Workbench booking Web Application

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Contents

About this project Abstract

The project aim is to create booking system for Bank of Ireland workbenches as its becoming more and more automated all branches across Ireland have viewer people in them and all the free space become available and unused so workbenches idea was introduced to fill the empty space. The approach taken to develop this was make a web application using MEAN (MongoDB, Express, Angular, Node) approach and swap MongoDB for Firebase. Conclusion was reached after much research to develop 2 websites one for the users one for the admin. The purpose of admin website is to add new workbenches all across Ireland and be able to edit them and suspend them if needed. The user site has authentication from third party software called Auth0 system them lets them log with gmail or GitHub for convenience or sign up for an account in and see all the workbenches added and lets them book and workbench available as well as search for any particular workbench in the Country, google Maps plug in is also available that shows all the workbenches on map marked with pin that displays additional details. The finished websites were uploaded on heroku server so can be accessed publicly. Firstly, at the moment, users must contact the workbench only during business hours to schedule a room. As the project proposes an online booking system, it will be available 24/7, thus solving this issue and cutting out the middle-man as the workbench does not need to be contacted directly. The project also enables the user to see all centres on a map within a specified distance. It will act as a 'one-stop shop' for the user, rather than having to contact each centre separately to check availability or to make a booking. As well as this it will display to the user alternate centres if one is not available. The application allows workbenches to be easily added, edited or removed as needed.

Authors

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Chapter 1

Introduction

The approach taken to develop this was make a web application using MEAN (MongoDB, Express, Angular, Node) approach and swap MongoDB for Firebase. Conclusion was reached after much research to develop 2 websites one for the users one for the admin. The purpose of admin website is to add new workbenches all across Ireland and be able to edit them and suspend them if needed. The user site has authentication from third party software called Auth0 system them lets them log with gmail or GitHub for convenience or sign up for an account in and see all the workbenches added and lets them book and workbench available as well as search for any particular workbench in the Country, google Maps plug in is also available that shows all the workbenches on map marked with pin that displays additional details. The finished websites were uploaded on heroku server so can be accessed publicly. Model View Controller was used in the development of this website as it separates all 3 components. So Firebase was chosen for Mode to store all the workbench data JavaScript controllers to manipulated filter and do the logic and html to display element for the user as booth websites bookAroom-user and bookAroom-Admin connect to same database but are restricted to certain capabilities. One of the requirements were that application need to be accessed by all different platforms research literature review was carried out in cross platform development and conclusion was reached to develop it as web application as it cross platform accessible as well as cross screen accessible with aid of bootstrap. This project was developed to create an easy way for a user to book a room in an Innovation Centre, or more specifically the Bank of Ireland Workbenches. There are a number of reasons why a system like this is needed. Firstly, at the moment, users must contact the workbench only during business hours to schedule a room. As the project proposes an online booking system, it will be available 24/7, thus solving this issue and cutting out the middle-man as the workbench does not

need to be contacted directly. The project also enables the user to see all centres on a map within a specified distance. It will act as a 'one-stop shop' for the user, rather than having to contact each centre separately to check availability or to make a booking. As well as this it will display to the user alternate centres if one is not available. The application allows workbenches to be easily added, edited or removed as needed.

Chapter 2

Context

These are the links to Github repositories used for this project as well as Latex repository used for this documentation.

https://github.com/VytasHub/bookAroom-admin
https://github.com/VytasHub/bookAroom-user
https://github.com/VytasHub/final-year-project-template
https://github.com/mcgrath94/FYP-Google-Maps

At present there is no system in place which would easily allow a user to view workbenches and book a room in these facilities. This project aims to solve this problem by offering a service which seeks to deliver both of these goals in one place. One of the objectives of this project was to display the locations of the workbenches on a map allowing the user to choose the most convenient one or see alternative options in their area.

Chapter 3

Methodology

3.1   Agile

During this project, the agile approach was chosen over more traditional approaches like the waterfall model or other sequential approaches for its flexibility. This approach helps respond effectively to change through incremental, iterative phases (called sprints), which seemed more effective than the waterfall methodology which relies on every requirement being known before any design or coding occurs. A Scrum methodology was used so that each phase included all aspects of development. Using this approach, small changes were added each phase to improve it.

3.2   GitHub

At various times throughout the project, GitHub, an online project hosting tool, was used to maintain and keep track of the development. GitHub was chosen as it offers all the distributed revision control and source code management functionality of Git but has other benefits which make it easier to use such as a web based interface and desktop integration, rather than just using the command line.

Here are the repositories links that the project is composed of.

https://github.com/VytasHub/bookAroom-user
https://github.com/VytasHub/bookAroom-admin
https://github.com/mcgrath94/FYP-Google-Maps

And also link to the documentation repository.
https://github.com/VytasHub/final-year-project-template

3.3 CROSS-PLATFORM DEV

There are a number of reasons a web application was selected over a native app. Web applications have the benefit of portability as they can be coded once and ran on many different devices rather than having to waste time and effort developing on multiple platforms. In a similar way, this makes the maintainability of a web app easier. Naturally these two factors mean they are more cost effective. Web apps also do not require the user to download or update them. Although web apps have some drawbacks such as not being able to achieve the same performance or user experience as native apps, there is little performance penalty for apps that aren't graphic heavy.

3.4 Testing

The app was tested by running it locally and listening to that port. This allowed to fix any errors and verify the application was in working order. It was also tested from various locations to determine how accurate it was at finding the users location.

Chapter 4

Technology Review

4.1 Development Environment

4.1.1 Debian

Debian is an open source operating System developed. It's one of many distributions of Linux but is one of the earliest distributions and was first announced in 1993 by Ian Murdock. It requires small hardware resources to run and is easy to set up and install it has graphical user interface version as well as command line version. When distribution is released initially it's marked as unstable, after sufficient amount testing is done it become as stable and usually is adopted by more people than because it has less bugs and is more reliable. Debian has access to over 50 000 to packages located on the internet and any package can be installed with one command line which makes ideal work environment for web development because web development relies on many different components put together and if not done right issues arise with dependencies etc. With commands like sudo apt-get you can install any package you want and well documented and big community behind it.Tools like npm Node packet manger and grunt work very well in this environment.

4.1.2 Cli and Gnu Nano

Command Line Interface (CLI) doesn't come with Debian it has to be installed. Moust of Operating Systems come with many tools installed which makes them very big and a bit slow Operating System like Debian takes different approach and start with just essential tools and then you install only tools that you need. CLI is needed to install some packages and execute some of the commands in Debian when working web environment.GNU Nano is a text editor Unix like operating system which makes it ideal for Debian and all Linux distributions. It allows for convenient bash scripts to be set up while in command prompt or terminal as now in Debian. As well it allows for convenient GitHub commits you can enter commit message and press chines hat and O to write out and commit changes to github.

4.1.3 Npm/Bower Grunt

These two tools are absolutely essential to web development environment and you are must like wouldn't be able to develop without them in today's world. Npm is a default manager for JavaScript runtime environment in Node.js.it manages all package dependencies of an application as well as installing them. Grunt makes web development environment more efficient by eliminating repetitive tasks such as unit testing as well as shortening your run scripts such grunt serve is very popular for running your application as that is very repetitive command and is executed a lot.

Bower its package management system for web applications and uses node.js and npm. In this project bower installation method was used preferably to npm. When installing firebase to the application throw npm using commands like.

- npm install firebase –save

Reference needs to be added to index.html page which downloads firebase module over the net.

```
src="https://cdn.firebase.com/js/client/2.2.4/firebase.js"
```

4.1.4   Github, git

Github was founded in 2008 its web based git repository it lets users have public repositories which are free and you can have any amount it also has an option for private repositories for which you have to pay and the more private repositories you have more you have to pay, but I has student bundles which provide 100 dollars' worth of development tools which is great for beginner developers such as myself. It provides graphical user interface for Windows and Mac to manage maintain and update projects but it does cause some errors failing to commit or failing to push or merge when that happens user is suggested to use git to fix the errors. For that reason git is way more stable and reliable which is command based tool it has five major commands hat are used constantly.It has played major role in this project and made project way more manageable and sustainable as well as less error prone regular commits made sure of small incremental progress throw out life of the project.

- git clone path/to/repo

  This command allows to clone any project from your github account or any publicly available project for that matter.
- git status

  Checks the status of project once it has been cloned it shows added deleted and modifies files as well as indicates which files are tracked.
- git add .

  Add folders or files to be tracked by github so later they can be committed and pushed on to github account.
- git commit –a

  Makes local commit of all the changes done in folder added by previous command git add .
- git push origin master

  Pushes commit (git commit -a) to users github account on his/her account

4.1.5 Sublime, Live Reload and Chrome

Sublime is code editor that supports cross platform functionality. It supports many different programming languages as well as mark-up languages and functionality can be extended with huge amount of plug in packages available. Currently Sublime is on version 3 it has been released in 2013. There are other editors out there such as Notepad++, Brackets, Vim Atom but Sublime proved to be most efficient in web development environment.Some of its best features;

- auto safe
- autocompleting
- multi-select-editing
- spell check
- snippets

4.2 Mean Stack

4.2.1 Mongodb/Firebase

MongoDB comes as part of popular stack MEAN it's a cross-platform document-oriented database and is classified as NoSql database. Its free and open source under a combination of the GNU Affero General Public License and the Apache License. Being object oriented data base it is shameless and needs no scheme as its older counter parts SQL based data bases. For that matter there is mongoose was developed which is an ORM for Mongo and is written in node.js and allows to give mongodb a scheme to make it more comparable with older system which all use SQL based data bases. It has grown in popularity and now is fourth most popular database management system. Its stores everything as an object in JSON like format and files object are indexed which allows instant retrieval of an object.

Firebase was founded in 2011 and is object oriented database allowing for fast retrieval of objects. It allows to store and sync data across many different platforms one of its best feature is three way data binding between Firebase and your applications view and controller and stores

data in json like format which is well understood format by developers across the world. Company has been acquired by google in 2014. Firebase is built in to Auth0 authentication framework which was one of the reasons why it was chosen for this project because Auth0 framework was used for authentication of this application Auth0 framework will be explained in more detail in Components section. Firebase generates authentication key which needs to be supplied to Auth0 in order to let firebase requests throw authentication system shown below.

```javascript
var ref = new Firebase("https://bookaroomfirebase.firebaseio.com/");
ref.auth("AUTH_TOKEN", function(error, result){
if (error){
console.log("Authentication Failed!", error);
}else{
console.log("Authenticated successfully with payload:", result.auth);
console.log("Auth expires at:", new Date(result.expires * 1000));
}
});
```

4.2.2 Express

Is part of the MEAN stack bundle and it handles server side. Express is owned by IBM as of 2015 ans in 2016 IBM announced that it will put Exprrss.js under the stewardship of the Node.js foundation incubator.

Express.js is a node.js web application (node.js is covered in other section) and uses minimalistic approach all server side script can be done in few lines of code this peace of code was used to run bookAroom-admin website shown below.

```javascript
var express = require('express');
var app = express();
var port = process.env.PORT || 8080;

app.use(express.static(__dirname + '/dist/'));

app.listen(port, function() {
console.log('Our app is running on port: ' + port);
});
```

And everything else is available as a plug in you simply require all the modules that you need. The modules below where used in bookAroom-user application to authenticate user.

```
var http = require('http')
var cors = require('cors');
var jwt = require('express-jwt');
var dotenv = require('dotenv');
```

4.2.3   Angular

Web applications are browser-based applications running in a browser using HTML5. WebHooks allow developers to access the hardware on a phone, this was unavailable before HTML5 [16], also it allows other features such as web storage, indexed database APIs, file APIs, web SQL Databases and Offline Web GeoLocations. This makes web applications more mobile friendly and compatible and allows them to use the full range of phone features. They do not require installation or any upgrades as it contains a one to many relationship (one server, many clients) so any updates are done on the server side and all clients get updated, but the network is required at all times in order to access the application. It lacks the native look and feel of target platforms such as Android, iOS or Windows Phone, altough there are many tools out there trying to solve the problem by simulating a native look such as Xui, JQyeryMobile, Sencha Touch, JQTouch and WebApp.net. Some 6 frameworks developing web applications include AngularJS, Ruby on Rails, Django and Drupal. AngularJS is explained in more detail down below.

It was developed by Misko Hevery in 2009 at Brath Tech LLC. It is now an open source framework mainly used for developing single page applications (SPA) it has become widely well known and is the top choice for many developers for creating dynamic html pages. In order to be able to program in AngularJS you have to know HTML, CSS and JavaScript. It is maintained by Google and the developer-community; it is under MIT license. It uses data binding which means you can attach controllers to certain parts of the page as well as taking advantage of the MVC (Model, View, Controller) pattern, creating a loosely coupled design to separate the three components of the web application so that they all are independent to one another; one of them can be

changed without impacting the others and you can swap and change components. If an application contains more than one page it can use Client side routing in order to dynamically switch content without refreshing the page. The Batarang plugin was built by Google in 2012 to improve the debugging of web applications built using AngularJS. It is also used with another three popular technologies known collectively as the MEAN Stack (MongoDB, Express, AngularJS and NodeJS). MongoDB is cross platform oriented database, it uses a JavaScript/JSON style syntax; it is open source. Express is a server framework that is used for building single page web applications and is expandable via plugins. NodeJS is cross platform runtime environment for server side applications, it's open source. As we can see all the technologies used in the MEAN stack are open source suggesting the reason for its huge community and popularity.

4.2.4   Node

Is an open source cross platform runtime environment for developing server-side web applications. It has been founded and released in 2009 and interprets googles V8 JavaScript engine. Some of the corporate users from industry include IBM, LinkedIn, PayPal, SAP, Yahoo so it's well adopted by heavy hitters in industry. Originally Node.js was only supported by linux operating systems, which enforces the reason for using Debian/linux operating system for this project.

4.3   Components

4.3.1   Yeoman/Modules

Yeoman is an open source client side development stack allowing developers web applications quickly not worrying about initial process of setting up it includes all industry standards such bootstrap responsive design etc. Some of the tools used in conjunction with yeoman generator.

– Grunt
– Gulp
– Bower

– Npm

When yeoman generator is initialized it generates full web application with all of the main structure. It generates app.js file which contains all the modules injections and any new injections need to be added to this file some of the modules used in this project:

– 'firebase'
– 'ngCookies'
– 'ngResource'
– 'ngRoute'
– 'ngSanitize'
– 'ngTouch'
– 'formly'
– 'formlyBootstrap'
– 'ngAnimate'

As well it contains Route Provider that maps all the views html pages to JavaScript controllers so each view is served one controller JavaScript class, this might prove a problem as it only allows for one script per class so services can be injected to controllers to add more scripts per one view.It also maps pages html address so this can be used in future for authentication.Code below how routing ow one html page looks like.

```
.when('/view', {
templateUrl: 'views/view.html',
controller: 'WorkBenchController',
controllerAs: 'fireApp'
})
```

Testing modules of Yoeman:

– jshint
– travis
– karma
– jscsrc

JSHint, a tool that helps to detect errors and potential problems in JavaScript code.   Karma a simple tool that allows you to execute JavaScript code in multiple real browsers.   Travis lets you test your build modules.

4.3.2   Angular formly

Angular formly simplifies form layout in html and allows for more structured code give forms consistency, flexibility, maintainability, simplicity and sanity. Before Angular-formly if you would wanted to have a form you would had something like this to get your input from user:

```html
<form>
<div class="form-group">
<label for="exampleInputEmail1">Email address</label>
<input type="email" class="form-control"
id="exampleInputEmail1" placeholder="Enter
email" ng-model="vm.user.email">
</div>

<div class="form-group">
<label for="exampleInputPassword1">Password</label>
<input type="password" class="form-control"
id="exampleInputPassword1" placeholder="Password"
 ng-model="vm.user.password">
</div>

<button type="submit" class="btn btn-default"
 ng-click="vm.submit(vm.user)">
 Submit</button>
</form>
```

For every button check box drop-down list etc you need a div with at-least 3 lines of code formly replaces that with this:

```html
<formly-form model="vm.user" fields="vm.userFields">
<button type="submit" class="btn btn-default"
ng-click="vm.submit(vm.user)">Submit</button>
</formly-form>
```
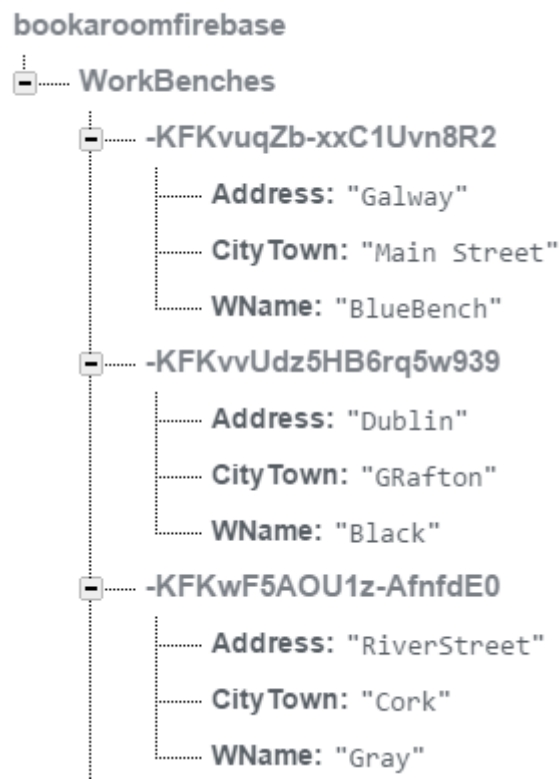
Which is efficient from html point of view but it does call additional JavaScript so it trims down on html but beefs up on server side. Depending on the application this can be used or not. But it does make html more readable and understandable.

4.3.3 Ng-repeat, orderBy, filter

All of the more advanced applications today have some sort of dynamic element to it there is very few simple static content websites. Websites today are dynamic and ever changing the dynamic element of the websites always includes some sort of connections to database might be sql, object oriented or graph database it calls those elements from database and must render them in html and css rendering each element manually would be tedious and time consuming ng-repeat allows to define html once for one element and looped throw all the elements using same code and it looks like this:

```
<tr ng-repeat="item in WorkBenches |
orderBy:sortType:sortReverse | filter:searchWorkbench">
<td>{{ item.Address }}</td>
<td>{{ item.CityTown }}</td>
<td>{{ item.WName }}</td>
<td>
</tr>
```

So with some JavaScript code it makes call to Fire-base database and for every item in Work Benches which we can see there a few t renders it in html.

```
bookaroomfirebase
 ┊
 ⊟······ WorkBenches
         ⊟······ -KFKvuqZb-xxC1Uvn8R2
                 ├······ Address: "Galway"
                 ├······ CityTown: "Main Street"
                 └······ WName: "BlueBench"
         ⊟······ -KFKvvUdz5HB6rq5w939
                 ├······ Address: "Dublin"
                 ├······ CityTown: "GRafton"
                 └······ WName: "Black"
         ⊟······ -KFKwF5AOU1z-AfnfdE0
                 ├······ Address: "RiverStreet"
                 ├······ CityTown: "Cork"
                 └······ WName: "Gray"
```

And the effect of ng-Repeat in html page is this and you can have as many elements as you like.

Search Workbench		
Workbench City/Town	**Workbench Address**	**Workbench room name**
Galway	Main Street	BlueBench
Dublin	GRafton	Black
RiverStreet	Cork	Gray

Few of other elements to mention is order By and filter. Order by allows to order item in ng-repeat so you can order by any of the three

attributes; Address, CityTown, WName. Filter allows to to add search
bar to the list so you can look for item so as you type in name you
looking for only those item containing typed in characters get rendered
in html and if search bar is empty all items are rendered because all
contain nothing. Ng- Repeat just makes life easier.

4.3.4   Heroku

Orion Henry, Adam Wiggins and James Lindenbaum founded Heroku
in 2007 and was acquired by Salesforce in 2010.Heroku is cloud based
Platform-as-a-service for short is called PaaS in the beginning it sup-
ported just Ruby but now since it grew so in popularity it supports more
languages like; PHP, Go, Java, Scala, Clojure, Python and most im-
portant Node.js which made it possible to develop this application.Few
things are needed to get started with heroku

- – Node
- – Npm
- – Heroku Toolbelt
- – Git Bash

After these tools are installed in command prompt you type in heroku
and then heroku login that will give you powers to upload your website
from command line from your git repository.

You will need to create proc file in your root repository and include this
peace of code to tell heroku server to run your application just same
way you start your application locally same way it start on Heroku
server you just need to tell it.

- – web: node server.js

When you are loged in your heroku account throw cmd you need cloned
git repository using git command (This emplies your application has
node server build)

```
$git clone https://github.com/VytasHub/bookAroom-admin
```

You than go heroku create that creates your website.Afther that you type following command which gives website name and port number on which it listens.

```
heroku apps:rename heroku-node-8080 --app calm-reaches-6216
```

Than you simply push to server and your app is deployed.

```
git push heroku master
```

Few other use-full commands to mention.This will allow to see you if the application is running.

```
$ heroku ps:scale web=1
```

And this will open website from command line.

```
$ heroku open
```

One of the issues that occurred while deploying to server was when pushing to server using git push heroku master old website were getting pushed. So need to use git status to see what you actually pushing because git repositories get queued in heroku and only first one gets pushed.

4.3.5   Auth0

Auth0 pronounced "Auth Zero" provides authentications system and framework for all kinds of applications such as Web applications, Interpreted applications, Hybrid Applications, Generated Applications. It abstracts all of the authentication from the developer and lets developer focus on actual applications development instead of doing same repetitive tasks that all applications have .One of the reasons why it was chosen for this project is that it also works well with Firebase and with relative small adjustments to the code allows to retrieve information from firebase.

Auth0 handles login, signup, password recovery, as well one of its key features it allows social connections such as Facebook, Gmail, Twitter, GitHub etc. Which makes it very convenient for the user as it allows quick and fast access without tedious sign up process. As well as that it also allows database exporting and importing of existing users from different application. So old applications can be updated to log in system. Here as an example how easy it is to switch social connections in your Auth0 dashboard.

SocialProviders
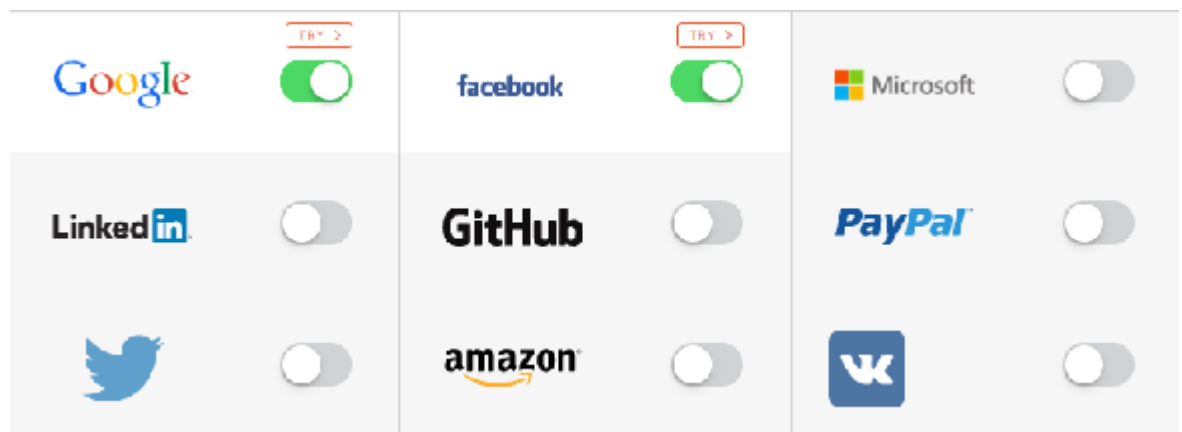
In the application in index.html page there only has to be 2 reference that gets the Auth0 widget log in window which are showed down below.

```
<script type="text/javascript" src="https://cdn.auth0.com/js/lock-7.12.min.
<script type="text/javascript" src="https://cdn.auth0.com/w2/auth0-angular-
```

And than depending on the applications you need to add few more JavaScript reference which get tailored to your application and are provided by Auth0.

```
<script type="text/javascript" src="auth0-variables.js">
</script>
<script src="//cdn.rawgit.com/auth0/angular-storage
/master/dist/angular-storage.js"
type="text/javascript"> </script>
<script src="//cdn.rawgit.com/auth0/angular-jwt/master/dist/angular-jwt.js"
type="text/javascript"> </script>
```

And the end result is beautifully looking widget added to your application.
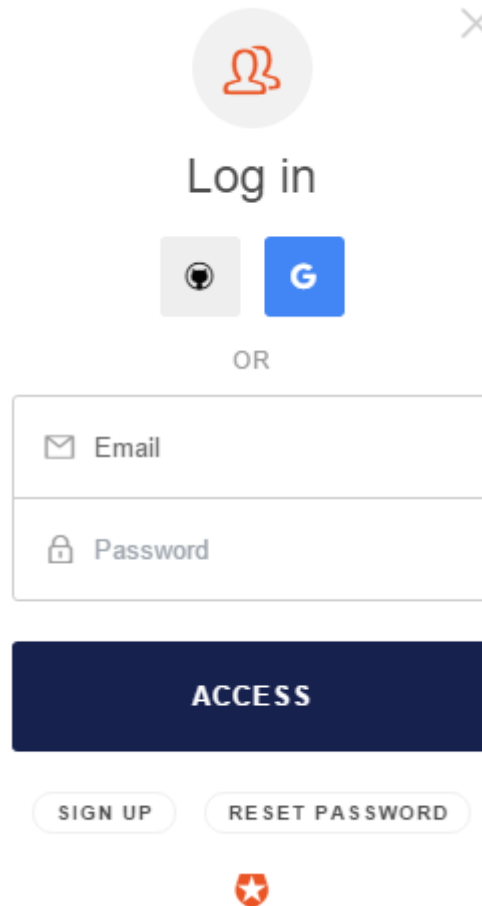
In development of this application more functionality was added using Auth0 framework. When user logs in using social provider such as Facebook Gmail etc. Auth0 node API retrieves a user object from that provider with all user information and that information can be used in conjunction with application in this instance I used the information to flavour the application to user and made a nav bar in html that gets user picture and log in name. The object that's retrieved from social provider can be used for further analysis as well as data analytics can be performed. Here is a diagram showing how Auth0 service works.
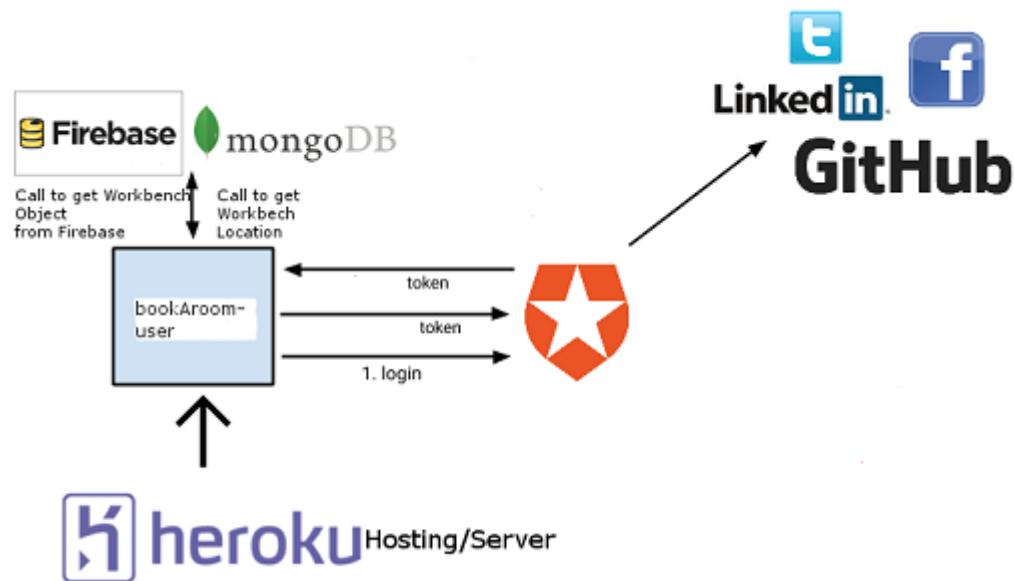
4.4   Google Maps

In the beginning, the Google Maps service was only accessible at https://maps.google.com but due to its popularity, Google decided to share it with the world by creating the Google Maps APIs in 2005 which allowed for simple use or extensive customization. These APIs allow developers to embed Google Maps into web pages where site specific data can be overlaid, or retrieve data from Google Maps. Google Maps use Ajax so data can be sent and received from the server asynchronously without affecting or having to reload the entire page.

4.5   Google Maps JS API

The Google Maps JavaScript API allows a number of different elements to be added to the map for functionality, such as;

- Overlays – these can represent a point of interest using markers for example.
- Events – triggered by an action such as clicking the map.
- Controls – controls to enable zooming, moving map and switching between map types.

– Services – allows functionality and features such as directions, geocoding (addresses to coordinates).

4.6 MongoDB Hosting

MongoLab, now called mLab, was founded in 2011 and provides a fully managed cloud database service that can host MongoDB databases. At present it allows you to choose from three different cloud providers; Amazon Web Services (AWS), Google's Cloud Platform, or Microsoft's Azure. Each of these offer plans with up to 500MB free storage with paid plans thereafter. MongoDB has partnered with Platform-as-a-service providers such as Heroku and Microsoft Azure. Network World named mLab as one of the 10 most useful cloud databases. mLab provides an easy to use, seamless, zero-downtime scaling service that lets you focus on your product instead of operations.

Chapter 5

System Design

5.1 bookAroom-user

We have five components to the application

   – Auth0

   – Firebase

   – MongoDB

   – WebApplication

   – Social Providers

   – Heroku

Down below flow diagram of the application is displayed.
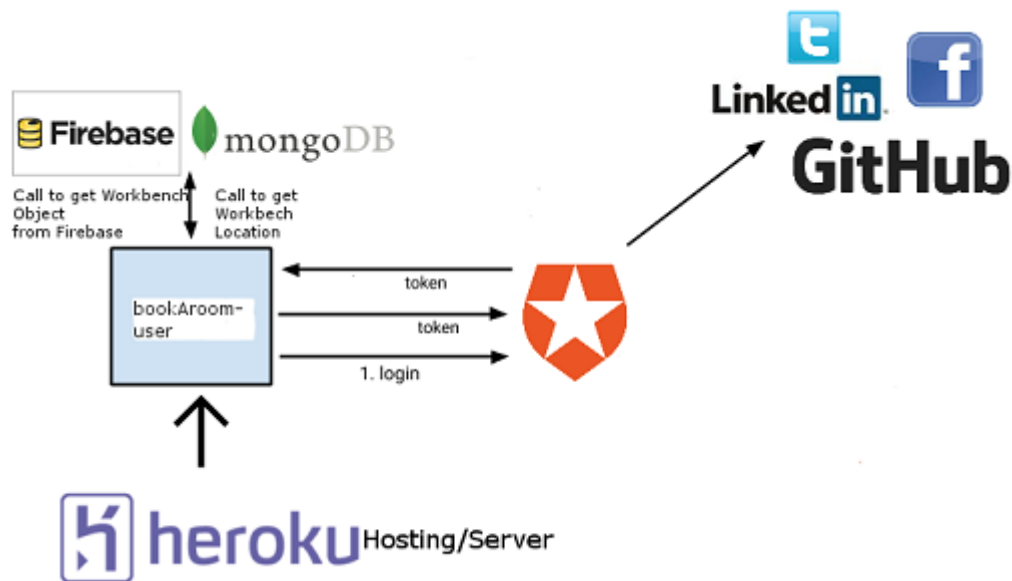
5.1.1   Auth0

Auth0 logging in system which allows user to sign up or log in with
social provider such GitHub or Gmail. And is composed of 2 part an
Angular app which contains all of the websites content and a node API
which handles the logging , but when uploading it to heroku server
prove to be challenging to start 2 separate components so bout were
combined into one server.js file.

```
var http = require('http');
var express = require('express');
var cors = require('cors');
var app = express();
var jwt = require('express-jwt');
var dotenv = require('dotenv');

dotenv.load();
var port = process.env.PORT || 3001;
```

Auth0 system had to be configured by adjusting following variables in
auth0-variables.js calss. The variables show below were obtained from
Auth0 provider when crating the application.

```
var AUTH0_CLIENT_ID='d4aV2GYuoQxjQ4qU5yfS3XiIQPwdmkOH';
var AUTH0_DOMAIN='book.eu.auth0.com';
var AUTH0_CALLBACK_URL=location.href;
var AUTH0_CLIENT_SECRET='78KGRbG59R-
FEevfFL8eIBeGt2bf3DucmAMqeLzuv4jpbGnM-uoXiea_EqZoWyLN';
```

Name	MyVytas	
Domain	book.eu.auth0.com	
Client ID	d4aV2GYuoQxjQ4qU5yfS3XilQPwdmkOH	
Client Secret	••••••••••••••••••••••••••••••••••••••	

The Client Secret is a base64 encoded string

Callback URLs	https://bookaroomnow.herokuapp.com/#/login

5.1.2 Firebase

Fire-base store all the workbenches object and can be Created, Updated, Deleted.

```
bookaroomfirebase
⊟⋯ WorkBenches
     ⊟⋯ -KFKvuqZb-xxC1Uvn8R2
          ⋯ Address: "Galway"
          ⋯ CityTown: "Main Street"
          ⋯ WName: "BlueBench"
     ⊟⋯ -KFKvvUdz5HB6rq5w939
          ⋯ Address: "Dublin"
          ⋯ CityTown: "GRafton"
          ⋯ WName: "Black"
     ⊟⋯ -KFKwF5AOU1z-AfnfdE0
          ⋯ Address: "RiverStreet"
          ⋯ CityTown: "Cork"
          ⋯ WName: "Gray"
```
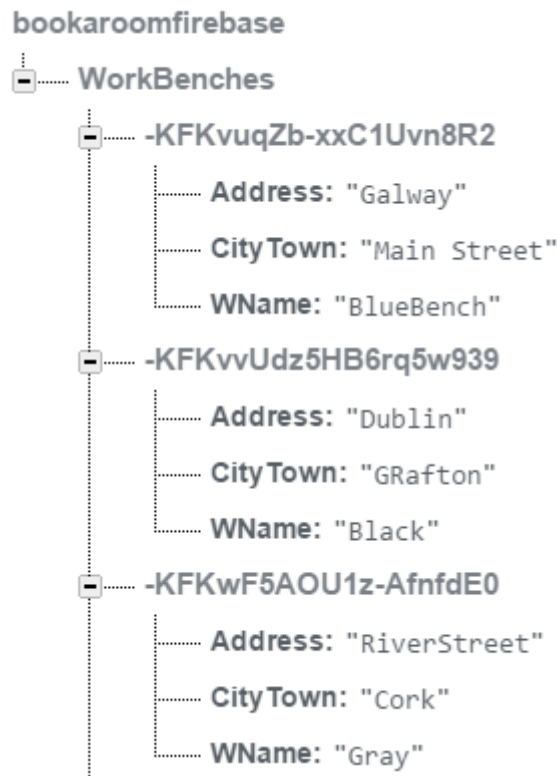
5.1.3 MongoDB

MongoLab, now called mLab, was founded in 2011 and provides a fully managed cloud database service that can host MongoDB databases. At present it allows you to choose from three different cloud providers; Amazon Web Services (AWS), Google's Cloud Platform, or Microsoft's Azure. Each of these offer plans with up to 500MB free storage with paid plans thereafter. MongoDB has partnered with Platform-as-a-service providers such as Heroku and Microsoft Azure. Network World named mLab as one of the 10 most useful cloud databases. mLab provides an easy to use, seamless, zero-downtime scaling service that lets you focus on your product instead of operations.

5.1.4   WebApplication
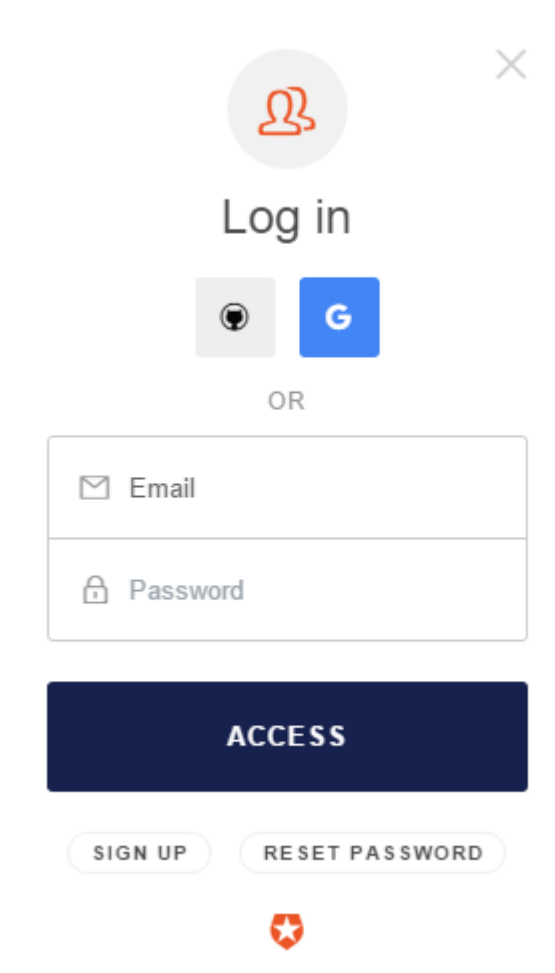
Web application consists of 3 components.

- Landing Page
- Login Widget
- Application Content

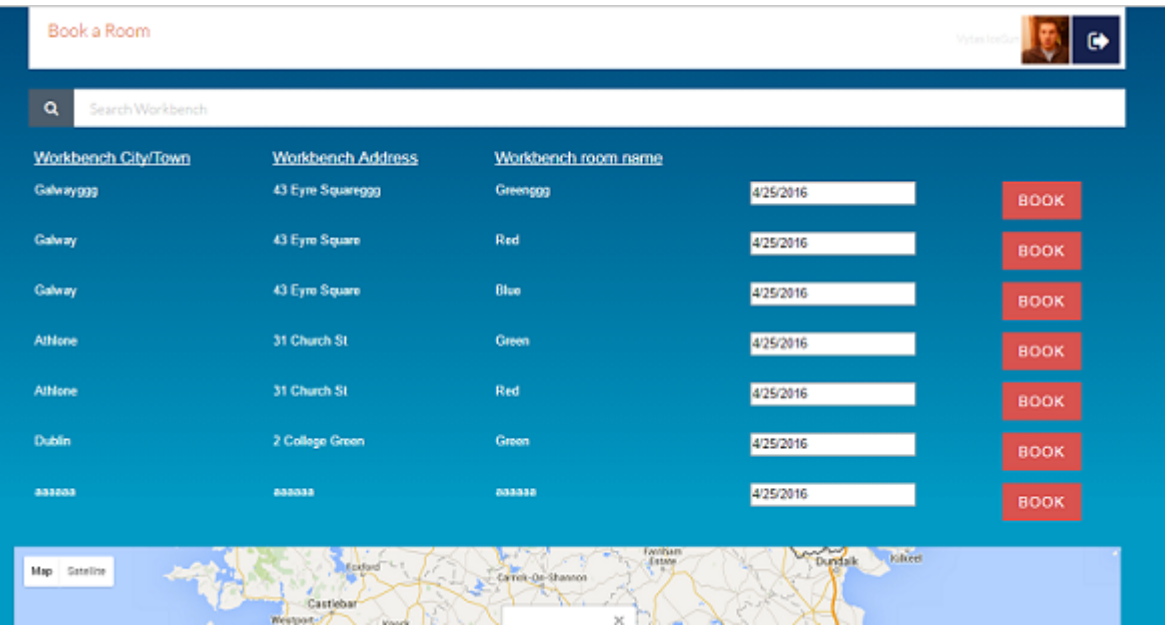Landing Page describes what's Webapp about briefly and lets user to sign.
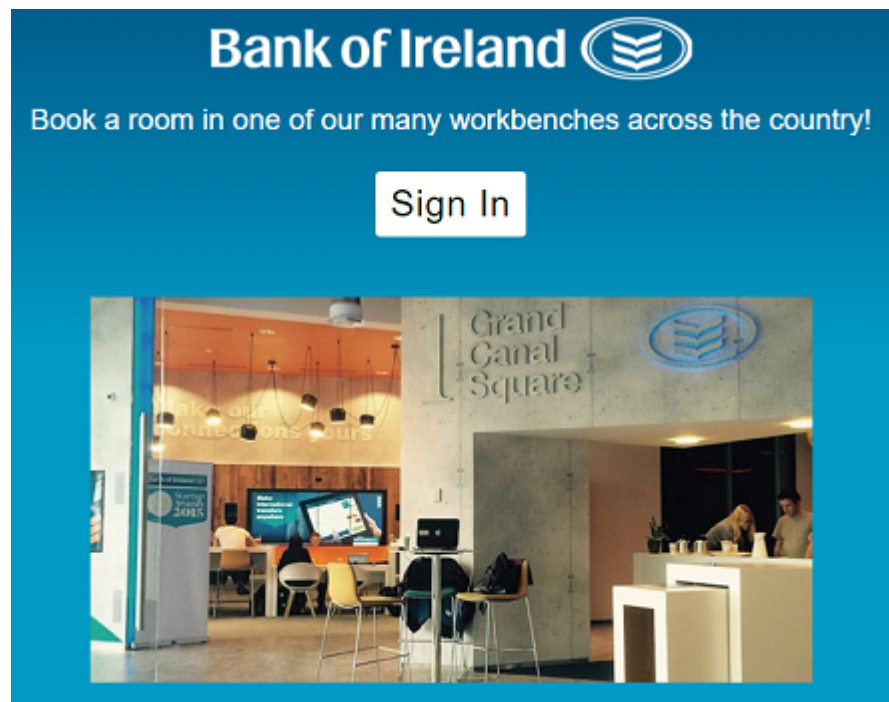
Login Widget allows user to log in to application with social provider such as github or gmail or sign up.

App Content displays all workbenches that can be booked lets sort them by each category, search for workbench set the date for booking and displays workbench location on google maps.

5.1.5 Social Providers

Social Provider needs to be set up on Auth0 website and keys need to be set up for any particular social provider such gmail github etc throw their website and developer account need to be created for gmail and github.

Github

GitHub

Settings   Apps

Name ⓘ

github

Client ID
How to obtain a
ClientID?

2bdbd142c115c7a50345

Client Secret

40ad57470150a181be8f4195ead384d542b9915b
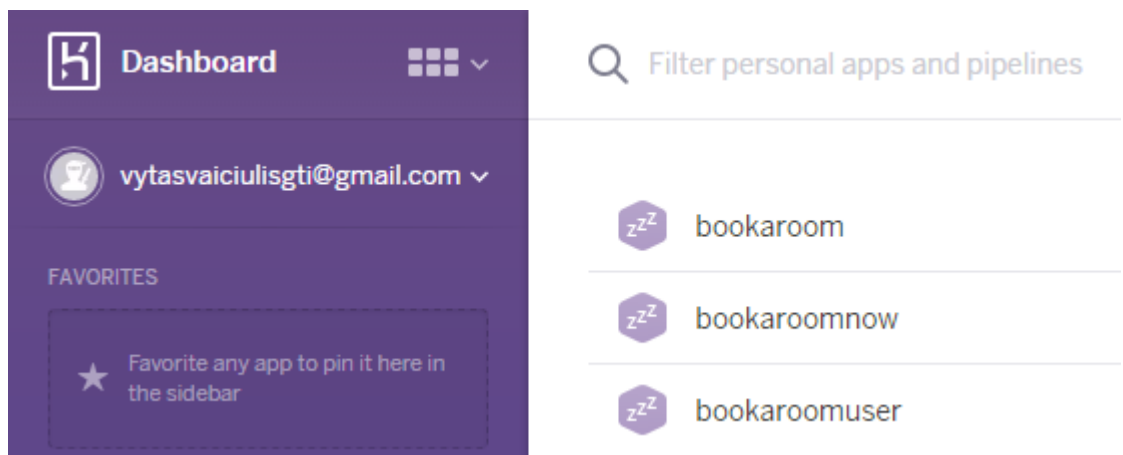
Attributes   ☑ Basic Profile [required] ⓘ

                  ☑ Email address ⓘ

Gmail

5.1.6 Heroku

Folowing commands are used to upload website to heroku server.

```
heroku login
heroku git clone https://github.com/VytasHub/bookAroom-user
heroku create bookaroomnow
heroku push origin master
```


Proc file needs to be created and put in top directory of the project this were issues arose because Auth0 consistent of two separate applications which had two separate server so bout of them were put in to one to alow heroku upload.

5.2 bookAroom-admin

This website was made using yeoman generator described in technical review. The main components of the app are listed below.

- Web application
- Heroku
- Firebase

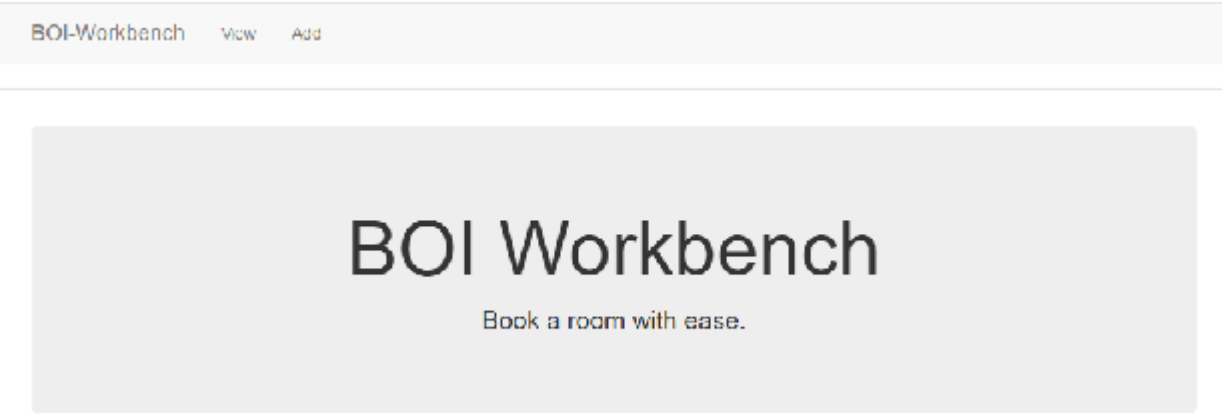Here is a flow diagram of the design of application.
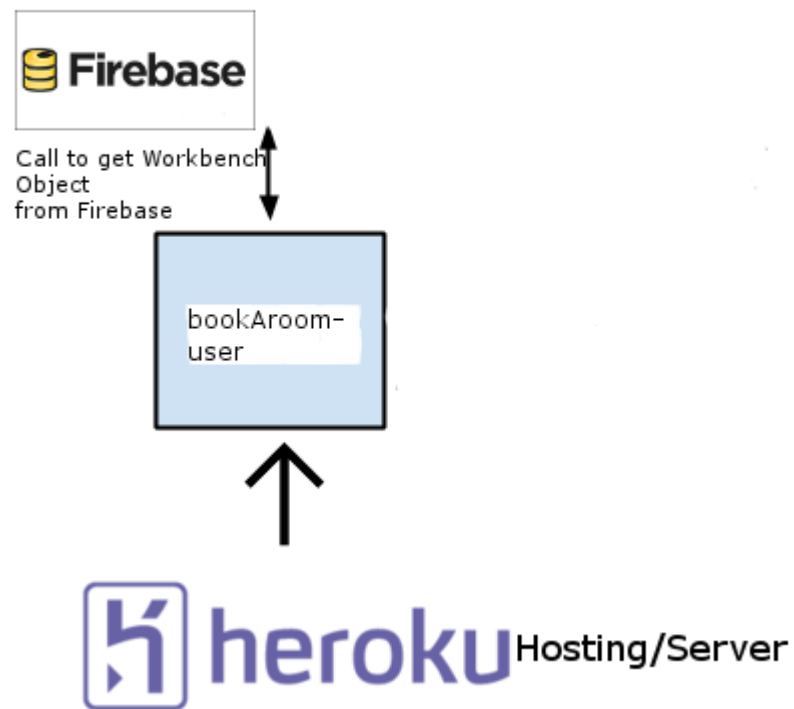
5.2.1 Web application

Web application consists of three pages.

– Landing page

– Add page

– View page

This is landing page of the application it doest't have any functionality apart from introducing Admin to the page.

This view page where all records can be viewed edited deleted, search for and sorted.

This page where records can be added and than be viewed on view page.

BOI-Workbench   View   Add

Search Workbench

Workbench City/Town	Workbench Address	Workbench room name
Galwayggg	43 Eyre Squareggg	Greenggg
Galway	43 Eyre Square	Red
Galway	43 Eyre Square	Blue
Athlone	31 Church St	Green
Athlone	31 Church St	Red
Dublin	2 College Green	Green
aaaaaa	aaaaaa	aaaaaa

Made with ♥ by Vytas
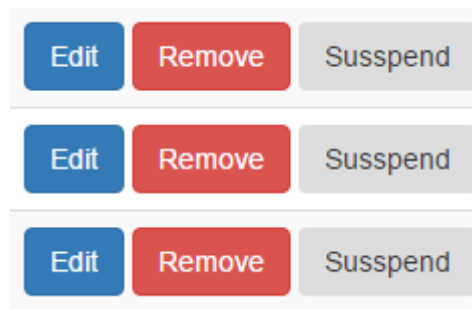
5.2.2 Heroku

Flowing commands are used to upload website to heroku server.

```
heroku login
heroku git clone https://github.com/VytasHub/bookAroom-admin
heroku create bookaroomnow
heroku push origin master
```

5.2.3   Firebase

Firebase store all the workbenches object and can be Created, Updated, Deleted.

```
bookaroomfirebase
├──── WorkBenches
      ├──── -KFKvuqZb-xxC1Uvn8R2
      │     ├──── Address: "Galway"
      │     ├──── CityTown: "Main Street"
      │     └──── WName: "BlueBench"
      ├──── -KFKvvUdz5HB6rq5w939
      │     ├──── Address: "Dublin"
      │     ├──── CityTown: "GRafton"
      │     └──── WName: "Black"
      ├──── -KFKwF5AOU1z-AfnfdE0
      │     ├──── Address: "RiverStreet"
      │     ├──── CityTown: "Cork"
      │     └──── WName: "Gray"
```
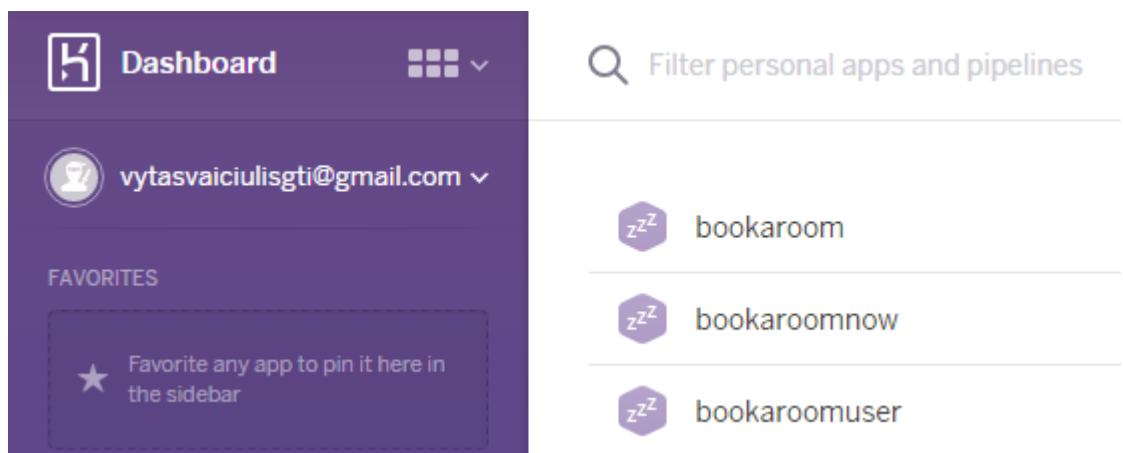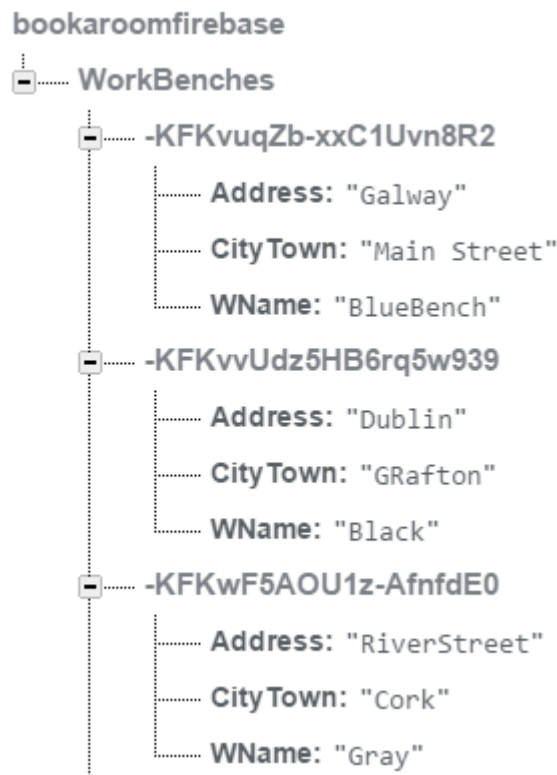
5.3   Google maps

MongoDB is used in this project to store the locations of the workbenches which are displayed on the map. MongoDB is the leading NoSQL database which is efficient and scalable. Unlike traditional table-based relational databases it uses JSON like documents with dynamic schemas to make the integration of data in certain types of apps easier and quicker. This application used mLab to host the MongoDB on Amazon Web Services. For each record there is a field for the Workbench name, location, number of rooms and a link to book a room. The database can be accessed by logging into mLab.com and here records can be added, edited or deleted. The following code extract is used so the application connects to the MongoDB on Amazon Web Services;

```
var mongoose = require('mongoose');
mongoose.connect("mongodb://workbenches1:workbenchlocations@ds013310.
mlab.com:13310/workbenches")
```

The data from MongoDB can then be displayed on the map as shown below; google maps
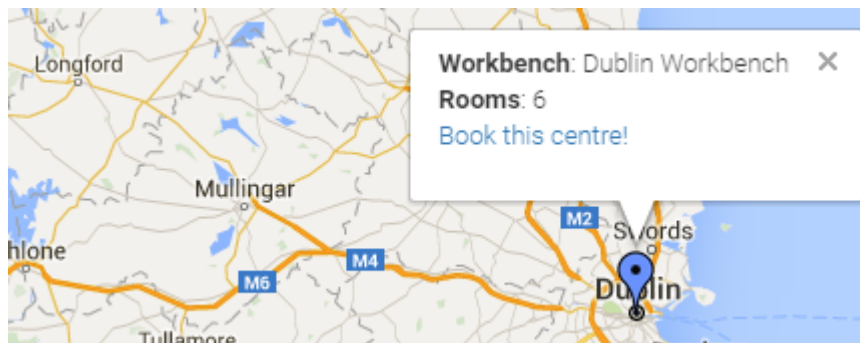
The application uses the Google Maps JavaScript API to displays a Google Maps element with markers for the workbench locations. To use these maps in a web application, a key must first be obtained from the Google Developers site. This key is then added into the html file which allows it to display the map on the page;

```
<script src="https://maps.googleapis.com/maps/
api/js?key=AIzaSyB6r9DaTCZdMx6MxqQQEviy3GaGS-5tXrg"></script>
```

Chapter 6

System Evaluation

Both of the applications are used developing MEAN (Mongo, Express, Angular, Node.js) stack and Firebase these technology's been tested by the industry and are well proven to robust and allows for quick and rapid development taking out mundane tasks combining this with yeoman generator it makes development even easier as yeoman generates test cases using modules such as:

– jshint
– travis
– karma
– jscsrc

6.1 Firebase

Firebase was founded in 2011 and is object oriented database allowing for fast retrieval of objects. It allows to store and sync data across many different platforms one of its best feature is three way data binding between Firebase and your applications view and controller and stores data in json like format which is well understood format by developers across the world. Company has been acquired by google in 2014. Firebase is built in to Auth0 authentication framework which was one of the reasons why it was chosen for this project because Auth0 framework was used for authentication of this application Auth0 framework will be explained in more detail in Components section. Firebase generates authentication key which needs to be supplied to Auth0 in order to let firebase requests throw authentication system shown below.

6.2   Express

Is part of the MEAN stack bundle and it handles server side. Express is owned by IBM as of 2015 ans in 2016 IBM announced that it will put Exprrss.js under the stewardship of the Node.js foundation incubator.

```
var express = require('express');
var app = express();
var port = process.env.PORT || 8080;

app.use(express.static(__dirname + '/dist/'));

app.listen(port, function() {
console.log('Our app is running on port: ' + port);
});
```

Express.js is a node.js web application (node.js is covered in other section) and uses minimalistic approach all server side script can be done in few lines of code this peace of code was used to run bookAroom-admin website shown below.

6.3   Angular

Web applications are browser-based applications running in a browser using HTML5. WebHooks allow developers to access the hardware on a phone, this was unavailable before HTML5 [16], also it allows other features such as web storage, indexed database APIs, file APIs, web SQL Databases and Offline Web GeoLocations. This makes web applications more mobile friendly and compatible and allows them to use the full range of phone features. They do not require installation or any upgrades as it contains a one to many relationship (one server, many clients) so any updates are done on the server side and all clients get updated, but the network is required at all times in order to access the application. It lacks the native look and feel of target platforms such as Android, iOS or Windows Phone, altough there are many tools out there trying to solve the problem by simulating a native look such as Xui, JQyeryMobile, Sencha Touch, JQTouch and WebApp.net. Some 6 frameworks developing web applications include AngularJS, Ruby on Rails, Django and Drupal. AngularJS is explained in more detail down below.

It was developed by Misko Hevery in 2009 at Brath Tech LLC. It is now an open source framework mainly used for developing single page applications (SPA) it has become widely well known and is the top choice for many developers for creating dynamic html pages. In order to be able to program in AngularJS you have to know HTML, CSS and JavaScript. It is maintained by Google and the developer-community; it is under MIT license. It uses data binding which means you can attach controllers to certain parts of the page as well as taking advantage of the MVC (Model, View, Controller) pattern, creating a loosely coupled design to separate the three components of the web application so that they all are independent to one another; one of them can be changed without impacting the others and you can swap and change components. If an application contains more than one page it can use Client side routing in order to dynamically switch content without refreshing the page. The Batarang plugin was built by Google in 2012 to improve the debugging of web applications built using AngularJS. It is also used with another three popular technologies known collectively as the MEAN Stack (MongoDB, Express, AngularJS and NodeJS). MongoDB is cross platform oriented database, it uses a JavaScript/JSON style syntax; it is open source. Express is a server framework that is used for building single page web applications and is expandable via plugins. NodeJS is cross platform runtime environment for server side applications, it's open source. As we can see all the technologies used in the MEAN stack are open source suggesting the reason for its huge community and popularity.

6.4 Node.js

Is an open source cross platform runtime environment for developing server-side web applications. It has been founded and released in 2009 and interprets googles V8 JavaScript engine. Some of the corporate users from industry include IBM, LinkedIn, PayPal, SAP, Yahoo so it's well adopted by heavy hitters in industry. Originally Node.js was only supported by linux operating systems, which enforces the reason for using Debian/linux operating system for this project.

6.5 Google Maps

When developing the app, it was tested from various locations to check the accuracy of the user's location and was found to be quite precise, usually within 2km of their actual location. This feature could be expanded upon and used as a check in system if the app was further developed. The app was tested on various sized devices and adjusted well in each case. One of the objectives of this project was to display the workbench locations on a map so that the user could easily determine suitable centres. Thankfully we were able to achieve this and the project includes a map which displays markers where the workbenches are that allows the user to easily zoom and move the map. Despite reaching this goal, there are some improvements that could have been made to this particular feature such as for the marker to display the distance from the user or the estimated travel time. On the whole, the Google Maps JavaScript API is considered quite robust and this is one of the reasons it is so universally used. The markers that are displayed on the map are stored on a MongoDB and hosted on the Amazon Web Service using mLab as this is quite fast and efficient. mLab was chosen for a number of reasons including its seamless, zero downtime scaling and its feature for backup and recovery. There were a number of limitations on the project including time constraints which we had to meet. A number of opportunities also arose due to the technologies used. Using the MEAN Stack meant JavaScript was used throughout so the app could be more easily integrated together than if using for example the LAMP stack. This meant that one language could be learned and also each layer uses JSON so data flows neatly.

Chapter 7

Conclusion

7.1 Vytas Conclusion

In the development of this project I learned a huge amount of new technologies and how everyone and each of them work and what are the advantages using development stacks and different frameworks usefulness of testing and power of automation by automating mundane tasks with bash scripting which proved to be very useful. I have automated GitHub commit push and upload to heroku server all in one script called .go/sh which made life a lot easier. These the technologies I learned in development of this web application:

- Firebase
- Mongo
- Node.js
- Express
- Angular
- Heroku
- Angular Formly
- Ng-Repeat
- Yeoman
- Debian
- Auth0

As well I learned full development life cycle of web application went from idea and planning to development debugging testing and finally deployment. Debugging web applications did prove tricky but using right tool it does improve and after a while errors get repetitive. Seeing a syntax error is one of the best things because it easy to fix. Few of moust encountered errors:

- Module is not defined
- It's not a function and got undefined
- Failed to inject dependency
- 404 not found

Once I learned how to deal with moust occurring errors the development of application got a lot smoother and cleaner. My biggest insight in to developing this application that using a stack like MEAN stack is a big advantage when developing an application because all technologies work very well together and there is good community around it to help. One of the biggest advantage was using Fire base as it has very good documentation and very good tutorials how to incorporate it in to your application. In the development I also contacted Auth0 team because I had an error they got back to me very quickly with solution which was big help so for any future applications that I might develop that would require authentication I would use Auth0.

7.2 Team Conclusion

We achieved the feature of a map displaying markers for the workbench locations but there are a number of ways the project could be expanded upon and improved if there had been more time. One way I think the project could be expanded upon is to create a hybrid or native application which could provide a slightly better experience for the user. I think the Maps feature could be improved so that the info window could display a short list of available times for a quick booking feature. This project was quite challenging and gave me a great insight into the process of developing an application from start to finish. I feel it has given me some invaluable experience and understanding of all the different stages from planning and designing the application to the development and finally the deployment stage.

Chapter 8

References

www.firebase.com
https://www.mongodb.org/
https://nodejs.org/en/
http://expressjs.com/
https://angularjs.org/
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https://scotch.io/tutorials/easy-angularjs-forms-with-angular-formly
https://scotch.io/tutorials/building-dynamic-angular-forms
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