



**IOT BASED
SAFETY GADGET FOR CHILD
SAFETY MONITORING AND
NOTIFIATION
NALAIYA THIRAN PROJECT BASED LEARNING
ON
PROFESSIONAL READLINES FOR
INNOVATION, EMPLOYABILITY AND
ENTREPRENEURSHIP
PROJECT REPORT SUBMITTED BY**

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1.INTRODUCTION

1.1 PROJECT OVERVIEW

Internet of things (IoT) is a set of systems and devices interconnected with real-world sensors and actuators to the Internet. It is able to make decisions via detecting the surrounding environment without human interaction. In this research, IoT is applied to propose a wearable smart band which helps parents to monitor and get known of their child's condition at anywhere and anytime even if they are not by their children side. Via the IoT smart band, children safety is guaranteed, and crime rate is reduced as immediate actions can be taken in case the child is in danger. Besides , unlike existing smart band, which is less focusing on child security aspect, the proposed system emphasizes in getting as much data as possible so that actual situation can be

identified. The use of IoT in this device is motivated by the need of child security system in world due to child safety issues resulting from increasing cases on child related crime. The device has IoT monitoring and a GSM module that allows the child to be monitored at all times. It also has numerous sensors that are connected danger and alerts the parents. On the device, there is an additional panic button. The purpose of this button is to notify parents and the police of a child's current location whenever they are in a perilous scenario. To trigger the alarm and enable automatic video recording whenever the emergency button is pressed. Then, emergency notification along with realtime video will be sent to and display in the parents' mobile apps. Develop a prototype of IoT wearable smart band connected to parents' mobile apps so that they can monitor the actual condition of children at anytime and anyplace.

1.2 Purpose

The Availability of Camera in Our Product. If Abnormal Situation Occurred, In our Competitive Products, Parents are Less Informed about Children Condition and incase the child is in Danger , Actions are not able to taken Immediately. Parents have No Other Option for View the Exact Scenario of the Children in Emergency Situation When they Away from there. The Solution here is, when a children leave a geofence and the time of the panic button is on & the alert will be send to the parents with a live video streaming. The availability of features of webcam in our product triggers them to buy. After reading / knowing about the innovative efficient solution in our product.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

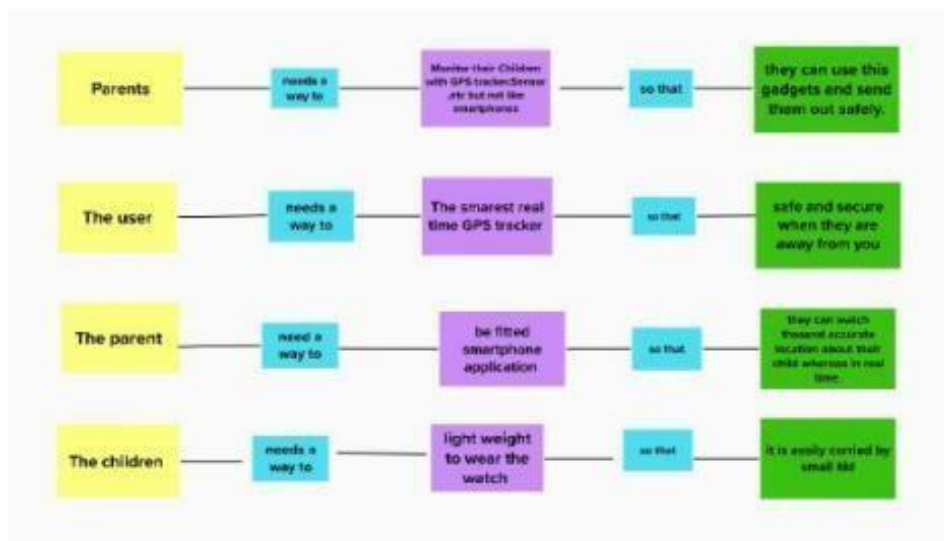
The existing system does not contain by using Node-RED service & python check whether the child is inside the geofence or not. Send the notification to cloud if the child goes out of the geofence . Store all the location data in the cloudant DB and by using the wokwi, if we turn on our push button the LED is on and the message send to the cloud and store in the cloud DB.

2.2 REFERENCES

[1] 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. The parameters such as touch, temperature & heartbeat of the child are used for parametric analysis and results are plotted for the same. 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.

2.3 PROBLEM STATEMENT DEFINITION

Parents have No other Option for View the Exact Scenario of the Children in Emergency Situation when they away from them. Customer must prioritize when providing a safe and secure. Customer can easily monitor their child location where they are now with a video when they leave geofence . With a smart GPS, watch your child always monitor the location of your child.

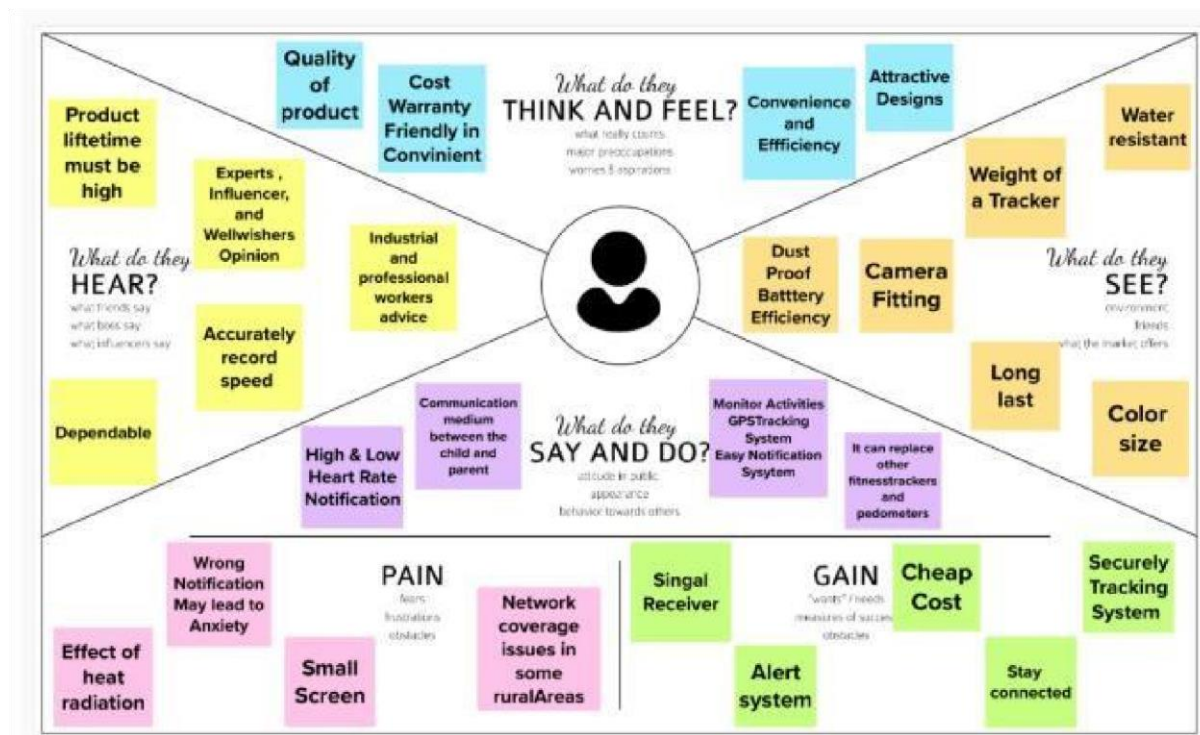


3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

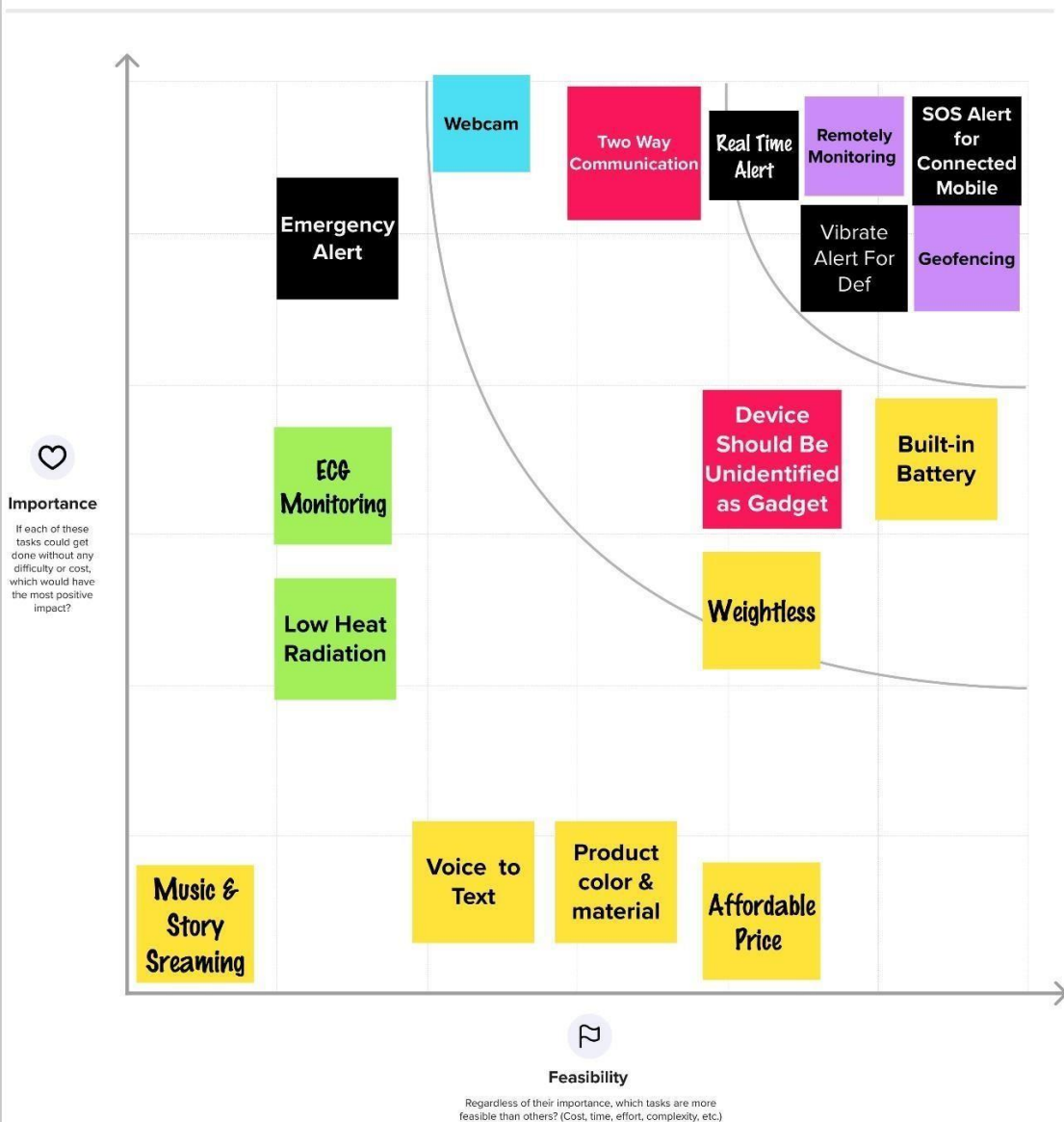
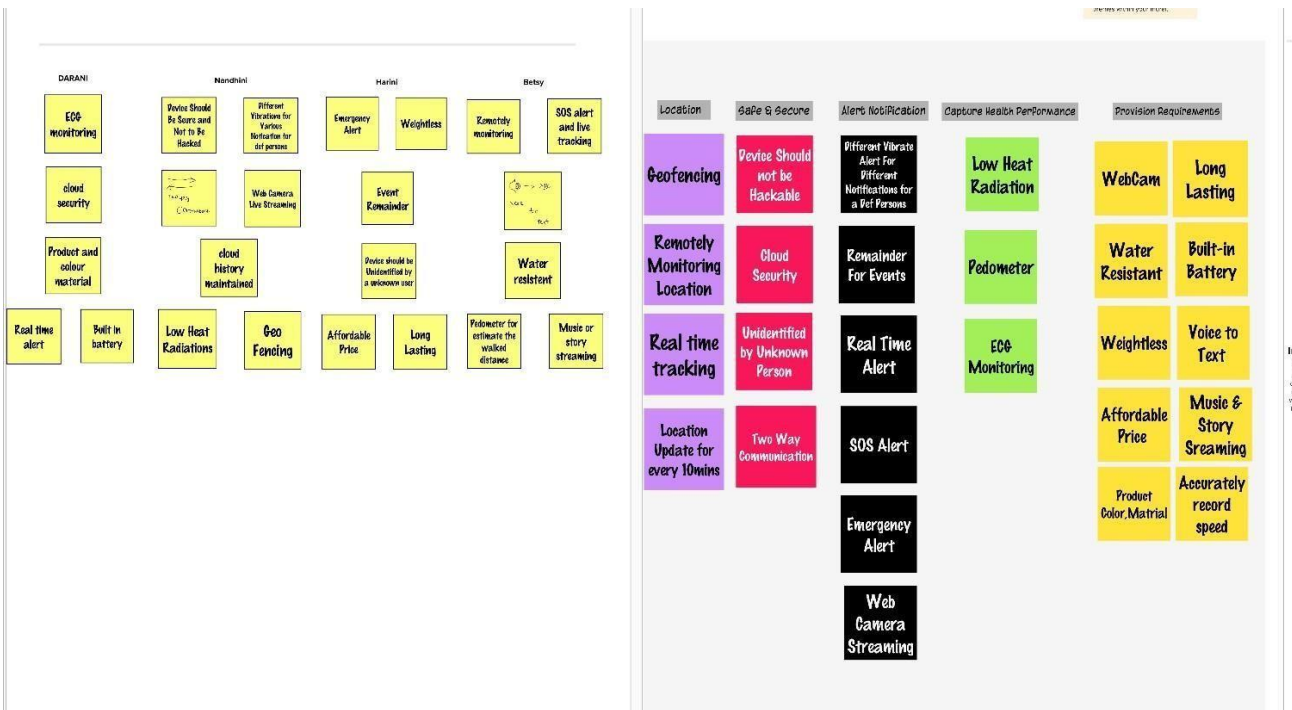
A collaborative tool teams can use to gain a deeper insight into their customers. Much like a user persona, an empathy map can represent a group

of users, such as a customer segment. Once you have clarified the goal, work your way clockwise around the canvas, until you have covered Seeing, Saying, Doing, and Hearing.



3.2 IDEATION & BRAINSTORMING

Ideation is often closely related to the practice of brainstorming, a specific technique that is utilized to generate new ideas. A principal difference between ideation and brainstorming is that ideation is commonly more thought of as being an individual pursuit, while brainstorming is almost always a group activity.



3.3 PROPOSED SOLUTION

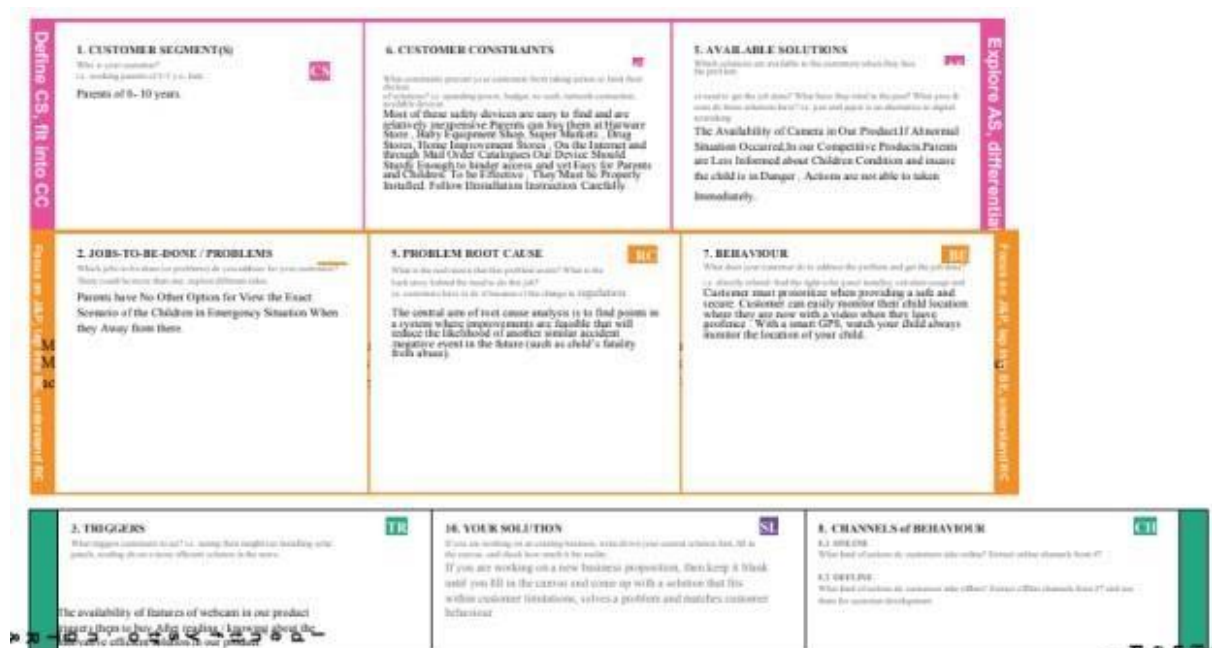
To overcome the existing solution by using Node-RED service & python check whether the child is inside the geofence or not. Send the notification to cloud if the child goes out of the geofence . Store all the location data in the cloudant DB and by using the wokwi, if we turn on our push button the LED is on and the message send to the cloud and store in the cloud DB.

	Parameter	Description
1.	Problem Statement (Problem to be solved)	Parents have No other Option for View the Exact Scenario of the Children in Emergency Situation when they away from them.
2.	Idea / Solution description	We have Overcome this Issue in Our Proposed Solution by using Web camera. When Children leave Geofences and the time of Panic Button is On, the Alert Will be Sent to the Parents /Gaurdians and they can able to view the live streaming video of children where they are now. The LED will blink when the children get out of the geofence .
3.	Novelty / Uniqueness	The Uniqueness in our Solution is we have attached a Webcamera so that the Parent can know their child's status in emergency Situation. The LED (red) will blink when it's go out of Geofence.
4.	Social Impact / Customer Satisfaction	In case Situations happen, As Notifications will be sent to Parents with a Video so that Actions can be done on right time. Through this, Child Safety can be ensure and Crime rate will be reduced. The LED (red) blink indicate the children it's not a safe zone. Parent can keep their children Safe and Secure with tension free Minded when they away from them.
5.	Business Model (Revenue Model)	In Market, Such as Kids in the Home, the consumer market, or kids in Schools. The revenue model is whether ad-supported or fee-based subscription or licensing.

6.	Scalability of the Solution	This Gadget Consists of Webcam, Panic Button, GPS Tracker, LEDs(Red-Alert the children when out of geofence , Green- This Indicates the GSM Signal , White- ON When Charging, OFF-When charge is full ,Blue-This shows the GPS Signal.)
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3.4 PROBLEM SOLUTION FIT

Most of these safety devices are easy to find and are relatively inexpensive. Parents can buy them at Hardware Store , Baby Equipment Shop, Super Markets , Drug Stores, Home Improvement Stores , On the Internet and through Mail Order Catalogues. Our Device Should Sturdy Enough to hinder access and yet Easy for Parents and Children. To be Effective, They Must be Properly Installed. Follow Installation Instruction Carefully.



4. EMOTIONS: BEFORE / AFTER	The Solution here is, when a children leave a geofence and the time of the panic button is on & the alert will be send to the parents with a live video streaming.	Social Media Videos Made by the users of This Gadget other People are why the Gadgets are Useful. Advertise Online with Influencers to let the product a Word of Mouth among Consumers.
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4.REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIUREMENT

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	IN MOBILE APP , User Registration	Registration through Gmail. Registration through Phone Number.
FR-2	User Confirmation	Confirmation via OTP to Email. Confirmation via OTP to Phone number.
FR-3	User Login	Set Username and Password.
FR-4	App Permissions	Allow App to Access Notifications from gadget, Data Usage, Enable Accessibility etc,.
FR-5	User Dashboard	Show Menu, In that there is Location Setting for Geofence and Settings Option for Notifications etc,.
FR-6	IN GADGET , SOS Button	On by Children when there is unwell Situation and the time of Fear for Children.
Fr-7	LED On	When Geofence Crossed – RED Blinks. When charging - WHITE. When GPS Network is gone Low – BLUE Blinks. When GSM GOOD – GREEN. BAD – Green BLINKS.
FR-8	Notifications	When Geofence out, The Camera is ON and send it as Notification to the Parents.

4.2 NON FUNCTIONAL REQUIREMENT

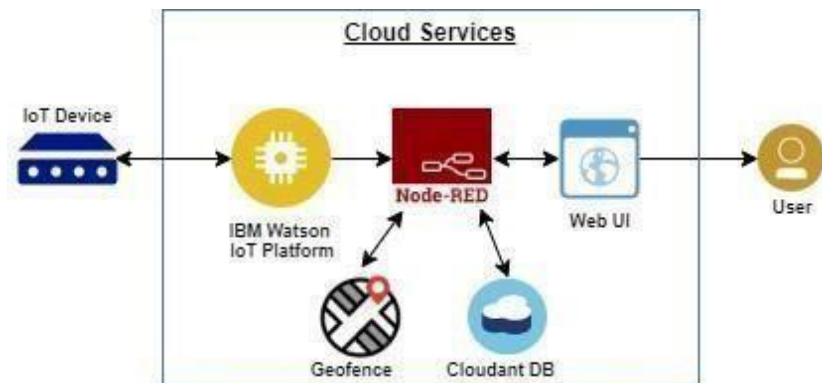
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The Gadget is Designed for Security Purposes at Emergencies to give GPS locations, videos scenario, and notification in real-time with instant time.
NFR-2	Security	Access Permissions for the Particular System Information is Only be Changed or Accessed by the System Administrator (Parents/Gaurdians) who was Monitor the Children.
NFR-3	Reliability	One of the most effective ways to protect children. And we design this Gadget only for Safety of Children and the Parent's Mind free Condition.

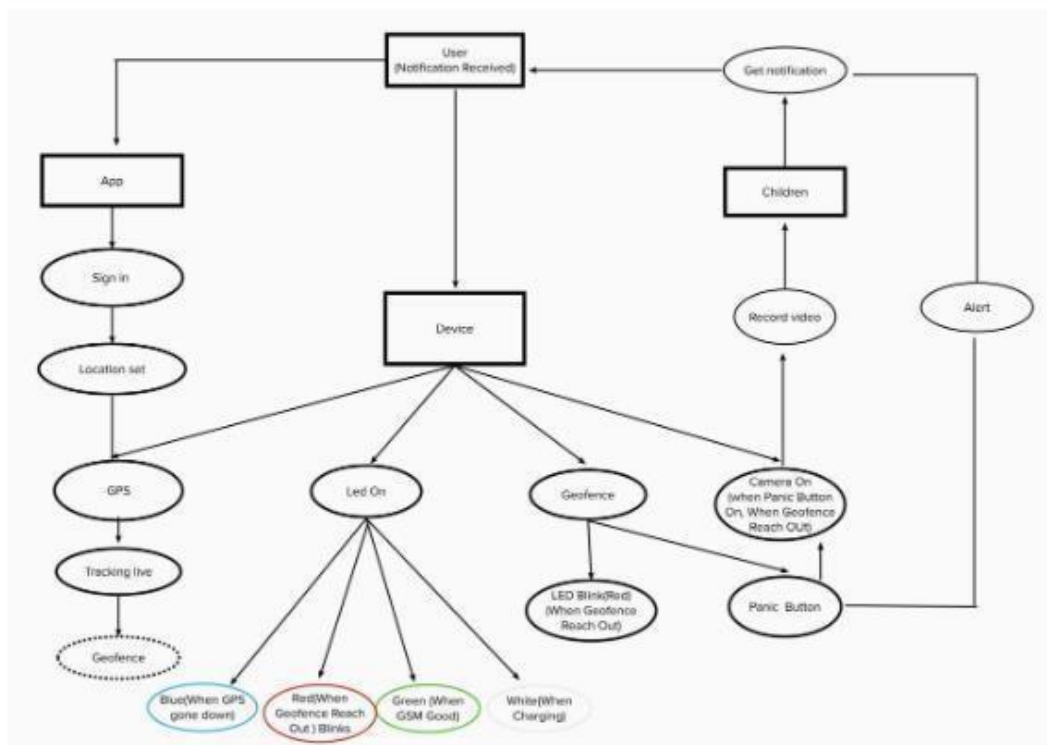
NFR-4	Performance	The load time for any Action is no more than 3 Seconds for Users that access the Work using an High Network Speed.
NFR-5	Availability	The Gadget is Off only if the Charge is dead, Otherwise can't off the Device by Anyone, And it is 24hour Stability for Charge Usage, once Charged fully.
NFR-6	Scalability	The App used for Access the Gadget is limited to Support 100,000 Users at a time. And little Slow for others come After 100,000 and the first batch finish can move fastly in their Work.

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

A data flow diagram (DFD) is a visual representation of the information flow through a process or system. DFDs help you better understand process or system operation to discover potential problems, improve efficiency, and develop better processes. They range from simple overviews to complex, granular displays of a process or system.





5.2 SOLUTION & TECHNICAL ARCHITECTURE

The button used is a push button that is suitable for the raspberry Pi as a controller. They will press a button on the device, then send an input signal to the controller in the form of a Raspberry Pi. The GPS module is used to record current location of the device which is used to track the device if the child is missing. This Gadget was constructed and Work well. When Panic Button is On.

PANIC BUTTON:

The button used is a push button that is suitable for the Raspberry Pi as a controller. They will press a button on the device, then send an input signal to the controller in the form of a Raspberry Pi.

CAMERA:

Then, the camera on the device will automatically capture the photo of the perpetrator's face.

GPS:

The GPS module is used to record current location of the device which is used to track the device if the child is missing.

DETAILS TRANSFERRED:

The input signal that enters the Raspberry Pi control will be forwarded to the server, and the captured image will be detected and once detected, the camera will automatically On, and the live video Streaming will be forwarded to the parent's cellphone.

LED:

The LED will Blink in Red Colour when the child is move away from the Geofence. It Will Indicate the child that it is not a allocated place by the Parents.



Design: The designed Prototype was Constructed in a Plastic Casing. The Designed can be reproduced & fixed at strategic locations.

Usable: These are all Designed for Security Purposes at Emergencies to give GPS locations, videos scenario, and notification in real-time.

Reliable: One of the most effective ways to protect children.

Fuctional: This Gadget was constructed and Work well. When Panic Button is On.

5.3 USER STORIES

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.

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	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Gmail	I can receive Verification Mail and Verify it.	Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password	I can receive Verification Mail and Verify it.	High	Sprint-1
	Dashboard	USN-5	As a User, I can Navigate to the Dashboard after successfully Login to the Application.	I can See the Options Available on the Platform.	High	Sprint-1
Customer Care Executive	Support	USN-6	As a User, I can connect with Experts for clearing Queries and facing any Challenges by interact they can help to overcome that.	I can Chat and Call them and get cleared about any Difficulties Via Toll Free Number.	High	Sprint-2
Administrator	Profile	USN-7	As an Administrator, I can enter my Details as phone number, Gmail, and So on while Registration or Login Process. As an Administrator, I will Manage the Recycle Bin, Backup and Security. As an Administrator, I can Set the Geofence Location Limit. As an Administrator, I am able to View the Notifications from the Gadget.	I can Use the Options Available on the Dashboard.	High	Sprint-3

Customer (Gadget User)	LED	USN-8	As a User, I Can View the LED light glow and Blinks for Various Situation.	I Can View Led glow, When Geofence Crossed – RED Blinks. When charging - WHITE. When GPS Network is gone Low – BLUE Blinks.	High	Sprint-4
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
				When GSM GOOD – GREEN, BAD – Green BLINKS.		
	Panic Button	USN-9	As a User, I can Press the Button when I feel the Situation is Dangerous	Customer (Mobile User) Can Get Notification and also with a Video Streaming.	High	Sprint-4

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Product Backlog, Sprint Schedule, and Estimation

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	1
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	1
Sprint-1		USN-3	As a user, I can register for the application through Gmail	2	Low	1
Sprint-1		USN-4	As a user, I can log into the application by entering email & password	2	Medium	1
Sprint-1	Login	USN-5	As a User, I can Navigate to the Dashboard after successfully Login to the Application.	1	High	1
Sprint-2	Support	USN-6	As a User, I can connect with Experts for clearing Queries and facing any Challenges by interact they can help to overcome that.	3	Medium	2
Sprint-3	Administrator	USN-7	As an Administrator, I can enter my Details as phone number, Gmail, and So on while Registration or Login Process. As an Administrator, I will Manage the Recycle Bin, Backup and Security. As an Administrator, I can Set the Geofence Location Limit. As an Administrator, I am able to View the Notifications from the Gadget.	3	High	2

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Project Kit Simulation (LED)	USN-8	As a User, I Can View the LED light glow and Blinks for Various Situation.	3	High	4
Sprint-4	Project Kit Simulation (Panic Button)	USN-9	As a User, I can Press the Button when I feel the Situation is Dangerous	3	High	4

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	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	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)

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

6.3 REPORTS FROM JIRA

		NOV
Sprints	IBSG...	IBSGFCMN Sprint 2, IBS...
>  IBSGFCMN-12 Registration		
>  IBSGFCMN-14 Support		 
>  IBSGFCMN-15 Login		 
>  IBSGFCMN-16 Administrator		
>  IBSGFCMN-17 Project Kit Simulation		

7.CODING AND SOLUTIONING

```
import json import
```

```
wiotp.sdk.device import time
```

```
myConfig = {
```

```

"identify":{

    "orgId":"rzitd9",
    "typeId":"sensors",
    "deviceId":"5432"

},

"auth": {

    "token":"98765432"

}
}

client      =      wiotp.sdk.device.DeviceClient(config=myConfig,
logHandlers=None) client.connect()

```

while True:

```

    name = "Smartbridge"

    #in are location    latitude=17.4225176
longitude=
78.5458842

```

```

#out area location

```

```

#latitude= 17.4219272

```

```

#longitude=78.5488783

```

```

myData={'name':name,'lat':latitude,'lon':longitude}

```

```
client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=0,onPublish=None)
```

```
print("Data Published to IBm IOT Platform: ",myData)
```

```
time.sleep(5) client.disconnect()
```

8.TESTING

8.1 TEST CASES

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation Y/N	BUG ID
LoginPg_Tc_001	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup popup displayed or not	https://shopnizer.com/	Login/Signup popup should display	Working as expected	Pass			
LoginPg_Tc_002	UI	Home Page	Verify the UI elements in Login/Signup popup		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	https://shopnizer.com/	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Working as expected	Fail	Steps are not clear to follow		BUG 1234
LoginPg_Tc_003	Functional	Home page	Verify user is able to log into application with Valid credentials		1.Enter URL(https://shopnizer.com/) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: chalum@gmail.com password: Testing123	User should navigate to user account homepage					
LoginPg_Tc_004	Functional	Login page	Verify user is able to log into application with Invalid credentials		1.Enter URL(https://shopnizer.com/) and click go 2.Click on My Account dropdown button 3.Enter Invalid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: chalum@gmail.com password: Testing123	Application should show 'Incorrect email or password' validation message.					

8.2 USER ACCEPTANCE TESTING

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved



Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	5	4	2	3	17
Duplicate	1	0	3	0	8
External	2	3	0	1	6
Fixed	8	2	3	14	23
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	0	6
Totals	16	14	12	19	63



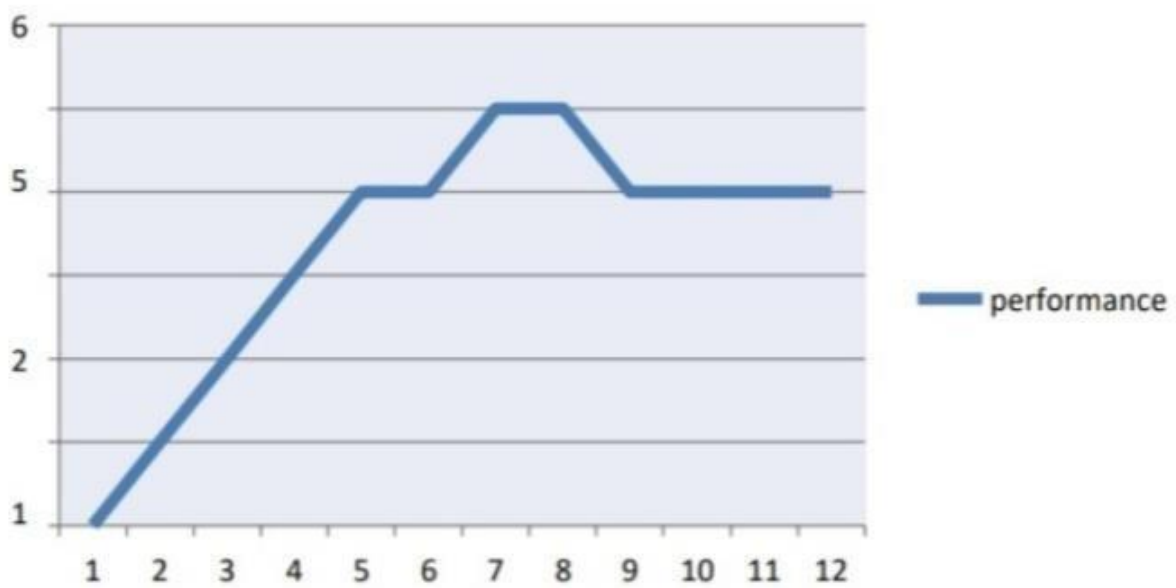
3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS

9.1 PERFORMANCE TESTING



10. ADVANTAGES & DISADVANTAGES

ADVANTAGES :

It assists parents to monitor their children remotely.

When Children leave Geofences and the time of Panic Button is On, the Alert Will be Sent to the Parents /Gaurdians and they can able to view the live streaming video of children where they are now.

A GSM module that allows the child to be monitored at all times.

The LED will blink when the children get out of the geofence .

It is more efficiency staying connected.

DISADVANTAGES:

The amount of data storage depends on memory size of your smart watch.

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

It employs Bluetooth as the way of communication in between parent and the child.

11. CONCLUSION

Throughout the research, it is clearly explained the IoT concept, child safety issues and the need of using child security system. It assists parents to monitor their children remotely. In case situations happen, notifications will be sent to parents so that actions can be taken. By using Node-RED service & python check whether the child is inside the geofence or not. Send the notification to cloud if the child goes out of the geofence . Store all the location data in the cloudant DB and by using the wokwi, if we turn on our push button the LED is on and the message send to the cloud and store in the cloud DB.

12. FUTURE SCOPE

This research demonstrates Smart IoT device for child safety and tracking helping the parents to locate and monitor their children. If any abnormal values are read by the sensor then an SMS is sent to the parents mobile and an MMS indicating an image captured by the serial camera is also sent. The future scope of the work is to implement the

IoT device which ensures the complete solution for child safety problems.

13.APPENDIX

SOURCE CODE:

```
import json import
wiotp.sdk.device import time
```

```
myConfig = {
    "identify":{
        "orgId":"rztid9",
        "typeId":"sensors",
        "deviceId":"5432"
    },
    "auth": {
        "token":"98765432"
    }
}
```



```
client      =      wiotp.sdk.device.DeviceClient(config=myConfig,
logHandlers=None) client.connect() while True:
    name = "Smartbridge"

    #in are location    latitude=17.4225176
longitude=
78.5458842

    #out area location
    #latitude= 17.4219272
    #longitude=78.5488783

    myData={'name':name,'lat':latitude,'lon':longitude}

    client.publishEvent(eventId="status",msgFormat="json",data=myData,
qos=0,onPublish=None)

    print("Data Published to IBm IOT Platform: ",myData)
time.sleep(5) client.disconnect()
```

