IOT BASED SAFETY GADGET FOR CHILD SAFETY MONITORING AND NOTIFICATION

A PROJECT REPORT

Submitted by

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TABLE OF CONTENTS

CHAPTER NO	TITLE
1	**INTRODUCTION** 1.1 Project OverviewPurpose 1.2 Purpose
2	**LITERATURE SURVEY** 2.1 Existing Problem 2.2 Reference 2.3 Problem Statement Definition
3	**IDEATION & PROPOSED SOLUTION**

3.1 Empathy Map Canvas

3.2 Ideation & Brainstorming

3.3 Proposed Solution

3.4 Problem Solution Fit

4 REQUIREMENT ANALYSIS

4.1 Functional Requirement

4.2 Non-Functional Requirement

5 PROJECT DESIGN

5.1 Data Flow Diagrams

5.2 Solution & Technical Architecture

5.3 User Stories

6 PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

6.2 Sprint Delivery Schedule

6.3 Reports from JIRA

7 CODING & SOLUTIONING

7.1 Feature 1

7.2 Feature 2

8 TESTING

8.1 Test Cases

9 RESULTS

9.1 Performance Metrics

10 ADVANTAGES & DISADVANTAGES

11 CONCLUSION

12 FUTURE SCOPE

13 APPENDIX

Source Code
GitHub & Project Demo Link

ABSTRACT

Attacks on children have been on the rise at an unprecedented rate in recent years, with victims finding themselves in perilous situations with little chances of contacting their families. The main goal of this project is to create a smart wearable device for children that uses advanced technology to ensure their safety. As a result, this strategy is perceived as sending an SMS from the children's wearable to their parents or guardians. This project employs cutting-edge technology to protect the youngster through the use of a GSM module, ensuring that the child does not feel abandoned while dealing with such social issues. An Arduino Nano, GSM, GPS, temperature sensor, heartbeat sensor, and a panic button will be included in the wearable. The heartbeat sensor detects the child's heart rate and delivers it to the guardian on a regular basis. If the child falls suddenly, the accelerometer detects it and alerts the parents. As a result, the parent has a sense of security.

CHAPTER 1

INTRODUCTION

1.1PROJECT OVERVIEW:

A smart mobile phone provides various up to date services to us. Using the global positioning system (GPS), we can get to know our devices' geographic location and give information through hort message service (SMS) service. Al-Mazloum et al. used these two services in their proposed system. They introduced GPS and SMS-based child tracking system using smart phone . This paper describes how a smart mobile phone helps parents track their children in real-time. Most kids and parents use an android mobile phone, and they know the mobile phone's available service. Their proposed system consists of two sides, the child side and the parent side. A request SMS goes to the child's device to know the child's exact location from the parent device.

After getting the request SMS, the child's device replies to the parent's device's GPS position. Kothawade et al. proposed a system “multi-platform application for parent and school using GPS tracking”. In this paper, they developed a GPS based application system for an organization and parents mobiles. The organization can use this application for monitoring and tracking the location of the school buses.

Parents can get the addresses of their children and locate them on his/her mobile devices. School authority also can monitor and track the school buses timely and ensures the safety of children. It also allows parents to track real-time information about the school bus during travels. Almomani et al. proposed a system with two types of applications a web application and a mobile application for a user facility. A user can access this system at any time from anywhere. There are two sides: client-server. The server-side carries a GPRS, a web, and an SMS server, and the client-side contains a GPS tracker and a GPS modem. The user information is stored in the database on the server-side . There is another similar concept used by Al-Suwaidi and Zemerly in their proposed system named "locating friends and family using mobile phones with a global positioning system (GPS)". They have also developed two approaches: the client-server approach. This paper showed both clients have the same control and command privileges, whereas the other system does not provide it. Gaoet al. developed a security method named child guard on smart devices for observing children's activities in real-time. Guardians used this system at a low cost, and they can get better benefits by using this system. Satish et al. described their paper about an android application used to track missing children. The android application works with two services: GPS and SMS service. The GPS is used to track the location of the missing child. If GPS service is unable, the application can work with SMS service by sending and receiving the message. There is another paper where the researcher Bhoiet al. implements a project based on a particular area for each child. When the child comes out of this specific area of their school, then an alert message sends to the parent's mobile phone by using a panic switch. Saranyaet al. proposed a child monitoring system based on android phones for the children's security. This system helps the parents to know whether their children are safe or not. This system consists of two functions. The software hand function monitors the child's activities, and the danger zone function alerts the guardians about their children's location

1.2 PURPOSE:

In today's technological world, it's a natural part of life for older children and young teenagers to have gadgets. In many ways, gadgets such as mobile phones can help give them a safety edge, yet having the latest and greatest mobiles can also put them at risk of danger.Cruel crimes against children have been on the rise in recent years, with victims finding themselves in incredibly perilous situations where using their cellphones to notify their parents or the police is nearly impossible. Despite the fact that technology is constantly evolving, these acts continue to occur in numerous areas.The major goal of this project is to use modern technology to create a gadget that provides "Smart Child Safety" to protect children, which will be far more effective than current methods in assisting victims.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM:

In today's world women are less secure and have many issues regarding their security purpose. This paper describes about safe and secured electronic system for women which comprises of an Arduino controller and sensors such as temperature LM35, flex sensor, MEMS

accelerometer, pulse rate sensor, sound sensor. A buzzer, LCD, GSM andGPS are used in this project. When the woman is in threat, the device senses the body parameters like heartbeat rate, change in temperature, the movement of victim by flexsensor, MEMS accelerometer and the voice of the victim is sensed by sound sensor.When the sensor crosses the threshold limit the device gets activated and traces thelocation of the victim using the GPS module. By using the GSM module, the victim's location is sent to the registered contact number.

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2.3 PROBLEM STATEMENT DEFINITION:

A problem statement is important to a process improvement project because it helps clearly identify the goals of the project and outline the scope of a project. It alsohelps guide the activities and decisions of the people who are working on the project.The problem statement can help a business or organization gain support and buy-in fora process improvement project. A good problem statement can be created by identifying and answering several questions related to the problem.

This process involves identifying what the problem is, why it is a problem, when and where the problem was identified, who the problem impacts, how they are impactedby the problem and how much of an impact the problem has. Creating a problem statement to understand customer's point of view. The below shown block diagram is a perfect example for our topic.

fig.Problem statement

CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1EMPATHY MAP CANVAS:

Empathy maps are an efficient tool used by designers to not only understand user behaviour, but also visually communicate those findings to colleagues, uniting theteam under one shared understanding of the user. Essentially, an empathy map is a square divided into four quadrants with the

user or client in the middle. Each of the fourquadrants comprises a category that helps us delve into the mind of the user. The four empathy map quadrants look at what the user says, thinks, feels, and does.With the user at the centre and the categories in each of the four surrounding quadrants, an empathy map arranges all of your research about the user into an easy-to-read visual.

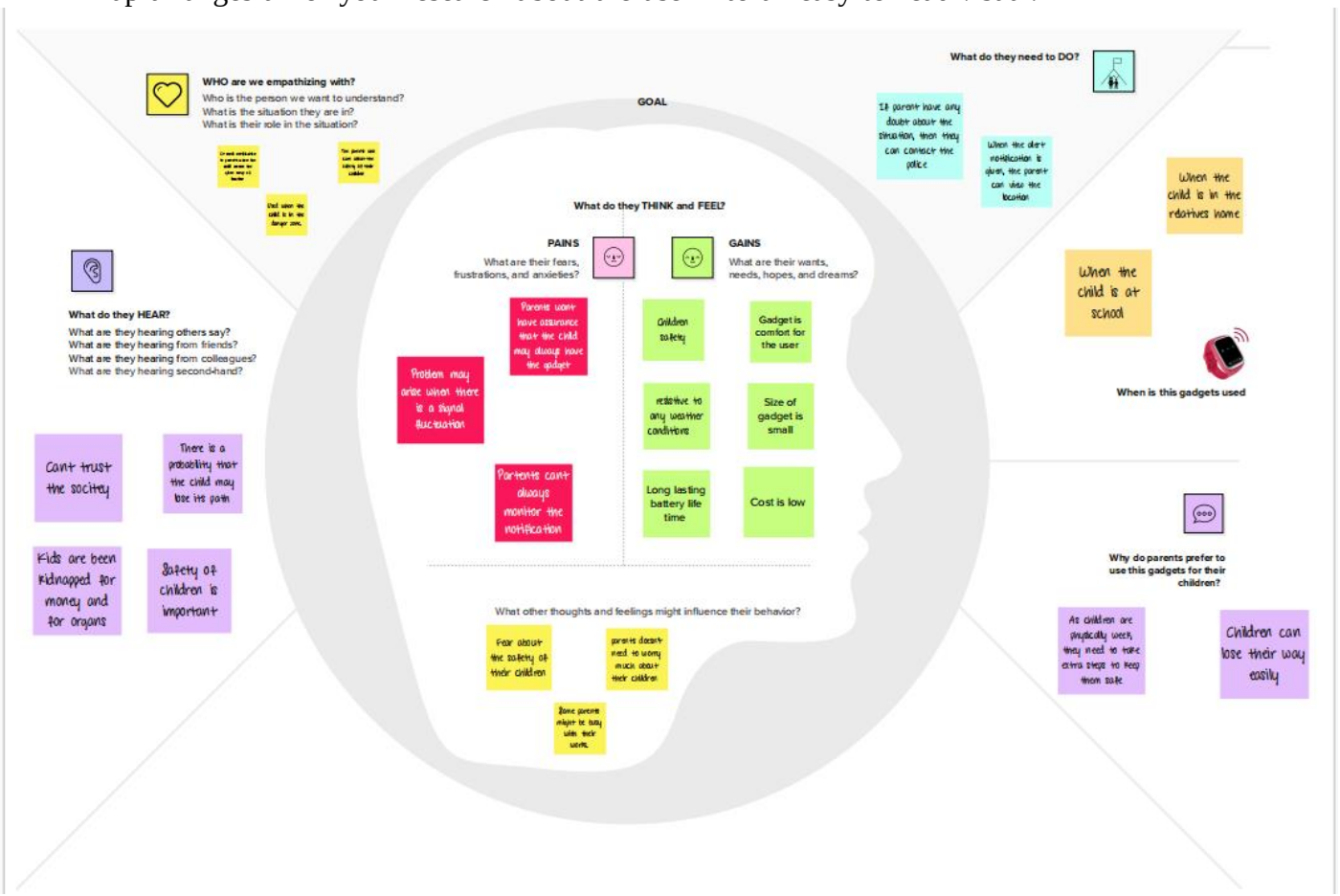


fig. Empathy Map

3.2 IDEATION & BRAINSTORMING

Brainstorming is a method design teams use to generate ideas to solve clearlydefined design problems. Brainstorming is a method of generating ideas and sharing knowledge to solve a particular commercial or technical problem, in which participantsare encouraged to think without interruption. Brainstorming is a group activity where each participant shares their ideas as soon as they come to mind. At the conclusion ofthe session, ideas are categorised and ranked for follow-on action.

When planning a brainstorming session it is important to define clearly the topicto be addressed. A topic which is too specific can constrict thinking, while an ill-definedtopic will not generate enough directly applicable ideas. The composition of the brainstorming group is important too. It should include people linked directly with the subject as well as those who can contribute novel and unexpected ideas. It can comprise staff from inside or outside the organisation.

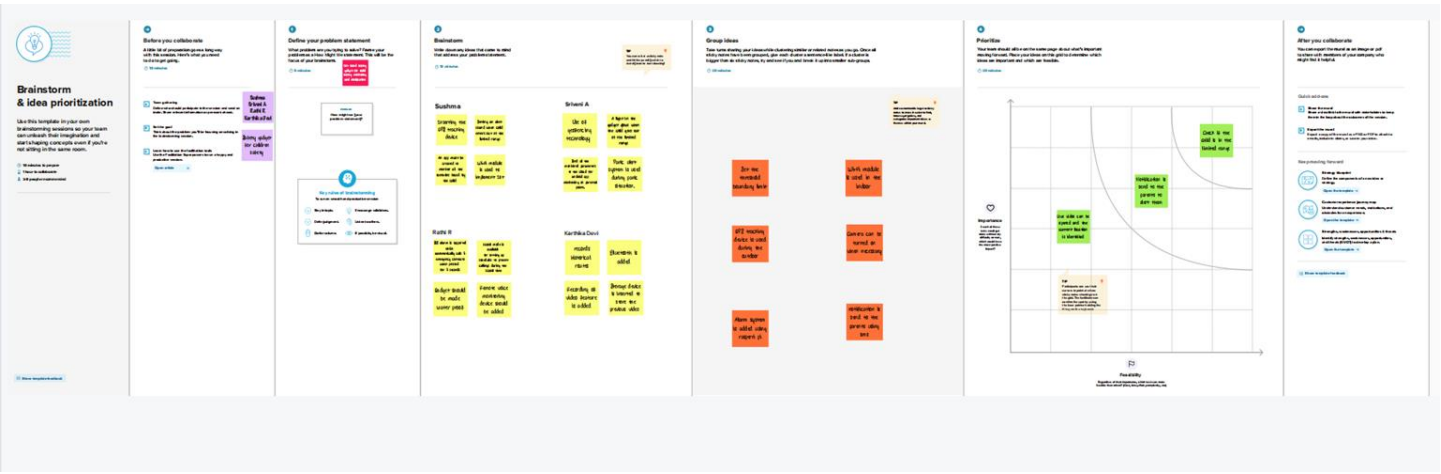


fig.Brainstorming

3.3 PROPOSED SOLUTION:

Proposed Solution means the technical solution to be provided by the Implementation agency in response to the requirements and the objectives of theProject.

S.No.	Parameter	Description
1.	Problem Statement(Problem to be solved)	Nowadays device can be used by stackholders to track the children and get real time data.
2.	Idea/Solution description	The device has Iot monitoring and a module that allows the child to be monitored at all times.
3.	Novelty/Uniqueness	The novelty of the work is that the system automatically alerts the parents/caretaker by sending SMS, when immediate attention is required for the child during emergency. The parameters of the such as touch,temperature&heartbeat of the child are used for parametric analysis and results are plotted for the same.

4.	Social Impact/Customer Satisfaction	Children's continuous usage of gadgets has many adverse effects such as attention deficits,loss of focuses difficulty in learning anxiety etc.Thus we need to understand that technology and gadgets make our life easier.Therefore, we should not become addicted to them.
5.	Business model/Revenue model	The global safety product market size to be valued at USD 132.2 billion by 2025 and is expected to grow at a compound annual growth rate of 50% during the forecast period.
6.	Scalability of the solution	As an enhanced solution , the parents needs to be intimated if the child is getting moved out of the stipulated geo-location assigned for the child.It focused on creating a solution with the IoT device which has GPS enabled and making use of cloud services for sending intimation to the parent using email or SMS along with current geo-location of the children.

3.4 PROBLEM SOLUTION FIT:

Proposed Solution means the technical solution to be provided by the Implementation agency in response to the requirements and the objectives of theProject.

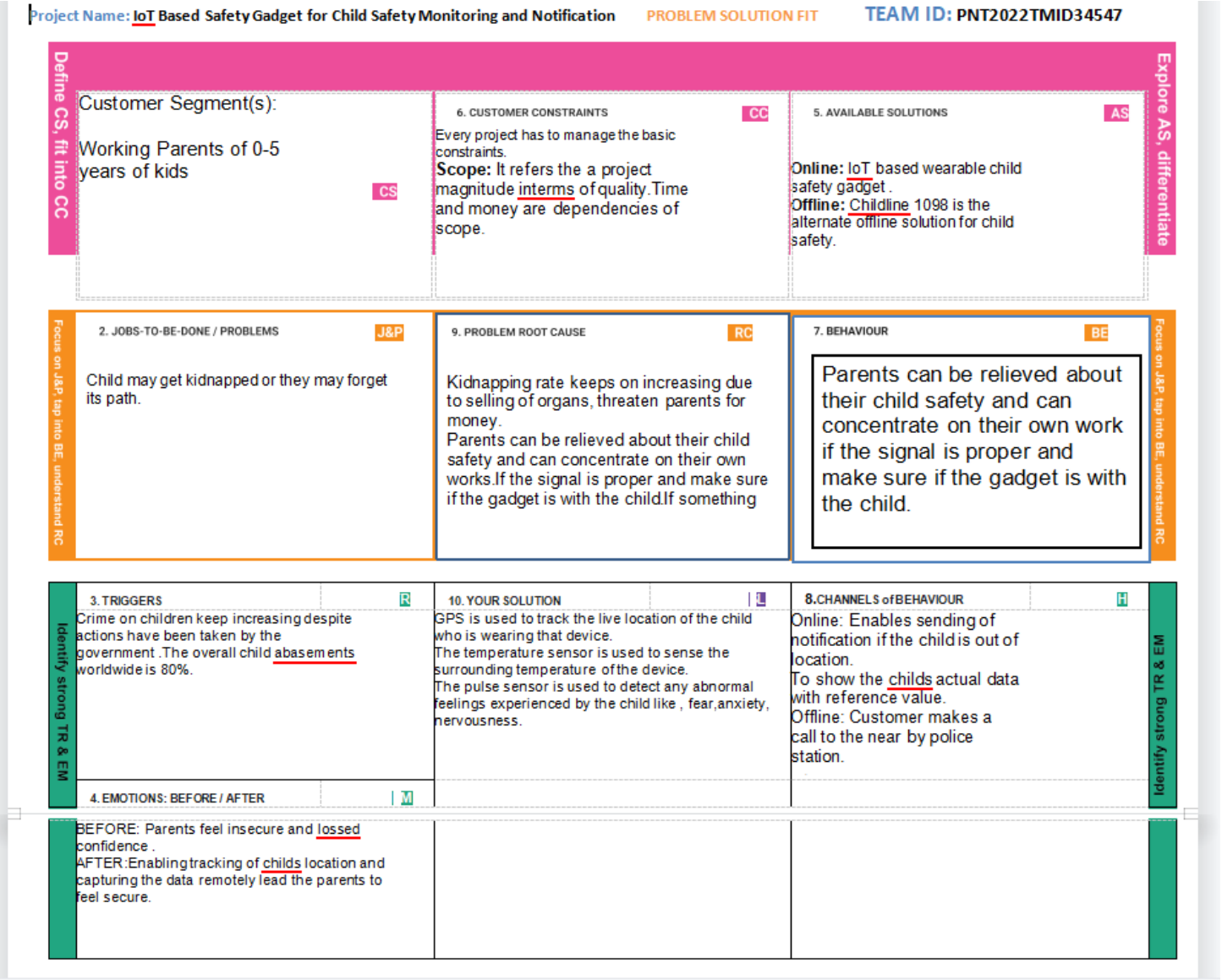


fig.Problem Solution Fit

CHAPTER 4

REQUIREMENT 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.
NFR-5	**Availability**	The data must be available whenever needed and the product should be able to use at any time.
NFR-6	**Scalability**	The process must be flexible to use at anytime and versatile.

CHAPTER 5

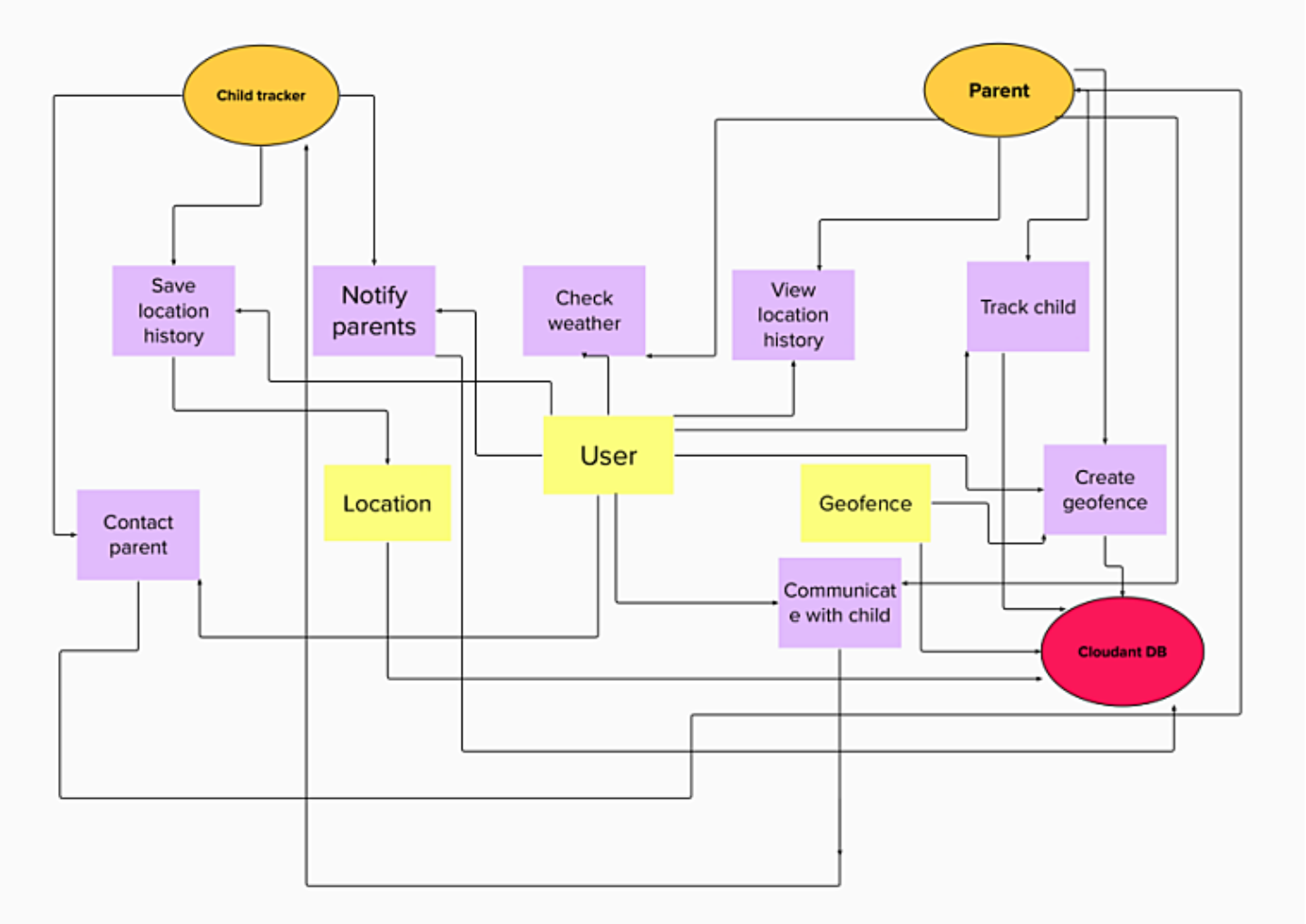
PROJECT DESIGN

5.1 DATA FLOW DIAGRAM:

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount ofthe system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

The Data Flow Graph of our proposed solution is shown below:



5.2 SOLUTION & TECHNICAL ARCHITECTURE

Solution Architecture:

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

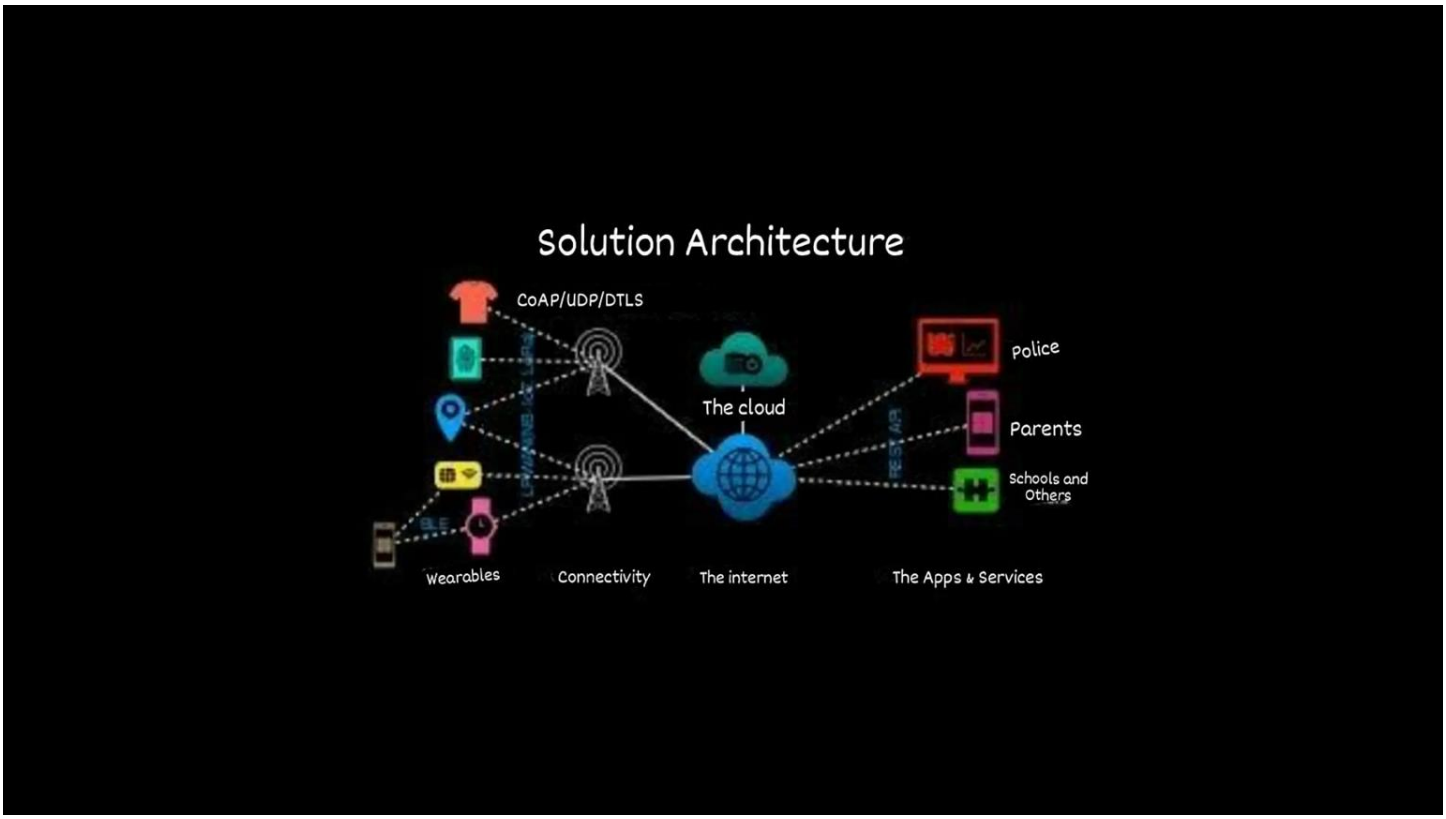


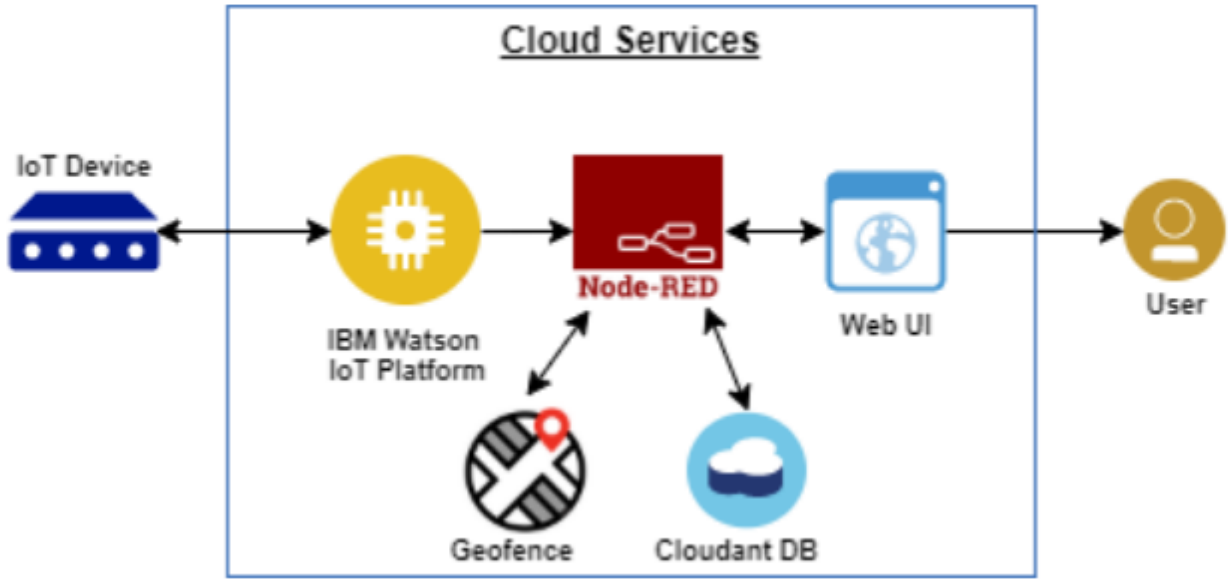
Fig: Solution Architecture

For Technical Architecture

Technical architecture—which is also often referred to as application architecture,IT architecture, business architecture, etc.—refers to creating a structured software solution that will meet the business needs and expectations while providing a strong technical plan for the growth of the software application through its lifetime. IT architecture is equally important to the business team and the information technology team.

Technical architecture includes the major components of the system, their relationships, and the contracts that define the interactions between the components.The goal of technical architects is to achieve all the business needs with an applicationthat is optimized for both performance and security. IT architects plan for things they know are coming in the future and for things they don't yet envision or dream. Taking the time to design the architecture at the start will prevent major design changes, coderefactoring, and expensive rework later in the project.

Technical Architecture:



5.3 USER STORIES:

A user story is an informal, general explanation of a software feature written fromthe perspective of the end user. Its purpose is to articulate how a software feature will provide value to the customer. It's tempting to think that user stories are, simply put,software system requirements. But they're not.

A key component of agile software development is putting people first, and auser story puts end users at the center of the conversation. These stories use non-technical language to provide context for the development team and their efforts. Afterreading a user story, the team knows why they are building, what they're building, and what value it creates. User stories are one of the core components of an agile program.They help provide a user-focused framework for daily work — which drives collaboration, creativity, and a better product overall.

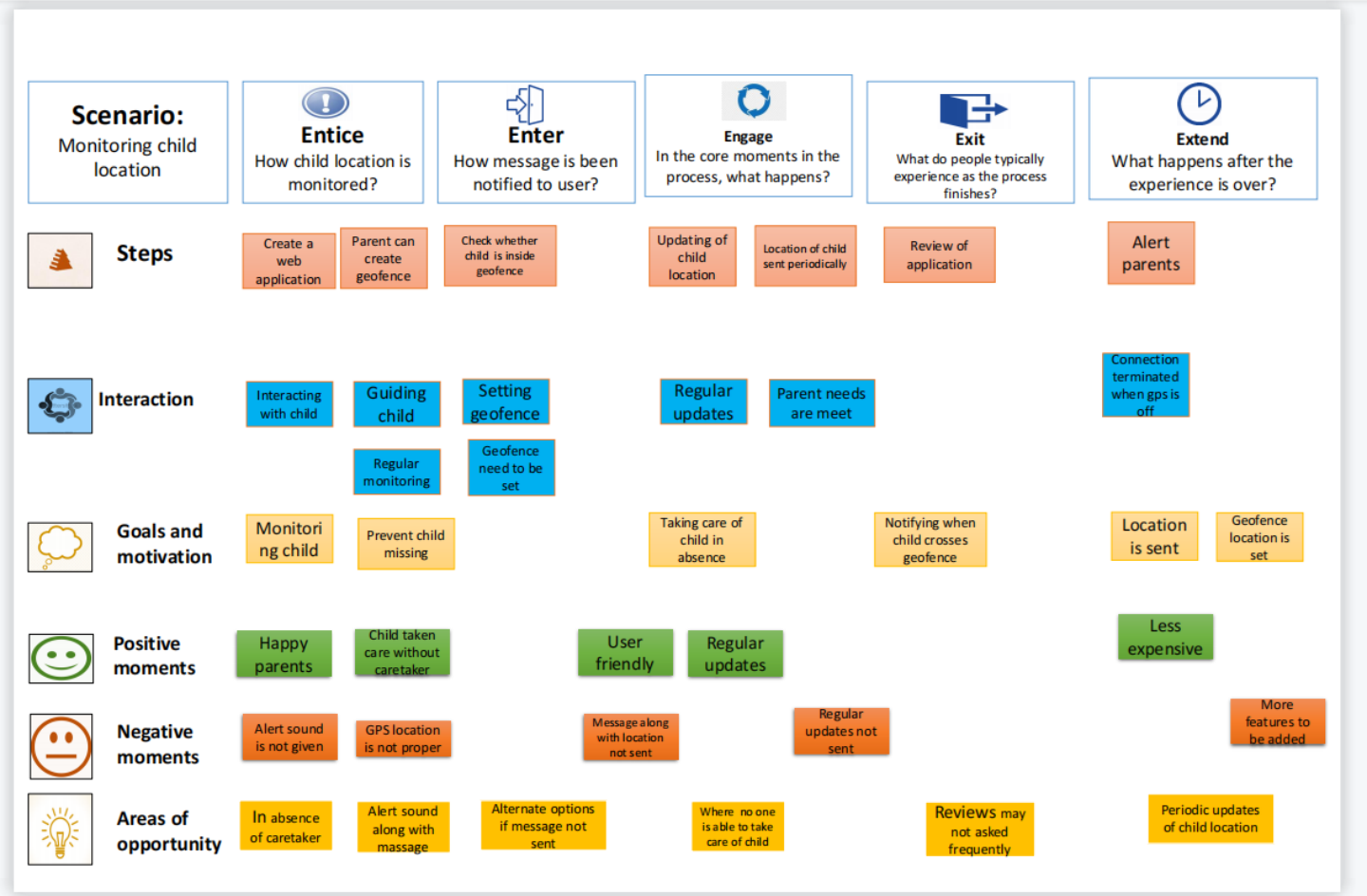


Fig.Customer Journey

CHAPTER 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION:

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create a product backlog and sprint schedule

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	4	High	SRIVENI A

			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	SUSHMA
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium	RATHI R
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	4	High	KARTHIKA DEVI M
Sprint-1	Dashboard	USN-5	As a user, I need to be able to view the functions that I can perform	4	High	SRIVENI A
Sprint-2	Notification	USN-1	As a user, I should be able to notify my parent and guardian in emergency situations	10	High	RATHI R
Sprint-2	Store data	USN-2	As a user, I need to continuously store my location data into the database.	10	Medium	SUSHMA
Sprint-3	Communication	USN-3,1	I should be able to communicate with my parents	6	Low	KARTHIKA DEVI M

Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Story Points**	**Priority**	**Team Members**
Sprint-3	IoT Device – Watson communication	USN-1,4	The data from IoT device should reach IBM Cloud	7	Medium	SUSHMA

Sprint-3	Node RED-Cloudant DB communication	USN-5,2	The data stored in IBM Cloud should be properly integrated with Cloudant DB	7	High	SRIVENI A
Sprint-4	User – WebUI interface	USN-1,4	The Web UI should get inputs from the user	6	High	SRIVENI A
Sprint-4	Geofencing	USN-2,3,5	The geofencing of the child should be done based on the geographical coordinates	7	High	SUSHMA

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)

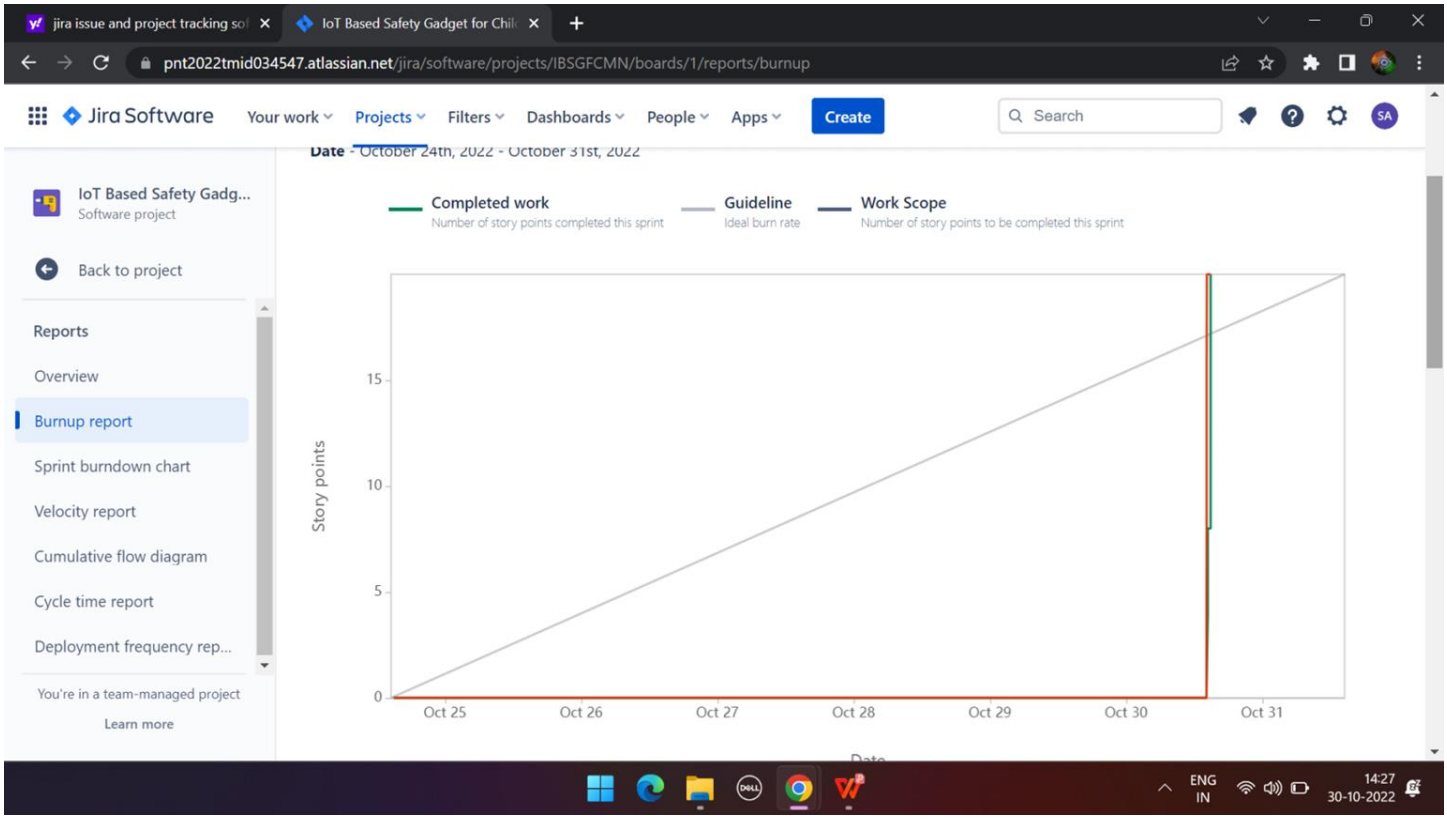
$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

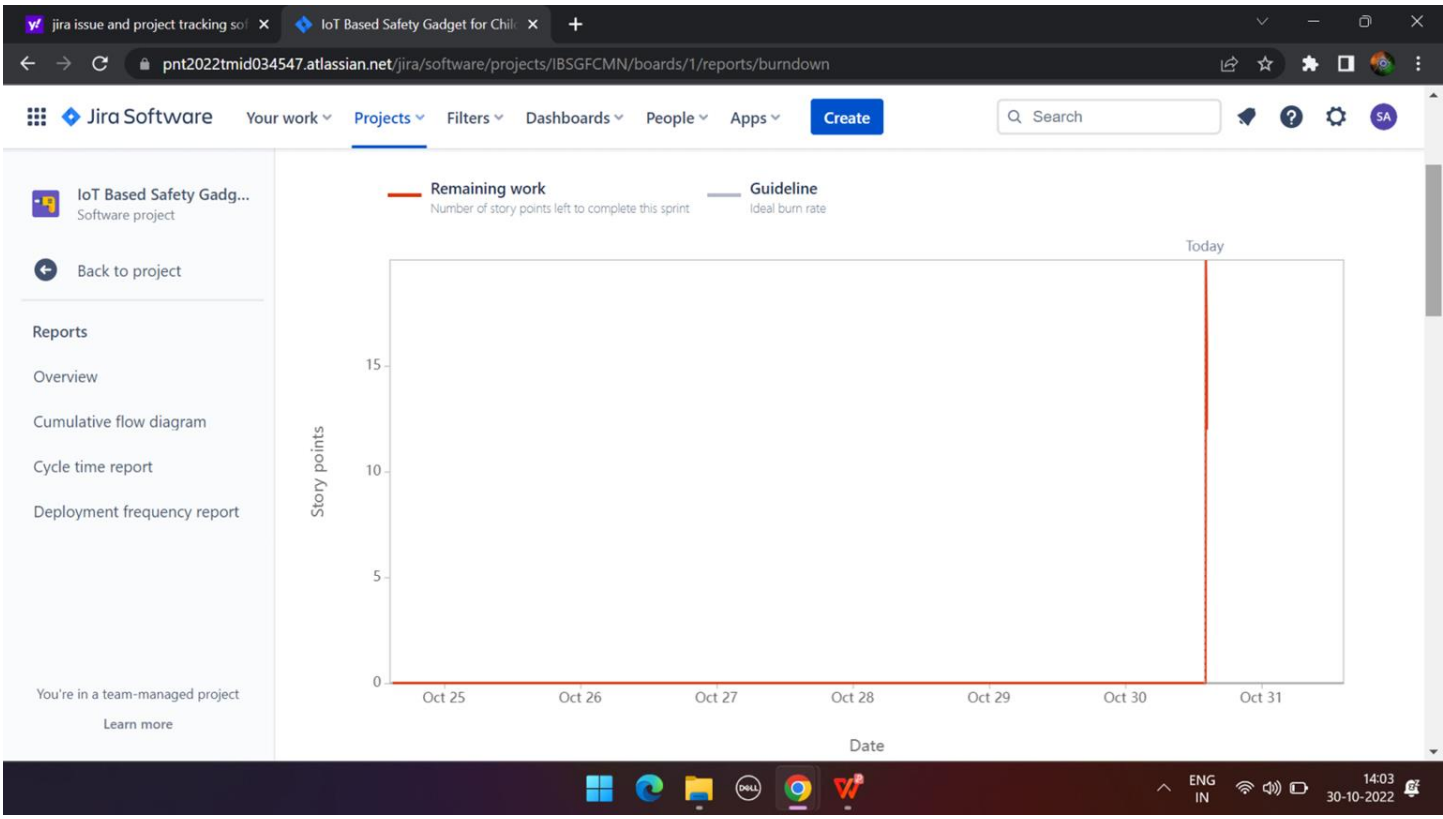
6.2 SPRINT DELIVERY SCHEDULE:

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:

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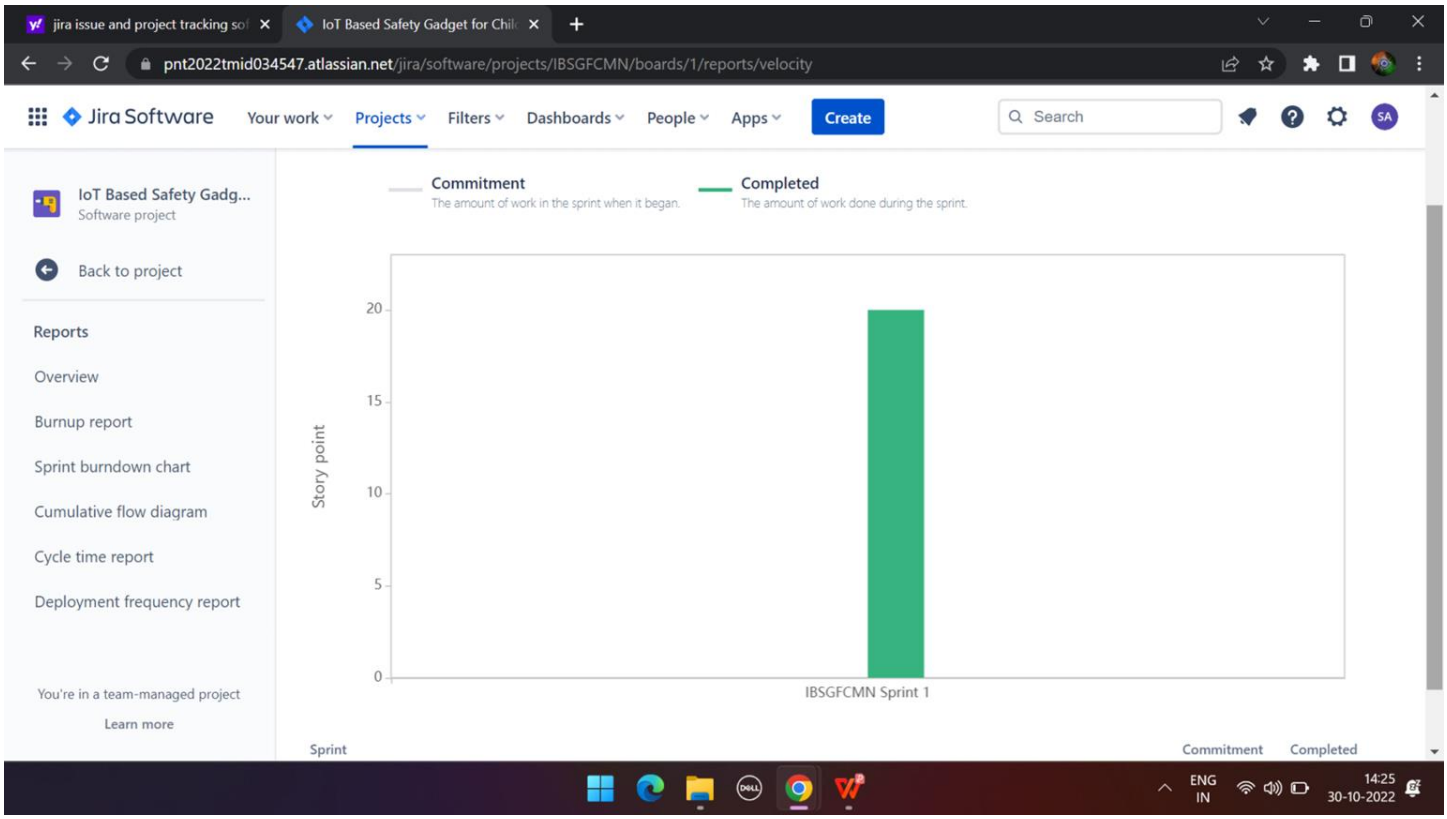
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Cumulative flow diagram
Cycle time report
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Learn more
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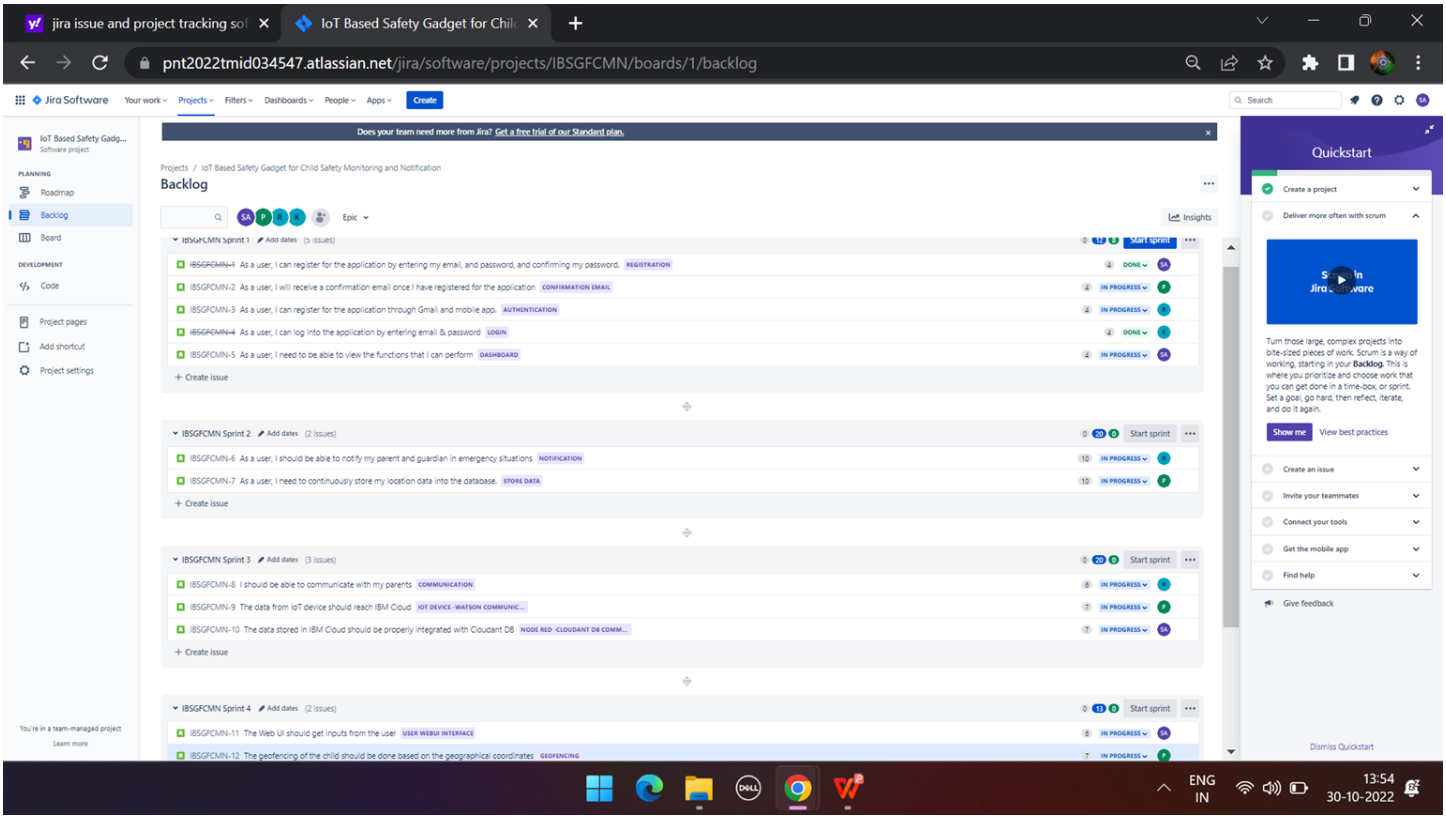
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Backlog
Epic
Insights
IBSGFCMN Sprint 1
IBSGFCMN-1 As a user, I can register for the application by entering my email, and password, and confirming my password. REGISTRATION
IBSGFCMN-2 As a user, I will receive a confirmation email once I have registered for the application CONFIRMATION EMAIL
IBSGFCMN-3 As a user, I can register for the application through Gmail and mobile app. AUTHENTICATION
IBSGFCMN-4 As a user, I can log into the application by entering email & password LOGIN
IBSGFCMN-5 As a user, I need to be able to view the functions that I can perform DASHBOARD
Create issue
IBSGFCMN Sprint 2
Add dates
(2 issues)
Start sprint
IBSGFCMN-6 As a user, I should be able to notify my parent and guardian in emergency situations NOTIFICATION
IBSGFCMN-7 As a user, I need to continuously store my location data into the database. STORE DATA
Create issue
IBSGFCMN Sprint 3
Add dates
(3 issues)
Start sprint
IBSGFCMN-8 I should be able to communicate with my parents COMMUNICATION
IBSGFCMN-9 The data from IoT device should reach IBM Cloud IOT DEVICE -WATSON COMMUNIC...
IBSGFCMN-10 The data stored in IBM Cloud should be properly integrated with Cloudant DB NODE RED -CLOUDANT DB COMM...
Create issue
IBSGFCMN Sprint 4
Add dates
(2 issues)
Start sprint
IBSGFCMN-11 The Web UI should get inputs from the user USER WEBUI INTERFACE
IBSGFCMN-12 The geofencing of the child should be done based on the geographical coordinates GEOFENCING
Quickstart
Create a project
Deliver more often with scrum
Turn those large, complex projects into bite-sized pieces of work. Scrum is a way of working, starting in your Backlog. This is where you prioritize and choose work that you can get done in a time-box, or sprint. Set a goal, go hard, then reflect, iterate, and do it again.
Show me
View best practices
Create an issue
Invite your teammates
Connect your tools
Get the mobile app
Find help
Give feedback
Dismiss Quickstart
ENG
IN
13:54
30-10-2022

Fig. Sprint Assignment page

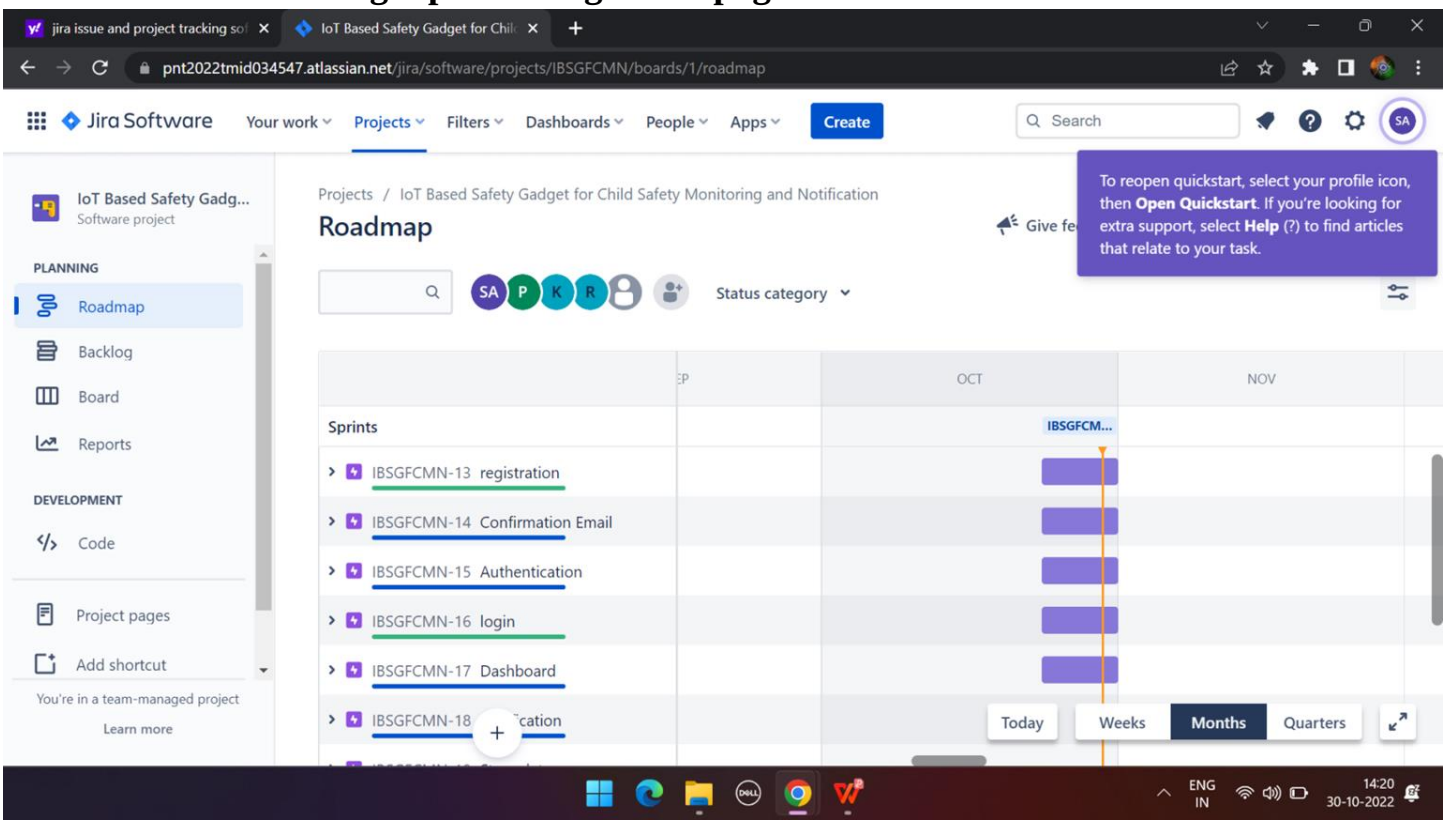
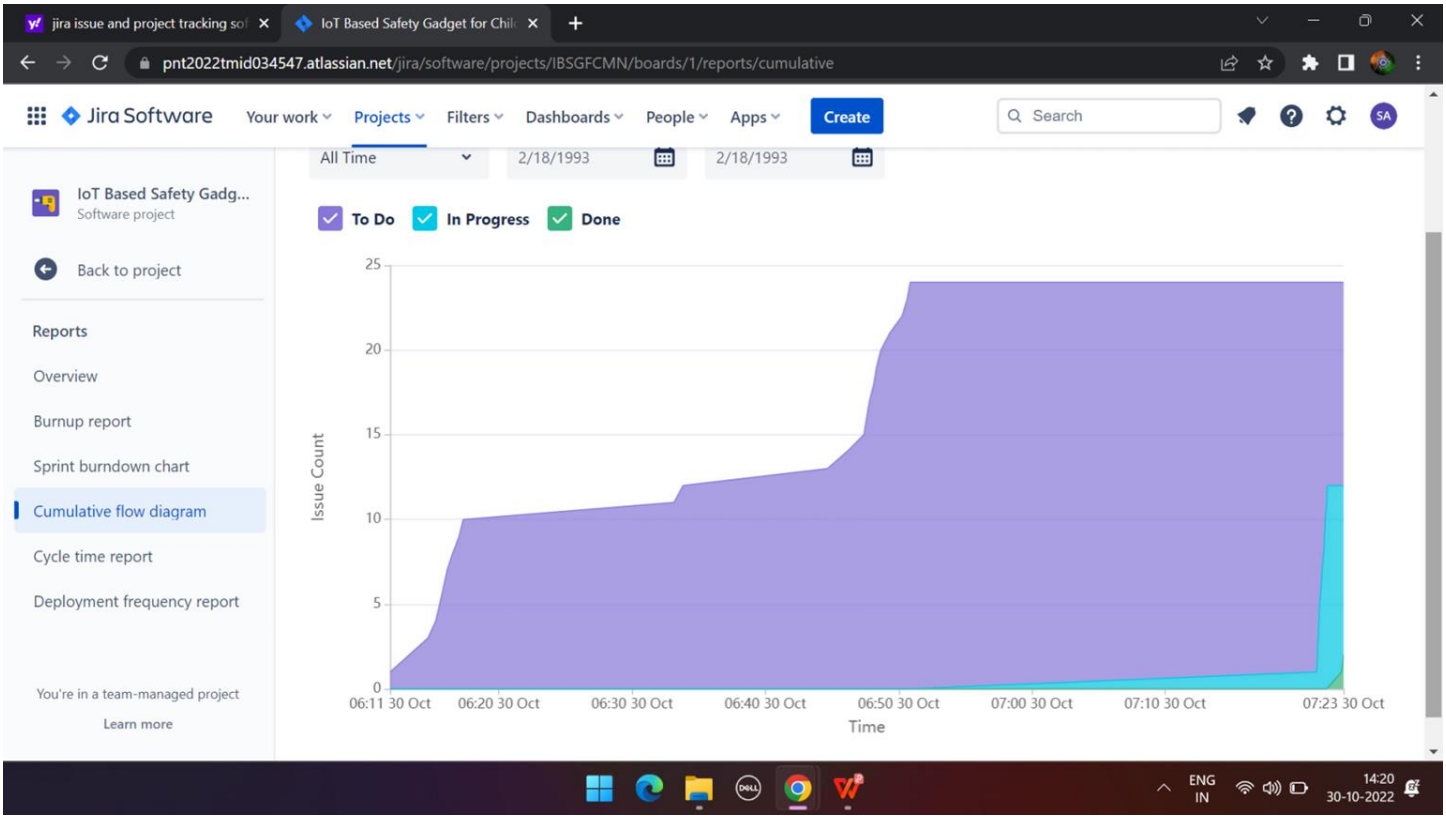


Fig. Road Map After Tasks Done



CHAPTER 7

CODING & SOLUTIONING

7.1 FEATURE 1

IBM WATSON IoT PLATFORM

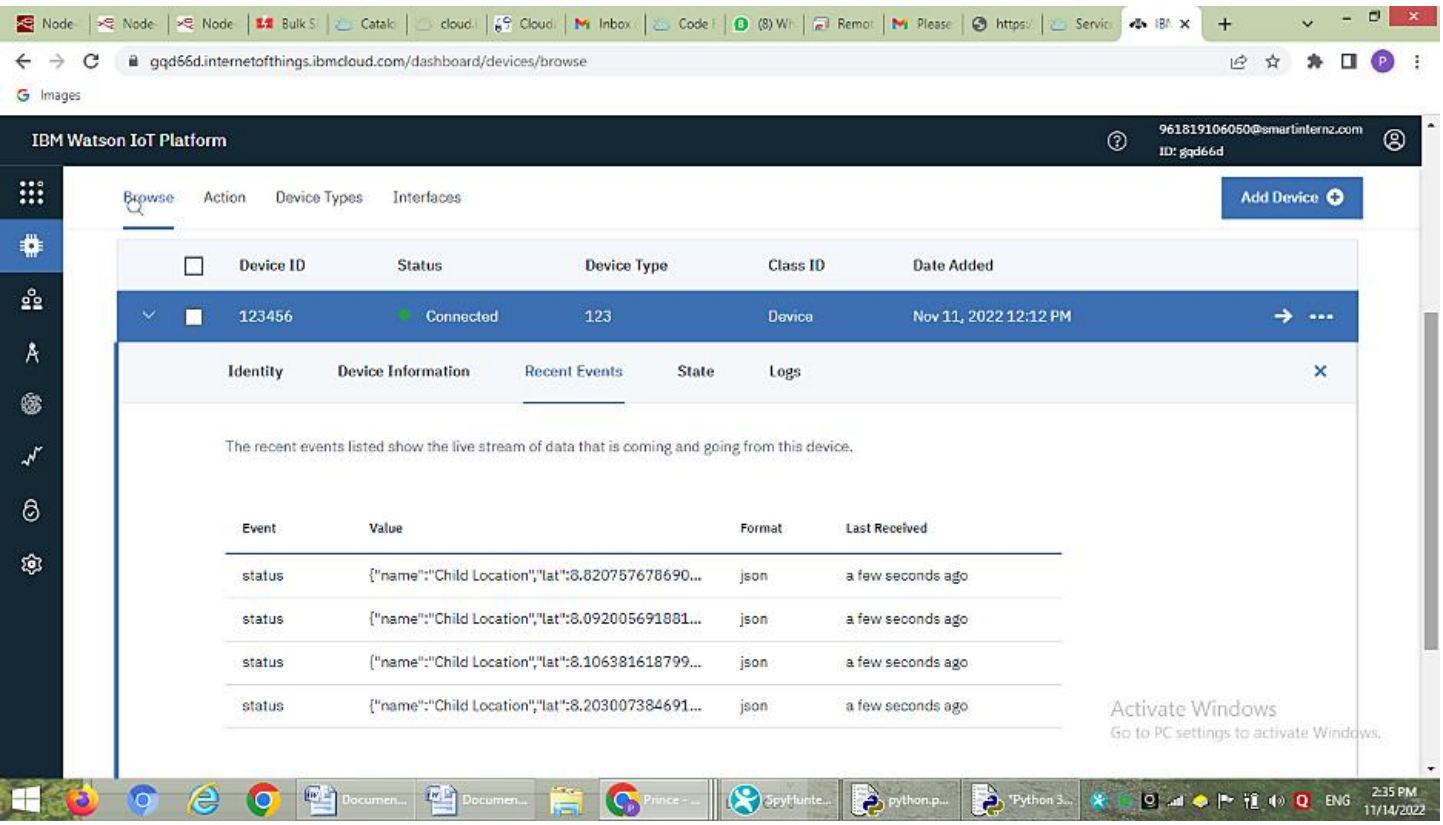
The very first process in this project section is to develop the IBM IoT Platform. This IoT platform is the core formula for all the conection process. As the only way ofconnecting several applications is the basic work of the cloud platform.The process ofsigning in to the cloud process is the large process which carriesverfication segments too. After creating the Cloud Profile, lets move to device creation part.

Device Creation:

Now the next step is to create a device, we have created a device with following details

Device Type : 123

Device Id : 123456



After registering to the IBM IoT Platform and created the device, now we move onto the Node-Red Service, in this here we can create the Web user interface and the WebApplication by designing the circuit. Our Node-Red Circuit designing are as follows.

The first step is to install the IBM IOT block from the node-red service and wehave set four functions namely , latitude, longitude, location these four
functions processess bin value with corrseponding location of the child, whenever the child gets out of the geo-fence , an alert message is sent to the guardian or parent .Location of the child can be seen in the map.

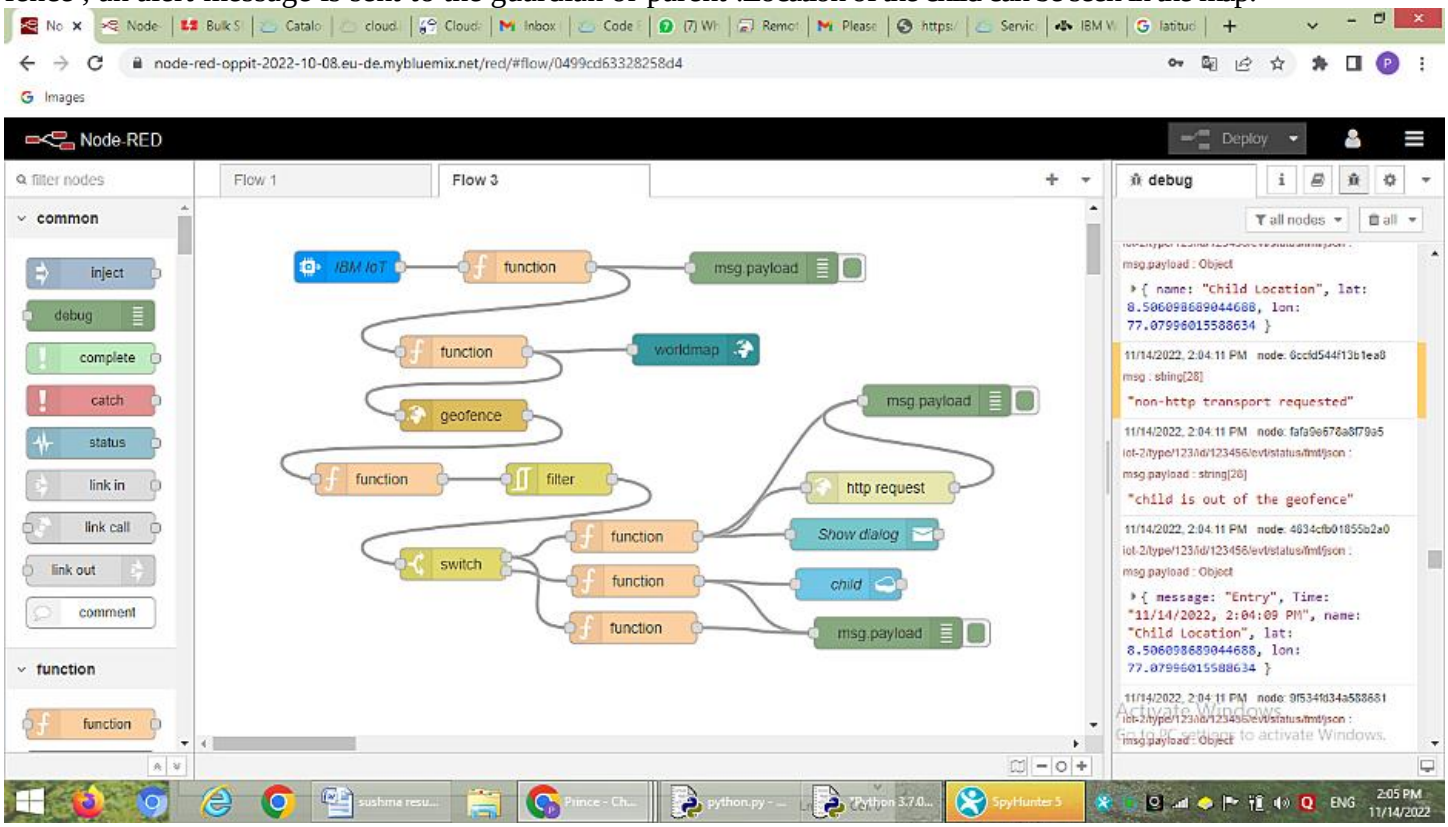
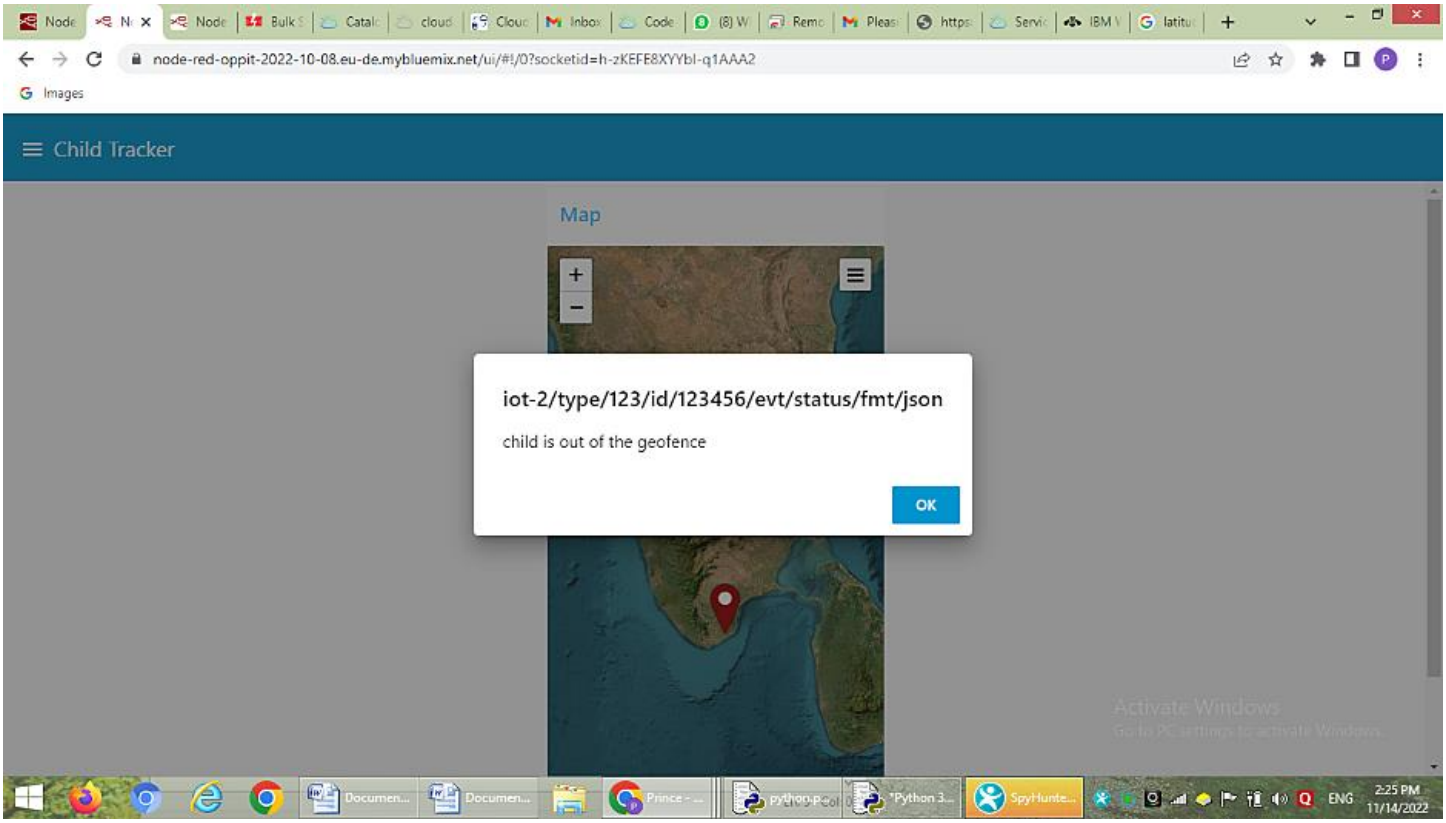


Figure: Node red circuit design

After the successful simulation of the Node-Red Service, User Interface is created. OurWeb UI includes a dashboard which has the location of the particular child and a alert message to be sent.

Our Executed User Interface from the Node-Red is shown below



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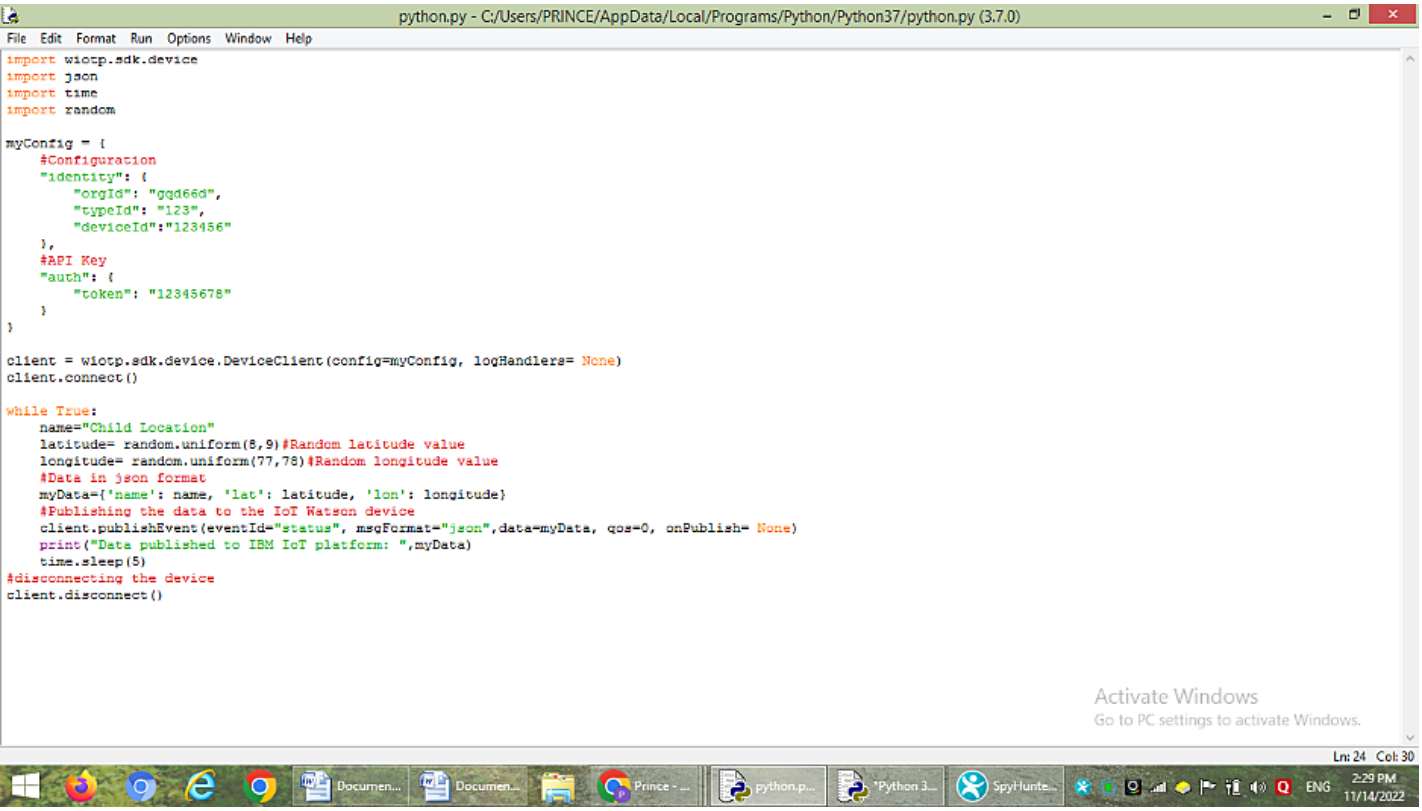
7.2 FEATURE 2

PYTHON CODE

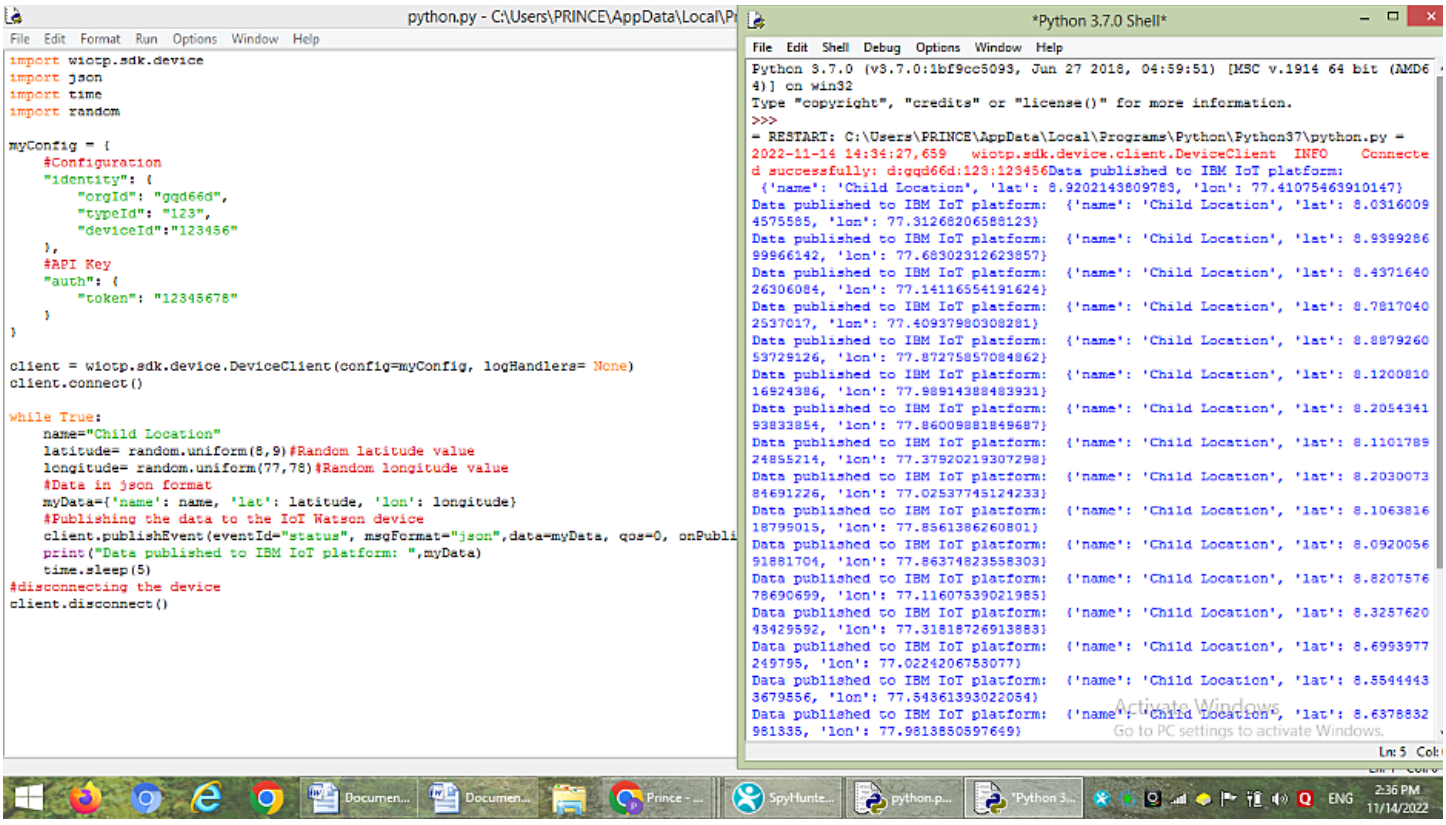
Our Python Code is very Simple and easy to understand. The programs carries our device detalis and the requirements of the project are kept defined. All conditions are made properly and the output is done successfully



CHAPTER 8
TESTING

8.1 TEST CASES:

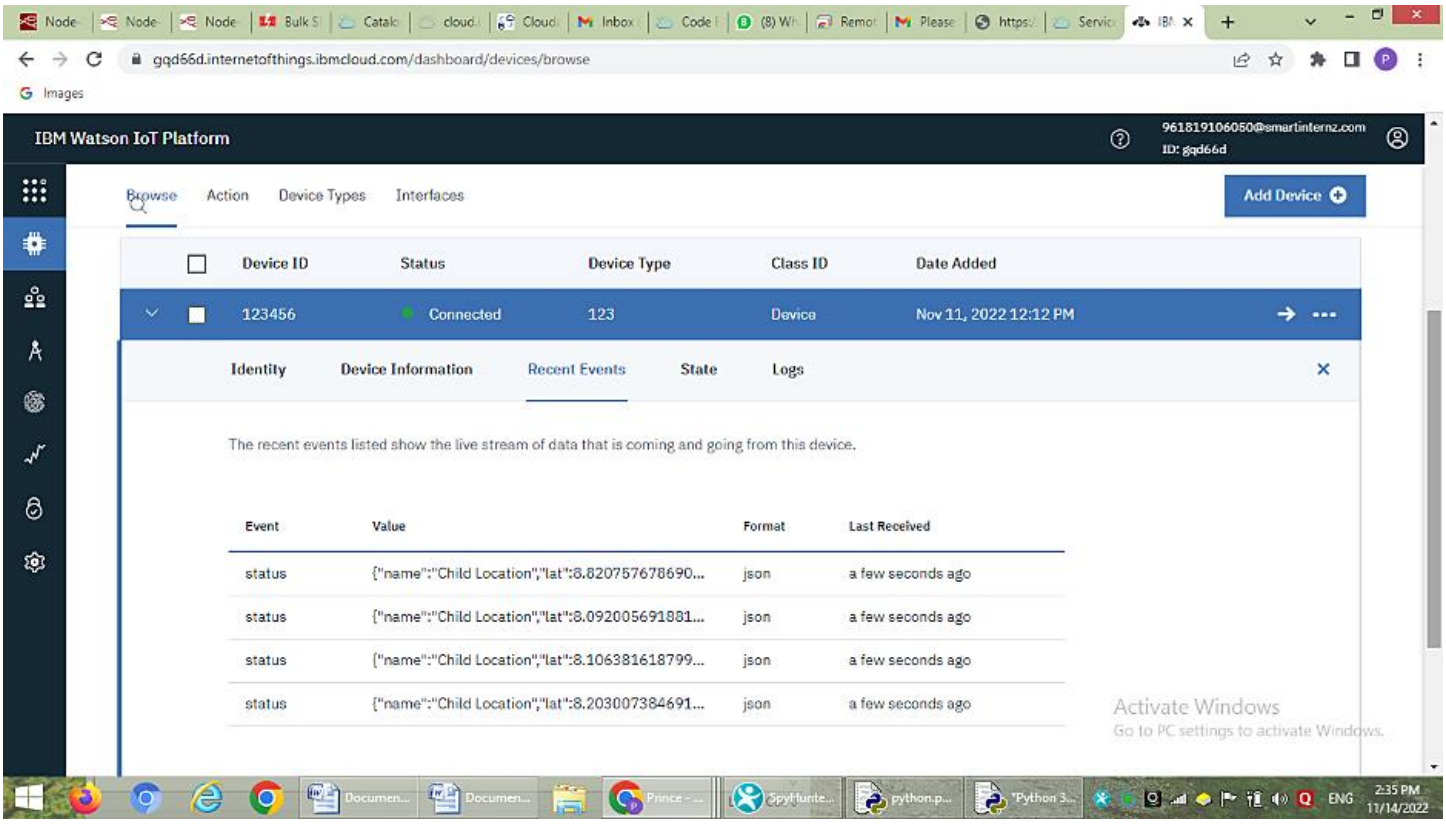
As the code is made to run, the system waits to connect with IoT platform. On account of coonection with the IBM Watson Platform, the code displays the output with relevant details. The output is shown in Cloud platform, the links to Node-Red also to the UI section. Finally when the Application is operated, the output is also displayed in it The output of our Code is shown below,



CHAPTER 9
RESULTS

9.1 PERFORMANCE METRICS:

The performance and the working of the code is ver quick and the results appears in quick succession. Our code is linked with the most used IBM Watson IoT Platform which works with much perfection. This cloud platform is very secure to use and configure easily. As the code is simulated within seconds the result appears. We have done lot of works using this IoT platform which is very simple and good user friendly platform. Below we display our connected IoT platform which delivers the results as the code is run.



CHAPTER 10

ADVANTAGES & DISADVANTAGES

ADVANTAGES:

1 Easy Availability& Affordability

Gone are the days when buying a GPS enabled Wearable Device for kids was considered a luxury. Today, however, the scenario is different. There are plenty of options readily available. It is easy to buy a smart watch for kids of your choice online. What's more, these magnificent tech gadgets don't burn a big hole in your pockets and make up for an affordable buy. Now a smart watch is just a click away! Besides ,these smart-watches lend a style statement to your fashion conscious kids.

2 Tracking Made Easy

Fueled by IOT, the GPS enabled Wearable Device act as a saviour for parents who are always clouded with worries about their kids. Tracking a child was never this easy. These Wearable Device allow parents to track their children in crowded/public places or when they are out of sight say at school, picnic or an outing. Parents can use these smart-watches to track the location of their lost kids.

3 Smart watch is Technology in Disguise

No matter how tech advanced the smart watches are, they hardly look like one. Most manufacturers have worked hard to mold their tech wonders in a time piece that looks everything but a tech piece! Their childish designs and bright colour combination is perfect to disguise them. This is precisely why most people can hardly spot the difference between a smart watch and an ordinary watch. Good for kids who use them, as their adorable designs keep these watches safe from the prying eyes.

4 Watches Over Your Kids

GPS tracker watches are a boon for parents as they help in watching over your kids when either they are away or you are away from them. These devices:

1. Tracks kids when they reach school or arrive home from school.

2. Track kids when they are untraceable in a crowded space.

3. Track kids when they are away from home and out of your sight.

5 Guarantees Peace of Mind to Parents

Parents, whether at home or office, are always worried about the safety of their kids. The fear of losing your child to avoidable circumstances is the concern area for all mommies and daddies. On the other hand, a smart watch equipped kid is always traceable and reachable in case of contingencies and emergencies. This in fact, offers great solace for parents, who are relieved at the thought of maintaining an uninterrupted connectivity with their children, anytime, anywhere. Enough to of course, guarantee the much-needed peace of mind

DISADVANTAGES:

Daily battery charging may be difficult to remember for the wearable trackers. Frequent monitoring of child location notification is difficult. Children may loss the gadget.

CHAPTER 11

CONCLUSION

One of the applications of modern Information and Communication Technologies (ICT) in video monitoring is a GPS-based vulnerable Child Tracking System. The next era of smart child safety will be based entirely on Internet of Things (IoT) technology, which has revolutionized every aspect of everyday life by making everything smart and intelligent.

The system analyses children activities with video enhancement and instant WEB/ANDROID app notification for better kid monitoring, according to the system. Atomization of the system with a cloud-based real-time database and precise sensors makes kid monitoring simple.This design concept is simple to apply and very flexible to meet the needs of the user. The integration of several sensors with live video monitoring will improve kid monitoring in the classroom or on the bus. The big issue of a

missing kid may be remedied with the use of a child monitoring system. For parents who need to keep track of their children's every move, this system is essential.

CHAPTER 12

FUTURE SCOPE

The purpose of this device is to facilitate the guardian or parents in locating their child with ease and ensuring its well-being. The basic mechanism of this system involves monitoring the environment through sensor nodes, acquiring real-time data and transmitting this data to a cloud server. The data can be accessed by users through a web-based interface present on this cloud server. The wearable also functions to send alerts to the user through a mobile application in case an emergency condition is detected by it. The design of this model involves developing a medium for communication between the parent/guardian and the child's wearable device. The child's location is tracked using GSM mobile communication to specify the location of the child in real-time. We have surveyed relevant papers and have discussed about the different methodologies that have been used to achieve similar but different results. We later also compare these papers using their advantages and disadvantages and we try to bring out the uses from their results.

CHAPTER 13
APPENDIX
PROJECT DEMONSTATION VIDEO UPLOADED HERE

GITHUB LINK: https://github.com/IBM-EPBL/IBM-Project-48085-1660804316

PROJECT DEMO LINK: **https://youtu.be/NvglbK2tAiI**

IoT Based Safety Gadget for Child Safety Monitoring and Notification

By

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