentication (MFA) delete settings.

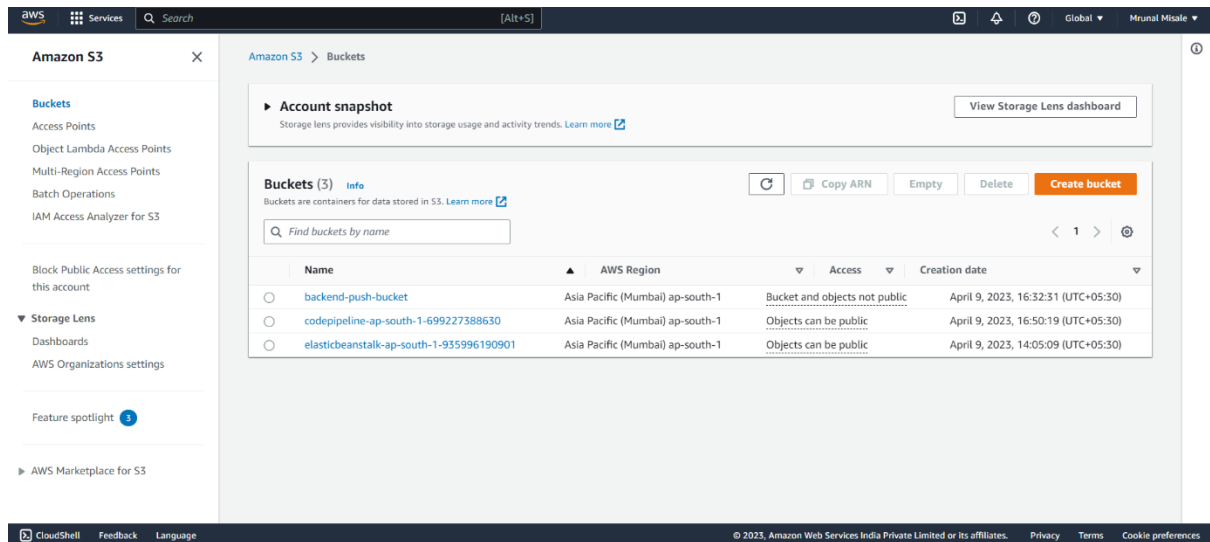
Amazon S3 console view for bucket **backend-push-bucket**. The **Edit Bucket Versioning** page is shown. The **Bucket Versioning** section has the **Enable** radio button selected. A blue information box states: "After enabling Bucket Versioning, you might need to update your lifecycle rules to manage previous versions of objects." The **Multi-factor authentication (MFA) delete** setting is **Disabled**. At the bottom, there are **Cancel** and **Save changes** buttons.



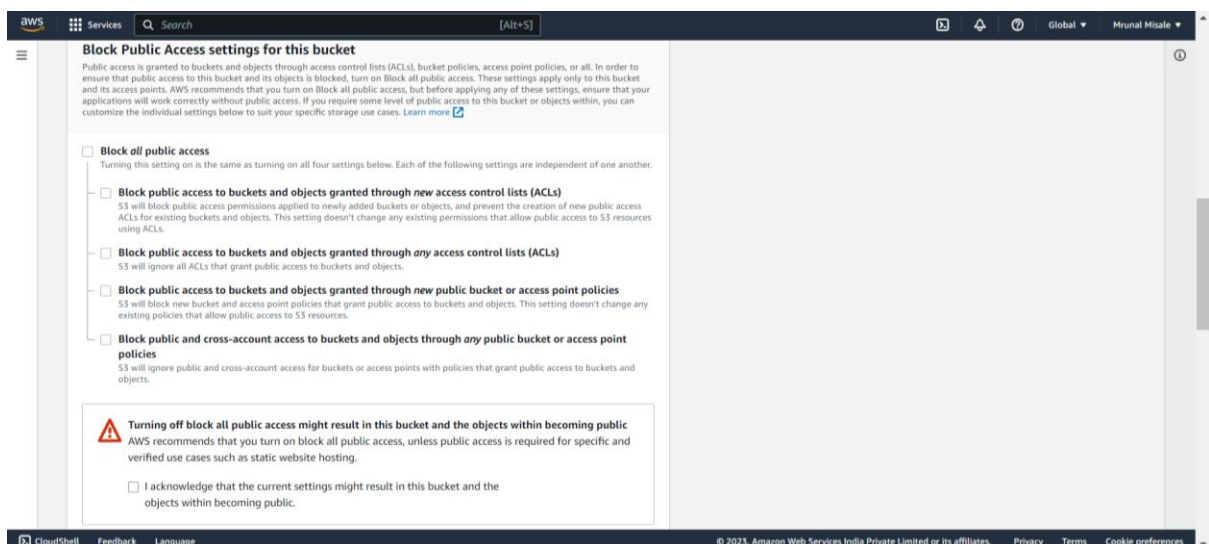
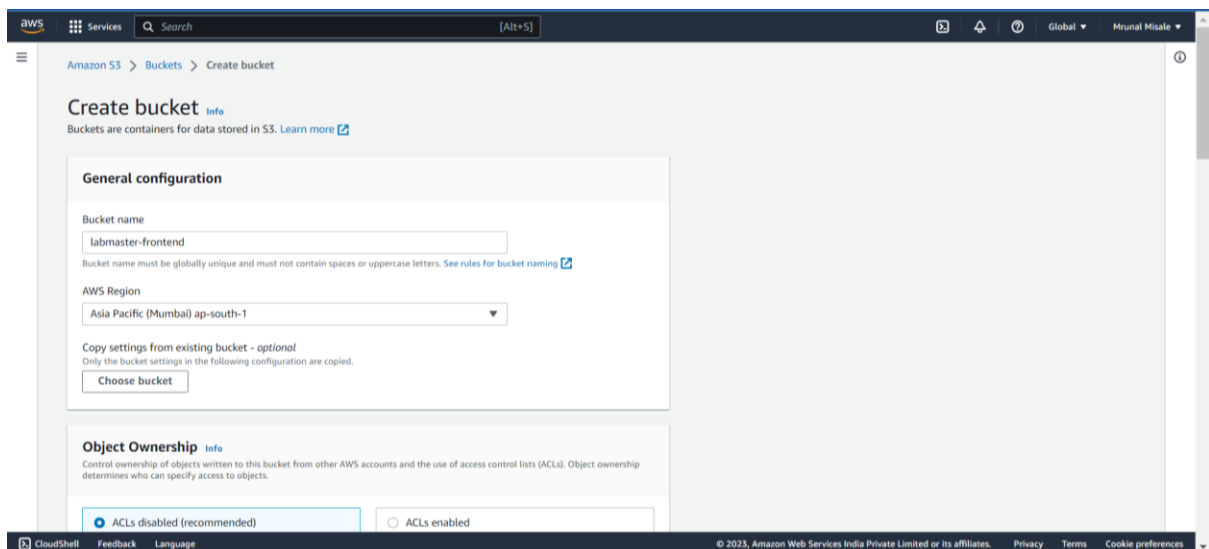
Step 6: Creating CodePipeline to our backend project. Follow the steps according. Go to CodePipeline in Services.

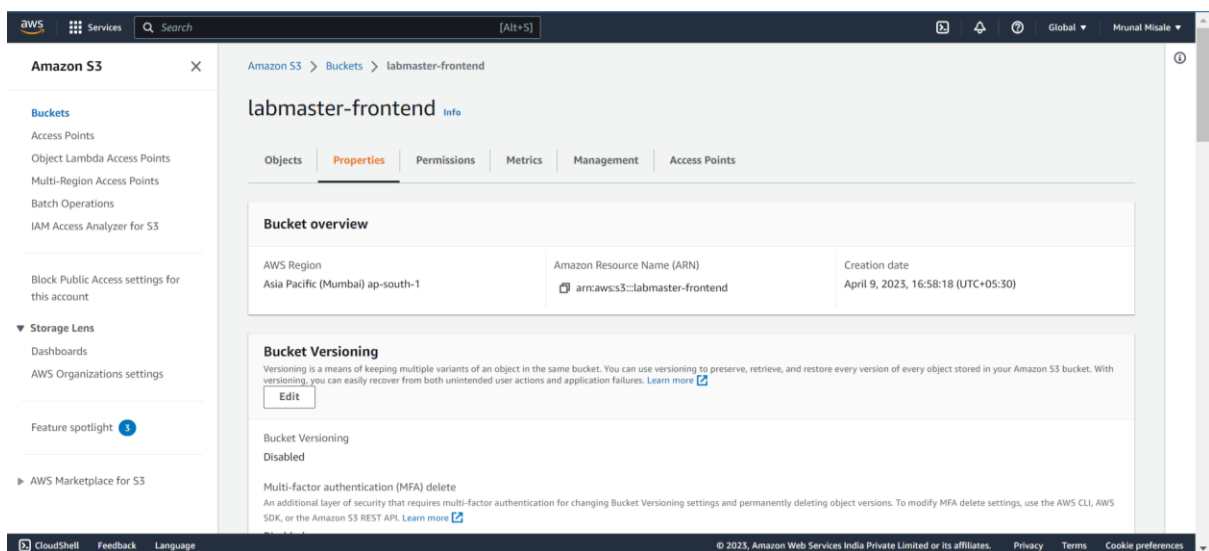
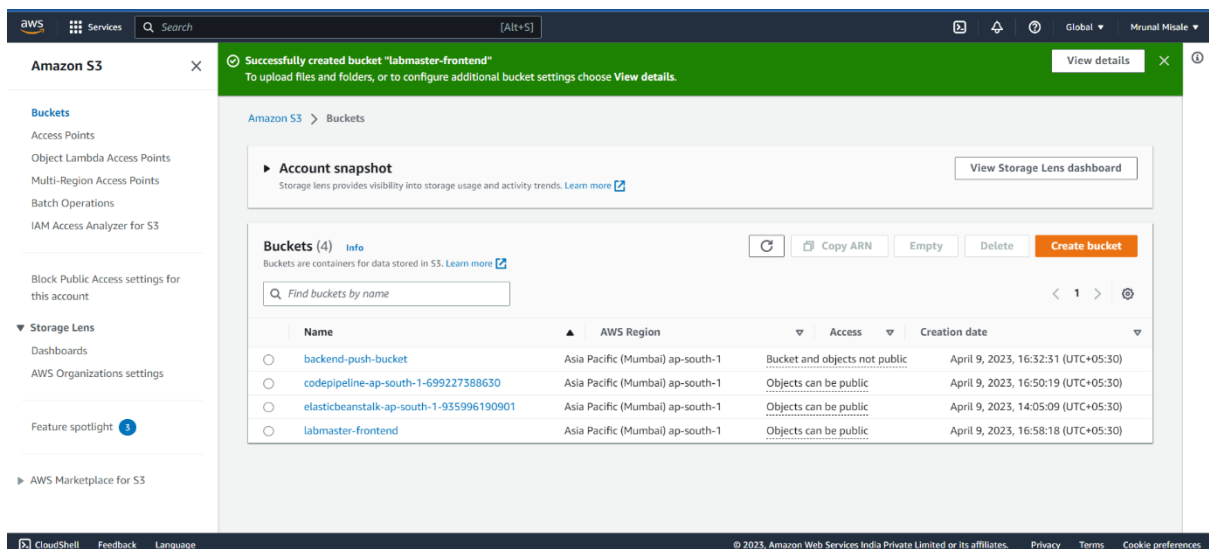
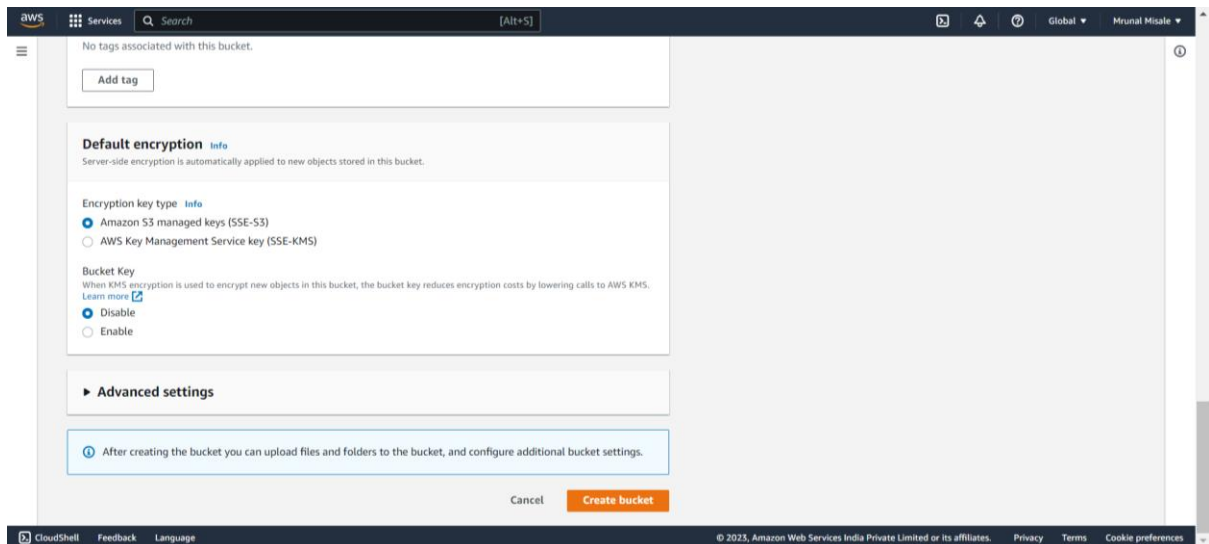


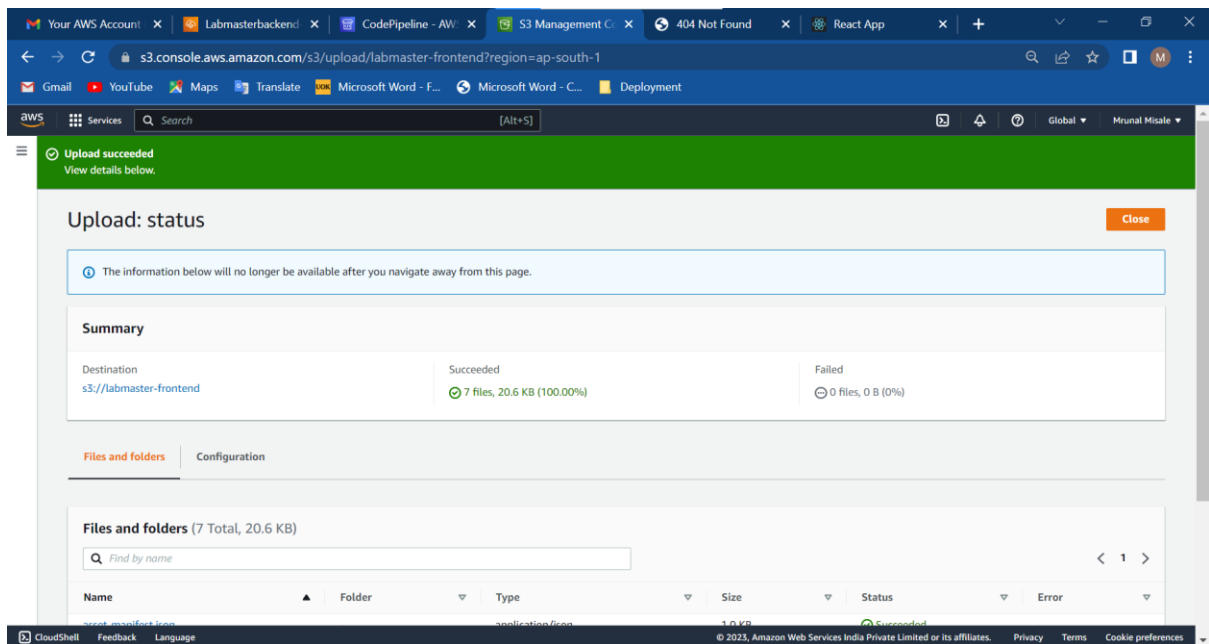
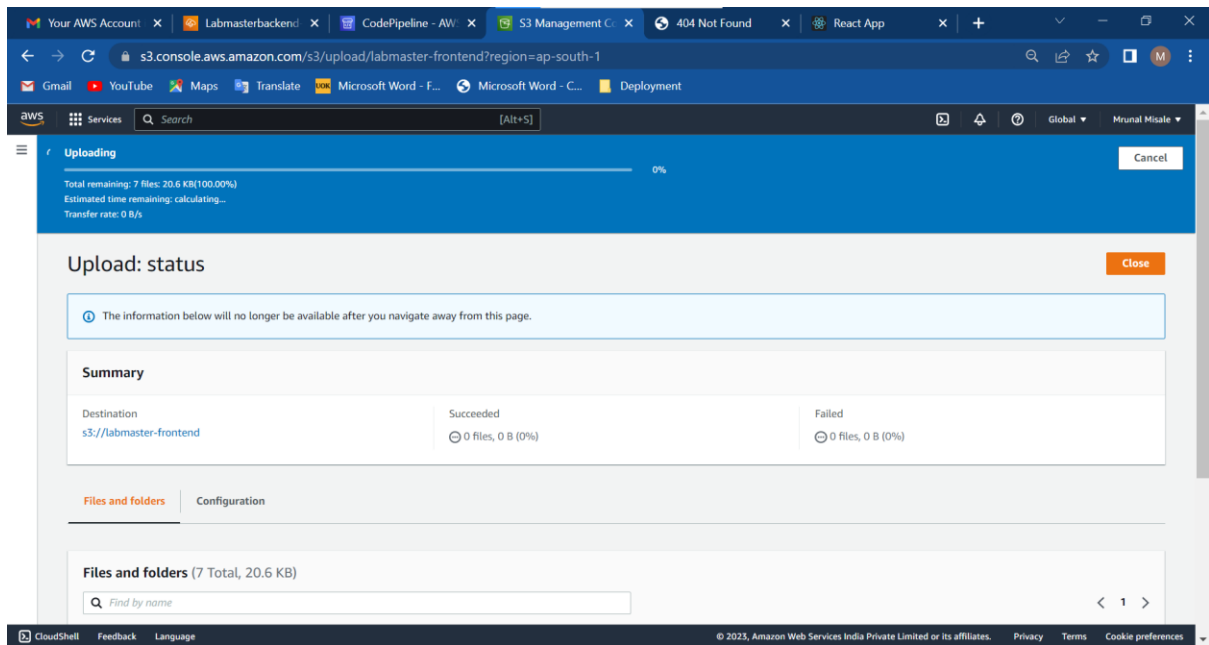




Step 6: Go to S3 Bucket for deploying Frontend and click on Create Bucket and fill the required information. Choose appropriate AWS Region. Click on Create Bucket. Follow the steps.







Chapter 7

Learning Outcome

The cloud mini project called Lab Master, which is a computer lab management system uploaded on AWS Cloud using AWS Beanstalk, AWS CodePipeline, and AWS S3 Service, provides a unique opportunity to learn about cloud-based application deployment and management. By working on this project, learners can gain hands-on experience in building scalable and fault-tolerant web applications on the cloud using various AWS services. They can also learn how to use AWS CodePipeline to automate the entire software delivery process, including building, testing, and deploying applications. Additionally, learners can gain insight into the different cloud deployment models and how to optimize the deployment process to meet the unique needs of their organizations. Overall, working on the Lab Master project can help learners acquire practical skills and knowledge essential for a career in cloud computing.

By completing a cloud project that utilizes AWS Beanstalk, AWS CodePipeline, and AWS S3 Service, learners can develop a deep understanding of cloud-based application development and deployment. They will gain practical experience in designing, building, and deploying scalable, fault-tolerant web applications on the cloud. Additionally, they will gain familiarity with AWS CodePipeline, which automates the entire software delivery process, from building to testing and deployment. Through working with AWS S3 Service, learners can learn how to effectively store, manage and access data on the cloud. Overall, learners can expect to develop valuable skills in cloud computing, such as understanding of cloud deployment models and optimizing deployment processes, which can help them build a strong foundation for a successful career in the field.