IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING & NOTIFICATION

A PROJECT REPORT

Submitted by

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ABSTRACT

Nowadays, crime rate associated with children keeps increasing due to which draws peoples' attention regarding child safety. This project "**IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING & NOTIFICATION** " is conducted to propose a child security smart band utilizing IoT technology. Online questionnaire and semi-structured interview are methodologies used to collect data. The online questionnaire gains feedbacks by sending questions electronically, where answers need to be submitted online. In the semi structured interview, researcher meets and asks respondents some predetermined questions while other being asked are not planned in advanced.

Through information obtained, a smart band have been proposed to monitor the safety of children. By this, parents know what is happening remotely and can take actions if something goes wrong. The future improvements of this device will be adding functions and software to make it works like a phone such as messaging, gallery, Google, YouTube, meanwhile, adding more child security features so that child safety is guaranteed

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Project Report

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INTRODUCTION

1.1. Project Overview :.

Creating a device that can be followed using GPS locations and has a panic button to inform the parent via a GSM module, this invention is primarily focused on improving child safety. An Android app for parents is created to control and monitor the device at any time. Smart gadget devices are always connected to parents' phones, which can receive and make phone calls as well as SMS gadget via a GSM module. Additionally, wireless technology is implemented on the device, which is useful to bind the device within a region of monitoring range; if the device is moving out of monitoring range, an alert will be triggered on a binding gadget, helping you maintain a virtual watch over the child. An alert will be sent to a bound device if the device moves outside of the monitoring range, allowing you to keep a virtual check on the child. Devices come with a health monitoring system that checks for factors including heart rate, pulse, and temperature. The parental app allows for the monitoring of these indicators. Using a contact switch, the device also keeps track of whether or not it is plugged in and notifies the parent the moment it is unplugged.

1.2. Purpose

Approximately 80% of all reports of child abuse are made nowadays, with 74% of the victims being girls and the remaining 20% being males. In this world, a child goes missing every forty seconds. Children are the foundation of a country; if their future was threatened, it would have an effect on the development of the whole country. The emotional and mental stability of the children is compromised as a result of the abuse, ruining their futures and careers. The things that happen to these defenseless kids are not their fault. Therefore, parents are in charge of raising their own children. However, parents are compelled to seek money because of the state of the economy and their desire to concentrate on their child's future and job. Consequently, it becomes challenging for them to constantly cling to their kids. We have created a setting in our system where this issue can be effectively solved. It enables parents to keep a close eye on their kids in real time while

concentrating on their own careers without having to take any physical action. In essence, kids cannot tell their parents about the abuse they experience on a regular basis. They are too young to really comprehend what truly occurs to them. Parents find it challenging to recognize when their children are being abused. So, the main objective of this module is to help working parents to be free from worry about their children by tracking their movements at any time. An autonomous real-time monitoring system is required for every child worldwide in order to stop attacks on children. In fact, IoT has been applied in domains such as smart home, smart city, smart factory, supply chain, retail, agriculture, lifestyle, transportation, emergency, health care, environment, energy, culture and tourism . However, it is seldom used to monitor child's safety in Malaysia. Actually, there is a need to use IoT-based child security system since the safety of children has become a major concern. In fact, crimes on children keep increasing despite actions have been taken by the government. Revealed by, the overall percentage of child abasements worldwide is about 80% nowadays, out of which 74% are girls and the remaining are boys. For every 40 seconds, a child is gone missing in the world. Due to that, parents are worried for their children and perhaps, a hard challenge for them to guarantee safety of their children when they are out.

1.2.1. Internet of Things (IoT)

Internet of things (IoT) refers to networked interconnection of objects featured with ubiquity intelligence . In IoT, objects are connected via internet for communication, interaction, exchanging data and making decisions automatically at anywhere and anytime. Thus, introducing the hyper connectivity concept meaning individuals and organizations able to communicate with each other effortlessly and remotely . Revealed by and , IoT is a revolution in advancing technology causing transformation in information technology, humans' lifestyle, and in businesses processes. The advancements of IoT make it possible to be used in organizations for automating and monitoring business processes . In term of society, IoT can be used for simplifying daily tasks, creating smart homes, smart cities, devices or application which improves the quality of life. However, security and privacy are the main challenges of IoT which need to be solved as it gathers much personal data capable of revealing sensitive information.

1.2.2. Sensor

Sensor known as a device measuring physical value and converts it into data. Common sensors like the temperature sensor measures heat of an object. Proximity sensor used to detect nearby

objects. For the pressure sensor, it calculates pressure applied. Optical sensor able to sense the light intensity . Humidity sensor will detect the presence of water vapor in the air . Micro sensor is designed to collects and relays information about the environment .

1.2.3. Cloud

Cloud computing means shared computing resources (networks, servers, storages, applications, services) are delivered as a service over the Internet from cloud to customer. According to , cloud is an interconnected network of servers providing services for people or businesses. In fact, cloud supports real-time operation, processing, analyzing, connecting, managing and securing IoT devices as well as applications. In addition, it reduces cost since users are paying based on usage without building the physical infrastructure. Furthermore, it allows developers to create projects faster . Organizations can also access Big Data from the cloud . Discovered by , the core concept of cloud is to reduce processing burden on users. Consequently, different devices like PC, laptop, smart phone able to access various utility programs, storage and application development platform over the internet.

1.2.4. Safety Device

The safety device protects individuals from potential harms and dangers. A research done by proposed the child safety wearable device using raspberry pi 3. The raspberry pi 3 gathers data from pi camera, pulse sensor and sound sensors. Then, send collected data to parents' smartphones by SMS using GSM shield. Images captured from pi camera and children's location detected by GPS will also be sent to parents' devices. In another study, designed a wearable smart watch for women security. Sensor inside the smartwatch senses the heartbeat of a child or woman who wears it . When he/she is exposed to attacks, heartbeat rate will be high . When this is detected, alarm sound will be triggered . It will then automatically make calls to registered contact and to the nearest police station . Based on the location provided by GPS, police will arrive soon at the correct destination.

1.2.5. Similar System

Figure 1 Gator Smart Watch

Source: https://cdn3.volusion.com/hvgjb.rxjoy/v/vspfiles/photos/MyGator-Watch--6.png?v-cache=1605859659

Gator, a kid's smartwatch from Gator Group Co. It comes with a SIM card and the free app is available on Play Store and Apple App Store . Gator supports calling features up to 13 different numbers, enables twoway voice messages from the app and watch. The location tracking is based on GPS tracking when children are outdoors and Wi-Fi tracking when children are indoors. Notification will also be sent to parents when children leave the geofences. Pedometer sensor is included and the SOS alarm is supported which automatically calls 3 emergency contacts when pressed for 3 seconds. Other than that, school mode is available for setting up schedules to prevent callings during the school time. Not only that, Gator is splash proofing, enables remote voice monitoring and records historical routes.

Figure 2 Explora Go

Source: https://images-na.ssl-imagesamazon.com/images/I/610FHcb9fJL._AC_SL1383_.jpg

Explora Go, a waterproof watch phone for children branded Explora which includes pedometer, alarm clock and stopwatch. It possesses an app available at Playstore and Appstore. With GPS and multiple services, Explora Go shows children's' location and supports the setup of safety zones. Meanwhile, it contains a SIM card and acts like a phone enables voice calls from 10 pre-saved contacts. Similar to a phone, Explora Go can send and receive text messages, emojis, images and voice messages. It is also equipped with the SOS button that children can press to notify emergency

contacts of their location. Beyond that, Wi-Fi and Bluetooth are available in Explora Go. It also supports the schedule function in which school schedules can be specified during which watch will only display time and make emergency calls.

The table below shows comparison between systems:

Table 1: Comparison between Gator Smart Watch, Explora Go and the proposed system.

	Gator	Explora Go	Proposed System
Wifi	✓	✓	✓
Phone Calls	✓	✓	✓
Waterproof	X	✓	✓
Camera	X	✓	✓
Video Record	X	X	✓
Text Messages	X	✓	X
Schedule	✓	✓	X
GPS	✓	✓	✓
Safety Zones	✓	✓	✓
Emergency Button	✓	✓	✓
SOS Light	X	X	✓
Altimeter	X	X	✓
Blood Pressure Sensor	X	X	✓

Emotion Detector	X	X	✓
Heart Rate Sensor	X	X	✓
Motion Sensor	X	X	✓
Pedometer	✓	✓	✓
Respiratory Sensor	X	X	✓
Sleep Quality Sensor	X	X	✓
Temperature Sensor	X	X	✓

Based on the table, Gator and Explora Go does not support much sensors like the proposed system to obtain children's data regarding their actual conditions. Thus, if abnormal situations occurred, Gator and Explora may not be able to realize quickly, easily and inform parents at once. Due to that, parents are less informed about children's conditions and in case the child is in danger, actions are not able to be taken immediately.

Furthermore, both systems do not record video and send it to parents during an emergency situation. Besides, SOS light function is not available in both systems but supported by the proposed system which will light up when the emergency button is pressed. In fact, Gator and Explora Go are emphasized in introducing mobile products for kids who are too young to use mobile phones. Because of that, they are less focusing on the child security aspect. On the other hand, the proposed system is more focused on tracking children's conditions that are suitable for child safety purposes

1.3. The Proposed System

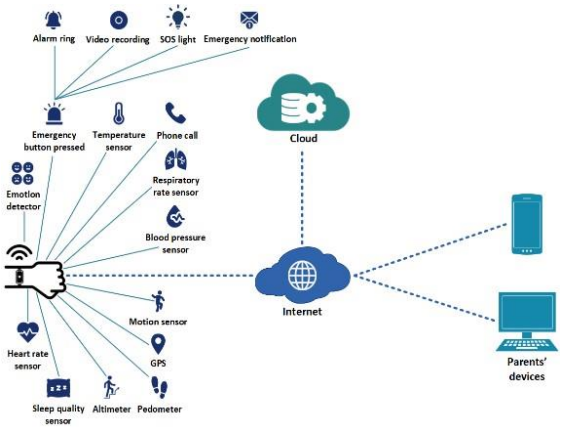


Figure 3 Diagram of the proposed smart band

An IoT based wearable smart band for children is proposed in this research for child security purposes. The smart band is waterproof, chargeable and equipped with sensors. Heart rate sensor measures pulse rate and BPM. Sleep quality sensor obtains children's sleep quality, cycle and positions. Altimeter detects changes in height and sense whether children are going down a slope or climbing stairs, thereby measuring calorie count. On the other hand, pedometer is used for counting steps. The motion sensor is applied to determines whether children are jogging or running. Blood pressure sensor used to measure blood pressure. In addition, the respiratory rate sensor detects breathing patterns and respiratory rate. Furthermore, the temperature sensor is used to detect body temperature. Besides, by using the emotion detector the emotional state, pressure and anxiety levels can be gained. Apart from that, this smart band contains GPS for tracking, identifying children's location and setting geofences. Via the smart band, children can also contact parents. Emergency button, a feature in which will automatically record video and automatically call 4 emergency contacts when it is pressed. As the diagram shows, sensors are connected through the internet. They detect and capture different kinds of data. These collections of data will then be sent to the cloud over the internet for securely process, analyze, monitor, store, access and retrieve data remotely. After that, the information indicating children's status, along with reference values will be sent to parents' devices with the app installed. If children's actual data is not within the range of reference value, alert notification and some suggestions will be sent to parents' devices. Also, when children leave geofences, notification will be sent to parents' devices.

2. LITERATURE SURVEY

2.1. EXITING PROBLEMS , REFERENCES AND PROBLEM STATEMENT

1. TOPIC: IoT-based Child Security Monitoring System**.**

AUTHOR: Lai Yi Heng1,Intan Farahana Binti Kamsin.

DESCRIPTION: Nowadays, crime rate associated with children keeps increasing due to which draws peoples' attention regarding child safety. This research is conducted to propose a child security smart band utilizing IoT technology. Online questionnaire and semi-structured interview are methodologies used to collect data. The online questionnaire gains feedbacks by sending questions electronically, where answers need to be submitted online. In the semi structured interview, researcher meets and asks respondents some predetermined questions while other being asked are not planned in advanced. Through information obtained, a smart band have been proposed to monitor the safety of children. By this, parents know what is happening remotely and can take actions if something goes wrong. The future improvements of this device will be adding functions and software to make it works like a phone such as messaging, gallery, Google, YouTube, meanwhile, adding more child security features so that child safety is guaranteed.

2. TOPIC: Child Safety Monitoring System Based on IoT

AUTHOR: N. Senthamilarasi, N.Divya Bharathi, D.Ezhilarasi, R.B.Sangavi

DESCRIPTION: The overall percentage of child abusements filed nowadays in the world is about 80%, out of which 74% are girl children and the rest are boys. For every 40 seconds, a child goes missing in this world. Children are the backbone of one's nation, if the future of children was affected, it would impact the entire growth of that nation. Due to the abusements, the emotional and mental stability of the children gets affected which in turn ruins their career and future. These innocent children are not responsible for what happens to them. So, parents are responsible for taking care of their own children. But, due to economic condition and aims to focus on their child's future and career, parents are forced to crave for money. Hence, it becomes difficult to cling on to

their children all the time. In our system, we provide an environment where this problem can be resolved in an efficient manner. It makes parents to easily monitor their children in real time just like staying beside them as well as focusing on their own career without any manual intervention.

3.TOPIC: Child Monitoring and Safety System Using Wsn and Iot Technology

AUTHOR: P.Poonkuzhlai,R.Aarthi ,Yaazhini.V.M ,Yuvashri.S ,Vidhyalakshmi.G

DESCRIPTION: This paper presents the design and implementation of a portable IOT-based safety and health monitoring system for children through a sensor embedded health monitoring device for safety and emergency services. It is known that the technological advancements are increasing at a faster pace. But the utilization of technologies in various sectors is very low. We know that people of different age group faces different difficulties. But the security for children's is very low. There is lot of cases registered regarding child safety. Nowadays, the schools and the parents are very much worried about their school children's for school transport and other places. So, the safety and monitoring the school children is very much difficult. In this project we are introducing the IOT based embedded system is used in this project. So we propose a system to continuously monitor the parameters of the child and also their location for safety purpose. The system provides smart child tracking and monitoring system.

4. TOPIC: IoT Based Smart Gadget for Child Safety and Tracking.

AUTHOR: N. Manjunatha, H. M. Jayashree, N. Komal, K. Nayana.

DESCRIPTION: This paper is mainly streamed towards child safety solution by developing a gadget which can be tracked via its GPS locations and also a panic button on gadget is provided to alert the parent via GSM module calling for help. Parental android app is developed to manage and track the device anytime. Smart gadget device is always connected to parental phone which can receive and make phone calls and also receive SMS on gadget via GSM module, also a wireless technology is implemented on device which is useful to bound the device within a region of monitoring range, if device is moving out of monitoring range then an alert will be triggered on binding gadget, this helps you keep a virtual eye on child. Health monitoring system on gadget checking for parameters like heart beat/pulse rate and temperature is included which can be

monitored on parental app. Gadget also monitors whether it is plugged on hand or not using contact switch and alert the parent as soon as it is unplugged.

5. TOPIC: Survey on Child Safety Wearable Device Using IoT Sensors and Cloud Computing.

AUTHOR: Prakriti Agarwal, R Ramya, Rachana Ravikumar, Sabarish G, Sreenivasa Setty.

DESCRIPTION: Child safety is a major concern in any society due to the vulnerability of a child and consequently, higher rates of crimes against children. With this issue on our hands, a smart wearable Internet of Things sensor network for monitoring the environment of a child can be developed to help parents ensure the safety of their children. It must also necessarily include a mechanism for tracking the child. An advantage of this wearable device is that, according to its design, it can be accessed from any mobile device and does not mandate a lot of technical knowledge from the user to operate. The purpose of this device is to facilitate the guardian or parents in locating their child with ease and ensuring its well-being. The basic mechanism of this system involves monitoring the environment through sensor nodes, acquiring real-time data and transmitting this data to a cloud server. The data can be accessed by users through a web-based interface present on this cloud server. The wearable also functions to send alerts to the user through a mobile application in case an emergency condition is detected by it. The design of this model involves developing a medium for communication between the parent/guardian and the child's wearable device. The child's location is tracked using GSM mobile communication to specify the location of the child in realtime. We have surveyed relevant papers and have discussed about the different methodologies that have been used to achieve similar but different results. We later also compare these papers using their advantages and disadvantages and we try to bring out the uses from their results.

3. IDEATION AND PROPOSED SOLUTION STATEMENT:

3.1. **EMPATHY MAP**

An empathy map is a widely-used visualization tool within the field of UX and HCI practice. In relation to empathetic design, the primary purpose of an empathy map is to bridge the understanding of the end user.

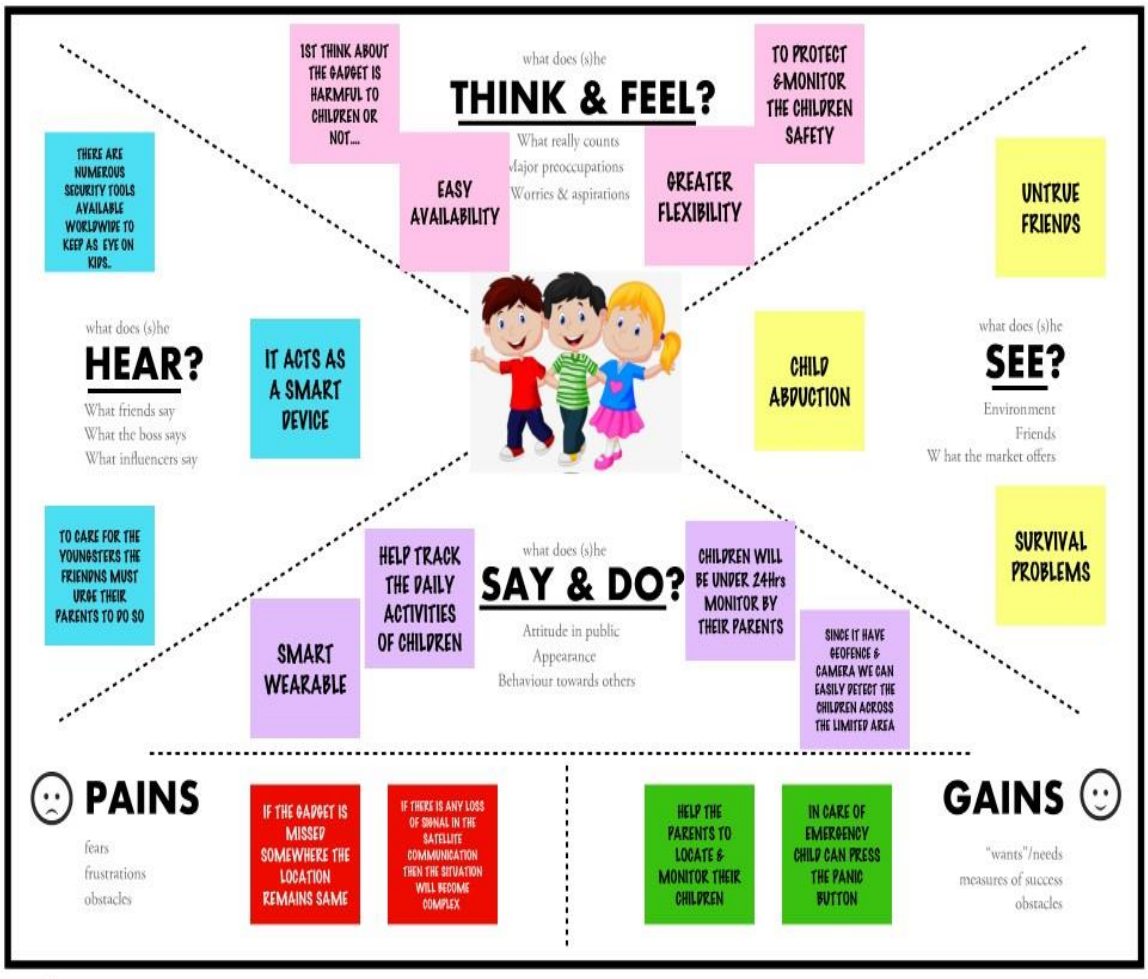


Fig .3.1. Empathy Map

3.2. **BRAINSTORM & IDEA PRIORITIZATION**

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Define your problem statement? What problem are you trying to solve?

Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

PROBLEM

IoT-Based Safety Gadget for Child Safety Monitoring and Notifcation

[IoT-Based Child safety monitoring system helps the parents in monitoring critical situation]

Step-2: Brainstorm, Idea Listing and Grouping

Write down any ideas that come to mind that address your problem statement

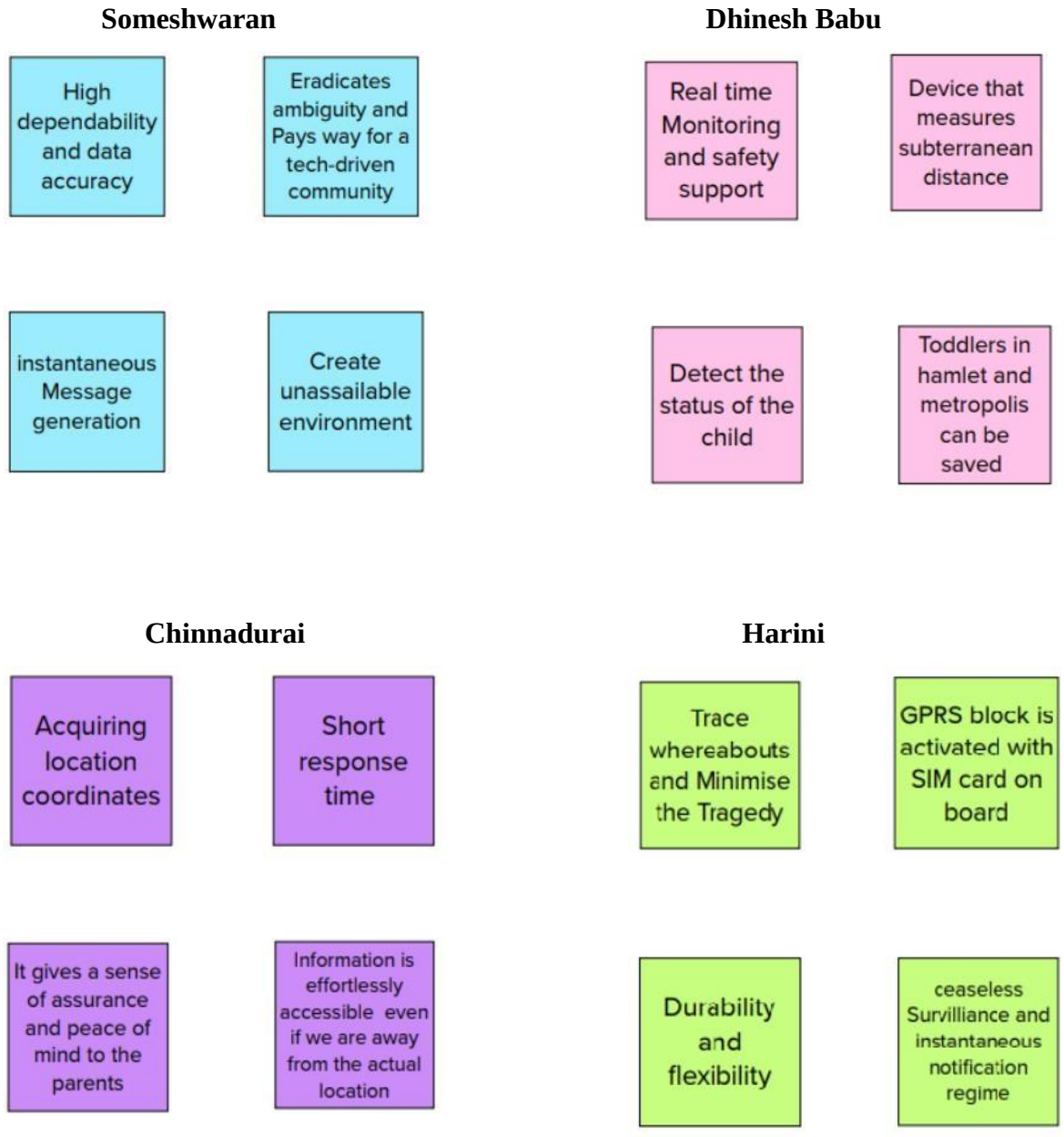


Fig : Brainstorming ideas

Group ideas:

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups

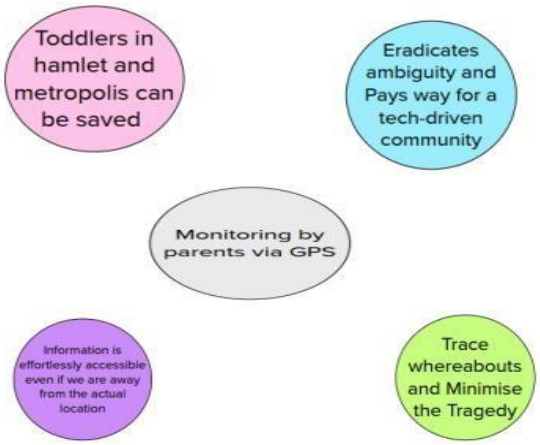


Fig : Group ideas

Step-3: Idea Prioritization

Your team should all be on the same page about what's important moving forward.
Place your ideas on this grid to determine which ideas are important and which are feasible.

Fig : Idea Prioritization

3.3. Proposed Solution:

Table : Proposed Solutions

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Child abductors are continually abducting the children from parents/legally appointed guardians to get the ransom/money for their benefit. Where the Parents have no supplementary option but to view the exact scenario of children's intuitions. The crisis outturn of kidnapping can be highly cynical and perpetual, more measures must be taken to protect children against abduction and its impacts.
2.	Idea / Solution description	Our Smart IOT device for tracking the children is developed to aid parents for detection. In this project, we are going to develop a wearable safety gadget to display the live location of a children at any time on the parent's mobile to set the seal on their safety. The application is to track down the children when they’re within Bluetooth range, also functions when the kids go farther afield. Its competence as a tracker is outstanding if you live in densely populated areas like cities or big towns. This means that will able to see the identity of the participating devices and also It helps to diminish their vulnerability in harmful situations and also protects the children in any emergency situations.
3.	Novelty / Uniqueness	The system software involuntarily alerts the parent/guardian by redirecting a text Message. Contrary to other devices, it has plenty of characteristics like the development of sensors technology, availability of internet-connected devices and the data analysis algorithms making IOT devices act smart in emergencies without human intervention.

4.	Social Impact / Customer Satisfaction	Child abduction is a scorching subject all over the world. It is a complex crime that can impair a child's future. Parents should ensure that their little ones are secure and are been protected from the menace of injury. In case of situation arises, notifications will be consigned to the Parents so that measures can be done at the apparent time, Via this, Child Safety can be assured and will take the edge off the crime rate. The parent can keep their children Secure with tension-free minded when they are away from them. Precisely predicting the circumstances of the children and swiftly sensing the problems around children will make parents at ease. It will be great helpful to parents who are busy workers not having time to watch over their children, and easy to operate so anyone can handle it.
5.	Business Model (Revenue Model)	In this contemporary market,this would be desired as kids need more protection in the current times. The gadget can be acquired at an affordable rate. Where Our gadget possesses a lot of ingenious attributes and it would be accessible and beneficial to everyone so it is a foundation for a prominent revolution in merchandise. It is a device with numerous subscriptions for tracing and notification assistance.
6.	Scalability of the Solution	This solution could be further enhanced by the installation of the mini camera inside a smart gadget for exemplary security and protection so that a glimpse can be caught on the live footage on the parental phone during panic circumstances. If an intricacy arises parents can see some of the attributes like the location, temperature and heartbeat of the child along with living perspective around the children without deterrence.

3.4. Problem Solution Fit:

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem.

Define CS, fit into CC	**CUSTOMER SEGMENTS** CS This helps the parents to track the daily activity of children and helps to find the child using GPS location.	**CUSTOMER LIMITATION** CC It is fully about safety and secured electronic system for child . Less tension to Parents.	**AVAILABLE SOLUTION** AS In Previous method, the model created which can be capable of handling the battery for long time. Nowadays, the system proposes a location tracking facilities and speeding monitoring using GPS, GSM with IOT technology for child safety at low cost which can be affordable by the people.	Explore AS
Understand RC	**PROBLEMS/PAINS** PR The child safety is a complex far reaching health priority, which requires holistics ways of identifying safety issues.	**PROBLEM ROOT/CAUSE** RC It fears frustration obstacles and understanding the working of the system. Due to this solution, the kidnapping rate will be decreased.	**BEHAVIOUR** BE It mainly focus on improving parent-child interactions, home safety and child health care as well as monitoring.	Understand RC
Identify strong TR & EM	**TRIGGERS TO ACT** TR The parents are working with new and various technology. So, they should monitor their child's activity daily. **EMOTIONS** EM Due to this, the emotional and mental stability of the children gets affected which in turn ruins their career and future.	**YOUR SOLUTION** SL The parents can monitor their child each and every second. If the child is in danger, they notified by SMS through their device and their parents can save them.	**CHANNELS OF BEHAVIOUR** CH Children and their parents are turning to digital solutions more than ever to support children's learning. While digital solutions provide huge opportunities for sustaining and promoting children's right	Extract online & offline CH of BE

Fig : Problem Solution Fit

4. Requirement Analysis:

4.1. Functional Requirements:

Following are the functional requirements of the proposed solution.

Table : Fundamental Requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through website Registration through app
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User login	Setting up User Id and password
FR-4	App permission	Grant the permission for the app to access location, contact etc..
FR-5	Interface with the Device	Connecting the device with the registered app with the device ID.
FR-6	Setting Geo-location	Creating the Geo-location area in the map
FR-7	Database	Location history is stored in the cloud. Can be accessed from the dashboard.
FR-8	Tracking location	Tracking the location through app. Tracking the location through website.

4.2. Non-functional Requirements:

Following are the non-functional requirements of the proposed solution

Table : Non-functional Requirements

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The device and its applications are user-friendly. The device is portable and easy to use.
NFR-2	**Security**	Providing permission for some information can only be decided by the user. Location data can only be viewed by the user.
NFR-3	**Reliability**	An update will be provided if any errors are found in the device.
NFR-4	**Performance**	The performance of the device decrease in a network less area. No interference between users. Location tracking will be accurate.
NFR-5	**Availability**	If there is any update then the device wont be able to operate for a amount of time.
NFR-6	**Scalability**	A single device can be monitored by two users.

5. PROJECT DESIGN

5.1. Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

DATA FLOW DIAGRAM:

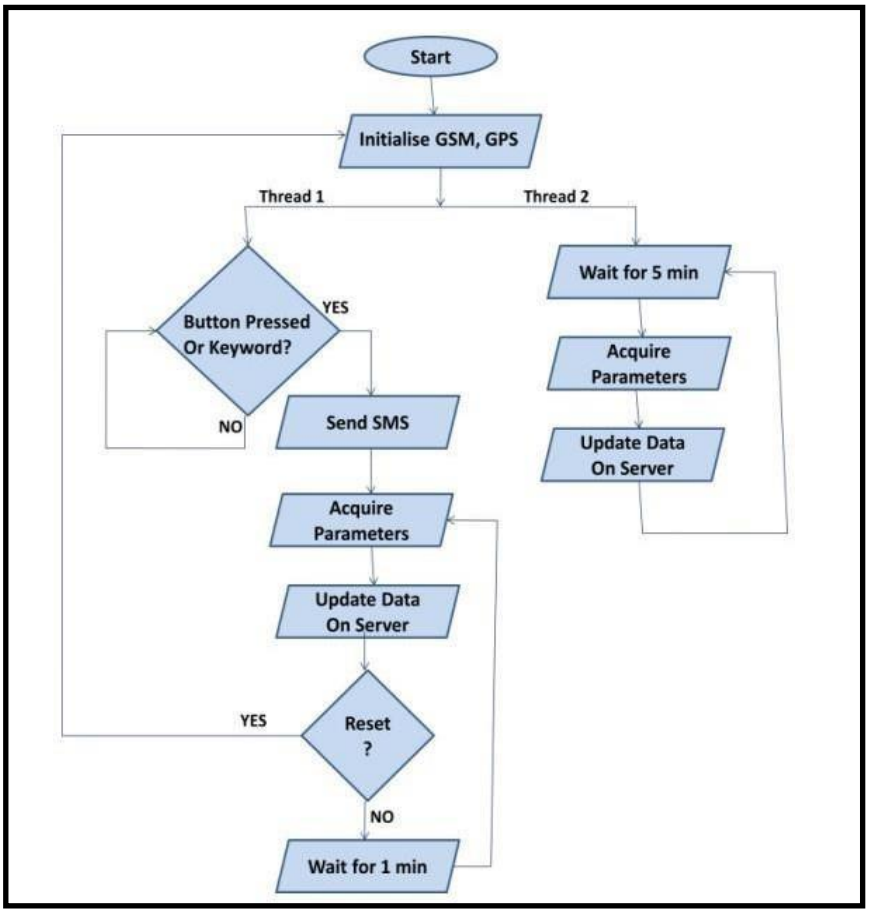


Fig : IoT Based Safety Gadget for Child Safety Monitoring & Notification Flowchart

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1 (FATHER)	As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials provided as a Father.	I can access my account / dashboard and receive confirmation email & click confirm	High	Sprint-1
		USN-2 (MOTHER)	As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials provided as a Mother.	I can access my account / dashboard and receive confirmation email & click confirm	High	Sprint-1

		USN-3 (GUARDIAN/ CARETAKER)	As a user, I can also monitor the children's activities using a safety gadget monitoring system.	I can access my account / dashboard and receive confirmation email & click confirm	Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password.	I can access my account / dashboard.	Medium	Sprint-2
	Dashboard	USN-5	As a user, I can fix the geofence for my child's location so that I will receive alerts if my child crosses the geofence.	I can monitor the current location of my child.	High	Sprint-2
Customer (Web user)	Registration	USN-1 (FATHER)	As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials	I can access my account / dashboard and receive confirmation email & click confirm	High	Sprint-1

			provided as a Father.			
		USN-2 (MOTHER)	As a user, I can register by entering my email, password, and confirming my password. I can access the location of my children using the credentials provided as a Mother.	I can access my account / dashboard and receive confirmation email & click confirm	High	Sprint-1
		USN-3 (GUARDIAN/ CARETAKER)	As a user, I can also monitor the children's activities using a safety gadget monitoring system.	I can access my account / dashboard and receive confirmation email & click confirm	Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password.	I can access my account / dashboard.	Medium	Sprint-2
	Dashboard	USN-5	As a user, I can fix the geofence for	I can monitor the current	High	Sprint-2

			my child's location so that I will receive alerts if my child crosses the geofence.	location of my child.		
Customer Care	Dashboard	USN-6	As a customer care service person, whenever I receive a complaint, I forward the complaint and ensure that the complaint is resolved.	I can keep track of all the complaints and the status of the complaints received.	Medium	Sprint-3
Administrator	Admin Dashboard	USN-7	As an administrator, I will take care of all the payment processes, queries and complaints and login credentials.	I can access all the customer details, payment details and complaints received.	High	Sprint-4

5.3. Solution architecture

Introduction:

Solution architecture is an architectual description of a specific solution with many data sources that bridges the void between industrial obstacles and technology solutions.

Its aims to

- Find out the finest tech solution to decipher subsisting business crises.
- Also Outlines the composition, attributes, behaviour, and other aspects of the software to project stakeholders.
- Defines the properties, development chapter, and quick fix essentials.
- And also produce the stipulation in accord to which the solution is interpreted, controlled, and dispatched.

It is comprised of many sub processes that draw the guidance from various enterprisse Architecture viewpoints.

REQUIREMENTS:

The requirements of this project are

- Embedded C
- Python framework

For AVR,ARM and in addition for Wiring as Device BootLoader.

- IBM Cloud workspace for depository and APIs.
- The front end by XML for android.

DESIGN:

All the requisite are used to draft the Application. The layout and architecture of the software are done in a distinctive approach so the software can be employed and developed imminently. The Arduino acquires the region from the GPS equipment and consigns it to the cloud to inspect if the end user is within the confined zone. If the user is further away

from the confined zone, an alert is sent to the catalogued mobile through the cloud. When the requisition is opened, the locality is obtained from the cloud and unveiled on the mobile.

IMPLEMENTATION:

The implementation is done and executed by progressing the logic and coding. Where the vital packages are imported and for each router specific logic is developed in accordance to the usage.

Development of a safety device for kids to guarantee their security in the absence of understated examination of their parents.

The various aspects involve:

INTEGRATION AND TESTING:

After individual testing, all the software sections were integrated and tried out ultimately, so the flask program could be run on any platform. The testing progression encompasses Alpha testing and Beta testing.

DEPLOYMENT:

- The flask application in the long run is distributed in the IAAS rostrum like IBM cloud assistance, so it can be run in HTTPS protocol alongside SSL.
- In the deployment process, a real-time database is fastened on the edge of real-time file storage.

MAINTENANCE:

After deployment, if there is any conglomeration refurbish, it is accomplished in the software.

SOME CATASTROPHIC FEATURES IN THE DEVICE:

1. **ALARM RING:**

The safety system redirects a warning to the phone at any occasion, it determines any pursuit. Arming methodology decides which category of alerts to get.

2. **EMERGENCY NOTIFICATION:**

An emergency notification system is a labour-saving mechanism to get in touch with group of people within a corporation and assign salient information during a crisis.

3. **GPS:**

The GPS helps to escalate the protection and fitness characteristics on the device. Depending on the device, it can alert parents about their child's location in case of any crisis and helps to trace their route duration and distance.

Solution Architecture Diagram:

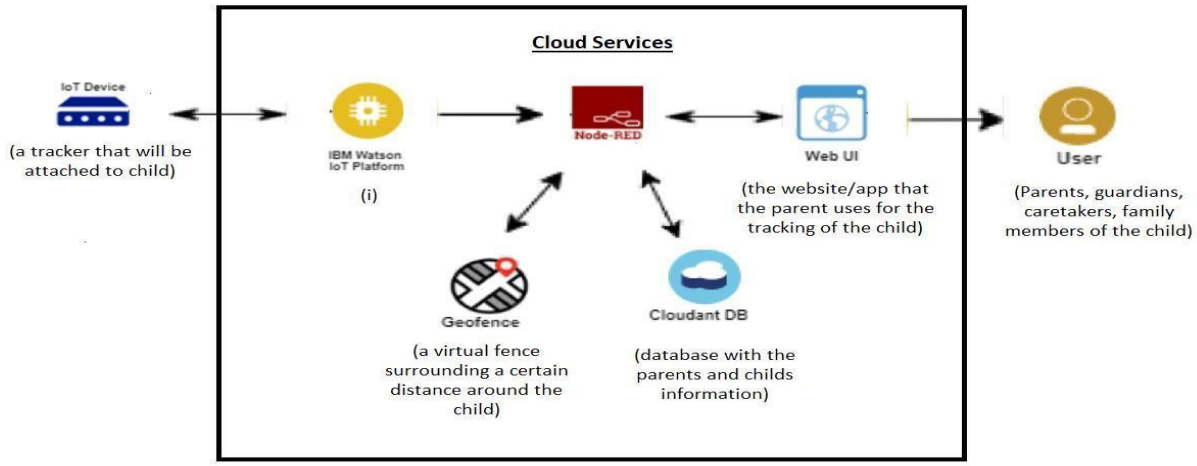


Fig : Solution Architecture

6. PROJECT PLANNING AND SCHEDULING

6.1. Sprint Planning and Estimation Product Backlog, Sprint Schedule, and Estimation

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	User Registration	USN-1	Registration through website Registration through app	2	High	Someshwaran S Dhinesh Babu A Chinnadurai M Harini K
Sprint-1	User Confirmation	USN-2	Confirmation via Email Confirmation via OTP	1	High	Someshwaran S Dhinesh Babu A Chinnadurai M Harini K
Sprint-2	User login	USN-3	Setting up User Id and password	2	Low	Someshwaran S Dhinesh Babu A Chinnadurai M Harini K
Sprint-1	App permission	USN-4	Grant the permission for the app to access location, contact etc..	2	Medium	Someshwaran S Dhinesh Babu A Chinnadurai M Harini K
Sprint-1	Interface with the Device	USN-5	Connecting the device with the registered app with the device ID.	1	High	Someshwaran S Dhinesh Babu A Chinnadurai M Harini K

Sprint-2	Setting Geo-location	USN-6	Creating the Geo-location area in the map	2	Low	Someshwaran S Dhinesh Babu A Chinnadurai M Harini K
Sprint-3	Database	USN-7	Location history is stored in the cloud. Can be accessed from the dashboard.	2	High	Someshwaran S Dhinesh Babu A Chinnadurai M Harini K
Sprint-4	Tracking location	USN-8	Tracking the location through app. Tracking the location through website.	2	High	Someshwaran S Dhinesh Babu A Chinnadurai M Harini K

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date (Planned)**	**Story Points Completed (as on Planned End Date)**	**Sprint Release Date (Actual)**
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	31 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	07 Nov 2022

Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	14 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

https://www.visual-paradigm.com/scrum/scrum-burndown-chart/

https://www.atlassian.com/agile/tutorials/burndown-charts

Reference:

https://www.atlassian.com/agile/project-management

https://www.atlassian.com/agile/tutorials/how-to-do-scrum-with-jira-software

https://www.atlassian.com/agile/tutorials/sprints

https://www.atlassian.com/agile/project-management/estimation

https://www.atlassian.com/agile/tutorials/burndown-charts

https://www.atlassian.com/agile/tutorials/epics

7. CODING AND SOLUTIONING

7.1. Feature 1(Adding Geofence)

- **Geofence is like a round wall covering the given location. So parents can use them to mark the location where their children are going .**
- **Multiple Geofence can be added.**

```
package com.example.geofence;

 import  android.app.PendingIntent;

import android.content.Context;

import android.content.ContextWrapper;

import android.content.Intent;

 import android.widget.Toast;

import com.google.android.gms.common.api.ApiException;

import  com.google.android.gms.location.Geofence;

import com.google.android.gms.location.GeofenceStatusCodes;

import com.google.android.gms.location.GeofencingRequest;

import  com.google.android.gms.maps.model.LatLng;

public class GeofenceHelper extends ContextWrapper {

   private static final String TAG = "GeofenceHelper";

  PendingIntent pendingIntent;

   public GeofenceHelper(Context base) {

super(base);
```

```
    }
    public GeofencingRequest getGeofencingRequest(Geofence geofence)
 { return new GeofencingRequest.Builder()                .addGeofence(geofence)

.setInitialTrigger(GeofencingRequest.INITIAL_TRIGGER_ENTER)
                .build();
    }
    public Geofence getGeofence(String ID, LatLng latLng, float radius, int transitionTypes) {
return new Geofence.Builder()
                .setCircularRegion(latLng.latitude, latLng.longitude, radius)
                .setRequestId(ID)
                .setTransitionTypes(transitionTypes)
                .setLoiteringDelay(5000)
                .setExpirationDuration(Geofence.NEVER_EXPIRE)
                .build();
    }
    public PendingIntent getPendingIntent() {
if (pendingIntent != null) {           return pendingIntent;
      }
       Intent intent = new Intent(this,  GeofenceBroadcastReceiver.class);
       pendingIntent = PendingIntent.getBroadcast(this, 2607, intent,
PendingIntent.FLAG_IMMUTABLE);
       return pendingIntent;
```

```
    }
    public String getErrorString(Exception e) {
if (e instanceof ApiException) {
        ApiException apiException = (ApiException) e; switch (apiException.getStatusCode()) {
case GeofenceStatusCodes
.GEOFENCE_NOT_AVAILABLE:
            return "GEOFENCE_NOT_AVAILABLE"; case GeofenceStatusCodes
              .GEOFENCE_TOO_MANY_GEOFENCES: return "GEOFENCE_TOO_MANY_GEOFENCES"; case GeofenceStatusCodes
              .GEOFENCE_TOO_MANY_PENDING_INTENTS:
            return "GEOFENCE_TOO_MANY_PENDING_INTENTS";
        }
      }
      return e.getLocalizedMessage();
```

7.2 Feature 2 (Alert Notification)

● Once geofence is added , when the child enters the geofence a notification will be sent ● When the child leaves the geofence a notification will be sent .

```
package com.example.geofence; import android.content.BroadcastReceiver; import android.content.Context; import android.content.Intent; import
android.location.Location; import android.os.CountDownTimer; import android.util.Log; import android.widget.Toast; import com.google.android.gms.location.Geofence; import
com.google.android.gms.location.GeofencingEvent import java.util.List; import
```

```
android.os.Handler;

public class GeofenceBroadcastReceiver extends BroadcastReceiver {      private static final String TAG = "GeofenceBroadcastReceiv";

   @Override     public void onReceive(Context context, Intent intent) {

      // TODO: This method is called when the BroadcastReceiver is receiving          // an Intent broadcast

      //.

    /*Toast.makeText(context,                                    "GEOFENCE_ENTERED", Toast.LENGTH_SHORT).show();

      final Toast mToastToShow;        int toastDurationInMilliSeconds = 1200000;

mToastToShow = Toast.makeText(context, "GEOFENCE_EXITED",

Toast.LENGTH_LONG);

// Set the countdown to display the toast                CountDownTimer toastCountDown; toastCountDown = new

CountDownTimer(toastDurationInMilliSeconds, 100000) {

         public void onTick(long millisUntilFinished) {              mToastToShow.show();

}

         public void onFinish() {              mToastToShow.cancel();

         }

      };

// Show the toast and starts the countdown                    mToastToShow.show(); toastCountDown.start();*/

 NotificationHelper notificationHelper = new NotificationHelper(context);
```

```
notificationHelper.sendHighPriorityNotification("GEOFENCE_TRANSITION_ENTER",
"", MapsActivity.class);

   GeofencingEvent geofencingEvent = GeofencingEvent.fromIntent(intent);                if
(geofencingEvent.hasError())

    Log.d(TAG, "onReceive: Error receiving geofence event...");          return;       }

     List<Geofence> geofenceList =

geofencingEvent.getTriggeringGeofences();       for (Geofence geofence: geofenceList) {

        Log.d(TAG, "onReceive: " + geofence.getRequestId());

     }

//       Location location = geofencingEvent.getTriggeringLocation();       int transitionType
= geofencingEvent.getGeofenceTransition();

     switch (transitionType) {          case Geofence.GEOFENCE_TRANSITION_ENTER:

          notificationHelper.sendHighPriorityNotification("Entered the Location", "",
MapsActivity.class);              break;

        case Geofence.GEOFENCE_TRANSITION_EXIT:

notificationHelper.sendHighPriorityNotification("Exited the Location ", "",
MapsActivity.class);              break;

     }

  }

  }
```

8. TESTING

8.1. Test Cases

What is UAT Execution:

User acceptance testing (UAT), also called application testing or end-user testing, is a phase of software development in which the software is tested in the real world by its intended audience.

Table: 1

Category	Description	DN sper Category	Summary of DN Status	
Category A	E.g. critical to core functionality	# of DNs per category	No. Of Open DNs	Enter #
Category B	E.g. Critical to noncore functionality	# of DNs per category	No. Of Closed DNs	Enter #
Category C	E.g. Non critical	# of DNs per category	Total No. Of DNs	Enter #
Category D	E.g. Cosmetic	# of DNs per category	Total No. of Change Requests identified	Enter #

[Submit this report to the Customer during User Acceptance Testing. This report identifies the status of Discrepancy Notices (DN) as UAT progresses. Note that even when a DN is 'Closed', it must be recorded here to ensure that the final status of any DN is available throughout the UAT period.]

Discrepancy Notice Details

#	System Area	Priority	Raised by	Assign To	Description	Status	Comment
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments

#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments

#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments
#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments

#	Screen, field, module	1-5	Tester #1	Tester #2	Details of DN	Open/Closed	Add comments

This report is maintained throughout the timeframe of the user acceptance testing (UAT). The aim of the report is to identify all discrepancy notices (DN's). Once the status of a DN is referenced as 'closed' it continues to be recorded on this report. This ensures that a full list of discrepancy notices is available throughout the UAT period.

UAT Initiation and design

User Acceptance Testing (UAT) checks whether a product is the right one for the end users. It has other names, e.g., end-user testing, operational, application, beta testing, or validation but they describe the same thing. In quality assurance, it's important to distinguish between validation and verification.

Verification refers to general QA processes aimed at testing the technical aspects of a product to ensure it actually works. **Validation** (or user acceptance testing) is conducted to make sure that the product corresponds with business requirements and can be used by the end user.

Alpha testing is the initial stage of acceptance testing, typically performed by internal testers, to ensure that the product functions correctly and meets business requirements.

Beta testing, the second type of acceptance testing, aims at meeting user acceptance criteria. UAT can be performed by

- the actual users of an existing product,
- users of a previous version of a product,

- stakeholders involved in the development of the product, and/or business analysts as end-user specialists.

This enables the development team to fix most of the usability problems, bugs, and unexpected issues concerning functionality, system design, business requirements, etc.

Play

Ensure correspondence with business requirements. As we already mentioned, UAT is done to verify that the product operates in the real-world circumstances as required and allows end users to solve targeted problems. If you skip UAT, you might miss out on some important flaws or system malfunctions that will inevitably cause user dissatisfaction.

Adjust initial requirements. Sometimes, as end users test the product, they can come up with some valuable thoughts on how to improve the tested software. Getting such feedback will allow you to adjust your requirements to get a result that will be more useful for your customers.

Avoid losses. First, it's cheaper to fix the product in the early stages of development, so finding flaws due to UAT will allow your development team to improve the product much more easily (that mostly concerns the Agile model though. Read on for more details). Second, we all know stories about product failures because of poor functionality and usability. UAT provides you with real-world user feedback and makes it far less likely to have losses caused by an unsuccessful product launch.

In any case, UAT requires organization and preparation work to make it effective. If you want to ensure your product's validity, consider the following steps in conducting user acceptance testing.

8.2. User acceptance testing deliverables

UAT test plan. Creating a UAT test plan will help you keep everybody aligned with the same objectives and vision. The main document, it includes all the information concerning what will be tested, by whom, and how. To cover all the organizational and processual aspects of UAT, you have to detail the testing strategy and entry/exit criteria.

End-user testing strategy. The strategy outlines the product you are testing, the purpose of user-acceptance testing, types of tests, and objectives. Your testing strategy should cover such information as

- product description,
- testing objectives,
- testing scope,
- standards,
- testing types,,
- testers/roles
- process curators (managers),
- reviewers,
- reporting standards, and outcomes.

Entry criteria. These are the conditions that establish that the software is ready to be tested. They are set at the earliest stage of planning by the development team, QA, business analysts, and stakeholders.

Exit or acceptance criteria. These are the conditions that dictate that the software is valid for the users. Matching acceptance criteria would be the final stage of your UAT.

Test scenarios. Test scenarios are hypothetical situations that users may encounter when interacting with your product. Their aim is to guide your testers through possible system usage problems.

Basically, a test scenario should convey a simple idea of what will be tested. An example of a scenario is “check shopping cart functionality.” Each user scenario is connected with one or two requirements or user stories. They are written to validate that the system is usable, checking the end-to-end operations with real data.

To write good test scenarios for user acceptance testing, consider involving end users in approval to include all the possible use cases, both common and uncommon. Also, consider writing them in plain language, avoiding complicated phrasing or overly techy explanations.

Test cases. A test case is a set of specific actions that are taken to test and verify a particular system behavior, feature, or functionality. Test cases are more detailed units that have to correspond with all the test scenarios. Most often you will convert your user stories and business use cases to write efficient test cases. Examples of test cases are:

1. Check unregistered user adding the product into the shopping cart.
2. Check shopping cart filtering.
3. Check the “continue shopping” button.

Test cases are efficient when there is a clear purpose stated, and the user is able to understand what they should do to complete it. The user guide to a test case may look like this:

1. Open the application.
2. Add any product to a shopping cart.
3. Authentication is not needed.
4. Proceed to the shopping cart.

You may also include expected results in the test case, so that the user is aware of what is going to happen:

1. The product will appear in a shopping cart.
2. The system will ask you to authorize as a registered user.

Reporting standards. Define how a report should look and what information an end user should provide.

Test reports. These accumulate documented output data when the test is completed. Depending on the testing standards and testing scenario, various information can be included in reports. But typically in UAT, QA teams will require only a sign-off from the tester. A sign-off is just a confirmation that the test is successful and it corresponds to the user’s criteria.

At the end of UAT, deliverables provided can be used by QA engineers or a UAT manager to extract valuable data and communicate results to the development team.

Traditionally, quality assurance engineers will be responsible for processing end-user feedback. The results of tests, bug reports, and fail/pass records are provided to developers to ensure constant communication between different parts of the team. Based on the end-user feedback, the QA team can also provide software quality metrics to measure progress in terms of UAT.

9. User acceptance testing templates

We've mentioned a few important documents that have to be created for proper UAT planning and execution. There are different ways to write them, but here are some templates that may come in handy.

- Test plan templates: Test Plan template by Coley Consulting, sfsu template (downloadable link), or iiba template (downloadable link)
- Test scenario template
- Test report template

Fig : User Acceptance

Utilization of testing tool

Software Testing tools are the tools which are used for the testing of software. Software testing tools are often used to assure firmness, thoroughness and performance in testing software products. Unit testing and subsequent integration testing can be performed by software testing tools. These tools are used to fulfill all the requirements of planned testing activities. These tools also works as commercial software testing tools. The quality of the software is evaluated by software testers with the help of various testing tools.

Types of Testing Tools:

As software testing is of two types, static testing and dynamic testing. Also the tools used during these testing are named accordingly on these testings.

Testing tools can be categorized into two types which are as follows:

1. Static Test Tools

2. Dynamic Test Tools

These are explained in detail as following below:

1. Static Test Tools:

Static test tools are used to work on the static testing processes. In the testing through these tools, typical approach is taken. These tools do not test the real execution of the software. Certain input and output are not required in these tools. Static test tools consists of the following:

- **Flow analyzers:**

  Flow analyzers provides flexibility in data flow from input to output.

- **Path Tests:**

  It finds the not used code and code with inconsistency in the software.

- **Coverage Analyzers:**

  All rationale paths in the software are assured by the coverage analyzers.

- **Interface Analyzers:**

  They check out the consequences of passing variables and data in the modules.

2. Dynamic Test Tools:

Dynamic testing process is performed by the dynamic test tools. These tools test the software with existing or current data. Dynamic test tools comprises of the following:

- **Test driver:**

  Test driver provides the input data to a module-under-test (MUT).

- **Test Beds:**

  It displays source code along with the program under execution at the same time.

- **Emulators:**

  Emulators provides the response facilities which are used to imitate parts of the system not yet developed.

- **Mutation Analyzers:**

  They are used for testing fault tolerance of the system by knowingly providing the errors in the code of the software.

  Mobile/android testing tool

We can use this type of tool when we are testing any mobile application. Some of the tools are open-source, and some of the tools are licensed. Each tool has its functionality and features.

For more details about the mobile or android testing tool, refers to the below link: Click Here **GUI testing tool**:

GUI testing tool is used to test the User interface of the application because a proper GUI (graphical user interface) is always useful to grab the user's attention. These type of tools will help to find the loopholes in the application's design and makes its better.

For more details about GUI testing tool, refers the below link: Click Here **Security testing tool**:

The security testing tool is used to ensure the security of the software and check for the security leakage. If any security loophole is there, it could be fixed at the early stage of the product. We need this type of the tool when the software has encoded the security code which is not accessible by the unauthorized users.

Benefits of software testing tools

Software testing tools offer many benefits for developers, testers, and QA teams.

- Higher product quality. Software testing tools help deliver higher quality applications by improving the accuracy of tests, increasing the coverage of code that is tested, accelerating the pace of testing, and delivering feedback to developers earlier in the process.
- Improved security. Cybercrime is a substantial threat to organizations large and small, and software vulnerabilities are a significant target for malicious actors. Software testing tools help ensure that applications are free of flaws and vulnerabilities that can be exploited by hackers, protecting companies, their users, partners, and customers from exposure to cyber criminals.
- More cost-effective development. By uncovering defects and design issues earlier in the software developer lifecycle, software testing tools enable developers to fix bugs more easily and cost-effectively.

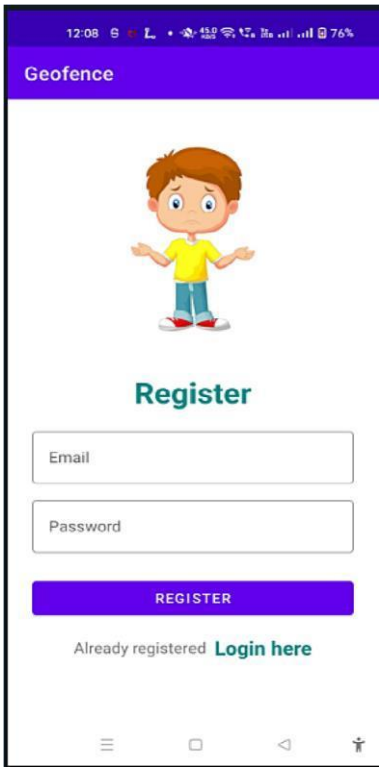
9. RESULTS

9.1. Performance Metrics

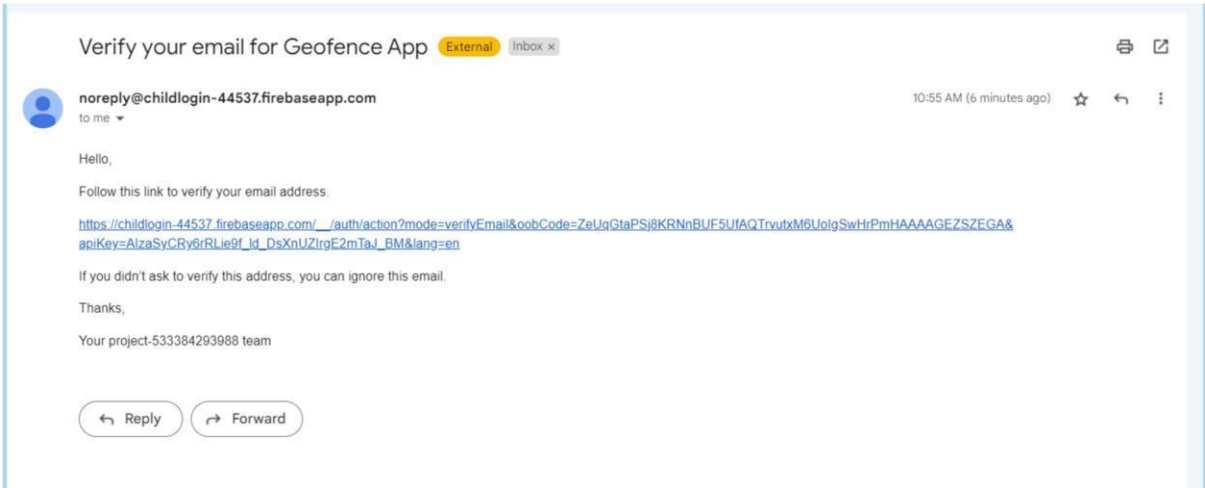
1.User Registration :

Users get registered to the app using their mail and create their password. On the user is registered a verification mail will be sent to the user mail id. The user needs to verify the account. All user details are stored in the firebase and verification mail is sent by firebase authentication .

Registration Page :



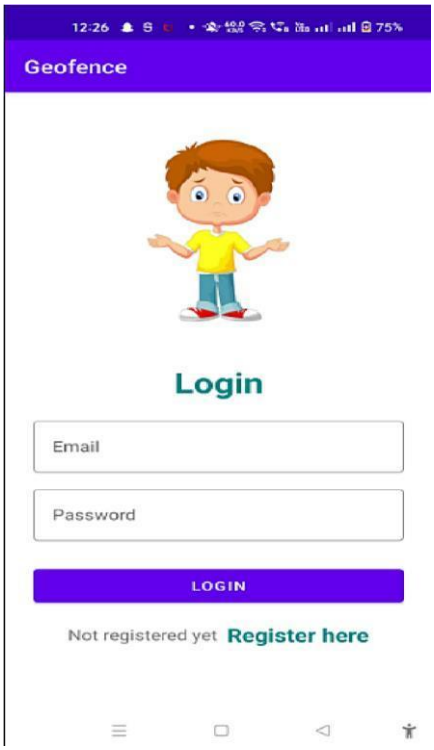
Verification mail



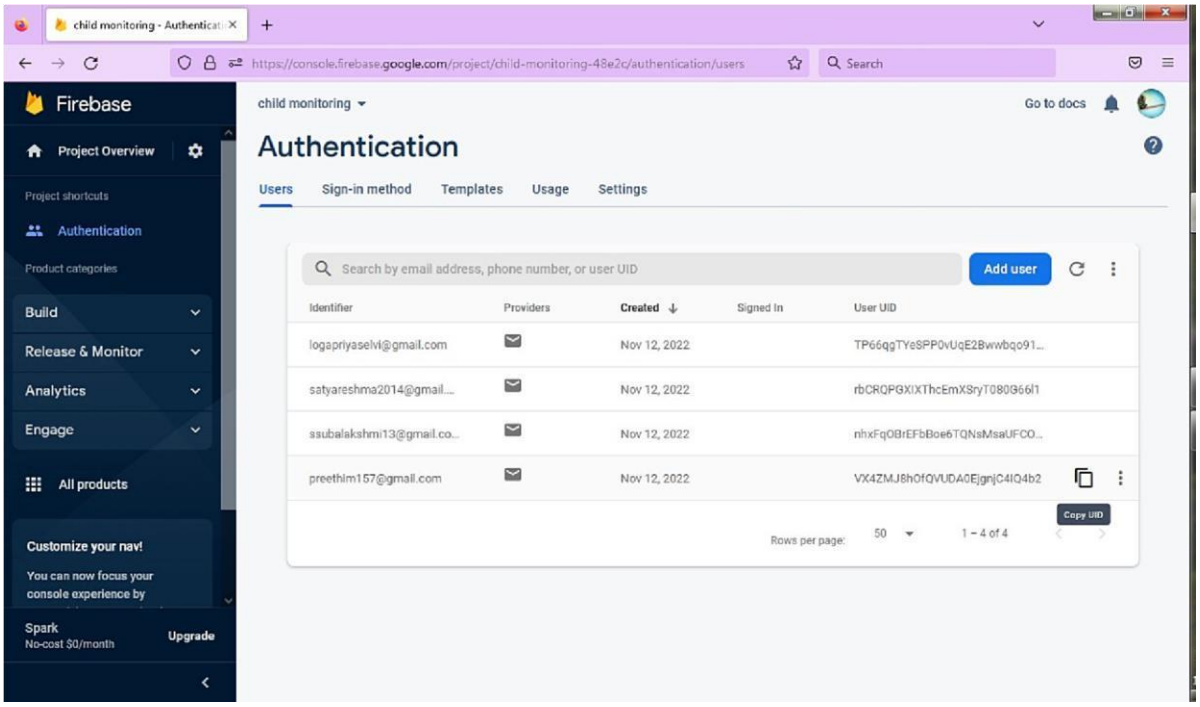
2. User Login

Users with their registered mail and password will login to the account . As the details are stored in firebase, when invalid email or password is entered a message say invalid email or password occur .

Login page :



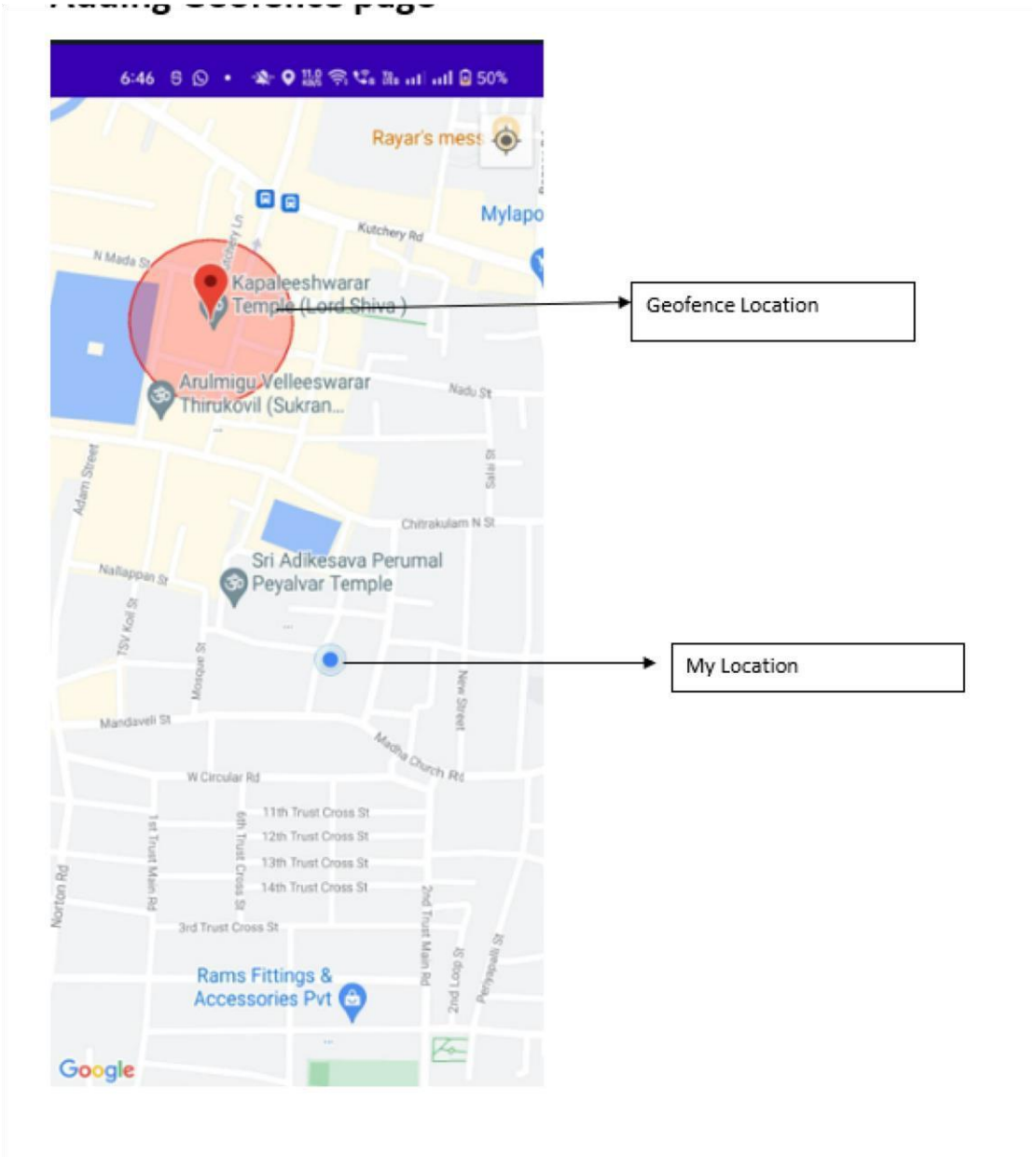
User Details



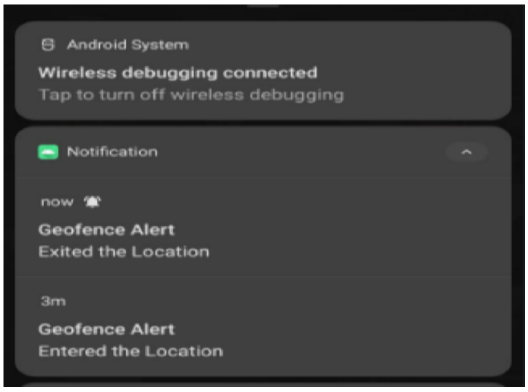
3. Adding Geofence and Alert Notification

Users can add geofence in the location where they want to add or where their child is going to play so they can monitor the child location . Once the child enters the geofence alert notification says entered the location will be displayed . When the child leaves the geofence alert notification says exited the location will be displayed.

Geofence



Notification



Analyse application performance:

I have collected a few important pieces of information you need about an application you analyze; irrespective of the type of device you should know these**,**

1. Support for Operating System.
2. Browser Compatibility.
3. Size of the application.
4. Security Protocol.
5. The device it is running on (Smartphones)
6. User Journeys (End to end) **APM metric:**

Application performance monitoring (APM) agent collects and compiles key metrics of your application and infrastructure that allow your IT or DevOps team to identify and resolve functionality issues before they have a negative impact on business outcomes.
To measure software delivery performance, more and more organizations are defaulting to the four key metrics as defined by the DORA research program: **change lead time, deployment frequency, mean time to restore (MTTR) and change fail percentage**.

Data is the fuel that powers an effective application monitoring and management strategy. When properly collected, managed and reviewed, application metrics transform meaningless

chunks of technical information into a comprehensive narrative that reveals the reliability of your system and provides important clues regarding the overall user experience.

Application performance monitoring (APM) agent collects and compiles key metrics of your application and infrastructure that allow your IT or DevOps team to identify and resolve functionality issues before they have a negative impact on business outcomes. Some of these metrics are response times, error rate, throughput, etc.

The key to application monitoring involves developing a greater understanding of your system and its users by collecting data that reveals if apps are behaving normally, alerting if there are anomalies, providing context about how functionality issues impact business outcomes, and optimizing the application to prevent performance issues.

Key metrics to monitor:

The abundance of data available can make application performance management seem overwhelming. Knowing which application performance metrics to focus on is essential to finding an APM solution that works for your organization. The following metrics are critical to identifying application errors or system issues:

- Error rates: Monitor how often app performance degrades or fails.
- CPU usage: Assess CPU usage, memory allocation, and desk read/write speeds to evaluate the effect of usage on performance.
- Response times: Determine whether speed is affecting application performance by tracking the average response time.
- Request rates: Measure your application traffic including spikes, inactivity, or number of active users.
- Uptime: Track your application availability over time to check compliance with service level agreements and assess overall reliability.
- Number of instances: Scale your application to meet actual user demand with autoscaling, based on the number of app or server instances running at any one time.
- Garbage collection: Improve performance by identifying and eliminating the problems caused by heavy memory use in Java or other languages that use GC.

- Customer experience: Understand and improve upon the user experience by using a combination of Apdex scores and SLA thresholds to measure customer tolerance or satisfaction.

10. ADVANTAGES AND DISADVANTAGES:

ADVANTAGES:

1.Staying Connected.

2.Data Accuracy.

3.It's Efficiency.

4.It can be used in any cell phone and doesn't necessarily require an expensive smart phone

DISADVANTAGES:

1. High cost but once it is implemented the expenses can be reduced..

11. CONCLUSION

Future is similar to the word children. Young people are the future pillars of one's nation, as Dr. A.P.J. Abdul Kalam once said, thus it is important to protect today's children's dreams and lives in order to give them a better future. Therefore, every parent should take good care of their own children to prevent them from being victims of abuse that will completely harm them on a physical, mental, and emotional level, wrecking our future. Due to the significance of our future, our product makes it simple for parents to track their kids and regularly visually monitor them, enabling them to assure their safety and lowering the incidence of child abuse.

12. FUTURE SCOPE

In our system, we use the Internet of Things, GPS, GSM, and Raspberry Pi to automatically monitor the youngster in real time. When we utilize a web camera and GPS to actively monitor, this system needs network connections, satellite communication, and a high-speed data connection. It is challenging to keep an eye out for any network problems or satellite connection problems. Additionally, there is a lag when streaming videos through the server. The Zigbee concept or accessing the system without the internet and employing high-speed server transmission can therefore be used in the future to solve these problems

13. APPENDIX

13.1. SOURCE CODE:

Alert Notification Code

```
package com.example.geofence;
import android.content.BroadcastReceiver;
import android.content.Context;
import android.content.Intent;
import android.location.Location;
import android.os.CountDownTimer;
import android.util.Log;
import android.widget.Toast;
import com.google.android.gms.location.Geofence;
import com.google.android.gms.location.GeofencingEvent;
import java.util.List;
import android.os.Handler;
public class GeofenceBroadcastReceiver extends BroadcastReceiver {
 private static final String TAG = "GeofenceBroadcastReceiv";
 @Override
 public void onReceive(Context context, Intent intent) {
 // TODO: This method is called when the BroadcastReceiver is receiving
 // an Intent broadcast
 //.
 /*Toast.makeText(context, "GEOFENCE_ENTERED", Toast.LENGTH_SHORT).show();
 final Toast mToastToShow;
 int toastDurationInMilliSeconds = 1200000;
 mToastToShow = Toast.makeText(context, "GEOFENCE_EXITED", Toast.LENGTH_LONG);
```

```
// Set the countdown to display the toast
CountDownTimer toastCountDown;
toastCountDown = new CountDownTimer(toastDurationInMilliSeconds, 100000) {
public void onTick(long millisUntilFinished) {
mToastToShow.show();
}
public void onFinish() {
mToastToShow.cancel();
}
};
// Show the toast and starts the countdown
mToastToShow.show();
toastCountDown.start();*/
NotificationHelper notificationHelper = new NotificationHelper(context);
notificationHelper.sendHighPriorityNotification("GEOFENCE_TRANSITION_ENTER", "",
MapsActivity.class);
GeofencingEvent geofencingEvent = GeofencingEvent.fromIntent(intent);
if (geofencingEvent.hasError()) {
Log.d(TAG, "onReceive: Error receiving geofence event...");
return;
}
List<Geofence> geofenceList = geofencingEvent.getTriggeringGeofences();
for (Geofence geofence: geofenceList) {
Log.d(TAG, "onReceive: " + geofence.getRequestId());
}
// Location location = geofencingEvent.getTriggeringLocation();
int transitionType = geofencingEvent.getGeofenceTransition();
switch (transitionType) {
case Geofence.GEOFENCE_TRANSITION_ENTER:
notificationHelper.sendHighPriorityNotification("Entered the Location", "",
MapsActivity.class);
```

```
 break;
 case Geofence.GEOFENCE_TRANSITION_EXIT:
 notificationHelper.sendHighPriorityNotification("Exited the Location ", "",
MapsActivity.class);
 break;
 }
 }
```

13.2. Geofence:

```
Package com.example.geofence;
import android.app.PendingIntent;
import android.content.Context;
import android.content.ContextWrapper;
import android.content.Intent;
import android.widget.Toast;
import com.google.android.gms.common.api.ApiException;
import com.google.android.gms.location.Geofence;
import com.google.android.gms.location.GeofenceStatusCodes;
import com.google.android.gms.location.GeofencingRequest;
import com.google.android.gms.maps.model.LatLng;
public class GeofenceHelper extends ContextWrapper {
 private static final String TAG = "GeofenceHelper";
 PendingIntent pendingIntent;
 public GeofenceHelper(Context base) {
 super(base);
 }
 public GeofencingRequest getGeofencingRequest(Geofence
geofence) {
 return new GeofencingRequest.Builder()
 .addGeofence(geofence)
```

```
.setInitialTrigger(GeofencingRequest.INITIAL_TRIGGER_ENTER)
 .build();
 }
 public Geofence getGeofence(String ID, LatLng latLng, float
radius, int transitionTypes) {
 return new Geofence.Builder()
 .setCircularRegion(latLng.latitude,
latLng.longitude, radius)
 .setRequestId(ID)
 .setTransitionTypes(transitionTypes)
 .setLoiteringDelay(5000)
 .setExpirationDuration(Geofence.NEVER_EXPIRE)
 .build();
 }
 public PendingIntent getPendingIntent() {
 if (pendingIntent != null) {
 return pendingIntent;
 }
 Intent intent = new Intent(this,
GeofenceBroadcastReceiver.class);
 pendingIntent = PendingIntent.getBroadcast(this, 2607,
intent, PendingIntent.FLAG_IMMUTABLE);
 return pendingIntent;
 }
 public String getErrorString(Exception e) {
 if (e instanceof ApiException) {
 ApiException apiException = (ApiException) e;
 switch (apiException.getStatusCode()) {
 case GeofenceStatusCodes
 .GEOFENCE_NOT_AVAILABLE:
```

```
return "GEOFENCE_NOT_AVAILABLE";
case GeofenceStatusCodes
.GEOFENCE_TOO_MANY_GEOFENCES:
return "GEOFENCE_TOO_MANY_GEOFENCES";
case GeofenceStatusCodes
.GEOFENCE_TOO_MANY_PENDING_INTENTS:
return "GEOFENCE_TOO_MANY_PENDING_INTENTS";
}
}
return e.getLocalizedMessage();
}
}
```

13.2. Github link:

https://github.com/IBM-EPBL/IBM-Project-30556-1660148833

Project Demo Link:

https://drive.google.com/file/d/1K-wUMtFWGSYeOfKX07D6EXx_8DpWu5dh/view?usp=share_link

REFERENCES

[1] Arun Francis G, Janani I, Kavya S and Ramiyadevi K. Child Safety Wearable Device Using Raspberry Pi. Waffen-UND Kostumkunde Journal. 11(2). 2020. pp.135-137.

[2] A. Helen, Kalaiselvi V.K.G, M. Fathima Fathila and R. Rijwana. A smart watch for women security based on iot concept ‘watch me’, International Conference on Computing and Communications Technologies (ICCCT). 2017.

[3] Alexey Vinel Feng Xia and Laurence T. Yang and Lizhe Wang. Internet of Things. International Journal of Communication Systems. 25(9). 2012. pp.1101-1102. DOI: https://doi.org/10.1002/dac.2417

[4] Anjum Khairi, M.U. Farooq, Muhammad Waseem, Sadia Mazhar and Talha Kamal, M.U. Farooq, Muhammad Waseem and Sadia Mazhar. A Review on Internet of Things (IoT). International Journal of Computer Applications. 113(1). 2015. pp.1-7. DOI: https;//doi.org/10.5120/19787-1571

[5] Arun K Mani1, M.Gokilavani, Shreevani D, Samra Said and Unnikrishnan K N. A Review: IoT And Cloud Computing For Future Internet. International Research Journal of Engineering and Technology (IRJET). 6(5). 2019. pp.1098-1102.

[6] AbdelRahman H. Hussein. Internet of Things (IOT): Research Challenges and Future Applications. (IJACSA) International Journal of Advanced Computer Science and Applications. 10(6). 2019. pp77-82.