

IoT Based Safety Gadget for Child Safety Monitoring and Notification

1. INTRODUCTION

1.1 Project Overview

- Gain knowledge of Watson IoT Platform.
- Connecting IoT devices to the Watson IoT platform and exchanging the sensor data.
- Gain knowledge on Cloudant DB
- Gain Knowledge of geofence
- Creating a Web Application through which the user interacts with the device.

1.2 Purpose

The project aims to create a system that allows the parents to keep a track of their children when they are out of their sight. This is done using a concealed WFPS-enabled device worn by the child which is connected to the parents' smartphone using a mobile network.

2. LITERATURE SURVEY

2.1 Existing problem.

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

2.2 References

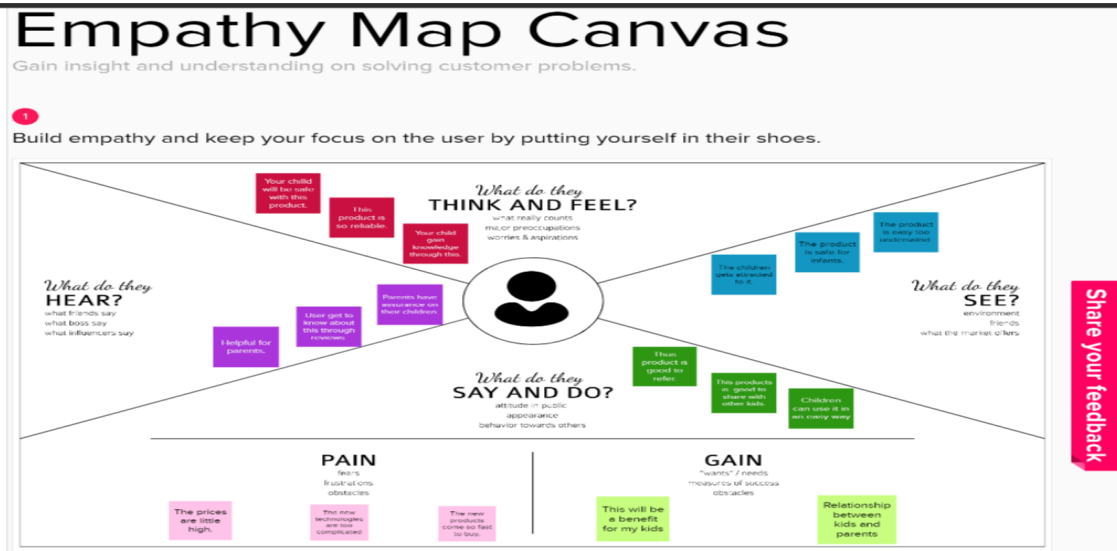
- H. Times, 30 August 2019. [Online]. Available: <https://www.hindustantimes.com/india-news/with-60-000-children-going-missing-in-india-every-year-social-media-has-popelled-child-lifting-fear/storyAvL4yvASen4fgXQPoAkBKP.html>. [Accessed August 2021].
- N. Projects, August 2012. [Online]. Available: <https://nevonprojects.com/child-monitoring-systemapp/>. [Accessed August 2021].
- [3] Ijesc, 2019. [Online]. Available: [https://ijesc.org/upload/4ae0fee98320daeb099ea96feea47ab0.Child%20Monitoring%20System%20\(1\).pdf](https://ijesc.org/upload/4ae0fee98320daeb099ea96feea47ab0.Child%20Monitoring%20System%20(1).pdf). [Accessed November 2021].
- Citeseerx, June 2009. [Online]. Available: <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.332.9054&rep=rep1&type=pdf>. [Accessed October 2021].
- IRJET, June 2020. [Online]. Available: <https://www.irjet.net/archives/V7/i6/IRJET-V7I6756.pdf>. [Accessed August 2021].
- R. Gate, January 2019. [Online]. Available: https://www.researchgate.net/publication/337309815_Child_Safety_Monitoring_System_Based_on_IoT. [Accessed September 2021].

2.3 Problem Statement Definition

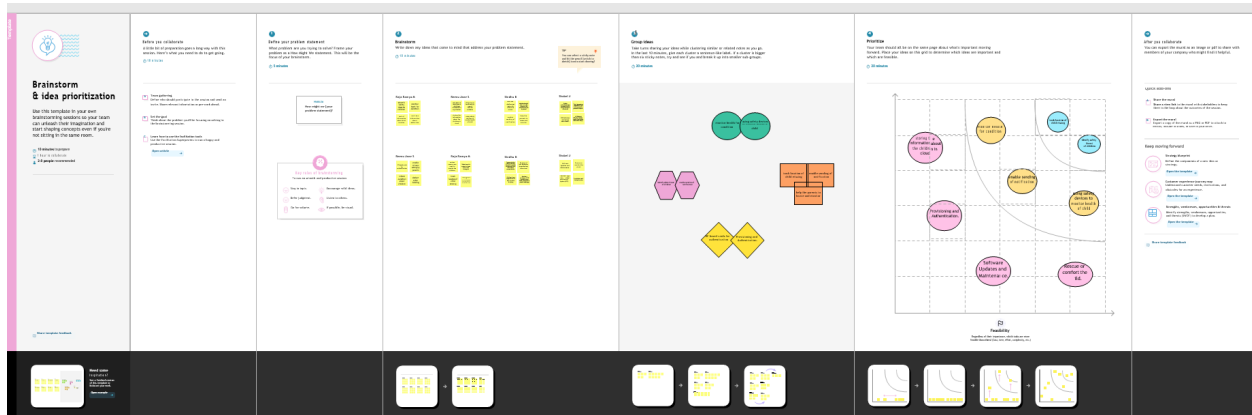
Child tracker helps the parents in continuously monitoring the child's location. They can simply leave their children in school or parks and create a geofence around the particular location. By continuously checking the child's location notifications will be generated if the child crosses the geofence. 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.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming



3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement(Problem to be solved)	Identify and manage a child's location,safety,security and authentication in order to intimate parents about their child's status.
2.	Idea / Solution description	Solution which will try to overcome the disadvantages of the existing systems and aims at providing false proof safety to women.IoT based safety device that relies on providing security to children.
3.	Novelty / Uniqueness	Additional features such as sending messages,audio messages are part of the proposed design. A mobile app is designed for child safety where safe locations from the victim's current location will be shown on the map so that parents can reach the safe place from their current location.
4.	Social Impact / Customer Satisfaction	The main purpose of this app is to provide a safe platform through Android phones which provides consumer valuable information.
5.	Business Model (Revenue Model)	IoT service providers will use their own IoT business models, architectures, and operating platforms.
6.	Scalability of the Solution	The ability to go from prototype to production in a seamless way.

3.4 Problem Solution fit

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) <i>Who is your customer? i.e. working parents of 0-5 y.o. kids</i> Parents who wants to monitor their children 24/7	6. CUSTOMER CONSTRAINTS <i>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.</i> Some inconvenient in monitoring the device	5. AVAILABLE SOLUTIONS <i>Which solutions are available to the customers when they face the problem</i> <i>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 is an alternative to digital notetaking</i> If there is danger for the child alert message will popup in parents mobile.	Explore AS, differentiate
Focus on J&P, map into	2. JOBS-TO-BE-DONE / PROBLEMS <i>Which problem do you solve for your customer? There could be more than one, explore different sides.eg. existing solar solutions for private houses are not considered a good investment (1).</i> Always locate the children lively.	9. PROBLEM ROOT CAUSE <i>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.</i> Lack of network efficiency will restrict location tracking.	7. BEHAVIOUR <i>What does your customer do to address the problem and get the job done?</i> When location of the child is unable to detect parents will contact the security services.	Focus on J&P, map into
	3. TRIGGERS <i>What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.</i> When their mobile is not capable to connect the IOT device 4. EMOTIONS: BEFORE / AFTER <i>How do customers feel when they face a problem or a job and afterwards?</i> Insecurity of disconnection -->Control of device makes them confident	10. YOUR SOLUTION <i>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.</i> To show live location of child anytime in parents mobile. To alert parents when child go across the geofence.	8.CHANNELS of BEHAVIOUR CH 8.1 ONLINE 8.2 OFFLINE ONLINE Parents will access the security service in online mode(Web Service) OFFLINE Parents will access the security service in offline mode(call using telephone)	Activ Go to S

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

- The system shall allow the user or family's to register phone number.
- The system shall provide report for the ongoing day to day activity both for the schools and families.
- The system should provide all the sensed data from each sensor send by text message.
- The system shall check the sensed data with the threshold value of each input.

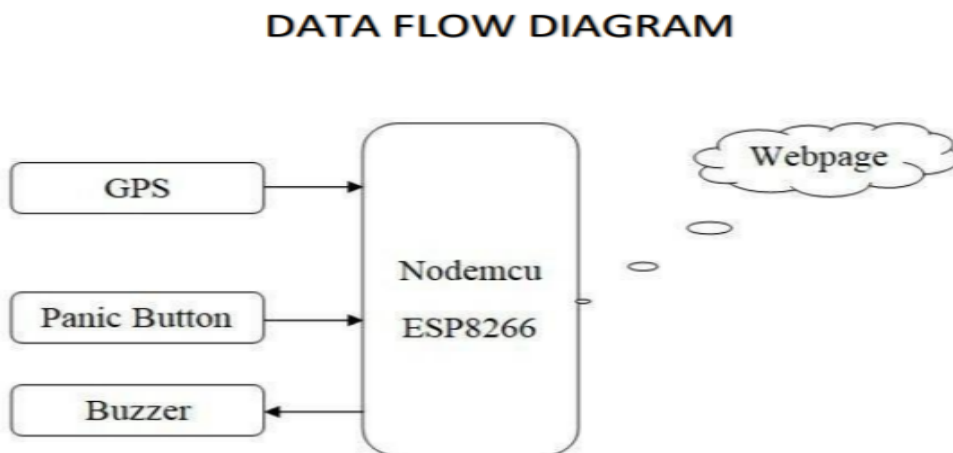
- The system shall notify the user while the input value exceed or become below the threshold value.

4.2 Non-Functional requirements

- The system shall give the accurate result for different factors using sensing material as a result their will not be any distractive damage.
- The system shall be maintainable whenever faller occurs.
- Sometime the GPS module works on rainy condition.
- The system is cost effective comparing to the features it provides.
- The system shall be usable within a few minutes training

5. PROJECT DESIGN

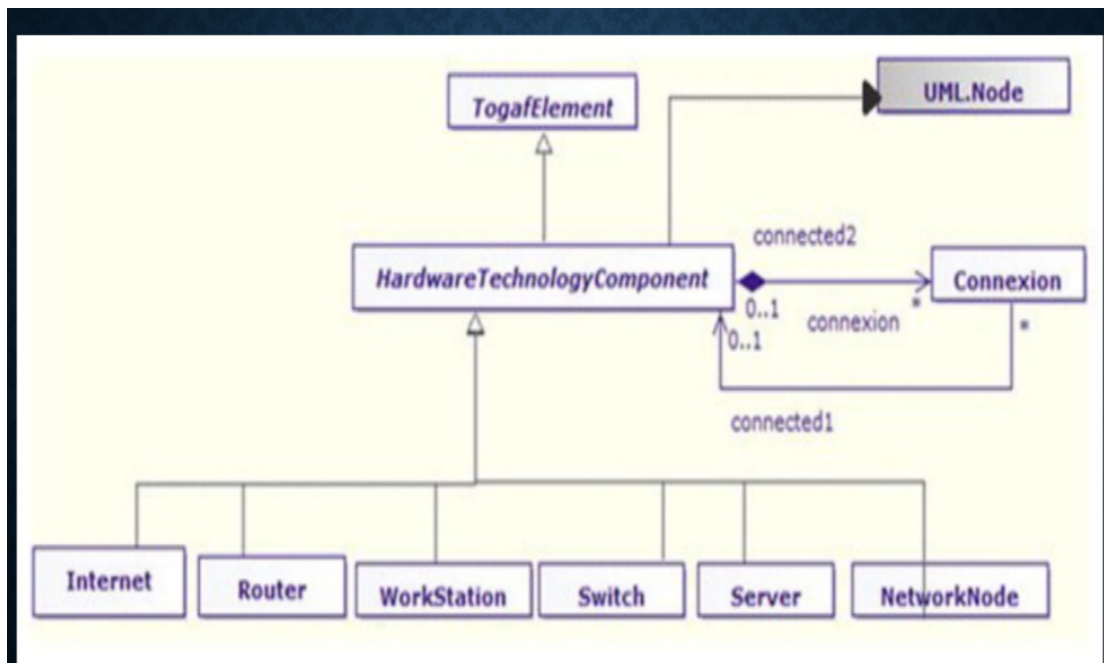
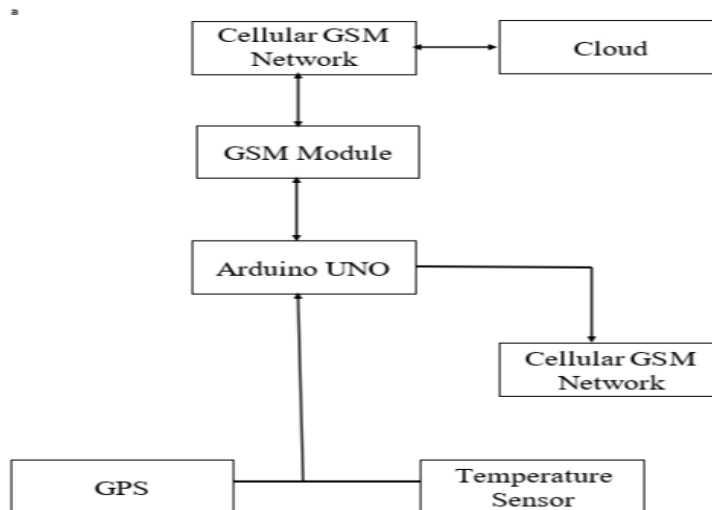
5.1 Data Flow Diagrams

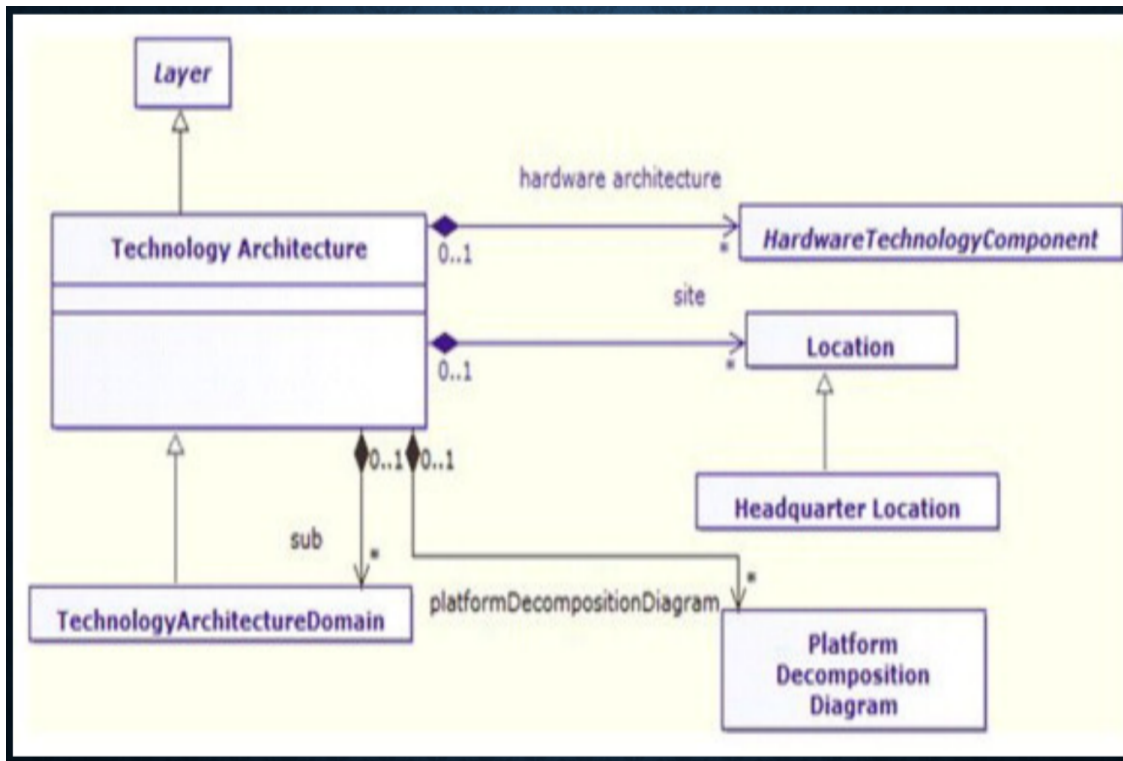


5.2 Solution & Technical Architecture

Project Design Phase-1 Solution

Architecture





5.3 User Stories

customer journey.pdf 1 / 1 13% +

Customer experience journey map

Use this framework to better understand customer needs, motivations, and obstacles by illustrating a key scenario or process from start to finish. When possible, use this map to document and summarize interviews and observations with real people rather than relying on your hunches or assumptions.

Product School

Where template feedback

Document an existing experience

Narrow your focus to a specific scenario or process within an existing product or service. In the **Steps** row, document the step-by-step process someone typically experiences, then add detail to each of the other rows.

Tip: As you add detail to the experience, make sure to document the "why" behind the steps, as you are documenting the process.

	Recognize Identifying, learning, understanding, and using a brand or idea	Enter How does someone already become aware of this process?	Engage What do people experience as they begin the process?	Engage In the process, what happens?	Exit What do people typically experience at the process finish?	Extend What happens after the experience is over?
Steps What does the person (or group) typically experience?						
Interactions What interactions do they have at each step along the way? • People: Who do they see or talk to? • Places: Where are they? • Things: What digital touchpoints or physical objects would they use?						
Goals & motivations What are they looking for in this process (primary goal or motivation)? (Think how, or "What are we here for?")						
Positive moments What steps show a special person that anticipates, understands, fulfills, motivates, delights, or excites?						
Negative moments What steps show a special person that anticipates, understands, fulfills, motivates, delights, or excites?						
Areas of opportunity What might we learn about this process? What could we do better? What have others suggested?						

Activate Windows
Go to Settings to activate Windows.

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.	4	High	M.Raja Ramya
Sprint-1	Confirmation Email	USN-2	As a user, I will receive confirmation email and SMS once I have registered for the application	3	High	S.Reenu Jane
Sprint-2	Authentication	USN-3	As a user, I can register for the application through Email ID and Mobile App.	2	Low	J.Shobel
Sprint-1	Login	USN-4	As a user, I can log into the application	2	Medium	B.Sindhu

			by entering email & password.			
Sprint-1	Dashboard	USN-5	As a user, I can monitor, measure, analyze relevant data in key areas.	8	High	M.Raja Ramya
Sprint-2	Notification	USN-1	As a user, I should be able to receive notification when the child is in emergency situations.	9	High	S.Reenu Jane
Sprint-2	Store data	USN-2	As a user, I need to store the location data and child information into the database.	10	High	J.Shobel
Sprint-2	Communication	USN-3,1	The child and the parent should be able to communicate.	7	Medium	B.Sindhu

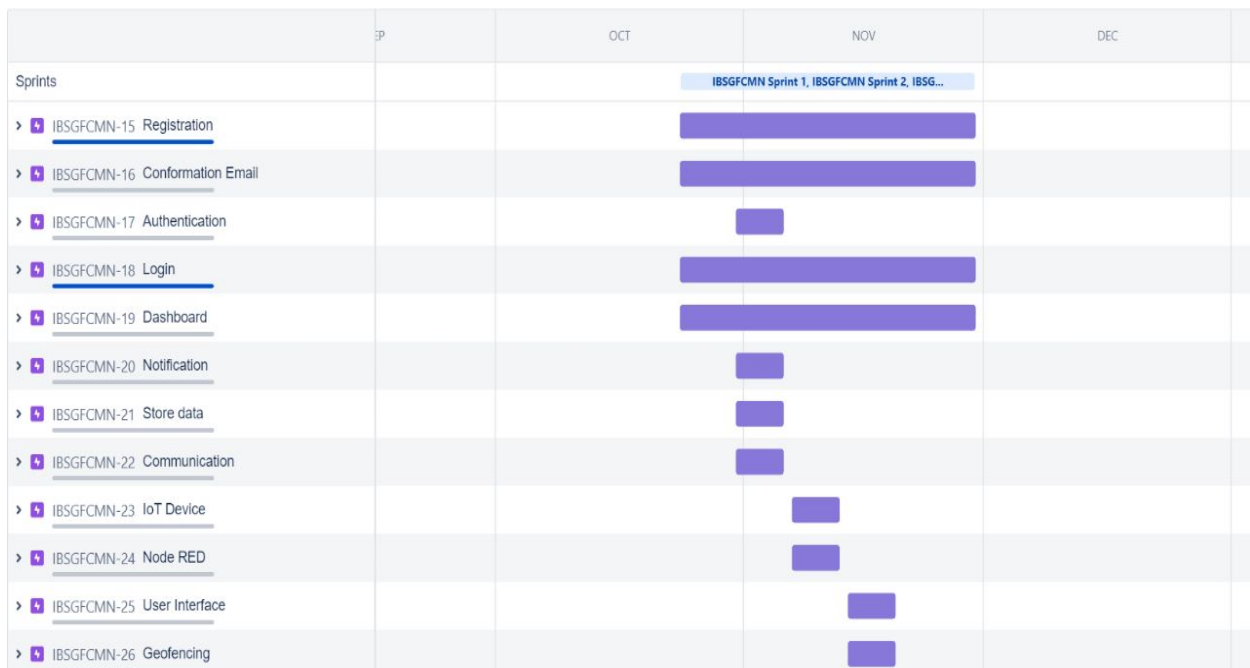
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	IoT Device	USN-1,4	We automatically monitor the child in real time using Internet of Things, with the help of GPS, GSM, and Arduino.	6	Medium	M.Raja Ramya
Sprint-3	Node RED	USN-5,2	The data stored in IBM Cloud should be integrated properly.	8	High	S.Reenu jane
Sprint-4	User Interface	USN-1,4	The point of human-computer interaction and communication in a device.	7	Medium	J.Shobel
Sprint-4	Geofencing	USN-2,3,5	Based on the geographical coordinates, the geofence of the child can be done.	8	High	B.Sindhu

6.2 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	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	19 Nov 2022

6.3 Reports from JIRA



7. CODING & SOLUTIONING

7.1 Feature 1

```
#include <TinyGPS++.h>
#include <Wire.h>

#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x20,16,2);
TinyGPSPPlus gps;
void getgps(TinyGPSPPlus &gps);

void setup() {
    // put your setup code here, to run once:
    Serial.begin(9600);
    lcd.begin(16,2);
    lcd.init();           // initialize the lcd
    lcd.init();
    // Print a message to the LCD.
    lcd.backlight();
}

void getgps(TinyGPSPPlus &gps)
{
    if (gps.location.isValid() and gps.date.isValid() and gps.time.isValid())
    {
        Serial.print("Latitude: ");
        Serial.println(gps.location.lat(), 6);
        Serial.print("Longitude: ");
        Serial.println(gps.location.lng(), 6);
        //Serial.print("Altitude: ");
        //Serial.println(gps.altitude.meters());
        lcd.setCursor(0,0);
        lcd.print("lat->");
        lcd.print(gps.location.lat(), 6);
        lcd.setCursor(0,1);
        lcd.print("lon->");
    }
}
```

```
lcd.print(gps.location.lng(), 6);  
delay(2000);  
lcd.clear();  
lcd.setCursor(0,0);  
lcd.print("Date->");  
lcd.print(gps.date.month());  
lcd.print("/");  
lcd.print(gps.date.day());  
lcd.print("/");  
lcd.print(gps.date.year());  
lcd.setCursor(0,1);
```

```
lcd.print("Time->");  
lcd.print(gps.time.hour());  
lcd.print(":");  
lcd.print(gps.time.minute());  
lcd.print(":");  
lcd.print(gps.time.second());  
delay(2000);  
lcd.clear();
```

```
}  
else  
{  
  Serial.println("Location: Not Available");  
}
```

```
}
```

```
void loop() {  
  // put your main code here, to run repeatedly:  
  byte a;  
  if (Serial.available() > 0 )  
  {  
    a = Serial.read();
```

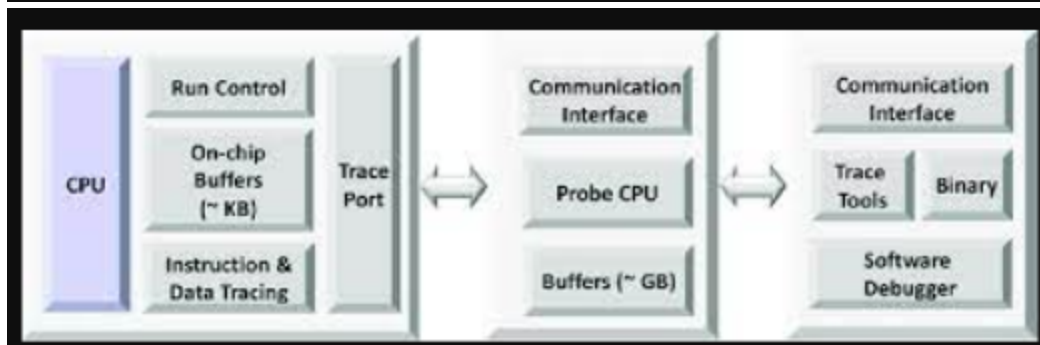
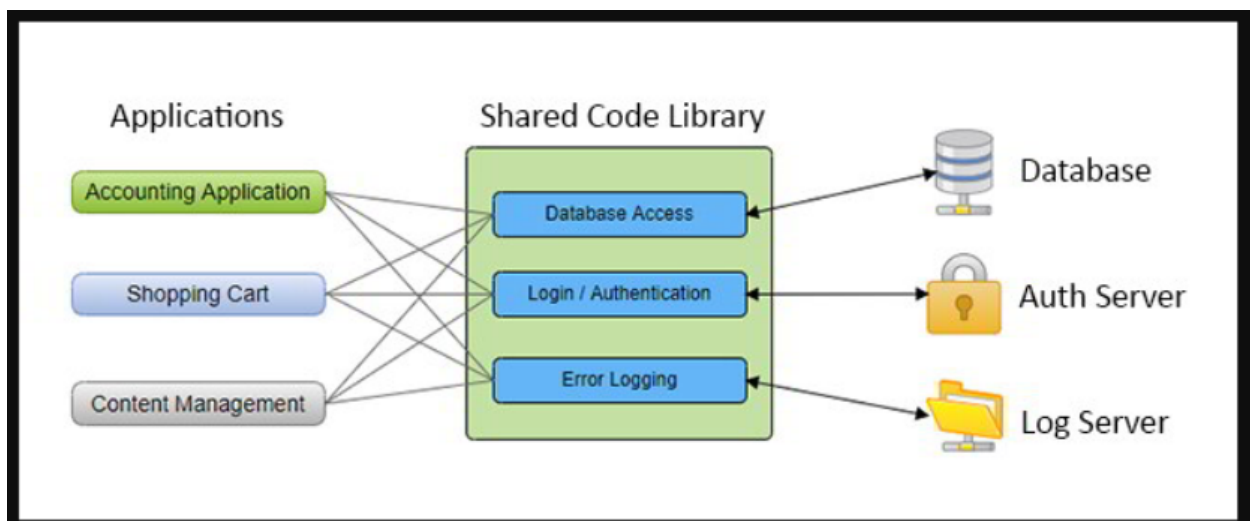
```
,
```

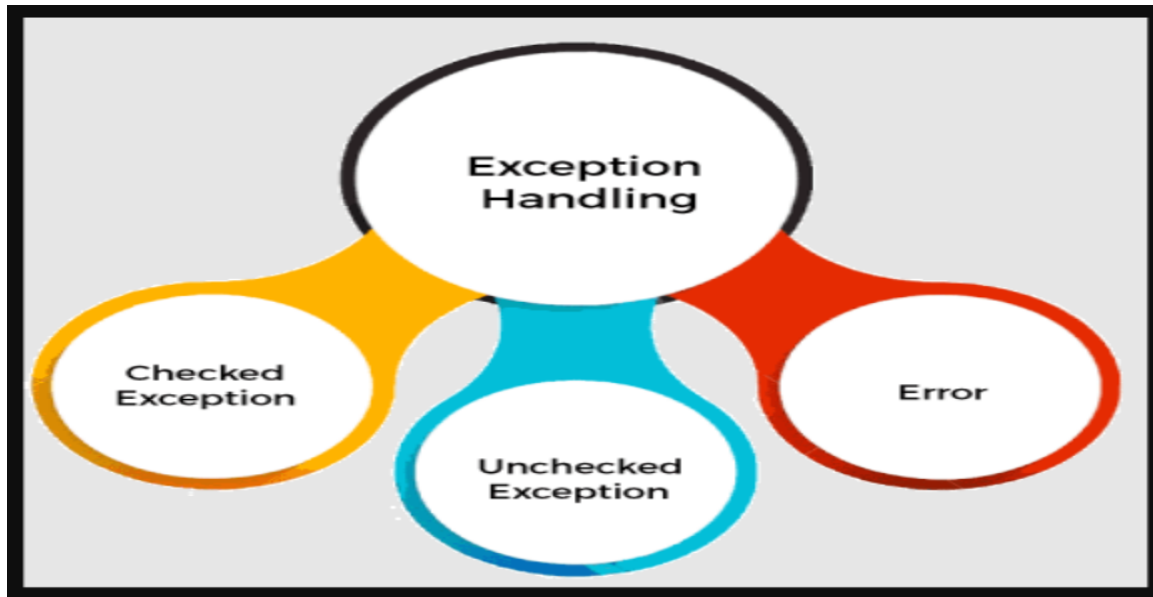
```

if (gps.encode(a))
{
    getgps(gps);
}
}
}

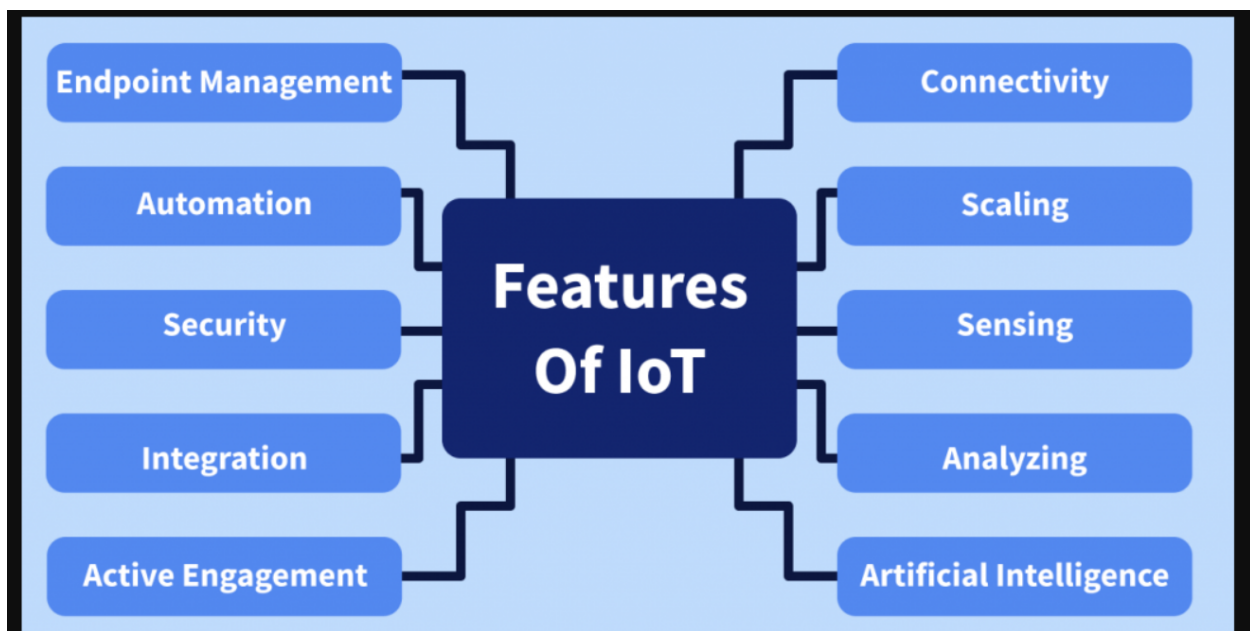
```

7.2 Feature 2





7.3 Database Schema



8. TESTING

8.1 Test Cases

UAT Test Initiation

- UAT test approach is defined
- Business users who would be performing this testing are identified
- Environments are sorted out
- Test Data requirements are identified
- Required support from all other teams are discussed and support team identified

UAT Test Design

- Business Scenarios to be validated are identified and documented
- Relevant test Data is identified
- Scenarios are uploaded in the corresponding Management Tools
- Appropriate user accesses are requested and sorted out

8.2 User Acceptance Testing

UAT Test Execution

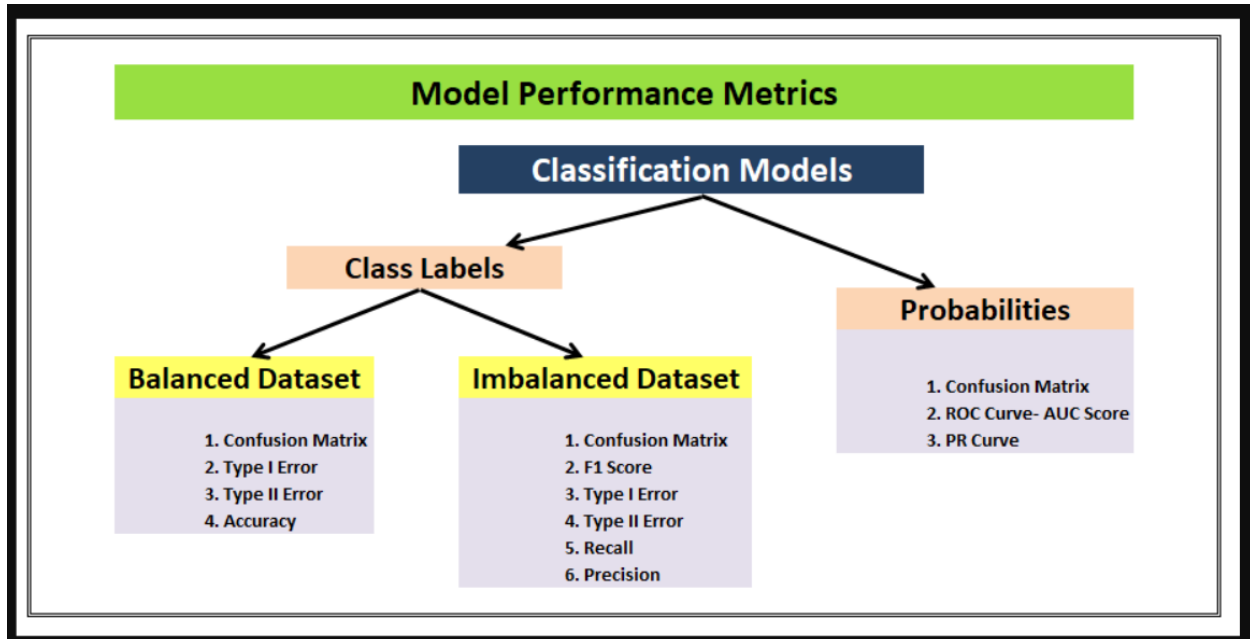
- Test Execution of the business scenarios are performed
- Appropriate defects are raised in the test management tool
- Defect Re-testing and Regression testing is performed

UAT Test Closure

- UAT closure report is produced
- Go/ No- Go decision is discussed and recommended

9. RESULTS

9.1 Performance Metrics



10. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- It assists parents to monitor their children remotely.
- In case situations happen, notifications will be sent to parents so that actions can be taken.
- Through this, child safety can be ensured and crime rate will be reduced.
- This work mainly focuses on alerting the individuals around the child so as to locate the child in safer zone before arrival of the parent.

DISADVANTAGES:

- It is an unreliable means to communicate as there are connectivity issue of Internet in buildings and congested areas.
- Then only it gives the outputs at the earliest otherwise it takes time for the result.
- Many of the safety devices available today are not wearable which becomes a major disadvantage with them as there is a chance of getting them fallen.

11. CONCLUSION

This ensures the safety of children and increase their confidence. Many experiments are operating in this area and have formulated different technologies to aid children. The key represented in this paper takes advantage of smartphones which proposes affluent elements like Google maps, SMS etc. The child safety and protection device is proficient in acting as a smart IoT device. It equips parents with real-time.

12. FUTURE SCOPE

The application will deal with the device and the parent's mobile app and is mindful to keep track of the location of the device. The child's account can also be edited by parents. The programme will have a route history trace, which will show the parent the path their child took over a period of time. After a specific period, the Web application on the device will update the location of the kid to the application. By pushing the distinct button that has been introduced, parents may even take action if their kid is unstable or in an inappropriate area. WFPS, a WIFI positioning system that doesn't connect to the internet but connects to Wi-Fi access points, will be used to track the child's whereabouts. As a result, the position of the child is shown on the parents' mobile app.

13. APPENDIX

Source Code

```
#include <TinyGPS++.h>
#include <Wire.h>

#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x20,16,2);
TinyGPSPPlus gps;
void getgps(TinyGPSPPlus &gps);

void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  lcd.begin(16,2);
  ,
```

```

    lcd.init();           // initialize the lcd
    lcd.init();
    // Print a message to the LCD.
    lcd.backlight();
}

void getgps(TinyGPSPlus &gps)
{
    if (gps.location.isValid() and gps.date.isValid() and gps.time.isValid())
    {
        Serial.print("Latitude: ");
        Serial.println(gps.location.lat(), 6);
        Serial.print("Longitude: ");
        Serial.println(gps.location.lng(), 6);
        //Serial.print("Altitude: ");
        //Serial.println(gps.altitude.meters());
        lcd.setCursor(0,0);
        lcd.print("lat->");
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        lcd.setCursor(0,1);
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        delay(2000);
        lcd.clear();
        lcd.setCursor(0,0);
        lcd.print("Date->");
        lcd.print(gps.date.month());
        lcd.print("/");
        lcd.print(gps.date.day());
        lcd.print("/");
        lcd.print(gps.date.year());
        lcd.setCursor(0,1);

        lcd.print("Time->");
        lcd.print(gps.time.hour());
        lcd.print(":");
        lcd.print(gps.time.minute());
    }
}

```

```

    lcd.print(":");
    lcd.print(gps.time.second());
    delay(2000);
    lcd.clear();

}
else
{
    Serial.println("Location: Not Available");
}

}

void loop() {
    // put your main code here, to run repeatedly:
    byte a;
    if (Serial.available() > 0 )
    {
        a = Serial.read();
        if (gps.encode(a))
        {
            getgps(gps);
        }
    }
}

```

GitHub & Project Demo Link

Github

<https://github.com/IBM-EPBL/IBM-Project-31665-1660204013>

Project Demo Link

https://drive.google.com/file/d/1ccBhDsLr79hP5wX1Dbasz9nUMIFlIC55/view?usp=share_link