Functional Specification

CA400

INTENDI

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1. Introduction

1.1 Overview

Intendi is a web application built for a variety of supported web browsers. The aim will be to help lecturers improve and create much more engaging presentations/course material by giving data/feedback on what students seemed to engage with more and what they did not find of interest. This will in turn hopefully allow students to access much more interesting and engaging content.
The lecturer will receive highly beneficial feedback from students through our web application by recording students, provided they have given permission. This will occur while they watch pre-recorded lecture videos on our website. Our facial analysis will then be able to recognize useful details such as emotion, eye movement and facial landmark direction. This will give valuable information like engagement and it can also determine when students are skipping, pausing and other playback features, while watching the videos.
Students' identities will be kept completely anonymous. This application will also take away some need for the end of module feedback forms which more often than not, are ignored by students. This way lecturers can get much more frequent feedback and also feedback for specific videos or topics.
Students will be able to securely sign up with a valid DCU email address and log on to the web application and then join modules they are taking. Once they join they will be able to see course videos which they can then watch. When they click on a video they are prompted to provide permission for their webcam to record, once they accept, when they press the play button the recording will begin. The video will then be analysed and the data extracted. This will then be reported to the relevant lecturer for them to see as anonymized data. They will be able to see useful information to see different feedback and reactions to the video. Different bar charts and graphs will generate a beautiful rich feedback report.

1.2 Business Context

Intendi has potential in numerous markets especially in the current climate with remote learning and working, this is no longer forecast as a temporary trend as many workplaces are looking into more permanent remote options. One of our target markets is the education sector. Intendi can be utilised by universities, colleges and schools as a way to constantly improve their academic performance through making their course/module content more engaging by assessment of past lectures and engagement levels of attendants. This would be a major selling point as many students are unlikely to provide honest feedback if any at all when presented with a survey or form to fill out.

With our application, Colleges can take advantage of direct honest feedback from students by getting raw data on the course group and their reaction to a particular topic or section of the presentation without needing students to fill out any forms/surveys while also allowing them to remain anonymous as they watch course videos provided by the lecturer as part of their learning, something required by students on a day-to-day basis within their modules. This data then allows lecturers to see what parts of the presentation students engagement levels may have dropped off and gives them the opportunity to reformat their slides for this section to see if it increases student engagement.
The project has a huge amount of scope. Further down the line of the web application, another target market for it could be towards numerous companies from small to medium (SMEs) to also large multinationals. They could use our web application to get genuine feedback on products, adverts, business presentations, meetings, online events and more. For example, if a company was to release a new Christmas advertisement, our application could detect the emotion and different aspects of how attentive their test user is while watching the advertisement during the consumer testing stage of development. The feedback they would receive could allow them to determine whether or not they need to change different parts to improve customer engagement in turn leading to an increased positive effect of the final product before it reaches consumers and the potential to remove any possible faux-pas before public release.

1.3 Glossary

- API - Application programming interface
- AWS - Amazon Web Services
- Rekognition - AWS service for facial recognition
- DynamoDB - AWS based database
- S3 Bucket - AWS based blob storage database
- Lambda - Computing service that runs code in response to events

2. General Description

2.1 Product / System Functions

User Sign-Up: The user will visit the website through their web browser. Next, the user will be prompted to sign up/sign in. Within signup the user will be asked for a valid DCU email and also for a password. The user's information will be stored in an external database. This will allow the user to access their account from any computer.

User Login Once a user has successfully signed up with a valid email address, the user will be able to log in with their unique email address and password. If the user's details are not correct, they will not be given access.

Video Playback: Users will be able to watch lectures of modules they are enrolled in. All usual video playback features will be available.

Facial Analysis: As students watch the lectures, our facial analysis will be able to recognize useful details such as emotion, eye movement and facial landmark direction. This will give valuable information such as engagement and it can also determine when students are skipping, pausing and other playback features, while watching the videos.

Feedback Report: Lecturers will receive a feedback report on each lecture. This report will outline parts of the lecture where students had a high or low level of interest. This will allow lecturers to improve their lectures and create more engaging content.

2.2 User Characteristics and Objectives

Overall our aim will be to enable students to give honest, anonymous and useful feedback to lecturers. We then hope this will in return give valuable feedback and data to the lecturer to allow them to seek improvements and insights into their lecture presentations. We will have two different types of users, students and lecturers. Students will log on and watch lectures. Lecturers will log on and analyse their lecture reports. There will be a simple UI so there will not be a steep learning curve to using our website. We will ensure to use colour schemes that do not exclude anyone with visual impairments.

2.3 Operational Scenarios

Unregistered user visits the website: The user will need to create a user account. They will be required to enter their DCU email address and password in order to create an account. All details are to be encrypted and secured in a Cognito user pool. Users on Sign up must verify their email by entering a one time passcode sent to their email address.

Registered users visit the website: The user will need to sign in using their DCU email address and password they previously registered.

Student visits their home page: The student will see a list of their enrolled modules on their home page. If a student clicks on one of their enrolled modules they will see a list of available lectures to watch uploaded by the respective lecturer.

Lecturers visit their home page: The lecturer will see a list of their taught modules. If a lecturer clicks on one of the modules they will see a report for each module in regards to facial analysis data.

Student watches a lecture: Students will be able to watch a lecture by clicking on the lecture from the module page. They will be brought to a new page and the lecture will begin playing once the play button is pressed. Their browser will prompt them to allow webcam access (unless already permitted). The Video will begin to play and the webcam will begin to record.

Lecturer views feedback report: Lecturers will be able to view their lecture reports after a number of students have watched the lecture. They will be brought to a new page with the lecture report on it. This report will outline parts of the lecture where students had a high or low level of interest, emotions, average watch time and much more. This will allow lecturers to improve their lectures and create more engaging content.

Home Button: On each page there will be a home button for both types of users to allow them to return to the respective main page.

2.4 Constraints

Time constraint: We have a finite set of time and will need to manage it carefully by setting personal deadlines. If we have additional time we will attempt to add additional features to the app.

Security constraint: As we intend to store account information we must ensure that the data is secure. Using AWS Cognito, the users passwords will be encrypted to ensure safe and secure data storage.

Privacy constraint: As we intend to use facial images of the users it is our utmost interest to ensure all video is safely and securely transferred and instantly deleted in its entirety once the video process is complete. No personal images or video will be stored or kept.

3. Functional Requirements

3.1 The Databases

Description:

The database will store the lecture videos, the recording of students and the lecture reports. The database will be AWS DynamoDB for the reports and data and an s3 bucket for both lecture videos and recordings.

Criticality:

The database is of utmost importance to our application. Our project is not possible without a database as it stores all necessary information.

Technical Issues:

Information must be stored in an efficient and secure manner and be maintained.

Dependencies:

The database is not dependent on any other requirements.

3.2 Registering a new account/Logging in with an account

Description:

Every user must create an account before using the application. This will require basic information such as a DCU email and password that is then saved to the database. After they register they can then proceed to log in to the application and use the full functionality of it.

Criticality:

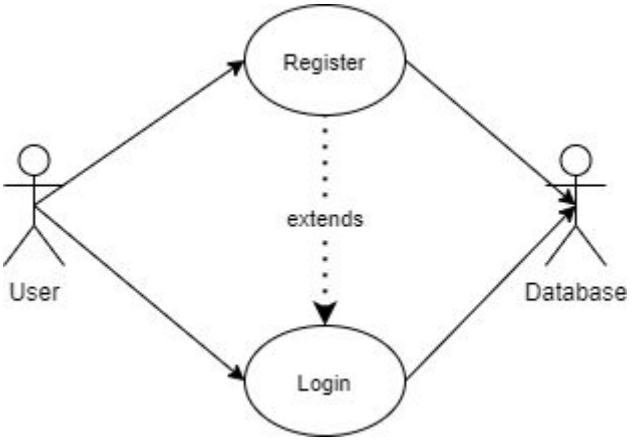
This is a critical functional requirement as without it the person won't be able to access any of the features of our website.

Technical Issues:

It is very important that when the user attempts to create a new account that they can enter all details correctly and all the data is securely saved into our database and no problems such as duplicate emails and non valid emails are saved to it.

Dependencies:

The login system is not dependent on any other requirements.



3.3 Video Playback

Description

Users will be able to watch lectures of modules they are enrolled in. All usual video playback features will be available.

Criticality

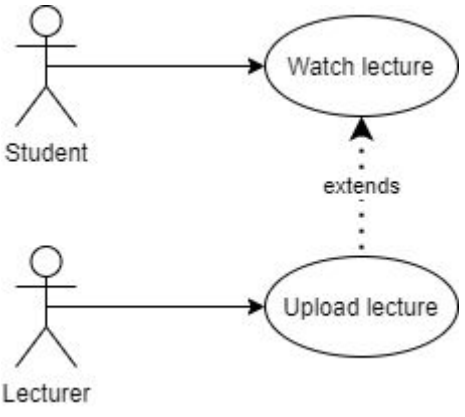
This is one of the main aspects of our website. In order to analyse students as they watch lectures, they must be able to watch lectures.

Technical Issues

Videos must be quickly and readily available for the users to be able to select and watch. Any wrong paths or searches for wrong video ID could lead to problems with video retrieval.

Dependencies

Our video playback is dependent on the database.



3.4 Facial Analysis

Description

As students watch the lectures, our facial analysis will be able to recognize useful details such as emotion, eye movement and facial landmark direction.

Criticality

This is one of the main aspects of our website. In order to create a feedback report for the lecturers, we must perform facial analysis on students as they watch lectures.

Technical Issues

We must ensure that we are able to accurately determine when a student is and is not paying attention. The student must also have a webcam.

Dependencies

Our facial analysis is dependent on the database.

3.5 Lecture report

Description

Lecturers will receive a feedback report on each lecture. This report will outline parts of the lecture where students had a high or low level of interest as well as information such as emotion, where they paused, skipped, average time watching and much more.

Criticality

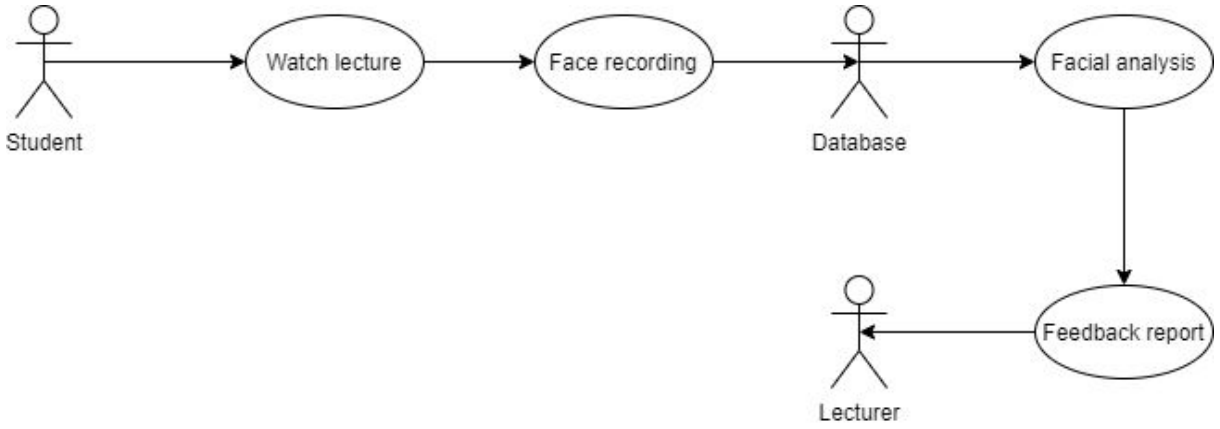
This is one of the main aspects of our website. In order to allow lecturers to improve their lectures and create more engaging content, we must provide them with a lecture report. Without this the recording of students would be not very purposeful.

Technical Issues

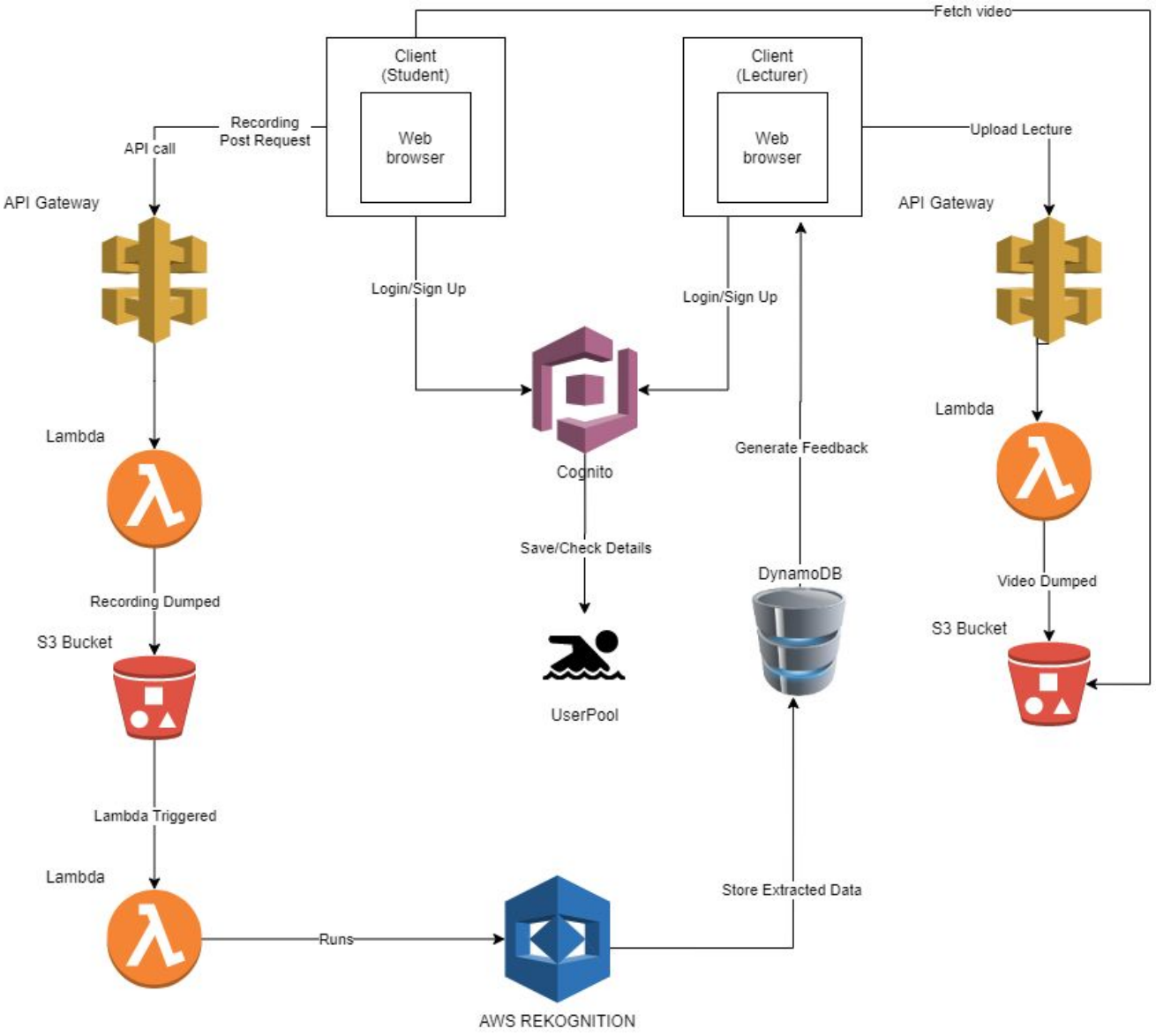
We must ensure that we can accurately create an easy to read report for the lecturer to read with useful and accurate information.

Dependencies

The creation of the lecture report is dependent on the database and facial analysis.


Student
Watch lecture
Face recording
Database
Facial analysis
Feedback report
Lecturer

4. System Architecture



Seen above is a provisional system architecture. It is yet to be finalised and we will continue to research other options for best compatibility. The above we will use for our basis of how we envision the system to work. It benefits us to have this sort of diagram to view any potential flaws in our design as well as areas we may choose to use a different approach. It is also useful when it comes to building the application so we know what we must set up or what we should be working on firstly.

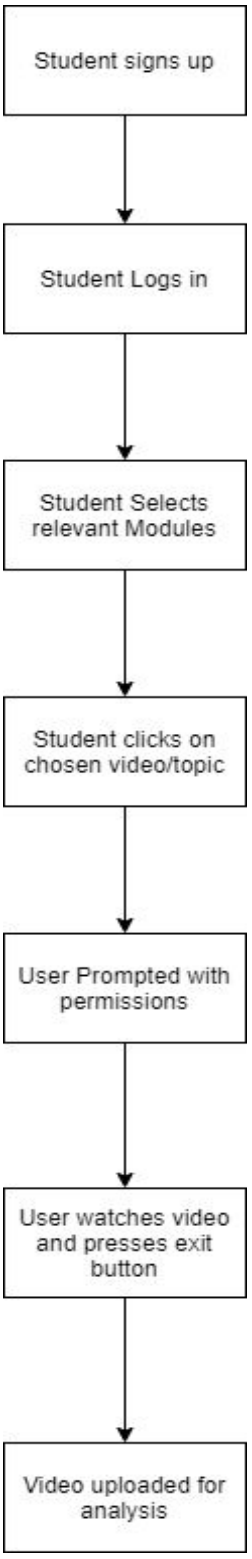
We are aiming to have a completely serverless web application by using the AWS services. The user will watch a uploaded lecture video which has been uploaded by a lecturer into a S3 bucket. While they watch their webcam will be recording them. Once they press the exit lecture button the recording will be sent using the API Gateway to a lambda function will be

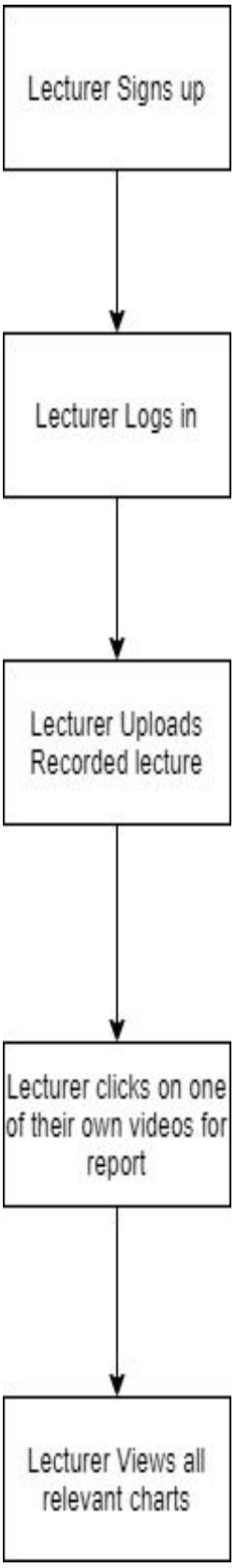
called and used to upload the recording of the student to an S3 bucket. When it is uploaded another Lambda will be automatically triggered to then begin the process of AWS Rekognition. This will analyse the video and once it retrieves all the needed useful information it will save it to a DynamoDB database. From here the lecturer will be able to retrieve the information and get a generated report of it and see some general feedback and response to the related video/topic.

As for the user logins, we plan to implement a cognito based security system at the moment, due to it working very well with the other AWS services such as the S3 bucket.

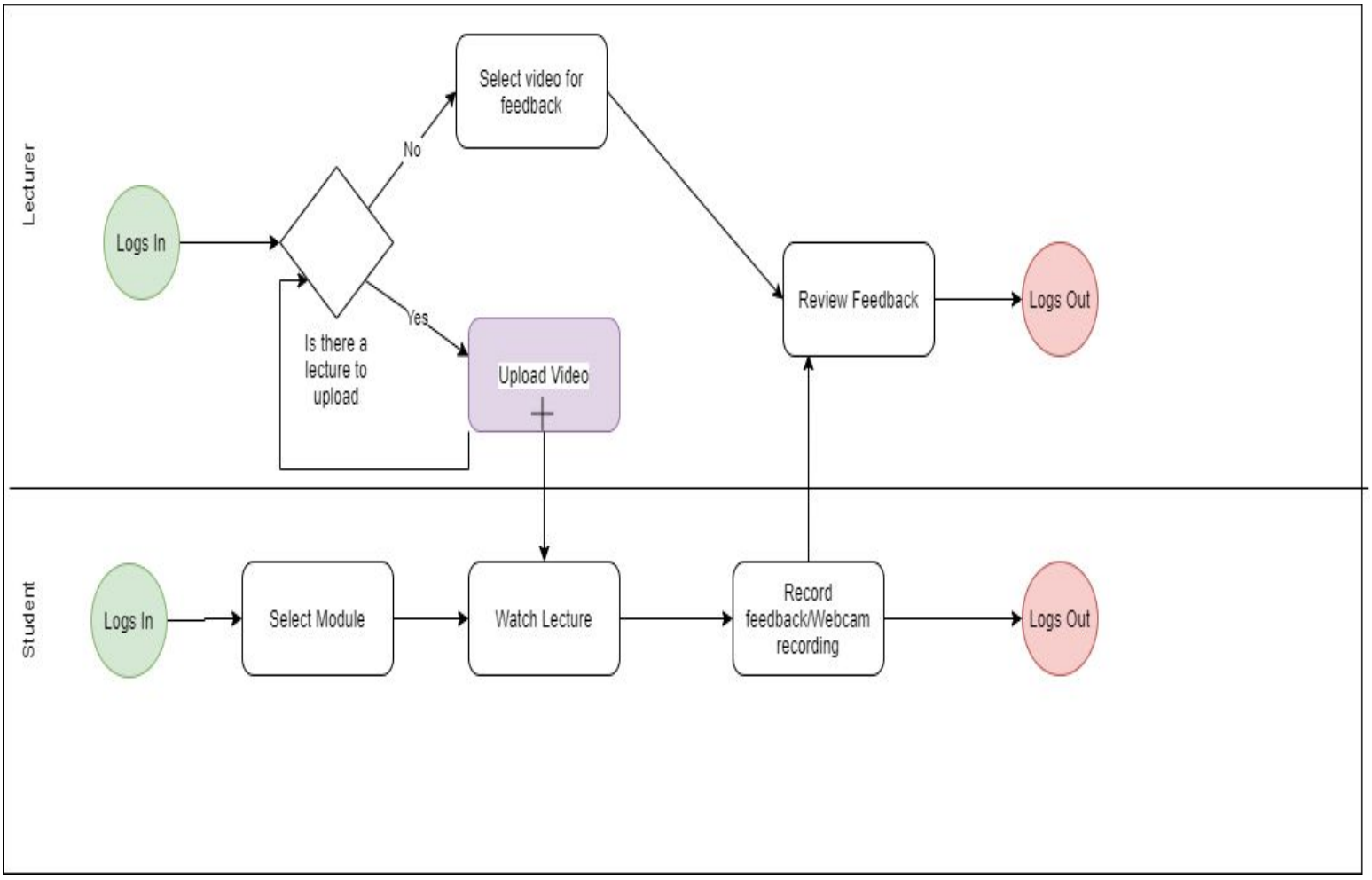
5. High-Level Design

5.1 High-Level Design Diagram




Lecturer Signs up
Lecturer Logs in
Lecturer Uploads Recorded lecture
Lecturer clicks on one of their own videos for report
Lecturer Views all relevant charts

5.2 BPMN – Business Process Modelling Notation



5.3 Use Case Diagrams

USE CASE #	User Sign Up	
Goal in Context	The User registers a new account with their DCU email and a password	
Scope & Level	System, Database	
Preconditions	The user has a valid DCU email address and has never used the website before and no previous registration information with the app	
Success End Condition	The user successfully created an account with their DCU email address and a password and can log in with it	
Failed End Condition	The User cannot successfully create an account with the website therefore not able to login	
Primary, Secondary Actors	Student, Lecturer	
Trigger	The sign-up button on the main page is pressed	
DESCRIPTION	Step	Action
	1	User navigates to the website URL
	2	User prompted with a Sign In/Up form
	3	User selects Sign Up
	4	User brought to Sign Up form
	5	User enters a DCU email address and a password
	6	A verification code is sent to the Users email address
	7	User inputs code and selects verify
EXTENSIONS	Step	Branching Action
	3a	User selects Login option
	6a	Email address already in use or not a DCU email
	5a	User asked to enter a stronger password

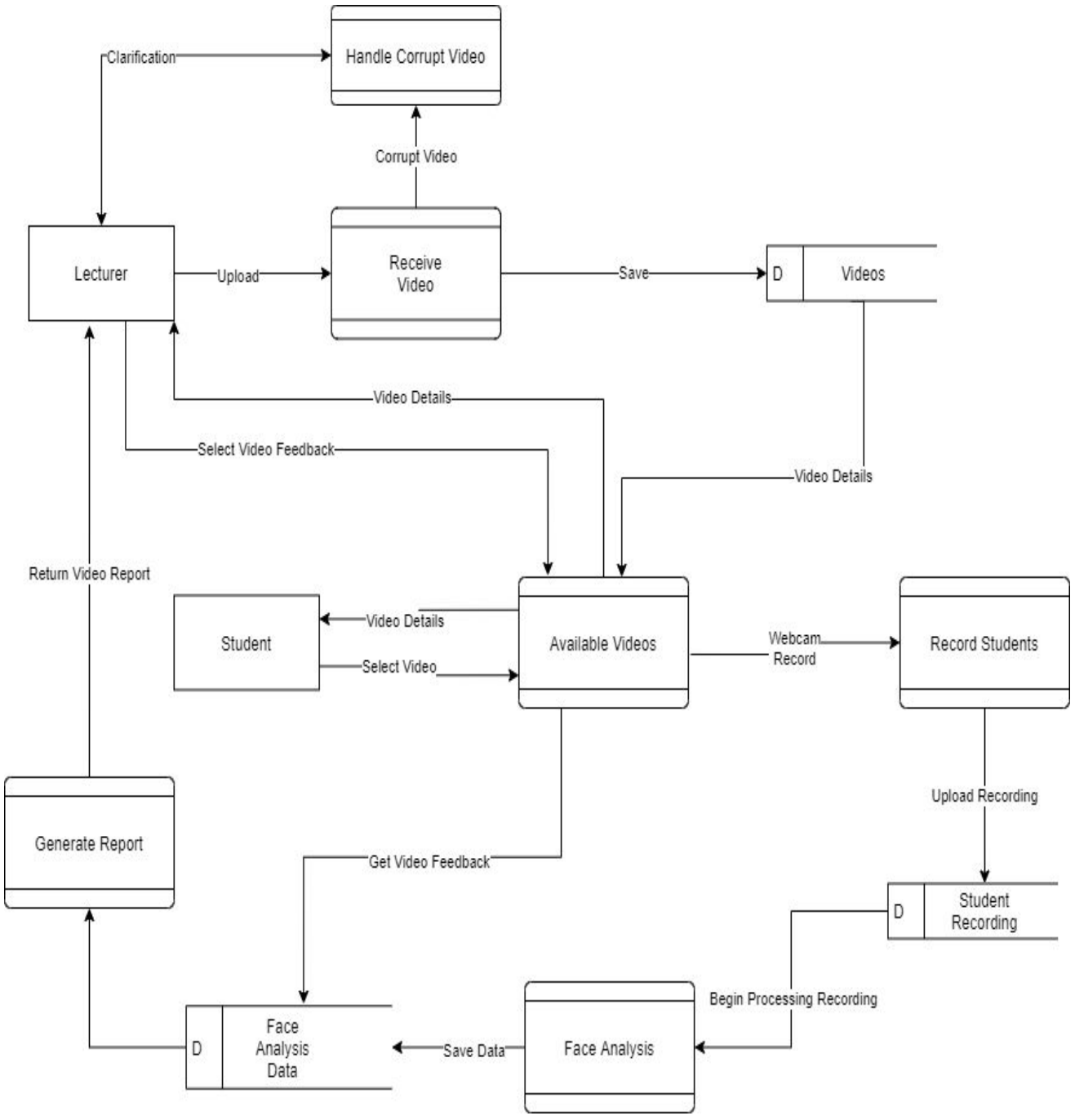
USE CASE #	User Logs In	
Goal in Context	The User logs in and is brought to the homepage	
Scope & Level	System, Database	
Preconditions	The user has successfully created a account.	
Success End Condition	The user successfully logs in and is on the main homepage	
Failed End Condition	The User cannot successfully login	
Primary, Secondary Actors	Student, Lecturer	
Trigger	The Login button on the main page is pressed	
DESCRIPTION	Step	Action
	1	User navigates to the website URL
	2	User prompted with a Sign In/Up form
	3	User enters their details they used to sign up
	4	User presses login button
	5	User is directed to their homepage
EXTENSIONS	Step	Branching Action
	4a	User selects Sign Up option
	5a	User is prompted with an incorrect credentials alert
	4c	User selects forgot password button

USE CASE #	User Watches a Video	
Goal in Context	The User logs in and watches a lecture video	
Scope & Level	System, Database	
Preconditions	The user has successfully created an account and logged in.	
Success End Condition	The user successfully watches and exits a video	
Failed End Condition	The User cannot access a video	
Primary, Secondary Actors	Student	
Trigger	A video is pressed to view	
DESCRIPTION	Step	Action
	1	User navigates to the website URL
	2	User logs in successfully
	3	User clicks a module code
	4	User presses a video of their choice
	5	User is directed to a page with the video and a button saying begin lecture.
	6	Permission prompt is accepted
	7	Webcam begins recording and the video begins playing
	8	Users presses the end lecture button
	9	Webcam turns off and the user is returned to the homepage
EXTENSIONS	Step	Branching Action
	6a	User declines permissions
	2a	User cannot login

USE CASE #	User (Lecturer) Views reports	
Goal in Context	The User logs in and views reports on a module	
Scope & Level	System, Database	
Preconditions	The user has successfully created an account and logged in as a lecturer.	
Success End Condition	The user views detailed reports based on students watching their videos.	
Failed End Condition	The User cannot access or see any reports data.	
Primary, Secondary Actors	Lecturer	
Trigger	A video "view feedback" button is pressed	
DESCRIPTION	Step	Action
	1	User navigates to the website URL
	2	User logs in successfully
	3	User clicks a module code
	4	User sees a video of their own and selects view feedback
	5	User is directed to a page with the video and multiple charts beside showing general response
EXTENSIONS	Step	Branching Action
	2a	User cannot login

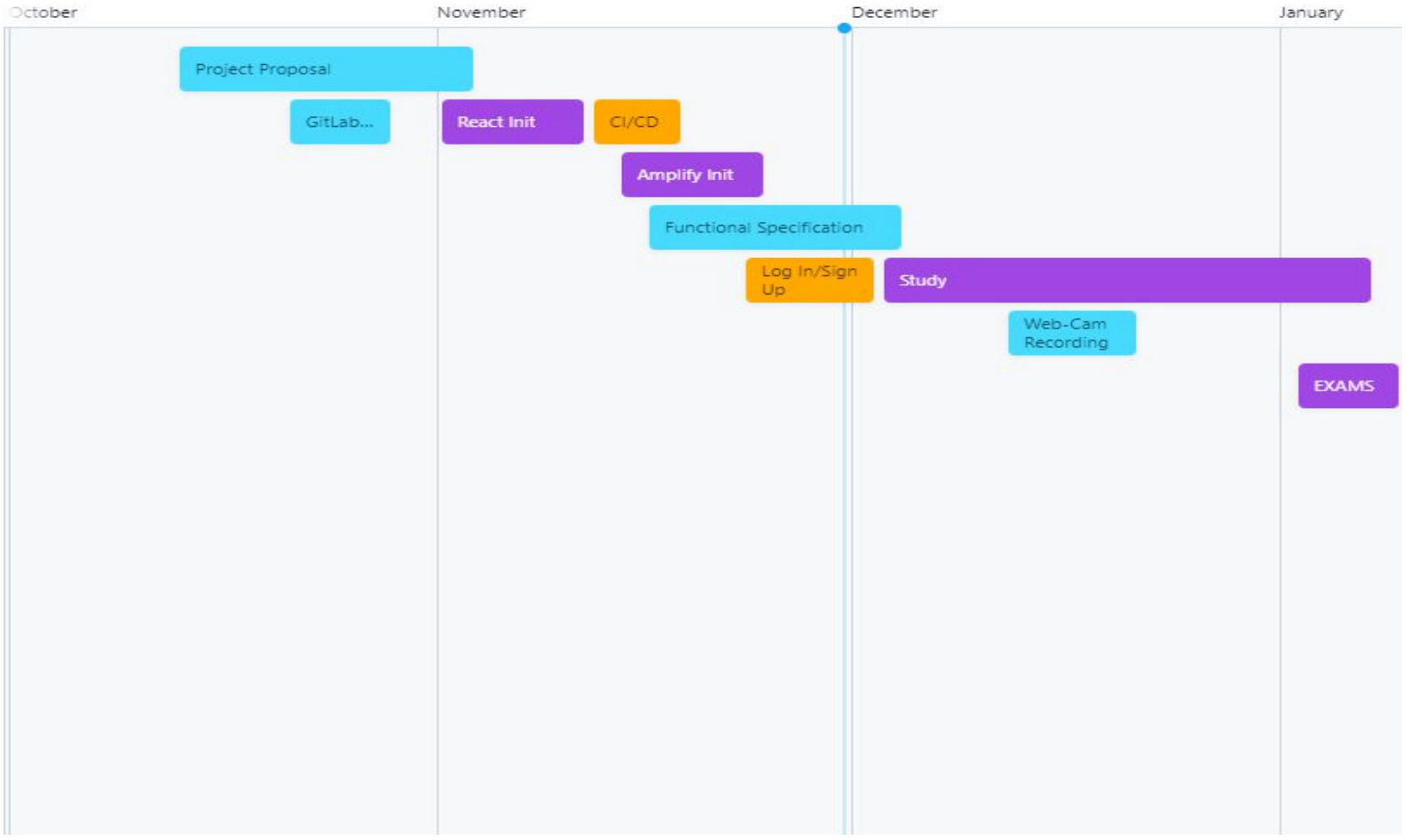
5.4 Data Flow Diagram

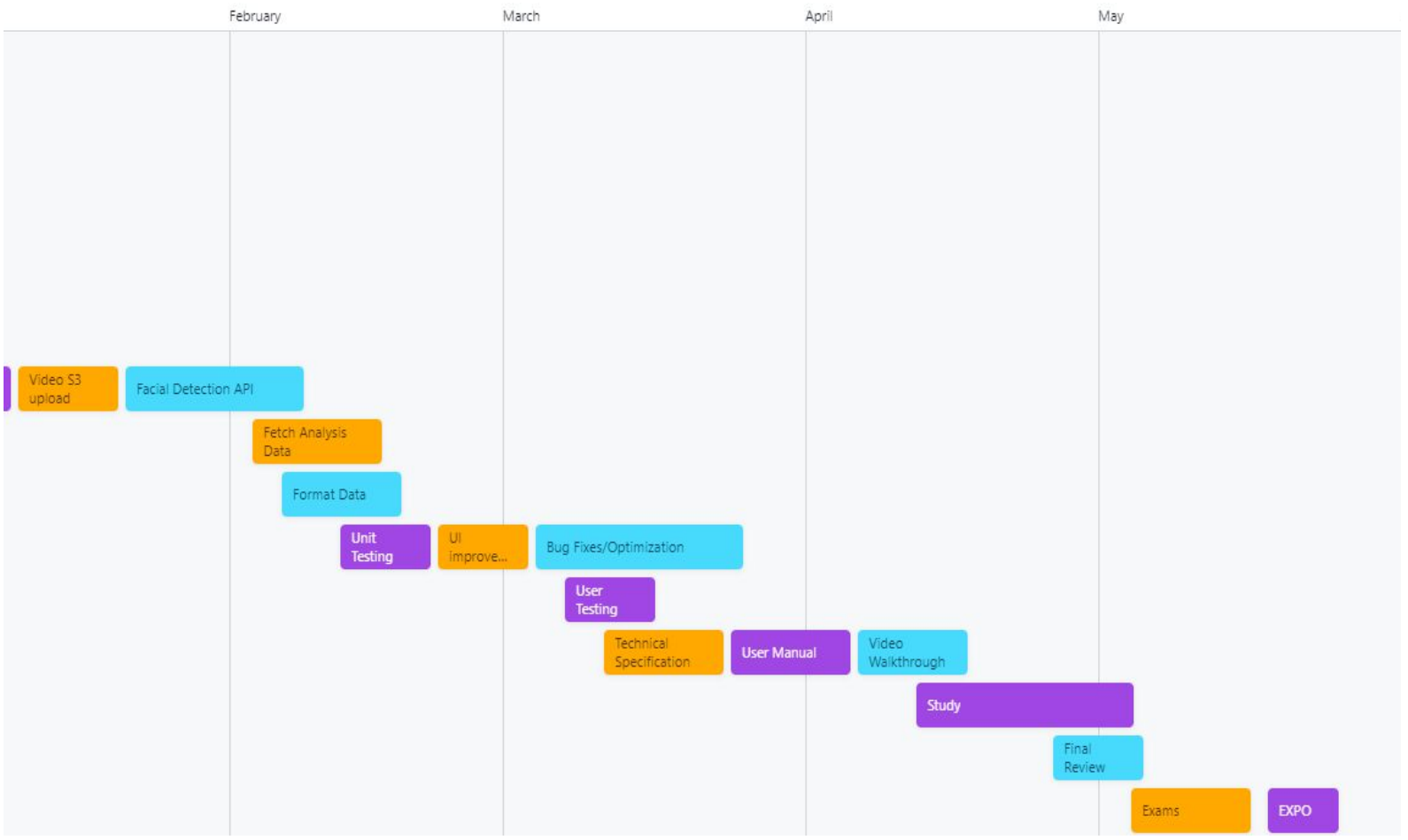
Below is a data flow diagram used to illustrate different data flow for some steps that the users may produce. It demonstrates how data is retrieved and then how it returns. As we can see the database is the center of all the different data flows. There are 2 main starting points in both student and lecturer.



6. Preliminary Schedule

As this project has multiple specific deadlines and there are also other course module deadlines to be met we must create and set out some project goals and time frames so we can keep track of our progress. We have created a Gantt chart (as seen below) to aid us in meeting our goals. As illustrated in 2 images we can see a monthly basis with a start and end date for each task ranging from October 2020 to May 2021. We also have a weekly meeting every Tuesday with our supervisor, Dr. Micheal Scriney, so we can also ensure we are making sufficient progress each week. We have also accounted for some time in tasks to allow for errors or plan changes.





We also intend to use Jira software to make our project Agile. We have set up a co-op Agile sprint board with various tasks to allow us to keep track of our progress throughout the 2 week sprints.

7. Appendices

Amazon Web Services Documentation:
www.aws.amazon.com

Amazon API Gateway:

www.aws.amazon.com/api-gateway

AWS Lambda:

www.aws.amazon.com/lambda

AWS S3 Bucket:

www.aws.amazon.com/s3

AWS Rekognition:

www.aws.amazon.com/rekognition

AWS DynamoDB:

www.aws.amazon.com/dynamodb

AWS Cognition:

www.aws.amazon.com/cognito