

PROJECT DOCUMENTATION

IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION

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ABSTRACT

This paper is mainly streamered towards child safety solutions by developing a gadget which can be tracked via its GPS locations and also apanic button on gadget is provided to alert the parent via GSM modulecalling for help.

Parentalandroid app is developed to manage and track thedevice anytime. Smart gadget device is always connected to parental phonewhich 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, ifdevice is moving out of monitoring range then an alert will be triggered onbinding gadget,this helps you keep a virtual eye on child. Health monitoring system on gadget checking for parameters like heart beat/pulserate 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

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.

2. Literature Survey

[1] **Authors:** Akash Moodbidri, Hamid Shahnasser

Title: Child safety wearable device.

Published in: 2017 IEEE. This gadget is designed to make it easier for parents to find their kids.

There are already a lot of wearables available on the market that may be used to track children's daily activity as well as to locate them utilizing the Wi-Fi and Bluetooth capabilities of the device.

Merits: The advantage of this wearable over others is that it can be operated with any phone; a high-end smartphone is not necessary, and it doesn't require a person to be highly tech knowledgeable.

Demerits: Due to its low battery life, this device.

[2] **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 Link-It ONE board, programmed in embedded C, is used to construct the system. It is connected to temperature, heartbeat, touch, GPS, GSM, and digital camera modules. The work is innovative in that when a child is in need of rapid attention during an emergency, the system instantly notifies the parent or caregiver by sending an SMS.

Merits: The child's heartbeat, temperature, and touch are employed as parameters in a parametric analysis, and the results are shown.

Demerits: To put in place an IoT gadget that offers a comprehensive remedy for issues with child safety.

[3] **Authors:** Dheeraj Sunehera, Pottabhatini Laxmi Priya.

Title: Children Location Monitoring on Google Maps Using GPS and GSM.

Published in: 2016 IEEE.

This study offers parents an Android-based tool to follow their kids in real-time. Through internet-connected channels, various gadgets can communicate with one another. The concerned gadget has an internet connection to the server. Parents can use the gadget to keep track of their kids in real-time or to protect ladies. The location services offered by the GSM module are used in the suggested solution. It enables parents to receive an SMS with their child's location information.

Merits: Uses an Android terminal and ad hoc networks, a child tracking system.

Demerits: This device cannot be used in rural areas.

[4] **Authors:** Aditi Gupta, Vibhor Harit.

Published in: 2016 IEEE.

Title: Child Safety & Tracking Management System by using GPS.

This study offered a model for child safety using smartphones that give parents the option to track their children's whereabouts as well as the ability for kids to send a fast message and their current location in case of an emergency via Short Message Services.

Merits: The benefits of smartphones that offer a wealth of capabilities like GPS, SMS, Google Maps, etc.

Demerits: This system is unable to detect child-like human behavior.

References:

[1] Aditi Gupta, Vibhor Harit, 'Child Safety & Tracking Management System by using GPS, GeoFencing & Android Application: An Analysis,' 2016 Second International Conference on Computational Intelligence & Communication Technology.

[2] Dheeraj Sunehera, Pottabhatini Laxmi Priya, 'Children Location Monitoring on Google Maps Using GPS and GSM,' 2016 IEEE 6th International Conference on Advanced Computing.

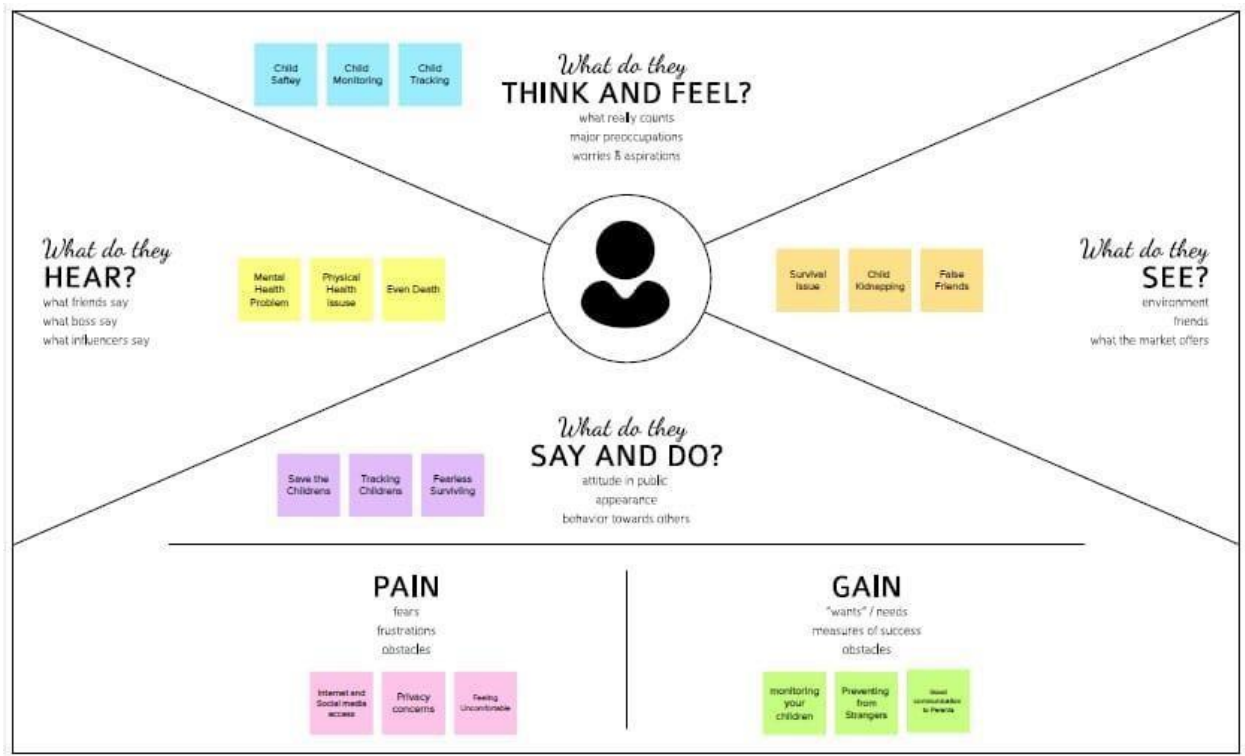
[3] M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S. Sarveswararao, E. Kusuma Kumari,

'Smart IoT Device for Child Safety and Tracking' International Journal of Innovative Technology and Exploring Engineering, Volume 8, Issue 8, June 2019.

[4] 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. Ideation and Proposed Solution

3.1 Empathy map canvas



3.2 Ideation and Brainstroming

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

We have followed the first step of brainstorming, we have discussed as a team to decide a problem statement.

As per the guideline the following is done

1. Team Gathering
2. Collaboration
3. Deciding the problem statement

Step-2: Grouping

BY GROUPING IDEAS:

1. We have planned to use GSP for detecting location and to sent the message parents we can use GSM or Cloud.
2. The location will be shared in application or as message to parents
3. The notification is also sent in case of emergencies.

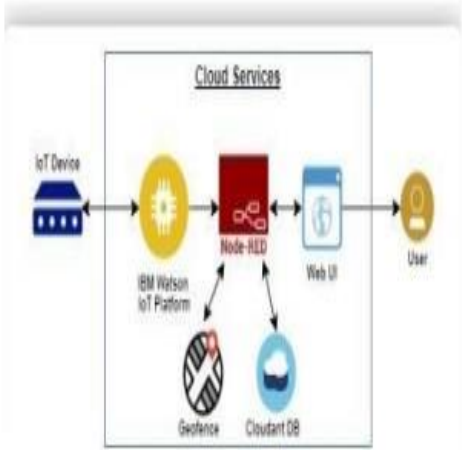
Step-3: Idea Prioritization

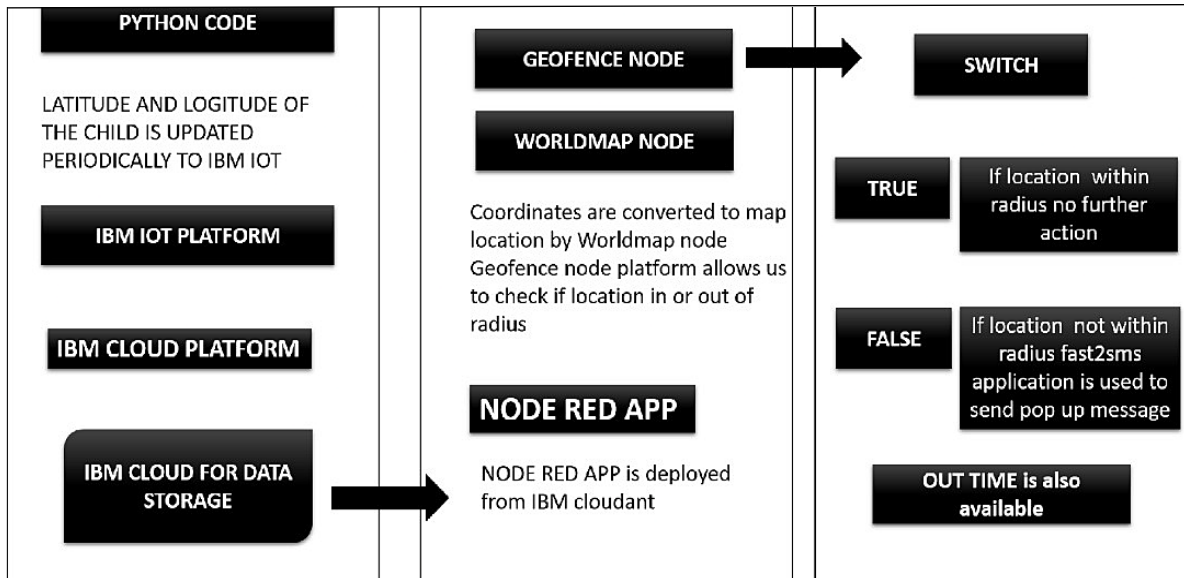
1. Using location trackers like GPS in order to detect the location of the child.
2. The GPS are connected to IOT application in order notify the parents
3. Use other sensors if required for the particular application as temperature,heart beats etc.
4. Using automation without the knowledge of parents or human resource

3.3 Problem Statement and Proposed Solution

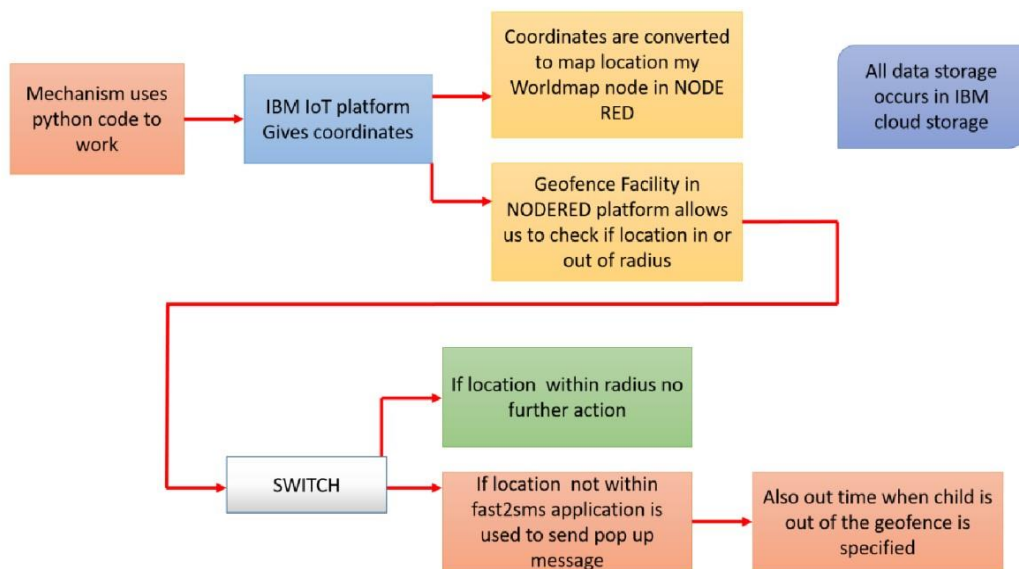
<u>S.No.</u>	<u>Parameter</u>	<u>Description</u>
1.	<u>Problem Statement (Problem to be solved)</u>	<u>A parent has to ensure the safety of his child from anywhere in case of need</u>

		<p>1.Location tracking 2.Mapping the coordinates 3.Send message to parents</p> <p>Step 1 generally requires a GPS module and the coordinates need to be updated periodically</p> <p>Here we are going to use an assumed longitude latitude location in python code</p> <p>Step 2 is done using world map node in NODE RED app facility in IBM Cloud that maps the coordinates on map as a pin location</p> <p>This location is also fed to geofence node that checks whether the location is within the radius or not</p> <p>Step 3 ensures message is shown if location is not inside geofence area</p> <p>For real world application GPS module can be given to children in form of watch or any other sophisticated gadget</p>
3.	Novelty / Uniqueness	Parents will receive accurate location anytime anywhere (they will know if the child is in the geofence or not)

4.	Social Impact / Customer Satisfaction	<p>Child Safety will be within reach for the parents</p> <p>Gadget will be childsafe and environment friendly</p>
5.	Business Model (Revenue Model)	<p>Technical Architecture:</p>  <p>The diagram illustrates the technical architecture of the system. It shows an IoT Device connected to a central cloud services box. Inside the cloud services box, the data flows from the IoT Device to the IBM Watson IoT Platform, then to Node-RED, and finally to the Web UI. The Web UI is connected to the User. Additionally, the IBM Watson IoT Platform is connected to Geofence and Cloudant DB, which are also connected to Node-RED. The Web UI is connected to Cloudant DB.</p>
6.	Scalability of the Solution	Requires proper internet connection for working with cloud



Solution and technical architecture &reirements:



Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail Registration through Number
FR-2	User Confirmation	Confirmation via Email and OTP
FR-3	User Login	login through User Id and Password
FR-4	Network Connectivity	via wifi/mobile data Internet connection with at least 10 to 20 kbps
FR-5	IBM IoT Platform	Access cloud storage via internet and it gives coordinates
FR-6	Node-RED	World Map node- Coordinates are converted into map location. Geofence - ensures the child is within the geofence
FR-7	Fast2sms	used to send pop up messages.

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	It can easily track and monitor the location of the child and share the information to parents
NFR-2	Security	The cloud database is highly secured and it prevent data from hacking issues
NFR-3	Reliability	Safety of the children is assured all the time.
NFR-4	Performance	Monitoring the child whether he/she is within the geofence
NFR-5	Availability	To check the presence of child within the geofence area

User stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Registration	USN-1	I am able to get speed updates correctly	I can get speed constraints	High	Sprint-1
		USN-2	As a user, I can register in the application correctly	I can perfectly get synced account details	Medium	Sprint-2
		USN-3	As a user, I can increase or decrease speed based in the change in weather conditions with the help of sign boards	Increment or decrement in speed	High	Sprint-1
		USN-4	As a user, I am able to go through an alternative direction when traffic is ahead	Correct updates of traffic details ahead of time	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can log into the application	High	Sprint-2
Customer (Web user)	Generating data	USN-6	As a user I am able to utilize the web app to get information regarding child location	I can access information from web app	High	Sprint-1
Customer Care Executive	Problem solving	USN-7	As an executive I am able to solve the problems of the users with the given instructions	Easy maintenance and problem solving	Medium	Sprint-2
Administrator	Administering the timely data	USN-8	As an admin I am able to get through the interface and administer the data functionality	Easy administration when data is timely updated	High	Sprint-2

</settings-safety-check-extensions-child> 6.TESTING

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Ashwin Kumar R
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Vignesh V
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Praveen Kumar T
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	Jeeva A
Sprint-1	Login	USN-5	As a user, I can log into the application by Entering email & password	1	High	Ashwin Kumar R

5. CODING & SOLUTIONING

Features added in the project along with code.

Feature 1 : 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.

CODING:

```
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();
}

```

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 .

Coding:

```
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";

receiving

@Override

public void onReceive(Context context, Intent intent) {

// TODO: This method is called when the BroadcastReceiver is

// 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());
}

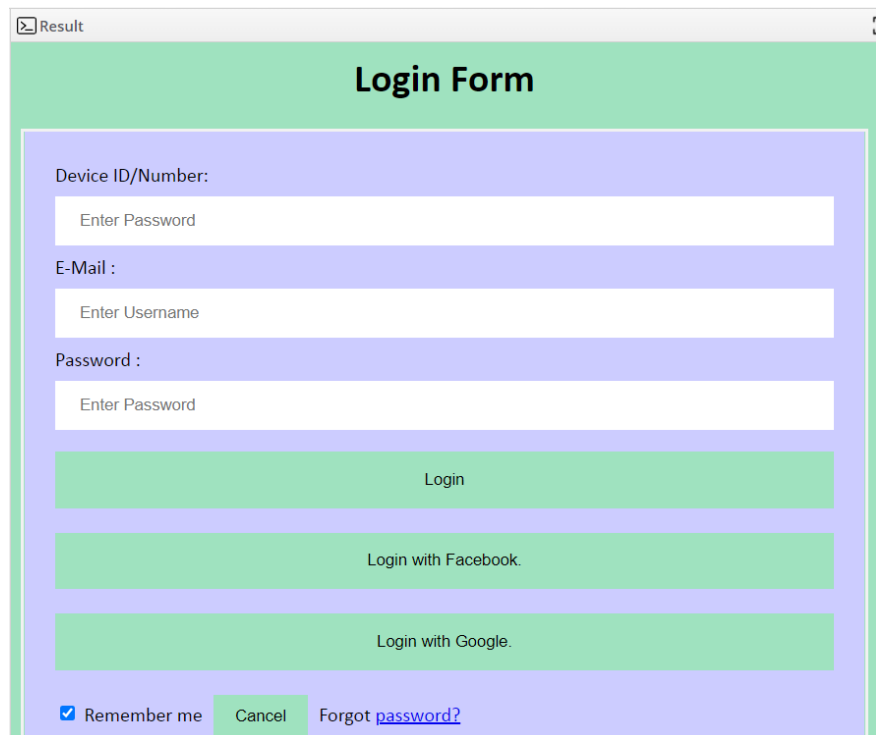
//Location location = geofencingEvent.getTriggeringLocation();int transitionType =
geofencingEvent.getGeofenceTransition();
switch (transitionType) {
case Geofence.GEOFENCE_TRANSITION_ENTER:
notificationHelper.sendHighPriorityNotification("Entered the Location", "", MapsActivity.class);
break;
case Geofence.GEOFENCE_TRANSITION_EXIT:
notificationHelper.sendHighPriorityNotification("Exited the Location ", "", MapsActivity.class);
break;
}
}
}
}

```

7. RESULTS

a. User Registration:

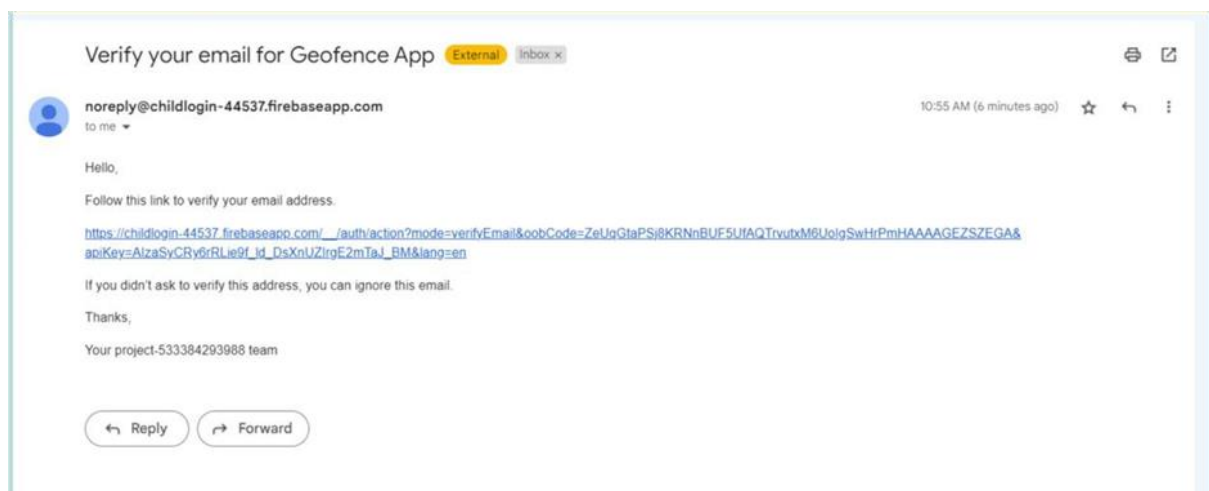
Users get registered to the app using their mail and create their password. On the user is registered a verification mail will be sent to the user mailid. The user needs to verify the account. All user details are stored in the firebase and verification mail is sent by firebase authentication.



The screenshot shows a web browser window titled "Result" displaying a "Login Form". The form has a light blue background and contains the following elements:

- Device ID/Number:** A text input field with the placeholder "Enter Password".
- E-Mail :** A text input field with the placeholder "Enter Username".
- Password :** A text input field with the placeholder "Enter Password".
- Login:** A large blue button.
- Login with Facebook:** A large blue button.
- Login with Google:** A large blue button.
- Remember me:** A checked checkbox.
- Cancel:** A small blue button.
- Forgot password?:** A link in blue text.


Verification mail



b. 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:



Result

Login Form

Device ID/Number:

E-Mail :

Password :

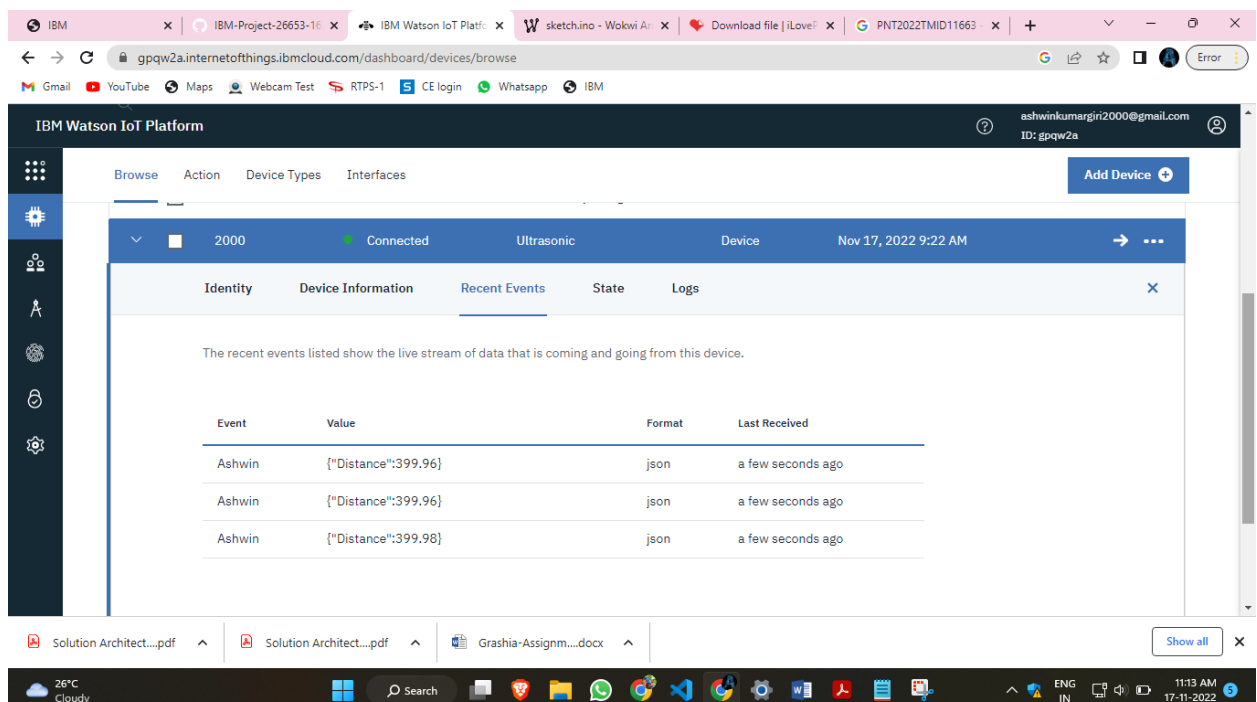
Login

Login with Facebook.

Login with Google.

☒ Remember me [Forgot password?](#)

User Details



IBM Watson IoT Platform

ashwinkumargiri2000@gmail.com ID: gpqw2a

Browse Action Device Types Interfaces

Add Device

Identity	Device Information	Recent Events	State	Logs
2000	Connected	Ultrasonic	Device	Nov 17, 2022 9:22 AM

The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
Ashwin	{\"Distance\":399.96}	json	a few seconds ago
Ashwin	{\"Distance\":399.96}	json	a few seconds ago
Ashwin	{\"Distance\":399.98}	json	a few seconds ago

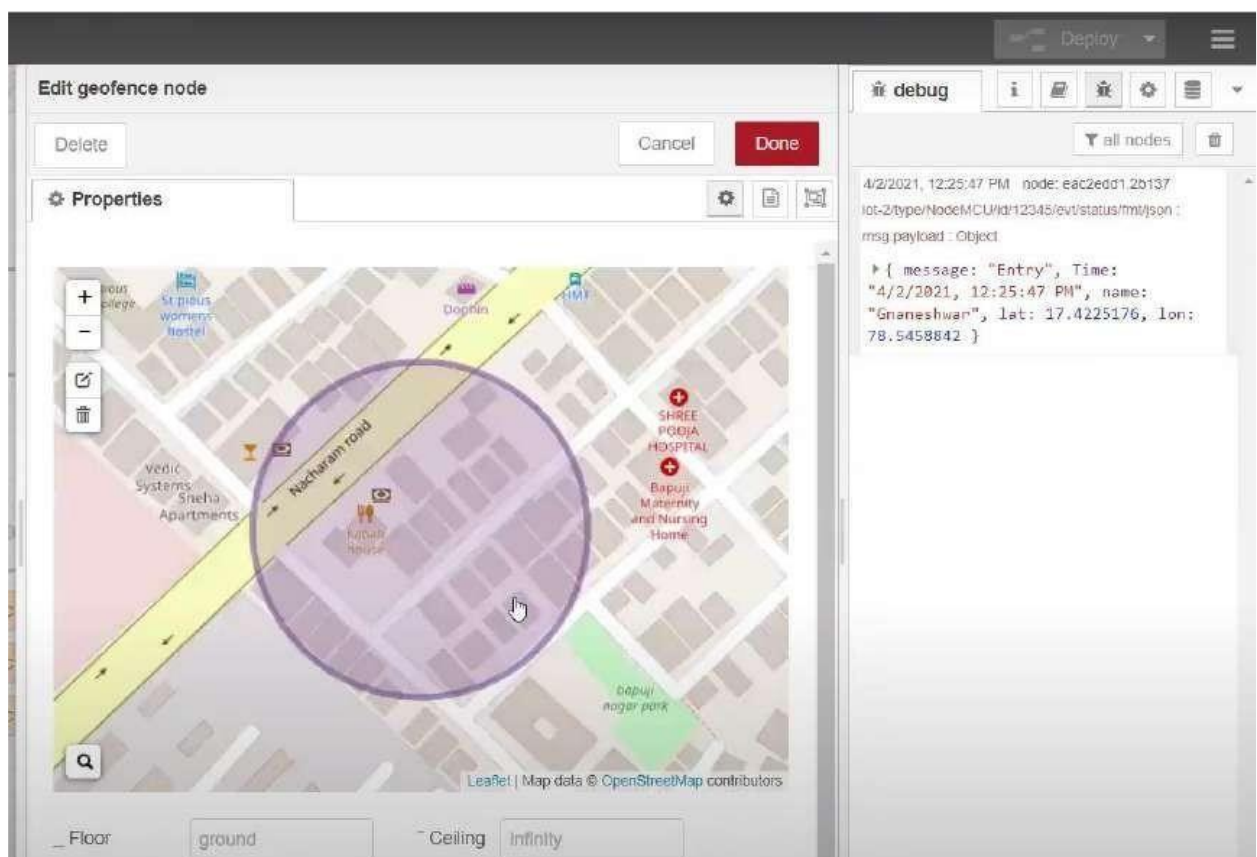
Solution Architect....pdf Solution Architect....pdf Grashia-Assignm....docx

26°C Cloudy 11:13 AM 17-11-2022

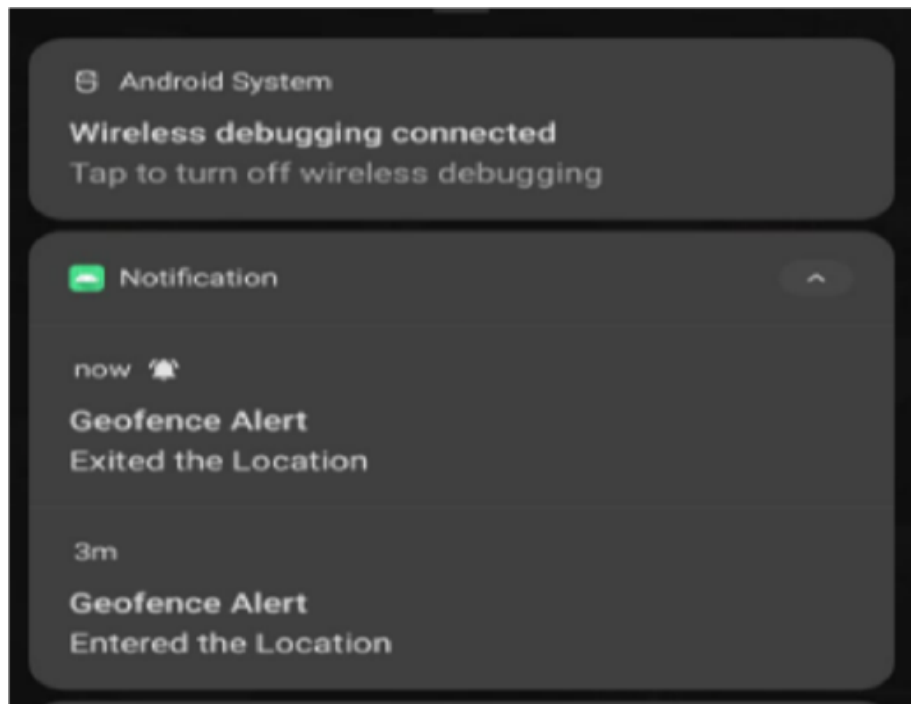
Adding Geofence and Alert Notification

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



8. Advantages and Disadvantages

The parent can monitor their child from anywhere at any time, and also get a notification when the child goes away from the permitted radius. It also allows the parent to know if their child is in any dangerous situation.

The disadvantages of this system are that the child could not produce the exact alert command during a panic condition. The command produced may not match the previously stored command. This project requires manual intervention.

9. 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.

10. 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 webcam 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.

11. Appendix :

11.1 Source code link:

<https://github.com/IBM-EPBL/IBM-Project-26653-1660032483>

11.2 GitHub and Project demo link

GitHublink:

<https://github.com/IBM-EPBL/IBM-Project-26653-1660032483>