

PROJECT REPORT

CONTEXT

TEAM ID: PNT2022TMID03720

1.INTRODUCTION

1.1 PROJECT OVERVIEW

1.2 PURPOSE

2.LITERATURE SURVEY

2.1 EXISTING PROBLEM

2.2 REFERENCES

2.3 PROBLEM STATEMENT DEFINITION

3.IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

3.2 IDEATION & BRAINSTROMING

3.3 PROPOSED SOLUTION

3.4 PROBLEM SOLUTION FIT

4.REQUIREMENTS ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

4.2 NON-FUNCTIONAL REQUIREMENT

5.PROJECT DESIGN

5.1 DATAFLOW DIAGRAM

5.2 SOLUTION & TECHNICAL ARCHITECTURE

5.3 USER STORIES

6.PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

6.2 SPRINT DELIVERY SCHEDULE

6.3 REPORTS FROM JIRA

7.CODING & SOLUTIONS

7.1 FEATURE 1

7.2 FEATURE 2

7.3 DATABASE SCHEMA

8.TESTING

8.1 TEST CASES

8.2 USER ACCEPTANCE TESTING

9. RESULTS

9.1 PERFORMANCE METRICS

10.ADVANTAGES & DISADVANTAGES

11.CONCLUSION

12.FUTURE SCOPE

13.APPENDIX

SOURCE CODE

GITHUB & PROJECT DEMO LINK

1.INTRODUCTION

1.1 PROJECT OVERVIEW

Child safety and tracking is a major concern as the more number of crimes on children are reported. The children are too young to take care of themselves. we cannot monitor the children at all times in school , plat area , and outside. Sometimes parents in differently leave their child in school or parks somewhere. According to this critical situation we would able to find the child with the help of IoT (Internet of Things). This device helps the child when they cross geofence area the notifications will be sent to their parents or caretakers.

1.2 PURPOSE

Internet of Things (IoT) plays a major role in every day to day life. IOT devices are smart devices, which are able to take decisions by sensing the environment around the devices. IoT brings advanced elements in the social, economic impact of users.

2.LITERATURE SURVEY

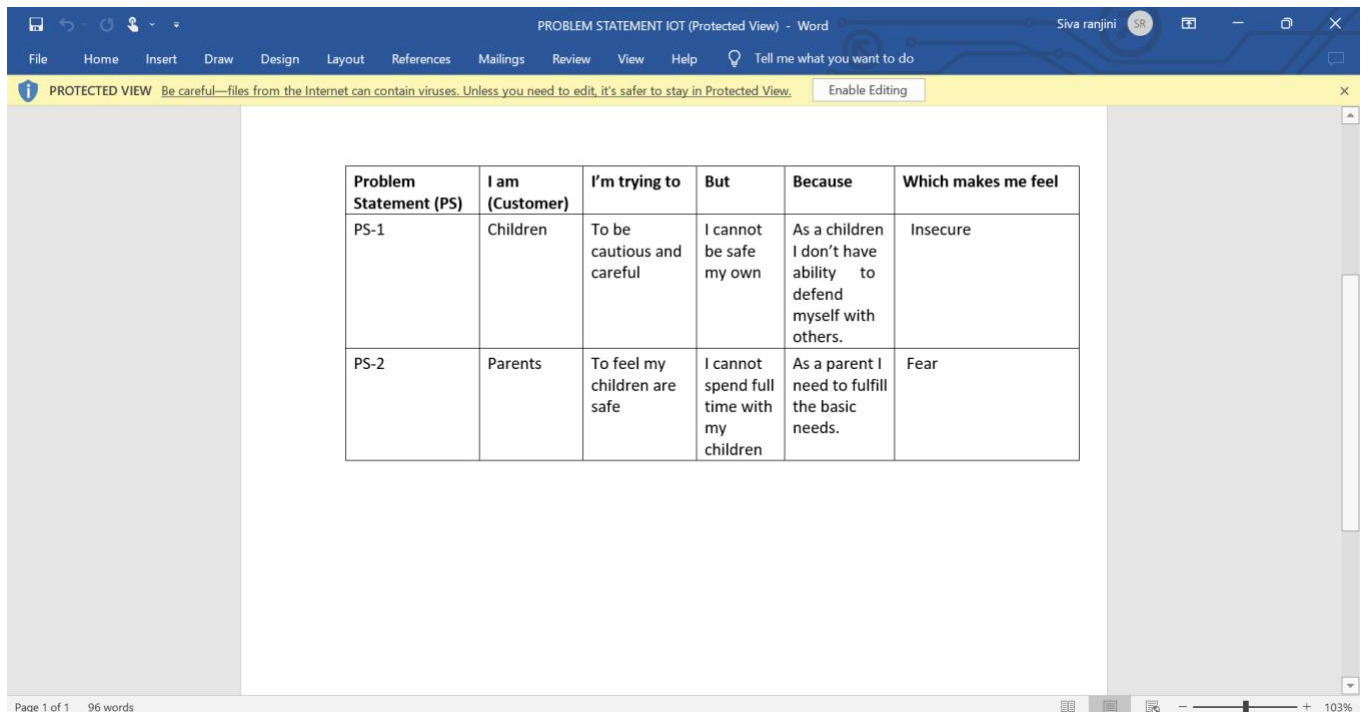
2.1 EXISTING PROBLEM

M. Madhuri, A. Q. Gill and H. U. Khan [1]-“ The proposed integrated digital technology architecture such as the Salesforce cloud, Mobile Application and GPS can be easily used for tracking a missing child in an event. This work is a first steps towards the development of a working software for a Smart Child Tracker ” .A. Srinivasan, S. Abirami, N. Divya, R. Akshya and B. S. Sreeja [2]-” This paper has focused mainly on the autonomous operation of the safety system. Combined usage of three different vitals has increased the accuracy of detecting the abnormal situation. Usage of machine learning has improved the accuracy and made the system intelligent” .B. Ranjeeth, B. S. Reddy, Y. M. K. Reddy, S. Suchitra and B. Pavithra, [3]“ This IoT based device brings a revolutionary change in the current problems regarding child safety issues. Child safety is the most common problem in the world. By this project, the child missing and kidnap issues can be brought down and help the society” .M. Benisha et al., [4]-“ The planned mechanism provides a better methodology to view & track the location of the children in terms of latitude and longitude which can additionally track using Google maps It is used by the Arduino module to overcome GSM by using IT to better Communication and heartbeat sensor and MEMS accelerator is also added. If an accident happens, message with location sends instantly to the registered contacts and also to the nearest police stations “

2.2 REFERENCES

[1] M. Madhuri, A. Q. Gill and H. U. Khan, "IoT-Enabled Smart Child Safety Digital System Architecture," 2020 IEEE 14th International Conference on Semantic Computing (ICSC), 2020, pp. 166-169, doi: 10.1109/ICSC.2020.00033.[2] A. Srinivasan, S. Abirami, N. Divya, R. Akshya and B.S. Sreeja, "Intelligent Child Safety System using Machine Learning in IoT Devices," 2020 5th International Conference on Computing, Communication and Security (ICCCS), 2020, pp. 1-6, doi: 10.1109/ICCCS49678.2020.9277136.[3] B. Ranjeeth, B. S. Reddy, Y. M. K. Reddy, S. Suchitra and B. Pavithra, "Smart Child Safety Wearable Device," 2020 International Conference on Electronics and Sustainable Communication Systems (ICESC), 2020, pp. 116-120, doi: 10.1109/ICESC48915.2020.9156001.[4] M. Benisha et al., "Design of Wearable Device for Child Safety," 2021 Third International Conference on Intelligent Communication Technologies and Virtual Mobile Networks (ICICV), 2021, pp. 1076-1080, doi: 10.1109/ICICV50876.2021.9388592

2.3 PROBLEM STATEMENT DEFINITION



Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Children	To be cautious and careful	I cannot be safe my own	As a children I don't have ability to defend myself with others.	Insecure
PS-2	Parents	To feel my children are safe	I cannot spend full time with my children	As a parent I need to fulfill the basic needs.	Fear

3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

Step – 2: Brainstrom , Idea Listening and Grouping

3 BRAINSTORM
Write down any ideas that come to mind that address your problem statement.

15 minutes

Tip
You can collect a sticky note from each participant to ensure you have a wide range of ideas.

Sivaranjini M

1. A smart IoT device for child safety and tracking
2. A smart IoT device for child safety and tracking
3. A smart IoT device for child safety and tracking
4. A smart IoT device for child safety and tracking
5. A smart IoT device for child safety and tracking

Monisha E

1. A smart IoT device for child safety and tracking
2. A smart IoT device for child safety and tracking
3. A smart IoT device for child safety and tracking
4. A smart IoT device for child safety and tracking
5. A smart IoT device for child safety and tracking

Suvetha P

1. A smart IoT device for child safety and tracking
2. A smart IoT device for child safety and tracking
3. A smart IoT device for child safety and tracking
4. A smart IoT device for child safety and tracking
5. A smart IoT device for child safety and tracking

Theerthika R

1. A smart IoT device for child safety and tracking
2. A smart IoT device for child safety and tracking
3. A smart IoT device for child safety and tracking
4. A smart IoT device for child safety and tracking
5. A smart IoT device for child safety and tracking

Group Ideas
Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each other a sentence - two labels. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

PLANNING

a smart IoT device for child safety and tracking

we are going to use a smart IoT device for child safety and tracking

child missing and kidnapping issues can be brought down and help the society.

PROCESSING

They are interfaced with temperature, heart beat, GPS, GSM & digital camera modules.

sending a notification if the child is out of location

It also enables when the device makes a network connection.

EXECUTING

It is used to track and get exact location of children.

It increases the interaction of family's with their children.

Child safety can be ensured and crime rate will be reduced.



3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Parents are often worried about their children when they are out of sight. The aim of this project is to help parents to monitor their children's location and to see whether their child is safe or not. This system provides a tracking solution for the parent to keep tracking their child's location outdoors by using GPS as it allows them to determine the exact location of the child
2.	Idea / Solution description	By using IoT Sms based solution to reduced parent insecurity and schools to track children in real time.
3.	Novelty / Uniqueness	This project is basically for the parents who cannot balance their children and work at the same time and also for nonworking parents. The uniqueness of our project is about geofencing, temperature sensing, and location monitoring.
4.	Social Impact / Customer Satisfaction	The ability to locate and track child which gives peace of mind to parents. So that they will be satisfied.
5.	Business Model (Revenue Model)	Child safety monitoring is a guardian angel for the parents who can have the exact location of their child which helps to protect the child from any critical situations, we resolve the problems like high standard geofencing and since we store data in the cloud it can be retrieved when needed.
6.	Scalability of the Solution	Technical complexity is one of the greatest IoT scalability issues. By using right technology is paramount to safeguard.

3.4 PROBLEM SOLUTION FIT

Problem-Solution fit canvas 2.0 Purpose/Vision

1. CUSTOMER SEGMENT <i>Who is your customer?</i> <p>This is used by the parents who have child below 18 years.</p>	6. CUSTOMER CONSTRAINTS <i>What constraints prevent our customers from taking action or limit their choices of solutions?</i> <p>Spending lots of money to the caretakers, parents might also lose their peace of mind in thinking about</p>	5. AVAILABLE SOLUTION <i>Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have?</i> <p>CCTV and caretakers are the alternative solutions for monitoring the children</p>
2. JOBS-TO-BE-DONE/PROBLEMS <i>Which jobs-to-be-done (or problems) do you address for your customers?</i> <p>The children are misguided nowadays, so parents want them to be safe and monitored periodically</p>	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> <p>There are missing cases of children everywhere, so society is concerned about it.</p>	7. BEHAVIOUR <i>What does customer do to address the problems and get the job done?</i> <p>Even some parents optional caretakers to monitor their children, so there is a possibility of child getting harmed by the caretakers.</p>



4.REQUIREMENTS ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Login/Sing up	Through app using forms to input details
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Interfacing	Connecting all involved databases , scripts and device
FR-4	Setting Geo fence	Creating the geo fence in the map
FR-5	Database	Create and maintain a database containing user(child's) locations
FR-6	Tracking location	Update current location in cloud and store location history. Current location is viewable from the dashboard.

FR-7	User Location Check	Check for out of boundary location against established geo-fence by fetching live location from cloud database.
FR-8	User Notification	Notification to registered mobile number Notification via app

4.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional Requirements:

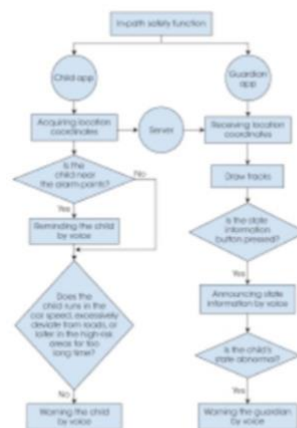
Following are the non-functional requirements of the proposed solution

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The device and its applications are user-friendly. The device is portable and easy to use.
NFR-2	Security	Providing permission for some information can only be decided by the user. Location data can only be viewed by the user.
NFR-3	Reliability	Current location and history of previous ones too can be viewed so it provides enables guardians to continuously monitor child
NFR-4	Performance	Works well as long as there is internet connectivity to use the app
NFR-5	Availability	Can last as long as backup power supply is available.
NFR-6	Scalability	Very scalable as more sensors can be added easily according to need.

5. PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

Data Flow Diagrams:



User Stories

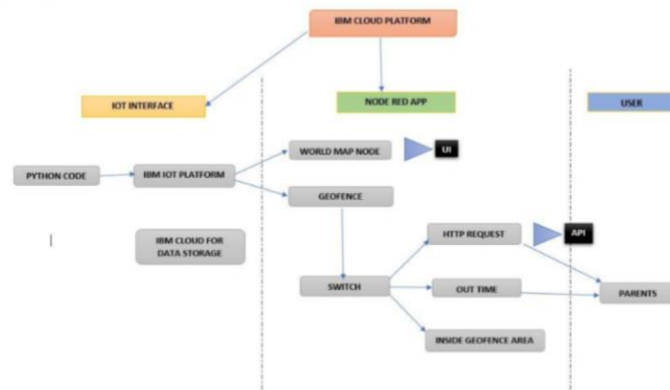
Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Guardian (Mobile user)	User signup/login	USN-1	As a user, I can sign up for the application by entering my phone number , user name, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
	User confirmation	USN-2	As a user, I can login with my username and password once signed up	I can log in by entering only valid user name and password	High	Sprint-1
		USN-3	As a user, I will receive confirmation email once I have signed up for the application	I can receive confirmation email & click confirm	Medium	Sprint-1
		USN-4	As a user, I will receive confirmation OTP once I have signed up for the application	I can receive confirmation message(OTP) for verification	High	Sprint-1
Developer	Interfacing	USN-5	I need to connect all involved scripts, database and devices	I integrate the whole system and make it work	High	Sprint-4
	Setting geo fence	USN-6	I specify the geo location coordinates for geo fence based on user given input	Geo location input must be valid	High	Sprint-2
	User notification	USN-7	I develop a module to notify user via app in case of possible emergency	User receives the notification via app	High	Sprint-4

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
		USN-10	I develop a module to make current location viewable from dashboard	User can check the live location of child whenever needed	Medium	Sprint-3
	User location check	USN-11	I check for out of boundary location against established geo-fence by fetching live location from cloud database	Child should see red light and hear a buzzer sound continuously from device in case of danger until it returns inside geo fence.	High	Sprint-3
Administrator	Database	USN-12	I create a database	The database has fields and records in it	High	Sprint-2
		USN-13	I maintain a database	I update records in database	High	Sprint-4

5.2 SOLUTION AND TECHNICAL ARCHITECTURE

Technical Architecture:



Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Coordinates mapped to location	World Map Node in NODE RED facility IBM Watson STT service (map)
2.	Application Logic-1	Updating geographical coordinates of the child's location to IBM IoT platform periodically (in this project we use static inputs)	Java / Python
3.	Application Logic-2	Checks if location in within safe zone radius or not Radius can be set as per requirements	Geofence Node in NODE RED facility IBM Watson STT service (map)
4.	Cloud Database	Database Service on Cloud	IBM Cloudant

5.	File Storage	File storage requirements	IBM Block Storage
6.	External API-1	To send message to parents if child is out of safe zone radius set	fast2sms API
7.	Infrastructure (Server / Cloud)	Deployment of NODE RED app and further usage	Cloud Foundry

Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Scalable Architecture	We need to update the implemented application periodically	IOT (Internet Of Things)
2.	Availability	To make it available 24/7 for uninterrupted services we have implemented in distributed servers (cloud)	IBM CLOUD
3.	Performance	Network conditions should be stable even at worst conditions	High speed network plays a major role in efficiency

5.3 USER STORIES

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Parents	Login	USN-1	As a <u>parents</u> I want to secure my child.	I can use my mobile phone to track child location from their smart <u>device</u> .	High	Sprint-1
Child who kidnapped	login	USN-2	As a child I will not secure myself.	From my device it will send notification and location to my parents.	High	Sprint-1
police	Login	USN-3	As a <u>police</u> its my responsibility to secure the child.	Parents send the information(location) about the kidnapped child.	High	Sprint-1
Child who is in danger	Login	USN-4	By using the <u>device</u> they will secure themselves.	They protect themselves using the device.	High	Sprint-1

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

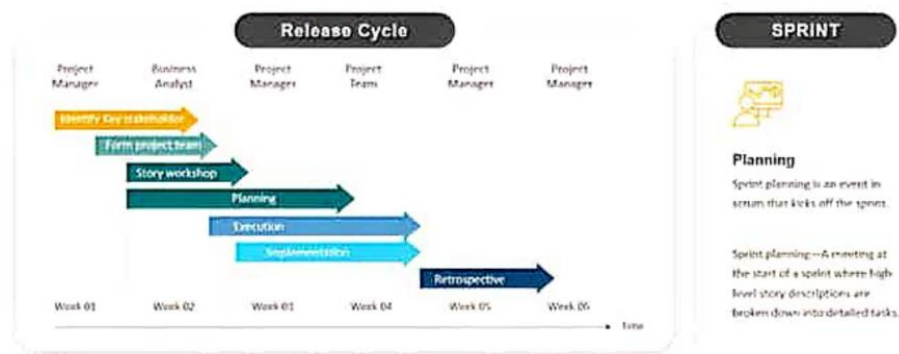
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	User signup/login	USN-1	As a user, I can sign up for the application by entering my phone number , user name, password, and confirming my password.	2	High	Monisha, Sivaranjini
Sprint-1	User confirmation	USN-2	As a user, I can login with my username and password once signed up	2	High	Theerthika, Suvedha
Sprint-1		USN-3	As a user, I will receive confirmation email once I have signed up for the application	1	Medium	Sivaranjini, Theerthika
Sprint-1		USN-4	As a user, I will receive confirmation OTP once I have signed up for the application	2	High	Sivaranjini
Sprint-4	Interfacing	USN-5	I need to connect all involved scripts, database and devices	2	High	Sivaranjini, Monisha, Theerthika, Suvedha

Sprint-2	Setting geo fence	USN-6	I specify the geo location coordinates for geo fence based on user given input	1	Medium	Theerthika, Monisha
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	User notification	USN-7	I develop a module to notify user via app in case of possible emergency	2	High	Monisha, Sivaranjini
Sprint-4	Emergency usage	USN-8	I develop a module to notify user via mobile number in case of possible emergency	2	High	Sivaranjini, Monisha
Sprint-2	Tracking location	USN-9	I input live location from sensor	1	High	Theerthika
Sprint-3		USN-10	I develop a module to make current location viewable from dashboard	2	Medium	Sivaranjini
Sprint-3	User location check	USN-11	I check for out of boundary location against established geo-fence by fetching live location from cloud database	2	High	Suvedha
Sprint-2	Database	USN-12	I create a database	2	High	Monisha
Sprint-4		USN-13	I maintain a database	2	Medium	Monisha

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date
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SPRINT PLANNING



6.2 SPRINT DELIVERY SCHEDULE

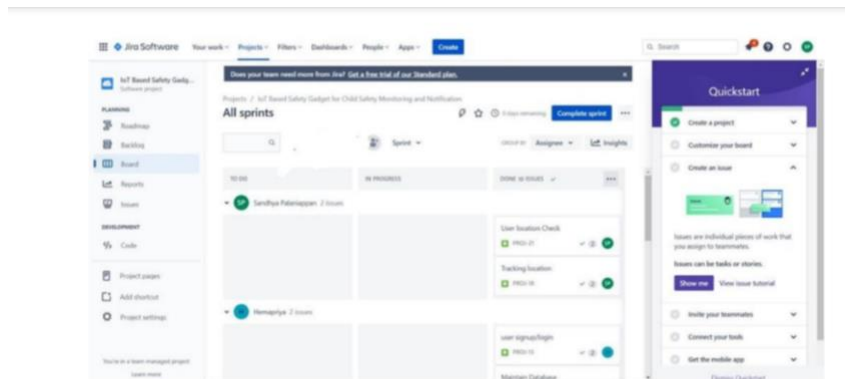
						(Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	04 Nov 2022
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	11 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity:

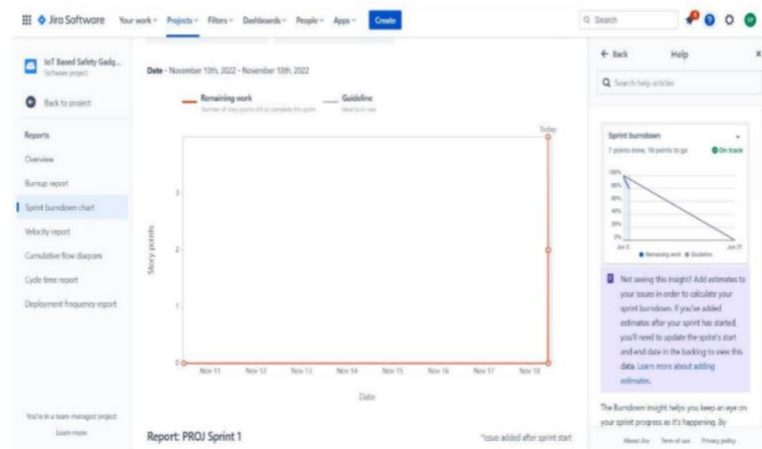
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

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

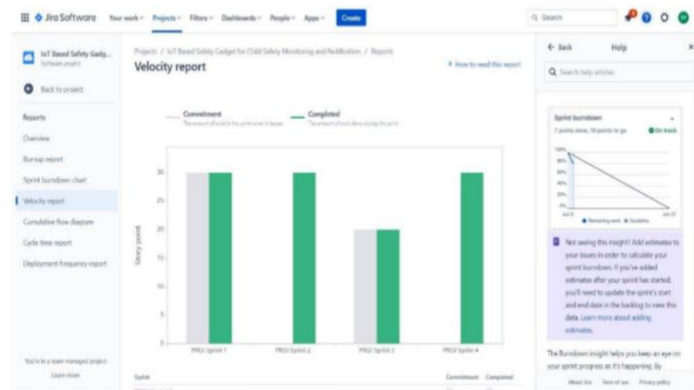
6.3 REPORTS FROM JIRA



➤ BURNDOWN REPORT



➤ VELOCITY REPORT



7.CODING & SOLUTIONS

7.1 FEATURES 1

Alert notification

```
package com.example.geofence;  
import android.content.BroadcastReceiver;  
import android.content.Context;  
import android.content.Intent;
```

```

import android.location.Location;
import android.os.CountDownTimer;
import android.util.Log;
import android.widget.Toast;
import com.google.android.gms.location.Geofence;
import com.google.android.gms.location.GeofencingEvent;
import java.util.List; import android.os.Handler;
public class GeofenceBroadcastReceiver extends BroadcastReceiver {
private static final String TAG = "GeofenceBroadcastReceiv";
@Override
public void onReceive(Context context, Intent intent) {
// TODO: This method is called when the BroadcastReceiver is receiving //
an Intent broadcast
//.*Toast.makeText(context, "GEOFENCE_ENTERED", Toast.LENGTH_SHORT).show();
final Toast mToastToShow;
int toastDurationInMilliseconds = 1200000;
mToastToShow = Toast.makeText(context, "GEOFENCE_EXITED", Toast.LENGTH_LONG);
// Set the countdown to display the toast CountDownTimer toastCountDown; toastCountDown = new
CountDownTimer(toastDurationInMilliseconds, 100000) {
public void onTick(long millisUntilFinished) {
mToastToShow.show();}
public void onFinish() {
mToastToShow.canc
// Show the toast and starts the countdown
mToastToShow.show();
toastCountDown.start();*/
NotificationHelper notificationHelper = new NotificationHelper(context);
notificationHelper.sendHighPriorityNotification("GEOFENCE_TRANSITION_ENTER", "", MapsActivity.class);
GeofencingEvent geofencingEvent = GeofencingEvent.fromIntent(intent);
if (geofencingEvent.hasError()) {
Log.d(TAG, "onReceive: Error receiving geofence event..."); return;
}
List<Geofence> geofenceList = geofencingEvent.getTriggeringGeofences();
for (Geofence geofence: geofenceList) {
Log.d(TAG, "onReceive: " + geofence.getRequestId());
}
// Location location = geofencingEvent.getTriggeringLocation();
int transitionType = geofencingEvent.getGeofenceTransition();
switch (transitionType) {
case
Geofence.GEOFENCE_TRANSITION_ENTER:
notificationHelper.sendHighPriorityNotification("Entered the Location", "", MapsActivity.class); break;
case
Geofence.GEOFENCE_TRANSITION_EXIT:
notificationHelper.sendHighPriorityNotification("Exited the Location ", "", MapsActivity.class); break;

```



```
}  
}  
}
```

7.2 FEATURES 2

Geofence code

```
Package com.example.geofence;  
import android.app.PendingIntent;  
import android.content.Context;  
import android.content.ContextWrapper;  
import android.content.Intent;  
import android.widget.Toast;  
import com.google.android.gms.common.api.ApiException;  
import com.google.android.gms.location.Geofence;  
import com.google.android.gms.location.GeofenceStatusCodes;  
import com.google.android.gms.location.GeofencingRequest;  
import com.google.android.gms.maps.model.LatLng;  
public class GeofenceHelper extends ContextWrapper {  
    private static final String TAG = "GeofenceHelper";  
    PendingIntent pendingIntent;  
    public GeofenceHelper(Context base) {  
        super(base); }  
    public GeofencingRequest getGeofencingRequest(Geofence geofence) {  
        return new GeofencingRequest.Builder()  
            .addGeofence(geofence)  
            .setInitialTrigger(GeofencingRequest.INITIAL_TRIGGER_ENTER)  
            .build(); }  
    public Geofence getGeofence(String ID, LatLng latLng, float radius, int transitionTypes) {  
        return new Geofence.Builder()  
            .setCircularRegion(latLng.latitude, latLng.longitude, radius) .setRequestId(ID)  
            .setTransitionTypes(transitionTypes)  
            .setLoiteringDelay(5000)  
            .setExpirationDuration(Geofence.NEVER_EXPIRE)  
            .build();  
    }  
    public PendingIntent getPendingIntent() {  
        if (pendingIntent != null) {  
            return pendingIntent;  
        }  
        Intent intent = new Intent(this, GeofenceBroadcastReceiver.class);  
        pendingIntent = PendingIntent.getBroadcast(this, 2607, intent, PendingIntent.FLAG_IMMUTABLE);  
        return pendingIntent;  
    }  
    public String getErrorString(Exception e) {
```

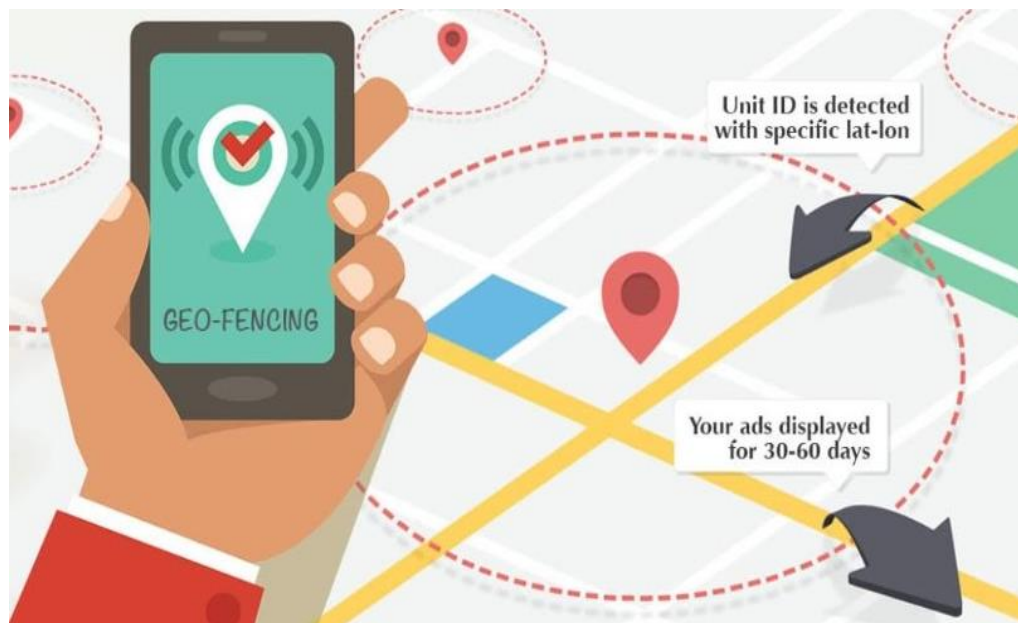
```

if (e instanceof ApiException) {
    ApiException apiException = (ApiException) e;
    switch (apiException.getStatusCode()) {
        case GeofenceStatusCodes
            .GEOFENCE_NOT_AVAILABLE:
            return "GEOFENCE_NOT_AVAILABLE";
        case
            GeofenceStatusCodes
            .GEOFENCE_TOO_MANY_GEOFENCES: return
            "GEOFENCE_TOO_MANY_GEOFENCES";
        case
            GeofenceStatusCodes
            .GEOFENCE_TOO_MANY_PENDING_INTENTS: return
            "GEOFENCE_TOO_MANY_PENDING_INTENTS"; }
    }
    return e.getLocalizedMessage();
}
}

```

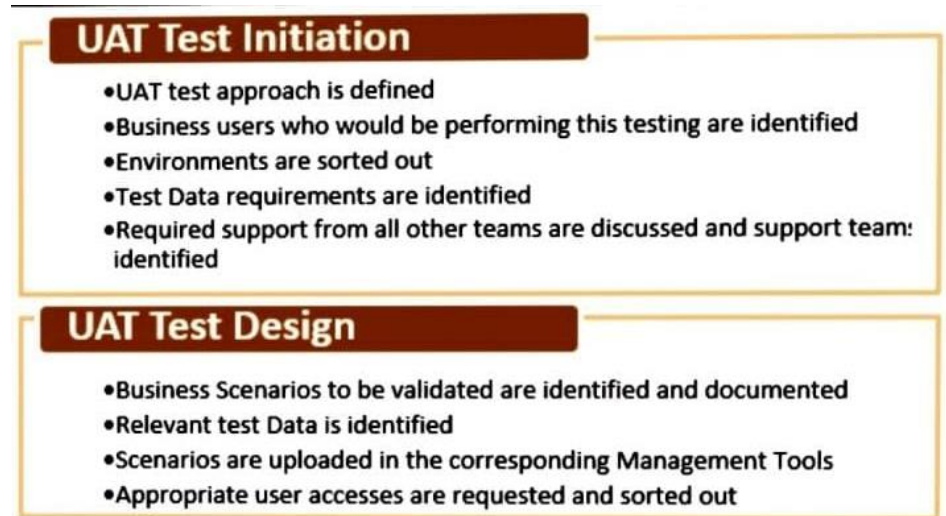
8. TESTING

8.1 TEST CASES



8.2 USER ACCEPTANCE TESTING

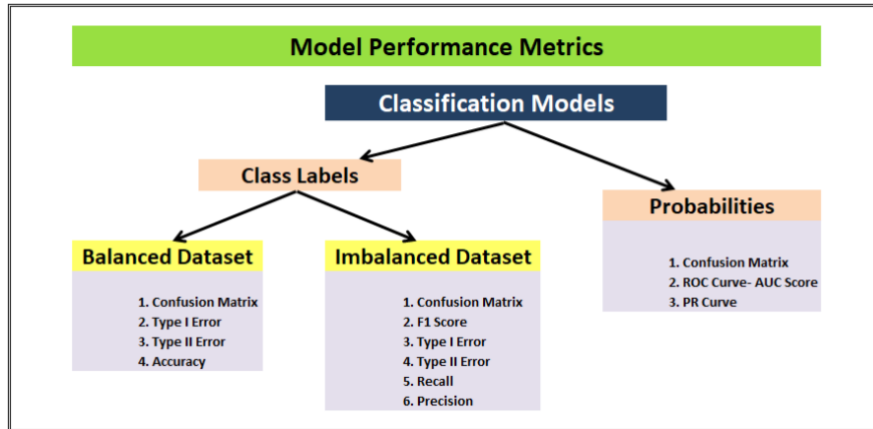
User acceptance testing (UAT) checks whether a product is the right one for the end users. Alpha testing is the initial testing .Beta testing second type of acceptance testing. Main purpose is the validate the product.



9.RESULTS

9.1 PERFORMANCE METRICS

By using the IoT the child will be safe from the risky factors. The crime case will be reduced . parents will feel better for rescuing their children.



10.ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- Keep track of children in cases of abduction
- Give peace of mind to parents
- Notification will send to parents

DISADVANTAGES:

- The cost in time

11. CONCLUSION

This IoT devices for child safety monitoring and notification helping parents to locate and monitor their children.Hence, considering the importance of our future our projects is easy for parents to track their children and to visually monitor them on regular basis ,which makes them ensure the safety of their children and reduces the rate of incidents of child abuse.

12. FUTURE SCOPE

In our system we automatically monitor the child in real time using Internet of Things. The future scope of the work is to implement the Iot device which ensures the complete solution for child safety problems.

13.APPENDIX

SOURCE CODE: IBM

GITHUB & PROJECT DEMO LINK

Github: <https://github.com/IBM-EPBL/IBM-Project-15813-1659604769>

Project Demo Link: https://drive.google.com/file/d/1Z5cCD_eHlyeB-pw8Dkt82LRwEU_-KQ3A/view?usp=drivesdk