

IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION

PROJECT REPORT

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in partial fulfillment of the requirements for the award of the degree of

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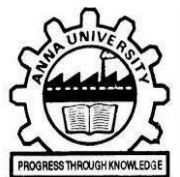
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CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

Child tracking system is an app that can track and monitor the child location. The aim of the project is to create a system to allow the parents to keep track of their kids when their child is out of their view. However, with the child tracking system the parent can track and monitor their child location in just a simple app when the parent is in office. A study on few existing tracking system have been done to gather the information and existing problem.

This project focused on how parents can keep track their children movement to avoid child missing, kidnapping and etc. By using GPS as a tracking tool where it allows to determine the exact location (longitude and latitude) of the children. Every an hour, the location of the children will be recorded in the system to keep track the children.

1.2 PURPOSE

The parent is not possible to always stay beside of children as most of the parents needs to go for work. By having this child tracking system, parents can track the location of their children. Using GPS as a tracking tool where it allows to determine the exact location (longitude and latitude) of the children. The technology can allow parents to track child whereabouts. Parent can keep track their children movement when they were at outdoor and also current location of the child.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

“Nowadays, crimes always occur. This scenario not involves by adults only, but also happen to children. Parents concern more about serious cases such as missing children, abduction and rape. The crime also involve by school children have been reported in newspapers. Although the school have guards that posted on school grounds 24 hours a day, that simply not enough to monitor the student. To overcome these problems the authorized need to provide additional security measure” “Some parents do not have the privilege to send or fetch their children at school. Parents usually give a hundred percent of trust to their children to travel themselves. Those children would have to travel by bus, bicycles or walking. Children who travel to and from school by themselves without monitor by their parents are exposed to danger along the way.” Besides that, parents usually received late information if anything happen to their children such as accidents or involved in criminals.

2.2 REFERENCES

- [1] (Omer & Abdullah, 2013) Omer, E., & Abdullah, M. F. A. (2013). GPS and SMS-Based Child Tracking System Using Smart Phone. *Internasionala Journal of Electrical, Computer, Electronic and Communication Engineering*, 7(2), 171–174.
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- [3] (Pham, Drieberg, & Nguyen, 2013) Pham, H. D., Drieberg, M., & Nguyen, C. C. (2013). Development of vehicle tracking system using GPS and GSM modem. In 2013 IEEE Conference on Open Systems, ICOS 2013 (pp. 89– 94). <https://doi.org/10.1109/ICOS.2013.6735054>

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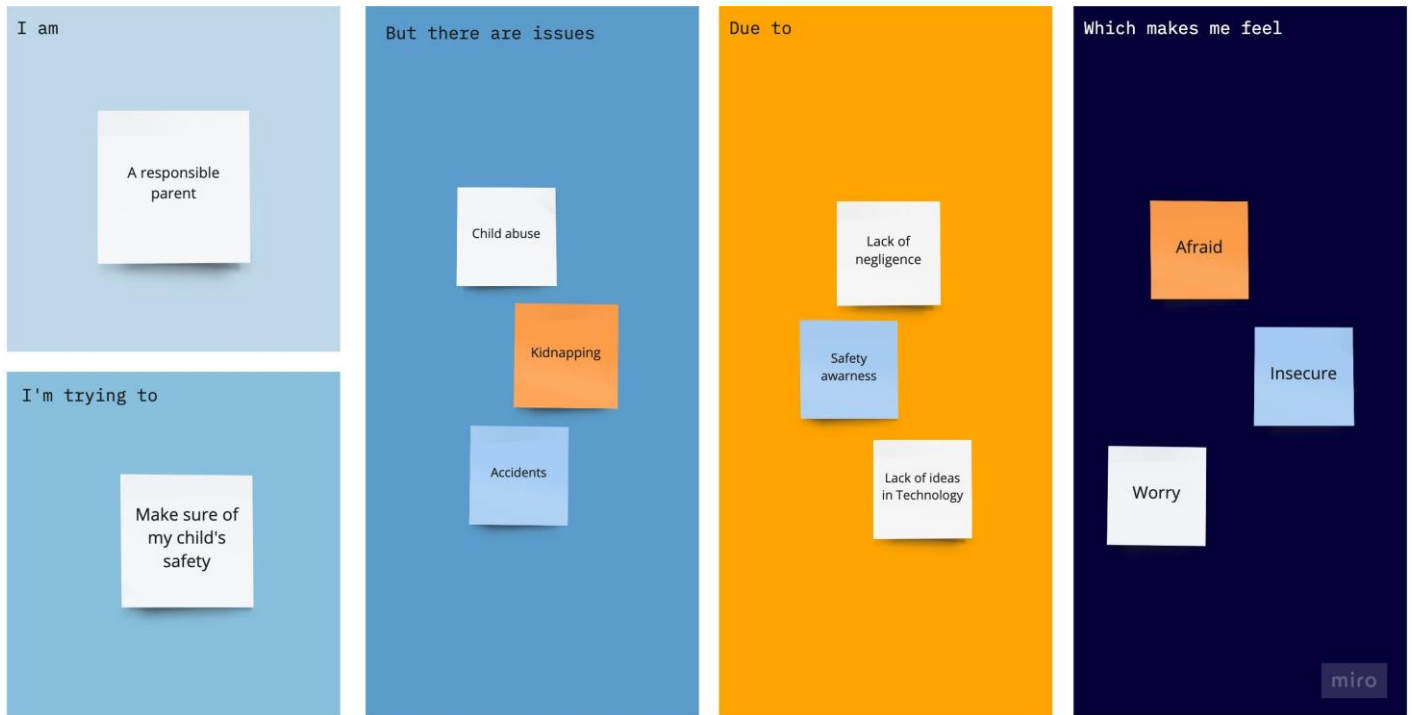
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2.3 PROBLEM STATEMENT STATEMENT DEFINITION

The parent is hardly to keep a watch on their child without the use of technology, especially when the child is in the outdoor. The parent even cannot avoid the negligence that will make by children in the future day.

There are very limited application available for tracking child when they are out of parents control and let kidnapping or missing cases occurred.



Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	A responsible parent	Make sure of my child's safety	Child abuse	Lack of negligence	Afraid
			Accidents	Safety awareness	Insecure
			kidnapping	Lack of ideas in technology	Worry

CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING

IDEATION

JAYASHRI GA

- Creation of mobile application
- Integration with smart watch
- Geofencing the child's movements
- Satellite call to child in case of emergency
- Creation of web application

ANISHA M

- Integration with mobile as PWA
- Geofencing child's movements through APIs

- RFID based additional tracking
- Brilliant UI/UX design for web application
- Good UI/UX design for mobile application

HARSHINI G

- Smart design of smart watches
- Integration with Cloud services
- Creation of any application
- Integration with parent's mobile
- Integration with police in case of emergency

JEEVITHA M

- RFID based home in and out tracking
- RFID based tracking for school
- GPS integrated bag/watch
- GPS integrated shoe
- Creation of any end user application

Top 3:

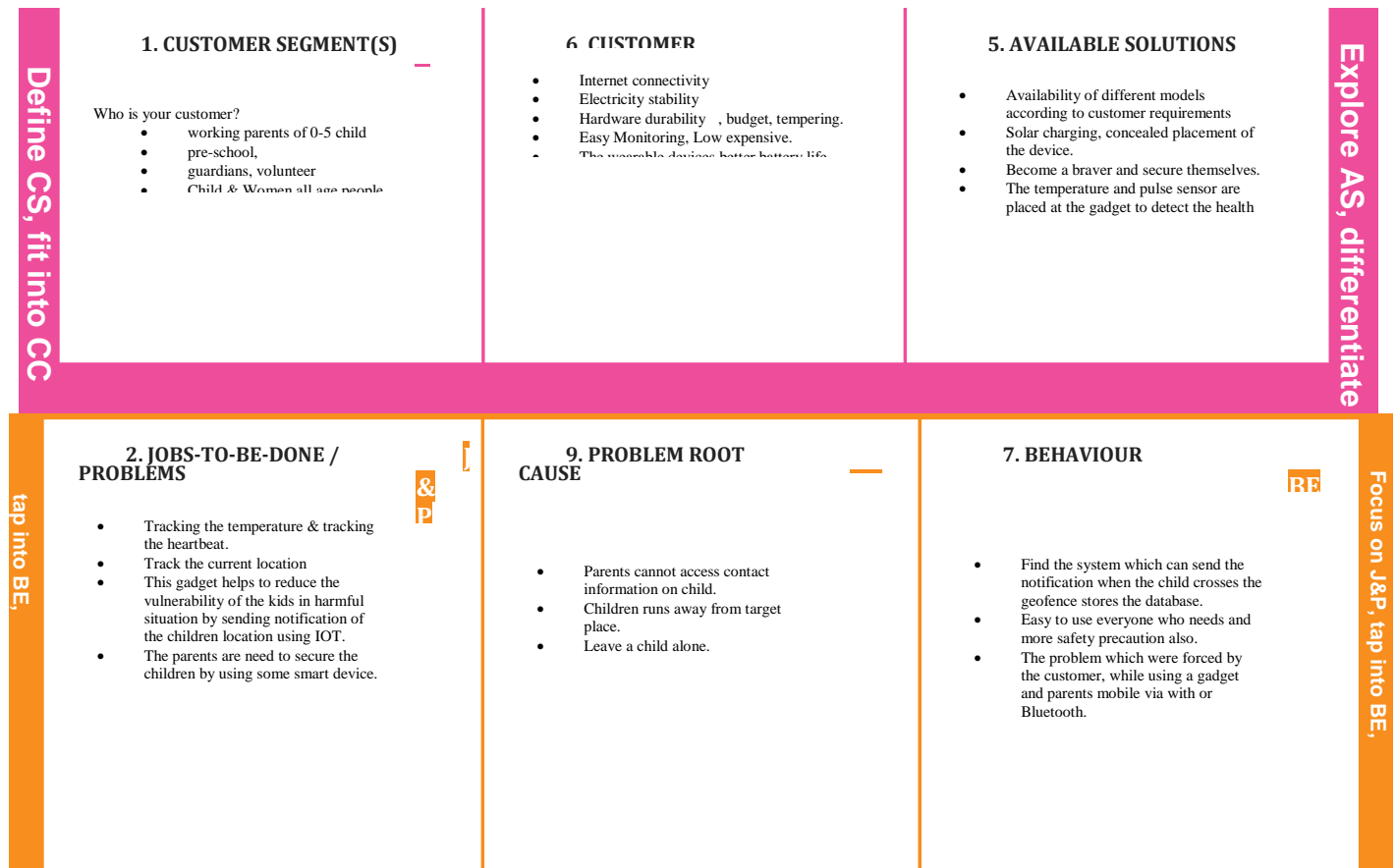
- Creation of mobile application
- Geofencing child's movements through APIs
- Integration with Cloud services

3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	IOT based Safety Gadget for Child Safety Monitoring System
2.	Idea / Solution description	<ul style="list-style-type: none"> • Using Temperature Sensor (for measuring body temperature of the child) one of the most commonly measured variables. The heartbeat sensor is used in the proposed system for measuring the pulse rate. • Heartbeat/Pulse sensor combined to heart rate sensor with amplification and nullification(fast and easy to get reliable pulse reading) • GPS for location track and Navigation. • GSM for sending and receiving short message(Audio and video is shared instantly to parent directly through GSM Module)
3.	Novelty / Uniqueness	<ul style="list-style-type: none"> • The system automatically alert the Parent/Guardian by sending SMS, where immediate attention is required for the child during emergency. • Temperature & Heart rate of the child are used for parametric analysis and result are plotted for the same. • For real time prediction of monitoring the child at any time.
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> • Parents track their children in real time of the location trackers by GSM. Improved safety index of places, provides freedom for the children with special needs. • Prevent their child from abuse and critical issues. The customer will be satisfied by assuring the safety of the child using safety gadget. • Result in a reduction of parents being worried. IOT and its insights help in personalising communication and prediction for attract them to specific fields.

5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> It is business model we first consider about cost and the gadget is not harmful to health, because the device was used by the person in. Service based product is developed to serve the parents to know the status of their children before they lost. In case the children got accident or kidnaped, this can be reduced by using this project. Weightless, Compatible, Easy to use, Low cost.
6.	Scalability of the Solution	<ul style="list-style-type: none"> Gadget ensure the safety and tracking of the children, Parents need not worry about their children. Developing the product for both web and mobile applications. It is portable and data can be accessed from cloud at any time. Ensuring cellular coverage for an IOT development may also prove difficult, especially when your developing devices across vast geographic areas.

3.4 PROBLEM SOLUTION FIT



<p>3. TRIGGERS</p> <p>TR</p> <ul style="list-style-type: none"> Increasing events of kidnapping in recent news a child who hasn't grown will enough to be ensure safety of self . Make awareness about the product directly to the people. Posting the product in social media. Advertisement is the best way to start triggering the people to use our app. Mobile applications are which is easily reachable for the remote side people 	<p>10. YOUR SOLUTION</p> <p>SL</p> <ul style="list-style-type: none"> Designing a gadget for protecting the kids and alerting the parents in emergency situations. Child tracker helps the parent in continuously monitoring the child's location. They can simply leave their children in parks, schools and create a geofence around the particular location. The notification will be generated when the child crosses the geofence. Notifications will be sent according to the child's location to their parents/caretaker. The entire location data of the child will be stored in the database. 	<p>8. CHANNELS of BEHAVIOUR</p> <p>CH</p> <p>8.1 ONLINE</p> <ul style="list-style-type: none"> Apps and add -one can be developed to track the live location of children. The customer can continuously monitor the database of the child's location in online. Online self-efficiency does not reduce risk exposure.
<p>4. EMOTIONS: BEFORE / AFTER</p> <p>EM</p> <p>BEFORE:</p> <ul style="list-style-type: none"> Frustration ,Indetermination , Insecure. <p>AFTER:</p> <ul style="list-style-type: none"> Security ,Determination, satisfaction, In control. Before using the gadget , It is difficulty to watch their children everytime. After using the gadget, the security is much stronger, so the parent can't panic about their children. Once they start to use the developed solution they might feel free to focus on their work and also surveillance of their children would happen with dare to any point of time. 		<p>8.2 OFFLINE</p> <ul style="list-style-type: none"> Sensor and other detectors can be developed. Parents have to keep their child safety.

CHAPTER 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 Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Authentication	Only the authorized person for that product will know Ensures security
FR-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
FR-5	Notification	Notified through mobile and mail

4.2 NON FUNCTIONAL REQUIREMENTS

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

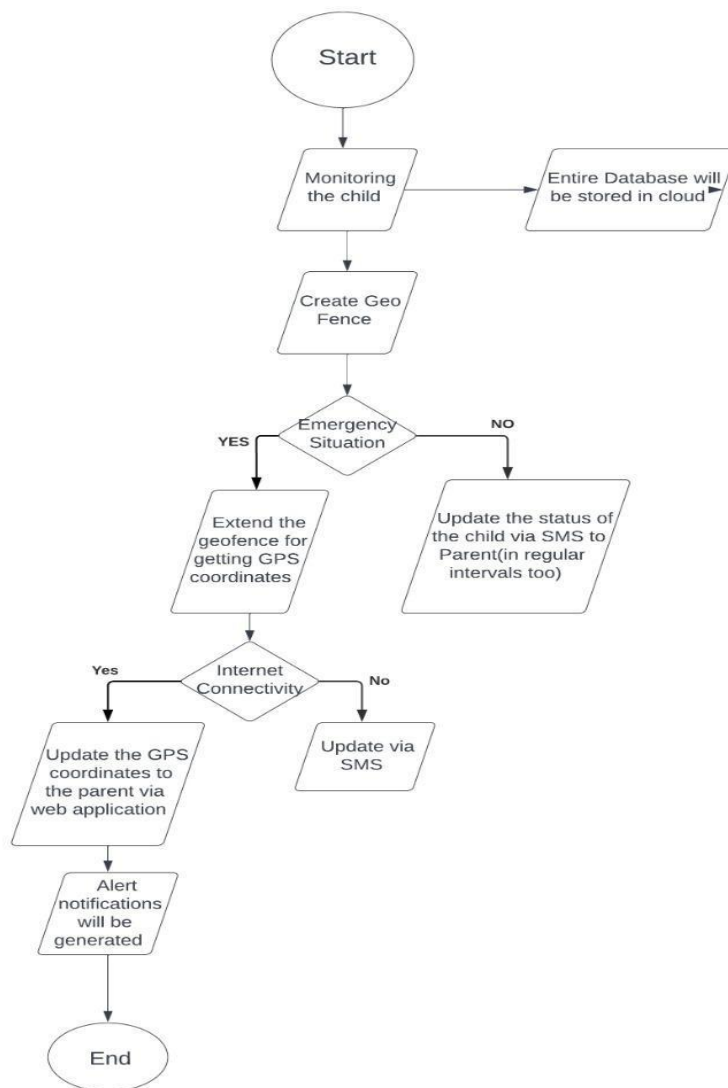
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Accessed through Mobile App Showing location (latitude and longitude) of child and also other measures to ensure safety like notification. Portable and comfortable to use.
NFR-2	Security	Database security and ensuring the safety of the product while in use.
NFR-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.

NFR-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.
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CHAPTER 5

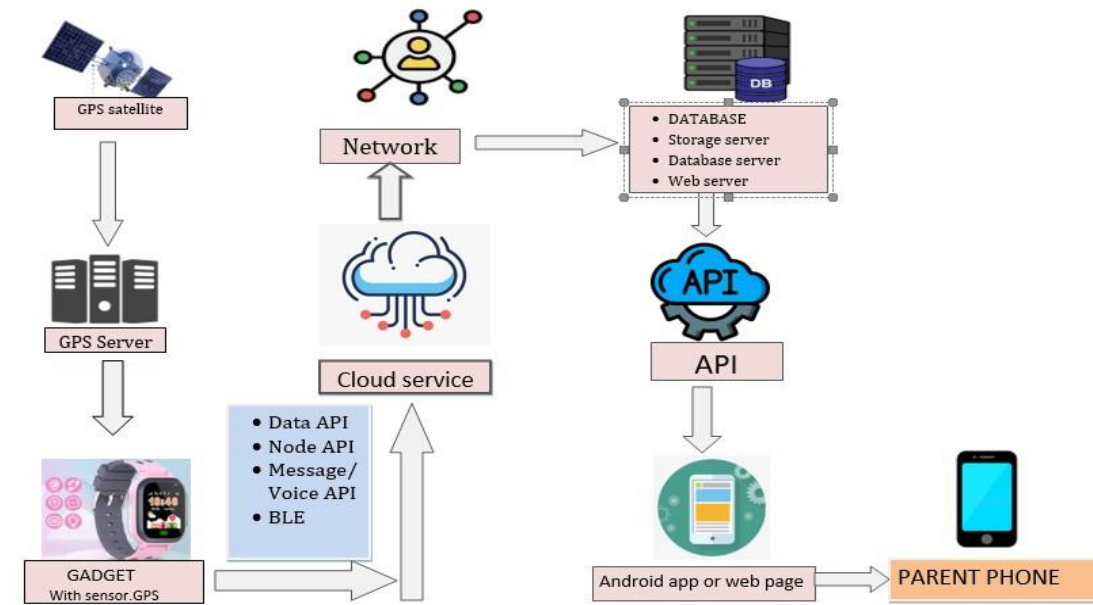
PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS



5.2 SOLUTION & TECHNICAL ARCHITECTURE

SOLUTION ARCHITECTURE:



Overview of Architecture:

An IOT system is interconnected with sensors, computing devices, and machines that are connected through a network to form one complete operation. Therefore, an IOT solution architecture is a design of the step-by-step data flow from collecting raw data to obtaining predictions or results. There is no universal standard for an IOT solution architecture, but typically this technology requires four major components, consisting of,

- ✓ Sensors,
- ✓ Gateways and Network,
- ✓ Cloud or Data Server,
- ✓ Applications Layer.

GPS Satellite:

When a device uses GPS, it finds an exact location through what's called triangulation. That's how your smart watch can know where you are at all times. Triangulation determines the difference between two signals. One is the signal that watch receives, and the other is the signal that was sent to your watch.

Application Programming Interface:

The most important in IOT devices is to connect the API application. Application Programming Interface (API) is an interfacing software platform that allows the exchange of any information or data and supports the interaction among different applications or any such intermediaries. There are such API's are used in this application is node API, data API and message/voice API.

Cloud Service:

An IOT cloud is a massive network that supports IOT devices and applications. This includes the underlying infrastructure, servers and storage, needed for real time operations and processing. The IBM cloud services are mainly used in the connection of device over the cloud. It is mainly used in the mediator between the gadget's information and the internet in the form of database.

Technical Architecture:

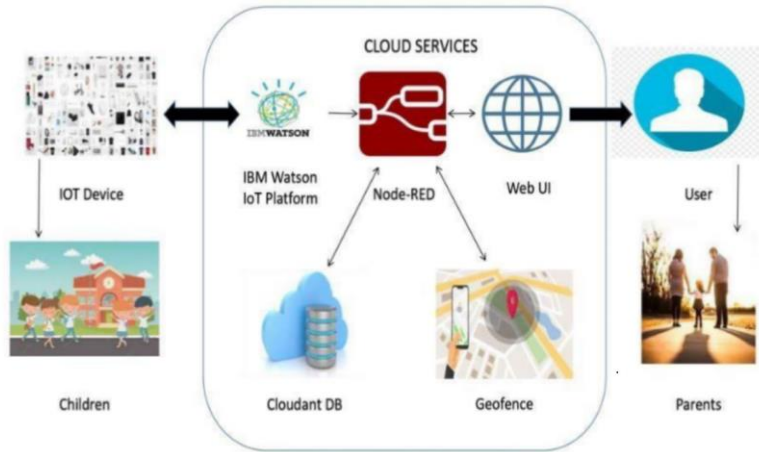
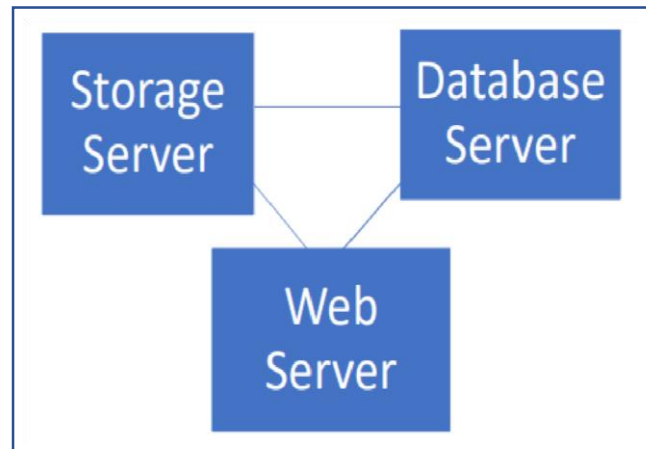


Table-1: Components & Technologies:

S. No	Component	Description	Technology
1.	User Interface	The communication protocol being used in the proposed solution might act as an interface the way like Wi-Fi, Bluetooth and ZigBee	MIT app
2.	Application Logic	The data to be collected and sent to the authenticator's(parent) via GSM providing the GPS coordinates to easily locate access and monitor the child	IBM Watson STT service, python etc
3.	Database	Data to be segregated and secured in the form of relational DBMS	MySQL
4.	Cloud Database	IBM	IBM Cloudant
5.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local File system

Table-2: Application Characteristics:

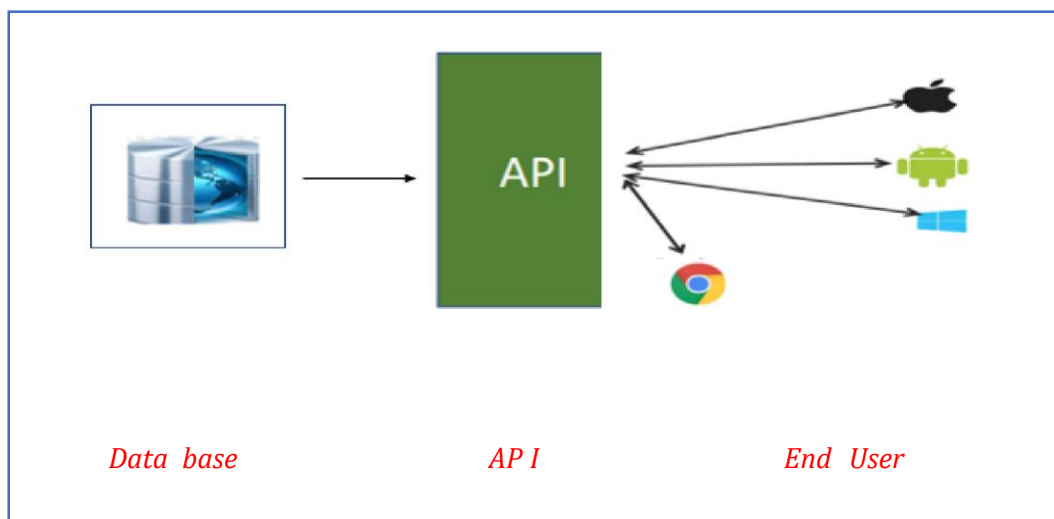
S. No	Characteristics	Description	Technology
1.	Open-Source Frameworks	The proposed solution being framed in the form an android application providing the end user an easy surveillance of their children (preferably users are parents)	UI/UX design development
2.	Security Implementations	The developed application should be accessible in the way it can only respond to the comments of the relevant users	Encryptions, IAM Controls.
3.	Scalable Architecture	The app format comes the way easier to handle and operate.	Not yet determined
4.	Availability	The developed solution tends to be available in the market at any time	Not yet determined
5.	Performance	Highly proper and betterment functionalities are to be ensured in the designed solution	Not yet determined



DATABASE

End user:

Database is stored for the future use and the web application is for fetching the information, the user wants in the client side. It acts as a server client configuration through the API.



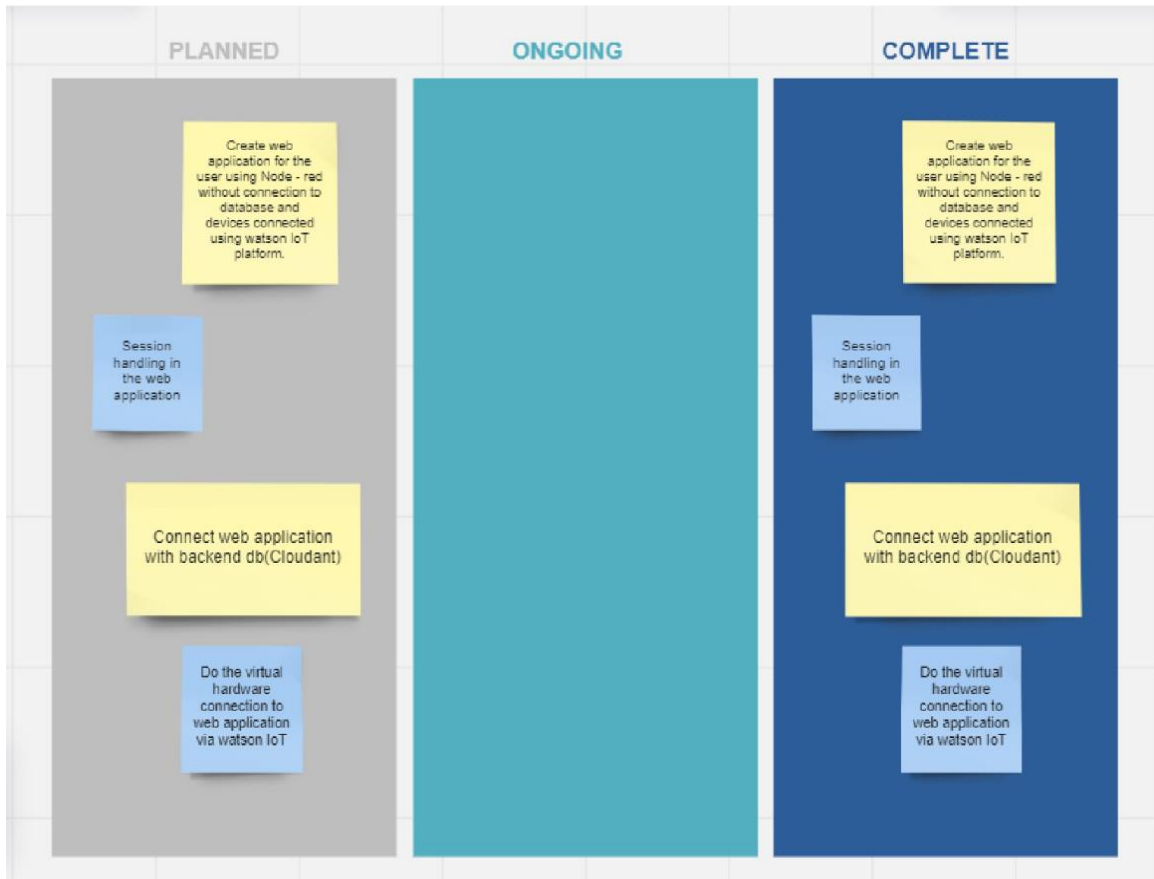
5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	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 Facebook	I can register & access the dashboard with IBM Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard					
Customer Care Executive	login		As I enter I can view the working of the application and scan for any glitches and monitor the operation and check it all the users authorized.	I can login only with my provided credentials.	Medium	Sprint-3
Administrator	login		Maintaining and making sure the database containing the locations are secure and accurate and update constantly.	I can login only with my provided credentials.	High	Sprint-4
Customer (web user)	login		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-2

CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION



6.2 SPRINT DELIVERY SCHEDULE

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, and password, and	4	High

			confirming my password.		
Sprint-1	Confirmation Email	USN-2	As a user, I will receive a confirmation email once I have registered for the application	4	High
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	4	High
Sprint-1	Dashboard	USN-5	As a user, I need to be able to view the functions that I can perform	4	High
Sprint-2	Notification	USN-1	As a user, I should be able to notify my parent and guardian in emergency situations	10	High
Sprint-2	Store data	USN-2	As a user, I need to continuously store my location data into the database.	10	Medium
Sprint-3	Communication	USN-3,1	I should be able to communicate with my parents	6	Low

CHAPTER 7

CODING & SOLUTIONING

7.1 FEATURE 1

Algorithm :

1. Enter the credentials and hit enter (email and password).
2. If already logged in user is taken to home page
3. Else, check for validity of credentials entered using query to cloudant db.
4. If wrong credentials entered, notification displayed to user and user stays in login page.
5. On correct credentials , user is taken to home page.

Login checker :

```
if(msg.req==null){  
  
    email = msg.payload.email;  
  
}  
  
else{  
  
    var email = msg.req.params.email;  
  
}  
  
msg.enteredPassword = msg.payload.password;  
  
msg.payload={  
  
    "selector":{  
  
        "email":{  
  
            "$eq":email
```

```

    }

    },

    "fields":["email","password"]

}

return msg;

```

7.1.2 FEATURE 2 : SIGNUP

Algorithm :

1. Enter the signup form fields (name , email , password , re-enter password , date of birth) and hit enter.
2. All credentials are validated at client side.
3. Email is checked if already registered or not in the database.
4. If already registered , notification displayed. Or else, the user is taken to the successful signup page.

Query to check if email is registered or not :

```

var email = msg.enteredFields.email;

msg.payload={

    "selector":{

        "entry-type":"user",

        "email":{

            "$eq":email

        }

    },

    "fields":["email"]

}

return msg;

```

7.1.3 FEATURE 3 : HOME

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. Home page buttons are displayed (Live tracker , Recent emergency notifications , Location history , Change password , Logout)
3. If buttons are clicked , the user is taken to the requested page.

7.1.4 FEATURE 4 : LIVE TRACKER

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. GPS sensor data is received via IBM IoT Watson platform , the location marker is displayed in the world map.
3. Location data is stored to db every 1 minute.

7.1.5 FEATURE 5 : LOCATION HISTORY

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. The location table contents are displayed in the table by querying the database.

Location query getter :

msg.payload =

```
{  
  "selector":{  
    "entry-type":{  
      "$eq":"location"
```



```

    }

    },

    "fields":["lat","lon","time","description"]

}

```

7.1.6 FEATURE 6: RECENT NOTIFICATIONS

Algorithm:

1. If the user is logged out, he/she is taken to the login page.
2. The notification table contents are displayed in the table by querying the database.

Recent notification getter:

msg.payload =

```

{

  "selector":{

    "entry-type":{

      "$eq":"notification"

    }

  },

  "fields":["lat","lon","time"]

}

```

7.1.7 FEATURE 7 : CHANGE PASSWORD

Algorithm :

1. If the user is logged out , he/she is taken to the login page.
2. User is asked to enter the new password twice and click the change password button.

3. Passwords are validated , and password of requested user is changed by querying the database.

7.2 DATABASE SCHEME

User			Location		
name	string		lat	float	
email	string		lon	float	
password	string		description	string	
dob	date		time	datetime	
entry-type	string		entry-type	string	
Add field			Add field		

Notification		
lat	string	
lon	string	
time	string	
description	string	
Add field		

CHAPTER 8

TESTING

8.1 TEST CASES

1. Login button click with wrong credentials entered.
2. Signup with already registered mail ID.
3. Signup with wrong form data entered.
4. Entering home page with logged out session.
5. Clicking home page buttons with logged out session.
6. Invalid data entered in change password page and requested for change in password.

8.2 USER ACCEPTANCE TESTING

S.NO	TEST CASE	REQUIRED OUTPUT	RESULT OUTPUT	STATUS
1	Login button click with wrong credentials	Wrong credentials entered notification	Wrong credentials entered notification	ACCEPTED
2	Signup with already registered mail ID.	Email already registered notification	Email already registered notification	ACCEPTED
3	Signup with wrong form data entered.	Wrong credentials entered notification	Wrong credentials entered notification	ACCEPTED
4	Entering home page with logged out session.	Take user to login page	Take user to login page	ACCEPTED
5	Clicking home page buttons with logged out session.	Take user to login page	Take user to login page	ACCEPTED
6	Invalid data entered in change password page and requested for change in password.	Wrong form data entered notification	Wrong form data entered notification	ACCEPTED

CHAPTER 9

RESULTS

9.1 PERFORMANCE METRICS

1. Planned value : Rs.4000
2. Actual value : Rs.1300
3. Hours worked : 50 hours
4. Stick to Timelines : 100%

5. Stay within budget : 100%
6. Consistency of the product : 75%
7. Efficiency of the product : 80%
8. Quality of the product : 80%

CHAPTER 10

ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

1. Low cost.
2. Simple UI.
3. Faster response due to single page web page.
4. Capability of adding many features with ease and less cost.

DISADVANTAGES:

1. Lack of efficiency . Efficiency of the product needs to be improved.
2. Consistency of the product is not 100%.
3. Not a compact sized product. Size needs to be decreased.

CHAPTER 11

CONCLUSION

The product can be easily made into a business model. With the help of this product, customers can have a happy life , since it is economical and offers a simple user interface to monitor their child . Children can have a safe place to live with the help of this product.This product has the capability of impacting the market if further

improvements have been done , due to its low price since , the cost of child safety gadgets in the market is of high cost.

CHAPTER 12

FUTURE SCOPE

The product can include many other additional features like checking the weather forecast of the child location, interacting with the child etc. If we improve the efficiency of the code and reduce the size of our product, the market will be able to find a new child tracker gadget with low cost and high quality.

CHAPTER 13

APPENDIX

INTERNET OF THINGS

The **Internet of things (IoT)** describes physical objects (or groups of such objects) with sensors, processing ability, software, and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks. Internet of things has been considered a misnomer because devices do not need to be connected to the public internet, they only need to be connected to a network and be individually addressable. The field has evolved due to the convergence of multiple technologies, including ubiquitous computing, commodity sensors, increasingly powerful embedded systems, and machine learning. Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), independently and collectively enable the Internet of things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the "smart home", including devices and appliances (such as

lighting fixtures, thermostats, home security systems, cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as smartphones and smart speakers. IoT is also used in healthcare systems. There are a number of concerns about the risks in the growth of IoT technologies and products, especially in the areas of privacy and security, and consequently, industry and governmental moves to address these concerns have begun, including the development of international and local standards, guidelines, and regulatory frameworks.

MQTT

MQTT is an OASIS standard messaging protocol for the Internet of Things (IoT). It is designed as an extremely lightweight publish/subscribe messaging transport that is ideal for connecting remote devices with a small code footprint and minimal network bandwidth. MQTT today is used in a wide variety of industries, such as automotive, manufacturing, telecommunications, oil and gas, etc.

NODE RED

Node-RED is a programming tool for wiring together hardware devices, APIs and online services in new and interesting ways. It provides a browser-based editor that makes it easy to wire together flows using the wide range of nodes in the palette that can be deployed to its runtime in a single-click.

Node-RED provides a browser-based flow editor that makes it easy to wire together flows using the wide range of nodes in the palette. Flows can be then deployed to the runtime in a single-click. JavaScript functions can be created within the editor using a rich text editor. A built-in library allows to save useful functions, templates or flows for re-use.

IBM WATSON IOT PLATFORM

IBM Watson IoT Platform for Bluemix provides a versatile toolkit that includes gateway devices, device management, and powerful application

access. By using Watson IoT Platform, you can collect connected device data and perform analytics on real-time data. The IBM Watson IoT Platform is a fully managed, Cloud-hosted service that provides device management capabilities as well as data collection and management in a time series format. As part of IBM's Platform as a Service offering, IBM Bluemix, you can use the IBM Watson IoT Platform to rapidly build IoT apps from the catalog of services available in IBM Bluemix. You can choose from such IoT app options as storage services, rules, analytics services, stream analytics, machine learning, visualization, and user apps (Web or mobile). You also can embed cognitive capabilities in your IoT apps by using IBM Watson services available in IBM Bluemix.

CLOUDANT

A fully managed, distributed database optimized for heavy workloads and fast-growing web and mobile apps, IBM Cloudant is available as an IBM Cloud® service with a 99.99% SLA. Cloudant elastically scales throughput and storage, and its API and replication protocols are compatible with Apache Couch DB for hybrid or multi cloud architecture.

SOURCE CODE LINK: <https://github.com/IBM-EPBL/IBM-Project-34441-1660235750>