

PROJECT REPORT

SMART SOLUTIONS FOR RAILWAYS

TEAM ID: PNT2022TMID32983

TEAM MEMBERS:

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INTRODUCTION:

ABSTRACT:

Now-a-days, Railway is one of the most used means of transportation due to ticketing price hike in buses. For the railway system to operate with continuous monitoring and inspection of railway tracks is required. Currently railway track inspection process and monitoring system was done manually which is time consuming and not efficiently, due to the high chance of man power error occurrence. Moreover, it is not possible to inspect and monitor continuously the track by human power as they run lakhs of miles. In this system, we describe the range of sensing based sensor technologies has expanded rapidly, whereas sensor devices have become cheaper. It leads to an improved expansion in condition monitoring of systems, structures, vehicles, and machinery using sensors devices. Important Key factors in this railway track monitoring system are the now-a-days advanced technology in networking technologies such as wireless, Wi-Fi communication and mobile ad hoc networking coupled with the technology to integrate devices. It can be used for monitoring system and inspection process the railway infrastructure such as rail tracks, track beds, and track hardware equipment along with motor, scooter based vehicle health monitoring such as chassis, bogies, wheels, and wagons. Track based Condition monitoring reduces human's power inspection requirement through

automated monitoring, reduces maintenance through detecting faults or error either environmental based normal based before they improves smart, safety and reliability. This is important for the development, upgrading, and expansion of railway networks .even if you are in the new cities or countries you have to know the upcoming locations and stops or you will be in serious troubles which was made easy by our IOT app .

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.

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:

IOT BASED ACCIDENT PREVENTION AND MONITORING SYSTEM IN RAILWAYS.

Author: Abhisekh Jain S, ArvindS ,Balaji B.S Ram ,Viyas N.P.
 They proposed method at solving long Prevailing problems in the Railway tracks. This Simple method of monitoring and assessment of the Condition of the railwaytracks can reduces major Disasters and save precious human being lives.

Author: G.Briundha, B.Perumal, C.Punithkumar, M.Sathyamoorthy .

They proposed that an Automatic railway gate control system at unmanned Level crossing changing the gates operated by Railway gate keepers and also the partial Automatically operated gates. It deals with the Decreased of time for which the gate is being kept Closed. To implement safety to the road users by Reducing the accidents, It usually occurs due to Carelessness and useless of road users at a times Errors made by the gatekeepers.

Author: B.Siva Rama Krishna, D.V.S Seshendra, G.Govinda Raja, T.SudharshanandK.Srikanth .

They proposed system that Introduced Bluetooth based technology, to reduce The train accident. Two digital based IR sensors are Inserted at front ends of the inspection robot which Monitors the track to detect crack and gives the Crack location in railway via Bluetooth to mobile Phone.

OUT-OF-ROUND RAILWAY WHEELS.

Author : J. C. O. Nielsen and A Johansson

This literature survey discusses the state-of-the-art in research on why out-of-round railway wheels are developed and on the damage they cause to track and vehicle components. Although the term out-of-round wheels can be attributed to a large spectrum of different wheel defects, the focus here is on out-of-round wheels with long wavelengths, such as the so-called polygonalization with 1-5 harmonics (wavelengths) around the wheel circumference. Topics dealt with in the survey include experimental detection of wheel/rail impact loads, mathematical models to predict the development and consequences of out-of-round wheels, criteria for removal of out-of-round wheels and suggestions on how to reduce the development of out-of-round wheels.

HIGH SPEED RAILS.

**Authors: Anuj Golya
Dheeraj Sharma
Dhruv Garg.**

In the current situation, Republic of India reaches the planet category equipment and prepared to contend with the highest leaders of the universe. Republic of India succeeds in launching the missiles and satellites, got well trained and unbeatable defense to safeguard the state and holding high category transportation facilities at intervals it. Republic of India full-grown into the prime role of transportation and rail business is that the key purpose of the Indian transport system. Within the field of rail transportation, Republic of India got such a big amount of experiences whereas implementing the recent technologies. This text goes to debate regarding the high speed trains in Republic of India. This analysis might relate to the current scenario of the high speed trains within the world countries additionally as in our nation. The study would possibly embrace the initiation plan of the high speed rails in Republic of India. The calculable stations were hand-picked for the high speed rails and also the international countries like Japan, France, Korea, China area unit showing a lot of interest on funding Republic of India to complete the assignment. During this special amount Government of { Republic of India|Bharat|Asian country|Asian nation} fashioned a singular department for the high speed railways named High Speed Rail Corporation of India Ltd. This paper concentrates on the event and execution of the design was established by the govt. in a good manner. The japanese passenger train saw the appearance of options like Automatic Train management (ATC), Centralised control, shorter train lengths and ballastless tracks.

INDIAN RAILWAYS.

Authors: Ramesh Kumar singh.

Indian Railways is the best transportation facility provider and biggest economic payee of the Indian government as well as biggest social service providers for the nation. Indian Railways historically established by the Britishers through East India Company (EIC) for the Business and to rule the whole Indian continents. Numerous studies has been done so far now concerned to its union, labour, industry, employment etc. Here in this paper it has been

tried to focus on decadal growth of Indian railways with the help of secondary data source e.i. time series data. The literature review and secondary data on statistical summary of Indian Railways has been analysed for the average annual growth rate, number of employees and officers, total employees' wages, railway stations, infrastructure etc.

A SURVEY PAPER ON VALUABLE SECURITY SYSTEM IN RAILWAYS USING BIOMETRIC AND WIRELESS COMMUNICATION.

**Author: Prof. Suhas Kothawale , Ms. Aarti Dugad , Mr. Arpit Mohorkar ,
Ms. Vaishnavi Agrawal, Ms. Devayani Tayade.**

The important objective of this device is to provide the security and alarm system to the Valuable Carrying in Railways which can be used by individuals which require a cheap but reliable security system. The idea behind this project is to provide its users with a simple, fast and reliable way to get help during emergency situations. The device can be placed at any remote location which can be easily accessed by the user. It uses Biometric for identification of an individual and provide security function such as electronic signature creation, valuables along with weight calculation of the valuable for security purpose. It uses a microcontroller for system control, GSM (Global System for Mobile Communication technology for communication and sends SMS containing the emergency message and the GPS (Global Positioning System) location of the sender by which it will be beneficial for the growth of Indian Railway Economics.

AUTOMATIC EMERGENCY AND SECURITY SYSTEM FOR RAILWAY TUNNEL USING PLC.

**Author: Yuvraj K jagdale, Niraj A Awasarkar, Rahul R Kukkar, Aadesh B
Sawale, Rajashree S Kadam.**

ITS (Intelligent Traffic System) is a topic of huge concern To our developing world and a lot of prior research has Been done but due to diversities of technologies and fields. The absence of a unified system exists. Acy M. Kottalil et.al Proposed a model of Automatic RailwayGate Control System using IR sensors for detection of trains at railway Crossings and controlling level crossing gates Accordingly. But thesystem is considered to be very Less reliable due to the presence of very highly sensitive IRSensors which is considered to compromise with the Sensing in the presence of sunlight. Anjali Jain et.al came Up with a Collision Detection and Avoidance System in Railways Using WiMAX the system incorporated 4G WiMAX with GPS for calculation location of equipped Locomotives the system is able to clarify the fact that one To one collisions can be avoided by using it however a Decrement in one to one collisions is observed with the Use of advanced automatic signaling in railways. Since This system might not be able to report collisions at level Crossing considering accidents at level crossings are Considerably trending the capital invested in the system Will not be efficient enough. Another microcontroller Based approach was discussed by Krishna et.al using 8952 Microcontroller and sensors to sense the location of train and act accordingly to control the movement of level Crossing.But the use of a small scale approach for a really complex .Network will not be sufficient enough to uphold the Requirements of railways also the reliability of the system Will not be good enough. A PLC based approach was Followed by Mahesh Nandaniya et.al with real time Monitoring using SCADA the approach is reliable but the Capital investment in every level crossing by single PLC Will result inefficient in a way since there is a very large Quantity

of level crossings and controlling every level Crossing with a PLC of its own will increase the capital cost

By many folds. Subrata Biswas et.al discussed an Approach for Pressure Sensed Fast Response AntiCollision System for Automated Railway Gate Control the system.

RAILWAY CYBER-SECURITY IN THE ERA OF INTERCONNECTED SYSTEMS.

Author: Simon Soderi, Daniele Masti, Yuriy Zacchia Lun.

Technological advances in the telecommunications industry have brought significant advantages in the management and performance of communication networks. The railway industry, where signaling systems are now fully computerized, is among the ones that have benefited the most. These interconnected systems, however, have a wide area exposed to cyberattacks. This survey examines the cybersecurity aspects of railway signaling systems by considering the standards, guidelines, and frameworks most widely used in the industry. We dedicate specific attention to communication networks since data communication systems are essential to signaling architectures. To this end, we explore using dedicated cyber ranges as an enabling technology to model attacks to computer networks, emulate attack-defense scenarios, study vulnerabilities impact in general, and finally devise countermeasures to them.

2.3 Problem Statement:

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 stationboard”.

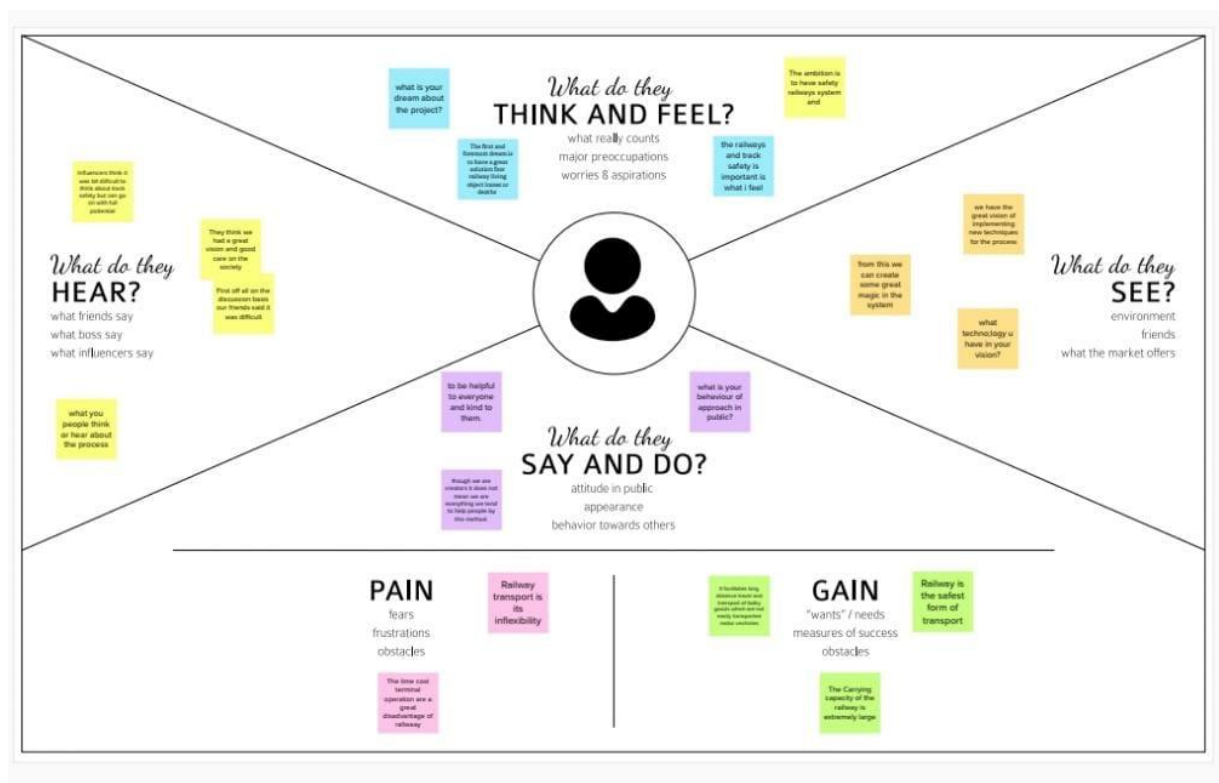


I am	I am a final year student who thinks that this project will be massive success				
I'm trying to	I am trying to solve railway accidents through IoT proposed solutions by using modern technology				
but	The main problem is their carelessness and not having serious concern about their life				
because	The main concern is that they think that nobody can ask them having they think they will be a hero in others point of view which cost their life				
Which makes me feel	Very sad about it and have to save their life through the modern technology				
Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
Ps1	I am a final year student who thinks that this project will be massive success	I am trying to solve railway accidents through IoT proposed solutions by using modern technology	The main problem is their carelessness and not having serious concern about their life	The main concern is that they think that nobody can ask them having they think they will be a hero in others point of view which cost their life	Very sad about it and have to save their life through the modern technology
Ps2	I am trying to solve the rate of death through the technical method	I am trying to solve railway accidents through IoT proposed solutions.	There is no system to ask questions to them who are travelling in the safe less manner	The main concern is that they think that nobody can ask them having they think they will be a hero in others point of view which cost their life	To stop these things by using modern technology and save their lives

IDEATION & PROPOSED SOLUTION

3.1 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.



3.2 Ideation & Brainstorming:

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.



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 [your problem statement]?

4 Key rules of brainstorming

To run an smooth and productive session

🗣️ Stay on topic	💡 Encourage wild ideas
👂 Defer judgment	👂 Listen to others
🗣️ Go for volume	🎨 If possible, be visual

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 (switch to sketch) icon to start drawing!

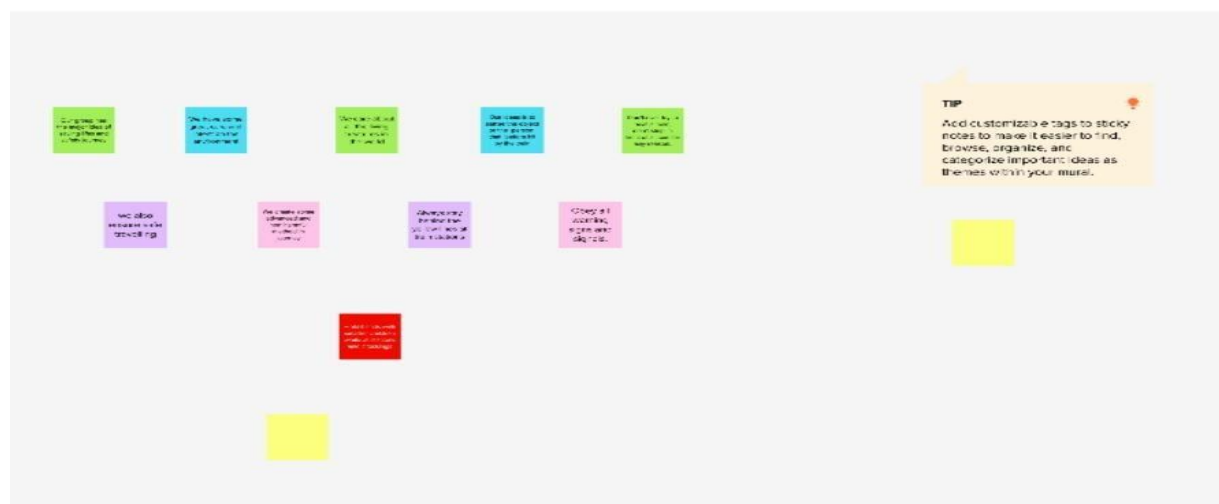


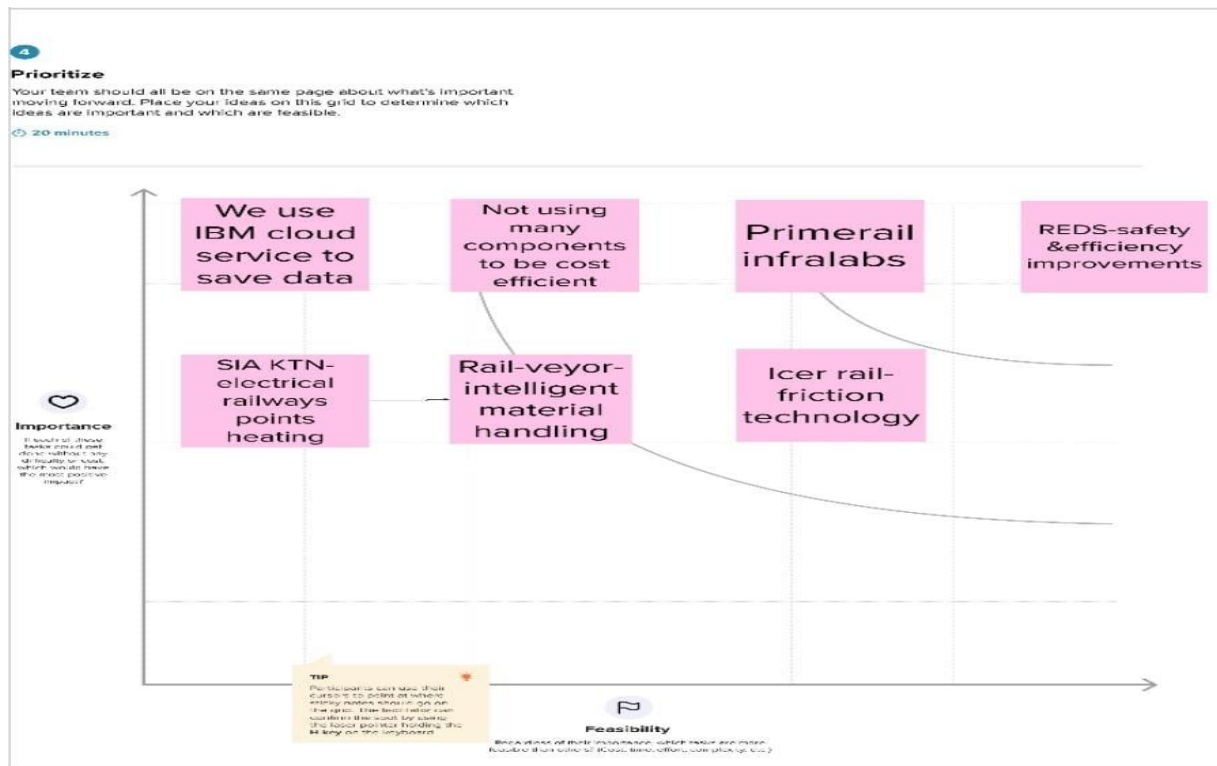
3

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





3.3 Proposed solution:

<u>S.NO</u>	❖ Parameter	<u>Description</u>
❖	❖ Problem Statement (Problem to be solved)	<u>Train accidents are one of the issues in India ,</u> <u>Even it was happening because of carless ness of the people some time it was happening due to the no men level crossing and also</u>

		<p><u>sometimes it is because of the carelessness of the train activators . Sometimes many animals dies because of this ,so we are trying to find solution for this issue and to save some lives. In other cases if some one was hit by the train but has a chance to live if he was taken to the hospital at the correct time our idea was one of the best example ton save lives in this process. And also it is applicable for the people who are traveling in the train foot steps.</u></p>
❖	❖ Idea/Solution description	<p><u>An assembled Arduino microcontroller is used as the core controller of the system. Once the code is uploaded to the microcontroller, no PC system, keyboard command, monitor is required to operate the system. The system functions automatically and independently according to the code uploaded to the</u></p>

		<p><u>microcontroller. We use ultra sonic sensors to detect the object by passing radiation on the rail track .after this if their any object on the rail track the sensor will detects and send message to the nearby station and also to the rail engine controller, unfortunately if the train hits the person the message will be sent to the nearby stations and also to the hospitality emergency .after the object detection the signal passed will be converted to the message in text form this is our idea for the smart solutions for railway.</u></p>
❖	❖ Novelty / uniqueness	<p><u>1)To reduce the accidents and also to save lives if the people.</u></p> <p><u>2)To this process we can also save some animals by this which are precious in the living world.</u></p>
❖	❖ Social impact/Customer satisfaction	<p><u>The main objective is to save life of the peoples and also to save animals. Over</u></p>

		<u>3499 animals were died due to train accidents during the year 2019,it was increasing by every year. This will save more animals and human beings from death.</u>
❖	❖ Business model (Revenue model)	<u>We can share this idea to industries to get us to fix it in the train. We can give this this as a free train for initial stage and can charge money for the train basis as a contract.</u>
❖	❖ Scalability of the solution	<u>Scalability of this device is very high and they can manage with less man power. The process of this may take time but the output and efficiency of this device is comparitively high</u>

3.4 PROBLEM SOLUTION FIT:

Project Title: Smart Solutions For Railways

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMD32983

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) Passenger Ticket collector	6. CUSTOMER CONSTRAINTS Reducing the paper work of customer	Explore AS, differentiate
	2. JOBS-TO-BE-DONE / PROBLEMS In their busy schedule as fast moving world public in need of online booking process. In queues in front of the ticket counters in railway stations have been drastically increased over the time.	9. PROBLEM ROOT CAUSE The main reason for the problem but has occurred due to lack of technology earlier. Since the passengers find it difficult to book the ticket and track the location of train.	
Identify strong TR & EM	3. TRIGGERS Save paper and workload	10. YOUR SOLUTION A web page is designed in which the user can book tickets and will be provided with the QR code, which will be shown to the ticket collector and by scanning the QR code the ticket collector will get the passenger details. The booking details of the user will be stored in the database, which can be retrieved any time.	Identify strong TR & EM
	4. EMOTIONS: BEFORE / AFTER No need of taking printout Counter ticket has to be handled with care, but SMS on mobile is enough. No need of taking out wallet and showing your ticket to TTR just tell your name to TTR that you are a passenger with valid proof	8. CHANNELS of BEHAVIOUR 8.1 ONLINE People can book their ticket through online and they get a QR code through SMS 8.2 OFFLINE In web application passenger details are stored and the ticket collector can view their details at any time.	

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 Official website Registration through Form Registration through App
FR-2	User Confirmation	Confirmation via QR code Confirmation via message
FR-3	Ticket Verification	Ticket collector check the tickets using the QR code which is generated during ticket booking.
FR-4	TTE work load reduction	TTE can simply scan the QR code to identify the personal details and also to reduce the use of paper.
FR-5	Data base storage	All the booking details of the customer is stored in the database with unique ID which can retrieved back when the ticket collector scans the QR code.
FR-6	Train tracking	The live status of the journey is updated in the web continuously

4.1 Non-functional Requirements:

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

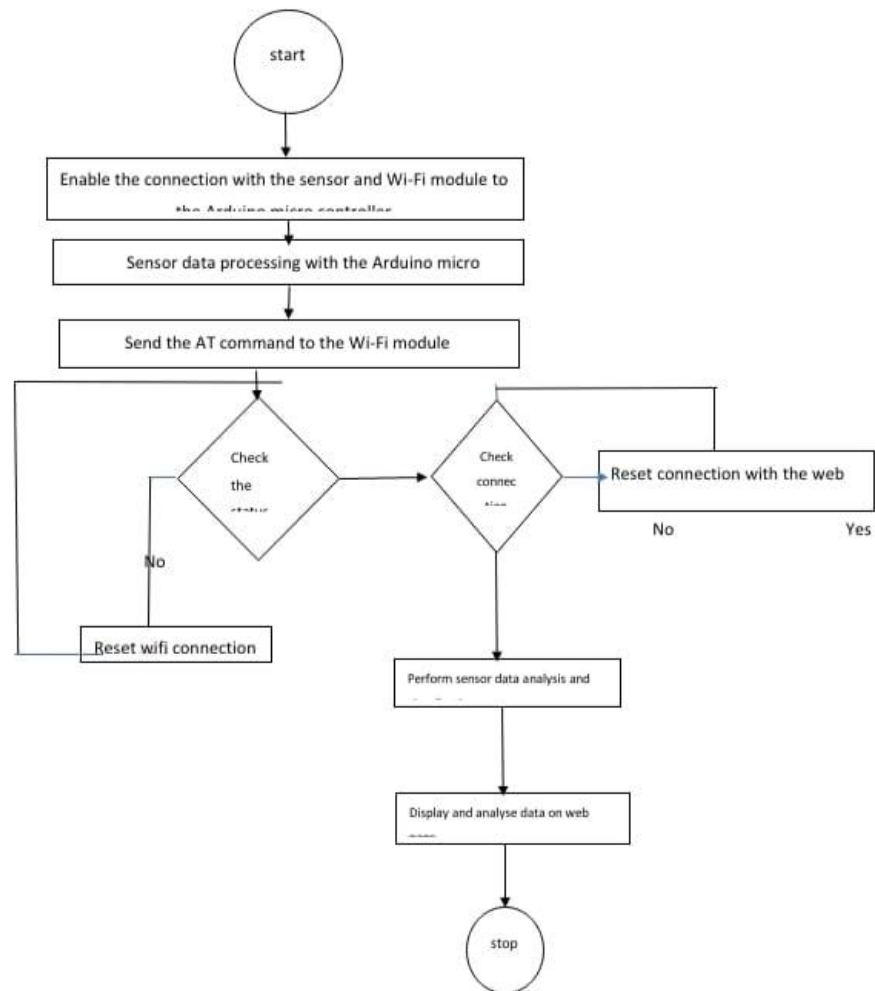
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The user can easily book the tickets at their own pace based on the availability of seats without waiting in the ticket counter.
NFR-2	Security	User's personal details are safely stored in the Cloud. QR code reduces the duplicate train tickets

NFR-3	Reliability	As IBM cloud is used to store the information about the customers this product is highly reliable.
NFR-4	Performance	The Web UI provides smooth user experience and improves the performance of this solution.
NFR-5	Availability	App is readily available on play store for mobile phone users or user can access the website using web browser.
NFR-6	Scalability	This solution can be easily scaled up based on the customer demand.

5.PROJECT DESIGN

4.2 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.



5.2 SOLUTION AND TECHNICAL ARCHITECTURE

Summary

Solution Architecture:

Transportation systems are complex with respect to technology and operations due to the involvement of a wide range of human actors,

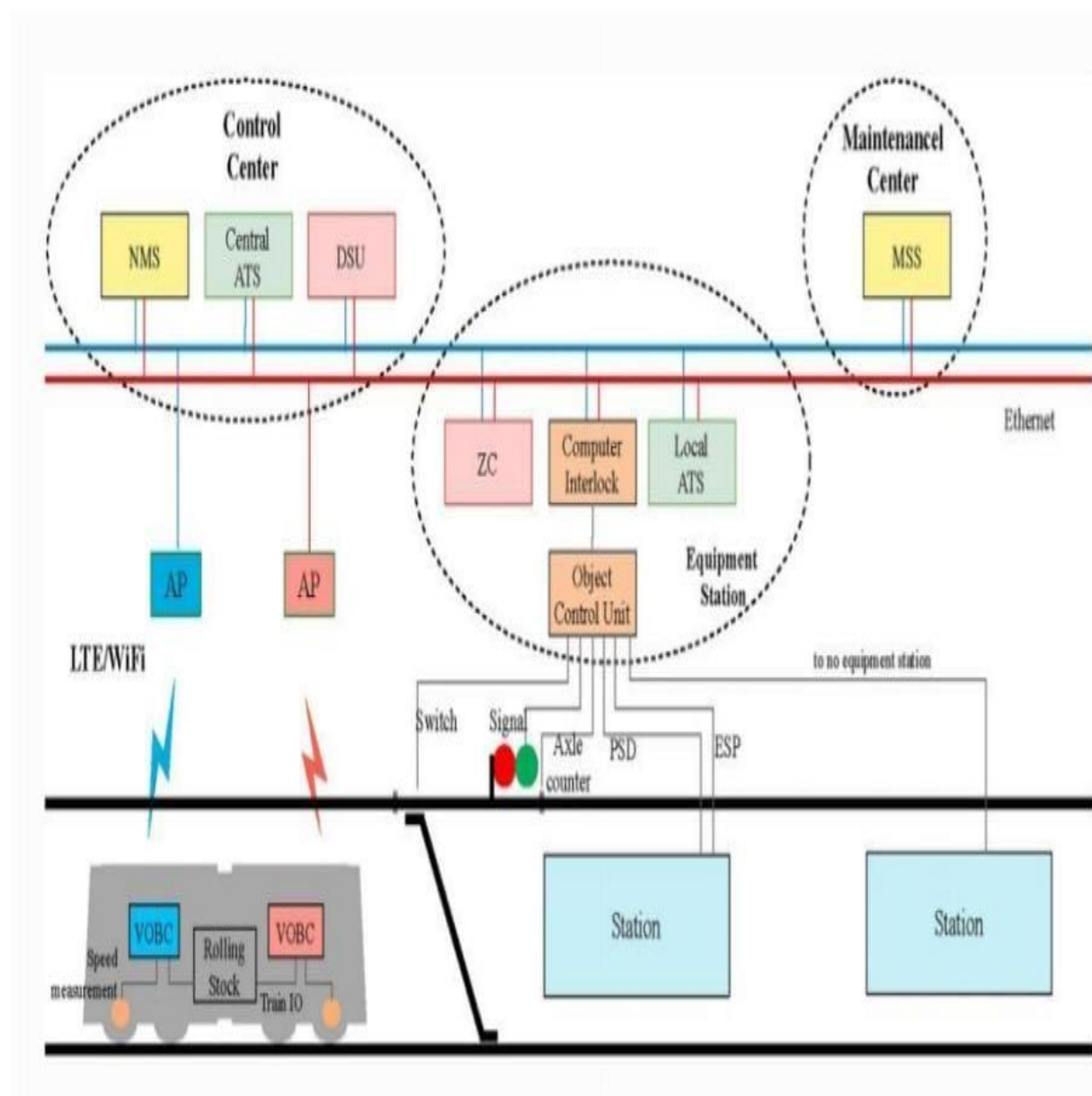
organisations and technical solutions. There is a need to apply intelligent computerised systems for the operation and control of such complex environments, such as computerised traffic control systems for coordinating advanced transportation.

Digitisation of Railways Includes:

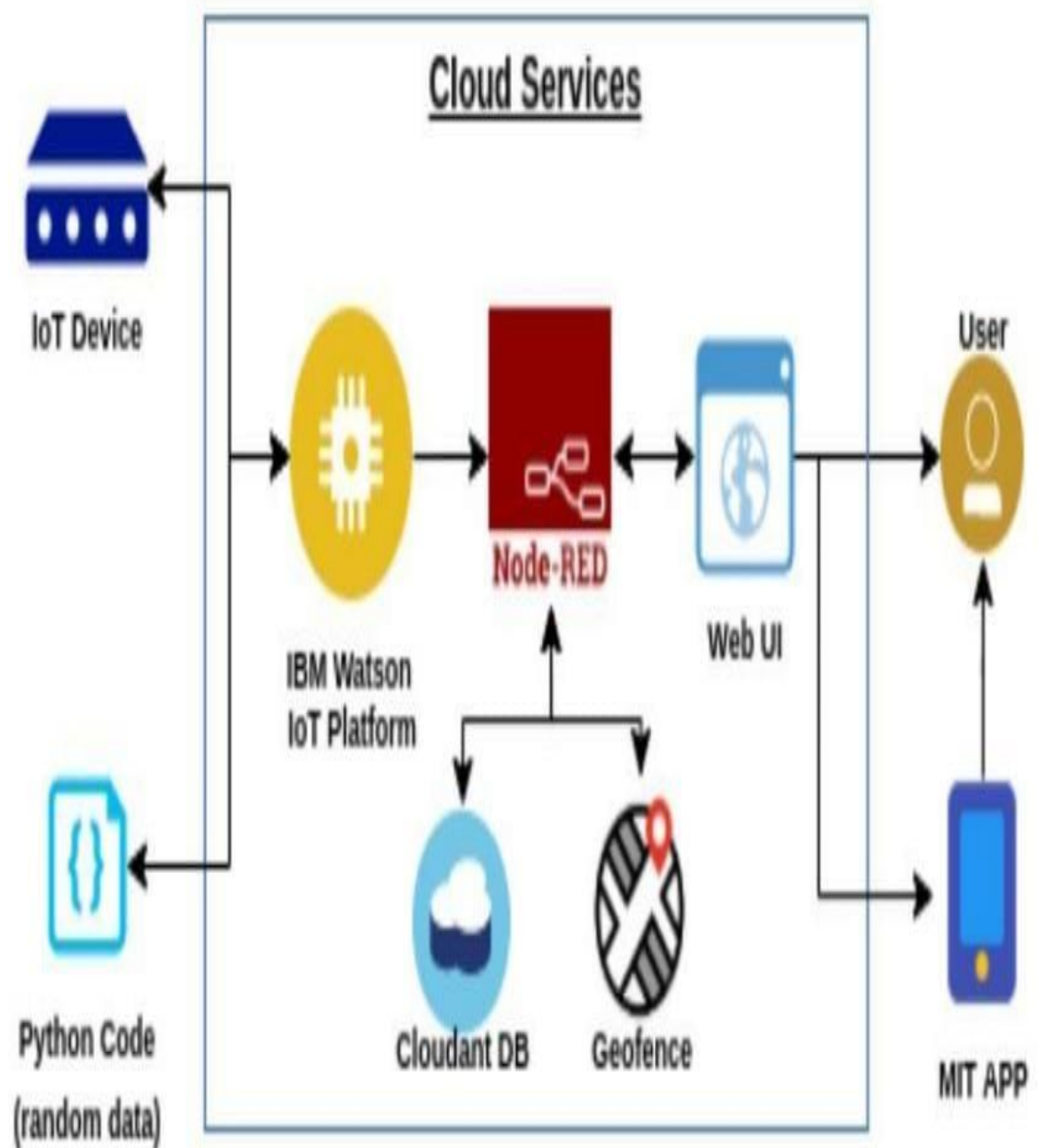
- ❖ B-scan ultrasonic rail flaw detection (both non-stop and stop-and-verify systems) and track inspection with automated high-speed test trains.
- ❖ Train control system levels 2 and 3 for high-density routes to increase network capacity and maintain the required safety standards.
- ❖ Increased surveillance of personnel with both interior and exterior locomotive-mounted video surveillance to improve monitoring.
- ❖ Track-laying machines for mechanisation of construction.
- ❖ Electrification through machines such as self-propelled overhead electrification laying trains.
- ❖ Complete train scanners for improved diagnostics and maintenance.
- ❖ Use of distributed power to improve the efficiency of train operations with coordinated acceleration and deceleration.
- ❖ Establishment of smart railway stations by implementing access control at entry points.
- ❖ e-ticketing with services such as infotainment and app-based systems.
- ❖ Use of training simulators and virtual reality (VR) training systems to improve personnel capabilities.

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

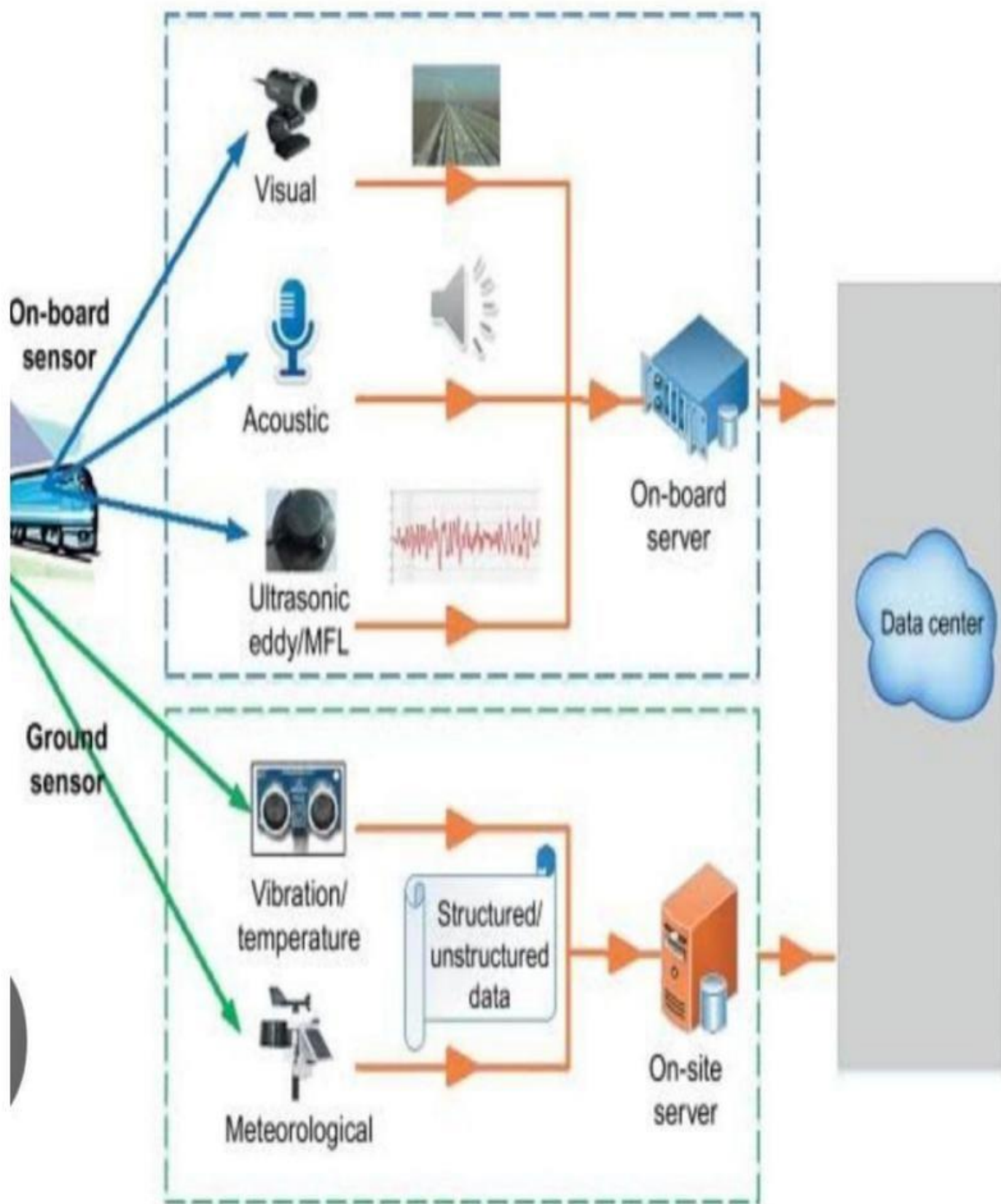
- ❖ Find the best tech solution to solve existing business problems.
- ❖ Describe the structure, characteristics, behavior etc

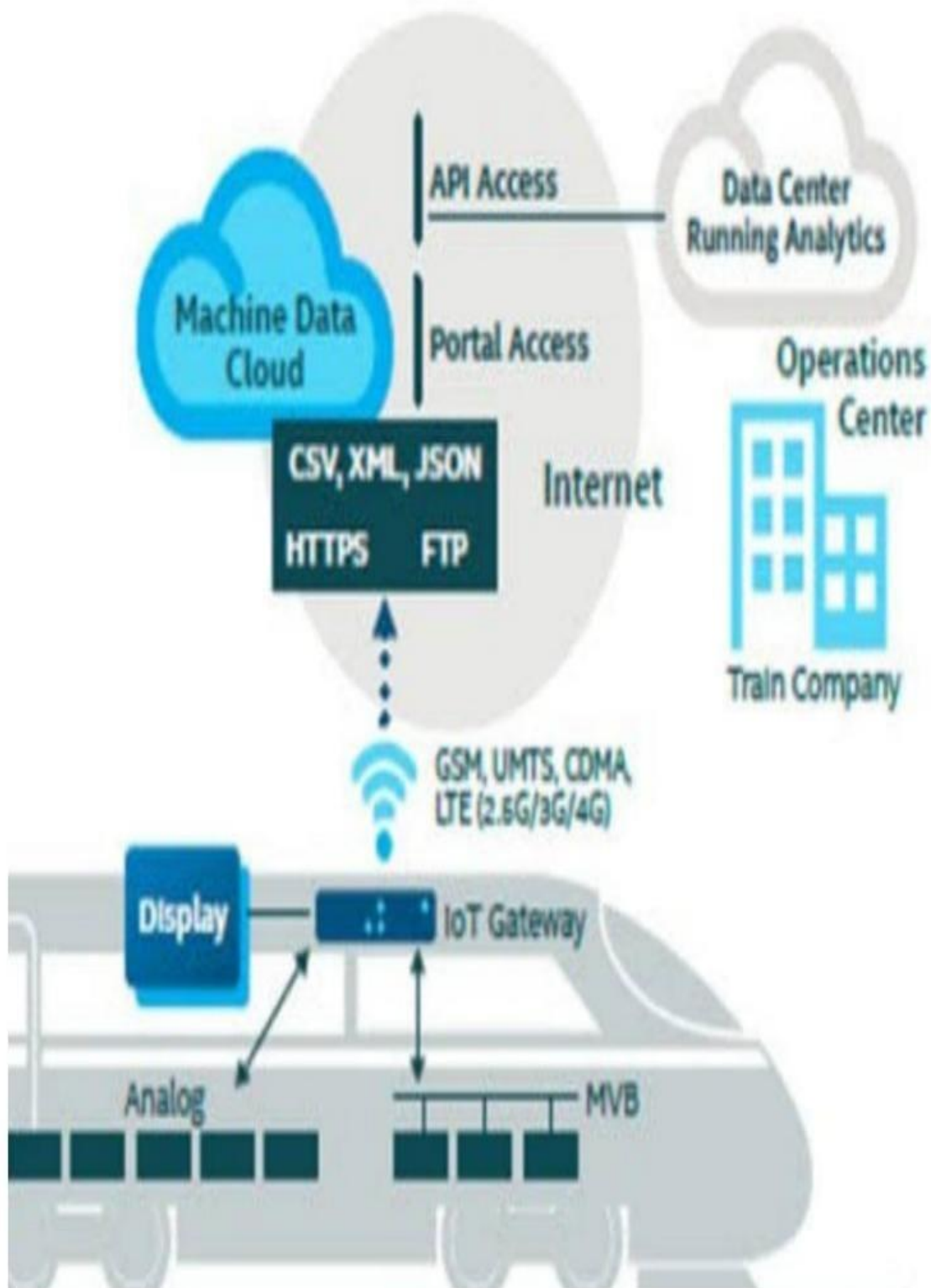


Smart solution of railways based on IOT



SOLUTION ARCHITECTURE DIAGRAM:





6.PROJECT PLANNING AND SCHEDULING:

6.1 SPRINT PLANNING AND ESTIMATION:

Sprint	Functional requirement(epic)	User story / task	Team member
Sprint 1	Registration	As a user , I can login through the app by using E-mail or user idy	Ganga Devi
Sprint 2	Train list		Abinaya
Sprint 3			Nagalakshmi
Sprint 4			Balapraveen

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 released date (actual)
Sprint 1	20	6 days	Oct,24	Oct,29	20	Oct,29
Sprint 2	20	6 days	Oct, 31	Nov,5	20	Nov,5
Sprint 3	20	6 days	Nov, 7	Nov,12	20	Nov,12
Sprint 4	20	6 days	Nov, 14	Nov,19	20	Nov,19

7. CODING AND SOLUTIONING:

7.1 FEATURES:

- ❖ IOT Device
- ❖ IBM Watson Platform
- ❖ NODE-RED
- ❖ Cloudant DB
- ❖ Web UI
- ❖ MIT App Inventor
- ❖ Python code

7.2 FEATURES:

- ❖ Registration
- ❖ Login
- ❖ Train Number
- ❖ GPS

8.TESTING:

8.1 TEST CASES:

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	15	0	0	15
Client Application	45	0	0	45
Security	1	0	0	1

Outsource Shipping	2	0	0	2
Exception Reporting	10	0	0	10
Final Report Output	4	0	0	4
Version Control	3	0	0	3

8.2: USER ACCEPTANCE TESTING:

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of Smart solutions for railways project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved.

Test case id	Feature	Component	Test Scenario	Steps to Execute	Test Data	Actual Result	Status
Login page	Functional	Home page	Verify user is able to see the Given app	1.Download the given APK File 2.Click on download button 3.Verify login popup displayed or not"	APK File	Working as expected	Pass
Login page	Functional	Home page	Verify user is able to see the Login/Signup popup when user open	1. Download the given APK File 2.Click on download button	APK File	Working as expected	Pass

			the Aqua Meter	3.Verify login popup displayed or not"			
Login page	Functional	Home page	Verify the UI elements in Login/Signup popup	1. Download the given APK File 2.Click on download button 3.Verify login popup with below UI elements: A .Username text box A .password text box B .Submit button	APK File	Working as Expected	Pass
Login Page	Functional	Home page	Verify user is able to log into application with Valid credentials	"1 Download the given APK File 2.Click on download button 3.Enter Valid "Given " username in Username text box 4.Enter valid password in password text box 5.Click on Submit button"	Username: Username Password: Password	Working as Expected	Pass
Login Page	Functional	Home page	Verify user is able to see the output	1.output displayed	APKFile	Working as Expected	Pass

9. RESULT:

9.1 PERFORMANCE METRICS:

NFT - Risk Assessment									
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Volumen Changes	Risk Score	Justification
1	SMART SOLUTIONS FOR RAILWAYS	New	Low	No Changes	Moderate	3days	>5 to 10%	ORANGE	As we have seen the changes

PERFORMANCE TABLE

PARAMETER	PERFORMANCE	DESCRIPTION
ADMIN TESTING	95%-100%	THE TESTING DONE BEFORE IT IS DEPLOYED AS AN APP
CUSTOMER SATISFACTION	75-85%	THE CUSTOMER NEED TO BE SATISFIED WITH THE MOBILE APPLICATION
USER INTERFACE	65-85%	THE APP CAN USED BY ANYONE.(EASE OF ACCESS)
SEVER RESPONSE	50-75%	url - response
DATA VALIDATION WITH NO. OF TEST CASE	60-80% (15-30 TESTCASE)	VALID DATA FROM THE APP
ERROR	3-5%	REAL-TIME DELAY MAY OCCUR

10. ADVANTAGES AND DISADVANTAGES:**10.1 ADVANTAGES:**

- Openness – compatibility between different system modules, potentially from different vendors.

- Orchestration – ability to manage large numbers of devices, with full visibility over them; ○ 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.

10. 2 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 solution for railway system preventive and 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:

13.1 SOURCE CODE:

PYTHON CODE TO PUBLISH DATA:

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
```

```
#Provide your IBM Watson Device Credentials
```

```

organization = "Ifkvn6"
deviceType = "SOLUTION"
deviceId = "SOLUTION_1"
authMethod = "token"
authToken = "12345678"

# Initialize GPIO

def myCommandCallback(cmd):
    print("Command received: %s" %
cmd.data['command'])
    status=cmd.data['command']
    if status=="Emergency Alert":
        print ("Emergency Alert")

    #print(cmd)

try:
    deviceOptions = {"org": organization, "type":
deviceType, "id": deviceId, "auth-method":
authMethod, "auth-token": authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
    #.....

except Exception as e:
    print("Caught exception connecting device: %s"
% str(e))
    sys.exit()

```

```
# Connect and send a datapoint "hello" with value
"world" into the cloud as an event of type "greeting"
10 times
deviceCli.connect()
```

```
while True:
```

```
    #Get Sensor Data from DHT11
```

```
    trainnumber=random.randint(10000,20000)
```

```
    lat=random.randfloat(10,11)
```

```
    lon=random.randfloat(77,78)
```

```
    data = { 'trainnumber' : trainnumber, 'lat':
lat,'lon': lon}
```

```
    #print data
```

```
    def myOnPublishCallback():
```

```
        print ("Published trainnumber = %s 'C' %
trainnumber, "lat = %s %%" % lat,"lon = %s %%" % lon,
"to IBM Watson")
```

```
        success = deviceCli.publishEvent("IoTSensor",
"json", data, qos=0,
on_publish=myOnPublishCallback)
```

```
        if not success:
```

```
            print("Not connected to IoT")
```

```
            time.sleep(10)
```

```
        deviceCli.commandCallback =
myCommandCallback
```

```
# Disconnect the device and application from the
cloud
```

```
deviceCli.disconnect()
```

OUTPUT:

The screenshot displays the IBM Watson IoT Platform interface. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. The main heading is 'Browse Devices'. Below this, there are tabs for 'All Devices' and 'Diagnose'. A descriptive text states: 'This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on using different criteria. To get started, you can add devices by using the Add Device button, or by using API.'

A search bar labeled 'Search by Device ID' is present. Below it, a table lists devices. The first device is selected, and its details are expanded. The details include a table of recent events.

Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location	Added By	Device Class	Firmware Version	Hardware Version
WNS716	Connected	All IoT Gateway	Device	Nov 8, 2022 12:42 PM		monikumar@student.auburn.in			

The expanded details for the selected device show a tabbed interface with 'Identity', 'Device Information', 'Recent Events', 'State', and 'Logs'. The 'Recent Events' tab is active, displaying a table of events:


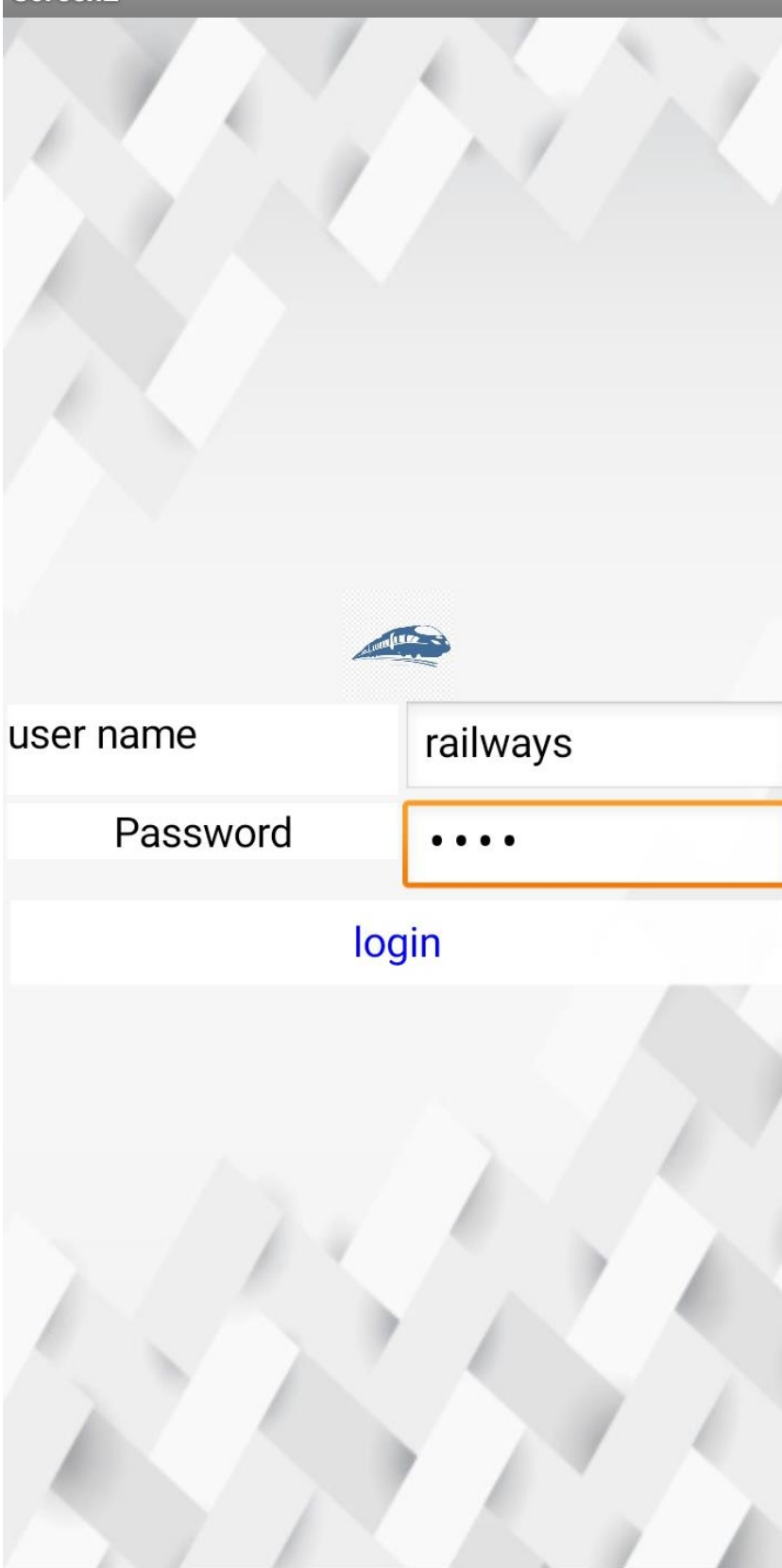
Event	Value	Format	Last Received
status	{"name":"TestC","id":"12.0.00077","m":"70.475..."}	json	a few seconds ago
status	{"name":"TestC","id":"12.0.04012","m":"70.475..."}	json	a few seconds ago
status	{"name":"TestC","id":"12.0.04000","m":"70.475..."}	json	a few seconds ago
status	{"name":"TestC","id":"12.0.04000","m":"70.475..."}	json	a few seconds ago
status	{"name":"TestC","id":"12.0.00740","m":"70.475..."}	json	a few seconds ago

At the bottom, another device entry is visible: 'generaldevice' with status 'Disconnected'.

[illegible]

13.2.MIT APP:





user name

railways

Password

....

login

< O ≡

Screen3

Train Number 16532

Location:

latitude 10.56343

logitude 77.34256

emergency alert

13.3: GITHUB link

<https://github.com/IBM-EPBL/IBM-Project-41063-1660639020>

