IoT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING & NOTIFICATION

A PROJECT REPORT

NMS0001: PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

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TEAM DETAILS

TEAM ID	PNTN2022TMID07147
TEAM	NAVINRAJ M SANTHOSH S PREM M SARAVANA GANESH S
PROJECT NAME	IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING & NOTIFICATION
CATEGORY	Internet of Things (IoT)

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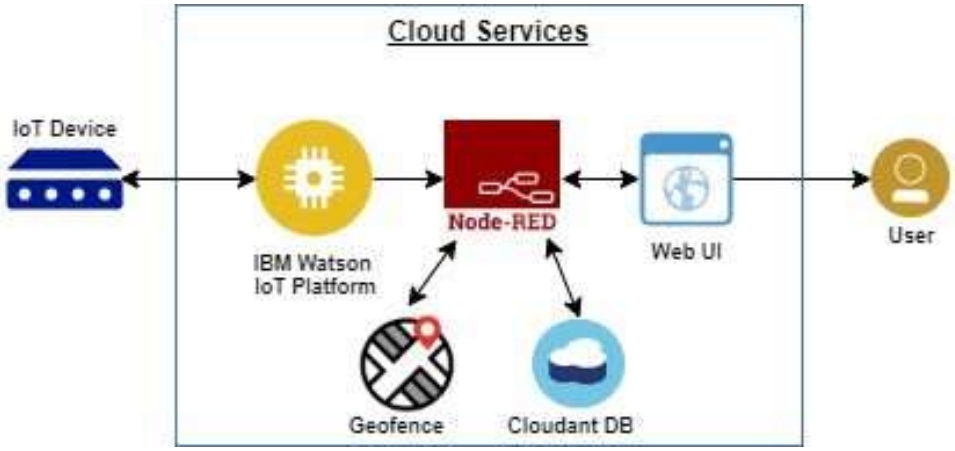
1. INTRODUCTION

a. Project Overview

Internet of Things (IoT) plays a major role in every day to day life. The major difference between IoT and embedded system is that a dedicated protocol/software is embedded in the chip in case of embedded system, whereas, IoT devices are smart devices, which are able to take decisions by sensing the environment around the device. The development of sensors technology, availability of internet connected devices; data analysis algorithms make IoT devices to act smart in emergency situations without human interventions. So, IoT devices are applied in different fields such as agriculture, medical, industrial, security and communication applications. IoT systems are useful within a system to do deeper automation, analysis, and integration. IoT contributes to technology by advances in software, hardware and modern tools. It even uses existing and upcoming technology in the fields of sensing, networking and robotics. IoT brings global changes by its advanced elements in the social, economic, and political impact of the users.



b. Purpose

Child tracker helps the parents in continuously monitoring the child's location. They can simply leave their children in school or parks and create a geofence around the particular location. By continuously checking the child's location notifications will be generated if the child crosses the geofence. Notifications will be sent according to the child's location to their parents or caretakers. The entire location data will be stored in the database.

2. LITERATURE SURVEY

a. Existing problem

Parents need to ensure safety of their children but in realtime they need to get to work and need to worry about their child whether he/she is safe or not. So to ensure safety they need to monitor & to notify their child what he/she is doing and to know whether they are in safe atmosphere or not to ensure the safety of the child.

b. References

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 automatically alerts 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.

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 using Wi-Fi and Bluetooth services present on the device.

Merits: This wearable over other wearable is that it can be used in any phone and it is not necessary that an expensive smartphone is required and doesn't want to be very tech savvy individual to operate.

Demerits: As, this device's battery gives short life-time. High power efficient model will have to be used which can be capable of giving the battery life for a longer time.

Authors: Aditi Gupta, Vibhor Harit.
Title: Child Safety & Tracking Management System by using GPS.

Published in: 2016 IEEE.

This paper proposed a model for child safety through smart phones that provides the option to track the location of their children as well as in case of emergency children is able to send a quick message and its current location via Short Message services.

Merits: The advantages of smart phones which offers rich features like Google maps, GPS, SMS etc.

Demerits: This system is unable to sense human behavior of child.

Authors: Dheeraj Sunehera, Pottabhatini Laxmi Priya, Ayesha Banu.
Title: Children Location Monitoring on Google Maps Using GPS and GSM.

Published in: 2016 IEEE.

This paper provides an Android based solution for the parents to track their children in real time. Different devices are connected with a single device through channels of internet. The concerned device is connected to server via internet. The device can be used by parents to track their children in real time or for women safety. The proposed solution takes the location services provided by GSM module. It allows the parents to get their child's current-location via SMS.

Merits: A child tracking system using android terminal and hoc networks. **Demerits:**

This device cannot be used in rural areas.

c. Problem statement definition

Customer Problem Statement Template:

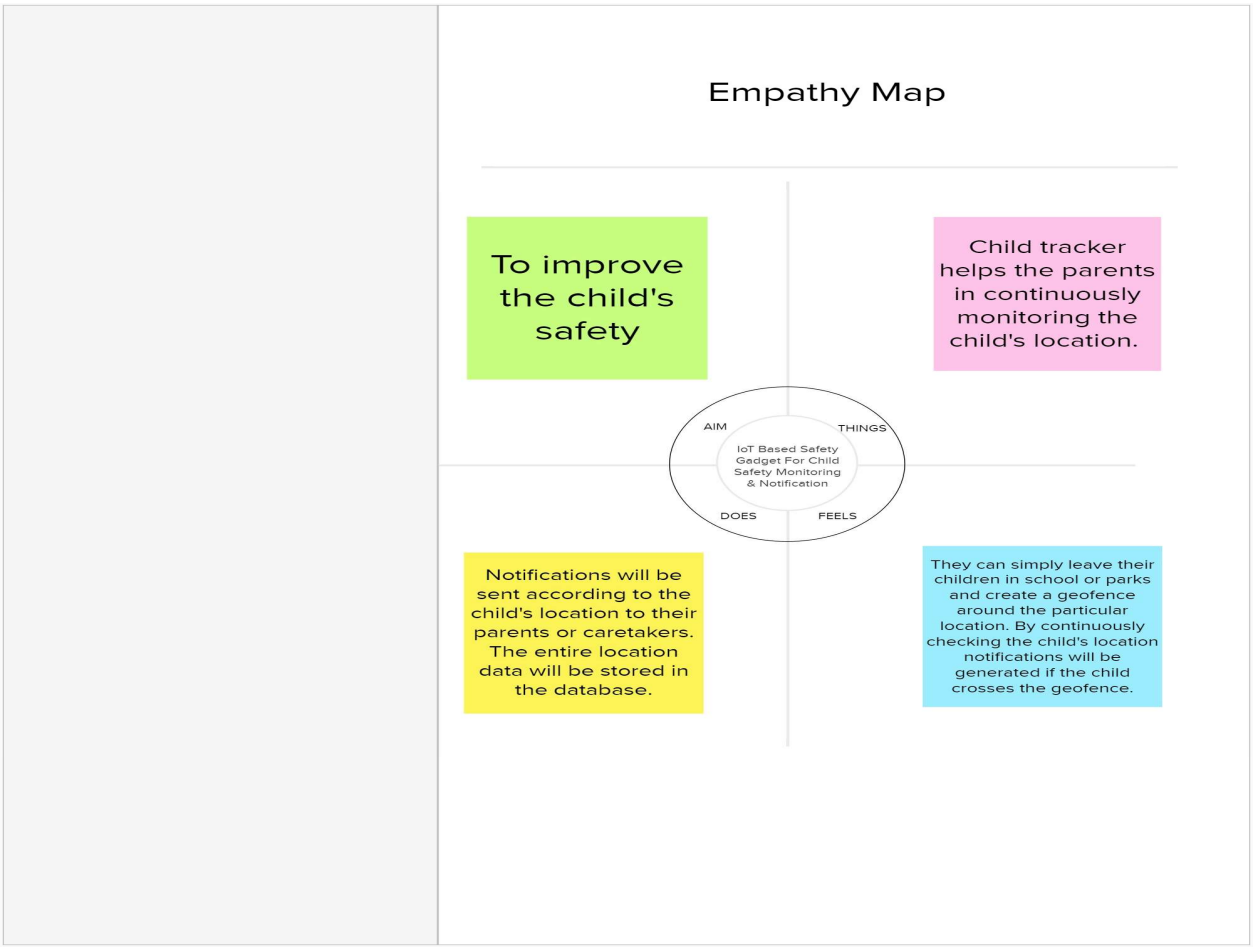
Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you be er understand how they perceive your product or service.

I am	Describe customer with 3-4 key characteristics - *who are they?*	Describe the customer and their attributes here
I'm trying to	*List their outcome or "job" the care about - what are they trying to achieve?*	List the thing they are trying to achieve here
but	Describe what problems or barriers stand in the way – *what bothers them most?*	Describe the problems or barriers that get in the way here
because	Enter the "root cause" of why the problem or barrier exists – *what needs to be solved?*	Describe the reason the problems or barriers exist
which makes me feel	Describe the emotions from the customer's point of view – *how does it impact them emotionally?*	Describe the emotions the result from experiencing the problems or barriers

3. IDEATION & PROPOSED SOLUTION

a. Empathy Map



b. Idea on and BrainStorming

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creatives solutions.

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not signing in the same room.

c. Proposed Solution

Proposed Solution Template:

Project team shall fill the following information on in proposed solution on template.

S.No.	Parameter	Descrip on
1.	Problem Statement (Problem to be solved)	Children are facing a lot of crimes nowadays whether in society or on any social media platform.
2.	Idea / Solu on descrip on	The idea is to develop an IOT-based safety gadget to monitor children and ensure their safety.
3.	Novelty / Uniqueness	To create a device that is easily carriable, wearable, comfortable, and safe for children to use.

4.	Social Impact / Customer Satisfaction	The user will be able to track their children throughout the day. if any emergency will be in mated about it. The user will get the exact information on about their child.
5.	Business Model (Revenue Model)	Portable, comfortable and small in size. To ensure that the device is safe for children to use.
6.	Scalability of the Solution	Reliable and cost-effective.

d. Proposed Solution Fit

1	CUSTOMER SEGMENT	Who is your customer? Working parents who are not able to safe their child (0-5) willing to use these .
2	JOBS-TO-BE-DONE / PROBLEMS	Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. Parents can't able to save their child from their workplace and Over parenting tends to deprive children of bad and negative experiences, which are crucial to a child's emotional growth. One form of overparenting is excessive monitoring

3	TRIGGERS	What triggers customers to act? i.e., seeing their neighbour using the gadget, reading about a more efficient solution in the news. It's not the situation or the feeling that's the problem; it's how kids think about these things and what they say to themselves that causes problems and child (0-2) years didn't know about anything this will trigger.
		How do customers feel when they face a problem or a job and afterwards?

4	EMOTIONS: BEFORE / AFTER	i.e., lost, insecure > confident, in control - use it in your communication strategy & design. BEFORE: Divergent thinking is a style of thinking that generates a range of alternative solutions or ideas to a problem that has multiple answers. AFTER: Feeling protective of your child is often manifested in the form of 'motherly' instincts. The feeling of protecting and wanting the best for your children is the ultimate parenting goal.

5	AVAILABLE SOLUTIONS	Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e., pen and paper The most important reason for monitoring each child's development is to determine whether a child's is on track. Looking for developmental milestones is important to understanding each child's development and behaviour.
6	CUSTOMER CONSTRAINTS	What constraints prevent your customers from taking action or limit their choices of solutions? i.e., spending power, budget, no cash, network connection, available devices. For predictive analytics to make the most impact on child protection practice and outcomes, it must embrace established criteria of validity, equity, reliability, and usefulness.
7	BEHAVIOUR	What does your customer do to address the problem and get the job done? The parents can monitor their child from their workplace when children have frequent emotional outbursts, it can be a sign that they haven't yet developed the skills they need to cope with feelings like frustration, anxiety

		and anger. Handling big emotions in a healthy, mature way requires a variety of skills, including.
8	CHANNELS of BEHAVIOUR	<u>ONLINE</u> What kind of actions do customers take online? Extract online channels <u>OFFLINE</u> What kind of actions do customers take offline? Extract offline channels and use them for customer development. Understanding how children perceive and interact with the point of sale has been the focus of various studies in the past decade. It is well documented that children have preferences in terms of shopping destinations .For working parents necessarily needed one.
9	PROBLEM ROOT CAUSE	What is the real reason that this problem exists? It's exactly what it sounds like—an exercise to determine the root cause for a failure or issue, so that the solution is based on the true problem, not just addressing the symptoms.

10	YOUR SOLUTION	If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

4. REQUIREMENT ANALYSIS

a. Functional Requirements

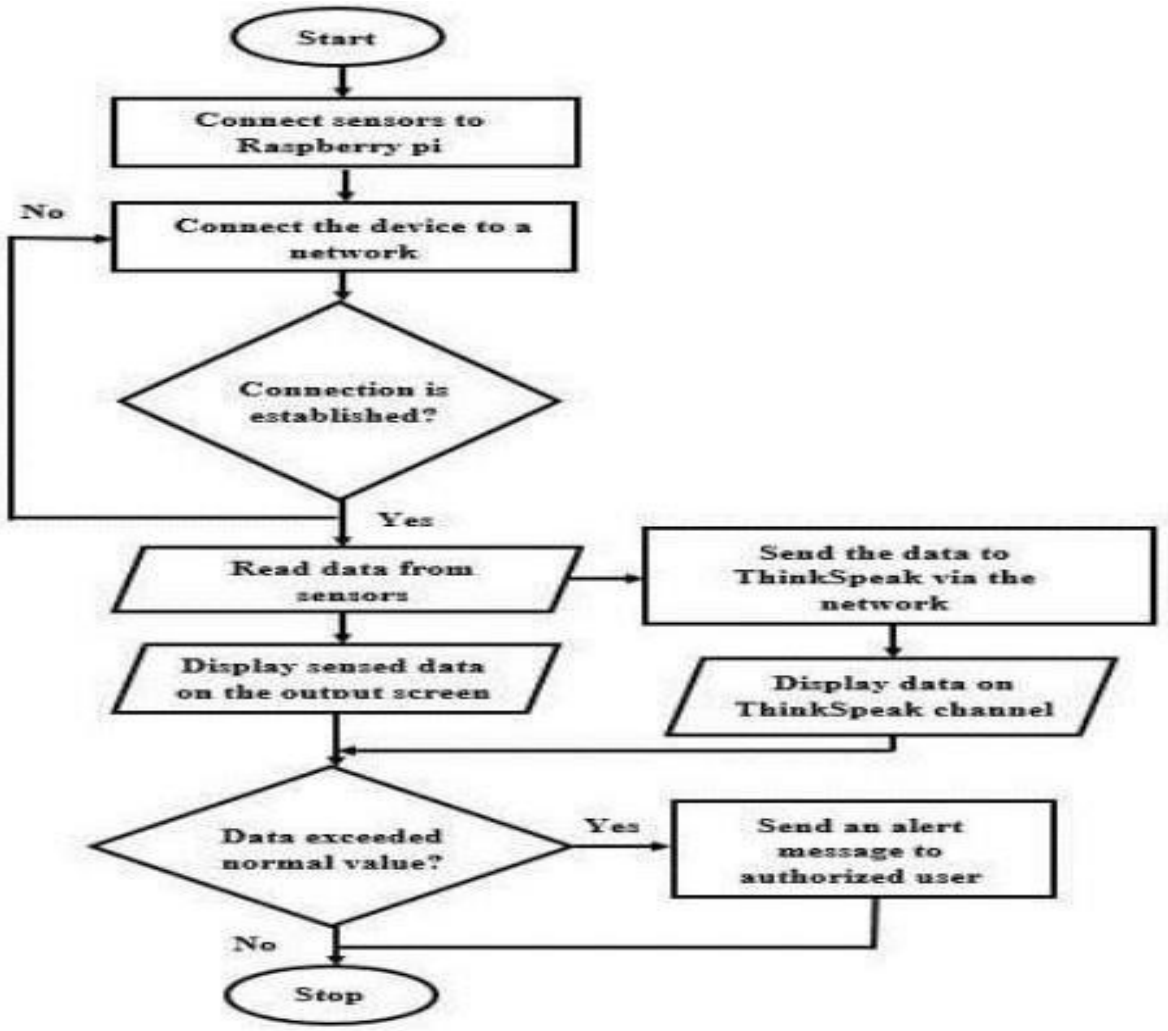
SI No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
1.	User Registration	Registration through Form Registration through Gmail Registration through LinkedIn
2.	User Confirmation	Confirmation via Email Confirmation via OTP
3.	Authentication	Only the authorized person for that product will know Ensures security
4.	User Interface	The Inventor Able to see the location of children when they are out of geofence will also track the exact information about the children
5.	Notification	Notified through mobile and mail

b. Non- Functional Requirements

SI No.	Non-Functional Requirement	Description
1.	Usability	Accessed through Mobile App Showing location (latitude and longitude) of child and also other measures to ensure safety like notification. Portable and comfortable to use.
2.	Security	Database security and ensuring the safety of the product while in use.
3.	Reliability	Once logged in, the webpage is available until logging out of the app, and a comfortable platform or creates a good environment for users to use.
4.	Performance	Each page must load within 4 seconds and database needs to be updated every few seconds and a notification must be sent immediately if seen a change in the child's location.
5.	Availability	The data must be available whenever needed and the product should be able to use at any time.
6.	Scalability	The process must be flexible to use at anytime and versatile.

5. PROJECT DESIGN

a. Data Flow Diagrams



b. Solution and Technical Architecture

Solution architecture is a complex process with many sub-processes that bridges the gap between business problems and technology solutions.

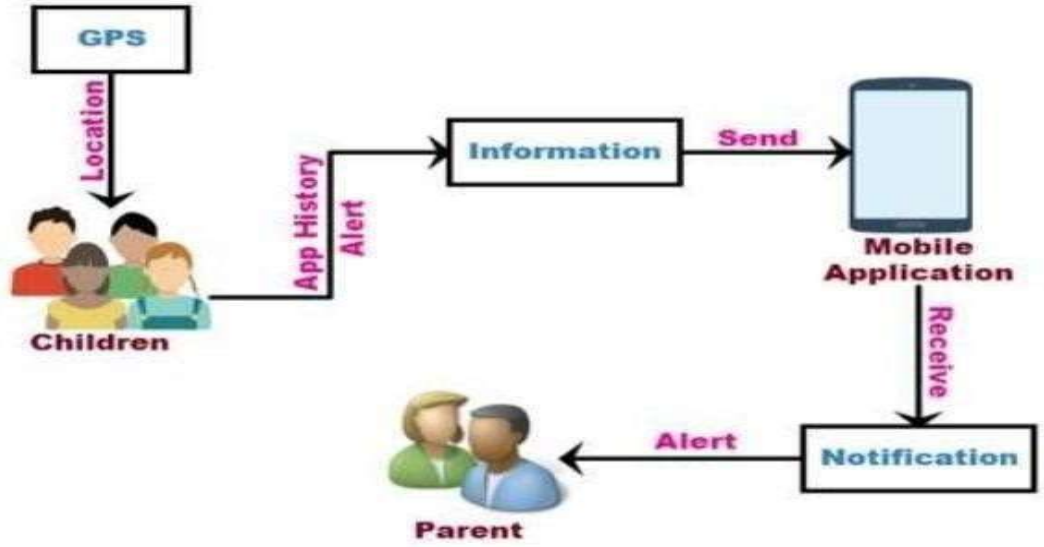
Its goals are to:

Find the best tech solution to solve existing business problems.

Describe the structure, characteriscs, behavior, and other aspects of the so ware to project stakeholders.

Define features, development phases, and solution requirements.

Provide specifications according to which the solution is defined, managed and delivered.



6. PROJECT PLANNING & SCHEDULING

a. Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Simulation creation	USN-1	Connect Sensors and Arduino with python code	2	High	NAVINRAJ M PREM M SANTHOSH S SARAVANA GANESH S
Sprint-2	Software	USN-2	Creating device in the IBM Watson IoT platform, workflow for IoT scenarios using Node-Red	2	High	NAVINRAJ M PREM M SANTHOSH S SARAVANA GANESH S
Sprint-3	MIT App Inventor	USN-3	Develop an application for the Smart Gadget for Child Safety using MIT App Inventor	2	High	NAVINRAJ M PREM M SANTHOSH S SARAVANA GANESH S
Sprint-3	Dashboard	USN-3	Design the Modules and test the connect to data base.	2	High	NAVINRAJ M PREM M SANTHOSH S SARAVANA GANESH S
Sprint-4	Web UI	USN-4	To make the user to interact with software and find the Location	2	High	NAVINRAJ M PREM M SANTHOSH S SARAVANA GANESH S

Product backlog and sprint schedule

b. Sprint Delivery Schedule

Project Tracker, Velocity & Burndown Chart

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	25 Oct 2022	30 Oct 2022	20	30 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

7. CODING AND SOLUTIONING

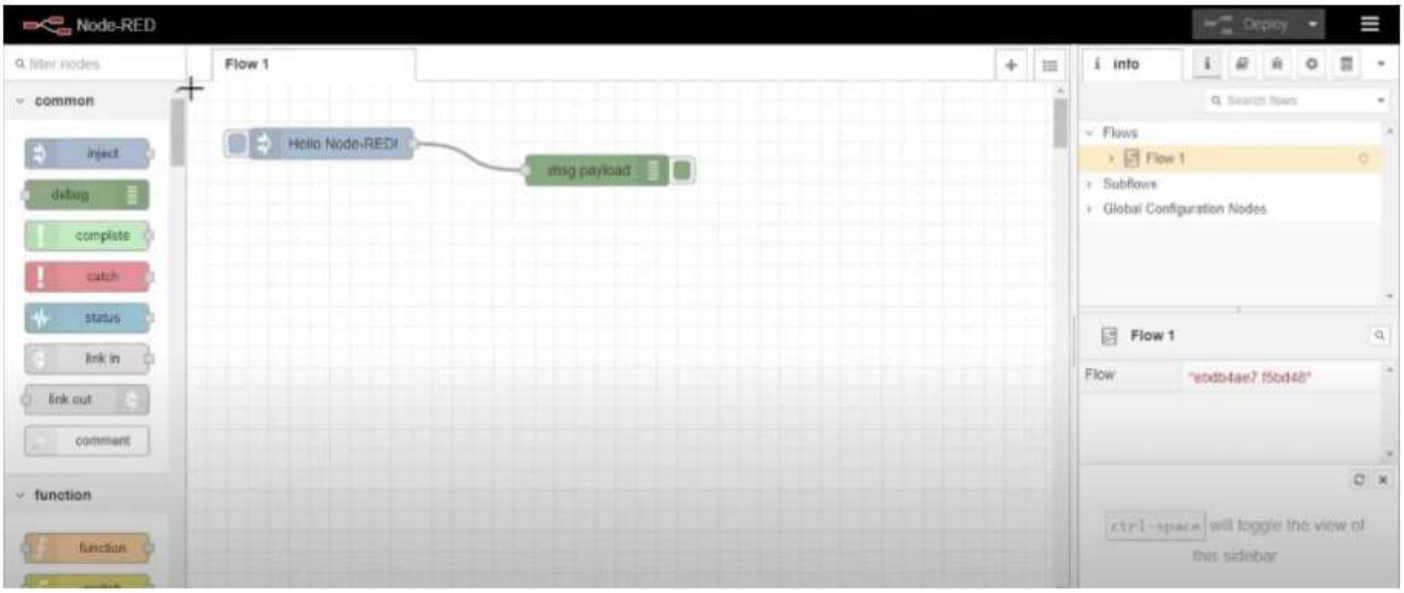
a. Coding

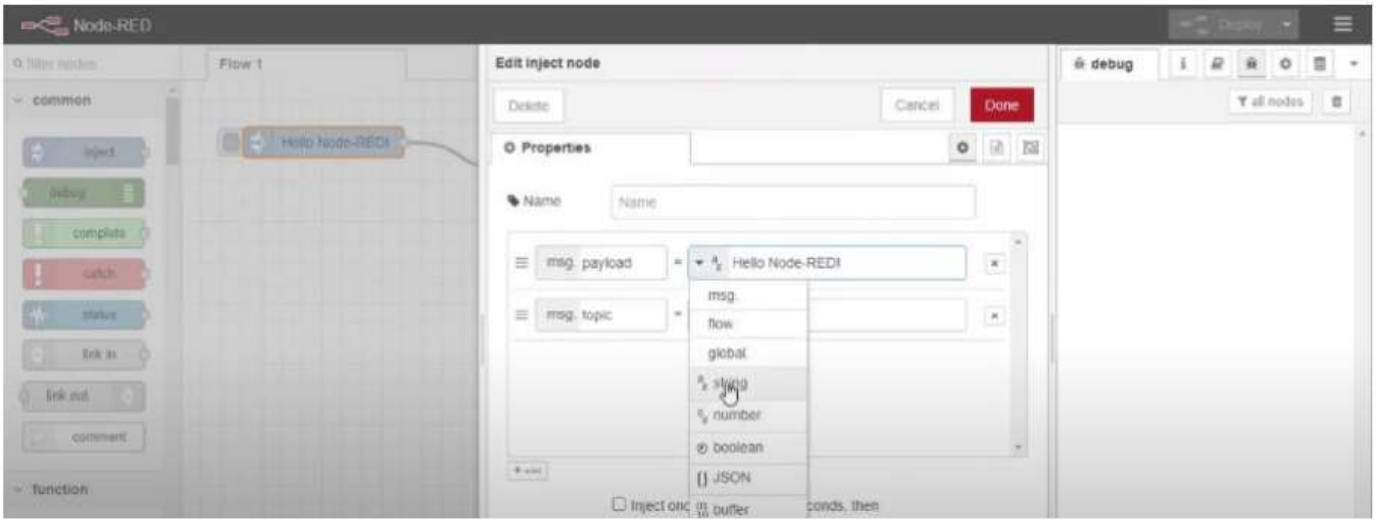
PYTHON SCRIPT

```
import       json
import wiotp.sdk.device
import time    myconfig =
{
"idebtity": {
"orgId": "hj5fmy",
"typeId": "NodeMCU",
"deviceId": "12345678"
},
"auth": {
"token": "12345678"

}
}

client = wiotp.sdk.device.Deviceclient(config=myconfig, logHandlers=None)
client.connect()
```

```
while True:
name= "hello world"
#in area location

#latitude=19.5678
#longitude=20.2132

#out area location

latitude=19.5678  longitude=20.2132
myData={'name': name, 'lat': latitude,'lon': longitude}
client.publishEvent(eventId="status",msgformat="jso n", data=mydata, qos=0,
onpublish=None)
print("Data published to IBM IOT platform :",myData)
time.sleep(5)
client.disconnect()
```

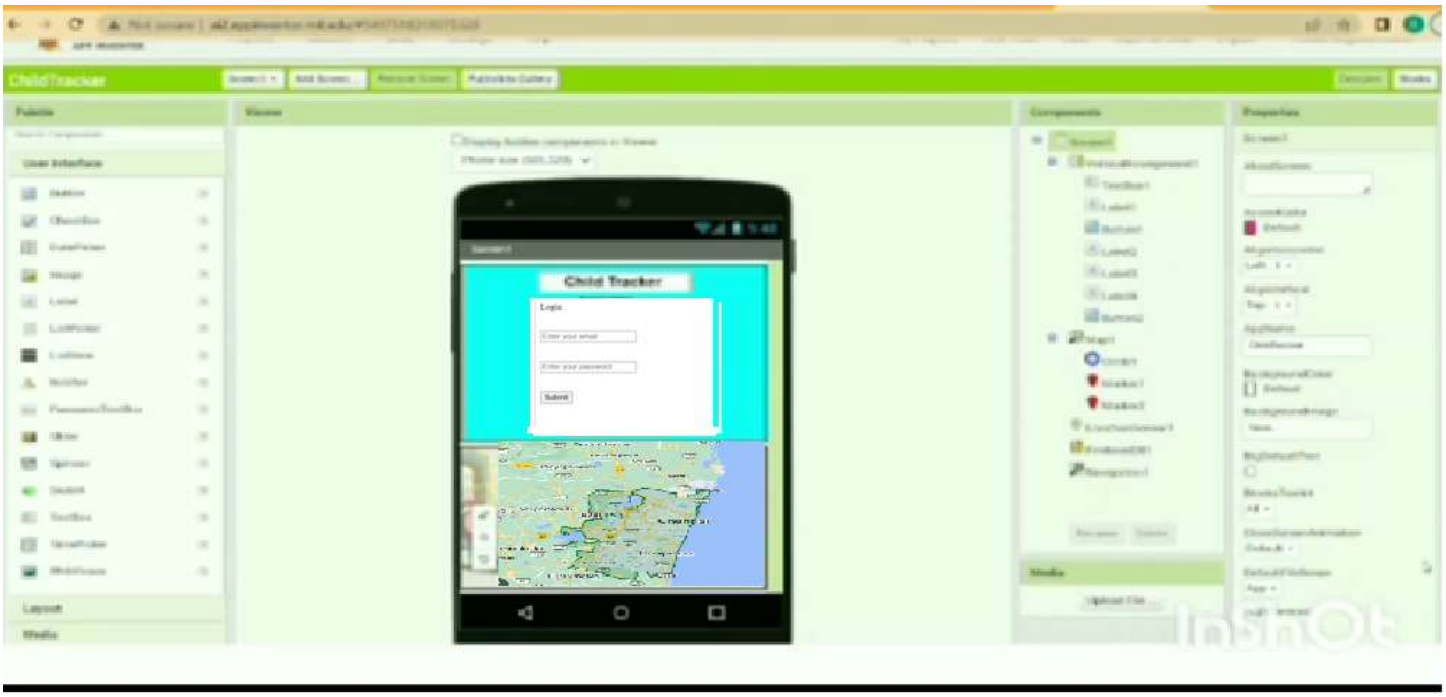
TESTING


Node-RED
Deploy
Flow 1
common
inject
debug
complete
catch
status
link in
link out
comment
function
Hello Node-RED!
msg.payload
info
Flows
Flow 1
Subflows
Global Configuration Nodes
Flow 1
Flow
ctrl-space will toggle the view of this sidebar


Node-RED
Deploy
Flow 1
common
Hello Node-RED!
Edit inject node
Delete
Cancel
Done
Properties
Name
Name
msg. payload
Hello Node-RED!
msg. topic
msg.
flow
global
string
number
boolean
JSON
buffer
debug
all nodes
function

Command Prompt

```
E:\IBM\Upload>type "Python Code.py"
import  json    import wiotp.sdk.device import time   myconfig =
{
"idebtity": {
"orgId": "hj5fmy",
"typeId": "NodeMCU",
"deviceId": "12345678"
},
"auth": {
"token": "12345678"

}
}

client = wiotp.sdk.device.Deviceclient(config=myconfig, logHandlers=None)  client.connect()


while True:
name= "Child Saftety IoT Gadget"
#in area location


#latitude=19.5678
#longitude=20.2132

#out area location


latitude=19.5678  longitude=20.2132 myData={'name': name, 'lat': latitude,'lon': longitude}
client.publishEvent(eventId="status",msgformat="jso n", data=mydata, qos=0, onpublish=None)
print("Data published to IBM IOT platform :",myData)
time.sleep(5)
client.disconnect()

E:\IBM\Upload>
```



b. GEOFENCE

A geofence is a virtual perimeter for a real-world geographic area.[1] A geofence could be dynamically generated (as in a radius around a point location) or match a predefined set of boundaries (such as school zones or neighborhood boundaries). The use of a geofence is called geofencing, and one example of use involves a location-aware device of a location-based service (LBS) user entering or exiting a geofence. This activity could trigger an alert to the device's user as well as messaging to the geofence operator. This info, which could contain the location of the device, could be sent to a mobile telephone or an email account.

Geo Fencing provides Security Strategy by giving Notification/Alert when the child is out of the boundary.

Thus it helps parent/caretaker to locate and monitor the children and ensures safety.

8. RESULTS

a. Performance Metrics

It is being used as it allows the correct sample of respondents to be selected due to which becomes convenient to obtain results. Besides, the results offered are affordable and usable. Since the respondents are properly chosen, the results tend to be more accurate, precise and reliable.

9. ADVANTAGES & DISADVANTAGES

Advantages

In this project, we provide an environment where this problem can be resolved in an efficient manner. It makes parents/caretakers 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.

Disadvantages

It can be easily removed or damaged while playing and by any intruders. This requires internet connectivity to get monitored and to notify alert messages to parents/caretaker.

10. CONCLUSION

This project demonstrates Smart IoT device for child safety and tracking helping the parents to locate and monitor their children.

11. FUTURE SCOPE

The future scope of the work is to implement the IoT device which ensures the complete solution for child safety problems.

APPENDIX

SOURCE CODE

```
import       json
import wiotp.sdk.device
import time    myconfig =
{
"idebtity": {
"orgId": "hj5fmy",
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client = wiotp.sdk.device.Deviceclient(config=myconfig, logHandlers=None)
client.connect()

while True:
name= "hello world"
#in area location
```

```
#latitude=19.5678
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#out area location

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myData={'name': name, 'lat': latitude,'lon': longitude}
client.publishEvent(eventId="status",msgformat="jso n", data=mydata, qos=0,
onpublish=None)
print("Data published to IBM IOT platform :",myData)
time.sleep(5)
client.disconnect()
```

GITHUB LINK :

https://github.com/IBM-EPBL/IBM-Project-28690-1660115234

PROJECT DEMO LINK :

https://drive.google.com/file/d/1oC5sHu0Bftfwzl5RhIpcxfeUhE8BfCkL/view?usp=sharing