IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION

ABSTRACT

This paper is mainly streamed towards child safety solutions by developing 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 tobound 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 likeheart 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.

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Basically, children cannot complain about abusements which they face in their daily life to their parents. They can’t even realize what actually happens to them at their age. It is also difficult for parents to identify their children are being abuse Since to prevent children before being attacked, an autonomous real-time monitoring system is necessary for every child out there. In this system, the collected values from every sensor like temperature sensor, pulse rate detection sensor, metal detection sensor, and the location value from GPS are used to detect the status of the child and alerts the respective guardians using GSM accordingly.

1.2 OVERVIEW

It assists parents to monitor their children remotely. In case situations happen, notifications will be sent to parents so that actions can be taken. Through this , child safety can be ensured and crime rate will be reduced . The motivation for this wearable comes from the increasing need of safety for the childrens , therefore it is efficient to use SMS as the mode of communication between the parents and childs wearable device , this has fewer chances of failing compared to WIFI and bluetooth.

2.LITERATURE SURVEY

Authors: M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S. Sarveswararao, E. Kusuma Kumari.Title: Smart IoT Device for Child Safety and Tracking. Published in: 2019 IEEE.The system is developed using Link-It ONE board programmed in embedded C and interfaced with temperature, heartbeat, touch sensors and also GPS, GSM & digital camera modules. The novelty of the work is that the system automaticallyalerts the parent/caretaker by sending SMS, when immediate attention is required for the child during emergency. Merits: The parameters such as touch, temperature & heartbeat of the child are used for parametric analysis

and results are plotted for the same.Demerits: To implement the IoT device which ensures the complete solution for child safety problems.[2] Authors: Akash Moodbidri, Hamid Shahnasser Title: Child safety wearable device.Published in: 2017 IEEE. The purpose of this device is to help the parents to locate their children with ease. At the moment there are many wearable's in the market which helps to track the daily activity of children and also helps to find the child ng Wiusi-Fi and Bluetooth services present on the device.

2.1 EXISTING PROBLEM

Real-Time Child Abuse and Reporting System In the existing system, we use a voice recognition module in which the alert commands from the child are stored and kept for further reference. If the same child delivers the same command, it will compare with the alert command which was previously stored and sets an emergency level according to the alert command. The GSM has a SIM which is used to send an alert message or an alert call to the trusted peoples. GPS is used to track the live location and it is used when needed. The server will search the respective device ID from the database and search for respective contacts according to that device ID and helps in alerting the registered guardians.

The disadvantage of this project are,

i. The child could not produce the exact alert command during a panic condition.

ii. The command produced may not match with the previously stored command.

iii. This project requires manual intervention.

2.2 REFERENCES

[1] M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S Sarveswararao,'Smart IoT Device for Child Safety and Tracking' International Journal of Innovative Technology and Exploring Engineering, Volume 8, Issue 8, June 2019.

[2] Akash Moodbidri , Hamid Shahnasser (Jan. 2017) 'Child safety wearable device , International Journal for Research in Applied Science & Engineering Technology, Vol. 6 Issue 2, pp. 438-444.

[3] Aditi Gupta, Vibhor Harit, ‘Child Safety & Tracking Management System byusing GPS, Geo-Fencing & Android Application: An Analysis,’ 2016 Second International Conference on Computational Intelligence & Communication Technology.

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[7] Pramod, M Uday Bhaskar, Ch. V and Shikha, K. (January 2018) ‘IoT wearabldevice for the safety and security of women and girl’ International Journal of Mechanical Engineering and Technology, Vol. 9, Issue 1, pp. 83-88.

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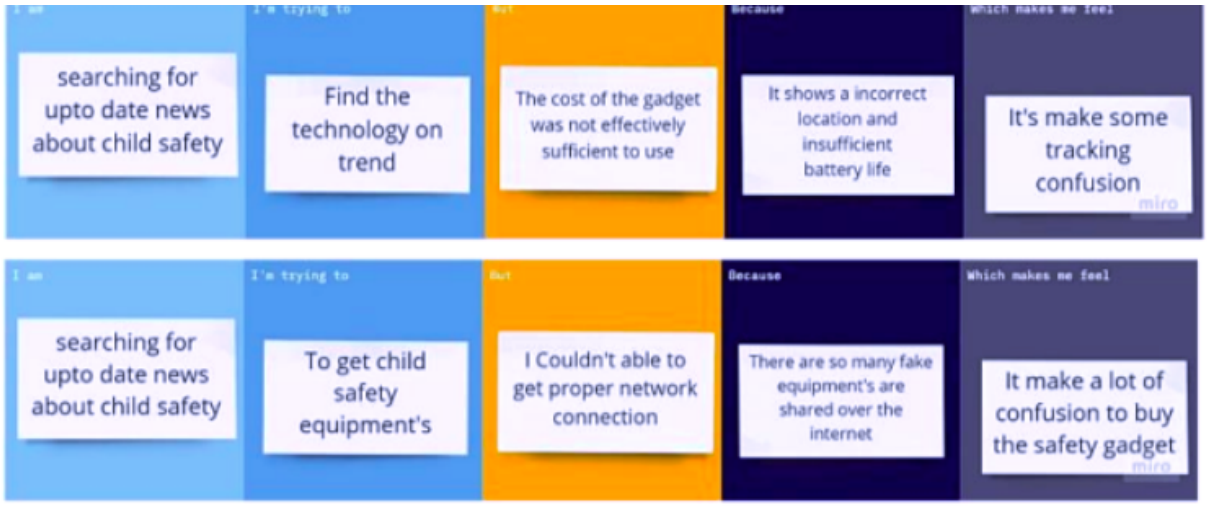
[9] Sarifah Putri Raflesia, Firdaus, Dinda Lestarini, ‘An Integrated Child Safety using Geo-Fencing Information on Mobile Devices’, International Conference on Electrical Engineering and Computer Science (ICECOS) 2018.

[10] Anwaar Al-Lawati, Shaikha Al-Jahdhami, ‘RFID-based System for School Children Transportation Safety Enhancement’, Proceedings of the 8th IEEE GCC Conference and Exhibition, Muscat, Oman, 1-4 February

2.3 PROBLEM STATEMENT DEFINITION



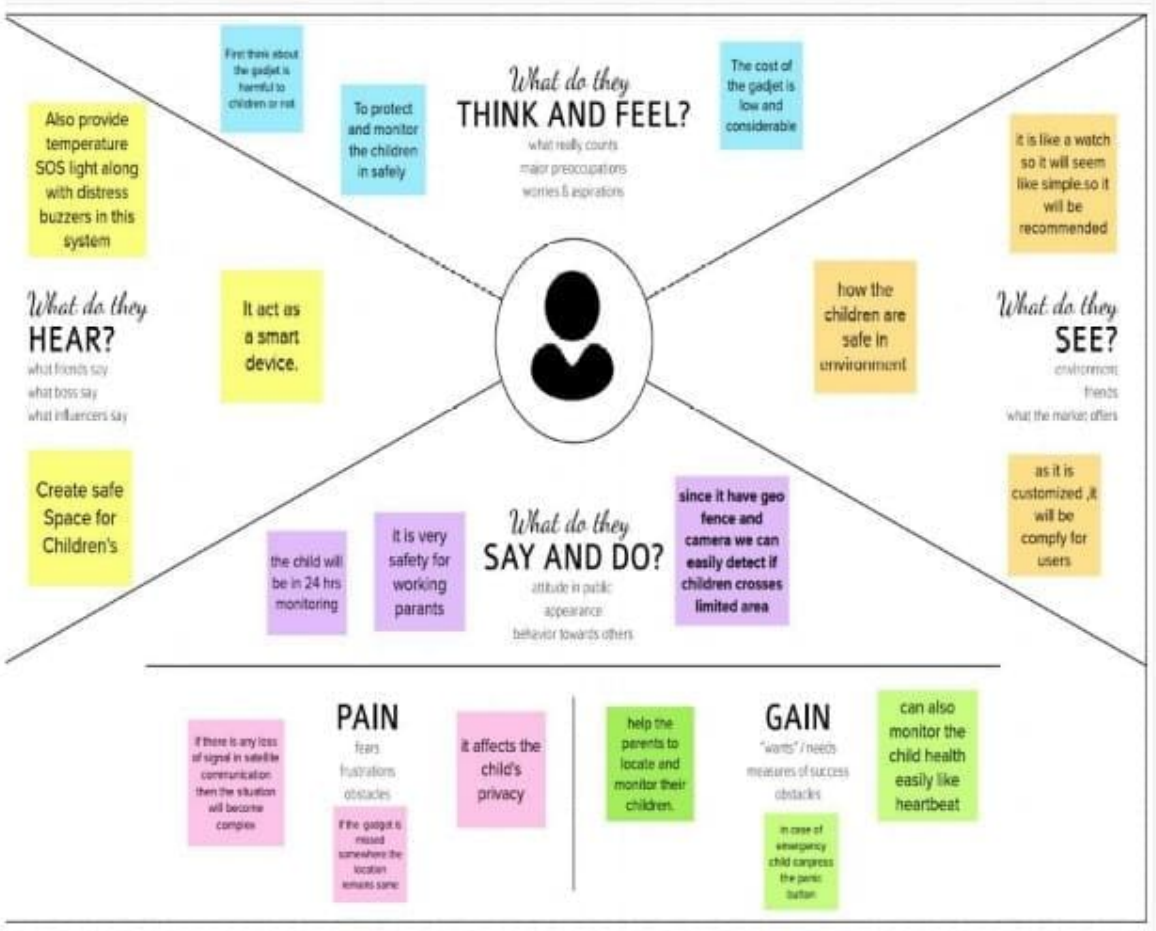
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes mefeel
PS-1	Searching for up to daynews about child safety	Find thetechnology on trend	The cost of the gadget was not effectively Sufficient to use	It shows a incorrect location and insufficient battery life	It's make some tracking confusion
PS-2	Searching for up to daynews about child safety	To get the child safety Equipment's	I couldn't able toget proper network connection	There are so many fake equipment's are shared over the internet	It's make a lot of confusion to buy the Safety gadget

Table 2.1 Problem Statement Definition

3. IDEATION & PROPOSITION

3.1 EMPATHY MAP CANVAS

An empathy map is a simple,easy –to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to helps teams better understand their users.. Creating an effective solution requires understanding the true problem and the person who is experiencing it.The exercise of creating the map helps participants consider things from the user'sperspective along with his or her goals and challenge



3.2 IDEATION & BRAINSTORMING

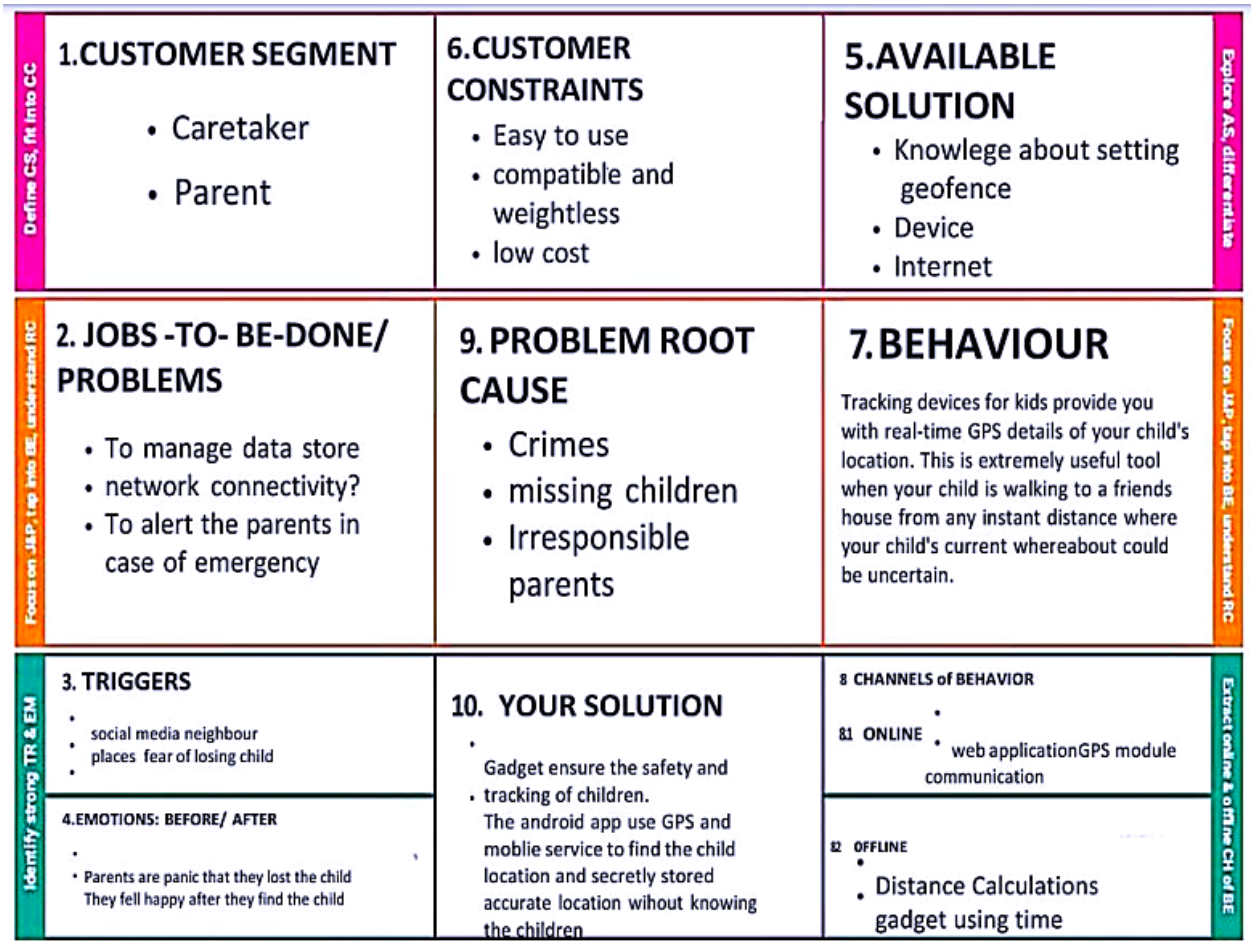
3.3 PROPOSED SOLUTION

S.NO	PARAMETERS	DESCRIPTION
1	Problem Statement (Problemto be solved)	With the increasing rate of child kidnapping and trafficking and lack of tracking technology for child, there is limited application for child monitoring. Hence an IoT based safety gadget for child safety is probably the need of the hour today
2	Idea / Solution description	A good solution to this issue would be to design a smart wearable Internet of Things sensor based device for monitoring the environment of a child along with a mechanism for tracking the child. The gadget will make use of GPS and a python script to publish the location details to the IBM IoT platform. The wearable also functions to send immediate alerts to the user through in case if the child crosses the geofence.
3	Novelty / Uniqueness	All the existing systems make use of GPS and a mobile app to track and receive alerts regarding the child's location, while

		this system make use of the IBM Watson IOT Platform and IBM Cloud Services which is reliable and efficient to maintain the database of the child's location. The parent can set geofence and receive alerts through the web application which is user friendly and secure Created using the Node Red Service. .
4	Social Impact /Customer Satisfaction	The main concern of any parent would be the safety and security of their kids. The design of this model does not mandate a lot of technical knowledge from the user to operate and it is simple.The purpose of this deviceis to facilitate the guardian or parents in locating their child with ease and ensuring its well- being.
5	Business Model(Revenue Model)	The target audience of this device is majorly the parents. Considering the Tracking ability of the device, Hardware quality, used technology and sensors, the starting range of price would go from Rs. 6000 and above. This type of wearable

		safety system is of utmost importance today and would be a must buy gadget in the market today.
6	Scalability of the Solution	With the present needs for monitoring the child the system is designed. It has a location database to maintain the entire location history of the child and the parent can set the geofence to determine the safer boundary of the child. . If there is a need for integrating additional sensors to improve accuracy, it can be done to make the system efficient in the long run.

3.4 PROBLEM FIT SOLUTION



4. REQUIRMENTS ANALYSIS

In this chapter, the requirement analysis of the proposed system has been discussed along with the brief explanation about its advantages**.**

4.1 FUCTIONAL REQUIREMENT

- The Sysyem shall allow the user or family's to register phone number
- The system shall provide report for the ongoing day to day activity both for the school
- The system should provide all the sensed data from each sensor send by text message.
- The system shall notify the user while the input value exceed or become below the threshold value.

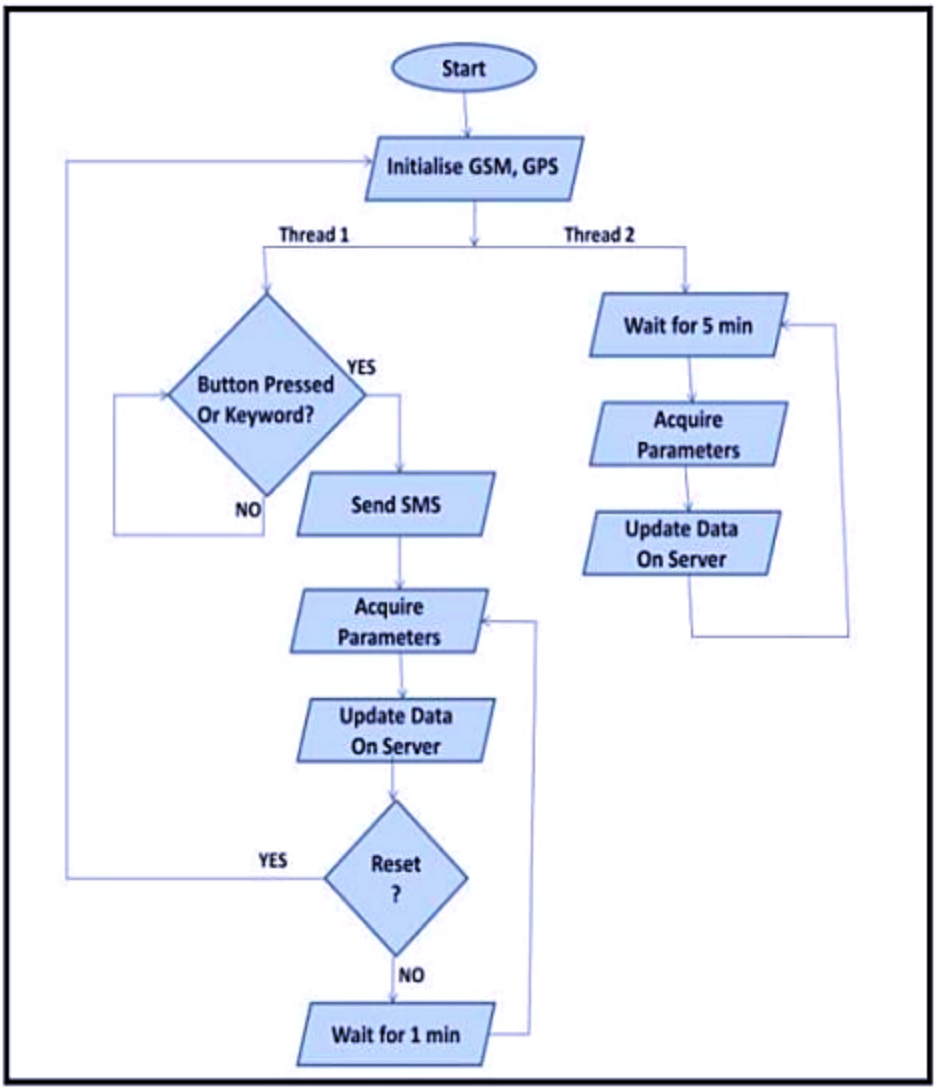
4.2 NON-FUNCTIONAL REQUIREMENT

- The system shall give the accurate result for different factors using sensing material as a result their will not be any distractive damages
- The system shall be maintainable whenever faller occur
- Sometimes the GPS module wroks on rainy season
- The system is cost effective comparing to features it provides.
- The system shall be usable within a few mintues training.

5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

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. IoT Based Safety Gadget for Child Safety Monitoring & Notification



5.2 SOLUTION &TECHINCAL ARCHITECTURE

Track current location of the child using GPS and continuous monitoring of the same is done. When the gadget detects the activity to be outside the given geofence(as mentioned by the parent or guardian), alert messages or notifications are sent to the registered device appropriately. Additional features such as recording of messages could be done if any kind of danger is sensed.

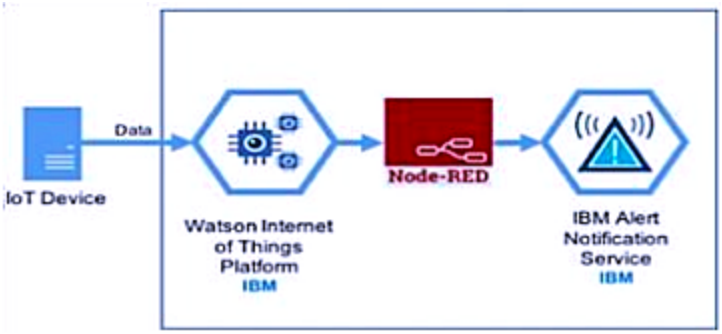
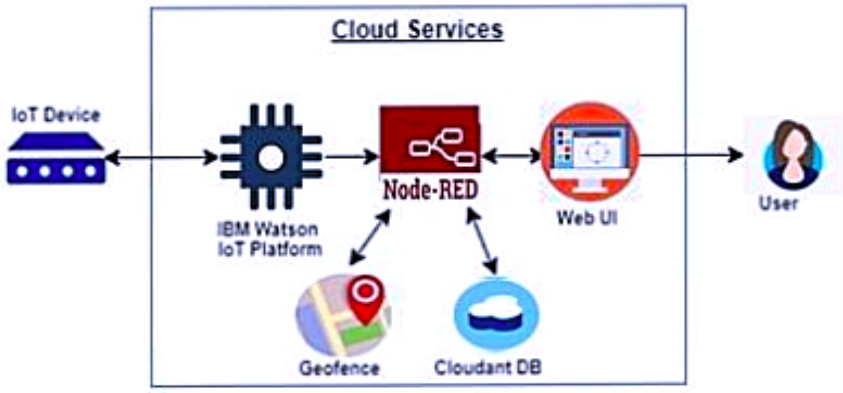


Fig 5.2 SOLUTION ARCCHITECTURE

5.2 TECHINCAL ARCHITECTURE



5.22 TECHINCAL ARCHITECTURE

5.3 USER STORIES

User Type	Fuctional Requirement(Epic)	User Stroy number	User Story/ Task	Acceptance criteria	Priority	Release
Customer (Mobile **user) and (Web user)**	Registration	USN-1	as user, can register my account by entering my email, password, and confirming myself	I can access my account / dashboard	High	Sprint 1
		USN-2	As a user, I will receive confirmation email once I have registered myslef	I can receive confirmatio nema il & click confirm	High	Sprint 1
		USN-3	As a user, I can register for the	I can register & access the	High	Sprint 1

			application through apple	dashboard with apple account Login		
		UNS-4	I can register & access the dashboard with apple account Login		High	Sprint 1

5.1 TABLE USER STORIES

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING &ESTIMATION

Sprint planning is an essential process that an organization needs to adapt to be successful. It indicates the roadmap for the next two to four weeks when stakeholders and team members decide as a group what they need to complete and deliver before the next sprint review meeting. Sprint planning is the first step in an agile project and is crucial to project success. A high level view of the sprint backlog is created where the scrum team discusses, creates a plan for completing their work, establishes dependencies, and identifies risks that need to be addressed

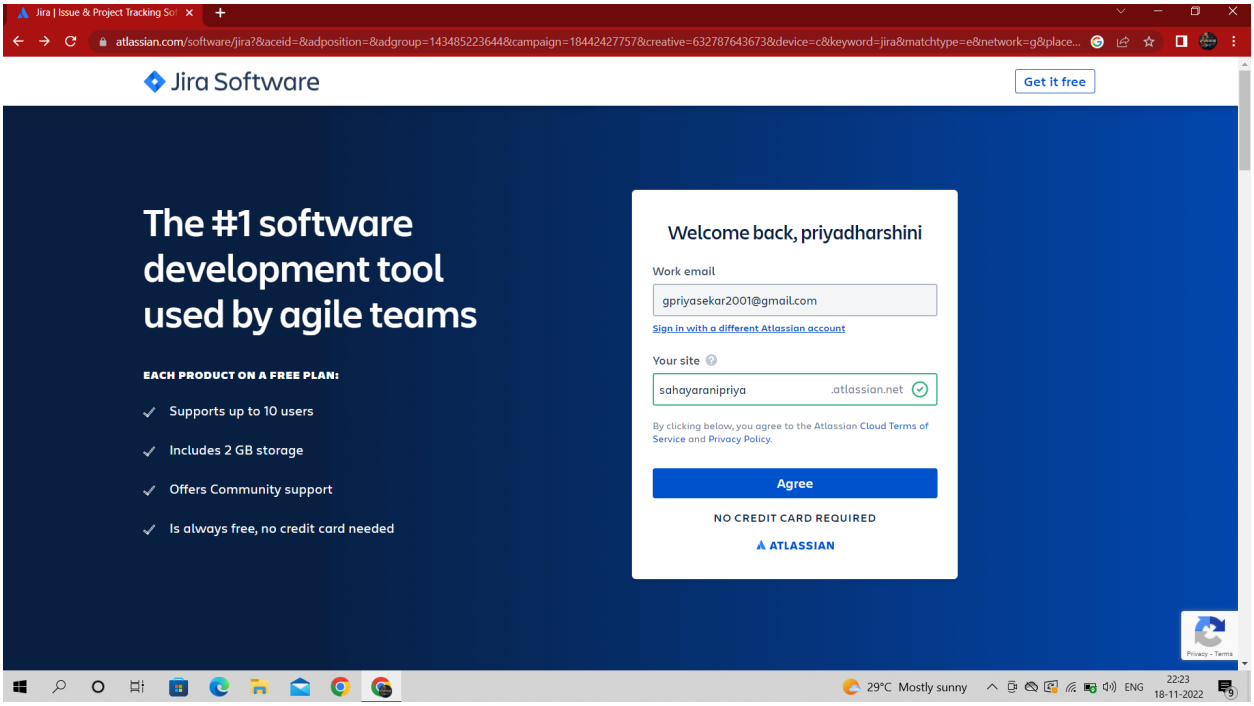
MILESTO-NE NAME	ACTIVITIES	MILESTONE NUMBER	DESCRIPTION	COMLETION DATE
PREREQUISITES			Create the IBM account and download the necessary software for your chosen cateory of the project	26/08/2022
IDEATION PHASE	Literature	1	Literature survey on the seleceted project by gathering and referring research papper and publication	02/09/2022
	Empathy map	1	Create an	

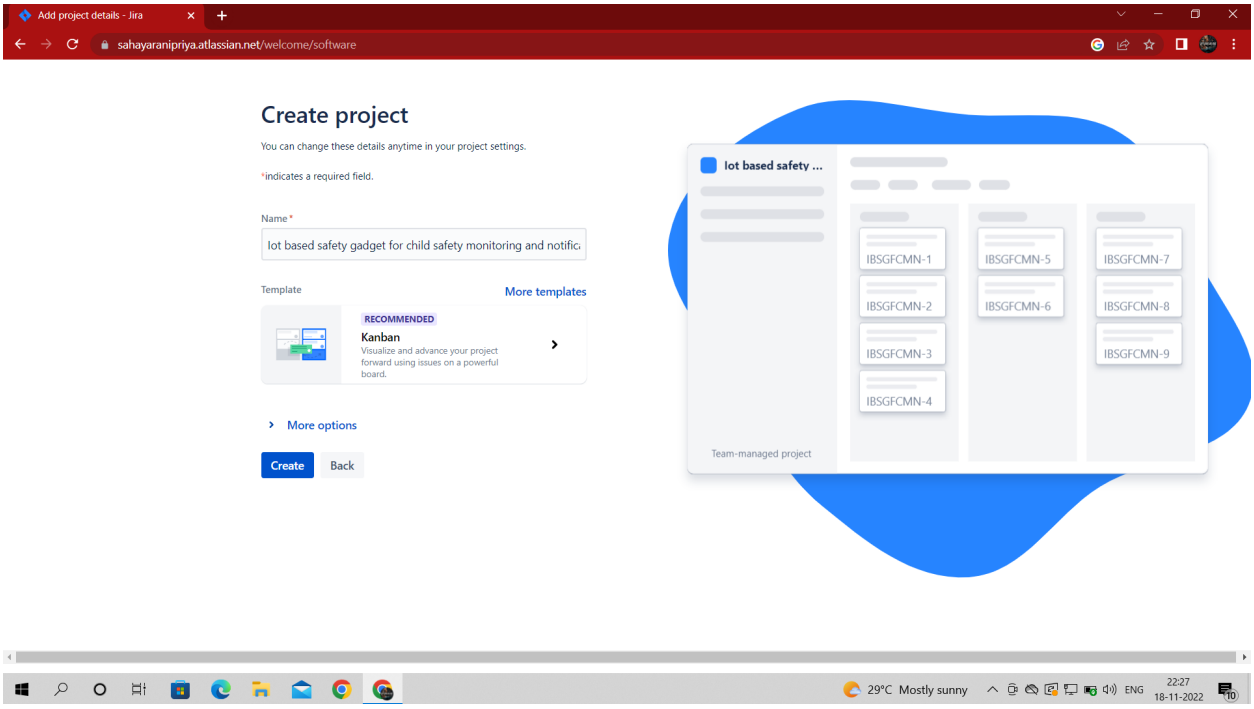
			empathy map that list the user's pains and gains	08/09/2022
	Problem statement	1	Summarize the problem that customers needs to be solved	09/09/2022
	Brainstroming	1	Gather many different ideas from the team mates and prioritize the idea based on feasibility and innovative	16/09/2022
PROJECT DESIGN PHASE	Proposed solution	2	prepare the proposed solution document that you proposed to solve the problem statement which should included feasiblity business model... etc.	24/09/2022
	Solution Architecture	2	prepare solution architecture	

			diagram for the proposed solution	01/10/2022
	problem solution fit	2	prepare solution fit document for the proposed solution	01/10/2022
PROJECT DESIGN	Customer journey	3	prepare a customer journey map to understand how the user interact and experience your product	08/10/2022
	Data flow Diagram	3	Draw the data flows diagram for you propsed solution	
	Solution requirements	3	Create a solution requirement document for the proposed solution	
	Technology stack	3	Prepare the technology stack diagram for yhe proposed solution	
PROJECT	``Milest			

PLANNING				
PROJECT DEVELOPMENT PHASE	Sprint-1	5	Delivery of the Sprint-1	
	Sprint-2	6	Delivery of the Sprint -2	
	Sprint-3	7	Delivery of the Sprint-3	
	Sprint-4	8	Delivery of the Sprint-4	

6.2 REPORT FROM JIRA




Add project details - Jira
sahayaranipriya.atlassian.net/welcome/software
Create project
You can change these details anytime in your project settings.
*indicates a required field.
Name *
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Template
More templates
RECOMMENDED
Kanban
Visualize and advance your project forward using issues on a powerful board.
More options
Create
Back
Iot based safety ...
IBSGFCMN-1
IBSGFCMN-2
IBSGFCMN-3
IBSGFCMN-4
IBSGFCMN-5
IBSGFCMN-6
IBSGFCMN-7
IBSGFCMN-8
IBSGFCMN-9
Team-managed project
29°C Mostly sunny
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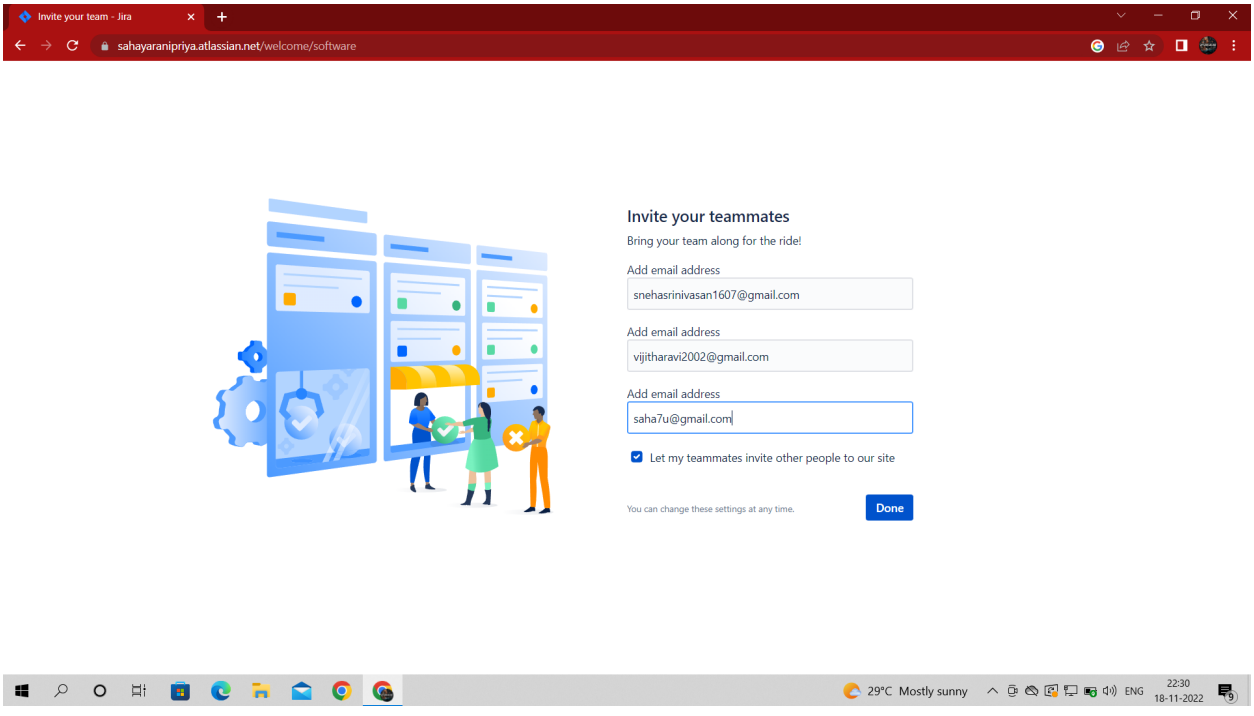
22:27
18-11-2022


Invite your team - Jira
sahayaranipriya.atlassian.net/welcome/software
Invite your teammates
Bring your team along for the ride!
Add email address
snehasrinivasan1607@gmail.com
Add email address
vijitharavi2002@gmail.com
Add email address
saha7u@gmail.com
Let my teammates invite other people to our site
You can change these settings at any time.
Done
29°C Mostly sunny
ENG
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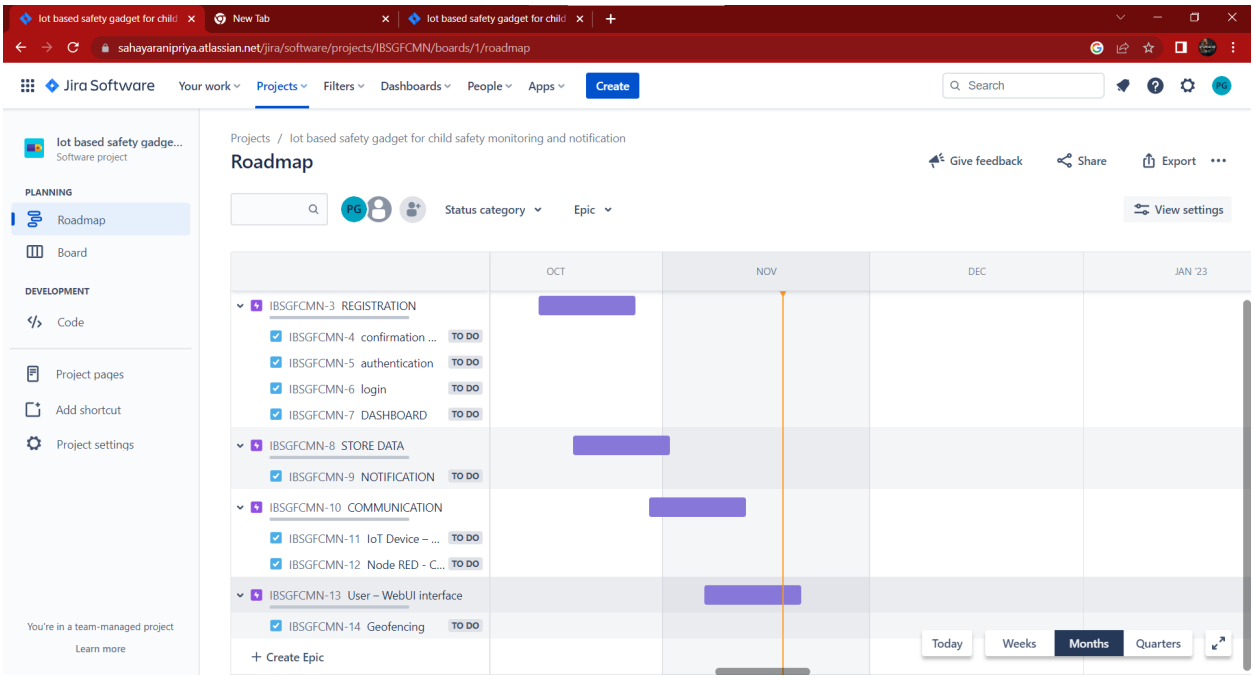
Iot based safety gadget for child
New Tab
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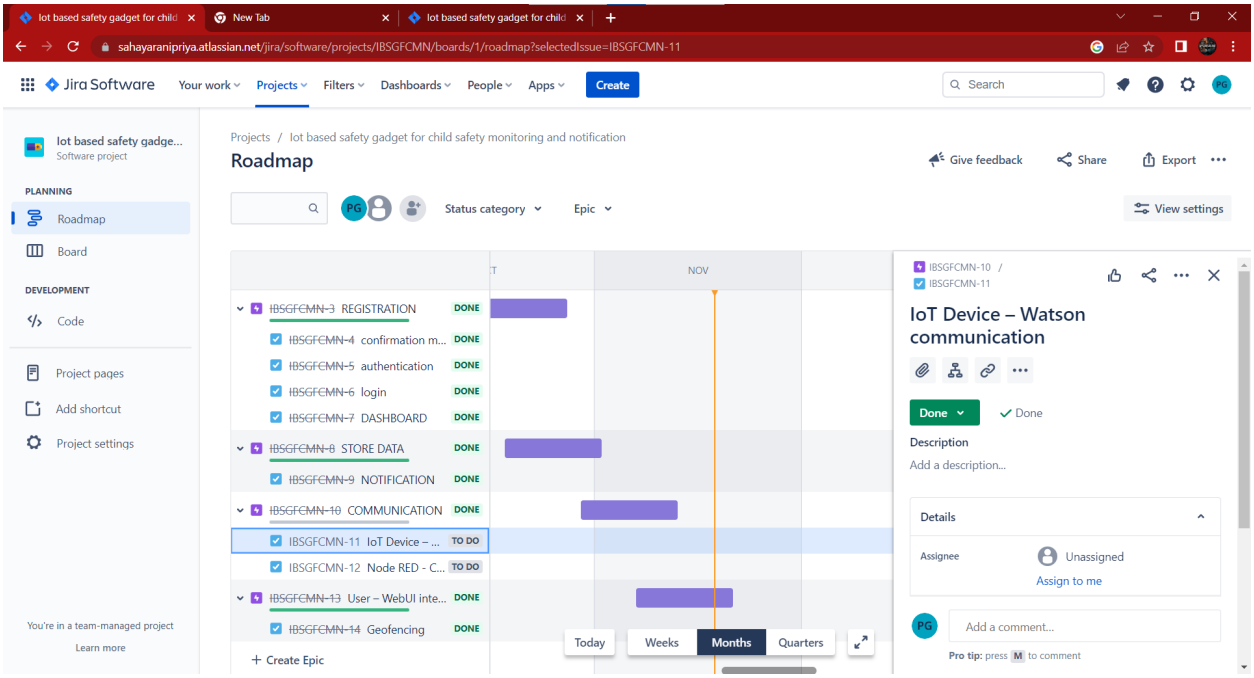
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Iot based safety gadge...
Software project
PLANNING
Roadmap
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Projects / Iot based safety gadget for child safety monitoring and notification
Roadmap
Give feedback
Share
Export
Status category
Epic
View settings
OCT
NOV
DEC
JAN '23
IBSGFCMN-3 REGISTRATION
IBSGFCMN-4 confirmation ...
IBSGFCMN-5 authentication
IBSGFCMN-6 login
IBSGFCMN-7 DASHBOARD
IBSGFCMN-8 STORE DATA
IBSGFCMN-9 NOTIFICATION
IBSGFCMN-10 COMMUNICATION
IBSGFCMN-11 IoT Device – ...
IBSGFCMN-12 Node RED - C...
IBSGFCMN-13 User – WebUI interface
IBSGFCMN-14 Geofencing
TO DO
Create Epic
Today
Weeks
Months
Quarters


Iot based safety gadget for child
New Tab
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Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Iot based safety gadge...
Software project
PLANNING
Roadmap
Board
DEVELOPMENT
Code
Project pages
Add shortcut
Project settings
You're in a team-managed project
Learn more
Projects / Iot based safety gadget for child safety monitoring and notification
Roadmap
Give feedback
Share
Export
Status category
Epic
View settings
NOV
IBSGFCMN-3 REGISTRATION
IBSGFCMN-4 confirmation m...
IBSGFCMN-5 authentication
IBSGFCMN-6 login
IBSGFCMN-7 DASHBOARD
IBSGFCMN-8 STORE DATA
IBSGFCMN-9 NOTIFICATION
IBSGFCMN-10 COMMUNICATION
IBSGFCMN-11 IoT Device – ...
IBSGFCMN-12 Node RED - C...
IBSGFCMN-13 User – WebUI inte...
IBSGFCMN-14 Geofencing
DONE
TO DO
Create Epic
Today
Weeks
Months
Quarters
IBSGFCMN-10 /
IBSGFCMN-11
IoT Device – Watson communication
Done
Description
Add a description...
Details
Assignee
Unassigned
Assign to me
Add a comment...
Pro tip: press M to comment

7.CODING & SOLUTIONING

7.1 FEATURES

Feature 1 : Log into the website by using email and password.

Feature 2 : Used to find out the location of the child.

Feature 3 : Monitor the child's pressure and temperature.

Feature 4 : Sends the message to the parents or their guardian.

Other Features: The system also consists of wi-fi module used to implement IoT and send all the monitored parameters to the cloud for android app monitoring on parental phone. Panic alert system is used during panic situations alerts are sent to the parental phone, seeking for help also aleart parameters are update the cloud.

```
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:
```

```
package com.example.geofence;

import android.app.Notification; import
android.app.NotificationChannel; import
android.app.NotificationManager; import
android.app.PendingIntent; import android.content.Context;
import android.content.ContextWrapper; import
android.content.Intent; import android.graphics.Color; import
android.os.Build;

import androidx.annotation.RequiresApi; import
androidx.core.app.NotificationCompat;   import
androidx.core.app.NotificationManagerCompat;

import java.util.Random;

public class NotificationHelper extends ContextWrapper {

  private static final String TAG = "NotificationHelper";

  public NotificationHelper(Context base) {       super(base);
    if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.O) {          createChannels();
    }
  }
  private String CHANNEL_NAME = "High priority channel";
  private String CHANNEL_ID = "com.example.geofence" + CHANNEL_NAME;
```

```
{
    NotificationChannel notificationChannel = new
NotificationChannel(CHANNEL_ID, CHANNEL_NAME, NotificationManager.IMPORTANCE_HIGH);
notificationChannel.enableLights(true);       notificationChannel.enableVibration(true);
notificationChannel.setDescription("this is the description of the channel.");
notificationChannel.setLightColor(Color.RED);


notificationChannel.setLockscreenVisibility(Notification.VISIBILITY_PUBLIC) ;       NotificationManager manager =
(NotificationManager) getSystemService(Context.NOTIFICATION_SERVICE);
manager.createNotificationChannel(notificationChannel);    }
  public void sendHighPriorityNotification(String title, String body, Class activityName) {


    Intent intent = new Intent(this, activityName);
    PendingIntent pendingIntent = PendingIntent.getActivity(this, 267, intent,
PendingIntent.FLAG_UPDATE_CURRENT);
    Notification notification = new NotificationCompat.Builder(this, CHANNEL_ID)
//            .setContentTitle(title)
//            .setContentText(body)
          .setSmallIcon(R.drawable.ic_launcher_background)
          .setPriority(NotificationCompat.PRIORITY_HIGH)            .setStyle(new
NotificationCompat.BigTextStyle().setSummaryText("summary").setBigContentTi tle(title).bigText(body))
          .setContentIntent(pendingIntent)
          .setAutoCancel(true)
          .build();


    NotificationManagerCompat.from(this).notify(new Random().nextInt(), notification);
}
}
```

8.TESTING

8.1 TEST CASES

- ✓ Login website with email
- ✓ GPS Tracking
- ✓ Send Message to Parents or Guardian
- ✓ Monitoring the location of the child

8.2 USER ACCEPTANCE TESTING

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.

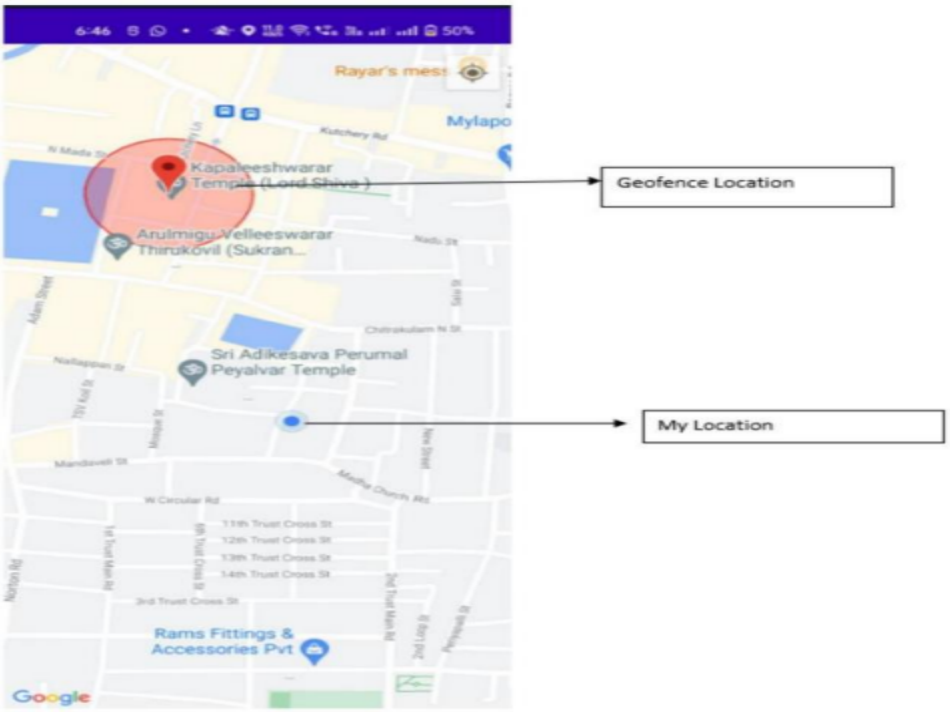
If the child is missed in the not available internet connection then it is very difficult to find the child.

9.RESULTS

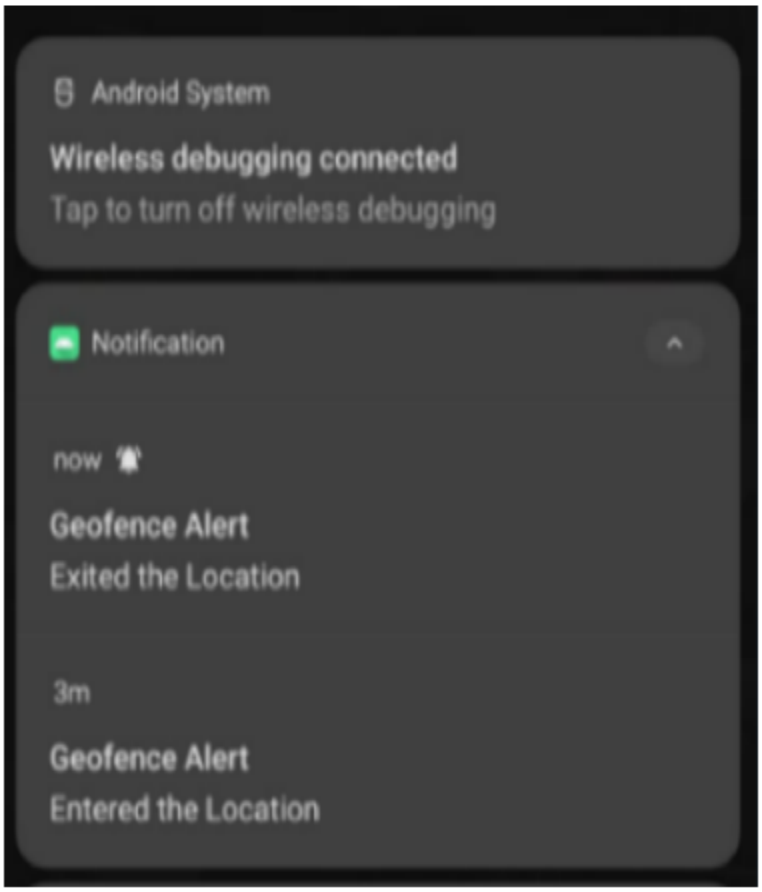
1.User Registration : Users get registered to the app using their mail and create their password. On the user is registered a verification mail will be sent to the user mail id. The user needs to verify the account. All user details are stored in the firebase and verification mail is sent by firebase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

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 .

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



CONCLUSION

➢ Though this child safety can be ensured and crime rate will be reduced .

➢ However, the proposed method is not robust enough and does not contain sufficient functions to operate like a mobile phone.

➢ Hence the future enhancement will be adding some more futures , software application, and hardware to make the proposed system cable of working more intelligently, and guarantee the safety of the children.

12.FUTURE SCOPE

In future, the currently proposed system can be improvised by adding other parameters that is required for children .The system can be developed further by implementing additional health monitoring sensors like, blood pressure, respiration rate, sleep cycles of REM&NREM and EEG analysis The system accuracy can also be improved by increasing the trustworthiness of the device to avoid any discrepancies, as in medical and healthcare, a minute error may cost a life. In addition we can also add different zones such as bus section, along with wireless camera which ensures the safety .In bus section we also can implement the fire detecting concept. 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 problem.

APPENDIX

SOURCE CODE AND GITHUB LINK

https://github.com/IBM-EPBL/IBM-Project-49717-1660836880

DEMO LINK

https://drive.google.com/file/d/16ZkG9wibfHhqYJf3Ob9cIyDJ-tGTsHhw/view?usp=share_link