PROJECT REPORT

SMART SOLUTIONS FOR

RAILWAY SYSTEMS

A PROJECT REPORT

Submitted by

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AND TECHNOLOGY

1.INRODUCTION

1.1 POJECT OVERVIEW

As trains are one of the most preferred modes of transportation among middle class and impoverished people as it attracts for its amenities. Simultaneously there is an increase at risk from thefts and accidents like chain snatching, derailment, fire accident. In order to avoid or in better words to stop all such brutality we came up with a solution by providing an application which can be accessed y the user after booking their tickets. With a single click this app addresses issues by sending a text message to TC and RPF as an alert. In our project we use Node-Red service, app-development, IBM cloud platform to store passenger data.

1.2 PURPOSE

The purpose of this project is to report and get relived from the issues related to trains.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

* A web page is designed for the public where they can book tickets by seeing the available seats.
* After booking the train, the person will get a QR code which has to be shown to the Ticket Collector while boarding the train.
* The ticket collectors can scan the QR code to identify the personal details.
* A GPS module is present in the train to track it. The live status of the journey is updated in the web app continuously.
* All the booking details of the customers will be stored in the database with a unique ID and they can be retrieved back when the Ticket Collector scans the QR code.

2.2 Reference

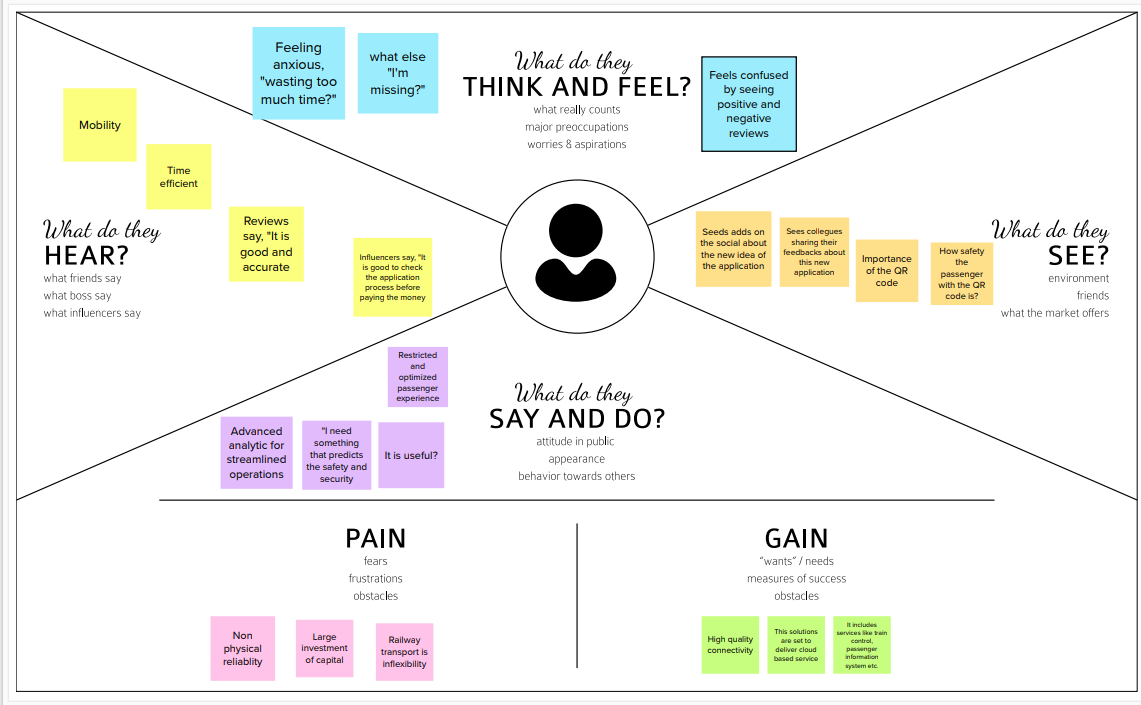
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PAPER NAME | AUTHOR | YEAR | METHOLOGY | MERITS | DEMERITS |
| Passenger Monitoring Model for easily Accessible Public City Trams/Trains. | Roman Khoeblal, Teeravisit Laohapensaeng, Roungsan Chaisricharoen | 2015 | Passenger monitoring, passenger control RFID distance reading, ticket control, RFID ticket inspection. | It is possible to travel cross country with a single public transportation card, using transport systems of several transport operators. | Applicable only for passenger monitoring. |
| Android Suburban Railway Ticketing with GPS as Ticket Checker. | Sana Khoja, Maithili Kadam | 2012 | Android, SQ lite, Cloud Database, ASR, QR Code. | E-Ticket facility, enabling reuse and replacement of components. | QR Codes before the user enters or leaves the station, where the user can have access which is risk in ticket booking |
| Novel Approach for Smart Indian Railways. | Sujith Kumar, K.M.Yatheendra Parvan, V.Sumathy, Thejeswari C.K | 2017 | Digitalization, Smart Railways, Aadhar Card, Smartphone, Identity Verification. | Employ a mobile application through which passengers can access various ticketing options in user friendly and efficient manner. | Biometric database is risk of hacking. |
| A Review on IOT based automated seat allocation and verification using QR code. | Sarvath Saba, Sharon Philip, Shriharsha, Mukund Naik, Sudeep Sherry | 2022 | The system lets the passenger to have a comfortable journey by checking the temperature first for normal and then the count for avoid crowd using the QR Code. | This model proposes a radical change in train operation and passenger experience. One of the many steps towards a more digitized society as a part of the “Digital India” movement proposed in 2015 by the Prime Minister. | The system is not fool-proof and requires a dramatic change in the existing system in terms of the people allowed on platforms, etc. but baby steps matter. |

2.3 Problem Statement Definition

Smart Solutions for railways are designed to reduce the work load of the user and the use of paper.

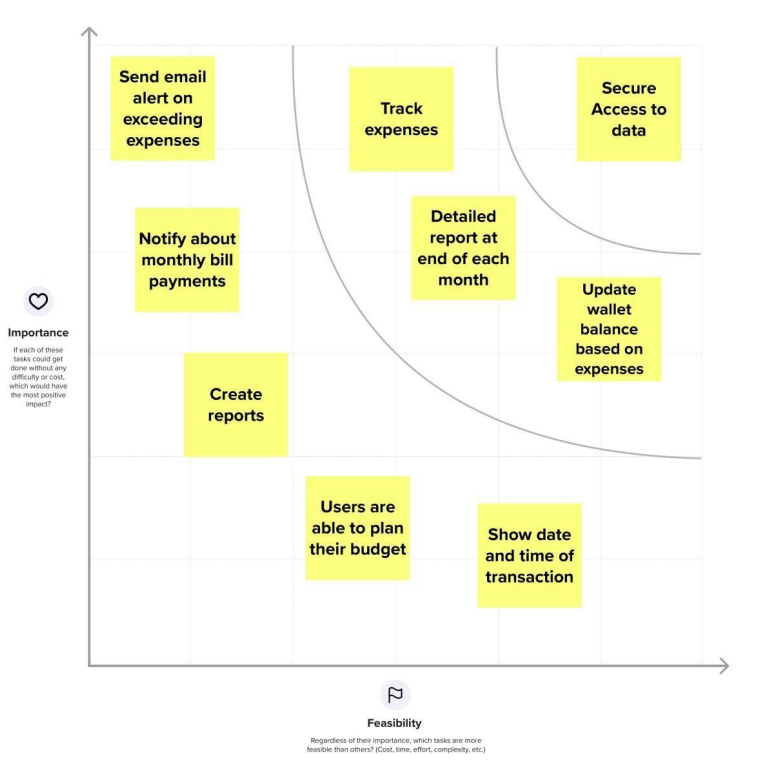
3. IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION AND BRAINSTORMING

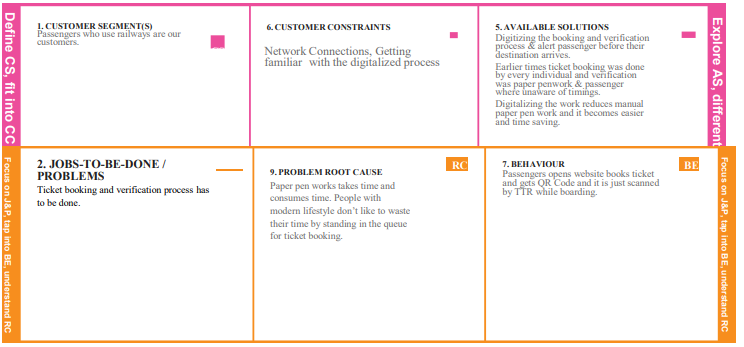
IDEA PRIORITIZATION:

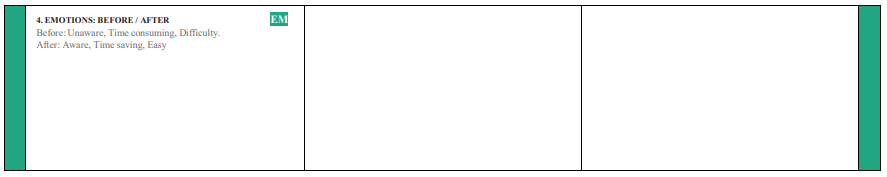


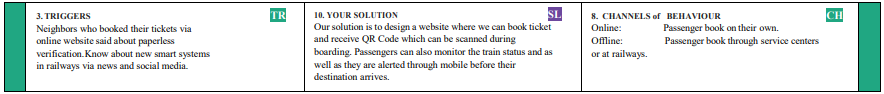
3.3 PROPOSED SOLUTION

|  |  |  |
| --- | --- | --- |
| SI No. | Parameter | Description |
| 1. | Problem Statement (Problem to be solved) | • To provide an efficient way by introducing paperless tickets using QR code  • To design a GPS module to track the location of the train. |
| 2. | Idea / Solution description | • GPS tracker is placed in the train so that the passengers can track the location of the train even it is delayed.  • Passengers can book their tickets using the website which is possible at anytime, anywhere.  • Smart ticketing to avail seasons so that physical work is eradicated |
| 3. | Novelty / Uniqueness | • This project stands unique from the existing ones, by implementing facilities for getting train seasons online and the passenger is alerted through mobile phone before destination arrives. |
| 4. | Social Impact/ Customer Satisfaction | • No Queuing to get tickets and burdenless because of e-tickets.  • Elimination of dilemma whether the train has left or yet to arrive.  • Can get the status and avail of e-seasons instead of visiting the station physically every time. |
| 5. | Business Model (Revenue Model) | This project enables railways to optimize their services by implementing eticketing when compared to the cost involved in paper ticketing thereby profiting with an increase in the number of users. |
| 6. | Scalability of the Solution | • The solution comprises high scalability to meet the increasing demand of users over the nation for more efficient and comfortable services |

3.4 PROBLEM SOLUTION FIT







4.REQUIREMENTS ANALYSIS

4.1 Functional Requirements:

|  |  |  |
| --- | --- | --- |
| FR No. | Functional  Requirement(Epic) | Sub Requirement (Story / Sub-Task) |
| FR-1 | Passenger ticket booking | Booking via online Railway mobileapp and websites. |
| FR-2 | Booking Confirmation | Booking Confirmation via Email Booking Confirmation via SMS |
| FR-3 | Passenger objections and feedback | Through the online application, SMS, and email to the respective authorities. |
| FR-4 | Passenger schedule | Passenger can see their train timing using the mobile application. |
| FR-5 | Passenger Emergency | Passengers in an Emergency, in case of accidents, natural disasters, or theft during the journey can be able to complain through online applications, emergency calls, SMS, and also through email |

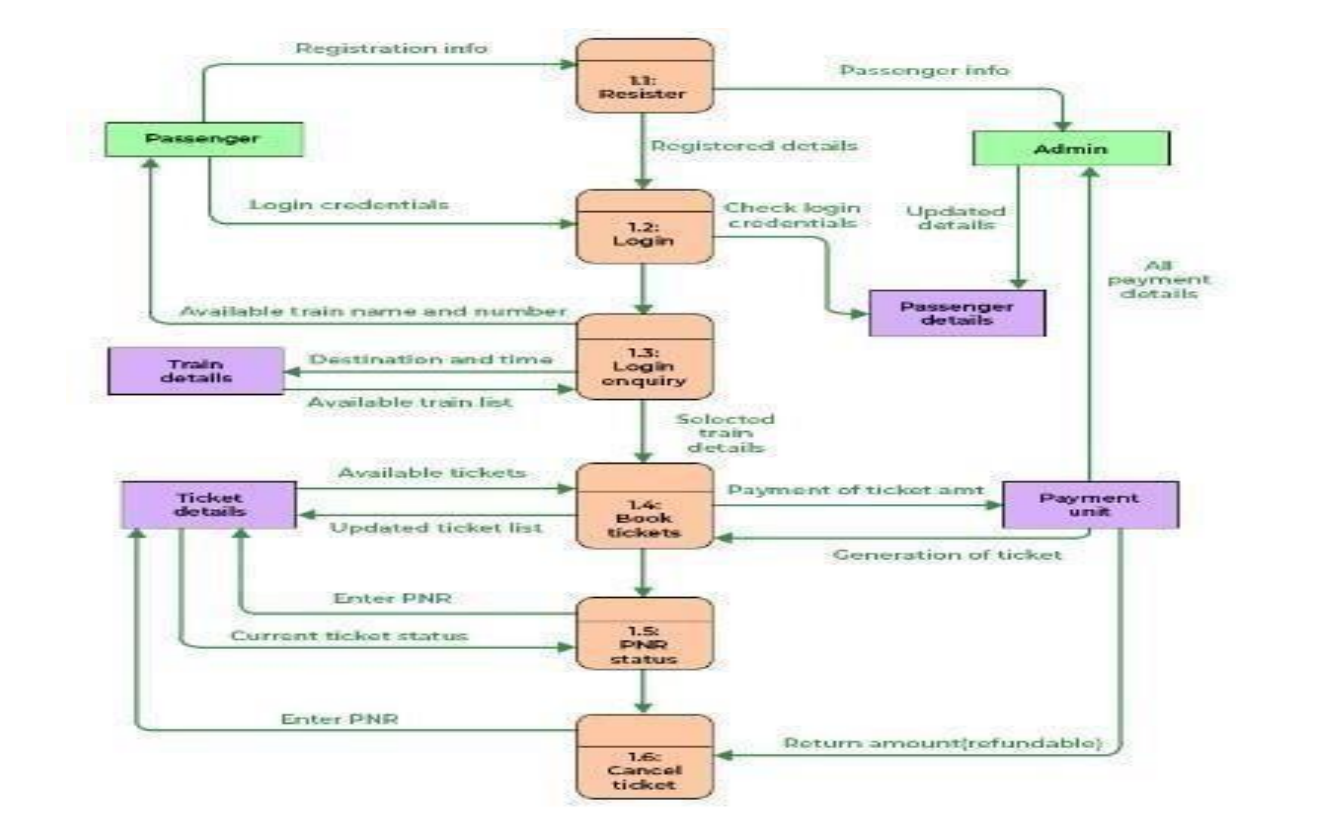
NON-FUNCTIONAL REQUIREMENTS:

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

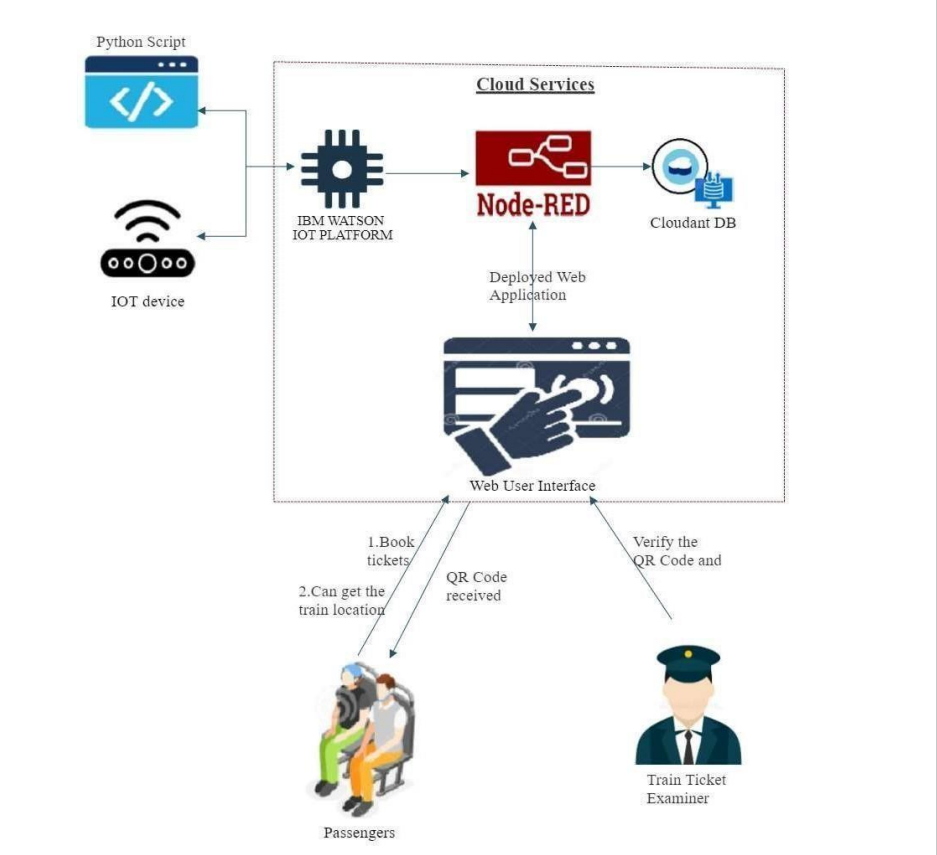
|  |  |  |
| --- | --- | --- |
| FR  No. | Non-Functional  Requirement | Description |
| NFR 1 | Usability | Within periodic maintenance, we can detect cracks in the railway track which will be highly usable on remote railway tracks. |
| NFR 2 | Security | Accidents and property damage can be prevented with the help of our smart sensors which immediately send the fault to the pilot and the administration. |
| NFR 3 | Reliability | Traffic lights and signaling can be made accurately with the help of sensors. Hence it is more reliable. |
| NFR 4 | Performance | Communication plays a vital role in transferring the crack-detected signal to the responsible authority so that they can take appropriate measures within a short span. |
| NFR 5 | Availability | Our idea is to make the crack alert to all the trains passing through that faultprone area. |
| NFR 6 | Scalability | Our project is based on IoT & cloud, which makes the pilot and authority updated every single second. Ad-hoc is easy to handle |

5 PROJECT DESIGN

5.1 DATA FLOW DIAGRAM



5.2 Solution Architecture



5.3 User Stories

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **User Type** | **Functional**  **Requirement**  **(Epic)** | **User Story**  **Number** | **User Story / Task** | **Acceptance criteria** | **Priority** | **Release** |
| Customer  (Mobile user) | Reserving ticket | USN-1 | As a user, I can register for the application by  entering my email, password, and confirmingmy  password. | I can access my account /  dashboard | High | Sprint-1 |
| Customer  (Mobile user) | Reserving ticket | USN-2 | As a user, I will receive confirmation email  once I have registered for the application | I can receive confirmation  email & click confirm | High | Sprint-1 |
| Customer  (Mobile user) | Reserving ticket | USN-3 | As a user, I can register for the application and  enter the details for reserving the ticket. | I can register & access the  dashboard with Facebook  Login | Low | Sprint-2 |
| Customer  (Mobile user) | Dashboard | Users | The details will be stored safely | I can access it using  database | Medium | Sprint-3 |
| Customer  (Mobile user) | Dashboard | Users | The details will be stored safely | I can access it using  database | Medium | Sprint-3 |
| Customer (Web  user)  Customer | Reserving ticket | User | Enter the details and click submit botton to book ticket | I can use the QR code  which is been generated | High | Sprint-1 |
| Care  Executive | Connecting the  service provider | Customer | Connects with the service by logging in | Can get connected with  the server | Medium | Sprint-3 |
| Administrator | Provides the  services | Admin | The data is given by the user | Can add or update the data  provided by the user | High | Sprint-1 |

6. PROJECT PLANNING & SCHEDULING

**6.1 Sprint Planning & Estimation**

# 

# **CODING & SOLUTIONING**

# **7.1 Feature 1**

• IoT device

• IBM Watson Platform

• Node red

• Cloudant DB

• Web UI

• MIT App Inventor

• Python code

**7.2 Feature 2**

• Login

• Verification

• Ticket Booking

• Adding rating

**9. ADVANTAGES**

• The passengers can use this application, while they are travelling alone to ensure their

safety.

• It is easy to use.

• It has minimized error rate.

**10. DISADVANTAGES**

Network issues may arise.

**11. CONCLUSION**

Almost all the countries across the globe strive to meet the demand for safe, fast, and reliable rail services. Lack of operational efficiency and reliability, safety, and security issues, besides aging railway systems and practices are haunting various countries to bring about a change in their existing rail infrastructure. The global rail industry struggles to meet the increasing demand for freight and passenger transportation due to lack of optimized use of rail network and inefficient use of rail assets. Often, they suffer from the lack in smart technologies and latest technological updates to provide the most efficient passenger services. This is expected to induce rail executives to build rail systems that are smarter and more efficient. The passenger reservation system of Indian Railways is one of the world's largest reservation models. Daily about one million passengers travel in reserved accommodation with Indian Railways. Another sixteen million travel with unreserved tickets in Indian Railways. In this vast system, it is a herculean task to efficiently handle the passenger data, which is a key point of consideration now-a-days. But the implementation of the latest technological updates in this system gradually turns inevitable due to increasing demand for providing the most efficient passenger services. Handling the passenger data efficiently backed by intelligent processing and timely retrieval would help backing up the security breaches. Here we've explored different issues of implementing smart computing in railway systems pertaining to reservation models besides pointing out some future scopes of advancement. Most significant improvements have been evidenced by more informative and userfriendly websites, mobile applications for real-time information about vehicles in motion, and eticket purchases and timetable information implemented at stations and stops. With the rise of Industry, railway companies can now ensure that they are prepared to avoid the surprise of equipment downtime. Like above mentioned, the developed application of our project can lead the passenger who travel can travel safely without any fear.

1. **FUTURE SCOPE**

This application is ensured for safety for the passengers while they are travelling alone as well

as they travel with their family or friends. In future, this application may also be used by passengers who travel through bus. By further enhancement of the application the passengers can explore more features regarding their safety.

CODE

GRP-LOCATION.PY

import time

import sys

Import ibmiotf.application

Import ibmiotf.device

Import random

import requests

import json

#Provide your IBM Watson Device Credentials

organization = "0z828r"

deviceType = "iotdevice" #Credentials of Watson IoT sensor simulator

deviceId = "1001"

authMethod = "token"

authToken = "prathyusha"

# Initialize the device client.

L=0

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:

overpass\_url = "http://overpass-api.de/api/interpreter"

overpass\_query = """

[out:json];area[name="India"];(node[place="village"](area););out;

"""

response = requests.get(

overpass\_url,

params={'data': overpass\_query}

)

coords = []

if response.status\_code == 200:

data = response.json()

Places = data.get('elements', [])

for place in places:

coords.append((place['lat'], place['lon'])) print ("Got %s village coordinates!" % len(coords))

print (coords[0])

else:

print("Error")

i = random.randint(1,100)

L = coords[i]

#Send random gprs data to node-red to IBM Watson

data = {"d":{ 'Latitude' : L[0], 'Longitude' : L[1]}}

#print data

def myOnPublishCallback():

print("Published gprs location = ", L, "to IBM Watson")

success = deviceCli.publishEvent("Data", "json", data, qos=0, on\_publish=myOnPublishCallback)

time.sleep(12)

if not success:

print("Not connected to IoTF")

time.sleep(1)

deviceCli.disconnect()

QR Scanner

importcv2

importnumpyasnp

importtime

importpyzbar.pyzbaraspuzbar

fromibmcloudant.cloudant\_v1importcloudantv1

fromibmcloudantimportcouchDbsessionAuthenticator

fromibm\_cloud\_sdk\_core.AuthenticatorsimportBasicAuhtenticator

authenticator=BasicAuthenticator('apikey-v2-

16u3crmdpkghhxefdikvpssoh5fwezrmuup5fv5g3ubz','b0ab119f45d3e6255eabb978)

service=cloudantv1(authenticator=authenticator)

service.set\_service\_url('https://apikey-v2-

16u3crmdpkghhxefdikvpssoh5fwezrmuup5fv5g3ubz:b0ab119f45d3e6255eabb978

cap=cv2.videoCapture(0)

font=cv2.FONT\_HERSHEY\_PLAIN

whileTrue:

\_,frame=cap.read(0)

decodeObjects=pyzbar.decode(frame)

forobjindecodeObjects:

#print("Data",obj.data)

a=obj.data.decode('UTF-8')

cv2.putText(frame,"Ticket",(50,50),font,2,(255,0,0),3)#print(a)

try:

responce=service.get\_document(db='booking',doc\_id=a).get\_result()

print(response)

time.sleep(5)

exceptExceptionase:

print("NotvalidTicket")

time.sleep(5)

cap.imshow("Frame",frame)

ifcv2.waitKey{1}&0XFF==ord('q'):

break

cap.release()

cv2.destroyAllWindows()

client.disconnect ()

**RESULTS**

Encouraged by the results of deployment of OMRS, including some critical

detection which could have potentially been cause of an accident, not otherwise

detectable by normal maintenance procedure, Indian Railways is now going

ahead with greater adoption of track side based maintenance systems with an

aim towards predictive maintenance.

Further, moving towards predictive maintenance practices in yards, Indian

Railways is envisaging to convert its ‘freight examination yards’ into technology

driven ‘Smart Yards’ for automatic detection of faults/defects/deficiencies in

freight wagons.

These Smart Yards will predict anomalies like Hot Wheel Hot Axle, defective

bearings, defective wheels, hanging/loose/missing parts etc.

long before any failure actually happens. Smart Yards will be equipped with

various automated technology driven systems including OMRS, Hot Box Detector,

Wheel Profile Recorder and Machine Vision Equipment's etc.