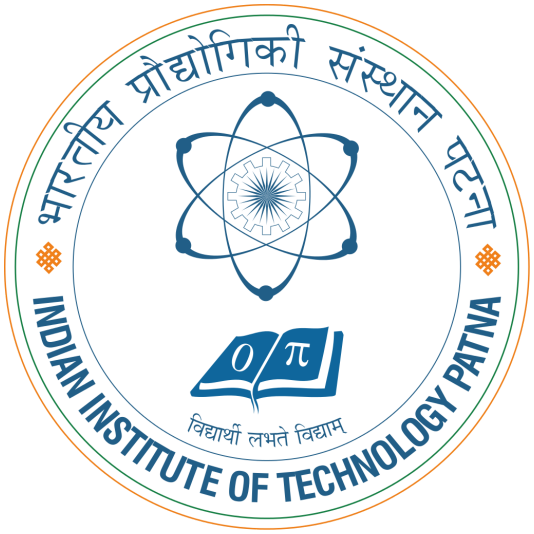
Indian Institute of Technology Patna

Summer internship Report

2017



For the evaluation of CS 400

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Acknowledgement

There are many people whom I want to thank for the successful completion of my Project.

First of all, I would like thank Dr. Jimson Mathew, my guide for this project for giving me this opportunity. I learnt a lot from his insights, discussions, and guidance. He is always encouraging and it was because of his confidence that I was able to complete the work that was assigned to me. He would always assign me to the right person whenever I needed any assistance or I was stuck at any place, and would also suggest new ideas to implement for the project.

I would like to thank my PhD supervisor, Mr. Rakesh Kumar Sanodiya, who gave me an introduction to the existing technologies which could be used for the project, and helping me out in times I needed help. We would have good discussions regarding the design and functioning of the app which gave me direction to work, and helped me a lot.

I cannot forget thanking my brother Santosh Kumar Singh, my parents and friends for their constant support, faith and encouragement.

Abstract:

The Objective:

To develop a mobile application which would:

- help the users to get information about buses
- track them real time, and also
- provide them data about what is the expected arrival times of them.

Another chief requirement was that the platform be

- mobile OS independent (must work for both iOS and Android),
- secure, and
- easy to use

Here are the ***set of tasks that I completed by the end of the internship*** (I shall elaborate on them in later chapters):

- Learnt about the Ionic platform for mobile application development. I spent considerable time reading documentation, developing and running simple prototype applications and using it.
- As I was complete beginner to the project, I had to get a firm grasp over several Languages and Technologies like: AngularJS, JavaScript, HTML, CSS, MySQL and Node.JS. For this I read their documentation and tutorials and also developed simple products using them. Before starting to develop my final application.
- I learnt using these technologies for specific functionalities that I would require for my application, connecting with the cloud, data fetching, data storing, back-end

management, getting GPS data from mobile devices, developing user login systems and integrating all these into the final product.

- Overall, I wrote approximate ***2000 lines of code, spent considerable hours of dedicated work daily, read the documentation of 4 GPS tracking softwares, read atleast 2 research papers, innumerable articles and websites for tutorials, ideas and debugging.***

Introduction to the Project:

What necessitates this project?

The objective of the project is well elucidated in the abstract page. The main aim of developing such a software is to smartify the existing public transport in an otherwise unorganised sector in India. Bringing up such smart systems would not just help people travelling to work daily, but also people in emergencies, travellers and tourists, and people who have newly immigrated to a place and have difficulty in travel because of language barrier. Overall this app would be of great convenience to the public and in the future be also great for smart traffic management (as public vehicles will be under the scanner of the traffic police, who would be able to better identify traffic patterns and take action). Also general people would be able to understand the traffic density of different roads real time, and make better informed driving choices.

Tools and technology used:

1. **Ionic Cordova:** It could have been perfectly fine to use Android Studio for developing the mobile application., But then we would not have been able to cater to the needs of people of other mobile operating systems. Hence we zeroed in on Ionic Cordova platform as our choice for developing our system. Here is an introduction to the platform:

   Ionic is a powerful HTML5 SDK that helps us build native-feeling mobile apps using web technologies like HTML, CSS, and Javascript. Ionic is focused mainly on the look and feel, and UI interaction of the app. That means it isn't a replacement for PhoneGap or Javascript framework. Instead, Ionic simply fits in well with these projects in order to simplify one big part of the app: the front end. Ionic currently requires AngularJS in order to work at its full potential which gives powerful UI interactions, gestures, animations, and other things.

2. **Cloud9 IDE:** is an online integrated development environment, published as open source from version 3.0. It supports hundreds of programming languages, including C, C++, PHP, Ruby, Perl, Python, JavaScript with Node.js, and Go. It enables developers to get started with coding immediately with pre-configured workspaces, collaborate with their peers with collaborative coding features, and web development features like live preview and browser compatibility testing.

3. **HTML:** Hypertext Markup Language (HTML) is the standard markup language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript it forms a triad of cornerstone technologies for the World Wide Web. Web browsers receive HTML documents from a web server or from local storage and render them into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

4. **JavaScript:** JavaScript , often abbreviated as JS, is a high-level, dynamic, weakly typed, object-based, multi-paradigm, and interpreted programming language. Alongside HTML and CSS, JavaScript is one of the three core technologies of World Wide Web content production. It is used to make webpages interactive and provide online programs,

including video games. The majority of websites employ it, and all modern web browsers support it without the need for plug-ins by means of a built-in JavaScript engine. Each of the many JavaScript engines represent a different implementation of JavaScript, all based on the ECMAScript specification, with some engines not supporting the spec fully, and with many engines supporting additional features beyond ECMA.

5. **CSS:** Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language. Although most often used to set the visual style of web pages and user interfaces written in HTML and XHTML, the language can be applied to any XML document, including plain XML, SVG and XUL, and is applicable to rendering in speech, or on other media. Along with HTML and JavaScript, CSS is a cornerstone technology used by most websites to create visually engaging web pages, user interfaces for web applications, and user interfaces for many mobile applications

6. **AngularJS:** AngularJS is a JavaScript-based open-source front-end web application framework mainly maintained by Google and by a community of individuals and corporations to address many of the challenges encountered in developing single-page applications. The JavaScript components complement Apache Cordova, the framework used for developing cross-platform mobile apps. It aims to simplify both the development and the testing of such applications by providing a framework for client-side model–view–controller (MVC) and model–view–viewmodel (MVVM) architectures, along

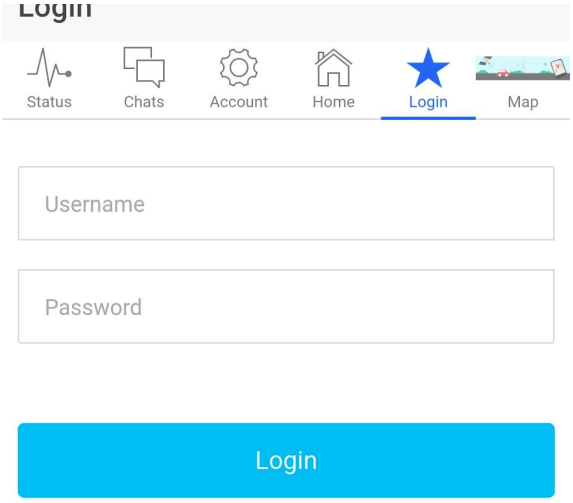
with components commonly used in rich Internet applications. In 2014, the original AngularJS team began working on Angular (Application Platform).

7. **NodeJS:** Node.js is an open-source, cross-platform JavaScript runtime environment for executing JavaScript code server-side. Historically, JavaScript was used primarily for client-side scripting, in which scripts written in JavaScript are embedded in a webpage's HTML, to be run client-side by a JavaScript engine in the user's web browser. Node.js enables JavaScript to be used for server-side scripting, and runs scripts server-side to produce dynamic web page content *before* the page is sent to the user's web browser. Consequently, Node.js has become one of the foundational elements of the "JavaScript everywhere" paradigm, allowing web application development to unify around a single programming language, rather than rely on a different language for writing server side scripts.

8. **MySQL:** MySQL is an open-source relational database management system (RDBMS). Its name is a combination of "My", the name of co-founder Michael Widenius daughter, and "SQL", the abbreviation for Structured Query Language. The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL was owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation. For proprietary use, several paid editions are available, and offer additional functionality.

9. **Google Maps API:** After the success of reverse-engineered mashups such as chicagocrime.org and housingmaps.com, Google launched the Google Maps API in June 2005 to allow developers to integrate Google Maps into their websites. It is a free service, and currently does not contain ads, but Google states in their terms of use that they reserve the right to display ads in the future.
   By using the Google Maps API, it is possible to embed Google Maps site into an external website, on to which site specific data can be overlaid. Although initially only a JavaScript API, the Maps API was expanded to include an API for Adobe Flash applications (but this has been deprecated), a service for retrieving static map images, and web services for performing geocoding, generating driving directions, and obtaining elevation profiles. Over 1,000,000 websites use the Google Maps API, making it the most heavily used web application development API. The Google Maps API is free for commercial use, provided that the site on which it is being used is publicly accessible and does not charge for access, and is not generating more than 25,000 map accesses a day. Sites that do not meet these requirements can purchase the Google Maps API for Business

Now I present the description for the various tasks that I completed in my project in subsequent pages.



Task1: Creation of Login page

Taking reference from 5-6 android application documentations on google, and on recommendation of Rakesh Kumar Sanodiya, we used AngularJS, JavaScript, HTML and CSS for basic login page. I had already learnt HTML and CSS but I did not know about AngularJS. So I learnt AngularJS from **TutorialsPoint** and **W3School.com**.
Also I spent considerable amount of time reading the documentation of Ionic Cordova, coding example apps (taking hints from the internet) and also writing code in AngularJS.

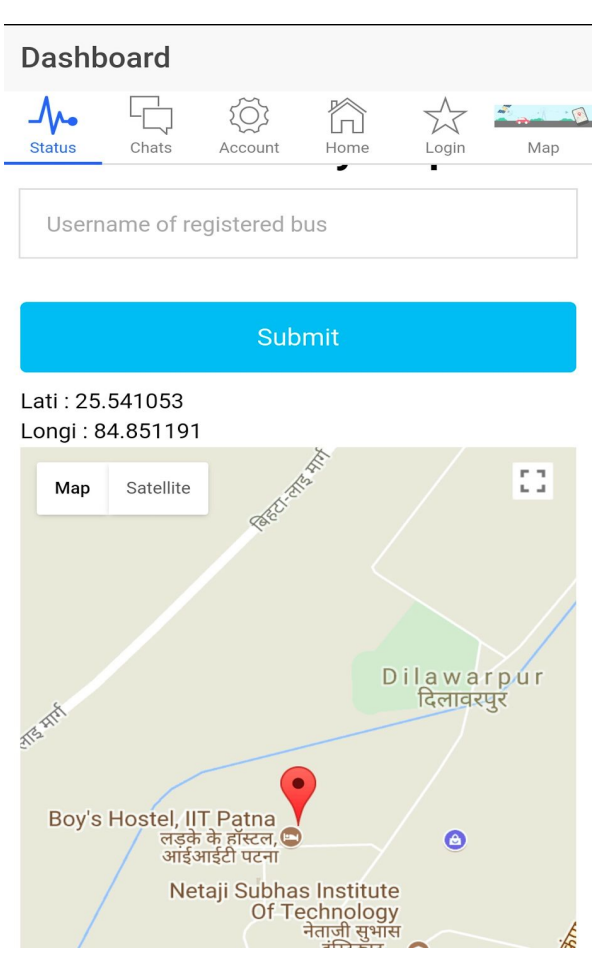
I wrote approximate two hundreds line of code (which contains JavaScript file and html template) for creating a basic login page. This is best moment for me because this is first achievement of this project and after this I was finally familiar with ionic cordova platform and AngularJS language.

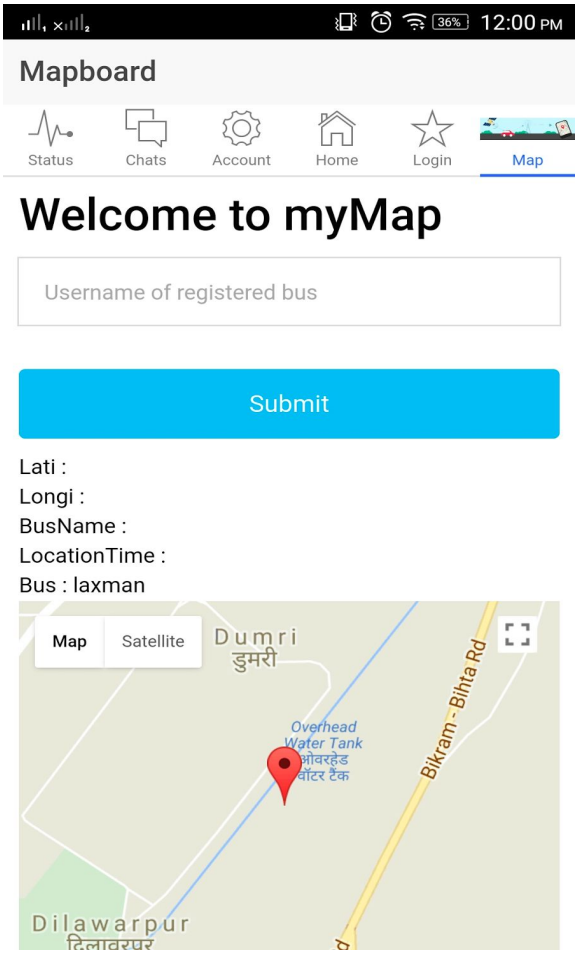
Task2: Connection with GPS device

In our project we were trying to build an application which can track the real time and location of bus (gps devices). Hence came the necessity to use Google maps API for this. Rakesh sir gave me some idea and background about using the API which are was very helpful for me to proceed.

I got the idea about how to connect GPS device of my mobile handset with Server. First of all we connect google map with our Ionic application and next step is sending the real time location and time of google map data to server which is helps us to track the other devices which are already registered with our server. For connecting gps device with server, I wrote approximate hundreds line of code for connecting the google map with our application, and hundred more

lines of code (which contains many modules and factory of Angularjs on client/frontEnd side) for sending gps real time data to server.

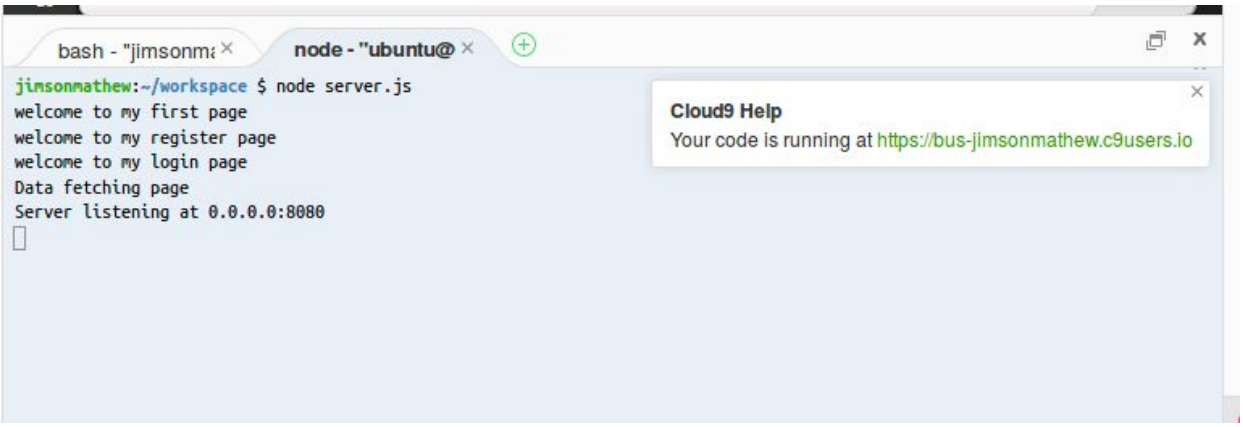




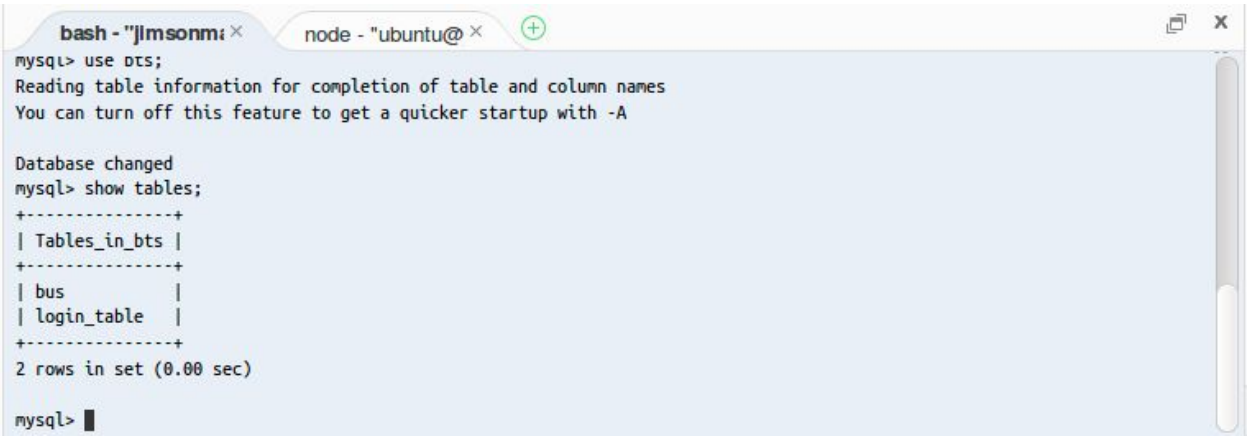
Task3: Server side implementation

Server side is important because it receives all the data which is coming from client (front-end) side. This data is stored on the server database for later use and data analysis. But main problem with implementation is how to connect device with server and fetch the data from server. For this I had to read lots of documentation, some research papers and also discuss it with my project guide before I understood logic behind the server side implementation. For implementation of this we need database management system (In this project I am using MySQL database management system which is explained in a later chapter). For sending data which is coming from front-end side to the server, I had to write hundred lines of code (which

contains paths or routes and many modules) on server side- this code extracts data from the mobile application and saves it on database. For implementation of server side first I learnt Node.Js and basic SQL commands which are required and created a database. I created and arranged all the tables according to our requirements which is explained in later chapter. Implementation of this part is easy but logic and understanding is important because it depends on all the fields of front-end side like - what type of input is present, how many fields of inputs are required for specific work like registration, login, real time, location, and data sending that's why this part is important.



In above image we can see server is on.



In this above image we can see tables which are defined on server side.

Task4: DataBase management

Any project in which we work depends on data manipulation and storing data. Hence we need some storage methods and techniques for manipulation, for this we need to have a database. In this project we use MySQL database and **Cloud9 IDE** which is an online integrated development environment, published as open source from version 3.0. It supports hundreds of programming languages, including C, C++, PHP, Ruby, Perl, Python, JavaScript with Node.js, and Go. It enables developers to get started with coding immediately with pre-configured workspaces, collaborate with their peers with collaborative coding features, and web development features like live preview and browser compatibility testing.

This is is help us to manage all the data and tables which is used to develop a real time tracking device. For completing our purpose we need at initial phase two tables which are integrated with each other: first is a Register table (which will store all information about registered gps device like username, password, bus number, route, bus stops in the route, timing etc) and second one is a location table (which stores latitude, longitude and saving time of current position of device).

In current implementation, all registered gps device position records are stored in a single table, but for better performance and analysis of data we need one table for each registered device. This will be taken care of, when we scale the application.

Conclusions:

Finally I was able to complete the basic version of the mobile application which keeps a track of Registered buses and makes the data available to all the mobile users who have the app. Further work would include a service for all the users of the application to view the expected arrival times of the buses in the stations, the schedule of buses, the last bus stop that a bus reached. We would include past traffic density data and use machine learning to estimate predictions of arrival times.
This extension shall be the part of my future project under Dr. Jimson Mathew sir.

Overall the project was a great learning experience for me. I became aware of several technologies which are currently used in this industry. I learnt how to work in deadlines, how to deliver what is asked of me, how to engage in meaningful discussions to gather knowledge, how to read documentation, how to learn a new technology quickly. I have now become more confident of taking up more projects and don’t fear them at all.

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5. Cloud Nine : https://c9.io/
6. Other : http://slides.com/timkindberg/ui-router#/7/7 https://www.sitepoint.com/creating-location-sharing-app-using-ionic-framework/ https://www.youtube.com/watch?v=YPTq1gctN-g