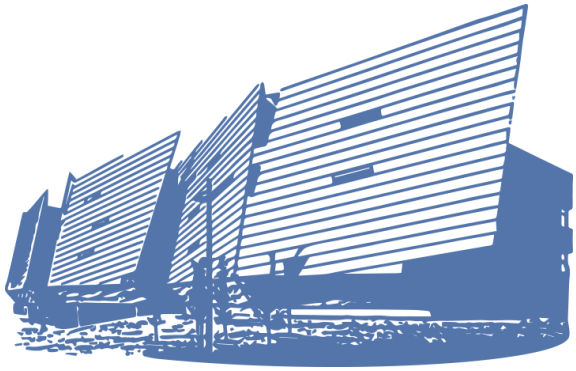

Galway Mayo Institute of Technology, Dublin
Rd Campus

BSc Project

React Native Web App

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Supervised by
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Department of Computer Science

April 21, 2020

Contents

Chapter 1

Introduction

Welcome to our Design document for the module Professional Practice in IT(41891).In week 1 of Semester 2 (3rd year) @Galway Mayo Institute of Technology we were each assigned a team member in which we had to decide on a topic we had never covered and expand it into a project to be presented to the entire class. Myself Tomás O'Malley (G00361128@gmit.ie) and my team member Benas Pelakauskas (G00356158@gmit.ie) agreed on using the React Native Framework to deliver our project. Each week we meet at scheduled room and time e.g Rm 1 Library @ 2.00pm where we would compile a list of ideas for our application..

Overall we settled on a mobile Application over a Website as we had already created websites in other frameworks e.g (Angular , Ionic) etc in the past years. After a week or two of meetings we had agreed on the applications Technology - Design , Application Architecture , Platform , Hardware , Framework , Language etc.Without a doubt throughout meetings there were many disagreements and concerns about the complexity of implementing features into the application however we confronted these issues e.g Server Sockets , Navigation etc to the best of our ability and we will go greater into detail further into the report.

Over this report I will document the work implemented in this project and areas which we were faced with difficulties and how these issues where resolved.Underneath you will find a table mapping the modules vital information that maps the project specification.

1.0.1 Module

Project Map		
Module :	PROFESSIONAL PRACTICE IN IT	Code: 41891 Weighting 100
Due Date	22nd April 2020	Online Submission
Team	Tomas O'Malley (G00361128@gmit.ie)	Benas Pelakauskas (G00356158@gmit.ie)
Version Control	Github	github.com/OmalleyTomas
Documentation	LaTeX	Overleaf

1.0.2 Brief

This module is intended to bring together many of the best practices that the student has learned in the previous semesters. It give the student an opportunity to design, develop and deploy a project, either individually or in a group environment, delivering a piece of software in a timely and standards driven manner.

Throughout my years studying software development @ Galway mayo Institute of Technology we haven't been faced with a module with a large amount of Independence.I hope to deliver this project in an appropriate manner like a in a company such as the use of version Control of code via GitHub , Documenting progress/Obstacles via a professional document system e.g Latex and Communicating frequently via MS Teams / Meetings throughout this module.Underneath is a table outlying the components that made up the project and the developers on the project who carried out each piece of work.

Project Overview		
Component	Technology	Developer
Student Home	React Native + Mongo , JS	Tomás O'Malley
Student Forums	React Native , Google Firebase + JS	Tomás O'Malley
Student Calendar	React Native , Js + API	Tomás O'Malley
Project Shell	React Native , Js + Git	Tomás O'Malley
Project Scheduler	GitHub Projects Repo	Tomás O'Malley
Project Write Up	LaTeX .PDF , Overleaf	Tomás O'Malley
Student Accommodation	React Native + Mongo , JS	Benas Pelakauska
Student Nightlife	React Native + JS	Benas Pelakauska

Chapter 2

System Requirements

2.0.1 Framework

After a couple of meeting and weighing the positives and negatives of other systems such as Android Studio Java/Http we came to the conclusion we would need a strong framework to develop with.All the options we discussed had either one of the two flaws 1. Web Based - Using a JSF framework , building with Java/HTML was a aimed at web development or 2.Non-Hybrid - Environments such as Android Studio only supported creating Mobile Applications for the Android ecosystem.

React Native is a JavaScript framework for writing real, natively rendering mobile applications for iOS and Android. ... React Native also exposes JavaScript interfaces for platform APIs, so your React Native apps can access platform features like the phone camera, or the user's location.

JavaScript is a text-based programming language used both on the client-side and server-side that allows you to make web pages interactive.Incorporating JavaScript improves the user experience of the web page by converting it from a static page into an interactive one. To recap, JavaScript adds behavior to web pages.

2.0.2 Database Connection

From day one it was obvious we would need some sort of database system such as SQL or No SQL to handle or data but it was unsure for the platform to use .SQL has always been the normal technology used until the new Object-Orientated Database model was deployed.After researching online and Discussing with our allocated project supervisor we came to the conclusion for this project using the MongoDb NoSQL Database System would be ideal.

MongoDB is a document-oriented database which stores data in JSON-like documents with dynamic schema. It means you can store your records without worrying about the data structure such as the number of fields or types of fields to store values.

2.0.3 API'S

An application program interface (API) is a set of routines, protocols, and tools for building software applications. Basically, an API specifies how software components should interact. Additionally, APIs are used when programming graphical user interface (GUI) components.

React native supports many rich apis fro creating applications such to access systems alert system , camera-roll memory and so on.We required so may of accessing memory and we decided to implement the Google Fire-base database System.We will incorporate firebase to save our users comments submitted to the forum

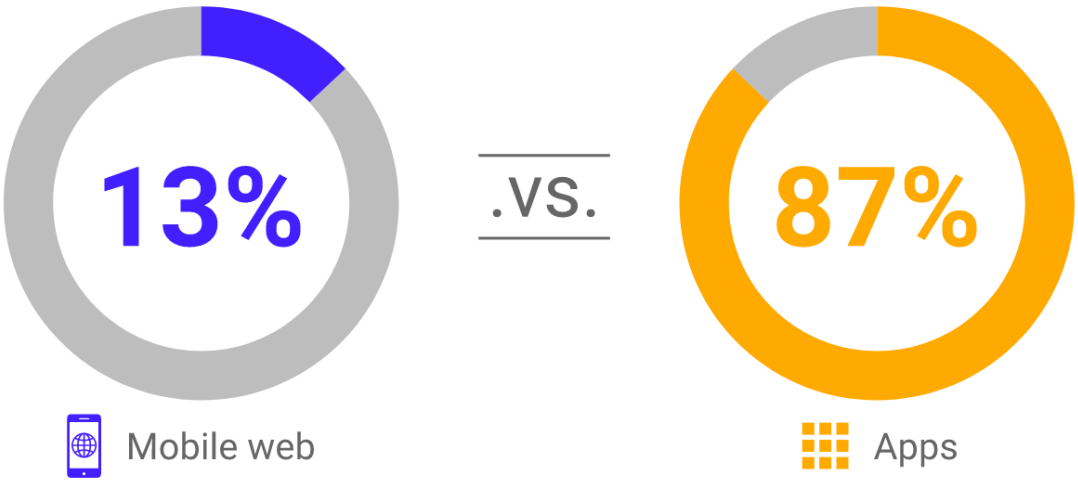
Firebase is a mobile and web application development platform developed by Firebase, Inc. in 2011, then acquired by Google in 2014. As of March 2020, the Firebase platform has 19 products, which are used by more than 1.5 million apps.

Another popular API we will use is the React native Calendar API sourced via Github.com .This API makes it a breeze to add a calendar system .

2.0.4 Web vs Mobile

The whole objective or learning outcome of this team project is to develop I piece of software .In our previous modules such as Mobile Applications Development(Semester 3) We created a UWP mobile application and in Data Centric Web Applications(Semester 5) We developed a web Application.We have never developed a hybrid Mobile Application in this semester(6).Mobile Applications are now the most way people interact with their smartphones.Developing a Hybrid Application will also be an extremely beneficial project to showcase at a software job interview.

One of the main the largest strengths of React Native is how flexible of a platform. I plan to host this application as a website too using a free host platform such as GitHub Pages.By providing a mobile/web version of this application I hope to create a larger target audience for my app.



2.0.5 Start up Guide

We used a very detailed set up guide from tutorial link which i will reference in the References page.Underneath is the install process.

1. Install Software's : Node.JS + npm
2. Open a command Prompt on Windows
3. Enter 'npm install -g create-react-native-app' and wait to install
4. Enter 'npm install -g create-react-native-app' and wait to install
5. Enter npm install -g react-native-cli and wait to install
6. Enter expo Start and the application will begin

Chapter 3

Technology

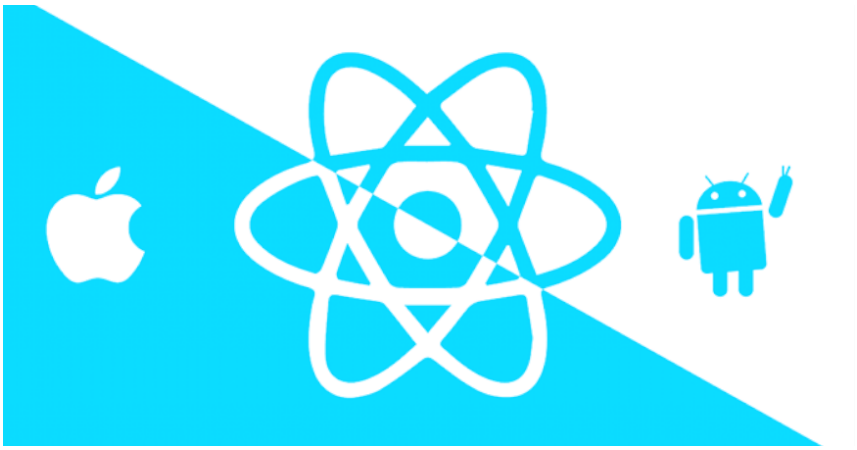
3.0.1 Hybrid Mobile Application

After 3 weeks of Meetings my team member and I came to an agreement on the technology used. We decided to use the framework React Native due to its rich collection of API's and its strong back-end language (JavaScript).Currently JavaScript is the 1 most popular programming language in the world by https://www.businessinsider.com/most-popular-programming-languages-github-2019-11?r=USIR=T1-javascript-10 researching/implementing JavaScript we can make ourselves more attractive in industry soon.More info on the react platform can be found via their website https://reactnative.dev/

After deciding on the language/framework we discussed which would be a better implementation for our project (A) - A website with a rich set of features orientated around (GMIT) Gal way Mayo Institute of Technology or (B) - A Mobile Application to meet the needs of students on the go who aren't connected to the internet 24/7.After a short meeting we can to the agreement that mobile was the way to go ! As being students we tried to describe the daily issues we encountered daily as students e.g Forgetting Timetables , Exam or Lab Rooms.

Finally the last question we asked ourselves was which environment will we deploy this mobile application to? (A)-Android or (B)IOS apples Mobile Platform.That was a easy descision .. Develop for both.Creating Hybrid mobile applications has never been easier with React native while other Frameworks or Development environments force you to choose one or the other such as XCODE -Apples IOS Development Environment or Android Studio.

As a bonus to our mobile application we decided it would be also a huge benefit to use the LaTex document preparation software to create the word document which outlines the core structure/obstacles overcame in our project.The current pdf you are reading was developed via www.overleaf.com/.



3.0.2 Benefits of React Native Framework

Mobile app can be built with the help of Web technology which enables any web developer to easily enhance his/her skills and create React apps. React Native helps in building cross platform mobile apps. Saves time and cost to build mobile apps on multiple platforms. Building blocks which are used in iOS and Android apps are also used while creating React Native based apps which means that React Native is a mobile framework that compiles app components for native mobile applications in JavaScript. A React Native app ensures speed and agility for the mobile apps with responsiveness and a great native app based user experience. A real-world famous React Native Example is Instagram. There are many other big names in the business for React Native Example like Wal-Mart, Facebook Ads, Townske, Delivery.com etc.

3.0.3 Benefits of LaTeX

During our Scheduled lectures our supervisor Dominic Carr delivered a lecture on 'LaTeX Document Preparation System' to our year.After reading the provided slides I felt it would be great benefit to learn the system for creating future write ups.We will need to use the LaTeX document system next year for our Thesis which was also a large push.Here some of the benefits I've experienced from the system.

- Dealing with mathematical notation. Layout and entry are generally easier using LaTeX than some other sort of equation editor.
- Consistent handling of intra-document references and bibliography. As of a couple of years ago the major WYSIWYG editors still had problems with re-numbering cross-references and bibliography items. This is never a problem with BibTeX or LaTeX.
- Tables and illustrations. With PSTricks or TikZ, one can produce high quality illustrations within the document (though the learning curve is a bit steep there). And I've found LaTeX to be better at preparing complex tables.
- Professional Document Preparation system standard for creating Journals etc.

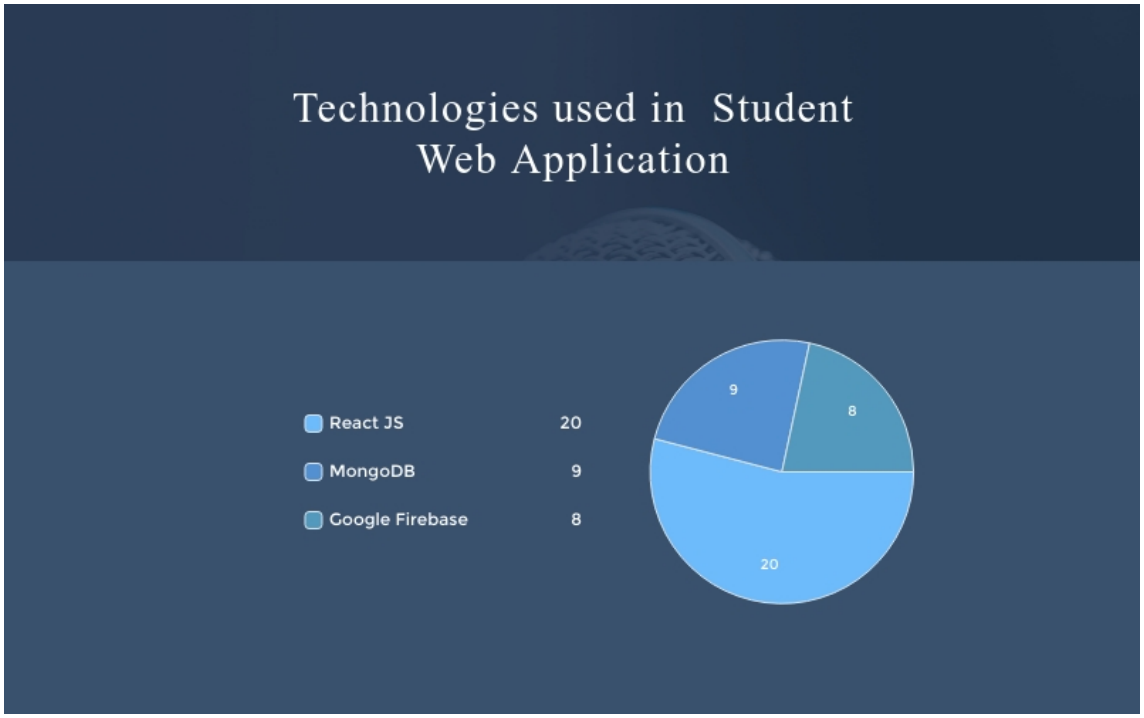
Chapter 4

System Architecture

After brainstorming over the first few weeks we settled on designing a system which will be developed through the rich framework React Native.Mobile applications are constantly evolving and becoming. standard for how some people carry out their day-today tasks.Traditional computer programs such as Microsoft's program suite office 365 has mobile port for all mobile phones and tablets.The framework was certain but we hadn't decided on which database system to store the users information for example logins , calendar events etc.Traditionally databases have always used the relational model until the new Non-Relational Object orientated became trending in the early 2010's , Due to the nature of testing new technologies we decided to use the MongoDB database system to handle our users data.

4.0.1 Technologies Pie Chart

- Underneath is a Pie Chart Displaying the technologies used in our Student App.

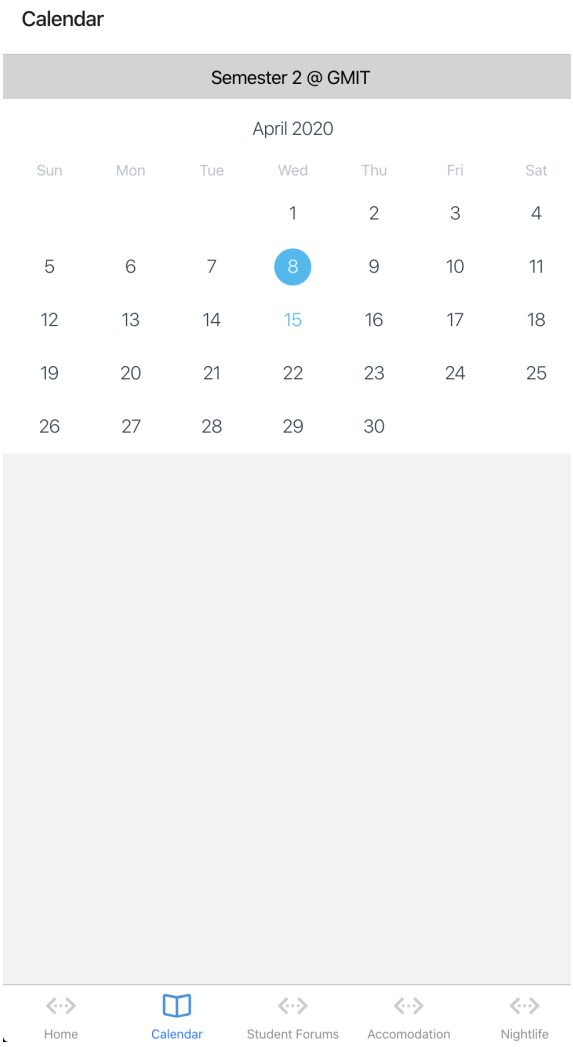


4.0.2 Google Firebase

Above is a screenshot of the basic Student forum created for the application. Users can post to the forum with questions such as 'Exam grinds needed email @ g00XXXXXX@GMIT.IE' , this is early development but i hope to implement the users sign in below the forum to inform who posted into the forum.All the information entered into the box is stored online via Google Firebase Cloud Platform.Under is the api Configuration

```
vconst config =
    {
      apiKey: "AIzaSyAngbJs6JDqi-xZbeA0wcmdv_f5ctznMB0",
      authDomain: "studentthreadforum.firebaseapp.com",
      databaseURL: "https://studentthreadforum.firebaseio.com",
      projectId: "studentthreadforum",
      storageBucket: "studentthreadforum.appspot.com",
      messagingSenderId: "83134266838",
      appId: "1:83134266838:web:cb6153427a1110b7f87877",
      measurementId: "G-914KPJY9HP"
    };
    this.app = firebase.initializeApp(config);
    this.database = this.app.database();
  }
```

4.0.3 Calendar API



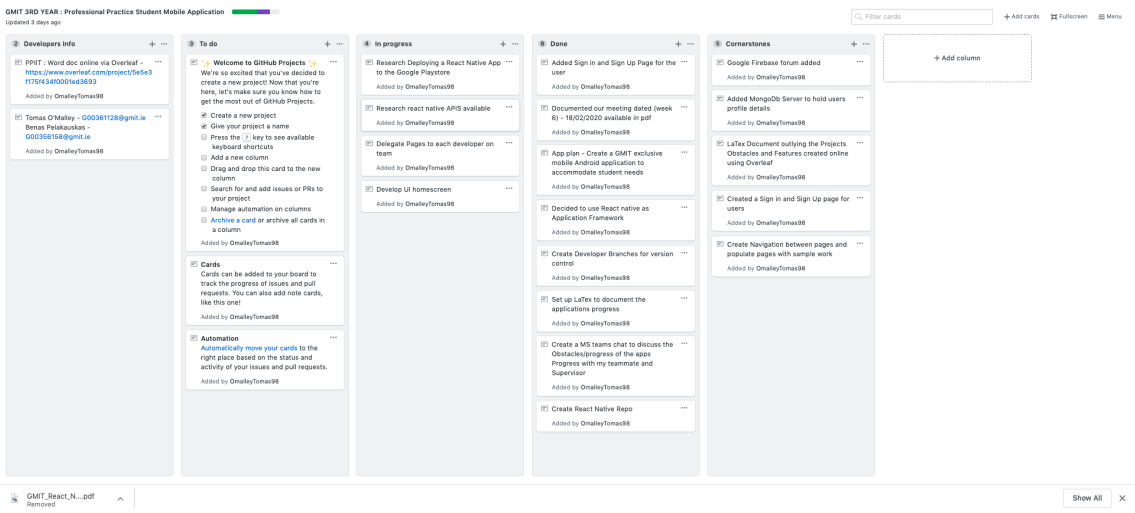
Above is a screenshot of the basic Student calendar created for the application. The app highlights the current day of the week which is the bubble highlighted in the colour blue.The calendar can show next months in advance.I hop to add alerts and Task section to allow the user to add events to be reminded.I found this api online through the React Native native documents .

Other Apps I downloaded on the iOS App-store such as moodle don't include a built in student year calendar which I found to be a big disadvantage.This is an early version of the calendar but I hope to add more buttons for creating tasks and push notification.

```
import {Calendar} from 'react-native-calendars';
  return (
      <ScrollView showsVerticalScrollIndicator={false}>
        <Text style={styles.text}>Monthly scheduler </Text>
        <Calendar
          style={styles.calendar}
          hideExtraDays
```

```
        onDayPress={this.onDayPress}
        markedDates={{
          [this.state.selected]: {
            selected: true,
            disableTouchEvent: true,
            selectedDotColor: 'orange'
          }
        }}
```

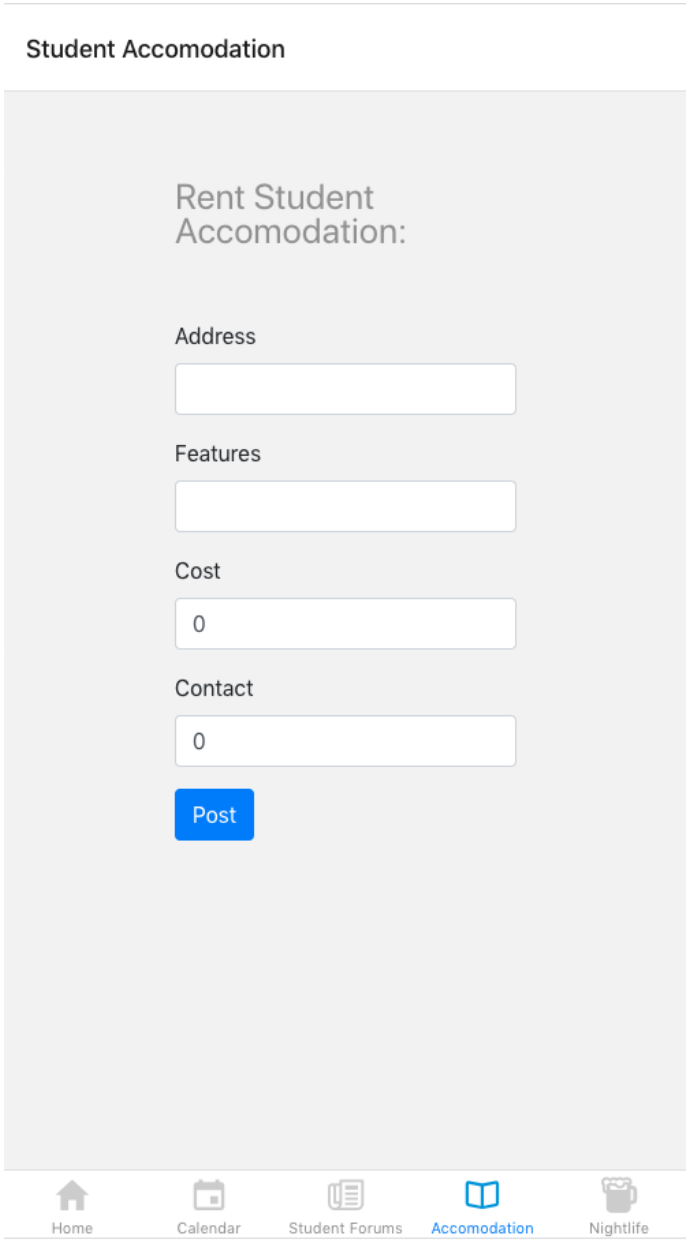
4.0.4 Process Management



- Above is a screenshot of the Storyboard used to document our components in the Applications development We used GitHub Projects to delegate our cornerstones in the project.I found this process very therapeutic being able to document and summarise bugs occurring and the resolutions.Here is a link to the Project

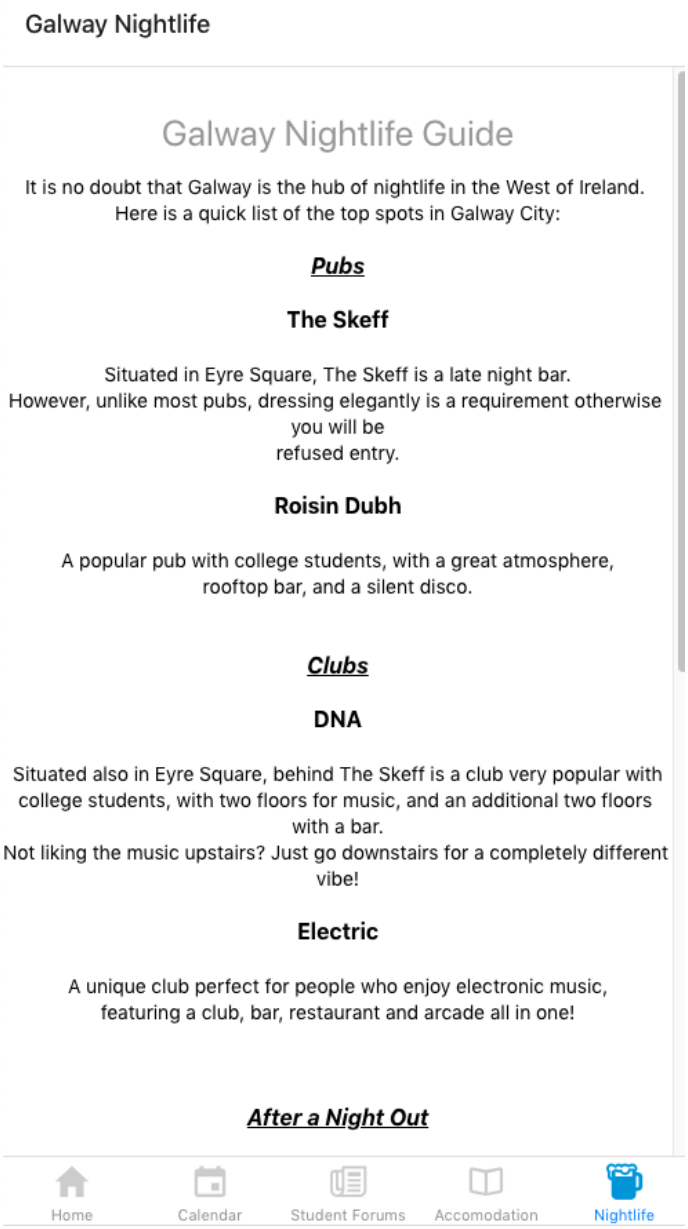
- Team repo : https://github.com/users/OmalleyTomas98/projects/2

4.0.5 Student Accommodation Upload



- Above is a screenshot of the Student Accommodation section.We decided to create a page where the user can add and read current properties listings for students in need.It is connected to a mongodb database for storage.

4.0.6 Student Nightlife Guide



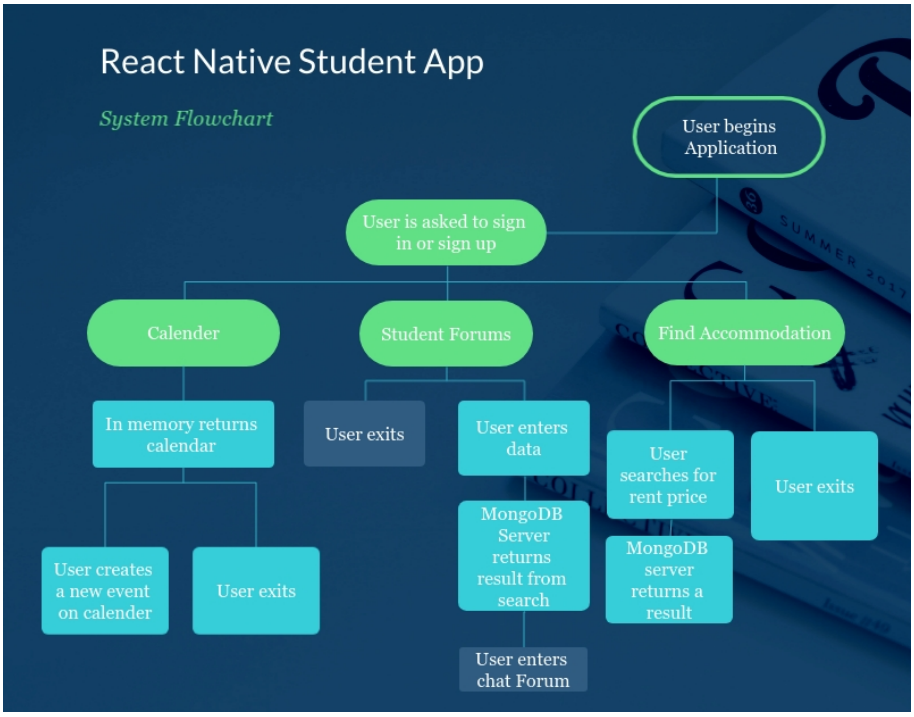
- Above is a screenshot of the Student Nightlife section.We decided to create a short information guide for students.The page consistent of attractions for students based in Galway city.It has a list of activities such as pubs and nightclubs for students to see.

Chapter 5

Architecture Obstacles Solutions

5.0.1 Flowchart

- Underneath is a flowchart marking out how the internals of the program will be executed when the user interacts with our system.

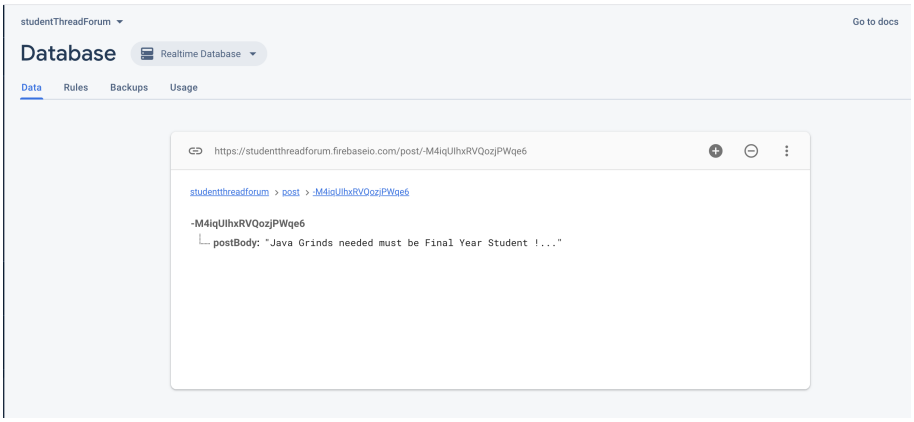


5.0.2 Real Time Database

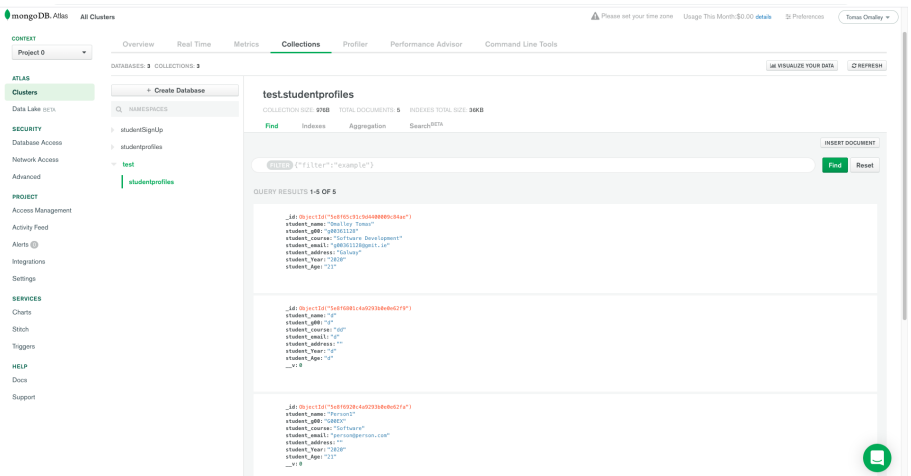
One of the largest issues of this application is finding a reliable database system which stores users information in real time.After being advised to use Google Firebase for the student forum I researched some of the main strengths of the technology . Some of the strengths are as follows :

1. minimal setup.

2. easy access to data, files, auth, and more.
3. no server infrastructure needed to power apps with data.
4. massive storage size potential.
5. real time data stroage.



I researched the google Firebase forums on how to incorporate their database system .One of the drawbacks to this approach is you must choose the platform you are intending to use e.g web , Android or iOS.I could only use the web version due to its complexity.Firebase holds lot of extra features for security for but for testing purposes the Firebase Database linked is saving data when anyone may send data up.



Above is a screenshot of the users data being successfully and uniquely saved in mongoDB.This is tied to the Home Tab where the user must type his/her info.To connect the server the node Server.js command must be ran which is a downfall compared to Google fire-base which is restful and doesn't need to be turned on

Chapter 6

Design Methodology

6.0.1 User Interface

We settled on a basic tabbed mobile application primarily for ease of use.Tabbed program layouts are very properly in near all popular react native applications such as Instagram , Facebook etc.The user scrolls from section to section by a navigation by located at the bottom of the screen.Each tab showcases it functions like the the user calendar , student forums and so on.I took this approach when using Instagram which is one of the more basic apps widely used.

We opted for a simple white background on all of our pages to make the icons and text easier to read.We opted for the less is more approach when designing the website and we were happier after playing around with other style-sheets and having no luck.

6.0.2 Ease of Use

From early development it was established that the user should be able to navigate the application without needing to read instructions.A good Human User interface is extremely important and i followed the apple Human Interface Guidelines.Smartphones make up for 52 percent of traffic and it is vital to make an application as easy as possible to use.

On the tabbed navigation bar located at the bottom of the screen we decided to use a icon specific to the task , For example for the home function we used a home symbol to make is clear and distinguishable to the user.All of the icons used were house (Homepage) , Book(Calender) , newspaper (Forums) , House (Accommodation) and a wine glass for the Nightlife page.Luckily React provides a package for importing all of these icons without any hassle.

6.0.3 Clients

This application is aimed primarily at students.From my experience as a Student there are issues I find each day such as whens my next class , exam submission date etc which ends with me searching for a mobile application.All the apps I downloaded such as moodle and blackboard are specified depending on IT or University and both lack a dedicated

calendar or a push notification system to alert the end user.Ideally in our application you should be able to upload your college details e.g semester timetables , exam timetables etc.

6.0.4 Maintainability

One of the less tangible areas to an application is its maintainability.By using an online server database such as mongodb and Firebase I can downgrade or upgrade the total storage of the database.

React Native is a framework which is created and is maintained by Facebook™.React was the result of a hackathon project in the summer of 2013.React native was released in 2015 and has stood strong alongside other frameworks such as Angular which was released in 2017.Having a strong framework backed by an even stronger back-end language (JavaScript) will hopefully allow for a longer lifeline.

Chapter 7

Testing Plans

7.0.1 Platforms

We plan to accommodate the two largest mobile Platforms iOS and Android .Both act in a similar nature under the hood but are accessed in different fashion. The application will also be available as a web App which I hope to host using GitHub Pages.We must publish the final build of the application to both the Apple App Store and the Google Play-Store which can be a long process.

7.0.2 Graphics

There are two main platforms to focus on iOS and Android.Both systems functionally at the core are near identical but both implement different standards in terms of graphics.The scaling of application will be handled with Bootstrap and series of custom css style sheets for more complex pages such as the Students Forum Thread for when viewed in the Web App.One of the largest issues between the platforms are design standards such as the types.

7.0.3 Validation

One of the most vital functions of an applications security is its validation.For examples a user should not be able to sign into their application without a correct password.All of the users sign in details will be stored using google Firebase.The

7.0.4 Security

Security is a huge area and can be make or break an application .Ideally we shouldn't have our servers public but in the future we will create a server locally which is controlled by admins.

Chapter 8

Planned Future Development

8.0.1 Deploy to iOS/Android

After fully completing the application we hope to deploy the application the iOS platform.Android is by far the most common smartphone platform of Mobile users but we don't want apple users to be left out.Overall deploying the app to the apple ecosystem is a lot more troubling and expensive but hopefully the application will be accepted for launch.

A huge advantage of React native is its ability to deploy to iOS without using Apples own mobile app language (Swift).The framework allows developers to build for multiple platforms at the sacrifice of platform stability.

8.0.2 Expansion

Overall our current server storage is being handled online via mongoDB, It would be ideal to own a separate machine to run from home.To expand our in application services it will be essential to gain a server with adequate storage to accommodate more users on the network.

Another feasible option is to host our web application via a virtual machine.There are many providers such as Microsoft Azure , Google Cloud and Amazon Web Services.This is a very cost effective approach and makes its very easy for maintaining and upgrading quickly.I hope to use google Cloud Service in the future.

- Google Cloud Platform offers services for compute, storage, networking, big data, machine learning and the internet of things (IoT), as well as cloud management, security and developer tools.

8.0.3 User Feedback

Once free from college work we play to launch an online form via a provider such as Google where we can query users and allow them to outline the areas they feel need attention such as the graphical interface , server response time etc.

Chapter 9

Learning Outcomes

9.0.1 React Native Framework

I was very pleased/impressed by how flexible and reliable the React Native framework.The online documentation was superb and helped me to allowed me to implement the core features such as Database connectivity , user input/output and styling . If I were planning to develop an app for a single platform such as iOS/Android I would have used Swift(iOS) or Android Studio(Android).A huge positive I learned from this project was knowing how easily React Native can accommodate multiple platforms simultaneously.

9.0.2 Teamwork

Rarely in our course Software Development (GA787) we have had the opportunity to participate in some form of teamwork.We found it quite difficult to adapt to at the beginning but once we delegated tasks to each other roles in the project we overcame this dread.Incorporating GitHub into our project defiantly made it easier to collaborate with each-other and also allow us to work in parallel to save time.In the future collaborative work is a guarantee and i Believe this project has given us a more positive v view into the complications and the ways to overcome team issues.

9.0.3 mongoDB Database System

MongoDb has proved its self to be a strong competitor in DB technology as of April the system is ranked as the fifth most used Database recorded by https://db-engines.com/en/ranking. Adding a mongodb database was a breeze but I had issues using the GUI program supplied instead I had to use the Terminal instead if the GUI to create the database for my students information.

9.0.4 Deployment

Mobile Applications are more relevant than ever today , Deployment is the process of building a app for a specific platform and publishing it to the public to access.I was I choose GitHub Pages to freely host our web app.

9.0.5 LaTeX Document System

LaTeX, computer programming language used for typesetting technical documents. LaTeX is a free software package created in 1985 by the American computer scientist Leslie Lamport as an addition to the TeX typesetting system. LaTeX was created to make it easier to produce general-purpose books and articles within TeX.

We decided to use the LaTeX Document system after a Lecture was held during week 6 of the module .LaTeX is a very professional Document System used in the Software industry.We found the document system had a steep learning curve but the we agreed the extra work resulted in a very well packaged product.

9.0.6 Google Firebase

Google fire base is by far the easiest database system to implement into an application.For our workload it was snappy and easy to maintain.It holds a rich set of features for security for creating admins and it also uses a JSON no-SQL technology similar to mongoDB.

Chapter 10

Conclusion

10.0.1 Submission

Overall we were pleased with the application we created and the obstacles of learning a new computing language(JavaScript) and the many algorithms features of the react native framework such as the many functional API's and the addition of the noSQL MongoDB database system and Google Firebase.The most difficult area I found in my opinion was the delegating of tasks amongst my team.

The main aim of the module was to design, develop and deploy a project using the thirteen weeks of time in the semester.Personally I have found using the LaTeX document preparation system to be of huge benefit for future projects such as next semesters Dissertation.Self Learning can be a very slow and painful experience however the Documentation for both React Native and LaTeX have been a breeze to research compared to other topics such as the c Language Documentation.

Teamwork has always been a weakness of mine but after the semester I found using the divide and conquer principle to breakdown the requirements of the project and listen to the concerns of my team allowed for a smoother development environment.Using technologies such as Microsoft Teams and GitHub Version Control to communicate with my team and delegate tasks .All work can be found at the url underneath thank you for Reading.

https://github.com/OmalleyTomas98/gmitStudentApp

Chapter 11

References

11.0.1 References

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10. MongoDB Ranking - https://db-engines.com/en/ranking
11. Google Cloud - https://searchcloudcomputing.techtarget.com/definition/Google-Cloud-Platform
12. Project Repo - https://github.com/users/OmalleyTomas98/projects/2
13. Set up guide - https://www.tutorialspoint.com/react$_native/react_native_environment_setup.html$