

Project Report Format

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Ideation Phase Literature Survey

Date	19 September 2022
Team ID	PNT2022TMID18337
Project Name	Project - IoT Based Safety Gadget for Child Safety Monitoring and Notification
Maximum Marks	4 Marks

Abstract:

Child safety and tracking is of utmost importance as children are the most vulnerable. Children can become victims to harm, injury, violence and abuse as they are vulnerable by virtue of their young age and evolving capacities.

Unfortunately, a child goes missing once every 10 minutes in India. With increasing crime rates such as child kidnaping, child trafficking, child abuse and so on, the need for an advanced smart security system has become a necessity, and thus our project aims at accomplishing the same.

SNo	Title	Inference
1	Children Security and Tracking System Using Bluetooth and GPS Technology	This device uses the alarm technique. It will trigger when the Bluetooth connection is disconnected, and the GPS application is used to track the location of the child whose wearing this device. The child detector device has 2 main units which is for parents and children. The child's units function as a transmitter that transmits a GPS signal, while the parent's units will receive the signal which will determine the position and distance of their child using their own smartphone.
2	IoT-enabled Smart Child Safety Digital System Architecture	This IoT –enabled digital system architecture integrates the Cloud, Mobile and GPS technology to precisely locate the geographical location of a child on an event map. It contains a basic architecture model for reference.
3	Crowdsourced Children Monitoring and Finding with Holding Up Detection Based on Internet –of –Things Technologies	CCMF framework can cooperatively find missing children equipped with wearable devices consisting of mobile iBeacon and 3axis accelerometer modules through crowd sensing networks formed by smartphone users with outdoor GPS and indoor IoT localization.
4	Design of Wearable Device for Child Safety	The problems overawed here using Arduino UNO, GSM, sensors like temperature and panic button by using IOT. Sensor tracks the best rate for children and sends the emergency message by using the GSM to save contacts.
5	Intelligent Child Safety System using Machine Learning in IoT Devices	This electronic system comprises of an Arduino controller and sensors to detect the changes in parameters such as temperature, BVP. The location of the victim is traced using the GPS module and is sent to the registered contacts as a text message using GSM module.

Ideation Phase

Define the Problem Statements

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Maximum Marks	2 Marks

Customer Problem Statement Template:

Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

I am	<small>Describe customer with 3-4 key characteristics - who are they?</small>	Describe the customer and their attributes here
I'm trying to	<small>List their outcome or "job" the care about - what are they trying to achieve?</small>	List the thing they are trying to achieve here
but	<small>Describe what problems or barriers stand in the way - what bothers them most?</small>	Describe the problems or barriers that get in the way here
because	<small>Enter the "root cause" of why the problem or barrier exists - what needs to be solved?</small>	Describe the reason the problems or barriers exist
which makes me feel	<small>Describe the emotions from the customer's point of view - how does it impact them emotionally?</small>	Describe the emotions the result from experiencing the problems or barriers

Reference: <https://miro.com/templates/customer-problem-statement/>

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	A parent	Keep my child safe	There are security issues	Of people with bad motives	Scared and worried
PS-2	A guardian	Protect my adopted child	My child is insecure	Can be easily lost	anxious



Child safety monitoring project helps to monitor the child's action and make sure they are safe in everywhere they go. It is very helpful for the working parents who are not able to be with their children during the day time. Through this device they can monitor the child's activity at anytime and anywhere.

Who are the important area of focus?	Children are the important area of focus. Since they are mostly affected.
What are the boundaries of the problem?	Boundaries are the constraints that we frame for the user to follow.
What is the problem?	Children are exposed to environments like physical and sexual abuse. More possibilities are there, that they can be abducted by anyone when they were not in the monitoring of their parents.
When can this problem can probably happen?	They can happen anytime and anywhere. Our major focus is on the areas where they are not familiar. Eg: Regions other than school and home
Area of study	Major focus of this project is to create a geofence where the children can feel safe like their home, school etc.. If they are located other than these areas, the system assumes that they are in trouble and a message is sent to their parents regarding this.
Who can cause harm?	Anyone can cause harm to the children. It is not necessary that an outsider should hurt the children. It can even be a close relative who has some bad intentions.
Who are mostly benefitted?	Parents who are working. They can monitor their child whenever they can and can feel safe about them. If they want to leave their child to a baby sitter or a preschool, they can make sure that they are safe.
Why it is important to solve this issue?	Children are the future India. They are the main assert. It is our responsibility to safeguard them from the bad eyes and to give them a good and healthy society.

Ideation Phase

Empathize & Discover

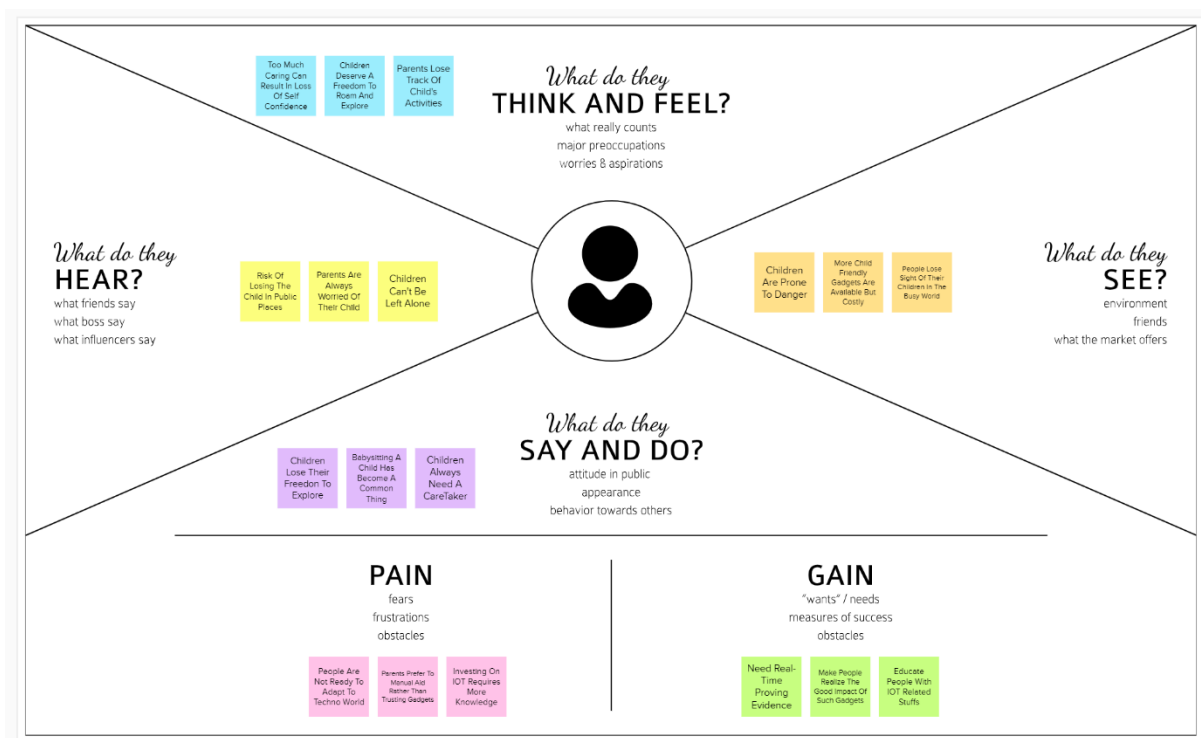
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Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to help teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



Reference:

<https://www.mural.co/templates/empathy-map-canvas>

Ideation Phase

Brainstorm & Idea Prioritization Template

Date	19 September 2022
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Brainstorm & Idea Prioritization Template:


Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Reference: <https://www.mural.co/templates/empathy-map-canvas>

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

Template



Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

🕒 10 minutes to prepare
🕒 1 hour to collaborate
👤 2-8 people recommended

➔

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

🕒 10 minutes

A

Team gathering

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B

Set the goal

Think about the problem you'll be focusing on solving in the brainstorming session.

C

Learn how to use the facilitation tools

Use the Facilitation Superpowers to run a happy and productive session.

[Open article](#) ➔

1


Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

🕒 5 minutes

PROBLEM

How might we monitor child for safety and get notification?



Key rules of brainstorming

To run a smooth and productive session

➔ Stay in topic.

💡 Encourage wild ideas.

➔ Defer judgment.

👂 Listen to others.

🗣️ Go for volume.

👁️ If possible, be visual.

Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

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

10 minutes

TIP

You can select a sticky note and hit the pencil icon to start drawing!

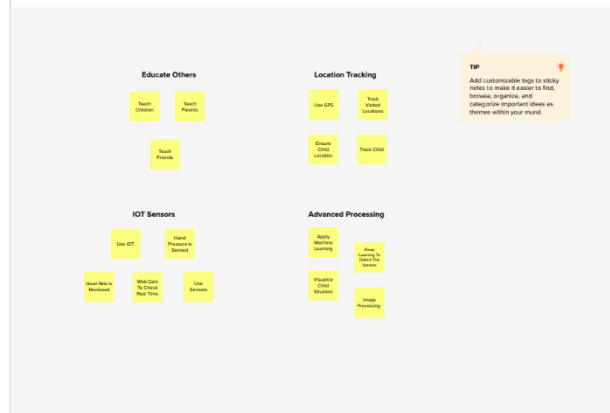


3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

20 minutes



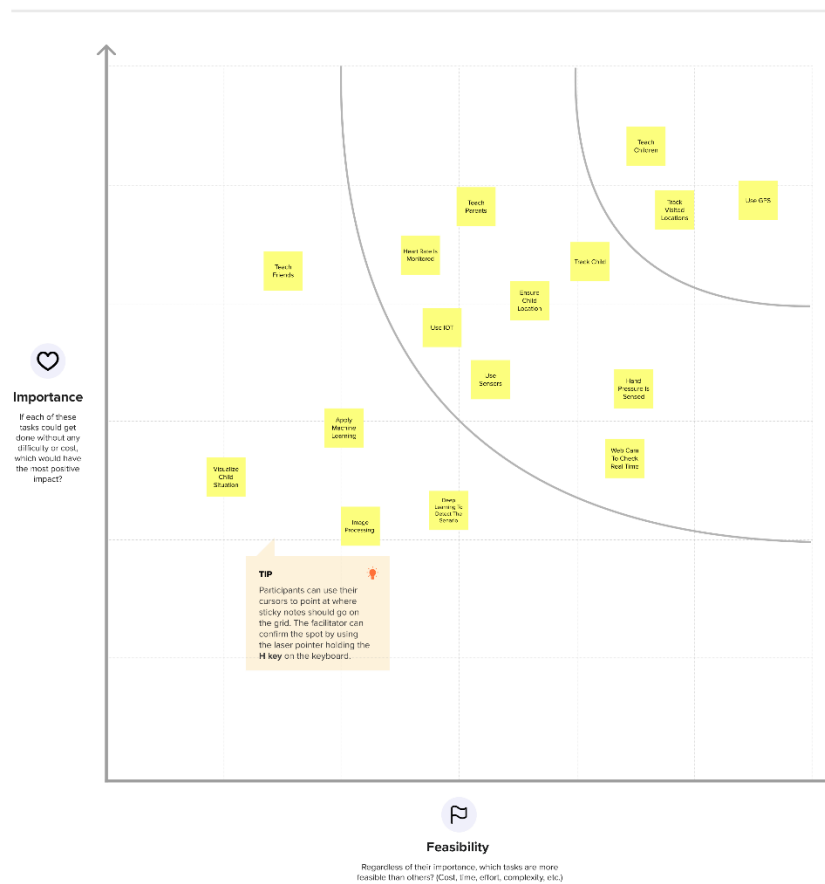
Step-3: Idea Prioritization

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



Project Design Phase-I
Proposed Solution Template

Date	19 September 2022
Team ID	PNT2022TMID18337
Project Name	Project - IoT Based Safety Gadget for Child Safety Monitoring and Notification
Maximum Marks	2 Marks

Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The rate of child kidnapping and trafficking is increasing and there are only limited applications for child tracking and monitoring. Therefore, developing an IOT based safety gadget for child to track their location constantly to ensure the safety of the child.
2.	Idea / Solution description	A good solution to this issue would be to design a smart wearable Internet of Things sensor-based device for monitoring the environment of a child along with a mechanism for tracking the child. The gadget will make use of GPS and a python script to publish the location details to the IBM IoT platform. The wearable also functions to send immediate alerts to the user through in case if the child crosses the geofence.
3.	Novelty / Uniqueness	All the existing systems make use of GPS and a mobile app to track and receive alerts regarding the child's location, while this system make use of the IBM Watson IOT Platform and IBM Cloud Services which is reliable and efficient to maintain the database of the child's location. The parent can set geofence and receive alerts through the web application which is user friendly and secure created using the Node Red Service.
4.	Social Impact / Customer Satisfaction	The safety and security of the child is the main concern of the parents. This proposed solution does not involve so much of technology to operate, and it is simple. The motive of this wearable device is to facilitate the parent or guardian in continuous monitoring of the child's location with ease and ensuring their safety.
5.	Business Model (Revenue Model)	The main concern of any parent would be the safety and security of their kids. The design of this model does not mandate a lot of technical knowledge from the user to operate and it is simple. The purpose of this device is to facilitate the guardian or parents in locating their child with ease and ensuring its well-being.
6.	Scalability of the Solution	Due to lack of tracking application this solution is proposed. It has a location database to maintain the entire location history of the child and the parent can set the geofence to determine the safer boundary of the child. Further if any sensor can be added to increase the accuracy, it can be integrated, and the system can be run efficiently in the long way.

Define CS, fit into CC	<p>1. CUSTOMER SEGMENT(S) CS</p> <p>Working parents or busy parents of 0-10 year old kids</p>	<p>6. CUSTOMER CONSTRAINTS CC</p> <p>Lack of affordable, reliable and hassle free technology, Lack of availability of secure and easy Ui</p>	<p>5. AVAILABLE SOLUTIONS AS</p> <p>There are existing solutions that offer location tracking for kids but they are not very efficient, cost effective and reliable all at the same time. This trade off should be addressed.</p>	Explore AS, differentiate
	<p>2. JOBS-TO-BE-DONE / PROBLEMS J&P</p> <p>Instantaneous tracking and updation of child's location, geofencing and notifying parents of any abnormalities</p>	<p>9. PROBLEM ROOT CAUSE RC</p> <p>Customers have to do this to protect their children from potential threats and to ensure the safety while being far away from them.</p>	<p>7. BEHAVIOUR BE</p> <p>Customers panic, prevent their children from going out on their own , try using easily available technologies</p>	
	<p>3. TRIGGERS TR</p> <p>Coming across news about children being kidnapped and abducted, missing cases being reported</p> <hr/> <p>4. EMOTIONS: BEFORE / AFTER EM</p> <p>Before : Feel insecure , worried , scared and confused. After : Relieved , calm , confident , happy</p>	<p>10. YOUR SOLUTION SL</p> <p>Building a reliable technology that can address all the customer needs while being reliable and secure ensuring efficient functioning.</p>	<p>8.CHANNELS of BEHAVIOUR CH</p> <p>8.1 ONLINE Tracking their kids location with their mobile phones' GPS, reading news about child safety and other child missing cases. 8.2 OFFLINE Customers accompany their children to ensure safety, send them together with other reliable people, seek for protection in public places.</p>	

Identify strong TR & EM

Identify strong TR & EM

Focus on J&P, tap into BE, understand RC

Focus on J&P, tap into BE, understand RC

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	03 October 2022
Team ID	PNT2022TMID18337
Project Name	Project - IoT Based Safety Gadget for Child Safety Monitoring and Notification
Maximum Marks	4 Marks

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 account
FR-2	User Confirmation	Registration through Gmail
FR-3	User Notification	Confirmation via Email
FR-4	User location check	Confirmation via OTP

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Allows parents to keep a track of their child's location and, help them
NFR-2	Security	raise an alarm in case of an emergency.
NFR-3	Reliability	Creates a secure environment for
NFR-4	Performance	children to move around.
NFR-5	Availability	Increased reliability towards technology and reduced reliability
NFR-6	Scalability	towards guardians.

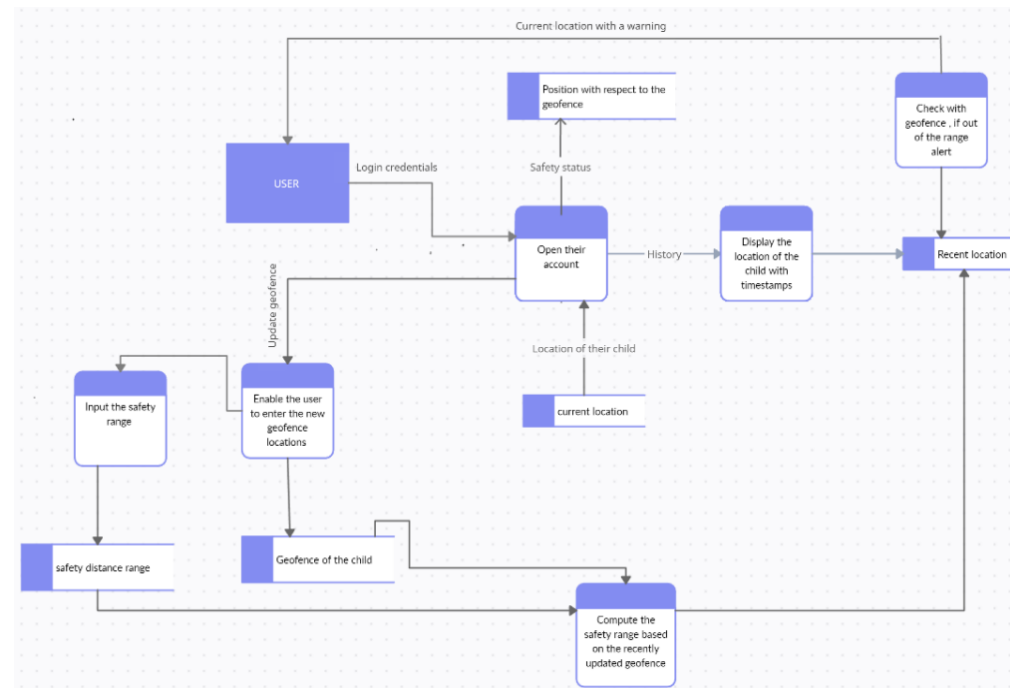
Project Design Phase-II

Data Flow Diagram & User Stories

Date	03 October 2022
Team ID	PNT2022TMID18337
Project Name	Project - IoT Based Safety Gadget for Child Safety Monitoring and Notification
Maximum Marks	4 Marks

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 of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



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
Customer (Mobile user and web user)	Registration	USN-1	As a user, I can register my account 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 myself	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through google account	I can register & access the dashboard with google account Login	High	Sprint-2
	Login	USN-4	As a user, I can log into the application by entering email & password	I can login to the application	High	Sprint-1
Customer Care Executive		USN-5	To address customer issues and resolve them in a timely and efficient manner.	I can login only with my provided credentials	Medium	Sprint - 3
Administrator		USN-6	Maintaining and making sure the database containing the locations are secure and accurate and updated constantly.	I can login only with my provided credentials	High	Sprint - 3

Project Design Phase-I Solution Architecture

Date	19 September 2022
Team ID	PNT2022TMID18337
Project Name	Project - IoT Based Safety Gadget for Child Safety Monitoring and Notification
Maximum Marks	4 Marks

Solution Architecture:

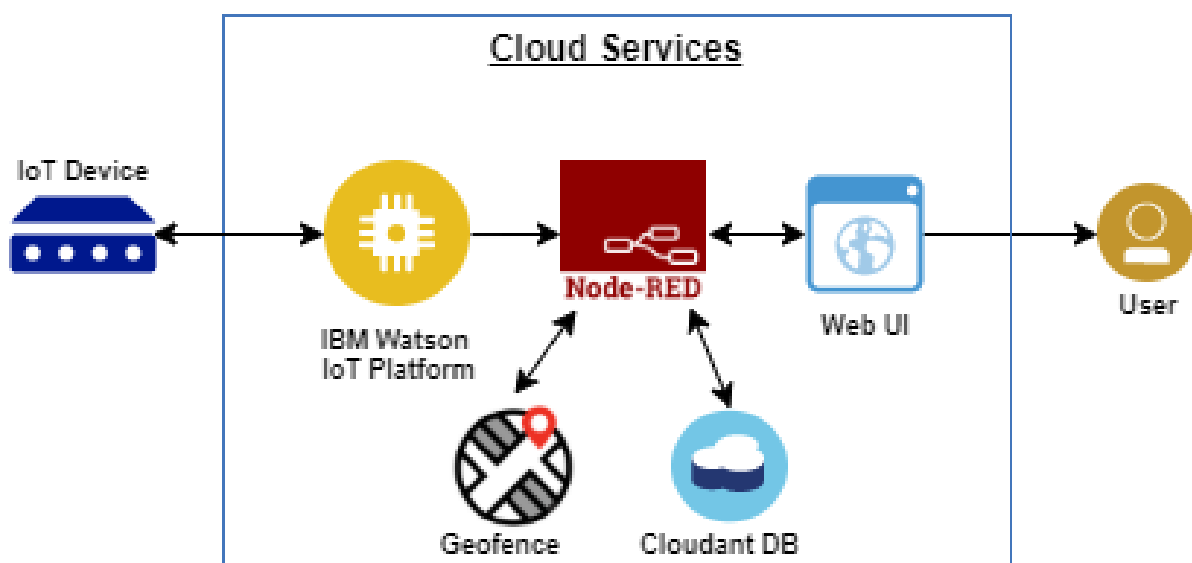
Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behaviour, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

FEATURES:

Development of a safety gadget for children to ensure their protection without direct monitoring of their parents. The various features involve:

- GPS
- Geo fence
- Notify alert signal



SOLUTION:

Track current location of the child using GPS and continuous monitoring of the same is done. When the gadget detects the activity to be outside the given geo fence (as mentioned by the parent or guardian), alert messages or notifications are sent to the registered device, appropriately. Additional features such as recording of messages could be done if any kind of danger is sensed.

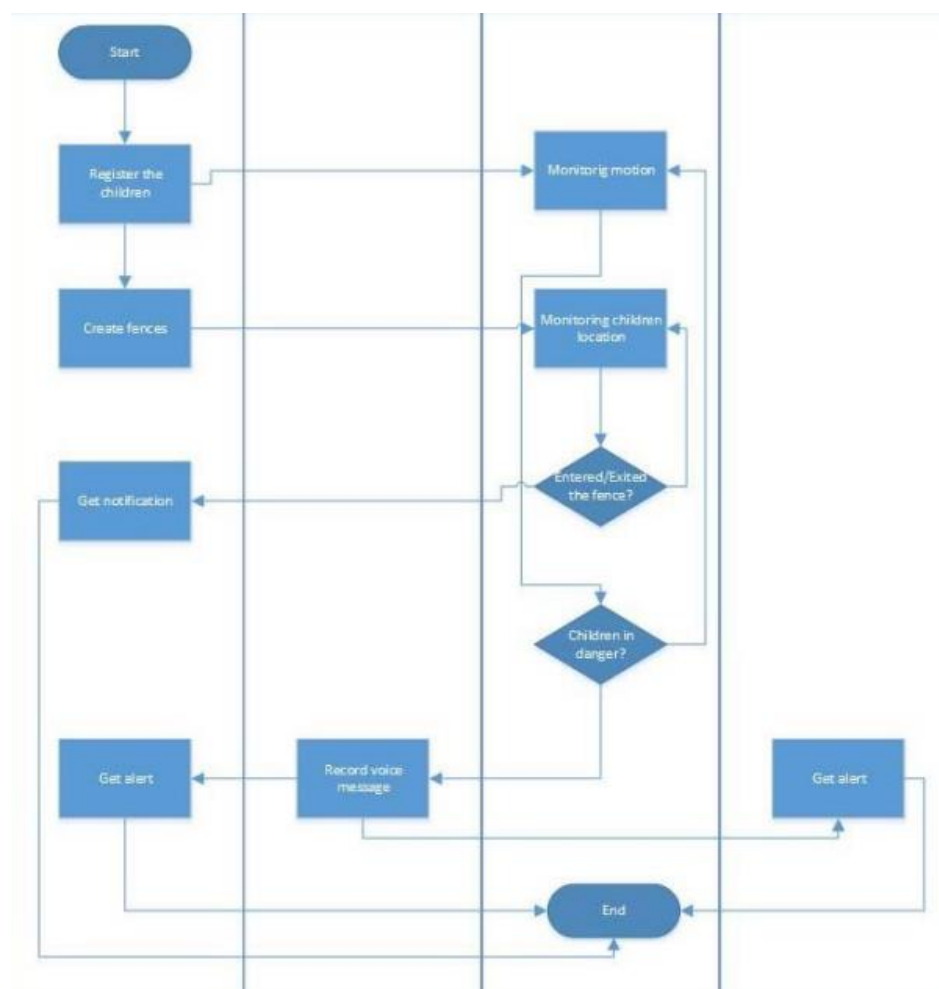
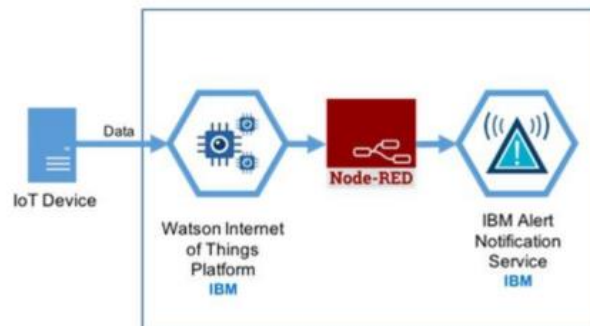


Figure 1: Architecture and data flow of the voice patient diary sample application

Reference: <https://aws.amazon.com/blogs/industries/voice-applications-in-clinical-research-powered-by-ai-on-aws-part-1-architecture-and-design-considerations/>

Project Design Phase-II Technology Stack (Architecture & Stack)

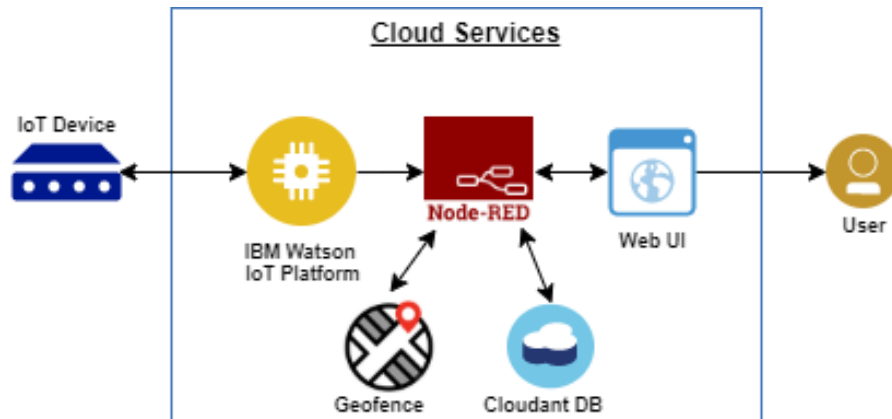
Date	03 October 2022
Team ID	PNT2022TMID18337
Project Name	Project - IoT Based Safety Gadget for Child Safety Monitoring and Notification
Maximum Marks	4 Marks

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Example: Order processing during pandemics for offline mode

Reference: <https://developer.ibm.com/patterns/ai-powered-backend-system-for-order-processing-during-pandemics/>



Guidelines:

1. Include all the processes (As an application logic / Technology Block)
2. Provide infrastructural demarcation (Local / Cloud)
3. Indicate external interfaces (third party API's etc.)
4. Indicate Data Storage components / services
5. Indicate interface to machine learning models (if applicable)

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Interaction of the user with the application using Web UI	Node Red
2.	Application Logic-1	Tracking of user's location and monitoring of the same	Python
3.	Application Logic-2	Sending notifications to the registered mobile number	IBM Watson STT service
4.	Application Logic-3	Send alert when user crosses the geo-fence mentioned	IBM Watson Assistant
5.	Database	Data provided by the user in the account and geo- fence range	MySQL, NoSQL, etc.
6.	Cloud Database	Handles software and hardware provisioning, management and scaling and support.	IBM DB2, IBM Cloudant etc.
7.	File Storage	High performance while dealing with large amount of unstructured data	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	API's offer the convenience and transparency needed to connect users to ideal experiences	IBM Weather API, etc.
9.	External API-2	Communication with both the user and the application is taken care of by API's	IBM API Connect
10.	External API-3	Easy user interface.	MIT App inventor
11.	Machine Learning Model	Used to differentiate user's features	Feature Differentiation Model
12.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	A software for which the original source code is made freely available and may be redistributed and modified according to the requirement of the user.	Watson IoT platform, Wokwi, Node red.
2.	Security Implementations	Secure monitoring of the user's location without open-source access	IBM encryption services
3.	Scalable Architecture	Presence of location sensors to quickly scale the user's current location.	GPS, IBM alert notification service
4.	Availability	Usage of data and location tracked in the account anytime with high availability.	Node RED
5.	Performance	Less amount of power consumption with high storage cache present.	Watson assistant

References:

<https://c4model.com/>

<https://developer.ibm.com/patterns/online-order-processing-system-during-pandemic/>

<https://www.ibm.com/cloud/architecture>

<https://aws.amazon.com/architecture>

<https://medium.com/the-internal-startup/how-to-draw-useful-technical-architecture-diagrams-2d20c9fda90d>

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	18 October 2022
Team ID	PNT2022TMID18337
Project Name	Project - IoT Based Safety Gadget for Child Safety Monitoring and Notification
Maximum Marks	8 Marks

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

Use the below template to create 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, username, phone number, password, and confirming my password.	10	High	Stewart Philip.G
Sprint-2		USN-2	As a user, I will receive confirmation email once I have registered for the application	10	Medium	Karthik Vishnu.E K
Sprint-1		USN-3	As a user, I can log into the application by entering email & password	10	Medium	Stewart Philip.G
Sprint-2		USN-4	As a user, I can register for the application through Gmail	10	High	Karthik Vishnu.E K
Sprint-4	Login	USN-5	As a user, I can logout of the application.	10	High	Prakash Kumar.B
Sprint-3	Dashboard	USN-6	As a user I can and monitor the child movement by clicking the monitor button on the homepage	10	High	Jai Vignesh.R
Sprint-3		USN-7	As a user, I can receive alert notifications in the webpage, if the movement of the child is beyond the geofence	10	High	Jai Vignesh.R
Sprint-4		USN-8	As a user, I can check the location of the child using the app	10	High	Prakash Kumar.B

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 (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

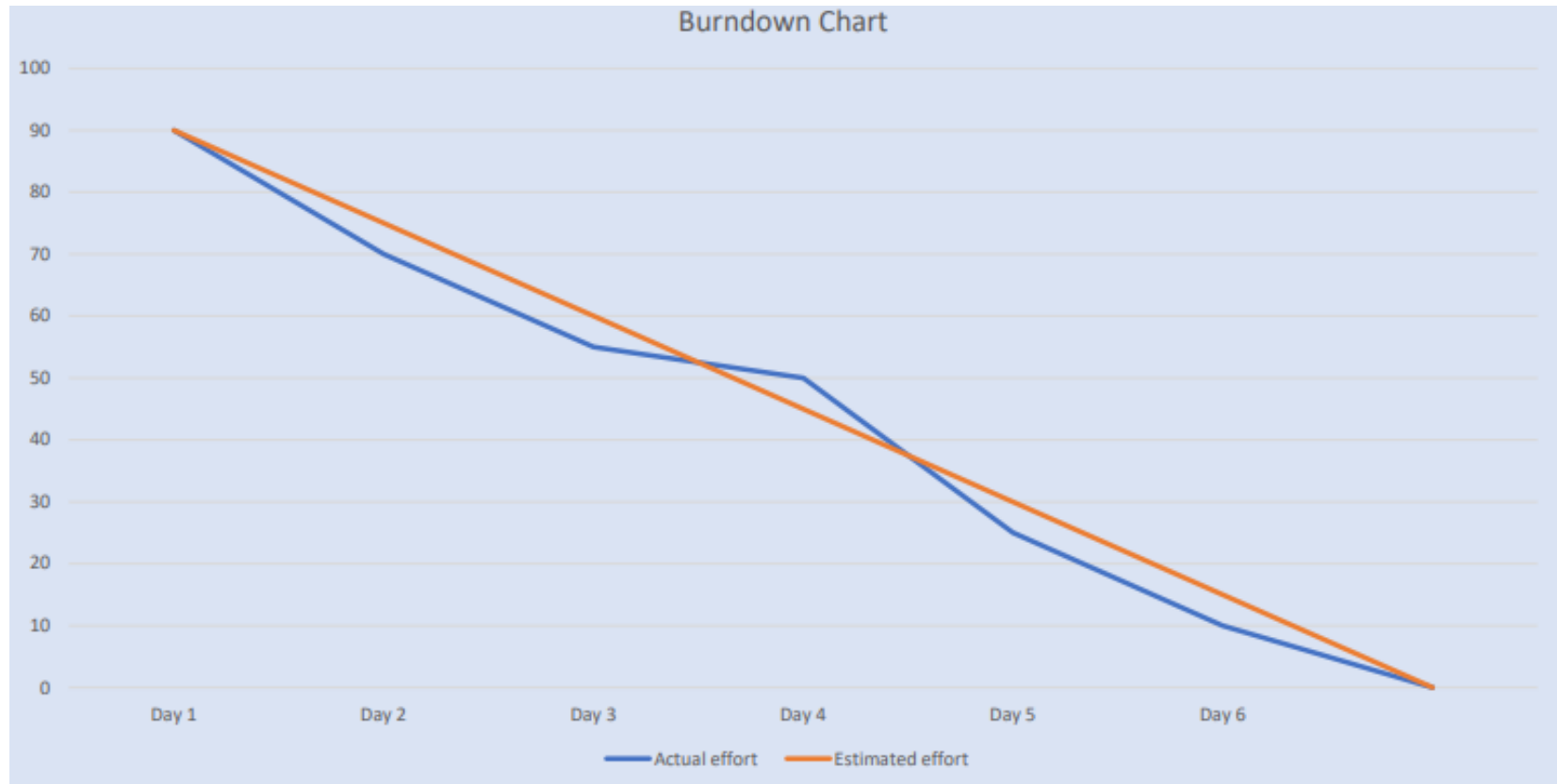
Velocity:

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)

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

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



<https://www.visual-paradigm.com/scrum/scrum-burndown-chart/>

<https://www.atlassian.com/agile/tutorials/burndown-charts>

Reference:

<https://www.atlassian.com/agile/project-management>

<https://www.atlassian.com/agile/tutorials/how-to-do-scrum-with-jira-software>

<https://www.atlassian.com/agile/tutorials/epics>

<https://www.atlassian.com/agile/tutorials/sprints>

<https://www.atlassian.com/agile/project-management/estimation>

<https://www.atlassian.com/agile/tutorials/burndown-charts>