ANDROID AND WEB APPLICATION FOR TRACKING EMPLOYEES

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ANDROID AND WEB APPLICATION FOR
TRACKING EMPLOYEES

A Project
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Computer Science

by
Kaival Dholakia
December 2019
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Approved by:

Dr. Ernesto Gomez, Committee Chair, Computer Science and Engineering

Dr. Kerstin Voigt, Committee Member

Dr. Owen Murphy, Committee Member
ABSTRACT

The purpose that this tracking system serves is to keep track of the employees of the company who have the nature of their job which involves a lot of traveling to various locations on a day to day basis. It is an amalgamation of Android as well as a Web application. The employee is supposed to pass the location and image as per the terms and conditions specified to use the Android application. The web application is used by the admin department to access the information which would help them monitor the location of the employee in a timely manner. The Android application is developed using Native Android on Android Studio while Visual Studio 2017 is being used for the functioning of the web application.
ACKNOWLEDGEMENTS

I express my deepest gratitude towards my project advisor and mentor Dr. Ernesto Gomez for giving me his valuable inputs and guidance throughout the production of this project. I would like to thank Dr. Kerstin Voigt and Dr. Owen Murphy for being the committee members and for showing flexibility in terms of time and work schedule.

I would like to thank my parents for their patience and constant support during these two years of my educational endeavor.
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CHAPTER ONE

INTRODUCTION

Background

Companies around the world have a number of employees serving them and each company would like to have knowledge of the output that their employees are providing which can be the only means to determine productivity. Different companies may have multiple methods to keep track of their employees and also to monitor the work that they provide and also the means of keeping track of productivity may vary for every company on the basis of the nature and requirement of the company. This system could serve more than a single purpose for any company existing in the market using it.

It could be said that the system could be much more useful for the work-places or work structures that would include extensive travelling by the employees. Many would also argue that the system can be useful only for marketing professionals who have extensive travel as a part of their job functionalities. But the system has a dynamic nature to itself where the system could be made functional according to the requirement of the company. It also helps the admin department of the company to have an easier way towards generating the payroll of the employees due to the clock-in/clock-out feature.
Purpose

The purpose that this system serves is that it makes monitoring the location of the employees very straightforward. Due to the clock-in/clock-out feature, attendance monitoring of the employees also becomes very easy for the admin and the HR department for monitoring the salary payroll of any particular employee.

Because the company makes it mandatory for each and every employee to use the system on a day to day basis, it saves a lot of time and energy solving attendance and pay-roll issues. And because the system has a specific employee ID for each employee, it is practically impossible to forge attendance by any of the employees. It also needs the employee to stay at a particular status which again works as a security against forgery on attendance. This is the basic purpose of this particular system so that it can be universally used in the corporate world and could be a solution to a lot of problems which the employers currently face.

Existing System

In the current scenario, there is no such web or mobile application which would track an employee to check whether he/she is at the location that he/she is supposed to be. The ADMIN/HR department who is responsible for maintaining a proper work structure could check on the output and productivity of each employee that is working. Till now the ADMIN department would find it impossible to find the location of any of the employees, which could also lead to forged attendance. The only way that the HR/ADMIN department could find a rough estimation of the location of any of the employees is to contact the employee is telephonically. This means of communication,
by many companies, would not be believed to be reliable. Because the chances of getting a false location is this means of communication is believed to be much higher. Thus, an upgrade in the current work system is much required and this system serves aptly for determining the desired employee location.
CHAPTER TWO
SYSTEM ANALYSIS

Proposed System

It would be recommended to use an amalgamation of RESTful web services which can be used accordingly for serving the requirements of the end users dynamically. A recursive algorithm should be used. Compile and run function can be executed once the below mentioned software requirements are fulfilled. The requirement of the version is 2.2. The requirement that has been specified is a minimum and any version above can be brought into use but using any version below is not permissive. This system has been made to use CAAS based RESTful web services. It gets hosted by real time server each time it gets executed. The employee having the android device is presumed to be clocking in and clocking out on a daily basis. This practice would be the only medium which would be taken into account while marking his/her attendance, so it becomes mandatory for every employee. As the application has started, it would run continuously and would provide the location of any employee to the server through specific GPS co-ordinates. These GPS co-ordinates can be checked upon by the ADMIN department with the help of a web application which has been made accessible to them. The system has a functionality where the system camera opens up and the user is supposed to take an image of him/herself in order to proceed ahead in the android system in order to clock-in.
System Requirement Specifications

This project will consist of a development phase and a production phase (prototype) that requires the following hardware and software requirements.

Hardware Requirements

- **Laptop or PC**
  1) I7 processor
  2) 1GB RAM (minimum)
  3) 5GB Hard Drive

- **Android Phone or Tablet**
  1) Processor: 1.2 Quad core or higher
  2) 1GB RAM

Software Requirements

1) **Laptop or PC**
   a) Windows 7 or above
   b) MySQL 2008
   c) ADK and ASP.NET

2) **Android Phone or Tablet**
   a) Android version 5 or above
CHAPTER THREE
FEASIBILITY REPORT

Feasibility Study

While working on any project, singularly or in a team, it is very important to create a feasibility report on various aspects so that it could be determined whether investing in the project, financially or professionally, worthy enough? There are certain aspects that need to be taken into consideration like:

- What problems could arise?
- Is there a solution to these problems?
- Is the solution optimum?

The most popular aspects taken into consideration are technical, operational and economic. Feasibility study is always based on the proposed system and to develop a better understanding of the future product. The below mentioned feasibilities should be taken into consideration in order to ensure that the execution and the running of the product is smooth and the client and the developer has to face minimalistic problems with readily available optimal solutions.

In this chapter, we study about the economic, operational and technical feasibility of the new version of the already existing project which is also addressed here as the proposed system. The feasibility study based on these three main factors are as follows.
Technical Aspect

Technical feasibility is one of the most important aspects for understanding the prospects of the project that is supposed to be made. It helps the developer foresee that the technologies required for implementing the project are already available, or they need to be developed which would also mean an increase in costs, affecting the economic feasibility.

This aspect also determines whether the technologies and skills required to use the technologies to develop the project is already is access to the organization. The system can be told to be feasible if the following requirements are met:

➢ The technologies required to implement and execute the system
➢ Whether the system can be updated for constant changes
➢ The system should be accurate, reliable and secure
➢ This system should be easily accessible for easily fixing the problems that may arise during development phase

All these factors must be considered and if these factors have a positive Outcome, then the system could be safely said to be feasible for development and usage of the project.

Operating system: Windows 7 or above
Language: ASP.Net with C# and Android Development Toolkit
Database: MySQL
Economic Aspect

Economic feasibility is also one of the aspects that need to be taken into consideration, while developing and implementing any project. For this particular system, it could be safely concluded to be feasible as it requires no extra investment and has been completed within 3 months.

In this phase, we did a lot of comparisons among different projects on the basis of investment that we needed to put in. The project which was more beneficial was selected for putting into execution. The means by which generally the feasibility of a project is tested is the amount of financial benefits that can be obtained. If the financial benefits obtained from the project are more than the investments made in building it, it could be said to be economically feasible. A project can be considered feasible if it incurs a profit or at least covers the cost of building and implementing the project. For addressing this issue, the following aspects should be considered:

➢ The cost of building the entire project
➢ Hardware and software costs
➢ Android Development Toolkit costs
➢ Maintenance costs

As the above mentioned points have a positive outcome when considered, our project passes this particular feasibility test and is well supported by many investors.

Operational Aspect

This is the third and the final aspect while creating a generalized feasibility report. The Operational aspect consists of factors such as time taken to finish the project, the
number of people who had to participate in completion of the project etc. The project which uses the least amount of resources is the solution which should be accepted as it is the most feasible when compared to others which would use more resources. The following points should be considered before declaring the project operationally feasible:

➢ The work ethic and the process of obtaining the results, implementing the code and executing the project should be universally accepted.

➢ The proposed system should not cause any problem while presenting it to the end-users and should be implemented properly.

This particular project is operationally feasible as the time constraints and operational aspects are met, and taking into consideration the other aspects, this project can be said to be feasible in a general sense.
Use Case Diagrams

Use Case diagrams are the set of diagrams which show us that what different kind of the system has to offer. It shows us all possible access that the system provides to users. The behavior of different and all kinds of users has to be taken into consideration while creating use case diagrams. A good way to develop optimized use case diagrams which would be able to provide all possibilities without replication is to create separate cases for different uses that it may provide and integrating them all into one diagram for a single user. There can be multiple use case diagrams depending on the number of different roles, users are supposed to perform. Use case diagrams are mostly used for the documentation part of any project and it helps you understand the specific usage details and can answer queries if the user is facing any problems while operating the system. The Use Case Diagrams also need to be updated if any changes are supposed to be made to the system.

The system can have many users and these users are mostly referred to as Actors. There can be more than one of these as mentioned above. The end-users of the system are represented as actors. This system in particular has two users: Admin and Employee
Use Case Diagram

Figure 1. Admin Use Case Diagram.

- Open the website
- Login
- Search with Employee ID
- Can Track the Employee
  Can Check the attendance
- Can see employee location
- Is responsible for data security
Figure 1. Employee Use Case Diagram.
Sequence Diagram

ADMIN

Enters ADMIN id & Password

Validates ADMIN

Invalid Login

If Valid, then Displays Main page

Checks for the new user

Retrieves the list of new Users

Checks/search for Employee details

Retrieves the list of Employee details

Tracks Employees attendance and location

Manages all security related issues

Web Service Based Android Tracking

Main Page

Figure 3. Admin Sequence Diagram.
Figure 4. Employee Sequence Diagram.
Data Flow Diagrams

Data flow diagrams are considered as one of the most important and useful components to understand the functionality and structure of the described project. It is the graphical representation of the entire working of the project where every user role and possibility is taken into consideration. There is a set of data flow diagrams which are divided into levels. An increase in level would a deeper understanding of the project. Below figures show the data flow in levels 0, 1 and 2 each extending the reach and thereby increasing the understanding of the system

![Level 0 Data Flow Diagram](image)

DATABASE DETAIL

Figure 5. Level 0 Data Flow Diagram
Figure 6. Level 1 Data Flow Diagram

1.0 Request

User Requirement

1.1 Data Access

Admin Request

User gets Access

Process Database

Database Access
Figure 7. Level 2 Data Flow Diagram
CHAPTER FIVE
SYSTEM TESTING

Testing

The testing phase is one of the most important phases in the software development life-cycle. For any project, be large or small scale, the testing phase holds utmost importance as it is the only means by which the developer can make sure that all the user requirements are served and in proper function. This particular system has been developed using C# for scripting of the web application and Android Development Toolkit for developing the mobile application. Even the applications that are claimed to be erroneous in nature have been tested before being deployed. Every possibility of every input gets tested before coming to any kind conclusion and after the desired output is achieved, the project is termed to be successful. Not only the output of the system, but also the flow of data through the entire system also gets tested. The main objective of the testing phase in the software development life-cycle is to make the entire project successful and also keep room for the project to update from time to time for allowing an increase of ease of using the system for any user. Hence, the testing phase, being one of the later phases of the software development life cycle, becomes one of the most important phases for the development of any system.

The testing phases divided into six types:

1) Unit Testing
2) Integration Testing
3) System Testing
4) Validation Testing
5) Output Testing
6) User Acceptance Testing

Unit Testing

Unit Testing is the most basic type of testing and one of the types by which the testing phase gets initiated. Each and every module of the project gets tested separately and each output gets monitored. This phase is called Module testing. This testing as the name suggests tests each and every module and gets implemented during the development phase by the individual who actually develops the code. In spite of this testing being performed majorly by the developer, there is a certain amount of time dedicated to this type of testing.

Integration Testing

Integration testing is the one which needs to be conducted after unit testing. Even after each and every unit gets tested individually, they need to get tested integrated to each other. When the previously tested modules get together into a structure, integration testing can be conducted. Integration testing is the first systematic part of the testing phase, it is the only part where, as the name suggests, the individual modules get integrated. As a part of integration testing, the system interface also gets tested with the requirement to integrate all the modules.
System Testing

System testing is the third part of the testing phase. The system testing is a very important requirement when it comes to testing as it is the means to test how well the system can adapt to any new situation. This part of the testing phase also becomes very important as it shows us how compatible or adaptive the system can be when projected live. It is also assumed that if every section of the system is working harmoniously, the system test can be called successful.

Validation Testing

This part is the next to the system testing part of the six-part testing phase. As the modules get tested individually, get integrated and the errors or problems that can supposedly occur are solved, the final section of the testing phase begins. Either the system performs according to certain requirements or it creates a list of things that still need to be addressed. The system in this scenario has been validated and seems to be working according to specific details.

Output Testing

This section, as it should, comes after the validation testing for the system has been successfully performed. After the system is validated, and said to be working appropriately, every output of the system as a whole is supposed to be tested. Every output of this system is judged in two parts. During the testing, the output on the screen is given as much importance as the output on paper. When both the output forms are such that the user gets satisfied, this part of the testing phase is said to be complete. The output testing of the concerned system has been performed with satisfactory results.
User Acceptance Testing

The final part of the testing phase is the User Acceptance testing. This is where the system gets tested as a product and it is the real audience that come into contact with the product. It gets constantly monitored and any changes that seem necessary to the user are provided in the form of updates.
CHAPTER SIX

OUTPUT SCREENSHOTS

The project has been tested completely using all of the above types of testing.

The output of the project is as per expectations and the screenshots are shown below.

Figure 8. Welcome Page.
Figure 9. Sign-up Page.

Figure 9 shows the sign-up page that every new user (students only) must first fill out in order to create an account before using the system.
The table below shows which fields in the sign-up page are being checked for data input.

Table 1. USER Login Page Validation.

<table>
<thead>
<tr>
<th>ID</th>
<th>Validation Description</th>
<th>Error Message</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Valid ID is required</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>■ If the field is empty</td>
<td>Please enter your ID.</td>
<td>Cursor stays in the field and user enters ID.</td>
</tr>
<tr>
<td></td>
<td>■ If the field is not empty</td>
<td>None</td>
<td>Cursor moves to the password field.</td>
</tr>
<tr>
<td>2.</td>
<td>Password is required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>■ If the field is empty</td>
<td>Please enter your last name.</td>
<td>Cursor stays in the field and user enters last name.</td>
</tr>
<tr>
<td></td>
<td>■ If the password is wrong</td>
<td>Please enter the correct password</td>
<td>Stays in the field</td>
</tr>
<tr>
<td></td>
<td>■ If the field is not empty</td>
<td>None</td>
<td>It allows the user access the mobile application</td>
</tr>
</tbody>
</table>
Figure 10. Camera access.
Figure 11. Image Captured.
Figure 12. Send Image Page.
Figure 12.1. GPS Screen.
Figure 14. Data transfer Notification.
Logout performs the similar process and directs to the login page with the last data update.

Figure 15. Logout functionality
Figure 16. The Admin Login Page.
Table 2. ADMIN Login Page Validation

<table>
<thead>
<tr>
<th>ID</th>
<th>Validation Description</th>
<th>Error Message</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Valid ID is required</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ If the field is</td>
<td>Please enter your ID.</td>
<td>Does not let you move forward to the next field.</td>
</tr>
<tr>
<td></td>
<td>empty</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ If the field is</td>
<td>None</td>
<td>Will let you progress to the next field</td>
</tr>
<tr>
<td></td>
<td>not empty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Password is required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ If the field is</td>
<td>Please enter your password</td>
<td>Does not let you move to the next page</td>
</tr>
<tr>
<td></td>
<td>empty</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ If the password is</td>
<td>Please use the correct password</td>
<td></td>
</tr>
<tr>
<td></td>
<td>wrong</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ If the field is</td>
<td>Transfers you to the Add employee page</td>
<td></td>
</tr>
<tr>
<td></td>
<td>not empty and not</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>incorrect</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 17. The ADD EMPLOYEE page for the Admin
Figure 18. The CHECK LOCATION page
Figure 19. Location Check Functionality

The location check which opens up the location on a map and gives you the option to open up different locations that the employee has been to during the day.
Figure 20. Location Check Functionality II

The location check which opens up the location on a map. It updates the location every time the location is changed by 200 meters.
Figure 21. The VIEW IMAGE page

This page has a similar kind of approach as the view location page. The ADMIN can select the image and click on show to view the image at different times. The image can be seen at the bottom of the page. Only one image is accessible at one time.
Figure 21.1. The VIEW IMAGE LAYOUT

Figure 21.1 is an extension of the view image page. The above image shows how the image is accessible to the ADMIN
Figure 23. Change Password Page

Figure 23 shows the change password page. This page is useful for the admin to change the password which gets used. The old password gets verified and the cursor moves to the next field which is ‘CHECK’. It checks the old password and once the old password gets verified, the admin can set the new password.
Figure 24 displays the list of employees that have been provided access to the application. The user information gets displayed. The information that gets displayed is exactly the same as the information entered by the admin at the ADD EMPLOYEE section.
Figure 25. Logout Functionality

Figure 25 displays the functionality of the Logout Button. It simply logs the admin out of the system.
CHAPTER SEVEN

FUTURE ENHANCEMENTS

GPS Co-ordinates Buffer Value
As of now, the buffer between of the location of the employee according to the GPS co-ordinates and the actual location of the employees is about 45 feet. This means that there will be no change in the co-ordinates of the employee location even if there is a change in the employee location which might be less than 45 feet. In future, these co-ordinates can be worked upon.

Password Authority
The password that needs to be used by the user (in this case: the employee) is set by the admin who creates the user profile and the same password needs to be used by the user each time. This system needs a change as the password can be used to forge the location

Internet Connectivity
This system currently needs internet connection for detecting the location of the employee. In the future, it would be very helpful if the system can detect the location without the need of internet access. It could be useful in case where the employee travels to a location where no internet access is available.

CHAPTER EIGHT
CONCLUSION

This system could be useful at a universal level. It can be used among any of the companies of the world for tracking the location of the employees and especially for the employees who work in the field of marketing. As the feature of clocking in and clocking out is also included, it also helps the ADMIN department run the payroll services. It also helps the ADMIN department to mark and monitor the attendance of the employees. Being enrolled in this system also makes the chances of forgery very much impossible for any of the employees.

In conclusion, it could be safely said that the system delivers satisfactory results and can be very useful for any of the companies who may face trouble managing the details of the employees and also could be commercially useful for the developer as it could be sold to multiple companies.
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