

# CAPE INSTITUTE OF TECHNOLOGY

## LEVINJIPURAM

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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**TEAM ID:PNT2022TMID34365**

**PROJECT NAME:SMART SOLUTIONS FOR RAILWAYS**

## 1. INTRODUCTION

### 1.1 PROJECT OVERVIEW

□ smart solutions for railways is to manage Indian Railways is the largest railway network in Asia and additionally world's second largest network operated underneath a single management. Due to its large size it is difficult to monitor the cracks in tracks manually. This paper deals with this problem and detects cracks in tracks with the help of ultrasonic sensor attached to moving assembly with help of stepper motor. Ultrasonic sensor allows the device to moves back and forth across the track and if there is any fault, it gives information to the cloud server through which railway department is informed on time about cracks and many lives can be saved. This is the application of IoT, due to this it is cost effective system. This effective methodology of continuous observation and assessment of rail tracks might facilitate to stop accidents. This methodology endlessly monitors the rail stress, evaluate the results and provide the rail break alerts such as potential buckling conditions, bending of rails and wheel impact load detection to the concerned authorities.

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## **1.2 PURPOSE**

Internet is basically system of interconnected computers through network. But now its use is changing with changing world and it is not just confined to emails or web browsing. Today's internet also deals with embedded sensors and has led to development of smart homes, smart rural area, e-health care's etc. and this introduced the concept of IoT . Internet of Things refers to interconnection or communication between two or more devices without human to human and human to-computer interaction. Connected devices are equipped with sensors or actuators perceive their surroundings. IOT has four major components which include sensing the device, accessing the device, processing the information of the device, and provides application and services. In addition to this it also provides security and privacy of data . Automation has affected every aspect of our daily lives. More improvements are being introduced in almost all fields to reduce human effort and save time. Thinking of the same is trying to introduce automation in the field of track testing. Railroad track is an integral part of any company's asset base, since it provides them with the necessary business functionality. Problems that occur due to problems in railroads need to be overcome. The latest method used by the Indian railroad is the tracking of the train track which requires a lot of manpower and is time-consuming

## **2. LITERATURE SURVEY**

### **2.1 EXISTING PROBLEM**

In the Existing train tracks are manually researched. LED (Light Emitting Diode) and LDR (Light Dependent Resistor) sensors cannot be implemented on the block of the tracks ]. The input image processing is a clamorous system with high cost and does not give the exact result. The Automated Visual Test Method is a complicated method as the video color inspection is implemented to examine the cracks in rail track which does not give accurate result in bad weather. This traditional system delays transfer of information. Srivastava et al., (2017) proposed a moving gadget to detect the cracks with the help of an array of IR sensors to identify the actual position of the cracks as well as notify to nearest railway station . Mishra et al., (2019) developed a system to track the cracks with the help of Arduino mega power using solar energy and laser. A GSM along with a GPS module was implemented to get the actual location of the faulty tracks to inform the authorities using SMS via a link to find actual location on Google Maps. Rizvi Aliza

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Raza presented a prototype in that is capable of capturing photos of the track and compare it with the old database and sends a message to the authorities regarding the crack detected. The detailed analysis of traditional railway track fault detection techniques is explained in table

## 2.2 REFERENCES

1. D. Hesse, “Rail Inspection Using Ultrasonic Surface Waves” Thesis, Imperial College of London, 2007.
  2. Md. Reya Shad Azim<sup>1</sup>, Khizir Mahmud<sup>2</sup> and C. K. Das. Automatic railway track switching system, International Journal of Advanced Technology, Volume 54, 2014.
  3. S. Somalraju, V. Murali, G. saha and V. Vaidehi, “Title-robust railway crack detection scheme using LED (Light Emitting Diode) - LDR (Light Dependent Resistor) assembly IEEE 2012.
  4. S. Srivastava, R. P. Chourasia, P. Sharma, S. I. Abbas, N. K. Singh, “Railway Track Crack detection vehicle”, IARJSET, Vol. 4, pp. 145-148, Issued in 2, Feb 2017.
  5. U. Mishra, V. Gupta, S. M. Ahzam and S. M. Tripathi, “Google Map Based Railway Track Fault Detection Over the Internet”, International Journal of Applied Engineering Research, Vol. 14, pp. 20-23, Number 2, 2019.
  6. R. A. Raza, K. P. Rauf, A. Shafeeq, “Crack detection in Railway track using Image processing”, IJARIT, Vol. 3, pp. 489-496, Issue 4, 2017.
  7. N. Bhargav, A. Gupta, M. Khirwar, S. Yadav, and V. Sahu, “Automatic Fault Detection of Railway Track System Based on PLC (ADOR TAST)”, International Journal of Recent Research Aspects, Vol. 3, pp. 91-94, 2016
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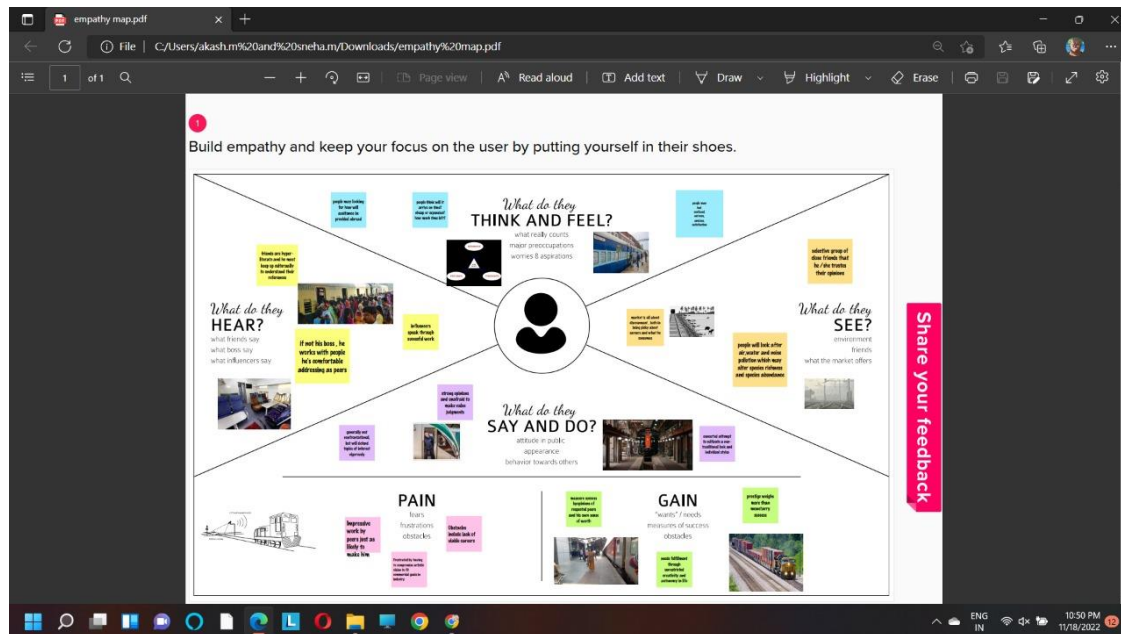
## 2.3 PROBLEM STATEMENT DEFINITION

Among the various modes of transport, railways is one of the biggest modes of transport in the world. Though there are competitive threats from airlines, luxury buses, public transports, and personalized transports the problem statement is to answer the question “What are the problems faced by the passengers while travelling by train at station and on board”

## 3. IDEATION & PROPOSED SOLUTION

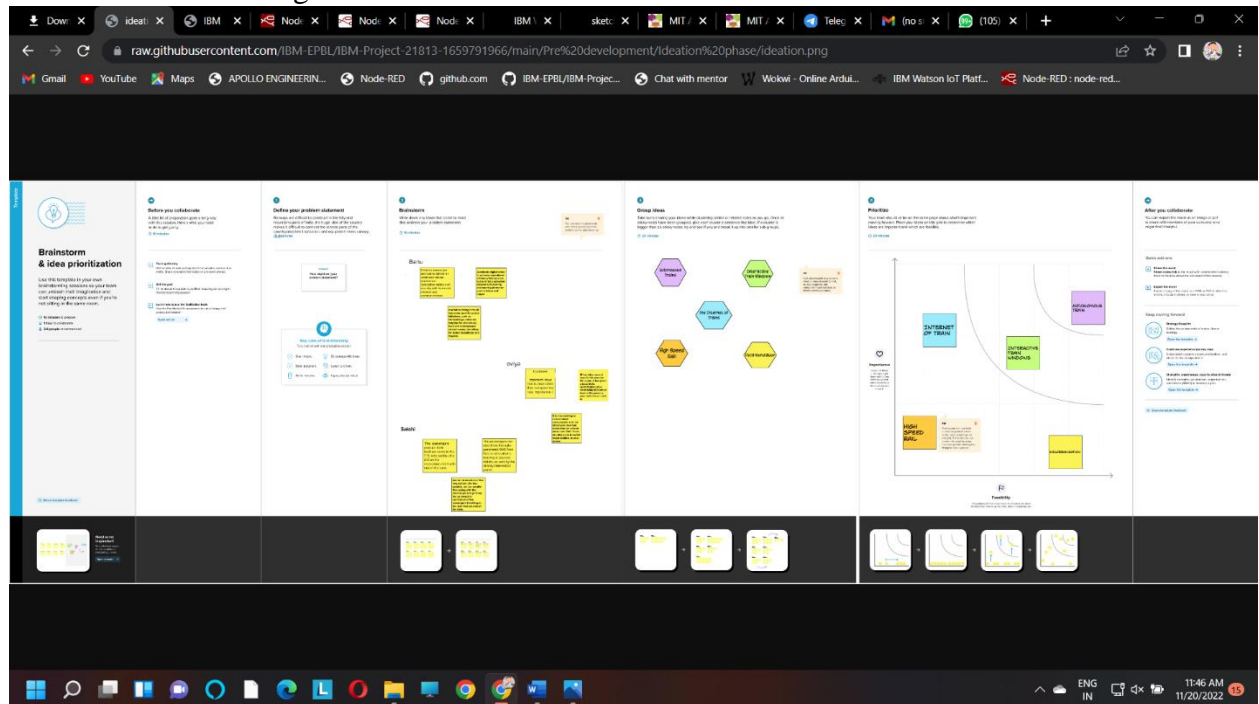
### 3.1 EMPATHY MAP CANVAS

An Empathy map is a collaborative tool teams can use to gain smart railways for customers. Much like a user persona, an empathy map can represent a group of users, such as a customer segment. Our empathy map canvas is shown as smart solutions for railways. The Thinks quadrant captures what the user is thinking throughout the experience. It is possible to have the same content in both Says and Thinks. However, pay special attention to what users think, but may not be willing to vocalize. Try to understand why they are reluctant to share — are they unsure, self-conscious, polite, or afraid to tell others something



### 3.2 IDEATION & BRAINSTORMING

Ideation refers to the whole creative process of coming up with and communicating new ideas. It can take many different forms, from coming up with a totally new idea to combining multiple existing ideas to create a new process or organizational system. Ideation is similar to a practice known as 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 the project. The following information may be useful to you in completing this portion of your team's work. Skim this section, then refer back to it as necessary.

**Proposed Solution Template:**

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

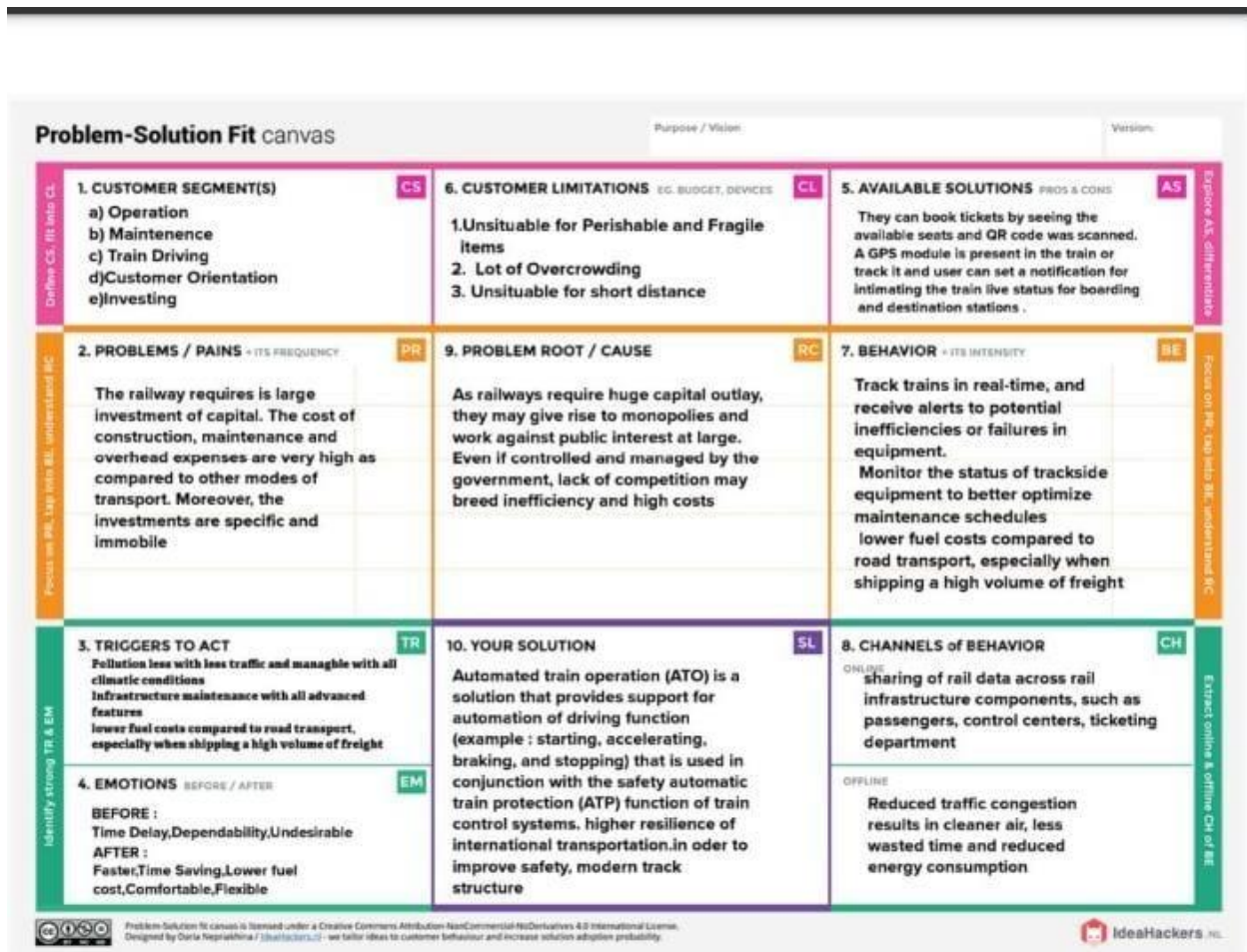
S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	this system can perform different parameter measurements early detection of building fires
2.	Idea / Solution description	This fire alarm system incorporates the heat and flame detector that are connected in parallel. The microcontroller is used as the heart of this fire alarm system that controls the entire operation involved. The fire alarm system is capable to locate and identified the place that is in fire where by its monitored using the monitoring system.
3.	Novelty / Uniqueness	In this paper, the installed Arduino device which was programmed with Android Studio receives gas smoke ,the temperature and humidity signal from the sensors . The sensor is connected to the input of the arduino with the help of connecting the cables or jumper cables . Further the circuit goes toward output where the buzzer is connected. If we differ the value of the buzzer then we get a variation in the buzzer sound.
4.	Social Impact / Customer Satisfaction	This product has huge social impact as presentation of the industry workers from fire related accidents.Prevention of the industry fire accident can also increases the industrial financial status
5.	Business Model (Revenue Model)	This product can be utilized by a industries .This can be thought of as a productive and helpful item as industries great many current rescuing people and machine from the fire accident
6.	Scalability of the Solution	It is trying to execute this technique as we need to introduce an arduino gadget which was modified with an arduino studio that takes received signals from sensors . This recognizes the fire from each area in turn assuming there is fire in other area the framework can not distinguish . So this item will be introduced in each required area independently.

### 3.4 PROBLEM SOLUTION FIT

Problem solving is the act of defining a problem; determining the cause of the problem; identifying, prioritizing, and selecting alternatives for a solution; and implementing a solution. In order to effectively manage and run a successful organization, leadership must guide their employees and develop problem-solving techniques. Finding a suitable solution for issues can be accomplished by following the basic four-step problem-solving process and methodology outlined below.

## PROJECT DESIGN PHASE – I

### PROBLEM SOLUTION FIT



## 4. REQUIREMENT ANALYSIS

Requirement analysis also called as requirement engineering is the process of determining user expectation for a new or modified product. These features are called requirement must be qualifiable relevant and detailed. Its classified as two major type.

### 4.1 FUNCTIONAL REQUIREMENT

The FlameRanger system, jointly presented by Unifire AB & Tyco, meet or exceed all of the functions described above, and all of the specifications set out in the functional Requisition.

### 4.2 NON-FUNCTIONAL REQUIREMENT

NFR generally stated, often contradictory, difficult to enforce during development and evaluate for the customer prior to delivery.

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Sensing function	Fire breakout has to be sensed by smoke detectors. Gas leakage has to be sensed by gas sensors.
FR-2	Alerting function	Blaring of alarms.
FR-3	Actuation function	Activation of sprinklers. Turning ON the exhaust Fan.
FR-4	Notification	Sending SMS with location to the fire station. Sending SMS to the authorities.

**Non-functional Requirements:**

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

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Ease of use and longevity of the system.
NFR-2	Security	Software remains secured in the face of attacks.
NFR-3	Reliability	High accuracy.
NFR-4	Performance	Faster response.
NFR-5	Availability	Availability of the systems for institutions, restaurants and other public places
NFR-6	Scalability	It accommodates easy modification for various requirements

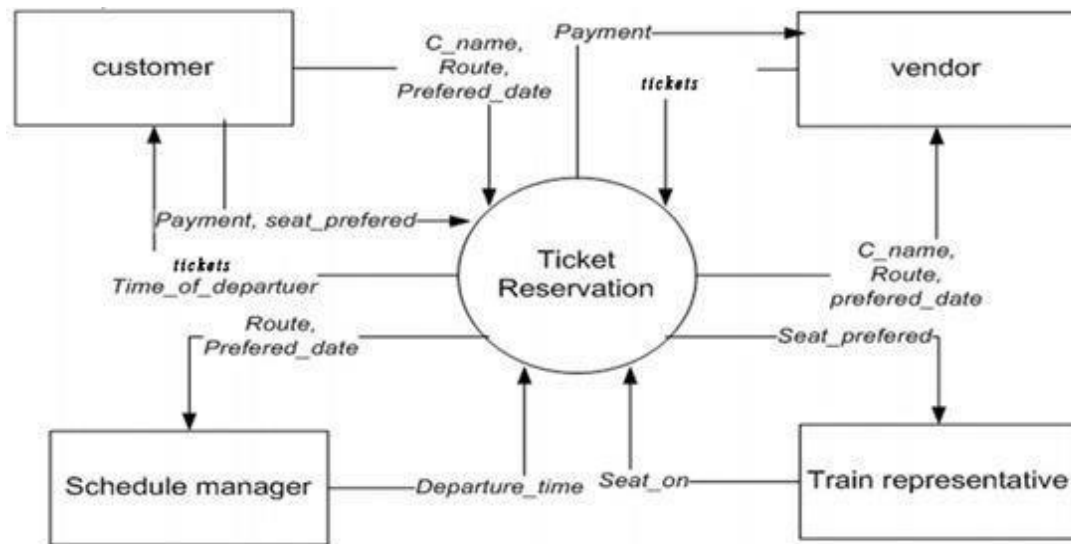
## 5. PROJECT DESIGN

### 5.1 DATA FLOW DIAGRAM

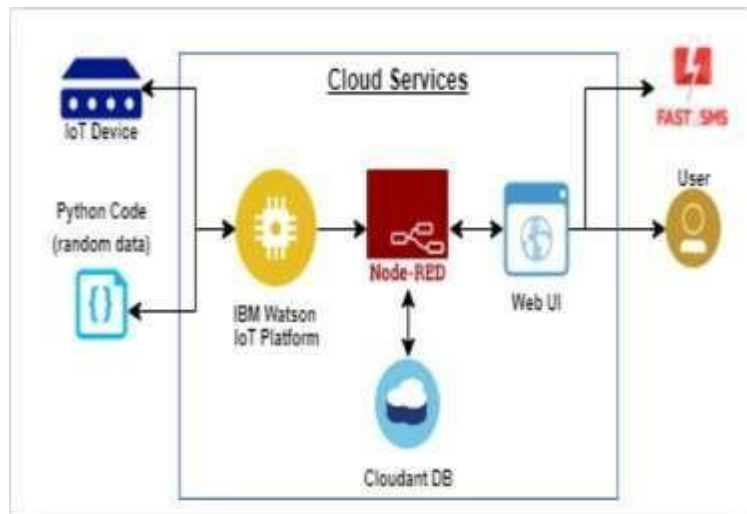
Data flow diagram is a way of representing a flow of data through a processor or a system. A data flow diagram as no control flow they are no decision rules and no loops.



### DATA FLOW DIAGRAM:



### 5.2 SOLUTION & TECHNICAL ARCHITECTURE



A Solution architecture is an architectural description of a specific solution. SAs combine guidance from different enterprise architectural viewpoints (business, information and technical) as well as from the enterprise solution architecture (ESA).

### **5.3 USER STORIES**

(1)Information collection module In order to realize the real-time collection and update of the information and ensure the accuracy of the information, the existing internet of things equipment such as monitoring, smoke feeling, fire control sign and so on are used to collect the field information and efficiently understand the situation on the spot. (2)Model module The BIM model of the building is established by using BIM technology. The model includes the information of all the components in the building, the information of water, electricity and gas and all the information of fire extinguishing equipment, thus which can provide data support for indoor escape and rescue of building firefighting. (3)Intelligent processing module The intelligent processing module can automatically plan the rescue path, rescue tools, indoor escape path, and modify the contents of fire protection sign by synthetically processing the data of the information collection module and the model module. (4)Decision module The rescue center reads the information on the equipment and models of internet of things, and other information through the decision module, and issues the emergency evacuation command, at the same time, which chooses the outdoor rescue routes and rescue tools, and sends rescue orders to the rescue teams. (5)Information feedback module After the decision is made, the information feedback module automatically releases the best escape route to the survivors, and indicates the location of the fire rescue tools nearby, besides provides the best rescue route, rescue ways, rescue tools and other information to the rescuers, and relieves the alarm in time after the rescuing. (6)Escape terminal APP module

## **6. PROJECT PLANNING & SCHEDULING**

### **6.1 SPRINT PLANNING & ESTIMATION**

Sprint planning is an event in scrum that kicks of the sprint. The purpose of sprint planning is to define what we can deliver in the sprint and how that work will be achieved. Sprint planning is done in collaboration with the whole scrum team

TITLE	DISCRIPTION	DATE
Literature Survey& Information Gathering	Literature survey on the selected project & gathering information by referring the technical papers, research publications etc.	03 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains. Prepare list of problem statements	07 SEPTEMBER 2022
Problem Statement	Prepare Problem statement of industry-specific intelligent firemanagement system	10 SEPTEMBER 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	16 SEPTEMBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	23 SEPTEMBER 2022

Problem Solution Fit	Prepare problem - solution fit document.	26 SEPTEMBER 2022
Solution Architecture	Prepare solution architecture document.	30 SEPTEMBER 2022
Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	8 OCTOBER 2022
Functional Requirement	Prepare the functional requirement document.	11 OCTOBER 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	14 OCTOBER 2022
Technology Architecture	Prepare the technology architecture diagram.	16 OCTOBER 2022
Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.	24 OCTOBER 2022
Sprint Schedules	Prepare the sprint plan and divided tasks according to agile method.	24 OCTOBER 2022
Project Development-Delivery Sprint - 1	Develop & submit the developed code by testing it.	29 OCTOBER 2022 IN PROGRESS.
Sprint - 2	Develop & submit the developed code by testing it.	05 NOVEMBER 2022 IN PROGRESS.
Sprint - 3	Develop & submit the developed code by testing it.	12 NOVEMBER 2022 IN PROGRESS.
Sprint - 4	Develop & submit the developed code by testing it.	19 NOVEMBER 2022 IN PROGRESS.

## 6.2 SPRINT DELIVERY SCHEDULE

The deliverables of the sprint are not as predictable as they are for the other project. Sprint participance have produced sketches and drawing, writing, photograph, comic, strip, video and fully coded working prototypes

## Project Planning Phase

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

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

Use the below template to create product backlog and sprint schedule

<b>Sprint</b>	<b>Functional Requirement (Epic)</b>	<b>User Story Number</b>	<b>User Story / Task</b>	<b>Story Points</b>	<b>Priority</b>	<b>Team Members</b>
Sprint-1	Registration	USN-1	As a user, I can register through the form by Filling in my details	2	High	sneha
Sprint-1		USN-2	As a user, I can register through phone numbers, Gmail, Facebook or other social sites	1	High	sakthi
Sprint-1	Conformation	USN-3	As a user, I will receive confirmation through email or OTP once registration is successful	2	Low	oviya
Sprint-1	login	USN-4	As a user, I can login via login id and password or through OTP received on register phone number	2	Medium	banupriya
Sprint-1	Display Train details	USN-5	As a user, I can enter the start and destination to get the list of trains available connecting the above	1	High	sneha
Sprint-2	Booking	USN-6	As a use, I can provide the basic details such as a name, age, gender etc...	2	High	sakthi
Sprint-2		USN-7	As a user, I can choose the class, seat/berth. If a preferred seat/berth isn't available I can be allocated based on the availability	1	Low	oviya
Sprint-2	Payment	USN-8	As a user, I can choose to pay through credit Card/debit card/UPI.	1	High	banupriya
<b>Sprint</b>	<b>Functional Requirement (Epic)</b>	<b>User Story Number</b>	<b>User Story / Task</b>	<b>Story Points</b>	<b>Priority</b>	<b>Team Members</b>
Sprint-2		USN-9	As a user, I will be redirected to the selected	2	High	sneha
Sprint-3	Ticket generation	USN-10	As a user, I can download the generated eticket for my journey along with the QR code which is used for authentication during my journey.	1	High	Sakthi
Sprint-3	Ticket status	USN-11	As a user, I can see the status of my ticket Whether it's confirmed/waiting/RAC.	2	High	Oviya

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Sprint-3	Remainders notification	USN-12	As a user, I get remainders about my journey A day before my actual journey.	1	High	banupriya
Sprint-3	Ticket cancellation	USN-13	As a user, I can track the train using GPS and can get information such as ETA, Current stop and delay	2	High	Sneha
Sprint-4		USN-14	As a user, I can cancel my tickets if there's any Change of plan	1	High	Sakthi
Sprint-4	Raise queries	USN-15	As a user, I can raise queries through the query box or via mail.	2	Medium	Oviya
Sprint-4	Answer the queries	USN-16	As a user, I will answer the questions/doubts Raised by the customers.	2	High	banupriya
Sprint-4	Feed details	USN-17	As a user, I will feed information about the trains delays and add extra seats if a new compartment is added.	1	High	sneha

#### 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	5 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)

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

## 7. CODING & SOLUTIONING

### FEATURE

`#include <WiFi.h> //library for wifi`

```

#include <PubSubClient.h> //library for MQTT
#include "DHT.h" // Library for dht11
#define DHTPIN 15 // what pin we're connected to
#define DHTTYPE DHT22 // define type of sensor DHT 11
#define LED 2
DHT dht (DHTPIN, DHTTYPE); // creating the instance by passing pin and type of dht connected void
callback(char* subscribtopic, byte* payload, unsigned int payloadLength);
//-----credentials of IBM Accounts-----

#define ORG "zbgr67" //IBM ORGANITION ID
#define DEVICE_TYPE "fershidevicetype" //Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "fershideviceid" //Device ID mentioned in ibm watson IOT
Platform
#define TOKEN "fershiageona" //Token String
data3; float t;

//----- Customise the above values ----- char server[] = ORG
".messaging.internetofthings.ibmcloud.com"; // Server Name char publishTopic[] = "iot-
2/evt/Data/fmt/json"; // topic name and type of event perform and format in which data to be send char
subscribtopic[] = "iot-2/cmd/command/fmt/String"; // cmd REPRESENT command type AND COMMAND
IS TEST OF FORMAT STRING char authMethod[] = "use-token-auth"; // authentication method char token[]
= TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID; //client id

//-----
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback, wifiClient); //calling the predefined client id by passing parameter
like server id, port and wificredential void setup() // configuring the ESP32
{
  Serial.begin(115200); dht.begin();
  pinMode(LED, OUTPUT); delay(10);
  Serial.println(); wifiConnect();
  mqttConnect();
} void loop() // Recursive Function
{
  t = dht.readTemperature();
  Serial.print("temperature:");
  Serial.println(t);

  PublishData(t); delay(1000);
  if (!client.loop()) {
    mqttConnect();
  }
}

/* .....retrieving to

```

```

Cloud.....*/
void PublishData(float temp) { mqttconnect();//function call for
connecting to ibm
/*    creating the String in in form JSon to update the data to ibm cloud
*/
String payload = "{\"temperature\": "; payload +=
temp; payload += "}";

Serial.print("Sending payload: ");
Serial.println(payload);

if (client.publish(publishTopic, (char*) payload.c_str())) {
    Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it will print publish ok in Serial
monitor or else it will print publish failed
} else {
    Serial.println("Publish failed");
}

} void mqttconnect() { if
(!client.connected()) {
    Serial.print("Reconnecting client to "); Serial.println(server);
    while (!client.connect(clientId, authMethod, token)) { Serial.print(".");
delay(500);
    }
    initManagedDevice();
    Serial.println();
} } void wificonnect() //function defination for wificonnect {
Serial.println();
Serial.print("Connecting to ");

WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish the connection while
(WiFi.status() != WL_CONNECTED) { delay(500);
    Serial.print(".");
}
Serial.println("");
Serial.println("WiFi connected");
Serial.println("IP address: ");
Serial.println(WiFi.localIP());
} void initManagedDevice() {
if (client.subscribe(subscribetopic)) { Serial.println((subscribetopic));
    Serial.println("subscribe to cmd OK");
} else {
    Serial.println("subscribe to cmd FAILED");
}
}
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)

```

```

{

    Serial.print("callback invoked for topic: ");
    Serial.println(subscribetopic);
    for (int i = 0; i < payloadLength; i++) {
//Serial.print((char)payload[i]);    data3 +=
(char)payload[i];
    }

    Serial.println("data: " + data3);
    if(data3=="lighton") {
    Serial.println(data3); digitalWrite(LED,HIGH);

    }
    else
    {
    Serial.println(data3); digitalWrite(LED,LOW);
    }
    data3="";

}

```

## 8. TESTING

### 8.1 Test Cases

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
1	Functional	Registration	Registration through the form by Filling in my details		1.Click on register 2.Fill the registration form 3.click Register		Registration form to be filled is to be displayed	Working as expected	Pass
2	UI	Generating OTP	Generating the otp for further process		1.Generating of OTP number		User can register through phone numbers, Gmail, Facebook or other social sites and to get otp number	Working as expected	Pass
3	Functional	OTP verification	Verify user otp using mail		1.Enter gmail id and enter password 2.click submit	Username: abc@gmail.com password: Testing123	OTP verified is to be displayed	Working as expected	Pass
4	Functional	Login page	Verify user is able to log into application with Invalid credentials		1.Enter into login page 2.Click on My Account dropdown button 3.Enter Invalid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: abc@gmail.com password: Testing123	Application should show 'Incorrect email or password' validation message.	Working as expected	Pass
5	Functional	Display Train details	The user can view about the available train details		1.As a user, I can enter the start and destination to get the list of train available connecting the above	Username: abc@gmail.com password: Testing12367868678687	A user can view about the available train to enter start and destination details	Working as expected	Full



Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
1	Functional	Booking	user can provide the basic details such as a name, age, gender etc.		1.Enter method of reservation 2.Enter name,age,gender 3.Enter how many tickets wants to be booked 4.Also enter the number member's details like name,age,gender		Tickets booked to be displayed	Working as expected	Pass
2	UI	Booking seats	User can choose the class, seat/berth. If a preferred seat/berth isn't available I can be allocated based on the availability.		1.known to which the seats are available		known to which the seats are available	Working as expected	pass
3	Functional	Payment	user, I can choose to pay through credit Card/debit card/UPI.		1.user can choose payment method 2.pay using tht method		payment for the booked tickets to be done using payment method through either the following methods: credit Card/debit card/UPI.	Working as expected	pass
4	Functional	Redirection	user can be redirected to the selected		1.After payment the user will be redirected to the previous page		After payment the user will be redirected to the previous page	Working as expected	pass

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
1	Functional	Ticket generation	a user can download the generated e ticket for my journey along with the QR code which is used for authentication during my journey.		1.Enter method of reservation 2.Enter name,age,gender 3.Enter how many tickets wants to be booked 4.Also enter the number member's details like name,age,gender		Tickets booked to be displayed	Working as expected	Pass
2	UI	Ticket status	a user can see the status of my ticket Whether it's confirmed/Waiting/PAC.		1.known to the status of the tickets booked		known to the status of the tickets booked	Working as expected	pass
3	Functional	Reminder notification	a user, I get reminders about my journey A day before my actual journey.		1.user can get reminder notification		user can get reminder notification	Working as expected	pass
4	Functional	GPS tracking	user can track the train using GPS and can get information such as ETA, Current stop and delay.		1.tracking train for getting information		tracking process through GPS	Working as expected	pass

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
1	Functional	Ticket cancellation	user can cancel my tickets there's any Change of plan		1.tickets to be cancelled		Tickets booked to be cancelled	Working as expected	Pass
2	UI	Raise queries	user can raise queries through the query box or via		1.raise the queries		raise the queries	Working as	pass
3	Functional	Answer the queries	user will answer the questions/doubts Raised by the customers.		1.answer the queries		answer the queries	Working as expected	pass
4	Functional	Feed details	a user will feed information about the trains delays and add extra seats if a new compartment is added.		1.information feeding on trains		information feeding on trains	Working as expected	pass

## 8.2 User Acceptance Testing

You must **test timings and seat allotment and with Qrcode correction in apk place to ensure where to start and where to end** . You may test with local trains and identified in the manufacturer's published instructions.

## **9. RESULTS**

We have successfully used to built a web based UI and integrated all the servies using Node RED web Application: <https://node-red-brcrj-2022-11-18.eu-gb.mybluemix.net/red/#flow/e9522b9f8417b54d>

## **10. ADVANTAGES & DISADVANTAGES**

### **ADVANTAGES OF INTELLIGENT FIRE ALARM SYSTEM:**

- ☐ Openness – compatibility between different system modules, potentially from different vendors;
- ☐ Orchestration – ability to manage large numbers of devices, with full visibility over them; o Dynamic scaling – ability to scale the system according to the application needs, through resource virtualization and cloud operation
- ☐ Automation – ability to automate parts of the system monitoring application, leading to better performance and lower operation costs

### **DISADVANTAGES**

- ☐ Approaches to flexible, effective, efficient, and low-cost data collection for both railway vehicles and infrastructure monitoring, using regular trains
- ☐ Data processing, reduction, and analysis in local controllers, and subsequent sending of that data to the cloud, for further processing

- Online data processing systems, for real-time monitoring, using emerging communication technologies; Integrated, interoperable, and scalable solutions for railway systems preventive maintenance

## 11. CONCLUSION

Accidents occurring in Railway transportation system cost a large number of lives. So this system helps us to prevent accidents and giving information about faults or cracks in advance to railway authorities. So that they can fix them and accidents cases becomes less. This project is cost effective. By using more techniques they can be modified and developed according to their applications. By this system many lives can be saved by avoiding accidents. The idea can be implemented in large scale in the long run to facilitate better safety standards for rail tracks and provide effective testing infrastructure for achieving better results in the future.

## 12. FUTURE SCOPE

In future CCTV systems with IP based camera can be used for monitoring the visual videos captured from the track. It will also increase security for both passengers and railways. GPS can also be used to detect exact location of track fault area, IP cameras can also be used to show fault with the help of video. Locations on Google maps with the help of sensors can be used to detect in which area track is broken

## 13. APPENDIX

### Source Code

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQTT
#include "DHT.h"// Library for dht11
#define DHTPIN 15 // what pin we're connected to
#define DHTTYPE DHT22 // define type of sensor DHT 11
#define LED 2
DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dht connected void
callback(char* subscribetopic, byte* payload, unsigned int payloadLength);
//-----credentials of IBM Accounts-----

#define ORG "zbgr67"//IBM ORGANITION ID
#define DEVICE_TYPE "fershidevicetype"//Device type mentioned in ibm watson IOT Platform
```

```

#define DEVICE_ID "fershideviceid"//Device ID mentioned in ibm watson IOT
Platform
#define TOKEN "fershiageona" //Token String
data3; float t;

//----- Customise the above values ----- char server[] = ORG
".messaging.internetofthings.ibmcloud.com";// Server Name char publishTopic[] = "iot-
2/evt/Data/fmt/json";// topic name and type of event perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd REPRESENT command type AND
COMMAND IS TEST OF FORMAT STRING char authMethod[] = "use-token-auth";// authentication
method char token[] = TOKEN; char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id

//-----
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined client id by passing parameter
like server id,portand wificredential void setup()// configureing the ESP32
{
    Serial.begin(115200); dht.begin();
    pinMode(LED,OUTPUT); delay(10);
    Serial.println(); wificonnect();
    mqttconnect();
} void loop()// Recursive Function
{
    t = dht.readTemperature();
    Serial.print("temperature:");
    Serial.println(t);

    PublishData(t); delay(1000);
    if (!client.loop()) {
        mqttconnect();
    }
}

/*.....retrieving to
Cloud.....*/
void PublishData(float temp) {
    mqttconnect();//function call for connecting to ibm
    /* creating the String in in form JSon to update the data to ibm cloud */
    String payload = "{\"temperature\""; payload +=
temp; payload += "}";

    Serial.print("Sending payload: ");
    Serial.println(payload);

    if (client.publish(publishTopic, (char*) payload.c_str())) {
        Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it will print publish ok in
Serial monitor or else it will print publish failed

```

```

    } else {
        Serial.println("Publish failed");
    }
} void mqttconnect() { if
(!client.connected()) {
    Serial.print("Reconnecting client to "); Serial.println(server);
    while (!!!client.connect(clientId, authMethod, token)) { Serial.print(".");
delay(500);
    }
    initManagedDevice();
    Serial.println();
} } void wificonnect() //function defination for wificonnect
{
    Serial.println();
    Serial.print("Connecting to ");

    WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish the connection while
(WiFi.status() != WL_CONNECTED) { delay(500);
    Serial.print(".");
    }
    Serial.println("");
    Serial.println("WiFi connected");
    Serial.println("IP address: ");
    Serial.println(WiFi.localIP());
} void initManagedDevice() {
if (client.subscribe(subscribetopic)) { Serial.println((subscribetopic));
    Serial.println("subscribe to cmd OK");
    } else {
        Serial.println("subscribe to cmd FAILED");
    }
} void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{

    Serial.print("callback invoked for topic: ");
    Serial.println(subscribetopic); for (int i = 0; i <
payloadLength; i++) { //Serial.print((char)payload[i]);
data3 += (char)payload[i];
    }

    Serial.println("data: "+ data3);
    if(data3=="lighton") {
        Serial.println(data3); digitalWrite(LED,HIGH);

    }
    else
    {
        Serial.println(data3); digitalWrite(LED,LOW);
    }
    data3="";
}

```

---

---