A Project Report on

Geofencing Based Employee Attendance System

Submitted in partial fulfilment for the award of the degree of

B.Tech (Branch)
By

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Vellore Institute of Technology
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Abstract
In any organization employee management is a lengthy and hectic task and a lot of resources are required to manage it . Attendance based systems exist but there are a lot of constraints present in it .Admin has to make sure that employees come to the office in the designated time. In today's world, work is done in different environments. Different employees are placed in different sectors. So this adds a burden on the admin to track employees and hence this reduces the efficiency of employees. The Employee Tracking App is an app that is designed to track the attendance of the employee by using GPS and Geofencing. The system engineer sets the fence around which attendance will be accepted. The employee gives the attendance by sending his picture and if the employee goes out of the fence then a notification will be sent to the admin.

1. Introduction
1.1. Motivation
In the current and post covid world, the manual or biometric method for taking attendance will become conventional. The face scanning system could also result in gathering of people in the same place which can also not be possible in this new normal. We propose this attendance taking software whose services will be triggered only when the employee is in the organisation's defined area which will be implemented through the geofencing approach. After marking his attendance in the mobile application, the front camera will scan the image of the employee which will be uploaded on the server

1.2. Aim of the proposed Work
In any organization, employee management is a hectic and lengthy task and requires a lot or resources to manage it. They spent heavily on this to get the effective work from them. Daily attendance and presence of employees in the premises is part of employee management and the administrator (ADMIN) has to make sure that the employees come to office and are present at the office premises during the office time. In today's world, work is done in a distributed environment. So, the ADMIN may present in some other geographical environment with respect to the employee's working location and this adds an extra burden for the ADMIN to make sure that the employees are present or not. An Internet based CCTV camera is one approach but this hardware based solution is costly and it's hard to monitor the activities of an individual in the pool of an employee and also not effective in many cases. The solution for this is that our project development team (TEAM) is proposing an Employee Tracking App (app) which is an android app to monitor the attendance and presence of an employee on premise. This document outlines the steps taken to create a working solution for the initial development of the app. The role of TEAM will be to design and implement an app that can be used by employees as an attendance tool. As soon as the employee will reach the office and login to the app and will take his/her own photo by front camera of mobile (SELFIE) at his workstation to make attendance. After that, his monitoring starts and when he will leave the premises of the office as per defined by the ADMIN (FENCE) then the ADMIN will get a notification.

1.3. Objective(s) of the proposed work
Primary Objectives:
A primary objective of testing is to: assure that the system meets the full requirements, including quality requirements (functional and non-functional requirements) and fit metrics for each quality requirement and satisfies the use case scenarios and maintain the quality of the product. At the end of the project development cycle, the user should find that the project has met or exceeded all of their expectations as detailed in the requirements. Any changes, additions, or deletions to the requirements document, Functional Specification, or Design Specification will be documented and tested at the highest level of quality allowed within the remaining time of the project and within the ability of the test team.

Secondary Objectives :

The secondary objectives of testing will be to: identify and expose all issues and associated risks, communicate all known issues to the project team, and ensure that all issues are addressed in an appropriate manner before release. As an objective, this requires careful and methodical testing of the application to first ensure all areas of the system are scrutinized and, consequently, all issues (bugs) found are dealt with appropriately.

1.4. Report Organization

➢ Main topics are bolded in a heading and are represented using whole numbers.
➢ Sub topics and bullets are indented beneath the main topic heading with a decimal version of the whole number.
➢ All acronyms will be introduced with its full name, followed by its acronym in parenthesis. From this point forward, the acronym is used in place of the full word titles.
➢ In the glossary in Appendix A, any acronyms used within this document are outlined in alphabetical order for easy reference.

2. Proposed System Requirements Analysis and Design

2.1. Introduction

The application should be able to register the attendance of the employees by pressing a button on the app while leaving or entering the geofence of the offices in the organization. The system should perform well even if under stress and should be able handle all the edge cases that can occur during the execution of the application.

2.2. Requirement Analysis

2.2.1. Stakeholder Identification

Stakeholders:

- Project manager
- Team members
- Managers
- Resource managers
- Senior management
- Company owners
- Investors

- Resource Identification:

➢ The project manager will head the finance department to decide upon the budget of the project and how to share among the departments which is discussed in the cost estimates and cost benefit analysis section.
➢ Interns will also be selected through different colleges to contribute to the project as well as gain skills. The developers will be required to work 6 hours per day for 5 days. Night shifts will also be provided to those who want to complete their work before the deadline or want to take a leave on any working day and the payment will be according to the number of extra hours worked.
➢ Five developers will be there for the coding part of the project with three UI/UX developers with experience in designing android apps. The finance department will comprise of 4 members with previous experience and the marketing department will comprise of 1 as the marketing head and 5 sales persons for marketing purposes which will include gaining potential client's attention.

- ❖ Progress tracking, reporting and conflict mediation:
- ➢ Whenever a conflict is encountered between two colleagues due to any issue technical or personal, the HR department will be the first to intervene in the issue and they will be required to provide the report to the head of the department concerned for further action.
- ➢ The head will be also responsible for tracking the progress of the work daily by taking proper updates from his/her subordinates such that product delivery is on time without any conflict of interests.

2.2.2. Functional Requirements

Functional Requirements

LG -1: a login page is displayed and asks the user to enter a username and password.
LG -2: the password will be masked as it is typed into the login interface
LG -3: a touchable button submits the username and password from the login form to the app Server
LG -4: the credentials are compared against those stored app database
LG -5: if login information does not match, the user will be given two more chances to enter correct login information
LG -6: after 3 failed login attempts, the user account is locked and an error message is displayed instructing the user to contact admin to reactivate the accountLG -7: if the database matches the credentials, the server returns the confirmation
LG -8: after confirmation of correct login credentials, Make attendance page will be displayed

Make Attendance

Description and Priority

Upon successful entry into the app, a will have the option to make attendance for current days. User will make attendance only if the attendance time matches with his specified time interval by the admin and the employee is inside geofence. If he is outside of GEOFENCE or his time interval is over he cannot make attendance. All successful attendance of current month will be listed below.

Stimulus/Response Sequences

For making attendance by employee a Mark attendance button will appear after login. On touch of the button the front camera of the mobile will be opened automatically and an option to click the photo will appear. After clicking the self image, the current image will show on the attendance screen and there will be a touchable upload button to upload the attendance. On successful attendance it will appear in table format on the same page with the exact timing of attendance.

Functional Requirements

MA-1: a Mark Attendance button will appear for the marking attendance
MA-2: on touching of button , the user latitude and longitude will be captured automatically and send to app server.
MA-3: EAT server will match the latitude and longitude by using the distance matrix algorithm and return with the minimum distance of the user from base point.
MA-4: the distance needed to compared for lesser than the allowed value or radius of the GEOFENCE circle. If not a message needed to display that employee is out of GEOFENCE.
MA-5: if User is inside GEOFENCE then front camera of mobile app needed to be opened
MA-6: on clicking image, the image has to be saved to the server and displayed to the image
MA-7: After this touchable upload button is to be displayed
MA-8: on touch of upload button the server verifies the server time with the time period allowed for attendance of the employee and then if it matches within the time period, image and timing and latitude and longitude needs to be saved in a table of attendance with employees in the database. And displayed on the page

2.2.3. Non Functional Requirements

Performance Requirements

The following are the performance requirements for the FCA Reservation Application:

- System Availability: The application will have no more than 4% of downtime within a given month. 12 hours of scheduled maintenance will be permitted in any given month. Unscheduled downtime and maintenance must be addressed and resolved in as little time as possible.
- System Response: The application must take no more than 4 seconds to respond to any request and return data from the app database.
- System Responsiveness: The system must display a loading indicator to signify any requests or retrievals of data between the application, the app servers, and the app databases.
- System Load Balancing: The system must be able to support 2,500 users without degradation. The system must support 5,000 users with no more than 8% degradation.System User
- Session Timeout: The system will recognize when a user has been idle for a period of 4 minutes. At this time, the application will close and the user will be required to reopen the application to restore a secured session and log into the system.

Safety Requirements

The following are the safety requirements for the app:

- System Accessibility: The application will react to the android phone accessibility settings for font size and font style. This includes default settings and special accommodations provided by Samsung for those with visual challenges.
- Soft Color Scheme: The application will use a color scheme that does not include high contrast colors in order to reduce eye strain.
- Smartphone Controls: The application will not override the safety functions of the android smartphone.
- Lost or Low Battery: The application will close when the smartphone battery is depleted. This will require that the user re-open the application and restart a session after restoring the device's battery.
- Lost or Stolen Device the application and user accounts will have the capacity to be deactivated in cases where a user's device is lost or stolen.

Security Requirements

The following are security requirements for the app Reservation Application:

- Automatic Logout: After 4 minutes of inactivity, the application will close. This will require that the user reopens the application in order to establish a secure session.
- Cache: The application will not store personal data on the device.

- SSL Certification: The application requires that a valid SSL certificate be maintained at all times to allow trusted and secure communication.
- Memory Protection: The application will perform garbage collection of the session data upon closure of the application.
- Proactive Response A trace log will be used to capture all interactions between the app and app servers. Suspect activity will alert the app administrator to take action.

2.2.4. System Requirements

2.2.4.1. H/W Requirements(details about Application-Specific Hardware)

Drive description	(25) LFF SAS/SATA/SSD per node for two-node
Storage type	Hot-plug LFF 3.5-inch SAS; Hot-plug LFF 3.5-inch SATA; Hot-plug LFF 3.5-inch SATA SSD; Hot-plug SFF 2.5-inch, SATA SSD ; Hot-plug SFF 2.5-inch SATA
Cache	25 MB L3; 20 MB L3; 15 MB L3; 10 MB L3
Processor family	Intel Xeon E5-2400 v2 Processor Family; Intel Xeon E5
Processor number	1 or 2 per node
Compute nodes	Up to 3
Processor core	4/6/8
Processor speed	2.5 GHz
Memory slots	12 DIMM slots maximum per node ; (6 DIMM slots per processor)
Maximum memory	192 GB per node
Memory type	HP Smart Memory; DDR3 Registered (RDIMM)
Memory protection	Advanced ECC (multi-bit error protection), online spare, and memory lock-step mode
Network Controllers	HP Ethernet 10 Gb 2P ; 544i Adapter

Storage controllers	HP Dynamic Smart Array B120i SATA RAID for controlling 2 SFF drives per node
Expansion slots	1 Maximum; The low profile expansion slot can contain a storage controller for external attached storage (HBA or Smart Array Controller), networking options, or an HP I/O accelerator.
Management	HP iLO Management, HP Insight Control
System fan features	5 dual fans modules, shipped standard
Power supply type	Up to 4 power supplies; 750W and 1200W Common Slot hot-plug redundant power supply; (Up to 94 percent efficiency) .
Graphic card	Integrated Matrox G200 video standard; 1280 x 1024 (32 bpp) ; 1920 * 1200 (16 bpp)
Form factor of chassis	4.3 U
Android based smartphone	
Type	Touchscreen smartphone
OS	Android 5.0, Lollipop
Weight	132g
Product Dimensions	5.59" x 2.76" x 0.28"
Internal Memory	32GB UFS 2.0
Processor Speed,	21 GHz, 1.5GHz;

Type	Octa-Core
Storage	128GB storage, no card slot
Battery	Non-removable Li-Ion 2550 mAh battery
Frequencies and Data	Infra: 3G WCDMA,4G LTE FDD; 4G FDD LTE:
Type	B1(2100), B2(1900), B3(1800), B4(AWS), B5(850), B7(2600), B12(700), B17(700), B20(800)
Wi-Fi	802.11 a/b/g/n/ac , 2.4g+5ghz, vht80 mimo
Usb	Usb 2.0
Bluetooth	Bluetooth v4.1
Bluetooth Profiles	A2DP, AVRCP, DI,HFP, HID, HOGP, HSP, MAP, OPP, PAN, PBAP
Main Display Resolution	2560 x 1440 (Quad HD)
Main Display Technology	Dual Edge Super AMOLED
Color Depth	16M
Sensor	Accelerometer, Barometer, Fingerprint Sensor, Gyro Sensor, Geomagnetic Sensor, Hall Sensor, HR Sensor
Type	Light Sensor, Proximity Sensor

2.2.4.2. S/W Requirements(details about Application-Specific Software)

Windows Server 2012 Operating System

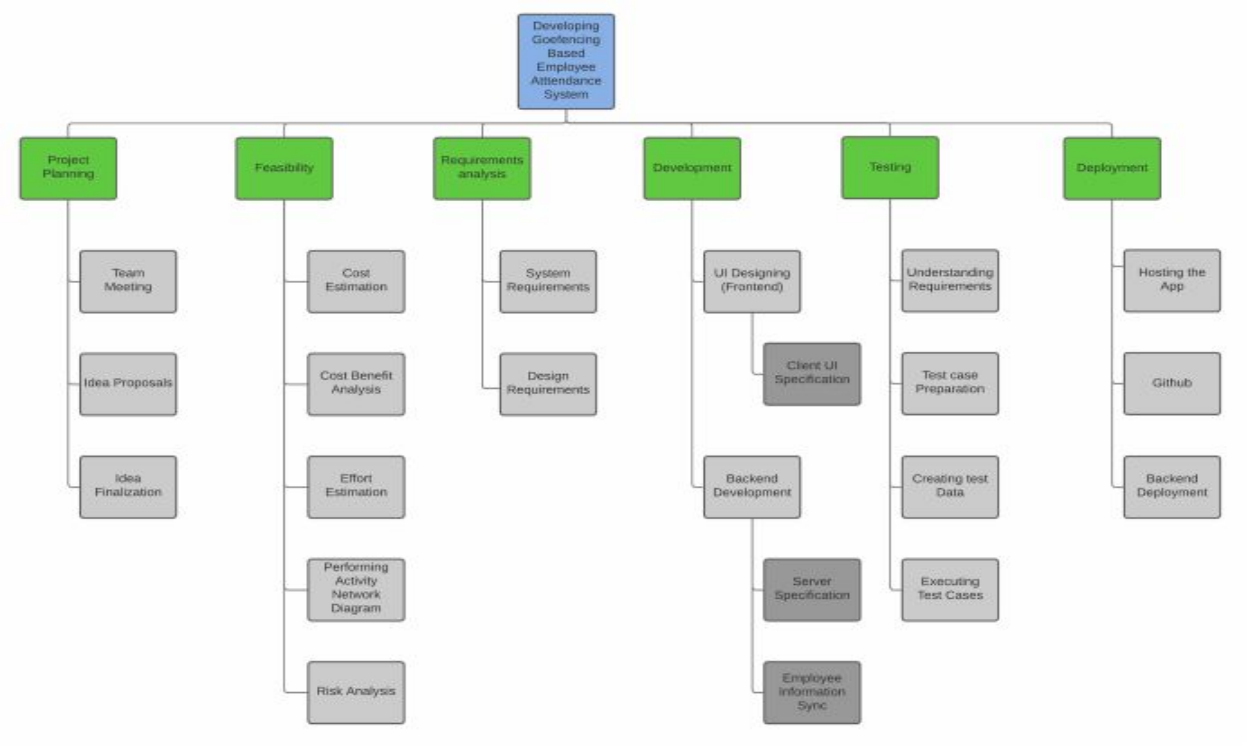
Processor	1.4 GHz 64-bit processor
RAM	512 MB
Disk space Requirements	32 GB
Throughput	Ethernet adaptor with 1 GB throughput
File System	ReFS
Communication Server	Message Block (SMB) protocol, Transmission Control Protocol/Internet Protocol (TCP/IP) protocol
Memory	NVDIMM-N
Encryption	BitLocker

Android 5.0, Lollipop Operating System

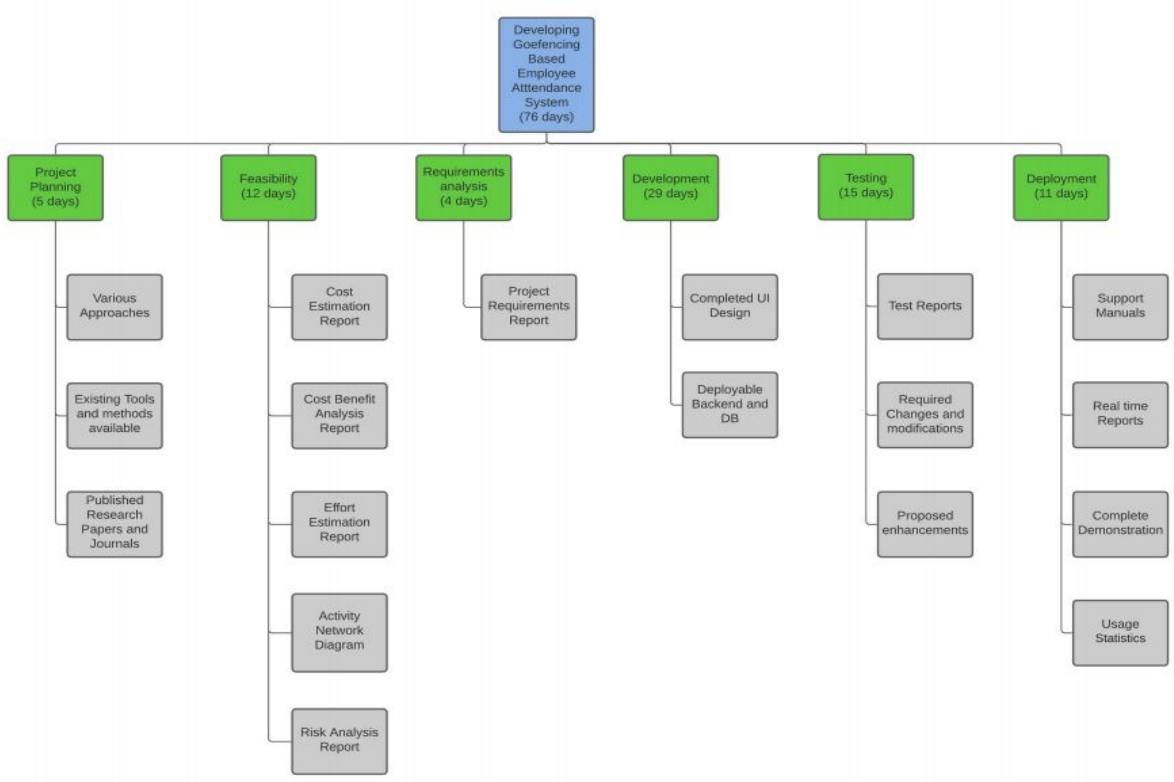
Security software version	MDF v2.0 Release 6, VPN v1.4 Release 6.0
Kernel version	3.10.61 dpi@SWHD7421 #1
RAM	512 MB

2.2.6. Work breakdown structure

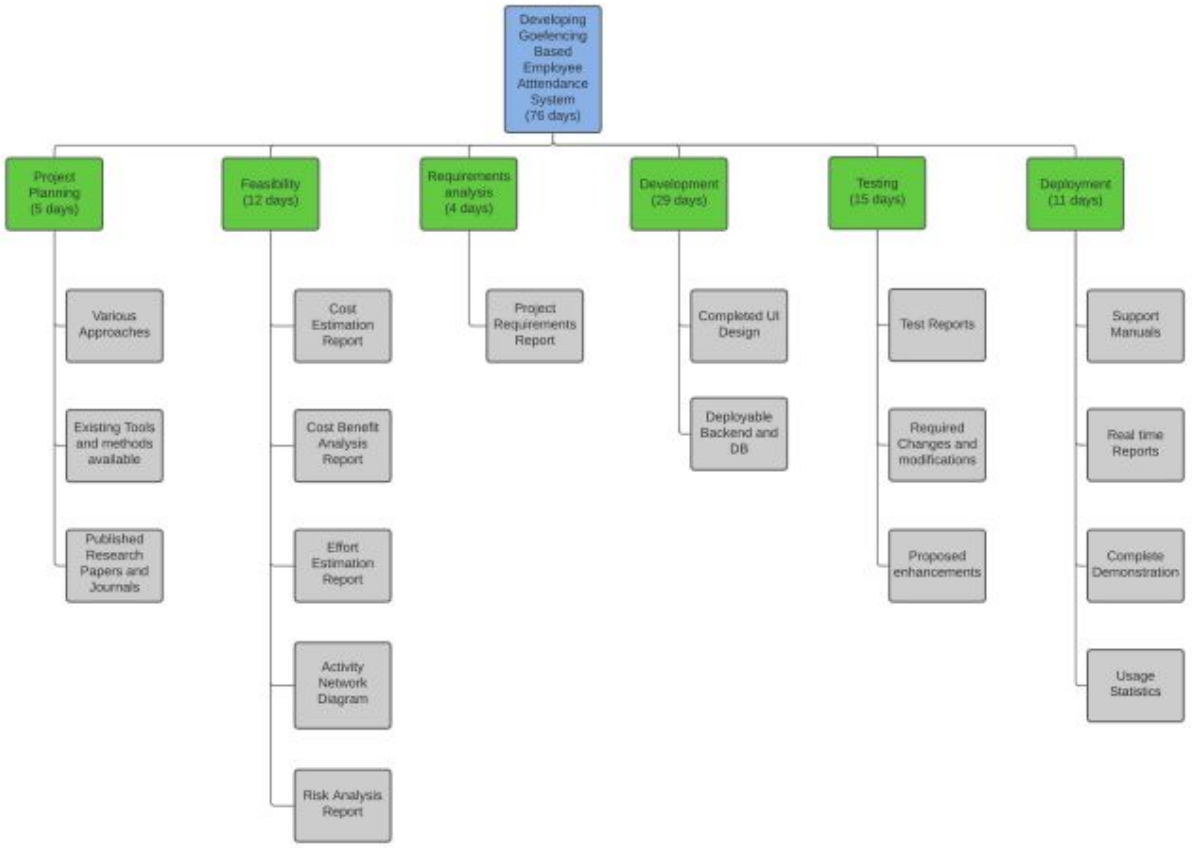
Verb based WBS:



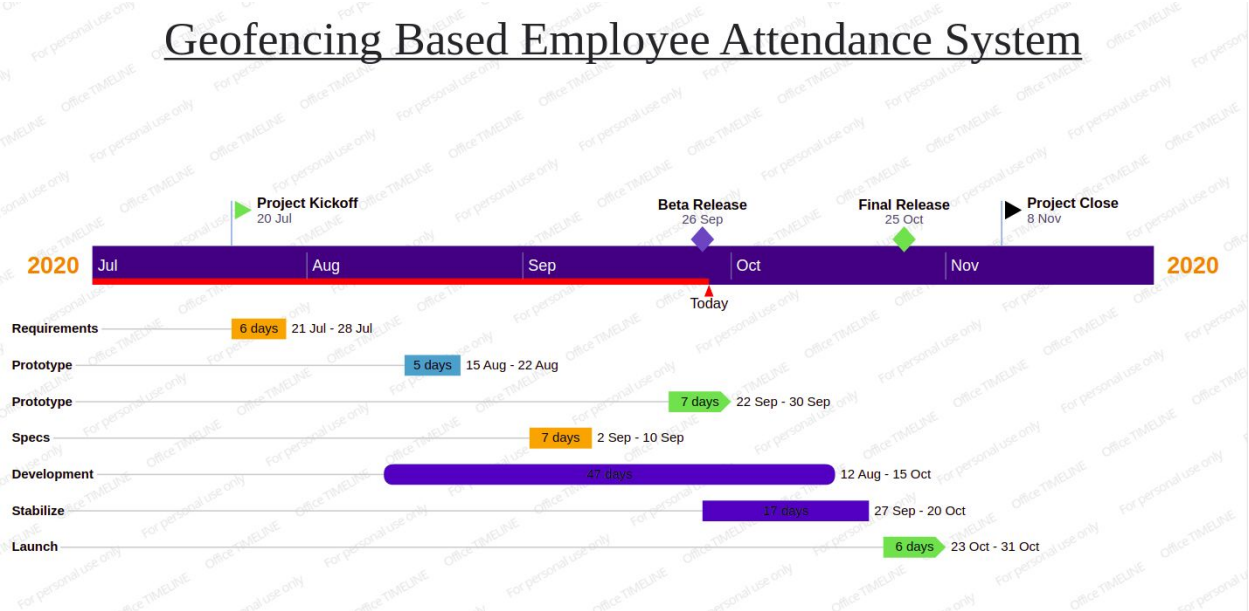
Time based WBS:



Noun based WBS:



2.2.8. Gantt Chart



3. Design of the Proposed System

3.1. Introduction

Proposed app is a new product which is based on the concept of new technologies, we can save time, money and resources to track the employees, which results in better productivity. In any organization it is very difficult to monitor and track the activity of each employee and thus the goal of app is to provide an easy, efficient and cost effective way to track employee with the use of Geographical Fencing (GEOFENCING) with the use Global Positioning System (GPS) and capture the whole data with GPRS. These all hardware requirements are already present in the android mobile phone of the employee which is very common and essential nowadays. On an average every employee has an android mobile phone and thus it is very feasible to implement in any organization. The app allows employees to install the application from the Google Play Store and perform operations like make or mark attendance on a daily basis and view his attendance. ADMIN will also install the app in his mobile from the Google Play Store and can perform a series of operations like create account form employee, modify account for employee, search for his attendance. The below in user case diagram of the proposed system.

3.2. High level Design (Framework, Architecture or Module for the Proposed System(with explanation))

3.2.1. Architecture design (choose the appropriate pattern with justification)

Model-View-Controller (MVC)

This is a design pattern used to disassociate user-interface i.e view, data i.e model, and application logic i.e controller which helps in achieving separation of the contents.

The MVC design pattern consists of three components – The Model, View and Controller. Here, we have got UI as Models,Views, flutter classes and Services as the Controller. The controller receives a request and creates a model for the same. The model has the classes that describe the info and contains the logic and method to retrieve the info from the database. The View contains the logic to come up with the rendered files to present the desired data. The Controller selects the view to be displayed to the user, and provides it with any of the Model data it needs to acquire. The View renders the ultimate page, supporting the info within the Model.

Advantages of MVC

Benefits of using MVC architecture:

- Easy to code maintain, scalable
- The Model component of MVC can be tested alone and separate from the user
- Various component's development can be performed parallelly.
- Avoids complexity as it divides an app into Model, view, and controller.
- Best supported for test-driven development
- It works well for Web apps which are supported by large teams of web designers and developers.
- Search Engine Optimization Friendly.
- Classes and objects can be tested separately.

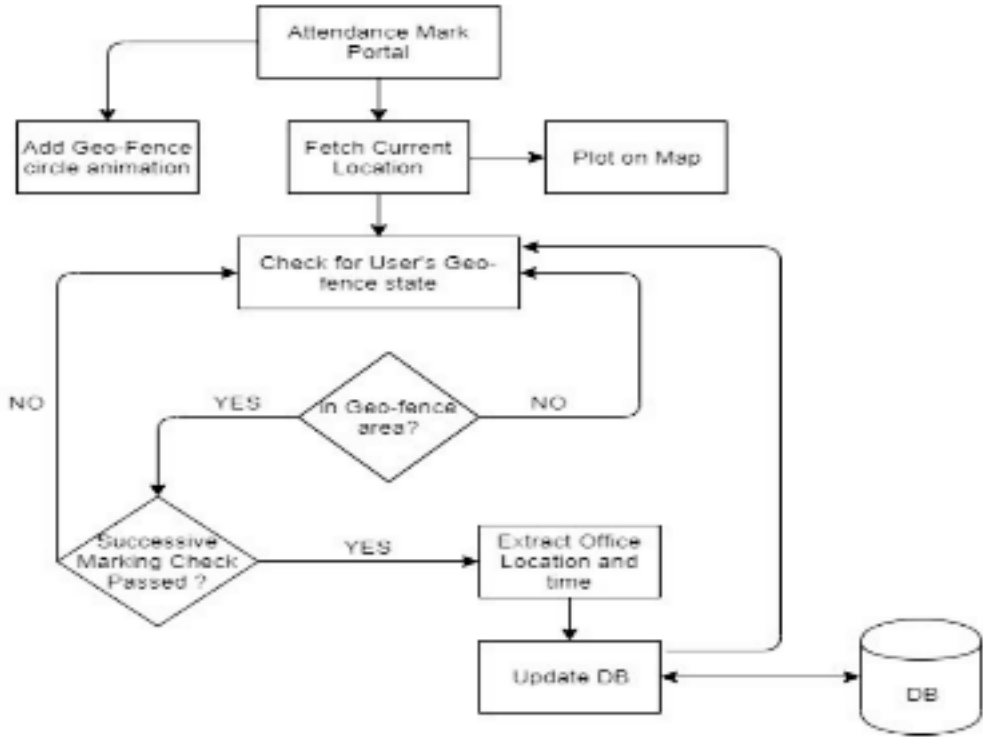
3.2.2. Architecture diagram (explanation)

Module Description:

1. User Registration
   It will make a user register with a unique identity in the system. Employee need to provide their employee ID and Password at the time of log in. If the user is not present then they can contact the admin to add them in the database.
2. Leave Status

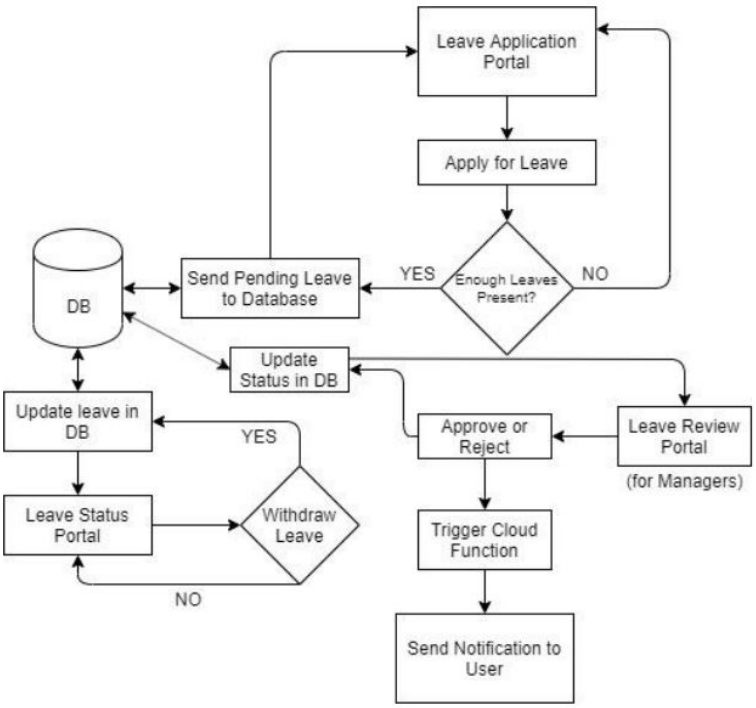
This feature will allow employees to mark their attendance once the employee has reached his allocated office. It will also mark the attendance of the employees once they leave the geofence or enter the geofence.

3. Leave Management
   It will provide a facility to employees for applying leave and track its status.
4. Dashboard
   The dashboard will appear as the first thing after logging in to the app and it will have the functionalities which have been mentioned in the above points.
5. Attendance based on the Location
   This feature will allow employees to mark their attendance once the employee has reached his allocated office.

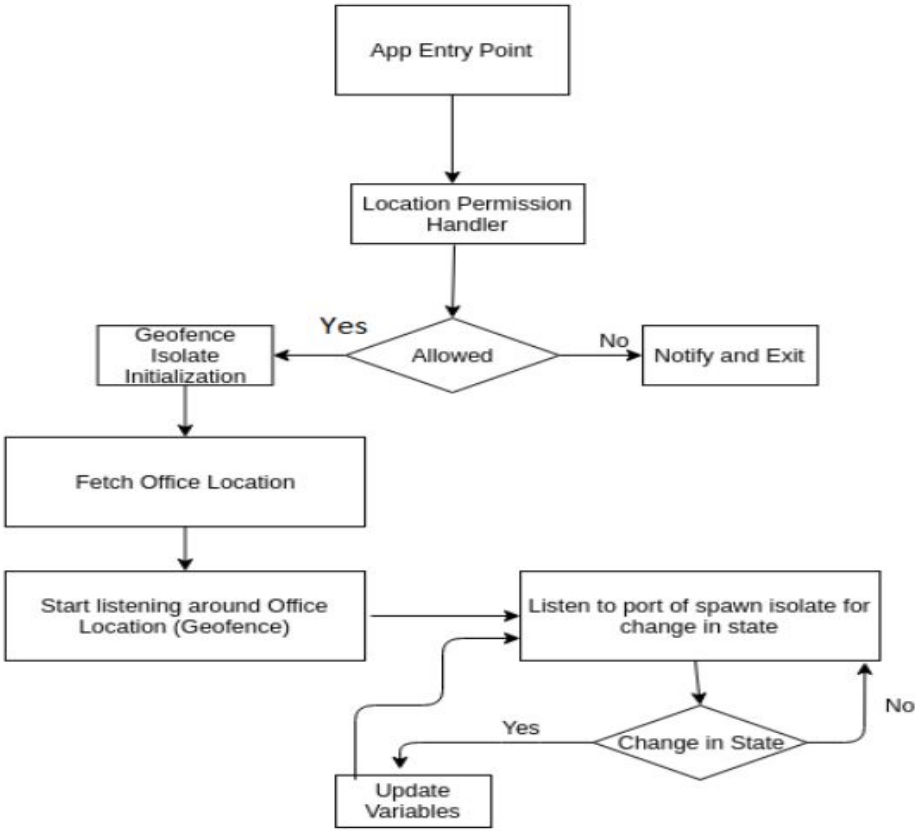


Architecture for Submitting attendance based on Location

6. Google Firebase integration
   Firebase is the backend service used in this application. Real Time Database is used serve employee id, user id,



7. Geofence Service Initialiser:

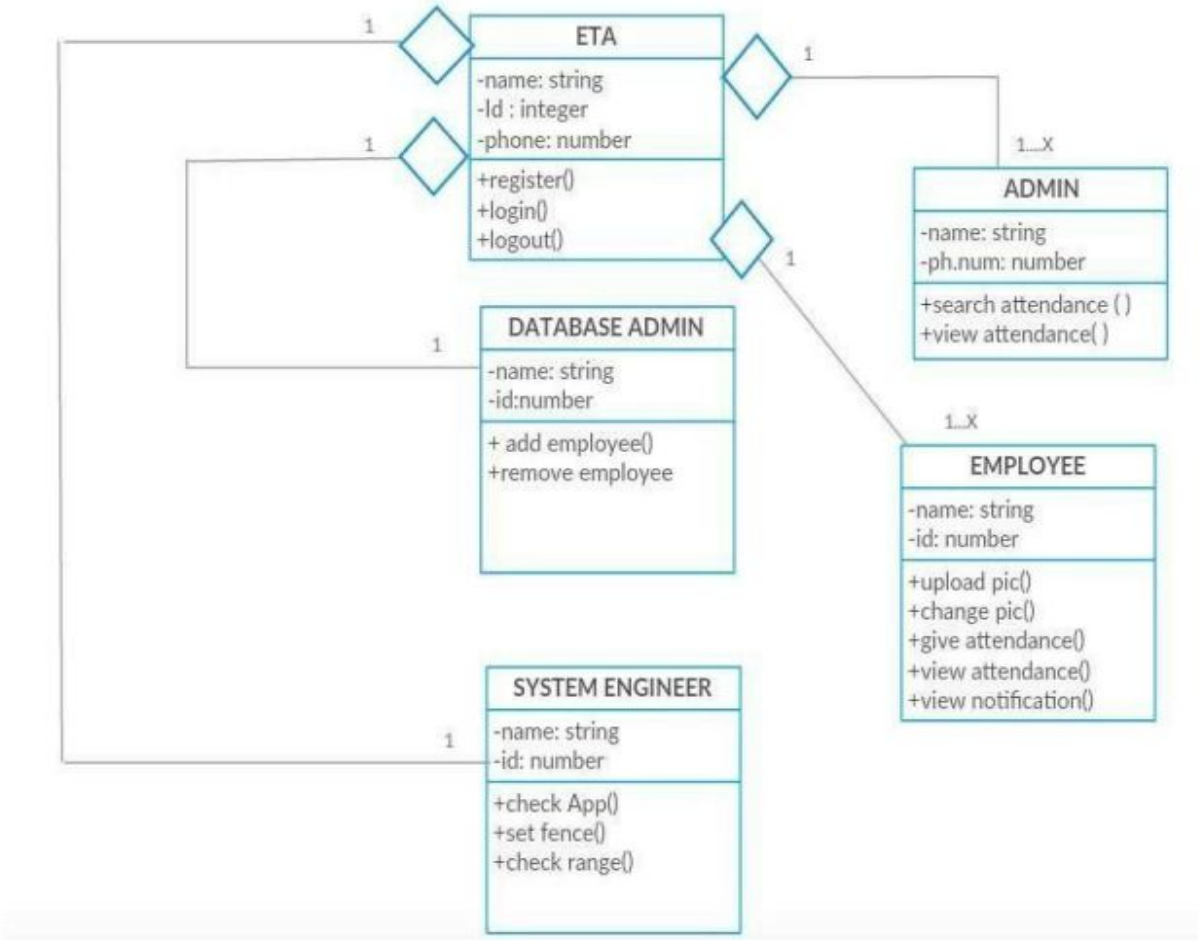


3.2.3. UI design

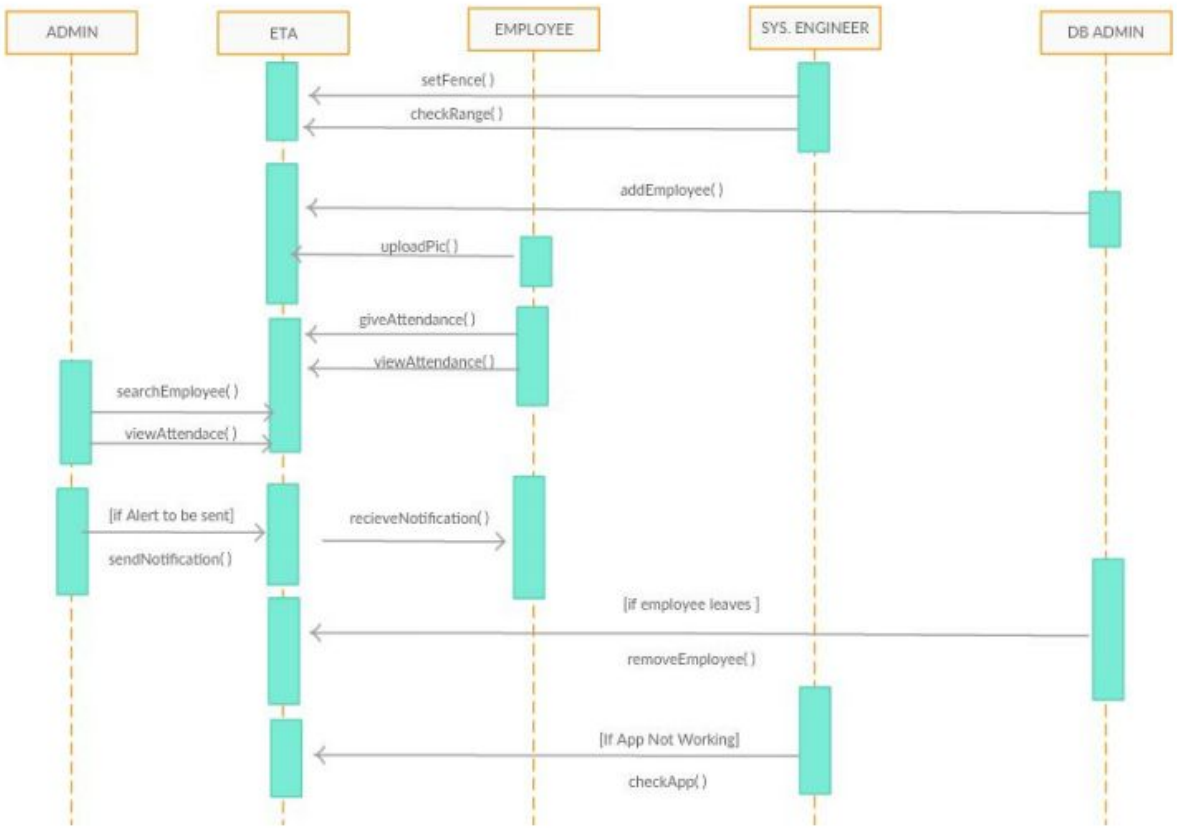
3.3. Detailed Design (ER Diagram/UML Diagram/Mathematical Modeling)

3.3.1. UML diagram (Use case, class, Statechart, Activity and interaction diagrams)

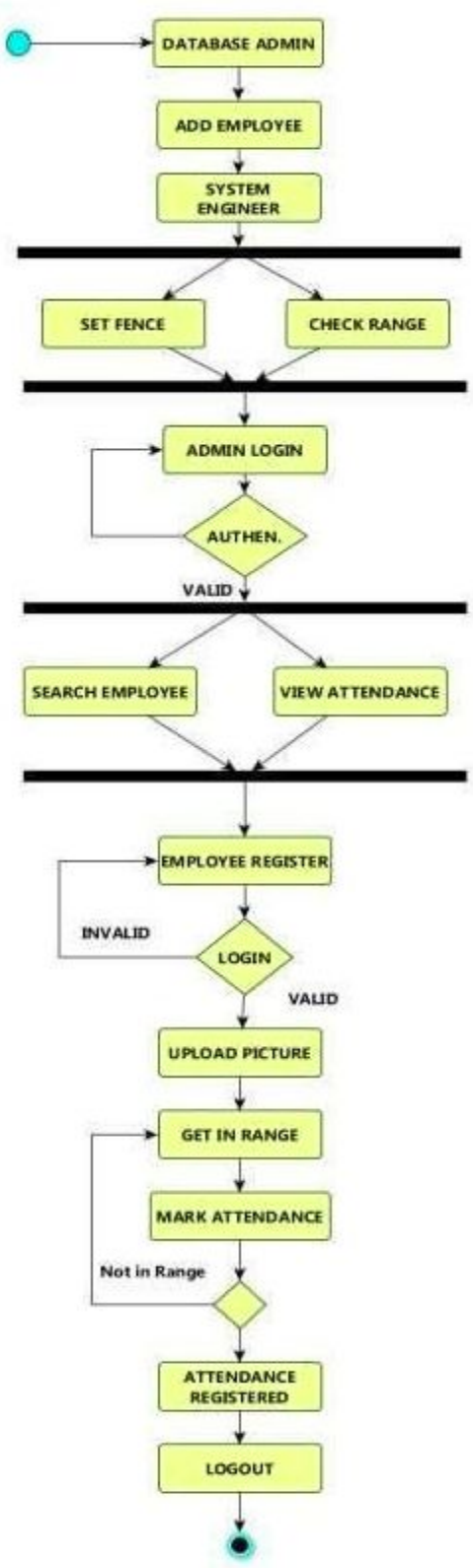
Class Diagram:



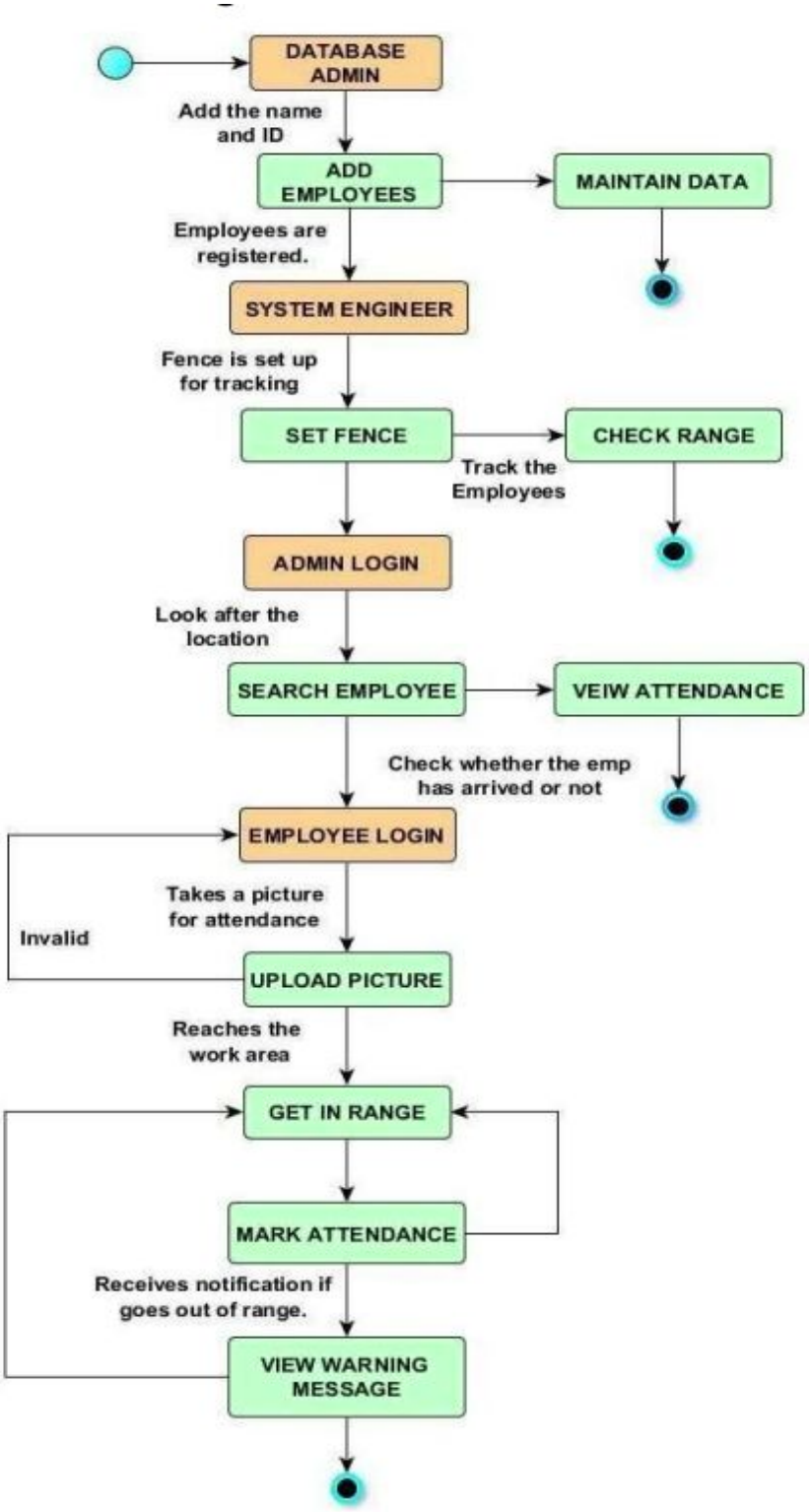
Sequence Diagram:



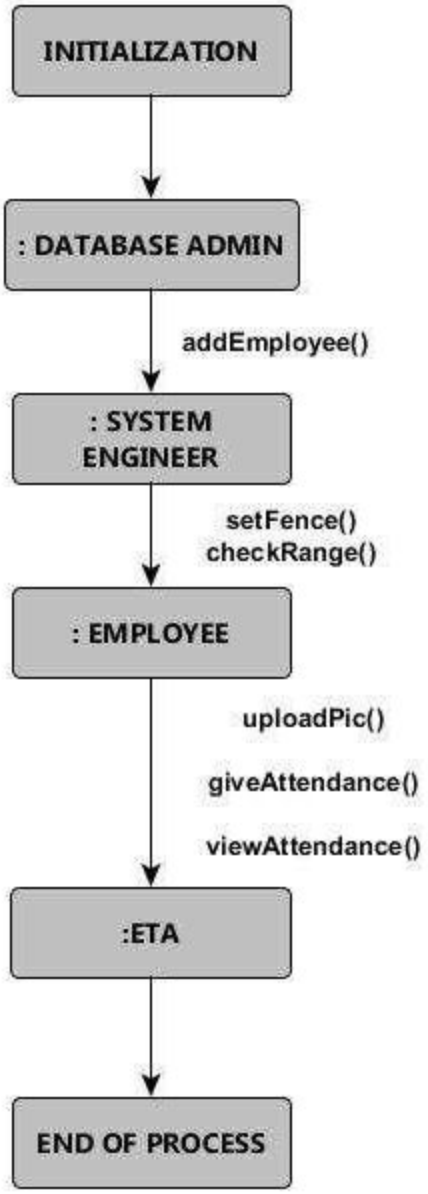
Sequence Diagram:



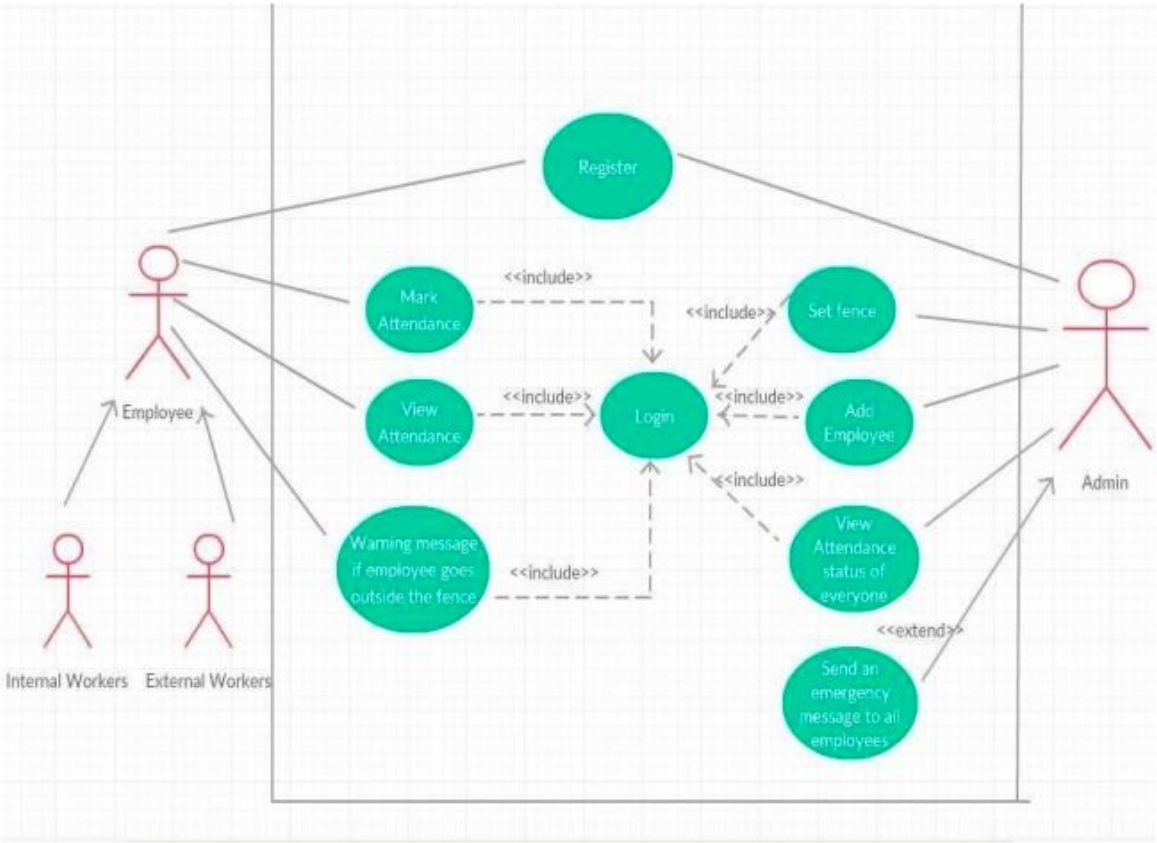
State Chart Diagram:



Collaborative Diagram:



Use Case Diagram:



4. Implementation and Testing (Snap shots with description)

4.1. Implementation details (snapshots)

As per the progress of our project, we have implemented the user interface and integrated the data related to it with the firebase real time database and also added he google maps API into our app to enable the location based attendance marking functionality**.**

Below are the screenshots from the app of the completed modules:

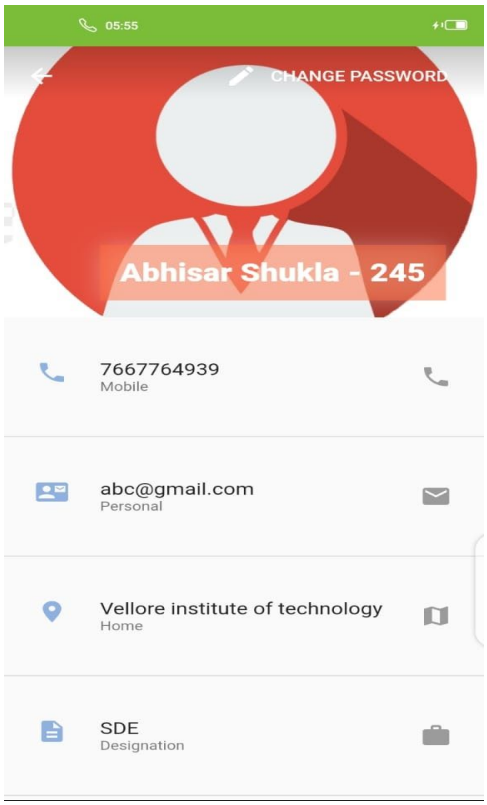
Geofencing-based Attendance Marking

Attendance will be marked only when the employee enters the radius within which his office lies. This will be done using the geofencing feature developed by enhancing the existing library since the new libraries do not have complete support through flutter. Geofencing is a location-based service in which an app or other software uses GPS, RFID, Wi-Fi or cellular data to trigger a pre-programmed action when a mobile device or RFID tag enters or exits a virtual boundary set up around a geographical location, known as a Geofence. As there is no Geofence library available in Flutter by default, therefore a Custom Geofence plugin was written for the Application for our requirements.

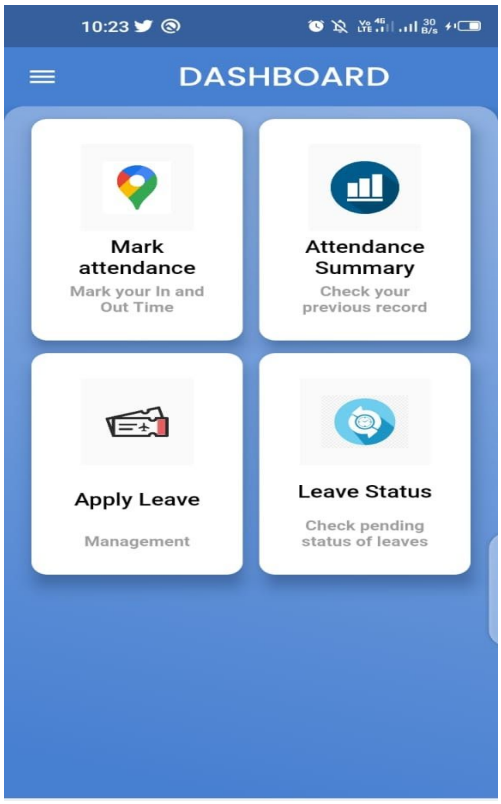
Leave Management System

The Employee can apply for leaves by specifying various fields i.e. type of leave, reason for leave, and dates for which he shall be absent. The leave request will be approved (or Rejected) by the corresponding manager through a tab which will be only visible to the Manager. When a particular counter of a specific leave reaches zero, employees can no longer use that particular leave type. Each user can view their leaves classified as annual, casual or medical leaves. Based on how many and if they are left, he can apply for leave. He can also track the status of these leaves if they have been approved or rejected.

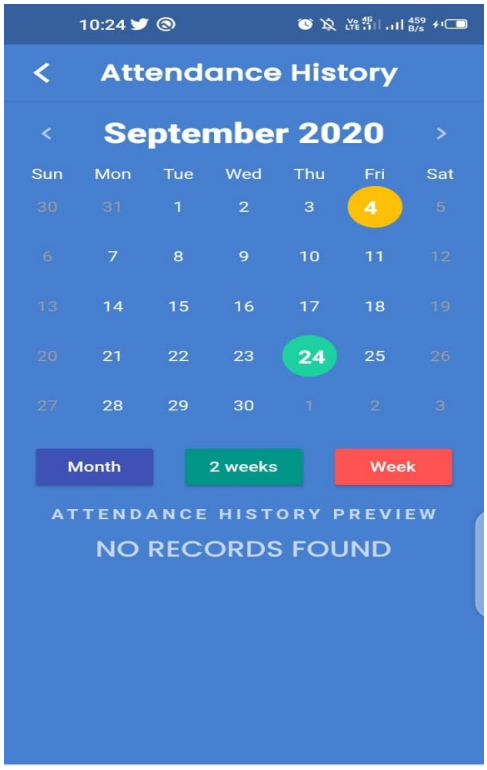
1. Profile



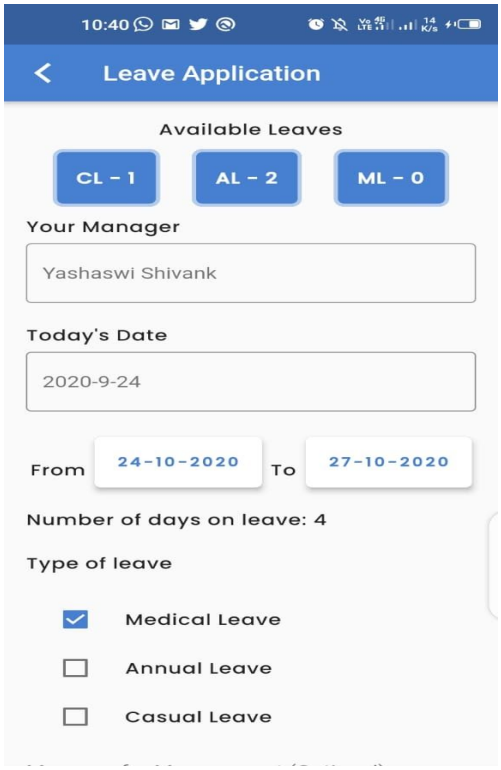
2. Dashboard menu



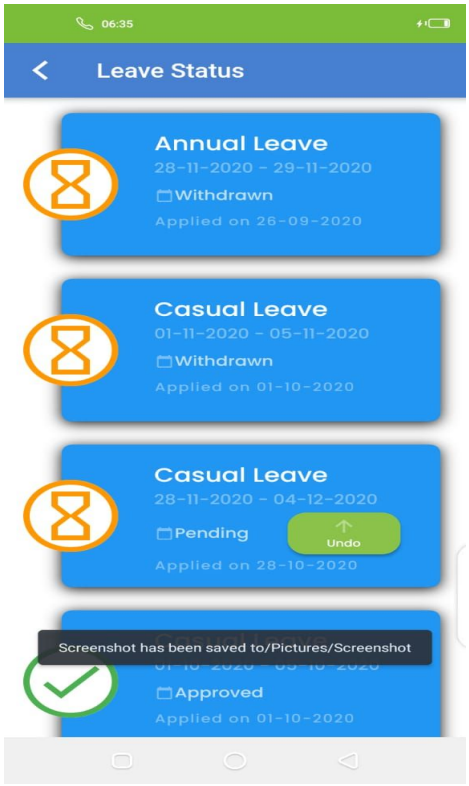
3. Attendance History Browser



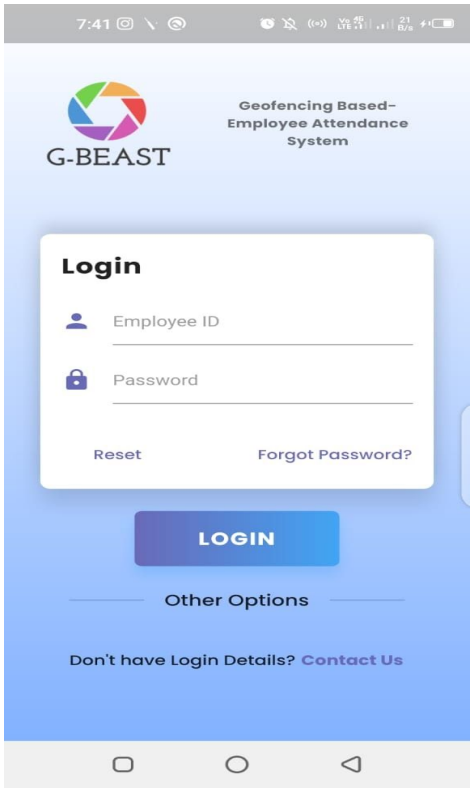
4. Leave Application Menu



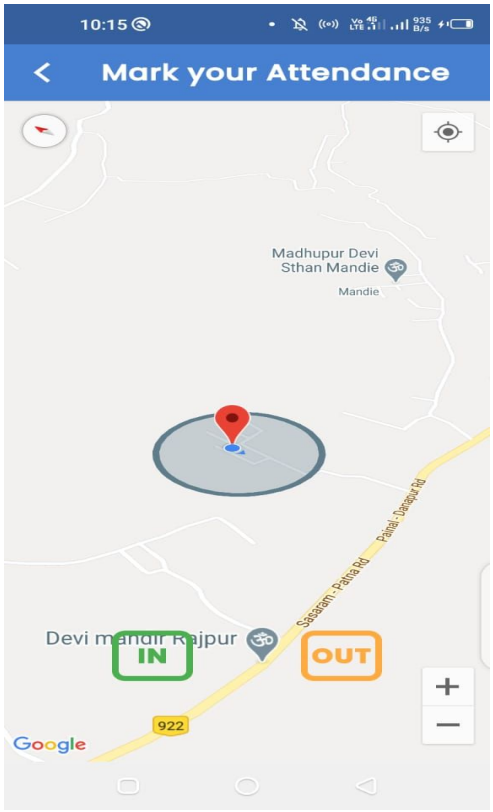
5. Leave Status



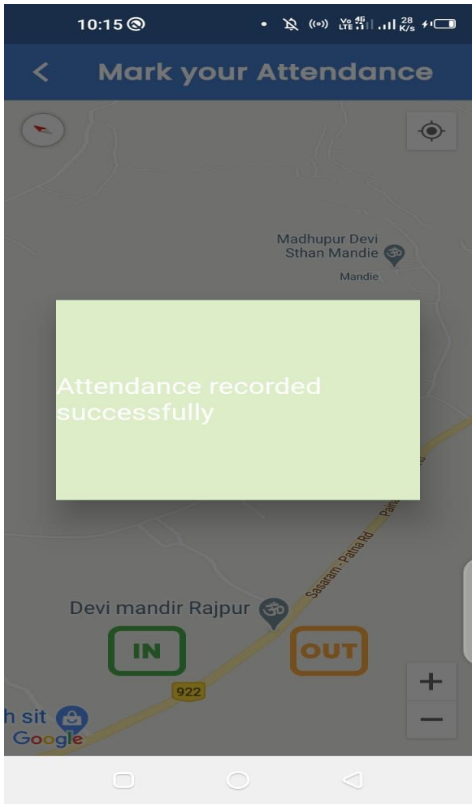
6. Login Page



7. Attendance marker(IN & OUT button)



8. Attendance Marked



4.2. Testing

TEST STRATEGY

-Understanding Requirements:

- Requirement specifications will be sent by the client.
- Understanding of requirements will be done by our team.
- Preparing Test Cases:
- Our Team will be preparing test cases based on the exploratory testing.

-Preparing Test Matrix:

Our Team will be preparing a test matrix which maps test cases to respective requirements. This will ensure the coverage for requirements.

-Reviewing test cases and matrix:

Peer review will be conducted for test cases and test matrix by Our Team . Any comments or suggestions on test cases and test coverage will be provided by the reviewer respective Author of Test Case and Test Matrix Suggestions or improvements will be re-worked by the author and will be sent for approval. Re-worked improvements will be reviewed and approved by the Reviewer Test.

-Creating Test Data:

Test data will be created by Our team on client's developments/test site based on scenarios and Test cases.

-Executing Test Cases:

Test cases will be executed by respective Our Team on client's development/test site based on designed scenarios, test cases and Test data.
Test result (Actual Result, Pass/Fail) will be updated in test case document .

-Defect Logging and Reporting:

Our Team will be logging the defects/bugs in Word documents, found during execution of test cases. After this, Our Team will inform respective developers about the defect/bugs.

- Retesting and Regression Testing:

Retesting for fixed bugs will be done by respective Our Team once it is resolved by respective developer and bug/defect status will be updated accordingly. In certain cases, regression testing will be done if required.

- Deployment/Delivery:

Once all bugs/defects reported after complete testing is fixed and no other bugs are found, the report will be deployed to the client's test site by PM.
Once a round of testing will be done by Our Team on the client's test site if required Report will be delivered along with sample output by email to respective lead and Report group.
Our Team will be submitting the filled hard copy of the delivery slip to the respective developer.
Once the lead gets the hard copy of the delivery slip filled by Our Team and developer, he will send the report delivery email to the client.

FEATURES TO BE TESTED

- G.U.I of the Employee Tracking App.
- Testing whether the notification is sent after the employee goes out of the fence.
- Performance of the app.
- Searching in the app.
- Validating Data.

4.2.1. Types of Testing

TESTING TYPES

- **Black box testing**

  It is also called behavioural testing or Partition testing. This kind of testing focuses on the functional requirements of the **Employee Tracking App**. We will derive set of inputs that will check al the functional requirements of the app

- **GUI Testing:**

  GUI testing will include testing the UI part of the report. It covers users Report format, looks and feels, error messages, spelling mistakes, GUI guideline violations that will be present in the **Employee Tracking App**.

- **Integration Testing**

  Integration testing is a systematic technique for constructing the program structure while conducting this test to uncover errors associated with interacting. Integration testing basically includes the testing Report from various location.

- **Functional Testing**

  Functional testing is carried out in order to find out the unexpected behaviour of the **Employee Tracking App.** The characteristic of functional testing is to provide correctness, reliability, testability and accuracy of the report output/data.

- **System Testing**

  System testing of the **Employee Tracking app** is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements.

- **Performance Testing**

  It will check the optimal time the app is loaded and also check the operation of the system when various are logged in.

- **User acceptance testing**

  The purpose of user acceptance testing is to confirm that the system is developed according to the specified requirements and is ready for operational use. Acceptance testing is carried out at two levels - Alpha and Beta Testing.

- **Security Testing**

  This testing is done to ensure that the application doesn't get infected by malware easily and all the data of employees are safe and protected.

- **Recovery Testing**

This testing is done to ensure that if in case the Employee Tracking App crashes then the proper backup of all attendance is maintained.

BUG SEVERITY AND PRIORITY DETECTION

Bug Severity and Priority fields are both very important for categorizing bugs and prioritizing if and when the bugs will be fixed. The bug Severity and Priority levels will be defined as outlined in the following tables below:

This is the bug severity list

Severity ID	Severity	Severity Description
1	Critical	The App crashes or the bug causes nonrecoverable conditions. System crashes or database or file corruption, or potential data loss, the program hangs requiring a reboot are all examples of a Sev. 1 bug
2	High	Major app component becomes unusable due to failure or incorrect functionality. Sev. 2 bugs cause serious problems such as a lack of functionality, or insufficient or unclear error messages that can have a major impact to the user, prevents other areas of the app from being tested, etc. Sev. 2 bugs can be fixed but fixing is difficult
3	Medium	Incorrect functionality of component or process. There is a simple fix for the bug if it is Sev. 3.
4	Minor	Documentation errors or signed off the severity of 3 bugs.

This is the priority list :

Priority	Priority Level	Priority Description
1	Must Fix	This bug must be fixed immediately; the product cannot ship with this bug.

2	Should Fix	These are important problems that should be fixed as soon as possible. It would be an embarrassment to the company if this bug shipped.
3	Fix When Have Time	It is not important (at this time) that these bugs be addressed. Fix these bugs after all other bugs have been fixed. Enhancements/ Good to have features incorporated just are out of the current scope.
4	Low Priority	The problem should be fixed within the time available. If the bug does not delay shipping date, then fix it.

ENVIRONMENTAL REQUIREMENTS:

Testing Tools

Process	**Tool**
Test case creation	Microsoft Excel
Test case tracking	Microsoft Excel
Test case execution	Manual, Flutter Driver
Test case management	Microsoft Excel
Defect management	Microsoft Word
Test reporting	PDF
Checklist creating	Microsoft Excel
Project structure	Mind Map (.xmind)

Configuration Management

Documents CM: SVN Code CM: Git

Test Environment Support level 1 (devices):

Samsung galaxy Note 10

Nokia Lumia 910,

Google Nexus 7, LG G3.

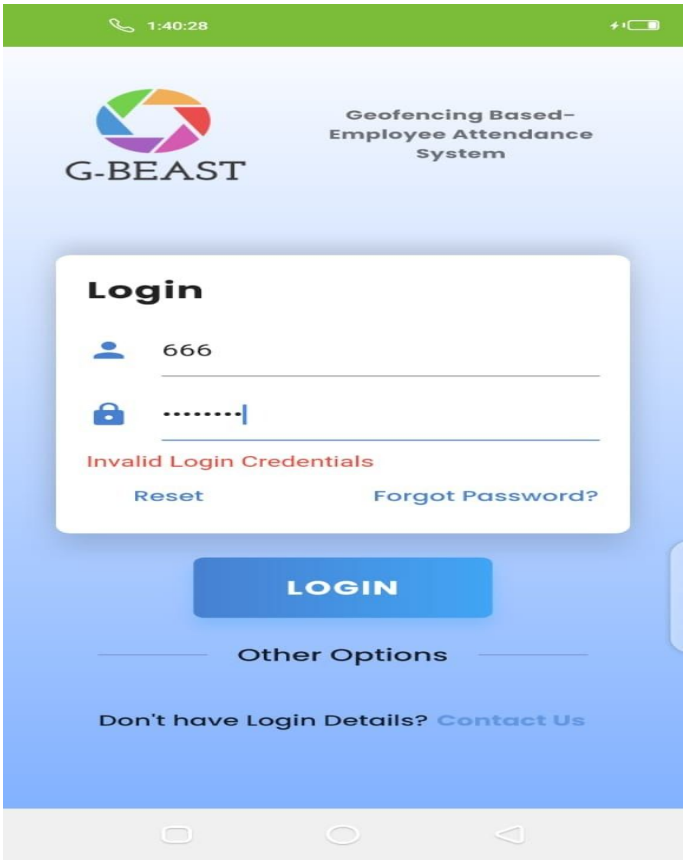
Support level 2:

All old android devices

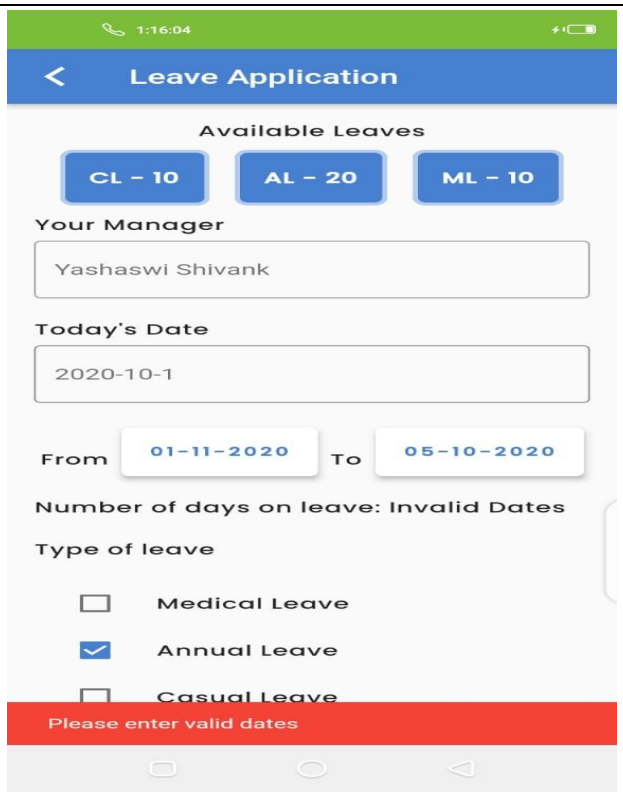
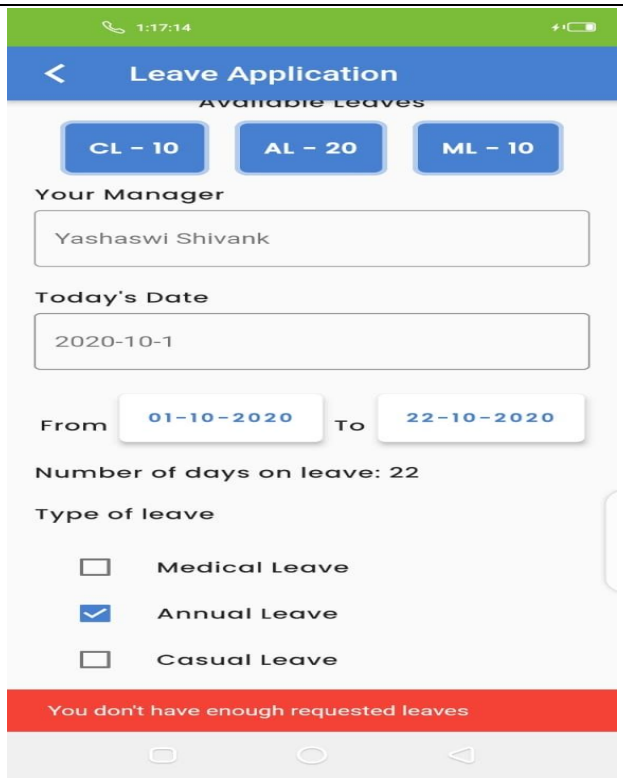
Support level 3: x anything else

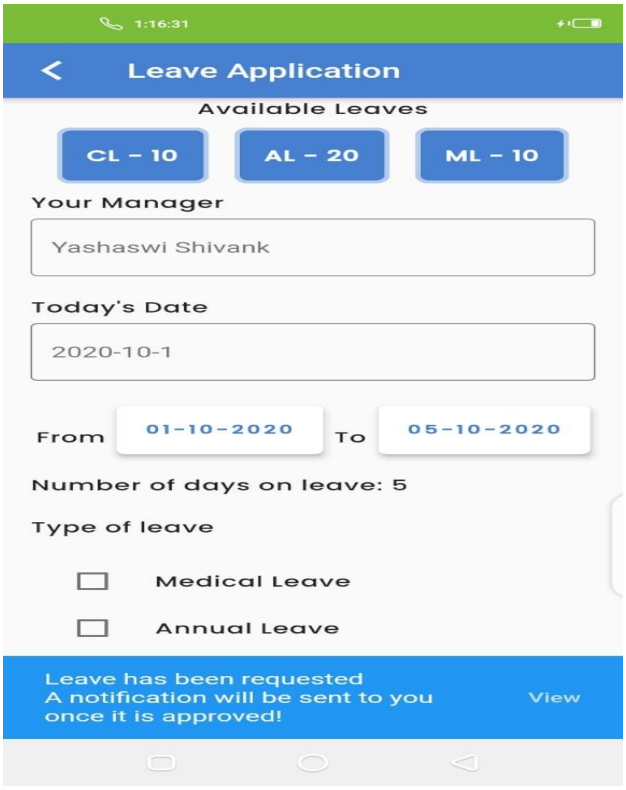
4.2.2. Test Cases (for all modules as per the template)

1) Testing for Login/ Sign Up module

Test Id	Test Case	Expected Result	Actual Result	Test Status
01	If user enter invalid credentials	Block Access and ask for Forgot password option		pass

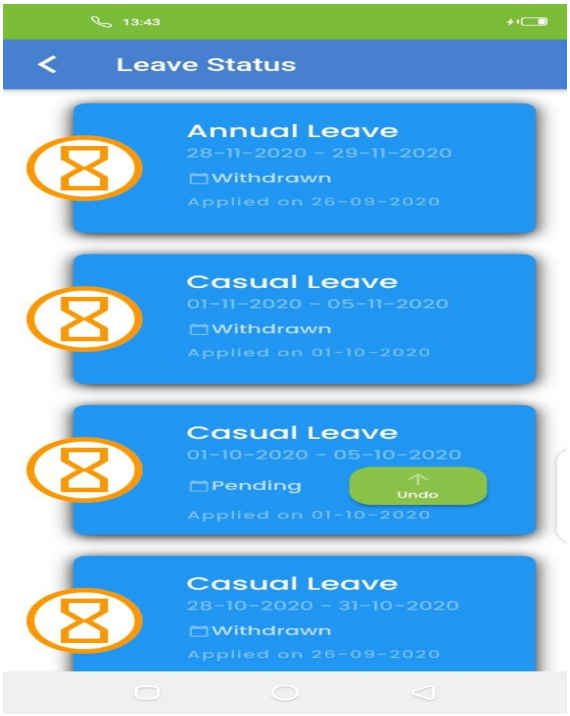
2) Testing For Leave Applying Module

Test Id	Test Case	Expected Result	Actual result	Test Status
01	If User enters invalid Date range (i.e. starting date of leave is greater than ending date)	Error message should appear		pass
02	If user requests leave for more days than permissible by admin	Error message should appear		pass

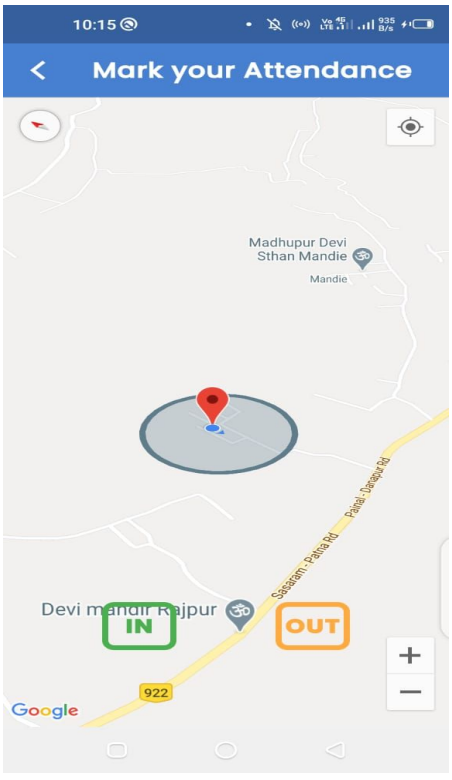
03	If User enters valid Date range and number of leaves under permissible range	Allow		pass

3) Testing For Leave Status:

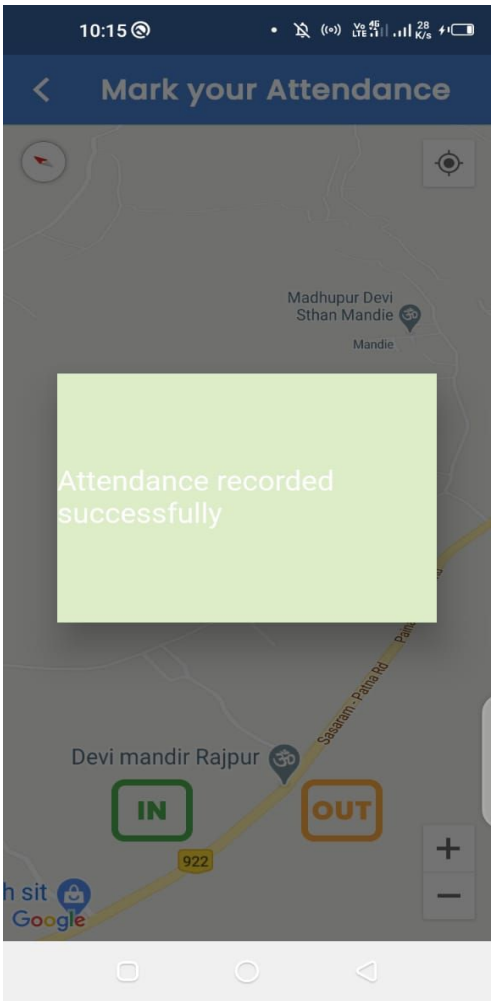
Test Id	Test Case	Expected Result	Actual result	Test Status
01	Information related to leave	Information about leave dates , Date of applying leave and current state.		Pass

02	Undo a leave	Leave Withdrawn		Pass

4) Testing for Geofence settings:

Test Id	Test Case	Expected Result	Actual result	Test Status
04	Checking the geofencing is deployed in the google maps	Geofence around the desired location with specified Radius		Pass

5) Testing for marking attendance:

Test Id	Test Case	Expected Result	Actual result	Test Status
05	Tapping IN and OUT button to mark the attendance, if an employee is present in the geofence area.	Attendance must be marked.		Pass

5. Conclusion, Limitations and Scope for future Work

5.1 Future Work

- Battery optimization by using a passive state Geofencing in the application so as to enable and disable location from the device when needed only. GPS uses a lot of battery overhead and leads to a very quick drain of battery which would be a problem for employees, especially employees during an on-field duty.
- UI/UX experience could be improved and optimized using better animations, icons as well as loading performance. A simple to use UI that would be easily usable for all age groups and people with varying technical knowledge.
- Code optimization by using better algorithms and data structures. This could also be achieved by using third-party libraries as they would release in the future
  Making the application more modular so as to make it ready to use it in different organizations with different requirements in the future. MVC is used for the structure of the application, thus providing future modularity as well.
- Increasing the Internet Connectivity tolerance of the application so that it can be used with much fluency even during low internet connection speed.
- More Rigorous Testing can be done to remove the slightest of bug still pertaining in the system.
- Checks and constraints will be updated as per the policies and norms of the firm.
- File upload support in HR Application to automate the addition of new employees.
- Automated Notification System using FCM to engage users towards the application

5.2 Conclusion

A paramount part in the functioning of any organisation is a streamlined and transparent interface that allows clean documentation of the employees. With this application, the Manager of an organisation would be well aware of the locations and the whereabouts of each employee at any given time of their working hours. As a part of the application, the manager would also be able to access the Regular Attendance Record of each and every employee in the future.

With the help of this application, we were able to provide a much-needed relief to the working at Indus Automotive Pvt. Ltd. Previously, the company was manually compiling the locations and the leaves granted to their workers This caused a major delay in their day to day functions resulting in exhaustion 35of time and resources and creating chaos. It also inevitably resulted in the organisation facing losses or hampered outcomes. This created a demand and a requirement for a tool that would be easy to use and greatly reduce the hassle created in the work space as well as outside. This project gave the advantage of an efficient, time-saving and labour-saving method of doing so.

With GeoFlix, many such issues will be solved once the organisation adapts to the technology. The hassle of making calls and consuming time in tasks that our user-friendly application can make the process uncomplicated and efficient. Subsequently, the application nullifies the requirement of manual labour in the process of documentation. We are on our path to completing the development of the application and would be providing the access to the application to begin a trial run in the near future. This would give us the opportunity to get necessary feedback from the organisation and make the required tweaks and changes to ensure an interface that the organisation can duly accept and inculcate in their functioning in the future.

6. References

1. International Journal of Computer Applications (0975 – 8887) Volume 153 – No3, November 2016 https://www.ijcaonline.org/archives/volume153/number3/enefiok-2016-ijca-911985.pdf International
2. Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 3 Issue: 2 537 - 541 http://www.ijritcc.org/download/1424501151.pdf GITHUB open source project
3. https://github.com/weddingjuma/Employee-Tracking-System-Android-Application- 5 | Page ResearchGate research paper https://www.researchgate.net/publication/267366241_ ENGPAPER research paper
4. https://flutter.dev/docs for the basics of Flutter Framework
5. https://api.flutter.dev/ for API Documentation
6. https://en.wikipedia.org/wiki/Flutter_(software)
7. https://dart.dev/guides/language/effective-dart/documentation
8. https://medium.com/flutter/executing-dart-in-the-background-with-flutter-plugins-and-
9. geofencing-2b3e40a1a124 for existing support of background services in Flutter
10. https://github.com/bkonyi/FlutterGeofencing for existing support of geofence in Flutter
11. https://dart.dev/guides/language/language-tour
12. https://sce2.umkc.edu/BIT/burrise/pl/software-process/
13. https://mixmastamyk.bitbucket.io/pro_soft_dev/models.html
14. https://www.tutorialspoint.com/mvc_framework/mvc_framework_introduction.htm
15. https://www.guru99.com/mvc-tutorial.html for MVC framework basics
16. https://www.smartdraw.com/uml-diagram/ for drawing Data Flow diagram
17. https://pub.dev for dependencies
18. https://firebase.google.com/ for Real-time database access
19. https://firebase.google.com/docs/functions for Integrating Cloud functions for automatically