

PROJECT **REPORT**

PROJECT TITLE: IoT Based Safety Gadget for Child Safety Monitoring & Notification

TEAM ID: PNT2022TMID14244.

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HARIPRASAD E

INBARAJ M

KARTHICK K

1.INTRODUCTION:

1.1 Project Review:

The main idea of this wearable arrangement arises from the challenging need for child safety as there can be circumstances where child gets missing in most of the crowded areas. This work mainly focuses on the vital aspect that lost children can be helped by the public. This system plays an important role in the protection of the kid until brought together with their parents. Arduino Uno microcontroller board based on the ATmega328P is the platform used for running. The process of communication with SMS is provided by the Arduino GSM Module by the use of the GSM network. And it will make available the current location of the kid to the concerned parents via short message service.

2.PURPOSE:

Wearable device The wearable device is not constructed on a system on chip SOC model. But it has been anticipated to use bigger components and in future, it can be built on the SOC platform. The wearable device acquires collection of data from the various modules that are connected to it.

2.LITERATURE SURVEY:

2.1.Existing Problem:

1.Authors: M Nandini Priyanka, S Murugan, K. N. H. Srinivas, T. D. S. Sarveswararao, E. KusumaKumari.

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.

2. Authors: Aditi Gupta, Vibhor Harit. Published in:

Title: Child Safety & Tracking Management System by using GPS. 2016 IEEE.

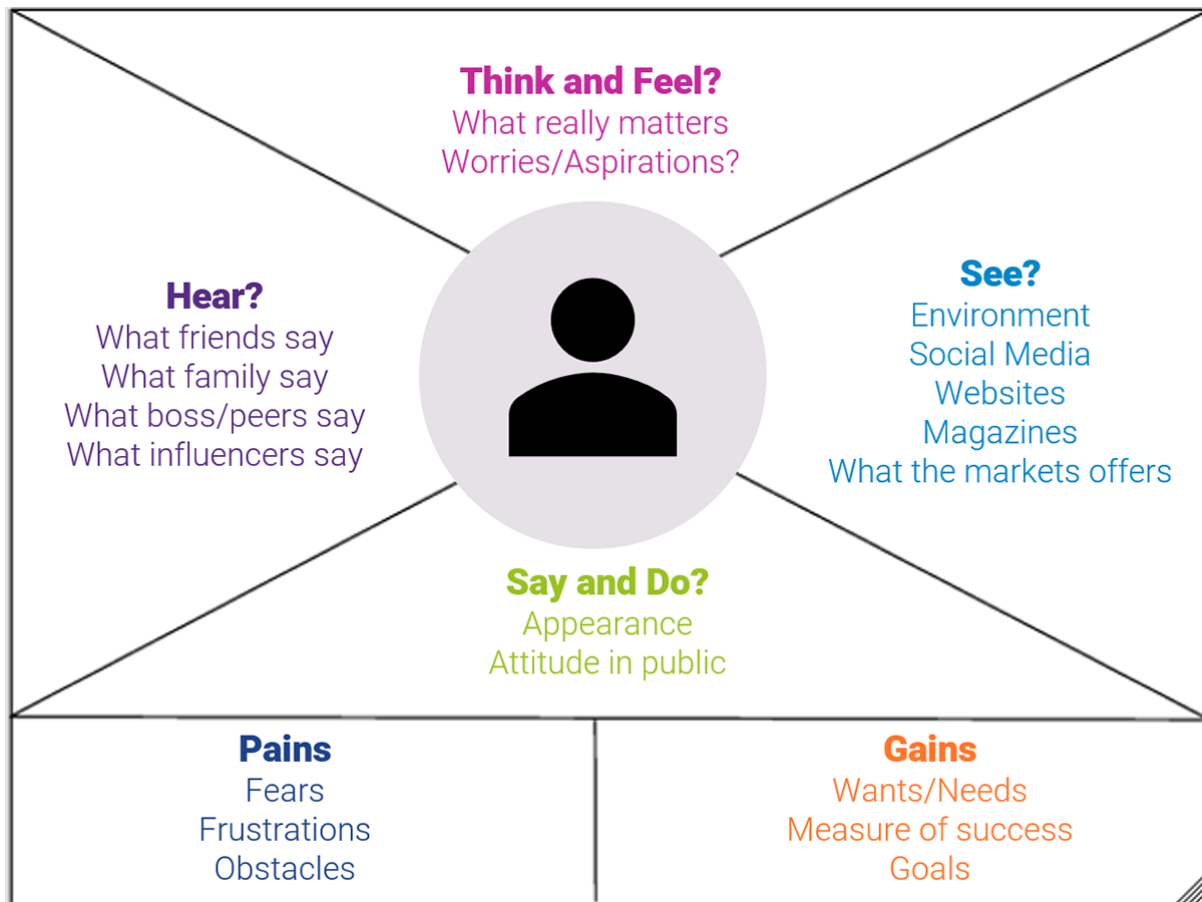
This paper proposed a model for child safety through smart phones that provides the option to track the location of their children as well as in case of emergency children is able to send a quick message and its current location via Short Message services.

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.

3.IDEATION PHASE AND PROPOSED SOLUTION:

3.1 Empathy Canvas:



3.2.Ideation and brainstorming:

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

Gathering information: previously there were approaches that were implemented to solve child monitoring system. Many schools and families use different types of approaches to locate and monitor children.

Problem statement: More family's spent their time for work and social duties but since Children are gift of GOD they need care of family. The current situation of our country is not comfortable for monitoring children in school. With the absence of child monitoring system it is hard to monitor the where about of children.

Step-2: Brainstorm, Idea Listing and Grouping:

Modeling: Based on the information we have gathered through interviewing the problems of the current monitoring system in our context designed the flow chart, system design and ER diagram for the project.

Team members 1 and 2: Enable sending of notification if the child is out of location or when the device realizes abnormal conditions/situations.

Team members 3 and 4: To trigger the alarm and enable automatic video recording whenever the emergency button is pressed. Then, emergency notification along with real-time video will be sent to and display in the parents' mobile apps.

Hardware and Software: the hardware construction and software implementation with Application software.

Evaluation and Conclusion: Based on the proposed system conclusion and evaluation of work is done.

3.3.problem solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	More family's spent their time for work and social duties but since Children are gift of GOD they need care of family. The current situation of our country is not comfortable for monitoring children in school. With the absence of child monitoring system it is hard to monitor the where about of children.
2.	Idea / Solution description	<ul style="list-style-type: none">• Enable tracking of the child's location and capturing of data remotely such as temperature, pulse, respiratory rate, quality of sleep and many more.• To show the child's actual data with reference values.• Enable sending of notification if the child is out of location or when the device realizes abnormal conditions/situations.• To trigger the alarm and enable automatic video recording whenever the emergency button is pressed. Then, emergency notification along with real-time 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.
3.	Novelty / Uniqueness	To overcome all such problems the recent innovations and technologies are recommended to improve the safety measure on children security. The Smart watches for kids can provide maximum services what parents need to know from their children place. But it can give only main areas which found in the GPS system.
4.	Social Impact / Customer Satisfaction	In our system, we provide an environment where this problem can be resolved in an efficient manner. It makes parents to easily monitor their children in real time just like staying beside them as well as focusing on their own career without any manual intervention.

5.	Business Model (Revenue Model)	one of the most dynamic and exciting developments in information and communications technology is the advent of the Internet of Things (IoT). Although networking technologies have become increasingly ubiquitous over the past two decades, until recently they have largely been restricted to connecting traditional end-user devices, such as mainframes, desktop and laptop computers, and, more recently, smartphones and tablets.
6.	Scalability of the Solution	The proposed system is equipped with GSM and GPS modules for sending and receiving call and SMS between safety gadget and parental phone, the proposed system also consists of Wi-Fi module used to implement IoT and send all the monitoring parameters to the cloud for android app monitoring on parental phone.

3.4.problem solution kit:

3.4.1.PROBLEM ROOT CAUSE:

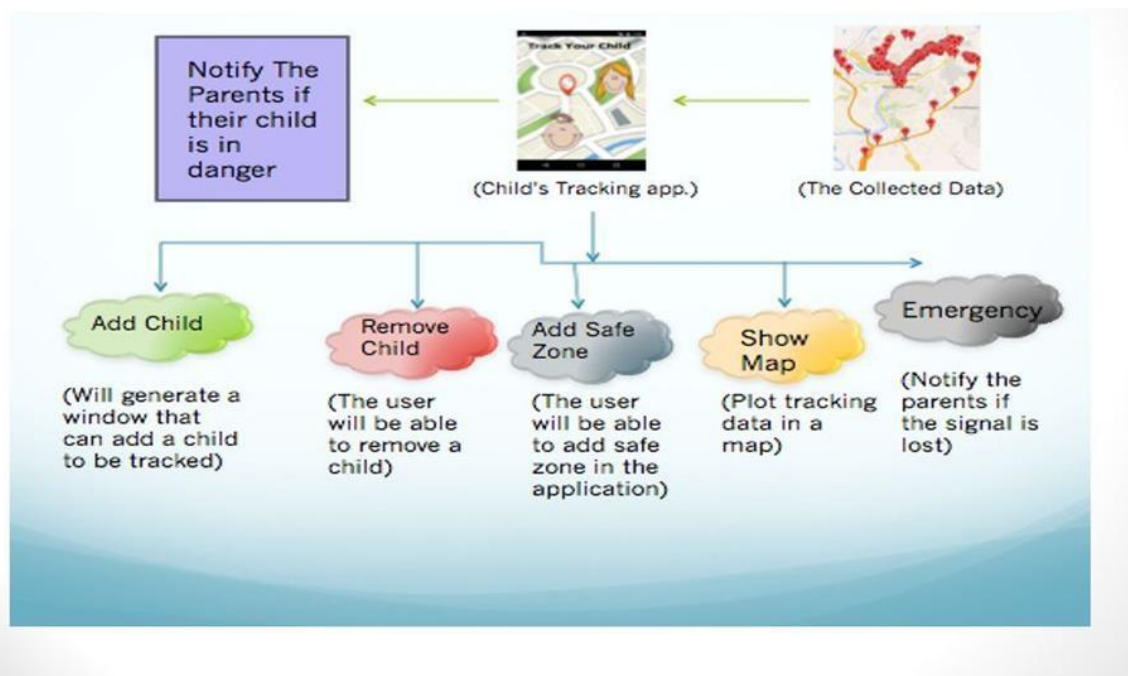
The poor performance of family's and school to monitor the children's by Collaboration. The use of manual system to connect family's and their students most of time teachers or other persons are intermediate between the students and family. In our country families and their children have no direct contact in school when they need to contact their children if the families came to school.

Lack of child monitoring in school affects the child's behavior. Under age children may be premature in the way they act and places to be. Most of human behavior is shaped in childhood stage, in order to get morally acceptable behavior child monitoring system is necessary.

Children are prone to many accidents. Safety of children is very critical since children cannot protect themselves.

.COUSTMER SEGMENT:

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



- Enable tracking of the child's location and capturing of data remotely such as temperature, pulse, respiratory rate, quality of sleep and many more.
- To show the child's actual data with reference values.
- Enable sending of notification if the child is out of location or when the device realizes abnormal conditions/situations.
- To trigger the alarm and enable automatic video recording whenever the emergency button is pressed. Then, emergency notification along with real-time video will be sent to and display in the parents' mobile apps.

4. REQUIREMENTS ANALYSIS:

4.1 Functional Requirements:

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 Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Mail Confirmation via OTP
FR-3	User Notification	Notification to registered Mobile number Notification via message
FR-4	User location check	Check through accounts

Non-functional Requirements:

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

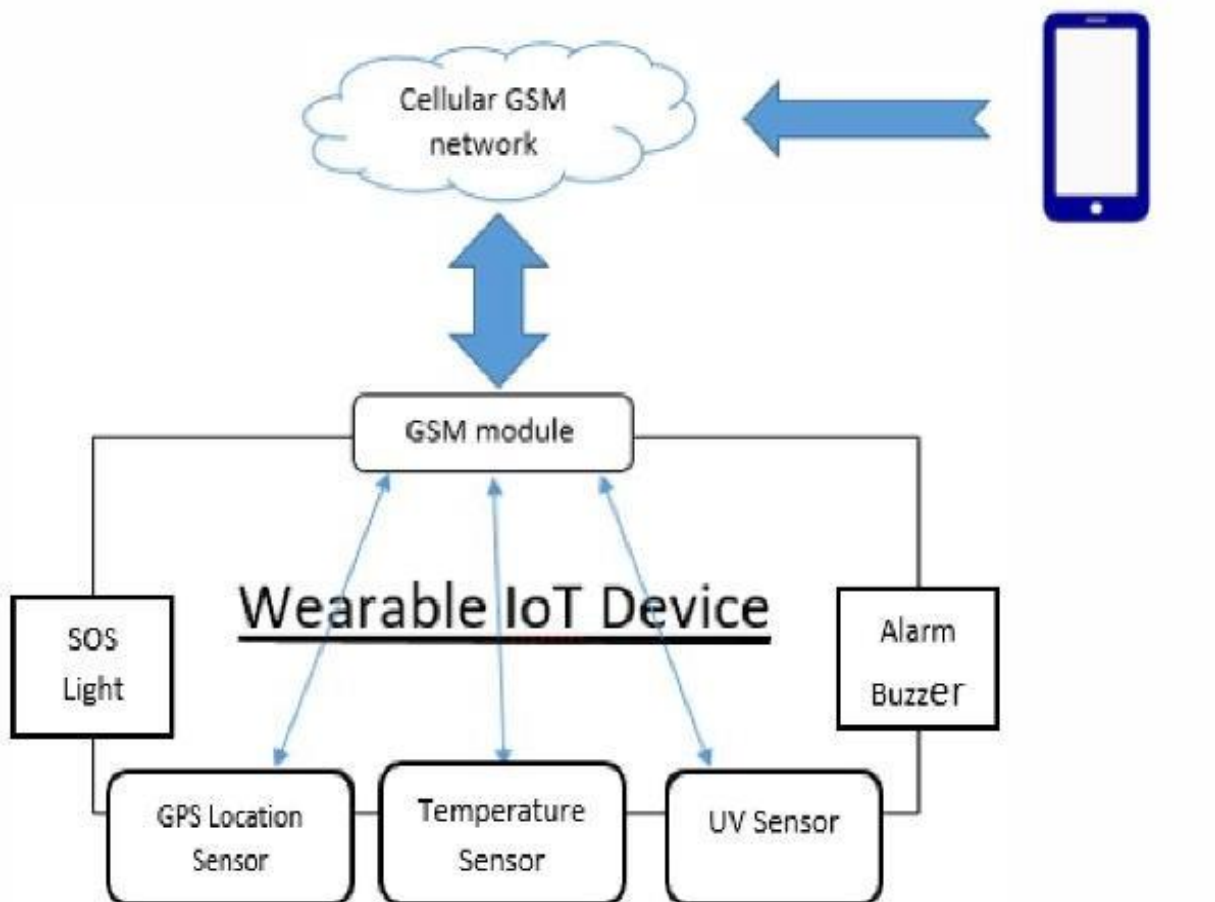
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Develop a prototype of IoT wearable smart band connected to parents' mobile apps so that they can monitor the actual condition of children at anytime and anyplace.
NFR-2	Security	Creates a secure environment for child to move around.

NFR-3	Reliability	Increased reliability towards technology and reduced reliability towards guardians.
NFR-4	Performance	High performance in terms of simple usage and security.

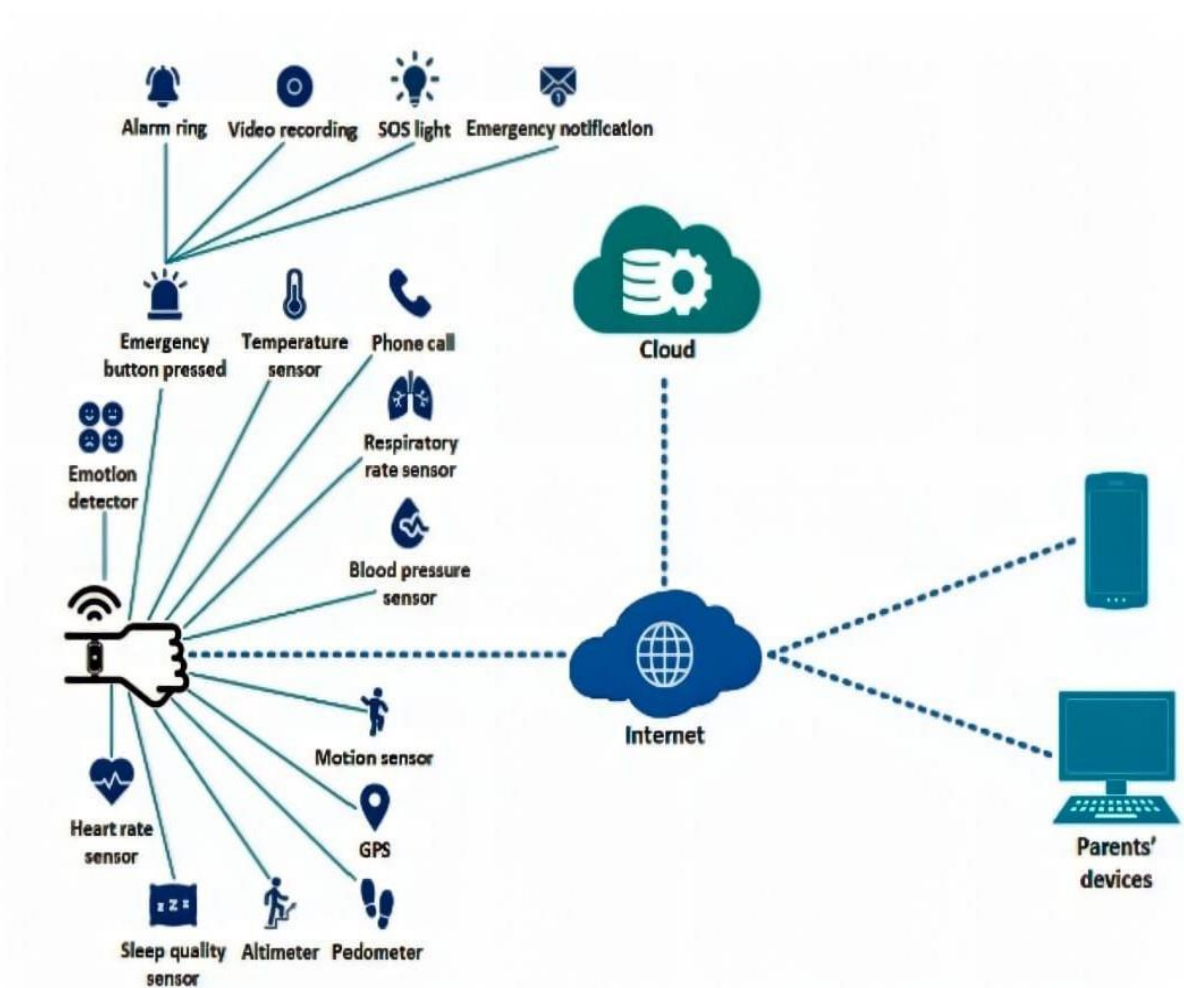
NFR-5	Availability	High usage backed up by power supply.
NFR-6	Scalability	increase in performance.

5.PROJECT DESIGN:

5.1.Data flow diagram:



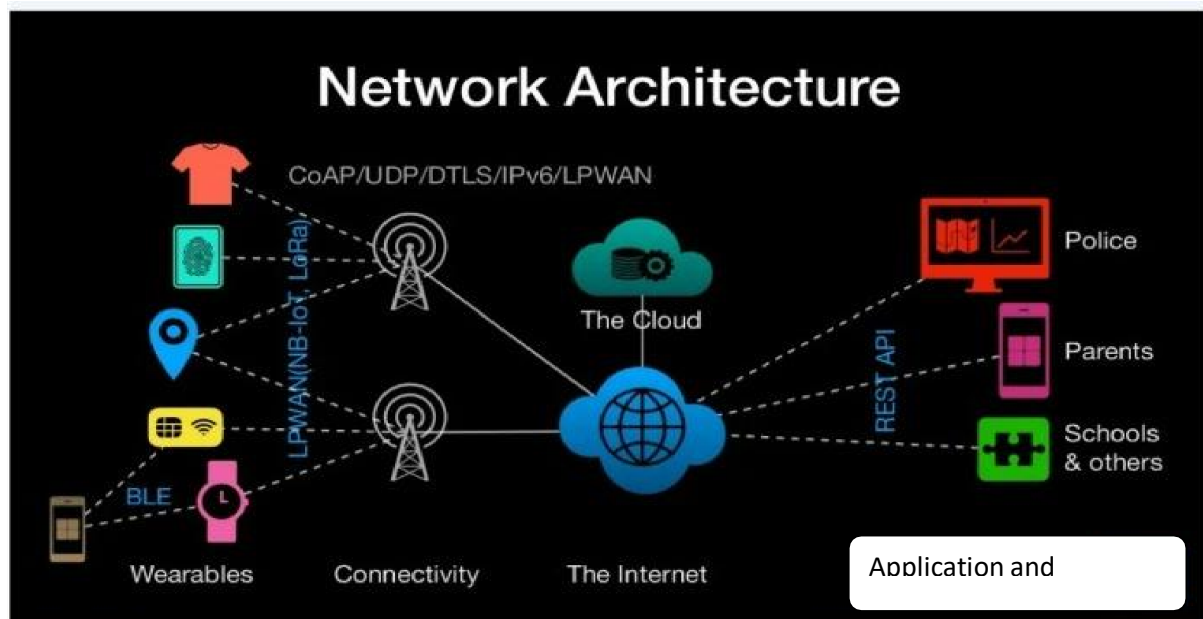
5.2.SOLUTION ARCHITECTURE:



5.3.USER STORIES:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	we can register for the application by entering my email, password, and confirming my password.	we can access my account /dashboard	High	Sprint-1
		USN-2	we will receive confirmation email once I have registered for the application	we can receive <u>confirmationemail</u> & click confirm	High	Sprint-1
		USN-3	we can register for the application through Google Account	we can register & access the dashboard with <u>GoogleLogin</u>	Low	Sprint-2
	Login	USN-4	we can log into the application by entering email & password		High	Sprint-1
	Dashboard					
Customer Care Executive	Login		we can view the working of the application and scan for any glitches and monitor the operation and check if all the users are authorized.	we can login only with my provided credentials.	Medium	Sprint-3
Administrator	Login		We can also Maintaining and making sure the database containing the locations are secure and accurate and updated constantly.	we can login only with my provided credentials.	High	Sprint-3

6.TECHNICAL ARCHITECTURE:



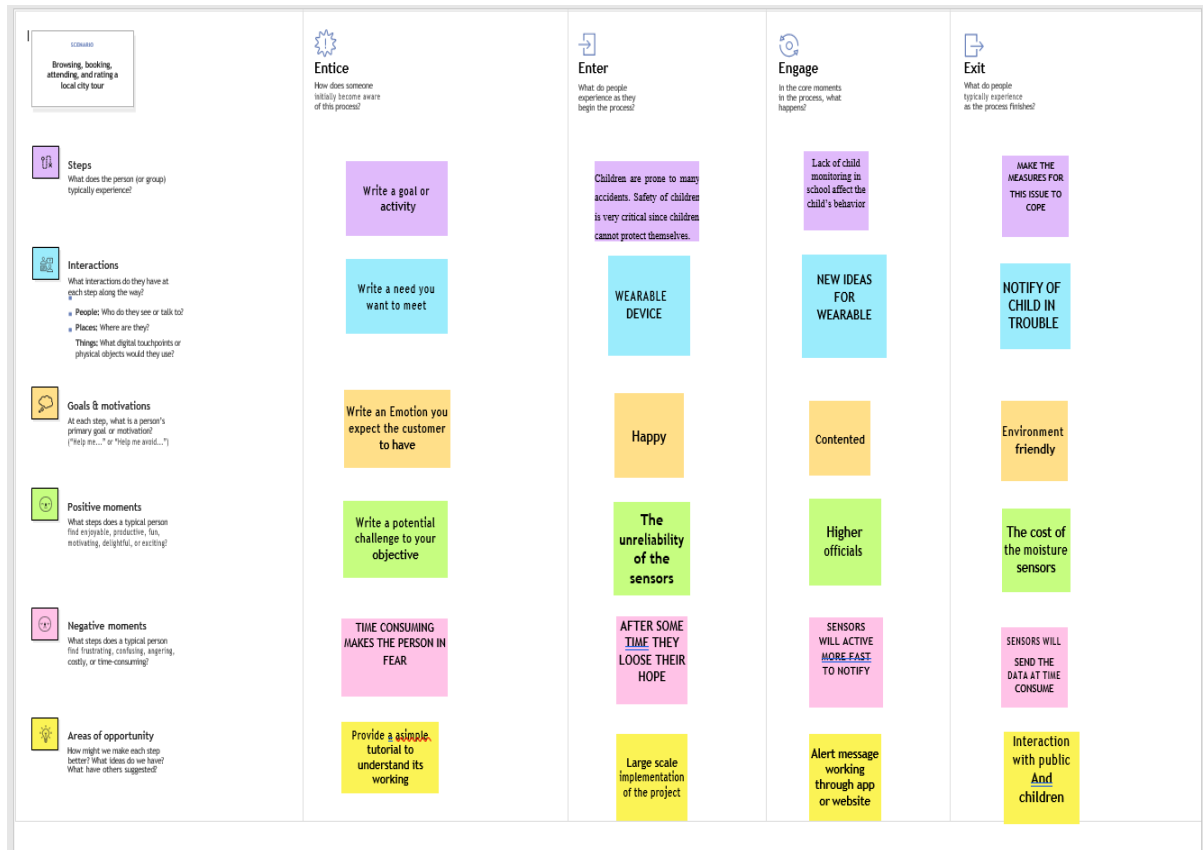
6.1:COMPONENTS AND TECHNOLOGIES:

S.No	Component	Description	Technology
1.	User Interface	User had to register and view the other device's location. e.g. Web UI, Mobile App etc.	HTML, CSS, JavaScript
2.	IoT Application Logic-1	Registration of child's and parent's device in each others device	Python
3.	IoT Application Logic-2	Child's GPS should be in on condition, Parent's B device should always connected to Child's device	IBM Watson Assistant IBM
4.	IoT Application Logic-3	If child shouts out of danger it will be notified to parent's device by tracking & converting using STT Data	Watson STT Service SQ lite,
5.	Database	Type can be any format such as arbitrary binary data, text.User-defined blob of data sent from Cloud IoT Core to a device etc.	In Flux DB
6.	Cloud Database	Users install tracking software on a cloud infrastructure to implement the database.	IBM DB2, IBM Cloudant etc.
7.	File Storage	Files will be labeled with what they contain and how long they should be kept.	IBM Block Storage or Local Filesystem
8.	External API-1	Purpose of External API used in the device is to use the internet for communicating and conducting allotted operations efficiently.	Aadhar API, etc.
9.	External API-2	External API used in the device to expose data that enables those devices to transmit data to your device/mobile, acting as a data interface.	City Geo-Location Lookup API etc.
10.	Machine Learning Model	IoT and machine learning deliver insights otherwise hidden in data for rapid, automated responses and improved decision making	Object Recognition Model, Danger Prediction Model etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Wearable tech device Cloud Server Configuration: Massive network that supports IoT devices and applications	Local, Cloud Foundry, Kubernetes, Underlying Infrastructure etc.

6.2.APPLICATION CHARACTERISTICS:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Device that removes much of the manual work needed to write and configure code. It provides rapid development, is easy to set up and has a strong support base	Main flux, Thinger.io, Zetta for non-stop streaming of child Condition, Open-remote
2.	Security Implementations	To trigger the alarm and enable automatic voice recording whenever the emergency button is pressed.	e.g. SHA-256, Encryption of data regarding child condition, Firewalls, Antivirus, Data Loss Prevention
3.	Scalable Architecture	If problem arises parents can see the features like location, voice recordings of the child along with live tracking around the children without hindrance	Multiple Data Storage Technologies, Reliable Micro services, Automated Bootstrapping
4.	Availability	Child monitor, audio monitor, location monitor	GPS, GSM, microphone, Raspberry pi microprocessor
5.	Performance	When the child crossed the geo-fence, the device starts record the sound and sends it to the parent(user).	GSM tracker, High Durable Device Battery

6.3CUSTOMER JOURNEY:



7.PROJECT PLANNING AND SCHEDULING:

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, and password, and confirming my password.	4	High	GOWTHAMASARAV ANAN V M

Sprint-1	Confirmation Email	USN-2	As a user, I will receive a confirmation email once I have registered for the application	4	High	HARI PRASAD E
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium	INBARAJ M
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	4	High	KARTHICK K
Sprint-1	Dashboard	USN-1	As a user, I need to be able to view the functions that I can perform	4	High	GOWTHAMASARAV ANAN V M
Sprint-2	Notification	USN-2	As a user, I should be able to notify my parent and guardian in emergency situations	10	High	HARI PRASAD E
Sprint-2	Store data	USN-3	As a user, I need to continuously store my location data into the database.	10	Medium	INBARAJ M

Sprint-3	Communication	USN-1,3	I should be able to communicate with my parents	6	Low	INBARAJ M, <u>GOWTHAMASARAVANAN V M</u>
Sprint-3	IoT Device – Watson communication	USN-1,4	The data from IoT device should reach IBM Cloud	7	Medium	GOWTHAMASARAV ANAN V <u>M,KARTHICK K</u>
Sprint-3	Node RED- <u>Cloudant DB</u> communication	USN-1,2	The data stored in IBM Cloud should be properly integrated with <u>Cloudant DB</u>	7	High	GOWTHAMASARAV ANAN V <u>M,HARI PRASAD E</u>
Sprint-4	User – <u>WebUI</u> interface	USN-1, 1,2 ,4	The Web UI should get inputs from the user	6	High	GOWTHAMASARAV ANAN V <u>M,HARI PRASAD E,KARTHICK K</u>
Sprint-4	Geofencing	USN-1,3,4	The geofencing of the child should be done based on the geographical coordinates	7	High	GOWTHAMASARAV ANAN V <u>M,INBARAJ M,KARTHICK K,</u>

8.CODING AND SOLUTIONING:

FEATURE 1

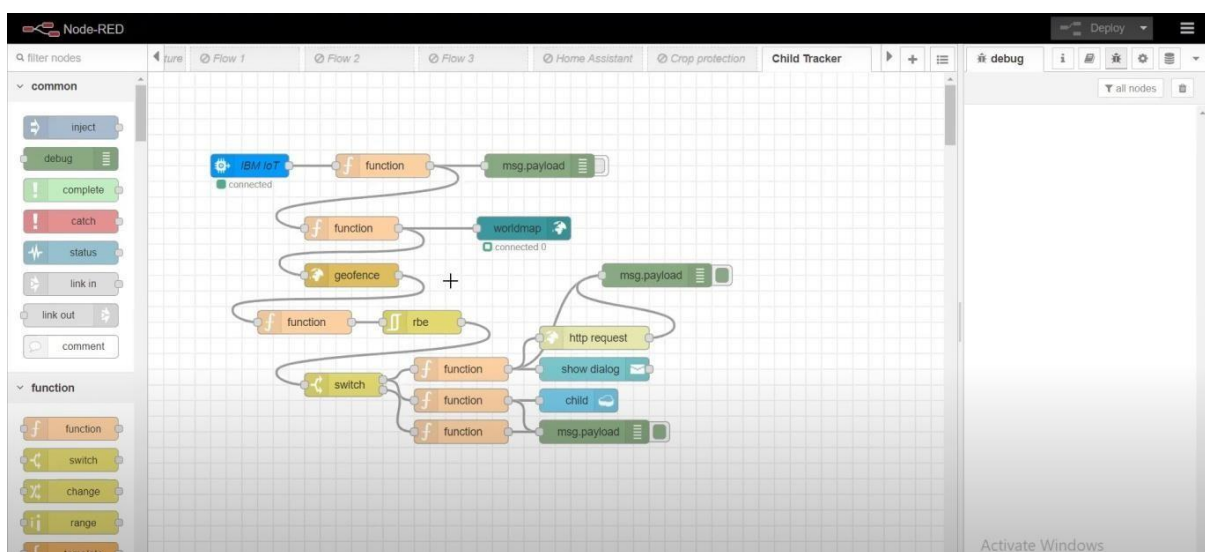
- IoT device
- IBM Watson Platform
- Node red
- Cloudbant DB
- Web UI
- Python code

FEATURE 2

- Login
- Wokwi

9.TESTING AND RESULTS:

Test cases:




```

import json
import wiotp.sdk.device
import time

myConfig = {
    "identity": {
        "orgId": "hj5fmy",
        "typeId": "NodeMCU",
        "deviceId": "12345"
    },
    "auth": {
        "token": "12345678"
    }
}

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

while True:
    name= "Smartbridge"
    #in area location

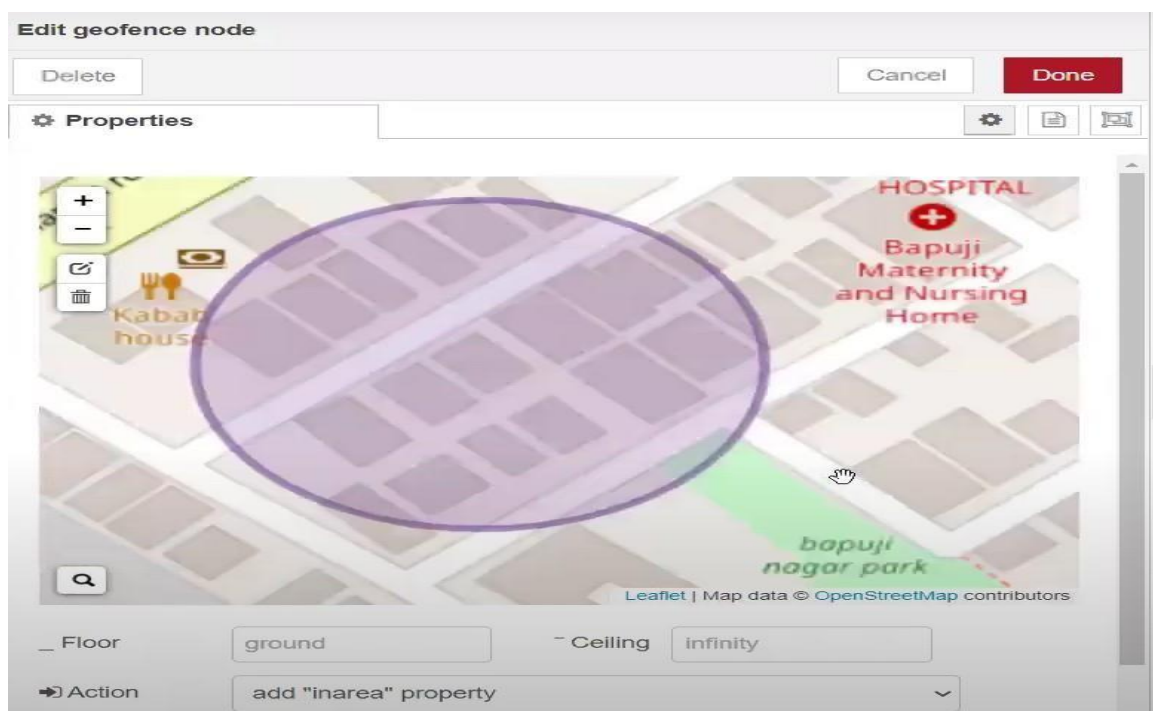
    latitude= 17.4225176
    longitude= 78.5458842

    #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 platfrom: ",myData)
    time.sleep(5)

client.disconnect()

```



10.Advantages:

- Reduced installation cost.
- They monitor 24/7.
- Improved security in homes, industries and Offices.
- It pin points location of the child.

11.Disadvantages:

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

2. 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.

12.CONCLUSION:

Camera Module can be used for surveillance of the child surroundings. This gets a clearer picture of the location or place this wearable can also be incorporated on a camera module . The hardware that can be used would be a adafruit TTL serial camera or any other camera module. Some camera module supports video streaming. Due to the constraint of trying to use only SMS, only four wire connections are used. The red and black wires will be connected directly to +5V and GND respectively to the Arduino Uno board. The RX pin is used for sending data via arduino Uno and GSM board .The TX pin is utilized for receiving incoming data from the modules. The 10 K resistor divider is used. The camera's serial data pins utilizes a 3.3V logic, and it would be a good idea to divide the 5V down so that it reaches 2.5V.Normally the output from the digital 0 pin is 5V high.

13.FUTURE SCOPE:

The child safety wearable system acts as a smart device. Child's surroundings can be located with the help of accurate and precise real-time location. Surrounding environment temperature, SOS light along with Distress buzzers are provided in this system .This helps in locating their child .This also aids the bystanders to rescue the child. The smart child safety wearable can be boosted considerably in the future by using extremely squeezed Arduino modules like

Lily Pad Arduino which can be embroidered into fabrics. Also as a future scope, more power efficient model can be created that holds the battery for a longer time.

14.APPENDIX:

14..SOURCE CODE:

```
#include<WiFi.h>//library for wifi
#include<PubSubClient.h>//library for
MQTT
void callback(char* subscribe topic, byte* payload, unsigned int payload
length);
//-----credentials of IBM Account-----
#define ORG "frpi8s"// IBM ORGANIZATION ID
#define DEVICE_TYPE "NodeMCU"//DEVICE TYPE MENTIONED IN IOT
WATSON
PLATFORM #define DEVICE_ID "12345"//DEVICE ID MENTIONED IN IOT
WATSONPLATFORM
#define TOKEN "12345678"//Token String data3;float
dist;
//-----customize the above value-----char server [] =ORG
".messaging.internetofthings.ibmcloud.com";//servername
char publish topic[]="ultrasonic/evt/Data/fmt/json";/*topic name andtype
of event perform and format
in which data to be send*/
char subscribetopic[]="ultrasonic/cmd/test/fmt/String";/*cmd REPRESENT
Command tupe and
COMMAND IS TEST OF FORMAT STRING*/
char authMethod[]="use-token-auth";//authentication method char
token[]=TOKEN;
char clientid[]="d:" ORG ":" DEVICE_TYPE":" DEVICE_ID;//CLIENT ID
//
WiFiClient wifiClient;// creating an instance for wificlient
PubSubClient client(server, 1883 , callback , wifiClient);/*calling the predefined
client id by passing parameter like server id,portand wificredential*/
int LED =4;
int trig =5; int echo=18; void setup(){
Serial.begin(115200); pinMode(trig,OUTPUT); pinMode(echo,INPUT);
```

```

pinMode(LED,OUTPUT); delay(10); Serial.println(); wificonnect();
mqttconnect();
void loop() { digitalWrite(trig,LOW); digitalWrite(trig,HIGH);
delayMicroseconds(10); digitalWrite(trig,LOW);
float dur=pulseIn(echo,HIGH); float dist=(dur * 0.0343)/2;
Serial.print("distance in
cm"); Serial.println(dist); PublishData(dist);
delay(1000);
if (!client.loop()){ mqttconnect();
}
}
/* .....retriving to cloud.
.....
*/
void PublishData(float dist){ mqttconnect();//function call for connecting to
ibm
/*creating the string in form of JSON to update the data to ibm cloud*/ String
object;if(dist<100)
{
digitalWrite(LED,HIGH); Serial.println("no object is near");
object="Near";
}
else
{
digitalWrite(LED,LOW); Serial.println("no object found"); object="No";
}
String payload="{\"distance\":"; payload +=dist;
payload +=",\" \"object\":\":"; payload += object;
payload += "\"}";
Serial.print("Sending payload: ");
Serial.println(payload);
if(client.publish(publishtopic, (char*) payload.c_str())){
Serial.println("Publish ok");/* if its sucessfully upload data on the
cloud then it will print publish ok in serial monitor or else it will print publish
failed*/
} else{
Serial.println("Publish failed");
}
}
void mqttconnect(){ if(!client.connected()){

```

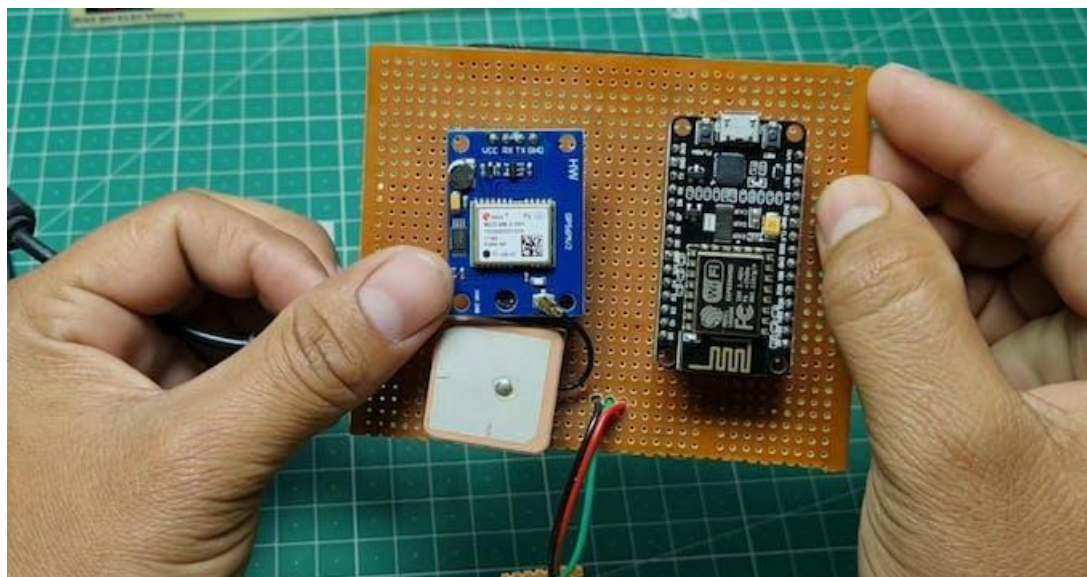
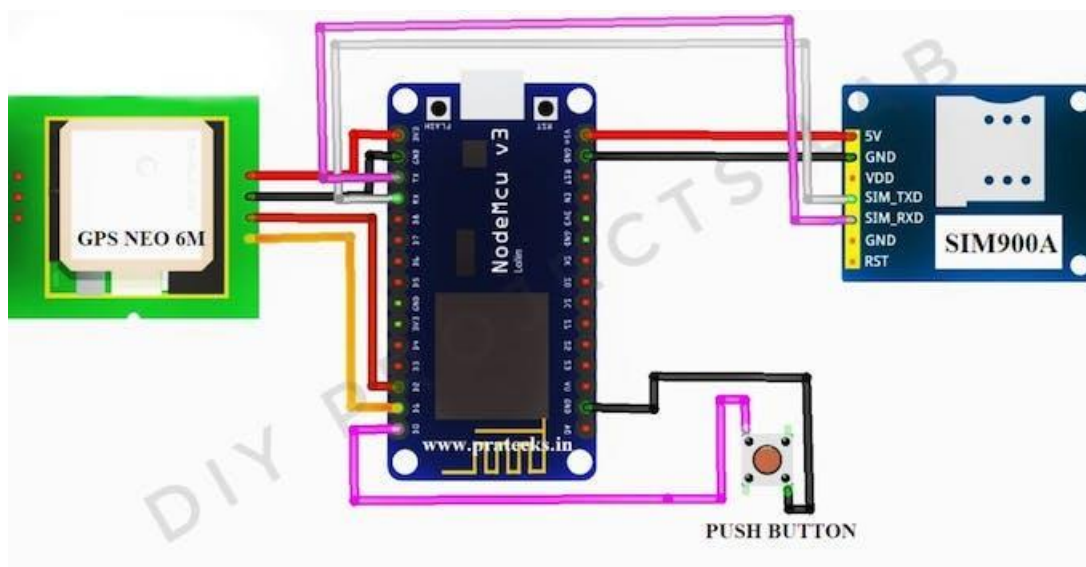
```

Serial.print("Reconnecting client to "); Serial.println(server);
while(!!!client.connect(clientid,authMethod, token)){
Serial.print("."); delay(500);
}
initManagedDevice();
Serial.println();
}
}
void wificonnect();//function defenition for wificonnect
{
Serial.println(); Serial.print("Connecting to ");WiFi.begin("vivo 1816",
"taetae95",6);//PASSING THE WIFI CREDIDENTIALS TO
ESTABLISH CONNECTION
while (WiFi.status() !=WL_CONNECTED){ delay(500);
Serial.print(".");
}
Serial.println(""); Serial.println("WiFi connected"); Serial.println("IP
address");
Serial.println(WiFi.localIP());
}
void initManagedDevice(){ if(client.subscribe(subscribetopic)){
Serial.println((subscribetopic)); Serial.println("subscribe to cmd OK");
}else{
}
}
Serial.println("subscribe to cmd failed");
void callback(char* subscribetopic,byte* payload,unsigned int payloadLength)
{
Serial.print("callback invoked for topic: ");
Serial.println(subscribetopic); for(int i=0; i< payloadLength; i++){
//Serial.print((char)payload[i]); data3 +=(char)payload[i];
}
//Serial.println("dta: "+ data3);
//if(data3=="Near")
//{
//Serial.println(data3);
//digitalWrite(LED,HIGH);
//}
//else //{
//Serial.println(data3);

```

```
//digitalWrite(LED,LOW);//} data3="";  
}
```

OUTPUT:



Service Details - IBM Cloud x IBM Watson IoT Platform x Node-RED: node-red-fetur-202 x +

← → ↻ fpi8s.internetofthings.ibmcloud.com/dashboard/devices/drilldown/NodeMCU:12345?returnTo=/devices/browse

IBM Watson IoT Platform 19ec035@kprlet.ac.in ID: fpi8ts

← Back

Device Drilldown - 12345

Device Credentials

Connection Information

Recent Events

State

Device Information

Metadata

Diagnostics

Connection Logs

Device Actions

Device Credentials

You registered your device to the organization. Add these credentials to the device to connect it to the platform. After the device is connected, you can navigate to view connection and event details.

Organization ID	fpi8s
Device Type	NodeMCU
Device ID	12345
Authentication Method	use-token-auth
Authentication Token	12345678

⚠ Authentication tokens are non-recoverable. If you misplace this token, you will need to re-register the device to generate a new authentication token.

[Find out how to add these credentials to your device](#)

←

Connection Information

26°C Cloudy Search the web ENG IN 08:02 PM 14-11-2022

Browse Action Device Types Interfaces Add Device +

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

Event	Value	Format	Last Received
data	{"Warning":28.95}	json	a few seconds ago
data	{"Warning":28.95}	json	a few seconds ago
data	{"Warning":49.98}	json	a minute ago
data	{"Warning":49.98}	json	a minute ago
data	{"Warning":11.03}	json	a minute ago

GITHUB PROFILE:

[IBM-EPBL/IBM-Project-9373-1658998414](#)