PROJECT REPORT

Intelligent Post-Lock Down Management System for Public Transportation

INTRODUCTION

1.1 OVERVIEW

The Post-Lockdown, it will be difficult and risky to allow public transportation without any safety measures. There must be a proper mechanism to maintain social distancing and manage the frequency of public transport services.

Thus, there is a need for an application that will schedule the timing of transportation, avoid over-occupancy, and maintain social distancing.

There is a certain insecurity among people to use public transport nowadays. This app will assist users, assure and make them aware too.

The following points will be considered during app development:

- Contact-less ticketing options like passes or digital payments
- Avoid over-occupancy of transport services
- Maintain social distancing by allocating distant seats to users
- Safety check whenever the user books a ride
- Proper guidelines about sanitation, mask while boarding
- Verification of booking at the time of boarding

Software Requirements: : IBM Cloud, Node Red, Watson Assistant, Cloudant Service

1.2 PURPOSE

India has orchestrated a move towards public transport, very systematically and deliberately. Today, it is time to re-assess and create a network meeting the challenges posed by the pandemic. We have designed a robust and quickly adaptable route in moving people efficiently, that will pace up the road for economic recovery.

At this juncture, it was important for us to recognize that urban mobility systems will be fundamental to ensure a quick recovery of our economy. They will enable people to access their jobs, children to access their schools and goods to access their markets. The economy cannot revive unless mobility systems function smoothly.

Enhancing the supply of bus, metro and train services, which offer a higher quality of service – such as assured seating, easy booking and no crowding. App-based transport services that have emerged will be one of such premium services.

LITERATURE SURVEY

2.1 EXISTING PROBLEM

Post-Lockdown, it will be risky to allow public transportation without proper mechanism to maintain the social distancing, especially the frequency of buses, trains and metros shall be managed properly to utilize the capacity with social distancing criteria. The transport authorities must integrate to maintain the system properly.
For these purpose an intelligent app should be developed to schedule the timings of transportation, avoiding the over occupancy of public transport / bus stations / railway stations etc.

2.2 PROPOSED SOLUTION

Steps:

a. Create IBM Cloud services
b. Create Cloudant Database
c. Create User Registration/Login page
d. Retrieval of Available Routes-Timings List
e. Create Covid19 Symptom Checker
f. Confirm Booking

a. Create IBM Cloud services

Create the following services:

i) IBM Cloud
ii) Node Red
iii) Cloudant DB service
iv) Watson Assistant

b. Create Cloudant Database

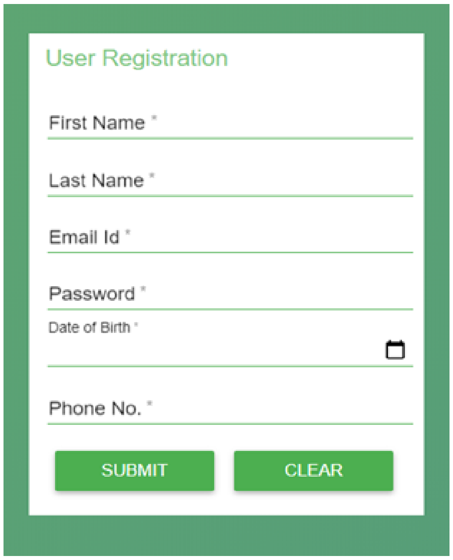
The Cloudant DB will store, manage, and update the data accordingly. Cloudant database consists of Transport Database and related tables such as User Credentials, Booking Information, etc. The Transport Database is collected from pcmcindia.gov.in and punecitybus.in which is stored in the cloudant in the form of columns such as Source, Stops, Destination, Route Number and Time. The available Routes-Timings list will be retrieved from cloudant and will be displayed in the user's app while the ticket reservation.

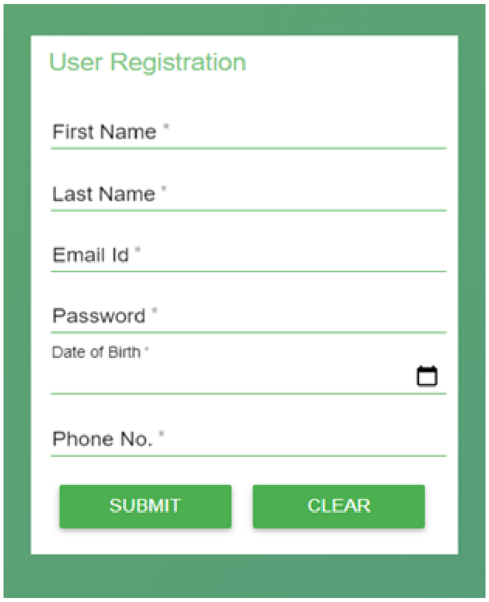
The Cloudant DB will store the following tables such as:

- User Credentials Table
- Booking Information Table
- Bus Route-Timings Table

c. Create User Registration/Login page

The homepage of the application will include user login. If the user has not registered already, he can be redirected to the registration page. There the user has to provide some information and create an account. Then he/she is redirected to the login page. The credentials and the password will be stored in the cloudant after user registration. These credentials will be checked every time a user logs in.



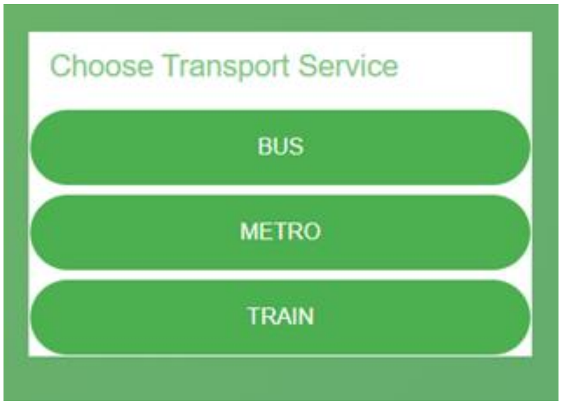


d. Retrieval of Available Routes-Timings List

The user will select the mode of transport from the following options: Bus, Metro or Train. Then he will be able to select the source and destination for his travel and the number of tickets he wants to book. According to the information provided by the user the app will retrieve all the available routes. The user can then select the route according to their preference.

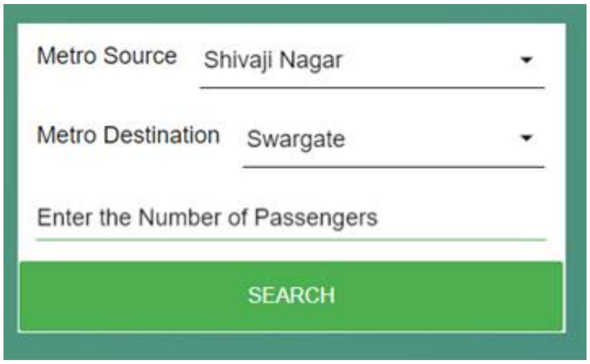
Selecting Mode of Transport

The user will be provided with 3 buttons which are Bus, Metro and Train. He can select the option he wants and will be redirected to the next page.



Provide Source and Destination

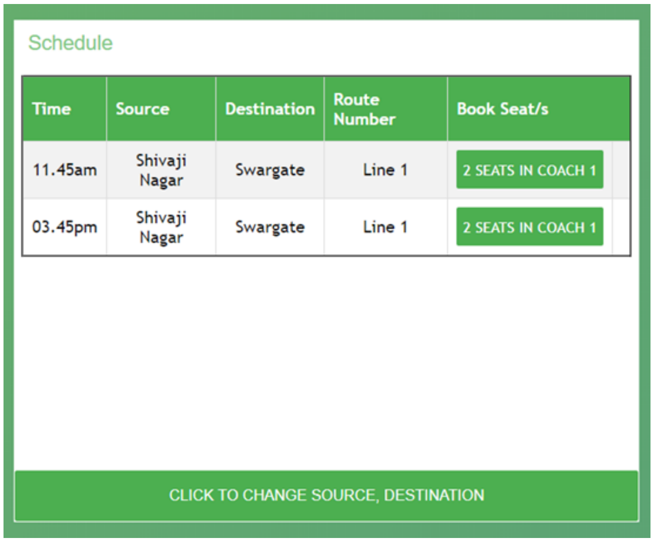
On this page the user provide the information of his travel. He has to give the source and destination of his travel. He will also provide the number of people he wants to book tickets for.


Metro Source Shivaji Nagar

Metro Destination Swargate

Show available routes

Using cloudant node the database is searched for all the routes that are available between the source and destination. These data is showed in a form of table to the user. Then the user selects the route for which he wants to book the tickets for.



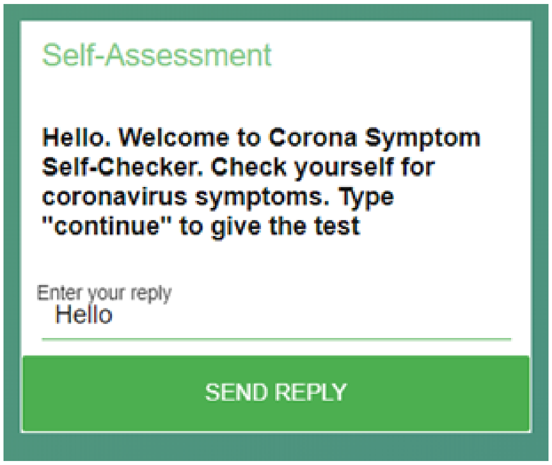
Schedule

Time	Source	Destination	Route Number	Book Seat/s
11.45am	Shivaji Nagar	Swargate	Line 1	2 SEATS IN COACH 1
03.45pm	Shivaji Nagar	Swargate	Line 1	2 SEATS IN COACH 1

CLICK TO CHANGE SOURCE, DESTINATION

e. Create Covid19 Symptom Checker

A chat-bot using Watson Assistant will be developed which will help the users to self-assess themselves for any coronavirus symptoms. The chat-bot will ask several questions from a questionnaire and tell at what scale of risk the user is. The questions will be predefined and the user will have to choose an option that best describes the user's current health state.



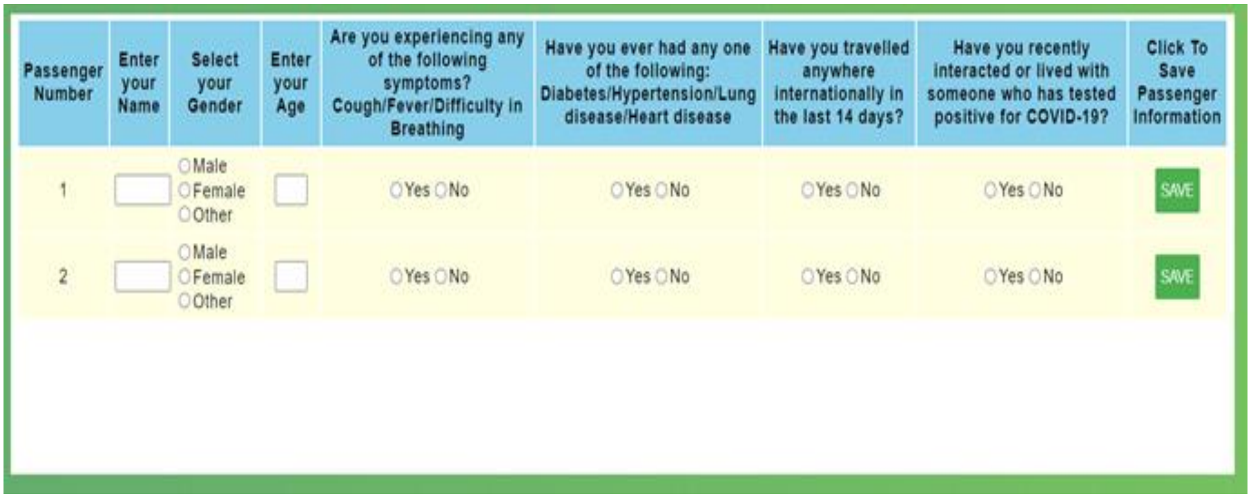
Self-Assessment

Hello. Welcome to Corona Symptom Self-Checker. Check yourself for coronavirus symptoms. Type "continue" to give the test

Enter your reply
Hello

SEND REPLY

If the user is booking tickets for more than 1 passenger, he will fill a form for all the passengers instead of using the chat-bot.



Passenger Number	Enter your Name	Select your Gender	Enter your Age	Are you experiencing any of the following symptoms? Cough/Fever/Difficulty in Breathing	Have you ever had any one of the following: Diabetes/Hypertension/Lung disease/Heart disease	Have you travelled anywhere internationally in the last 14 days?	Have you recently interacted or lived with someone who has tested positive for COVID-19?	Click To Save Passenger Information
1	□	○Male ○Female ○Other	□	○Yes ○No	○Yes ○No	○Yes ○No	○Yes ○No	SAVE
2	□	○Male ○Female ○Other	□	○Yes ○No	○Yes ○No	○Yes ○No	○Yes ○No	SAVE

f. Confirm Booking

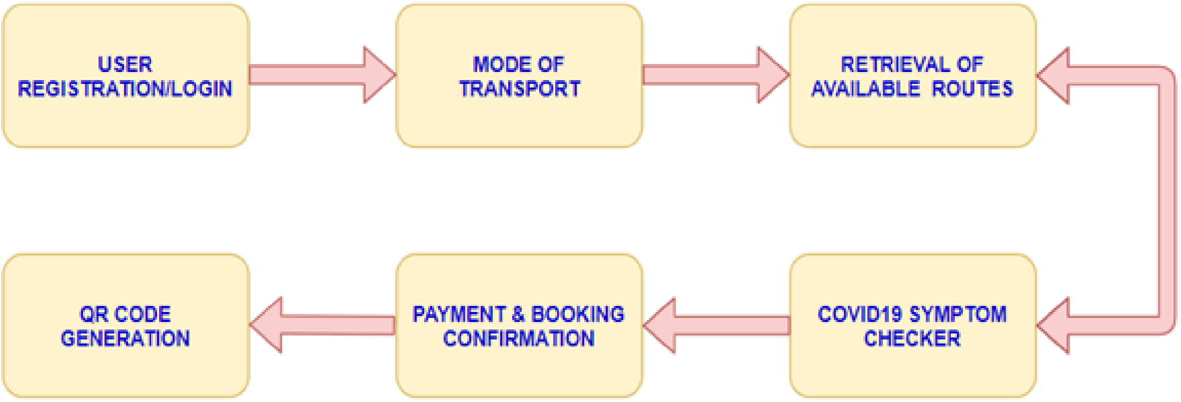
The user is redirected to payment where he is shown the total amount of the travel he has to pay. The amount to be paid is calculated as:

- Bus -> Rs 5 per stop
- Metro -> Rs 10 per stop
- Train -> Rs 10 per stop

After the user has successfully completed the payment he confirms the booking and then is provided with a unique QR code. This code will be scanned at the time of travel.

THEORETICAL ANALYSIS

3.1 BLOCK DIAGRAM



3.2 HARDWARE/SOFTWARE REQUIREMENTS

Project Requirements: IBM Cloud, IBM Watson Assistant, IBM Node-RED

Functional Requirements: IBM Cloud

Software Requirements: Watson Assistant, Node-RED

Hardware Requirements: QR Code Scanner

EXPERIMENTAL INVESTIGATIONS

After numerous discussions and research, we came to a solution that the major requirement of public is easy commuting and proper timing. So, it was necessary to build such schedules which will be suitable for passengers with the concept of social distancing in mind.

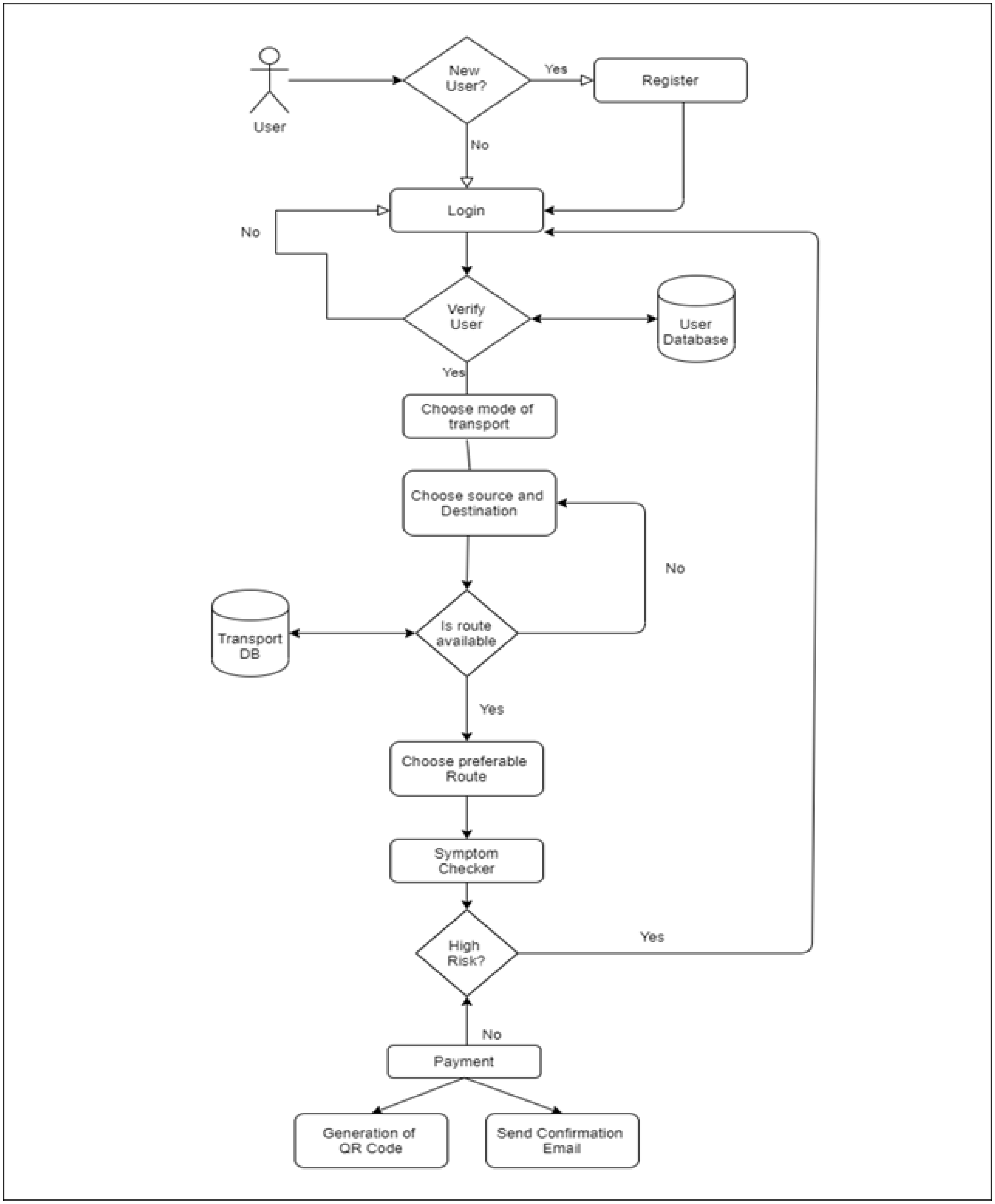
Also, the frequency of buses was required to be increased in order to avoid the over-occupancy in any transport service.

For security purpose, we implemented the idea of QR code generation after successful booking, it will be scanned by while boarding. This was implemented with a thought to keep minimal contact or contact-less commute.

Also, we implemented an email verification strategy so that the app will be quite secure from intrusion.

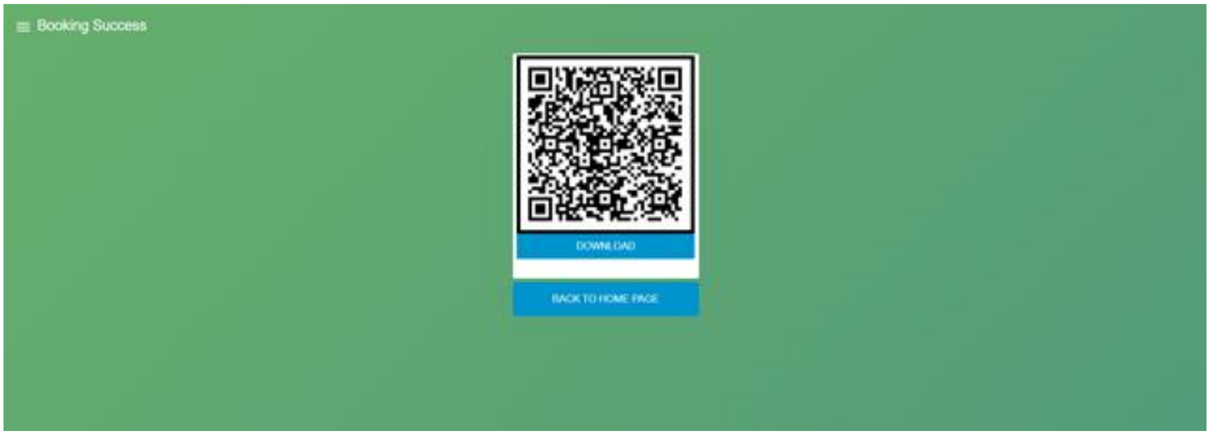
We adopted the idea from Aarogya Setu app in order to check the risk of a particular passenger. A set of questions will be asked and the risk will be analyzed.

FLOWCHART

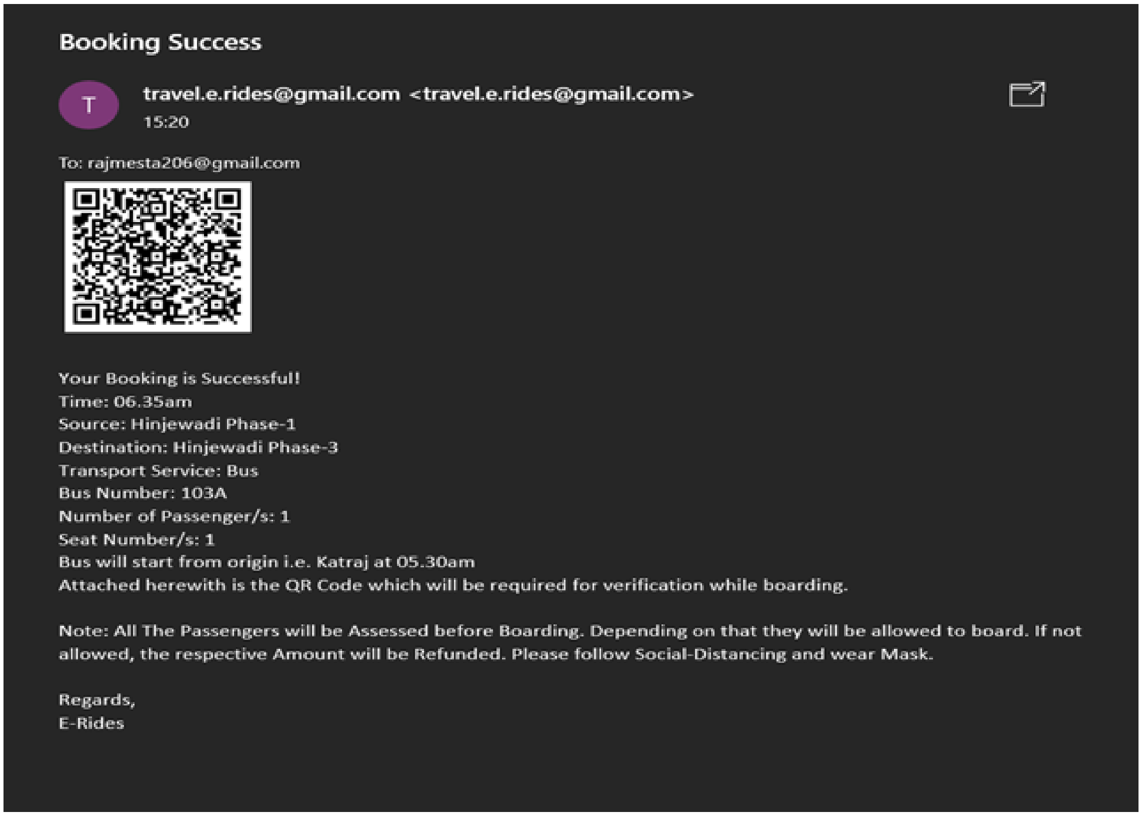

User
New User?
Yes
Register
No
Login
No
Verify User
User Database
Yes
Choose mode of transport
Choose source and Destination
No
Transport DB
Is route available
Yes
Choose preferable Route
Symptom Checker
High Risk?
Yes
No
Payment
Generation of QR Code
Send Confirmation Email

RESULT

When the booking is confirmed, the user has the option to download a unique QR code. This code needs to be scanned at the time of boarding.



The user also receives an email. This email will contain all the information of the travel and also a copy of QR code.



Booking Success

travel.e.rides@gmail.com <travel.e.rides@gmail.com>
15:20

To: rajmesta206@gmail.com

Your Booking is Successful!
Time: 06.35am
Source: Hinjewadi Phase-1
Destination: Hinjewadi Phase-3
Transport Service: Bus
Bus Number: 103A
Number of Passenger/s: 1
Seat Number/s: 1
Bus will start from origin i.e. Katraj at 05.30am
Attached herewith is the QR Code which will be required for verification while boarding.

Note: All The Passengers will be Assessed before Boarding. Depending on that they will be allowed to board. If not allowed, the respective Amount will be Refunded. Please follow Social-Distancing and wear Mask.

Regards,
E-Rides

ADVANTAGES & DIS-ADVANTAGES

ADVANTAGES

- The app is integrated with three modes of transport allowing users to choose from bus, metro and train. The user can travel or choose the number of passengers to travel with.

- The app comes with a inbuilt corona symptom checker which is used to assess if the patient is at high risk or not. If the patient is at high risk the user will not be able to board the bus.

- While using this app the driver will be free from any contact with the passenger. He will be completely isolated and safe.

- The money can be paid online so the passengers can leave without handing the cash directly to the conductor, passengers will have a unique QR, aiding the efforts to track them down.

- The QR code and temperature will be checked before entering the bus to ensure that the user is not boarding the wrong bus and has no signs of high temperature.

DIS-ADVANTAGES

- The major setback which is considered is the advanced technology used while developing this project. The hardware requirements like camera with QR code scanner, temperature sensor and piezoelectric sensor to guide the user to sit while maintaining social distancing.
- Here all the buses considered are smart with automatic opening and closing doors, installed with cameras and can be operated without conductor.
- Here the driver needs to be educated (trained) in order to understand the response that system shows, i.e. the basic information like the temperature of the passenger IS in normal range, is the passenger boarded the correct bus.
- The people using smartphones will only be able to take benefit of this service as the app requires the user to be using smartphone and can pay online thought the services provided.
- People who are not well acquainted with the technology or just started using smartphones might find it a bit difficult to book. The working people such as labors, maids will not be able to use such services which can prove to be inefficient at some point.

APPLICATIONS

App can be used to book bus, train as well as metro tickets. So, there is no explicit need to visit other websites for booking different modes of transport. The app comes with an easy drop-down source and destination list with an additional option of choosing the number of passengers, which makes it easy to use.

The App comes with an inbuilt symptom checker which can be integrated with other apps to ensure the safety of all passengers. This will help other services to book rides without the risk of drivers getting affected by referring to Ola, Uber where social distancing is a challenge. This will be convenient for the passengers and the drivers as well.

CONCLUSION

The web-app has been built that will cater the needs of customers using public transport and avoid over-occupancy, follow social distancing criteria which will be beneficial in the current pandemic situation. The web-app is available at the following link:

https://node-red-arceus.eu-gb.mybluemix.net/ui/

There still can be more improvements in the model like creating a Mobile App instead of a web-app, and some other features.

FUTURE SCOPE

The future Scope of this app can be by adding the following to make it more advanced:

1) Check the user temperature with infrared sensors:

In the current version of the app a symptom checker is used to identify the scale of risk at which the user is for Covid19. If the user is found out to be at a high risk, he/she will not be able to proceed for ticket booking. This symptom checker is developed using Watson assistant service. However, the con of this is that the user can give wrong answers to bypass the checker and continue with the booking. To avoid such a situation, infrared sensors can be used. These sensors will determine the user temperature and accordingly inform if the user is at a high risk for Corona or not.

2) Expanding the database:

The current cloudant database contains of 30 unique bus routes with their timings. The user can book tickets only for these routes. The database can be expanded and more bus routes will be available for the user to book. Besides this the frequency of buses can also be increased. This will lead to more number of users.

3) Use of piezo-electric sensors:

The main objective of this project is to maintain social distancing and minimize the risk of the communal spread of the corona virus. Hence those seats are allocated to the users which are at a safe distance from each other. However, the risk here is that the user ignores the allocated seat in his ticket and sits on another one. To avoid this piezo-electric sensor can be placed on the unallocated seats. If any passenger sits on these seats, the sensor can trigger an alarm. This will help in maintaining social distancing between the passengers.

BIBLIOGRAPHY

- https://developer.ibm.com/components/node-red/tutorials/how-to-create-a-node-red-starter-application/

- https://cloud.ibm.com/docs/assistant?topic=assistant-getting-started

- https://cloud.ibm.com/docs/Cloudant?topic=Cloudant-creating-an-ibm-cloudant-instance-on-ibm-cloud

- https://punecitybus.in/

APPENDIX

A. SOURCE CODE

QR Code Generation:

```
[{"id":"bdca6327.f8a628","type":"ui_button","z":"cb286b43.5d79f8","name":"","group":"914
ae5af.e7c838","order":1,"width":0,"height":0,"passthru":false,"label":"Generate QR
Code","tooltip":"","color":"","bgcolor":"","icon":"","payload":"","payloadType":"str","topic":"","x"
:190,"y":220,"wires":[["79d9ee36.c456e","b369ec48.3cecb8","f8bbbf59.dd27f"]]},{"id":"f8b
bbf59.dd27f","type":"function","z":"cb286b43.5d79f8","name":"qr code
message","func":"msg.payload=\"Generating QR Code! Please Wait....\";\nreturn
msg;","outputs":1,"noerr":0,"x":250,"y":320,"wires":[["20e1661b.b01562"]]},{"id":"20e1661b.
b01562","type":"ui_toast","z":"cb286b43.5d79f8","position":"dialog","displayTime":"3","hig
hlight":"","sendall":true,"outputs":1,"ok":"OK","cancel":"","raw":false,"topic":"","name":"","x":4
10,"y":380,"wires":[[]]},{"id":"b369ec48.3cecb8","type":"function","z":"cb286b43.5d79f8","n
ame":"group switch","func":"msg.payload={tab:'Booking
Success',group:{show:[\"Booking_Success_QRCode\"],hide:[\"Booking_Success_QR_Cod
e_Generation\"]}};\nreturn
msg;","outputs":1,"noerr":0,"x":450,"y":300,"wires":[["fbe9a8bb.24f7e"]]},{"id":"79d9ee36.c4
56e","type":"function","z":"cb286b43.5d79f8","name":"QR generate","func":"var email =
global.get(\"email\");\nvar date=new
Date().toLocaleString();\nglobal.set(\"timestamp\",date);\nmsg.payload =
'https://chart.apis.google.com/chart?cht=qr&chs=150x150&chl='+'Email: '+email +'
Timestamp: '+date+'&chld=H|0';\nreturn
msg;","outputs":1,"noerr":0,"x":450,"y":220,"wires":[["465b2161.3f934","858e5235.12fe9","
8894e576.e75338"]]},{"id":"858e5235.12fe9","type":"ui_template","z":"cb286b43.5d79f8","
group":"d13218f8.53b6b8","name":"","order":2,"width":"5","height":"6","format":"\n<img
id=\"qr\" crossorigin=\"anonymous\" width=\"150\" height=\"150\" src=  {{msg.payload}}
alt='QR Code' style=\"border:5px solid black\">\n<md-button style=\"background-color:
#0094CE\" onclick=\"ss()\">\nDownload\n</md-button>\n\n<canvas id=\"myCanvas\"
style=\"display:none;\"></canvas>\n\n<script>\nconst canvas =
document.getElementById(\"myCanvas\");\nconst img =
document.getElementById(\"qr\");\nfunction ss() {\n
canvas.getContext('2d').drawImage(img, 0, 0)\n  var download =
document.getElementById(\"download\");\n  var image =
canvas.toDataURL(\"image/png\").replace(\"image/png\", \"image/octet-stream\");\n
```

var link = document.createElement('a');\n link.download = \"qrcode.png\";\n link.href = image;\n link.click();\n}\n</script>","storeOutMessages":true,"fwdInMessages":true,"resendOnRefresh":true,"templateScope":"local","x":640,"y":220,"wires":[["2ebb1987.c6a0de","e954d71.de88228","1c126e96.aa38f9"]]},{"id":"fbe9a8bb.24f7e","type":"ui_ui_control","z":"cb286b43.5d79f8","name":"Show Group","events":"all","x":650,"y":380,"wires":[[]]},{"id":"465b2161.3f934","type":"http request","z":"cb286b43.5d79f8","name":"","method":"GET","ret":"bin","paytoqs":false,"url":"{{{payload}}}","tls":"","persist":false,"proxy":"","authType":"","x":630,"y":140,"wires":[["e9ea21bb.86f9"]]},{"id":"e9ea21bb.86f9","type":"image","z":"cb286b43.5d79f8","name":"","width":"140","data":"payload","dataType":"msg","thumbnail":true,"active":true,"pass":false,"outputs":0,"x":840,"y":140,"wires":[]},{"id":"914ae5af.e7c838","type":"ui_group","z":"","name":"QR Code Generation","tab":"bcdfa164.8602e","order":1,"disp":false,"width":"6","collapse":false},{"id":"d13218f8.53b6b8","type":"ui_group","z":"","name":"QRCode","tab":"bcdfa164.8602e","order":2,"disp":false,"width":"5","collapse":false},{"id":"bcdfa164.8602e","type":"ui_tab","z":"","name":"Booking Success","icon":"dashboard","order":12,"disabled":false,"hidden":true}]

The whole source code can be found at: https://github.com/SmartPracticeschool/SBSPS-Challenge-3220-Intelligent-Post-Lock-Down-Management-System-for-Public-Transportation