FEASIBILITY REPORT

CSCI 5410 – Serverless Data Processing

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Introduction

The company DALSoft5410 is working towards building a serverless SafeDeposit that will use a multi-cloud deployment model and a BaaS (Backend-as-a-Service) model. The features like customization of services and additional services offered to authorized users, whereas restricted services to the visitors are offered by the SafeDeposit application being developed. Along with all the above features, SafeDeposit will also provide an online virtual assistant that will assist the users in query resolution and allow authorized users to pass messages among them.

The SafeDeposit application will have three types of authorized users who can access the system via multi-factor authentication. On successful authentication, the user can leave a message for other authorized users and upload pictures of objects. The user authorized to access the SafeDeposit will be notified if certain criteria of the image uploaded are met. The authorized users are also able to withdraw money from the SafeDeposit.

Core Components

The SafeDeposit project of DALSoft5410 can be summarized to be composed of seven core components or modules. These modules cover everything from the front-end to the back-end of the SafeDeposit application making it robust and easy to use. Each module is built using either Amazon Web Services (AWS) or Google Cloud Platform (GCP) as a multi-cloud deployment model is used.

Module 1: User Management

The User Management module covers registration and login of the authorized and guest user and storing and retrieving their details when needed.

Tasks	Selected Cloud Service
Signup + Login + Validation Tasks	Amazon Web Services (AWS)
Managing + Storing User Details	Amazon Web Services (AWS)

The reason for choosing AWS instead of GCP is its ease of use and scalability. The User Management module needs a service supporting data storage and access based on various access rights.

Module 2: User Authentication

The User Authentication module focuses on Multi-Factor Authentication of users. There are three stages of authentication performed to ensure the security of the application. The first-factor authentication is done through ID and Password, whereas the second-factor authentication is done through Question and Answer. Finally, the third-factor authentication is done through Caesar - Cipher.

Tasks	Selected Cloud Service
First Factor (ID-Password)	Amazon Web Services (AWS)

Second Factor (Question-Answer)	Google Cloud Platform (GCP)
Third Factor (Caesar-Cipher)	Amazon Web Services (AWS)

Using a combination of Amazon Web Service (AWS) and Google Cloud Platforms (GCP) for this module is done because of seamless integration and data passing between cloud providers. The main reason for choosing a multi-cloud model for authentication is to enhance security using the best of both service providers.

Module 3: Online Support

The Online Support module focuses on deploying a virtual assistant for all different access type users throughout the application. Though the operations vary from user type to user type, for the guest users, the virtual assistant will guide them with registration difficulties. In contrast, for the authorized users, the assistant will assist them with forgot passwords or even with managing their profiles.

Tasks	Selected Cloud Service
Virtual Assistant for all types of users	Amazon Web Services (AWS)

The main reason for choosing AWS is because it provides an in-built flexible chatbot service with customizable features.

Module 4: Message Passing

As the name suggests, the Message Passing module is a feature that helps authorized users of the same SafeDeposit box communicate and be notified of the changes. This module notifies a user of that particular SafeDeposit box if any other user has carried out any transactions.

Tasks	Selected Cloud Service
SafeDeposit box user's communication	Google Cloud Platform (GCP)

The reason for choosing GCP for the messaging module is because of the real-time notification requirement, and GCP has an easy-to-use service for the same.

Module 5: Machine Learning (ML)

The main focus of the Machine Learning (ML) module is the classification of the uploaded images. The authorized users upload images in the SafeDeposit application, which the system needs to read and classify using ML algorithms and assign an appropriate score.

Tasks	Selected Cloud Service
Classification of Uploaded Images	Google Cloud Platform (GCP)

The reason for using GCP for this ML task is because it contains a classification algorithm.

Module 6: Web Application and Hosting

To build a robust and real-time rendering web application, we will use React.js and Node.js as both are easy to use, flexible, easily integrable, and lightweight.

Tasks	Selected Cloud Service

Application Hosting	Google Cloud Platform (GCP)

Programming Languages:
Front-End Technologies: React.js
Back-End Technologies: Node.js + Express.js

Module 7: Testing, Report Generation and Visualization

The Testing, Report Generation, and Visualization module focus on testing the web application built using cloud services to identify the errors and testing fault tolerance. At the same time, the report generation and visualization focus on the statistics of the application.

Tasks	Selected Cloud Service
Testing	Amazon Web Services (AWS)
Report Generation	Amazon Web Services (AWS)
Visualizations	Google Cloud Platform (GCP)

The AWS has services that provide testing and report generation functionalities, whereas the GCP provides services for visualizations.

Architecture

Figure below shows the architecture of the application DalSoft5410 – SafeDeposit.

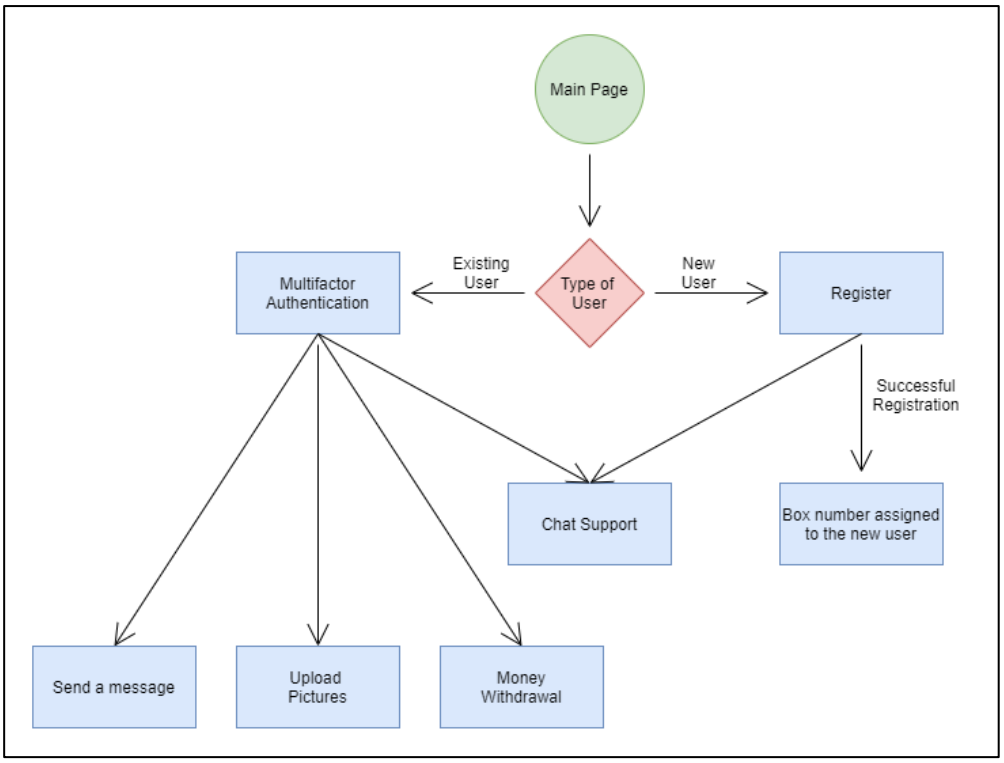

Figure 1 - Application Architecture [3]

Class Diagrams

Figure below shows the class diagram of the application DalSoft5410 – SafeDeposit.

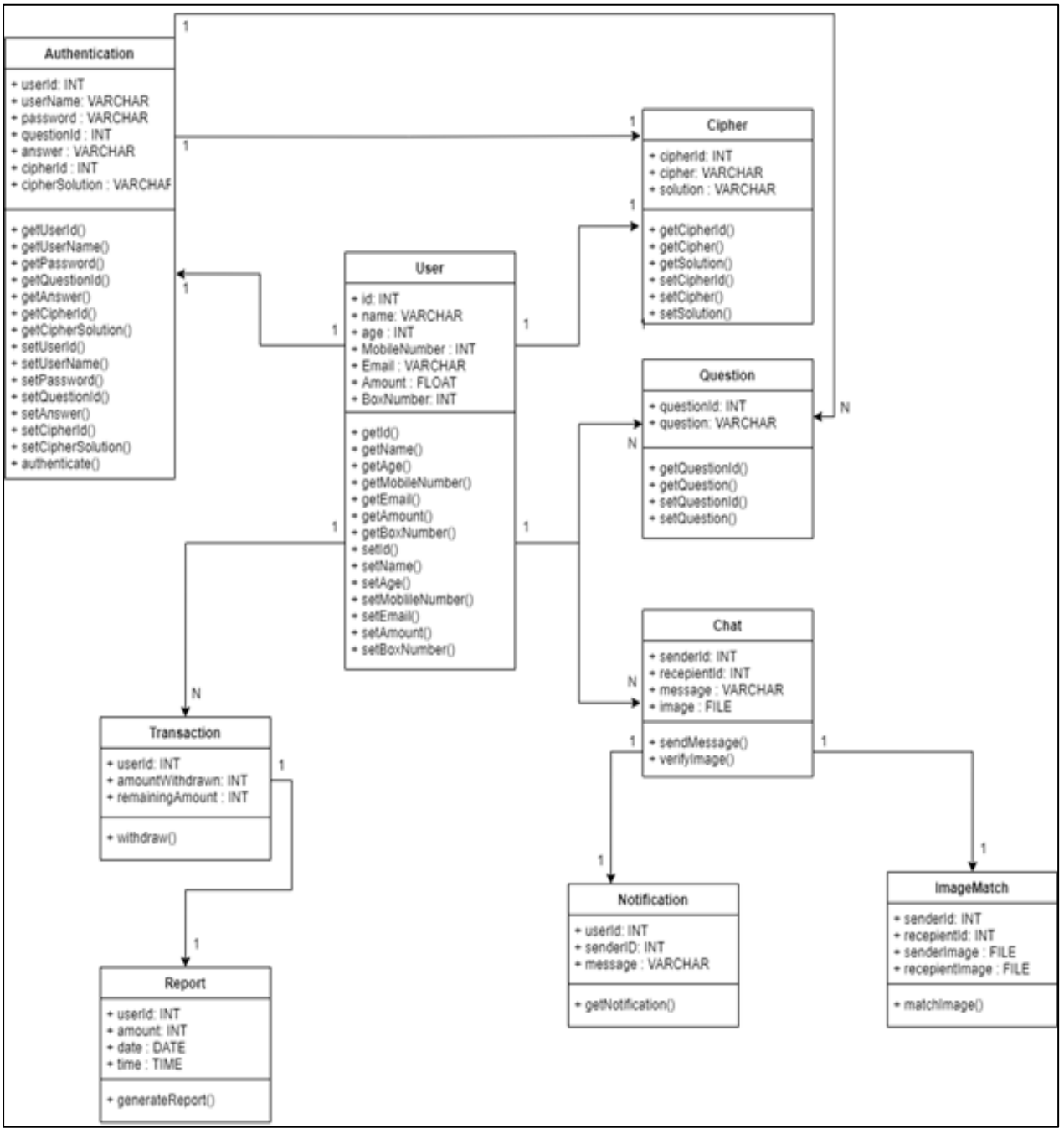

Figure 2 - Application class diagram [3]

Challenges

The course project work focuses on working with various components of any application such as authentication, profile management, information delivery, record maintenance, etc. The implementation of these components involves development of these using the libraries and frameworks in the MERN stack, object-oriented concepts, Amazon Web Services (AWS) services and their integration with SDK to be implemented using Java. Based on the implementation requirements, following are the challenges that need to be addressed:

- Shortcomings in the usage of AWS and GCP: The services and tools offered by AWS and GCP help in building value-based solutions. However, these services are provided with certain limits such as services offered based on regions, account type like student.
- Pricing of plans and services included in them: The various services offered by AWS and GCP are accessible with a wide range of plans but each plan covering very less number of services.
- Skill enhancement: Team members are not as skilled in the technology stack used for the project and hence this can consume a lot of time to arrange for their learnings and hands-on experience in the same.
- Regulations and policies of the cloud service providers: The service providers focus on maximizing the profit and hence have restricted the use of these services in the plans utilized for the project.

Project Timeline

The project development lifecycle phases covered while planning the development and release of the project are:

- Requirement check and analysis
- Feasibility Analysis
- Configuring project for implementation
- User Authentication and User Management
- Online support
- Machine Learning
- Web application development
- Testing
- Deployment

Planned Milestone	Start Date	Days needed to Complete
Requirement Check and Analysis	20-09-2021	4
Feasibility Analysis	24-09-2021	13
Configuring project for implementation	07-10-2021	2
User Authentication and User Manager	09-10-2021	10
Online support	19-10-2021	11
Message passing	30-10-2021	11
Machine Learning	10-11-2021	12
Web application development	22-11-2021	12
Testing	29-11-2021	7
Deployment	08-12-2021	9

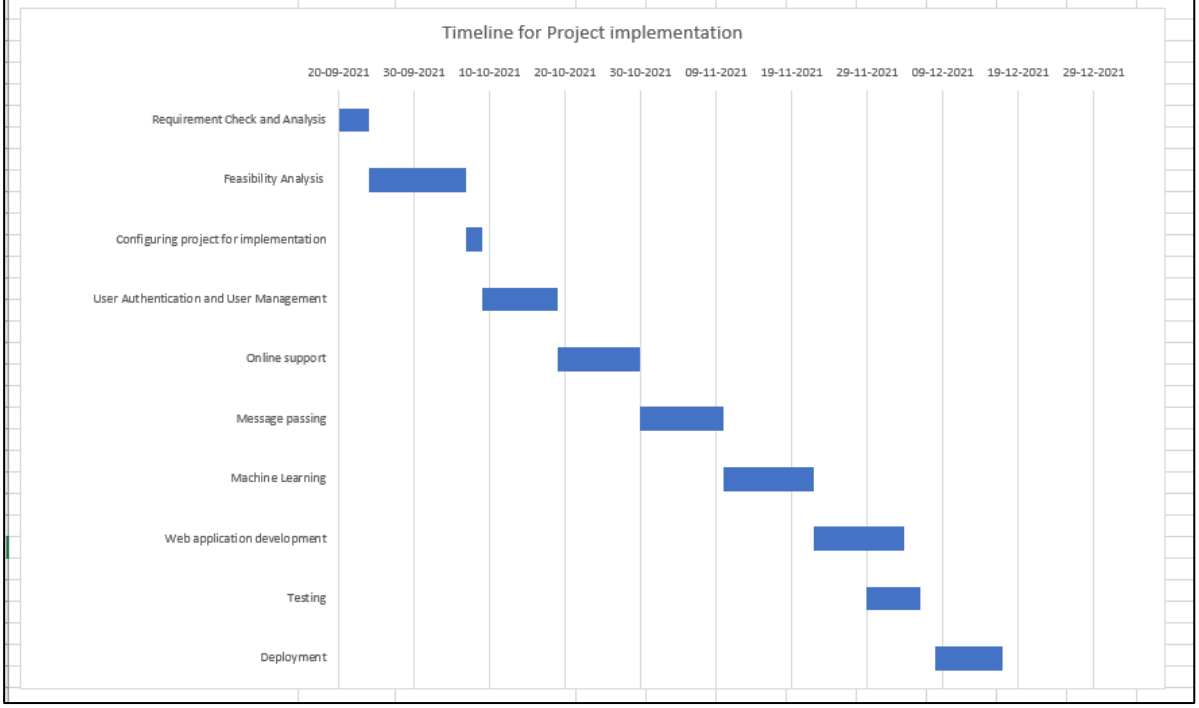

Figure 3 - Timeline for the project implementation

Strength and Weakness

Team member 1: Dhrumil Amish Shah (B00857606)

Strength:

- Possesses a good understanding and skilled with AWS, GCP services such as Amazon EC2, DynamoDB, S3, Amazon Lex and many more.
- Experienced working with projects implementing object-oriented concepts and primarily focused on programming language such as JAVA.
- Good interpersonal skills.
- Experienced working with web development applications and frameworks such as React, Express and Node.

Weakness:

- No expertise in implementing solutions based on AWS and GCP services.

Team member 2: Dhrumil Rakesh Shah (B00870600)

Strength:

- Great communicator with a good essence of teamwork.
- Familiar with various services of AWS and GCP like EC2, S3, DynamoDB and many more.
- Experience implementing solutions based on object-oriented concepts
- Experienced with web technologies such as React, Express and Node

Weakness:

- No experience working in AWS and GCP implemented services.

Team member 3: Sanket Ushangbhai Mehta (B00881783)

Strength:

- Familiar with object-oriented programming languages such as JAVA.
- Sound knowledge in the basics of AWS and GCP services.

Weakness:

- No hands-on experience in implementing AWS and GCP services.

Meeting logs

Meeting **1**

Meeting date – Tuesday, October 5, 2021
Meeting title – Introduction and Task Division
Meeting MoM – 25m 42s

- Team members introduction.
- Overview discussion of the project.
- Project explanation.
- Tasks distribution.
- Project timeline discussion.

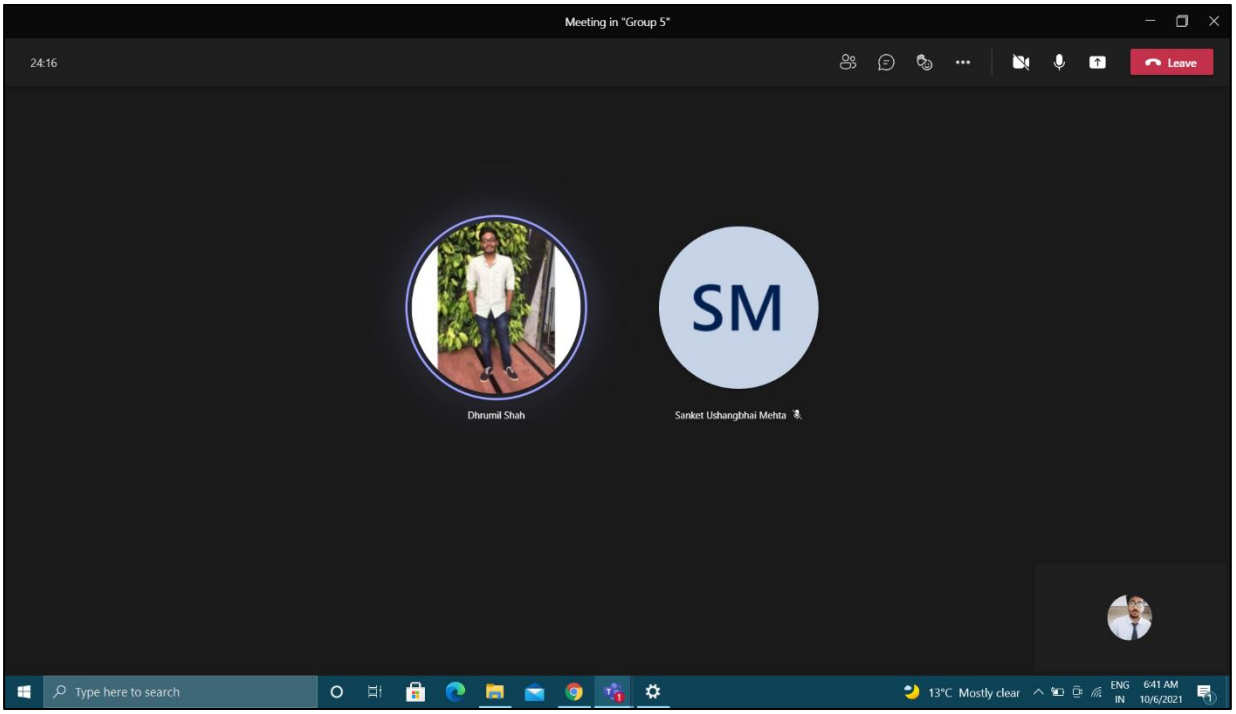

Figure 4 - Meeting 1 - Introduction and Task Division on Tuesday, October 5, 2021

Meeting **2**

Meeting date – Wednesday, October 6, 2021
Meeting title – Analysis of the services
Meeting MoM – 32m 55s

- Analysis of different services for the project.
- Finalizing the services.
- Implementation of the project specific problems discussion.

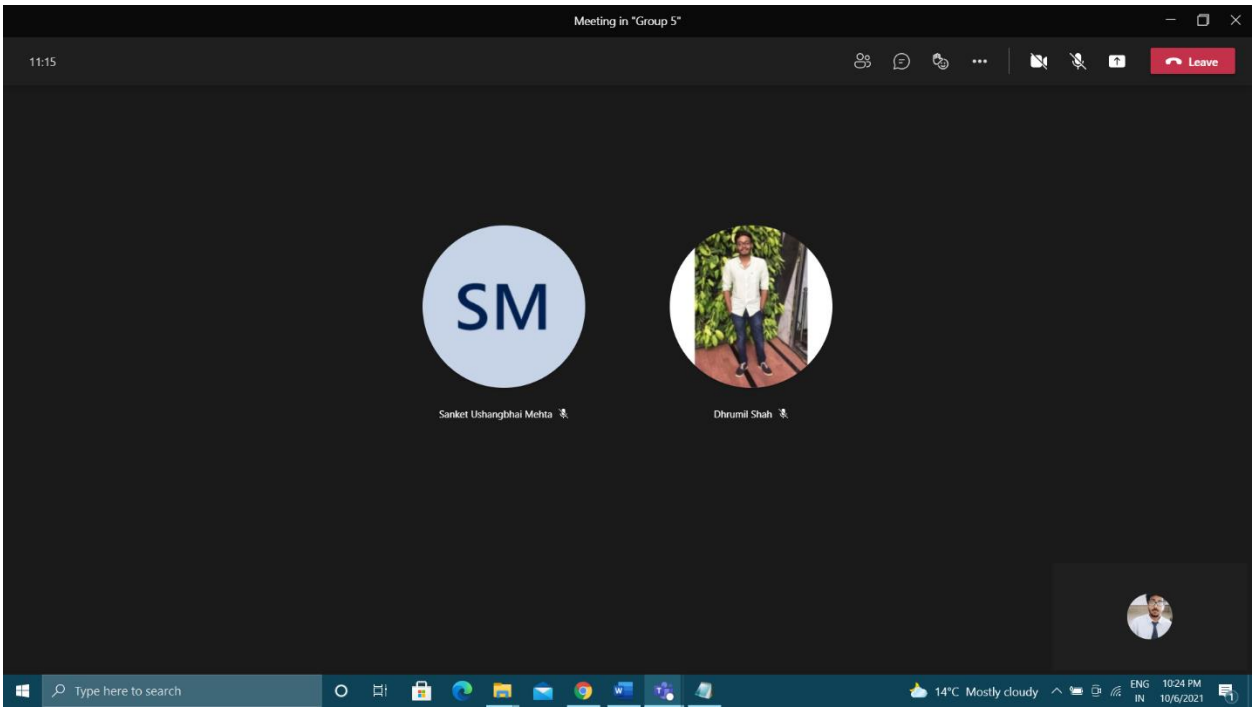

Figure 5 – Meeting 2 – Analysis of the services on Wednesday, October 6, 2021

Meeting **3**

Meeting date – Thursday, October 7, 2021
Meeting title – Final report analysis
Meeting MoM – 10m 39s

- Discussion about questions and concerns.
- Verifying the report.
- Making final modifications.

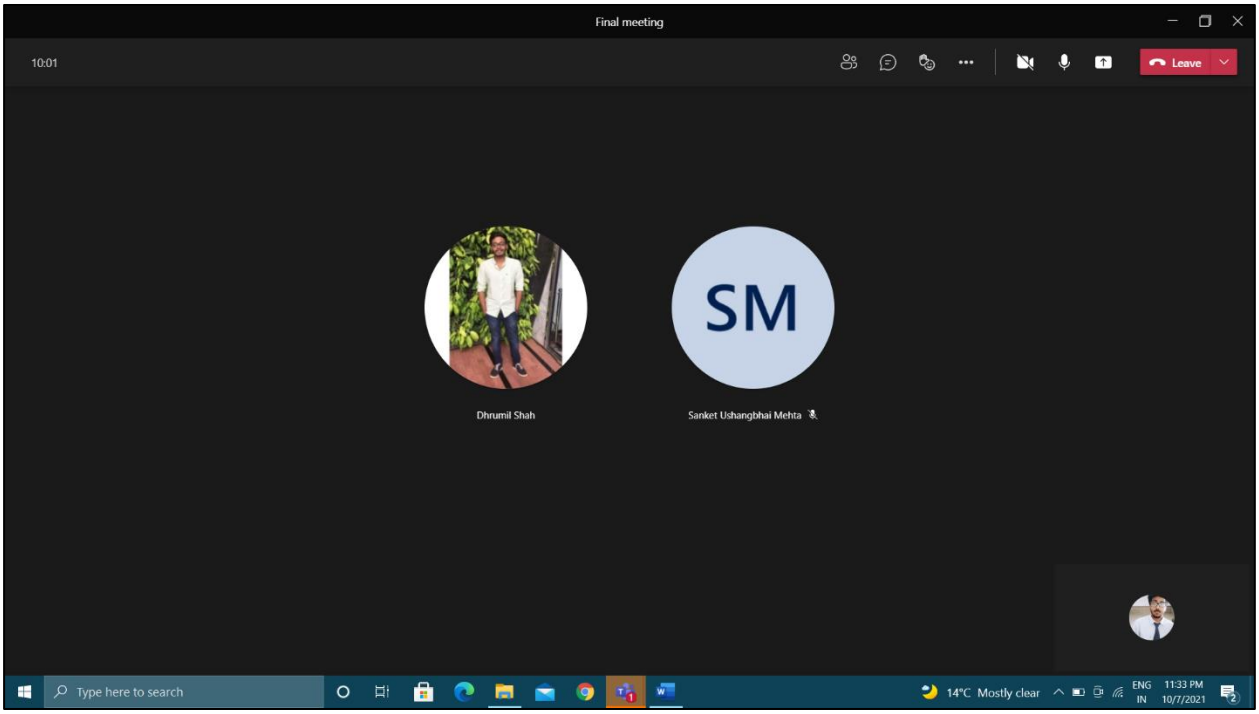

Figure 6 - Meeting 3 - Final report analysis

REFERENCES

[1] Cloud Services - Amazon Web Services (AWS), Amazon Web Services, Inc. 2021. [Online] Available: https://aws.amazon.com/?nc2=h_lg [Accessed: 4 October 2021].

[2] Products and Services | Google Cloud, Google Cloud. 2021. [Online] Available: https://cloud.google.com/products [Accessed: 4 October 2021].

[3] Flowchart Maker & Online Diagram Software, App.diagrams.net, 2021. [Online] Available: https://app.diagrams.net/ [Accessed: 5 October 2021].