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:

1. Contact-less ticketing options like passes or digital payments
2. Avoid over-occupancy of transport services
3. Maintain social distancing by allocating distant seats to users
4. Safety check whenever the user books a ride
5. Proper guidelines about sanitation, mask while boarding
6. 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

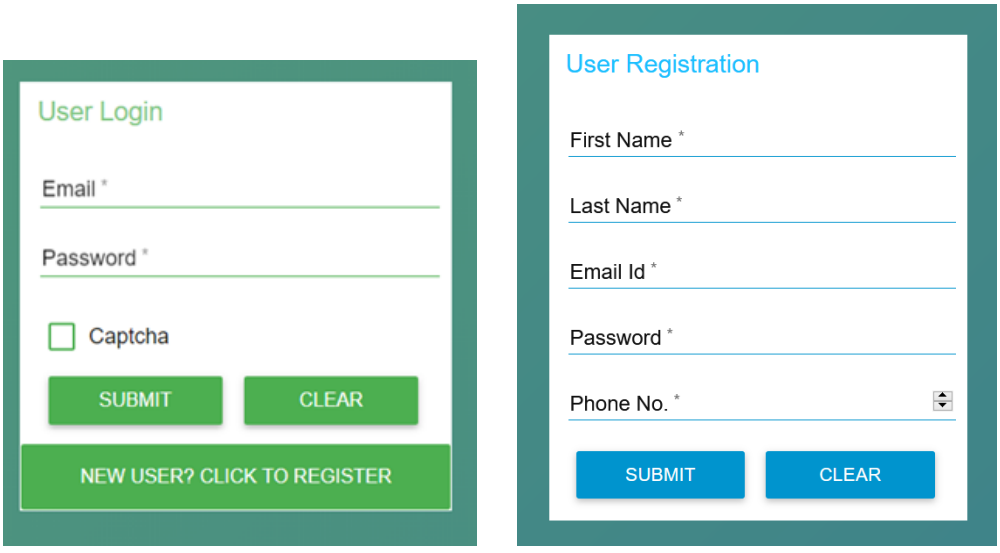
The Cloudant DB will store, manage, and update the data accordingly. Cloudant database consists of Transport Database and related tables such as User Credentials, Booking Information, etc. The Transport Database is collected from pcmcindia.gov.in and punecitybus.in which is stored in the cloudant in 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:

1. User Credentials Table
2. Booking Information Table
3. 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.

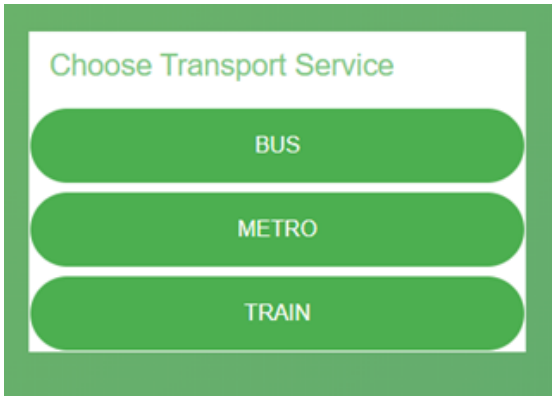


d. Retrieval of Available Routes-Timings List

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.

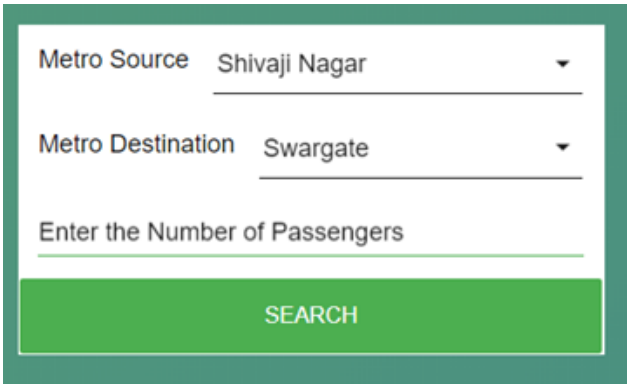
Selecting Mode of Transport

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.



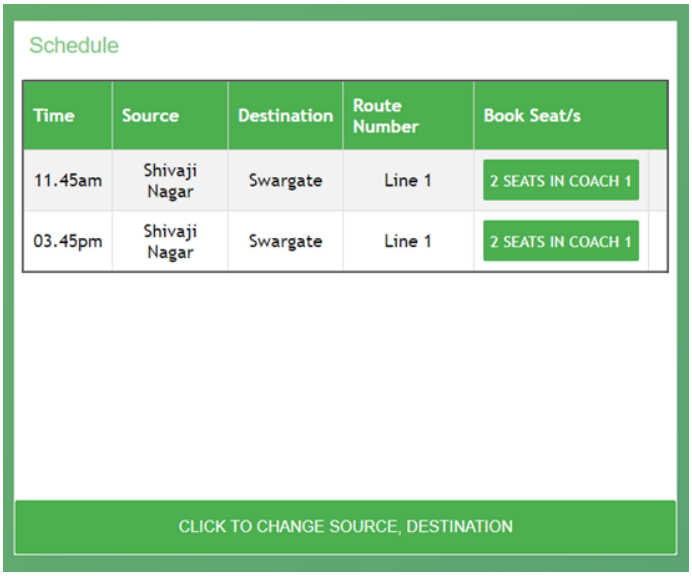
Provide Source and Destination

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.



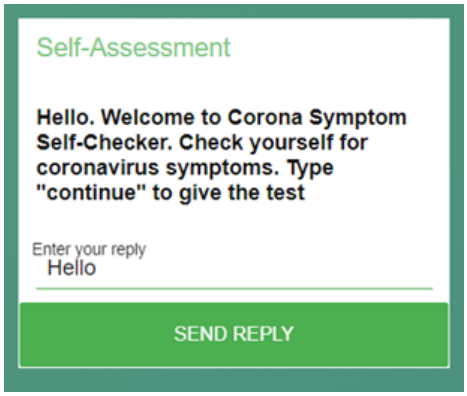
Show available routes

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.

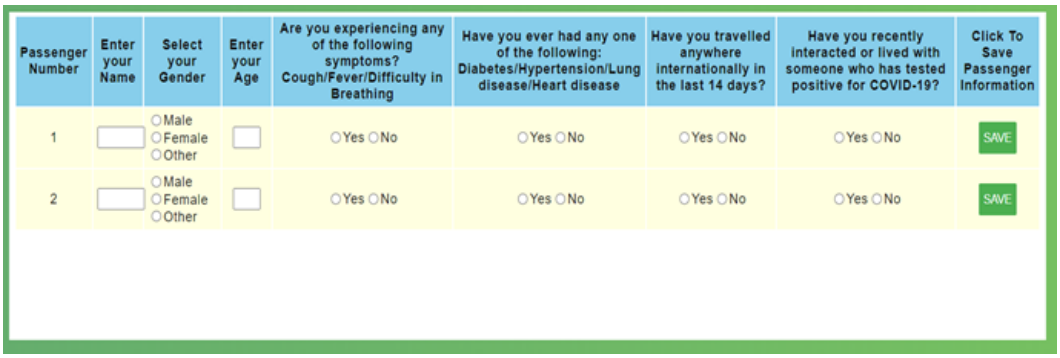


e. Create Covid19 Symptom Checker

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.



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

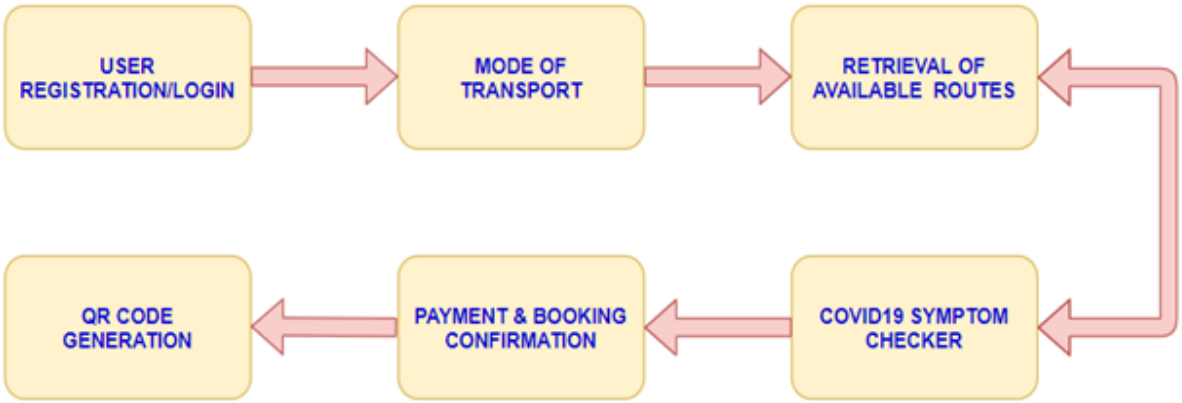
The user is redirected to payment where he is shown the total amount of the travel he has to pay. The amount to be paid is calculated as:

1. Bus -> Rs 5 per stop
2. Metro -> Rs 10 per stop
3. 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.

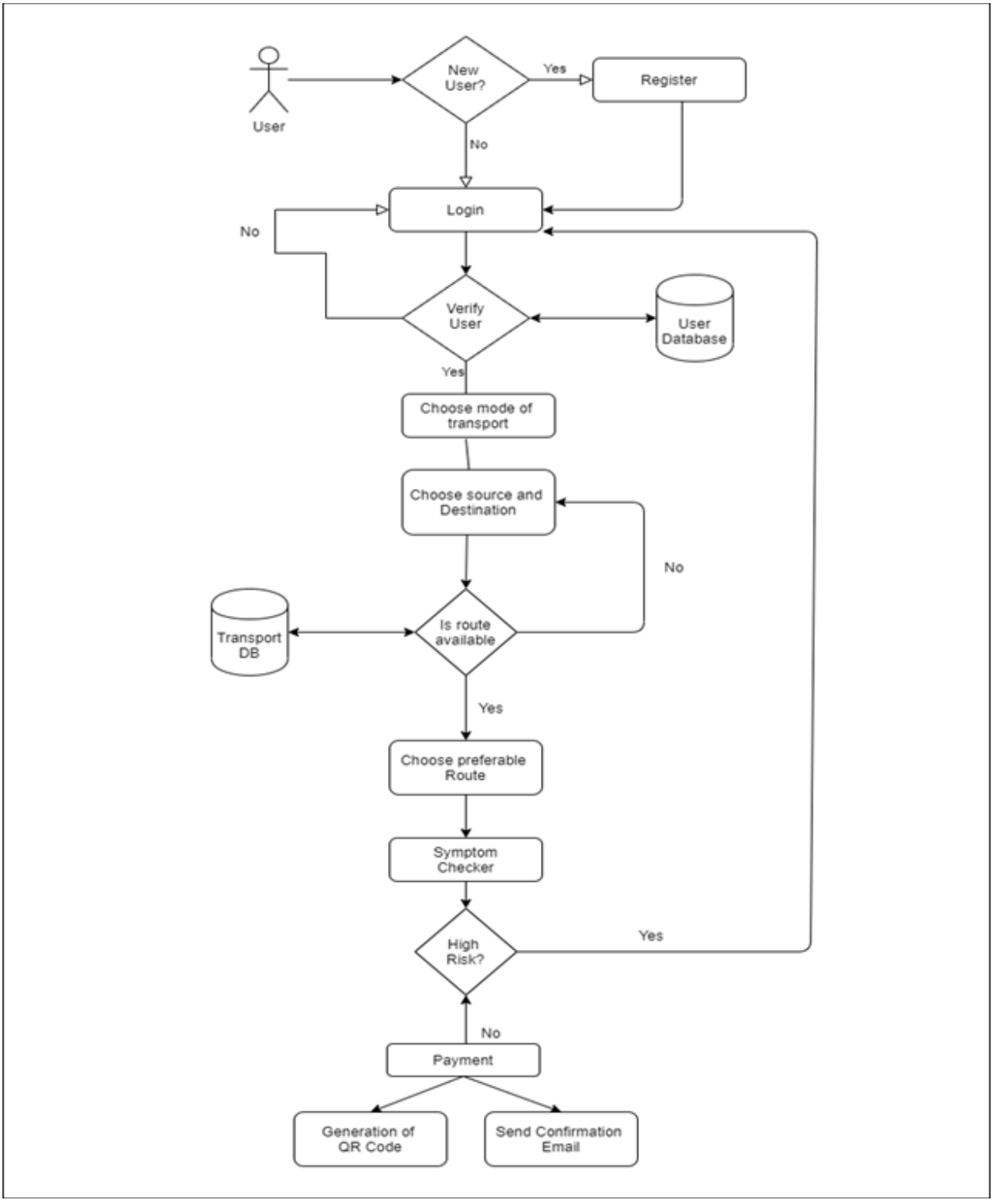
Also, the frequency of buses was required to be increased in order to avoid the over-occupancy in any transport service.

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.

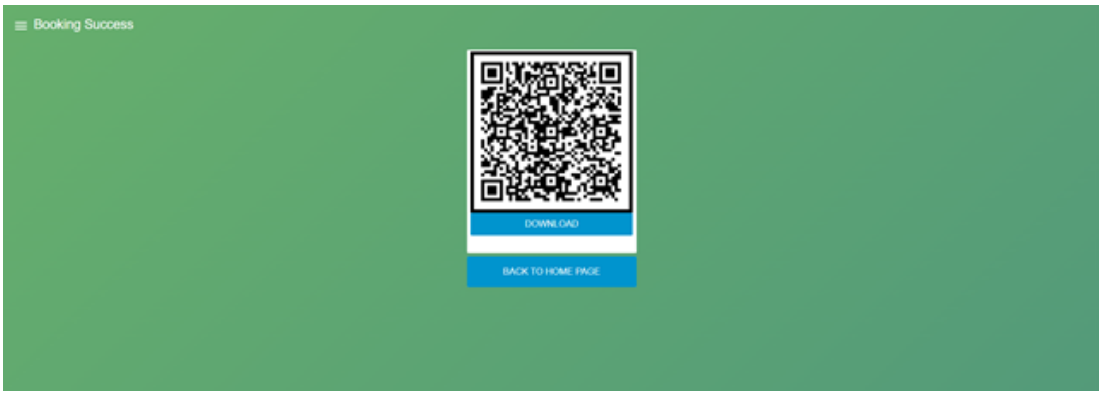
We adopted the idea from Aarogya Setu app in order to check the risk of a particular passenger. A set of questions will be asked and the risk will be analyzed.

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.

ADVANTAGES & DIS-ADVANTAGES

ADVANTAGES

1. 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.

1. 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.

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

1. 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.

1. 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

1. 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.
1. Here all the buses considered are smart with automatic opening and closing doors, installed with cameras and can be operated without conductor.
1. 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.
1. 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.
1. 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 poin

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

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

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

1. https://punecitybus.in/

APPENDIX

A. SOURCE CODE

QR Code Generation:

[{"id":"bdca6327.f8a628","type":"ui_button","z":"cb286b43.5d79f8","name":"","group":"914a
e5af.e7c838","order":1,"width":0,"height":0,"passthru":false,"label":"Generate QR
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Date().toLocaleString();\nglobal.set(\"timestamp\",date);\nmsg.payload =
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document.getElementById(\"myCanvas\");\nconst img =
document.getElementById(\"qr\");\nfunction ss() {\n
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document.getElementById(\"download\");\n var image =
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var link = document.createElement('a');\n link.download = \"qrcode.png\";\n link.href = image;\n
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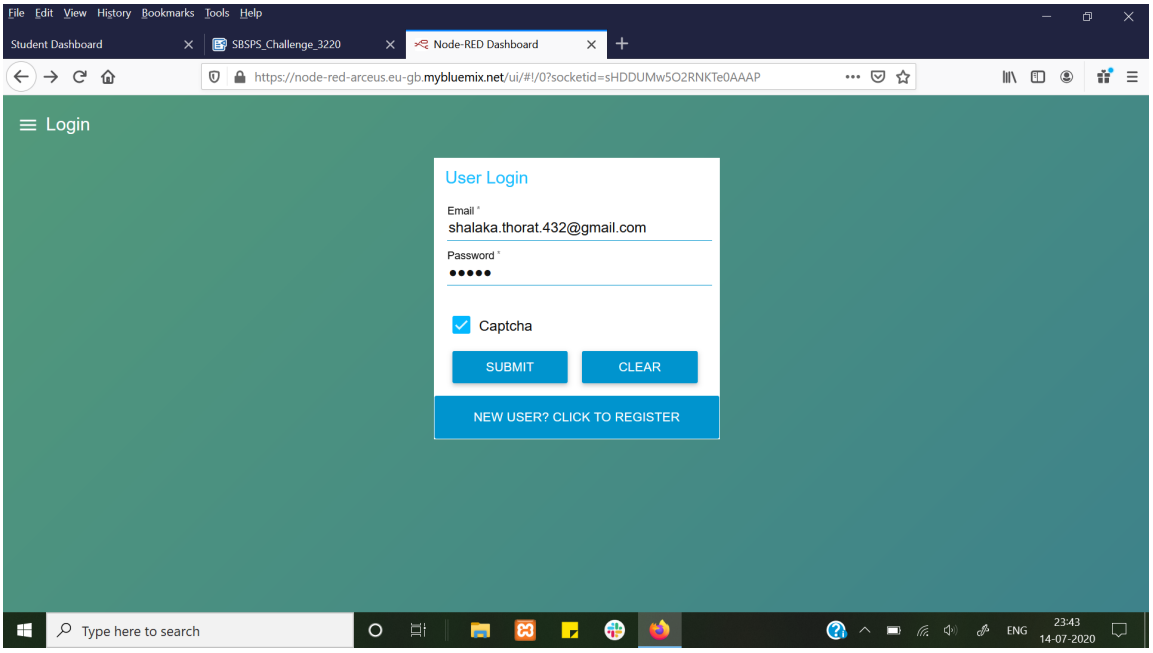
The whole source code can be found at:
https://github.com/SmartPracticeschool/SBSPS-Challenge-3220-Intelligent-Post-Lock-Down-Management-System-for-Public-Transportation

DATE	TASK NAME	MEMBER NAME	STATUS
20 June 2020	1) Setup Development Environment 2) Project Scope and Schedule 3) Watson Assistant Service 4) Creation of IBM Cloud Account	1) Shalaka Thorat 2) Shalaka Thorat 3) Raj Mesta 4) Shubham Shinde	1) Complete 2) In Progress 3) In Progress 4) In Progress
21 June 2020	1) Project Scope and Schedule 2) Watson Studio Service 3) Watson Assistant Service 4) Node-RED Service 5) User Registration and Login	1) Shalaka Thorat 2) Shalaka Thorat 3) Raj Mesta 4) Shubham Shinde 5) Shubham Shinde	1) Complete 2) In Progress 3) Complete 4) In Progress 5) In Progress
22 June 2020	1) Watson Studio Service 2) Bus Scheduling and Seat Allocation Algorithm 3) Watson Assistant Service 4) Cloudant Database Service 5) Collection of Transport Data 6) Creation of Related Tables	1) Shalaka Thorat 2) Shalaka Thorat 3) Raj Mesta 4) Prasad Mistary 5) Prasad Mistary 6) Prasad Mistary	1) Complete 2) In Progress 3) Complete 4) In Progress 5) In Progress 6) In Progress
23 June 2020	1) Symptom Checking and Payment 2) QR Code Generation and Booking Confirmation	1) Shalaka Thorat, Raj Mesta 2) Raj Mesta	1) In Progress 2) In Progress
24 June 2020	1) Cloudant Database Service 2) Collection of Transport Data 3) Creation of Related Tables	1) Prasad Mistary 2) Prasad Mistary 3) Prasad Mistary	1) Complete 2) Complete 3) Complete
25 June 2020	1) Retrieval of Available Routes-Timings List 2) Creation of IBM Cloud Account 3) Node-RED Service 4) User Registration and Login	1) Prasad Mistary 2) Shubham Shinde 3) Shubham Shinde 4) Shubham Shinde	1) In Progress 2) Complete 3) Complete 4) Complete
26 June 2020	In Progress Tasks	All Members	In Progress
27 June 2020	In Progress Tasks	All Members	In Progress
28 June 2020	In Progress Tasks	All Members	In Progress
29 June 2020	In Progress Tasks	All Members	In Progress
30 June 2020	In Progress Tasks	All Members	In Progress

01 July 2020	Symptom Checking and Payment	Shalaka Thorat, Raj Mesta	Complete
02 July 2020	QR Code Verification and Status	Shalaka Thorat, Raj Mesta	In Progress
03 July 2020	In Progress Tasks	All Members	In Progress
04 July 2020	1) Retieval of Available Routes-Timings List 2) Seat Allotment Notification	1) Prasad Mistary 2) Shubham Shinde	1) Complete 2) In Progress
05 July 2020	QR Code Generation and Booking Confirmation	Raj Mesta	Complete
06 July 2020	In Progress Tasks	All Members	In Progress
07 July 2020	In Progress Tasks	All Members	In Progress
08 July 2020	In Progress Tasks	All Members	In Progress
09 July 2020	Bus Scheduling and Seat Allocation Algorithm	Shalaka Thorat	Complete
10 July 2020	In Progress Tasks	All Members	In Progress
11 July 2020	QR Code Verification and Status	Shalaka Thorat, Raj Mesta	Complete
12 July 2020	Seat Allotment Notification	Shubham Shinde	Complete
13 July 2020	1) Project Report 2) Video Demonstration	All Members	In Progress
14 July 2020	Video Demonstration	All Members	Complete
15 July 2020	1) Project Report 2) Upload Codes	All Members	Complete

Login:



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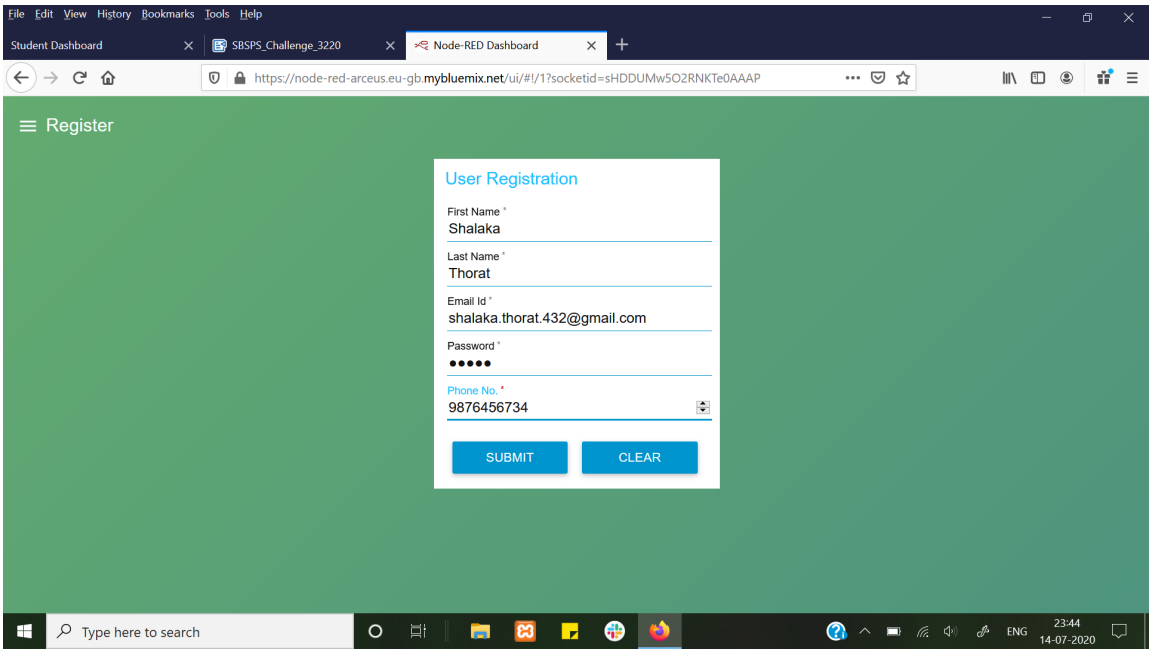

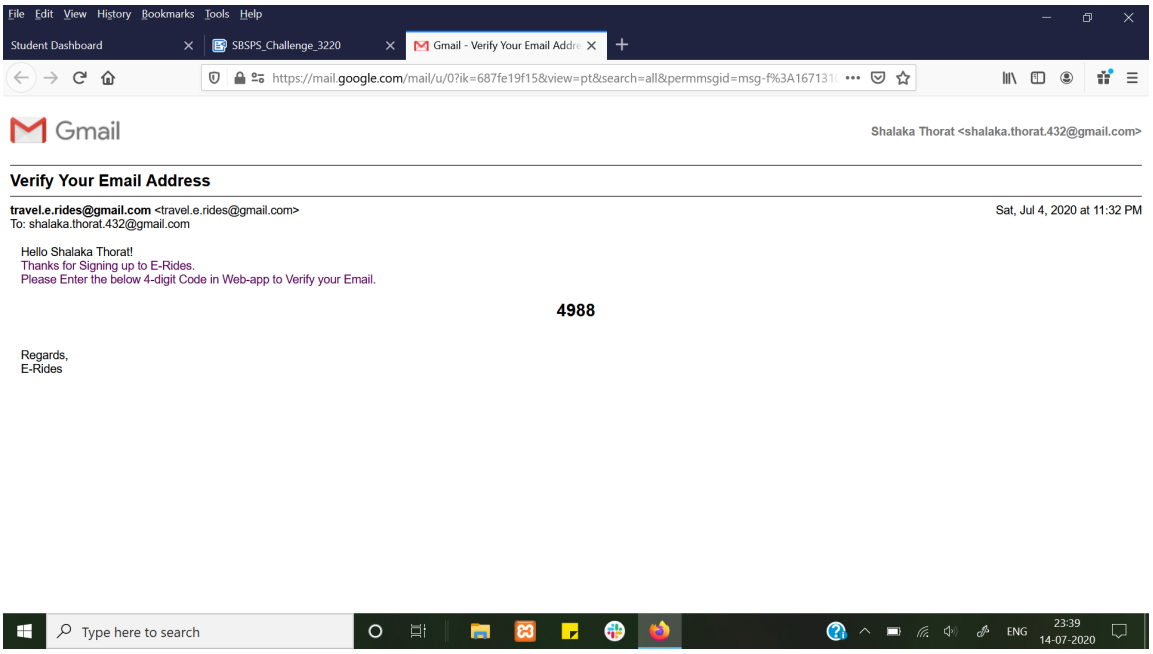
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Student Dashboard
SBSPS_Challenge_3220
Gmail - Verify Your Email Addr
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Gmail
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Verify Your Email Address
travel.e.rides@gmail.com <travel.e.rides@gmail.com>
To: shalaka.thorat.432@gmail.com
Sat, Jul 4, 2020 at 11:32 PM
Hello Shalaka Thorat!
Thanks for Signing up to E-Rides.
Please Enter the below 4-digit Code in Web-app to Verify your Email.
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Regards,
E-Rides
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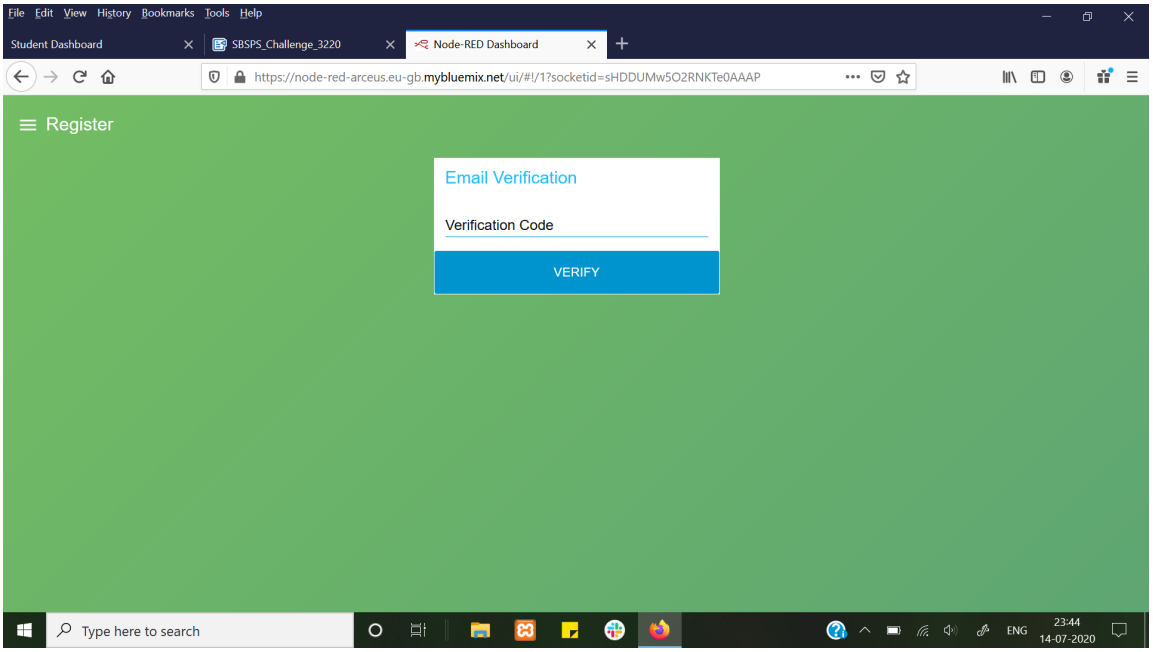
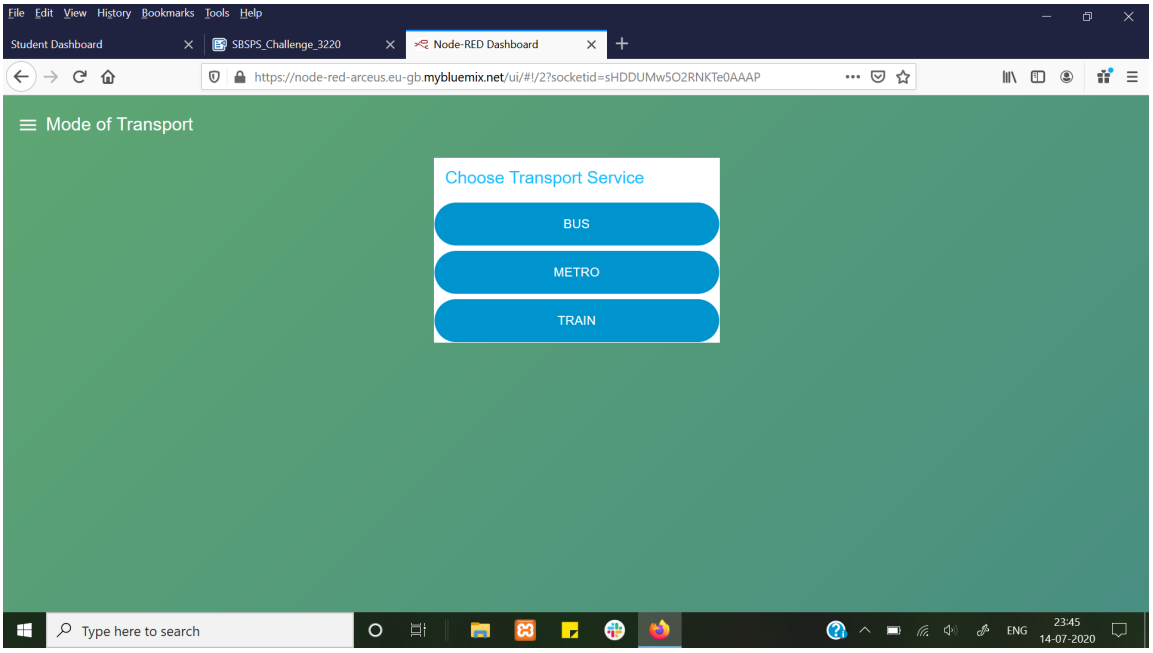
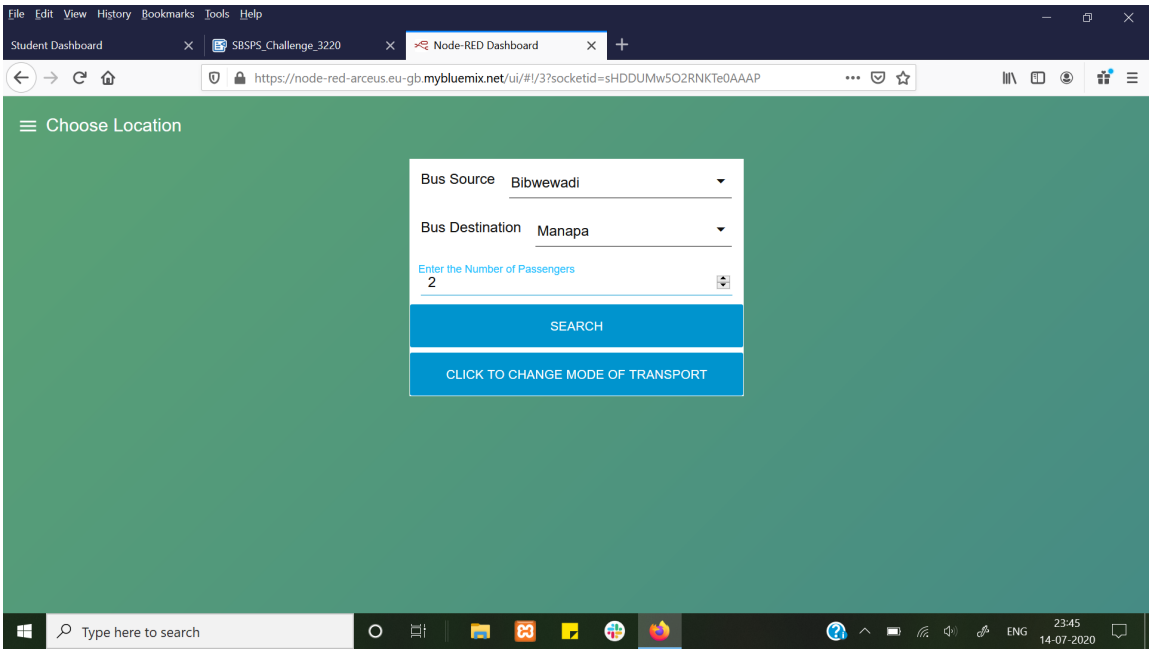

File Edit View History Bookmarks Tools Help
Student Dashboard
SBSPS_Challenge_3220
Node-RED Dashboard
https://node-red-arceus.eu-gb.mybluemix.net/ui/#!/1?socketid=sHDDUMw5O2RNKTe0AAAP
Register
Email Verification
Verification Code
VERIFY
Type here to search
ENG
23:44
14-07-2020

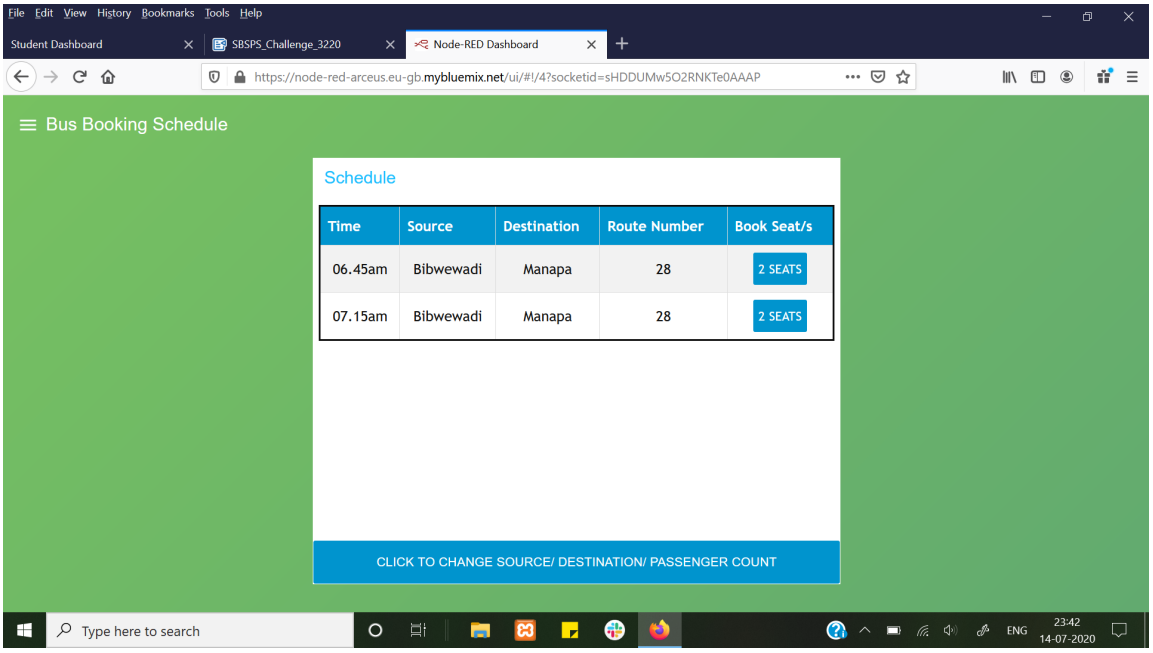
Mode of Transport:



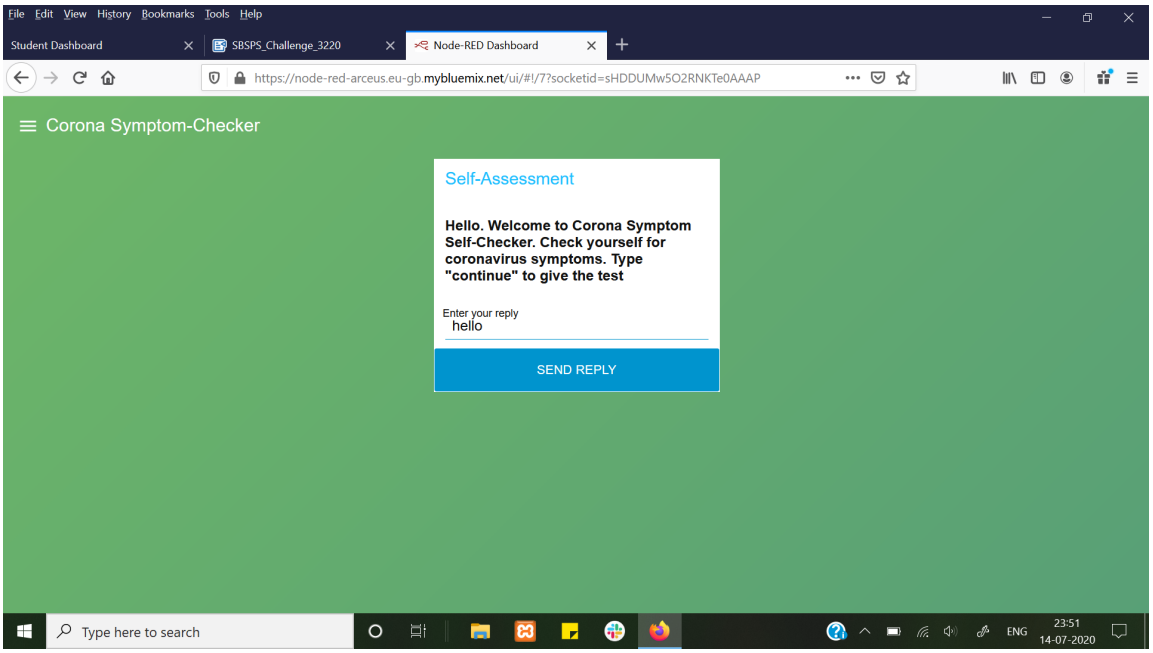
Select Source and Destination:



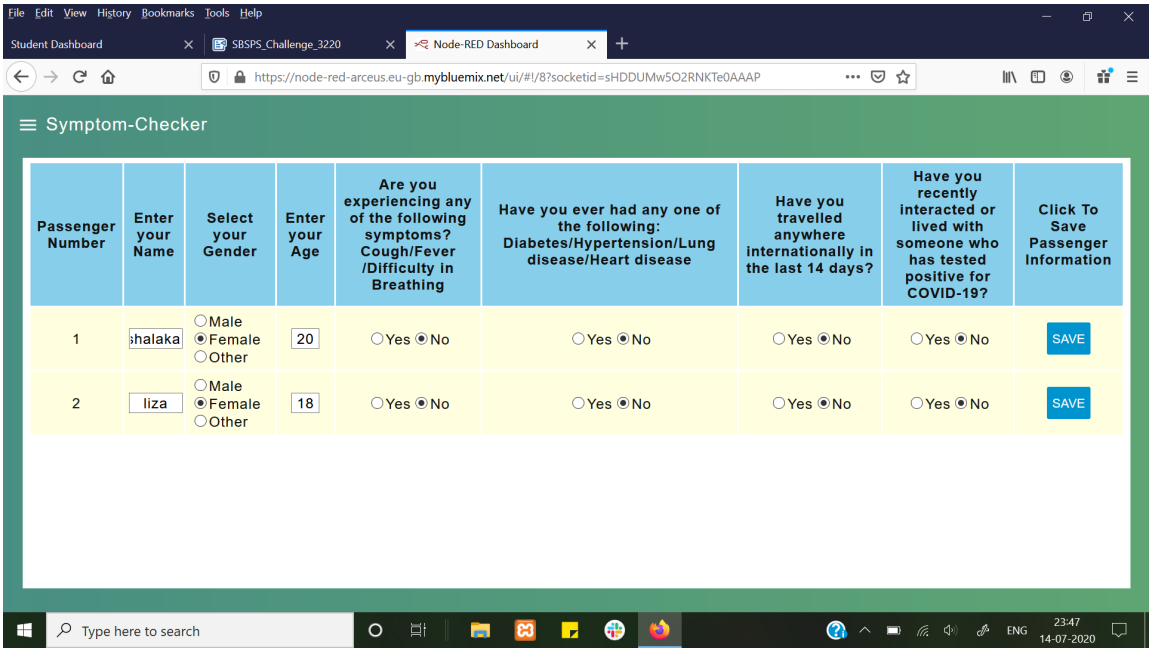
Retrieval of Transport Schedule:

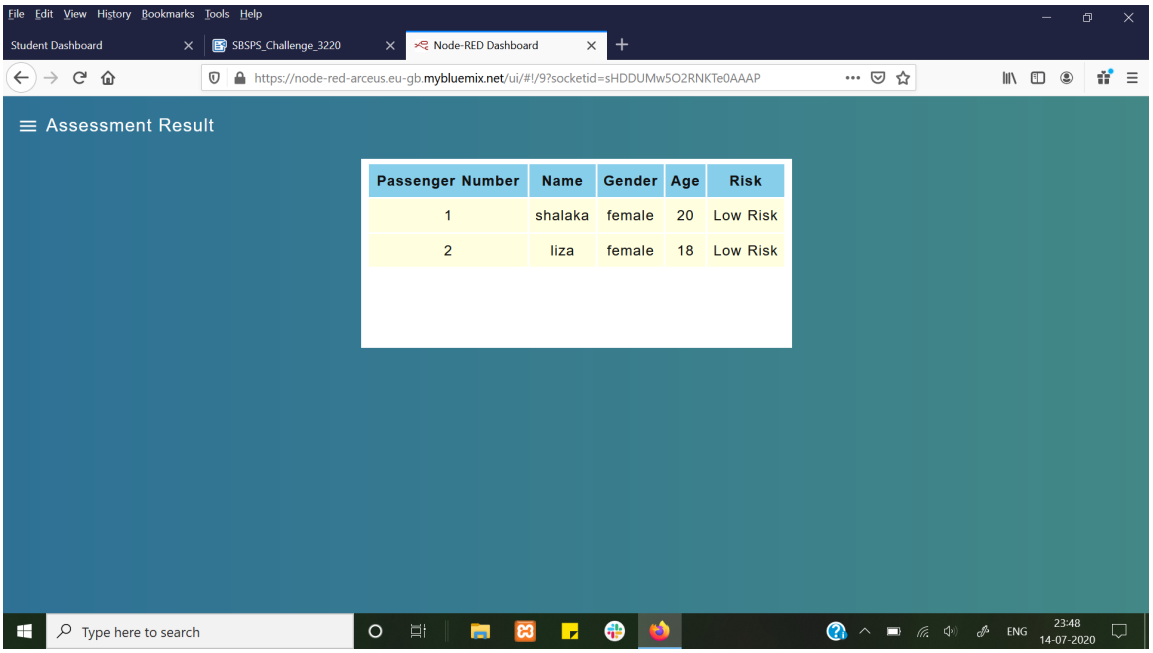


Corona Symptom-Checker Bot (for 1 Passenger):

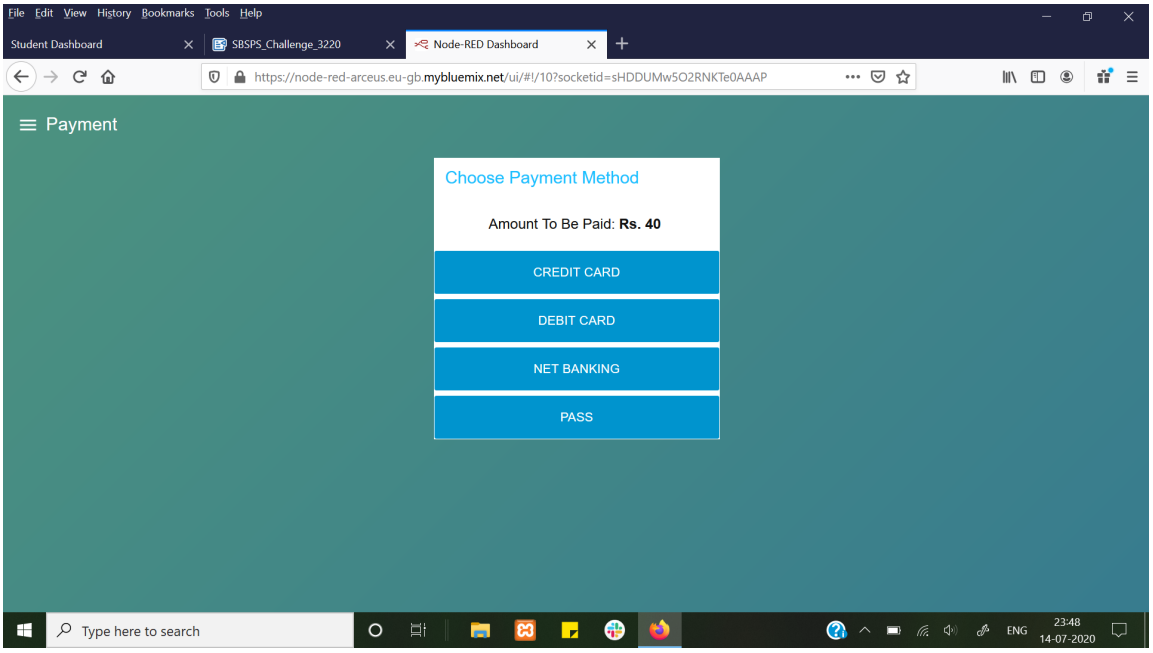


Corona Symptom Checker Form (for >1 Passengers):

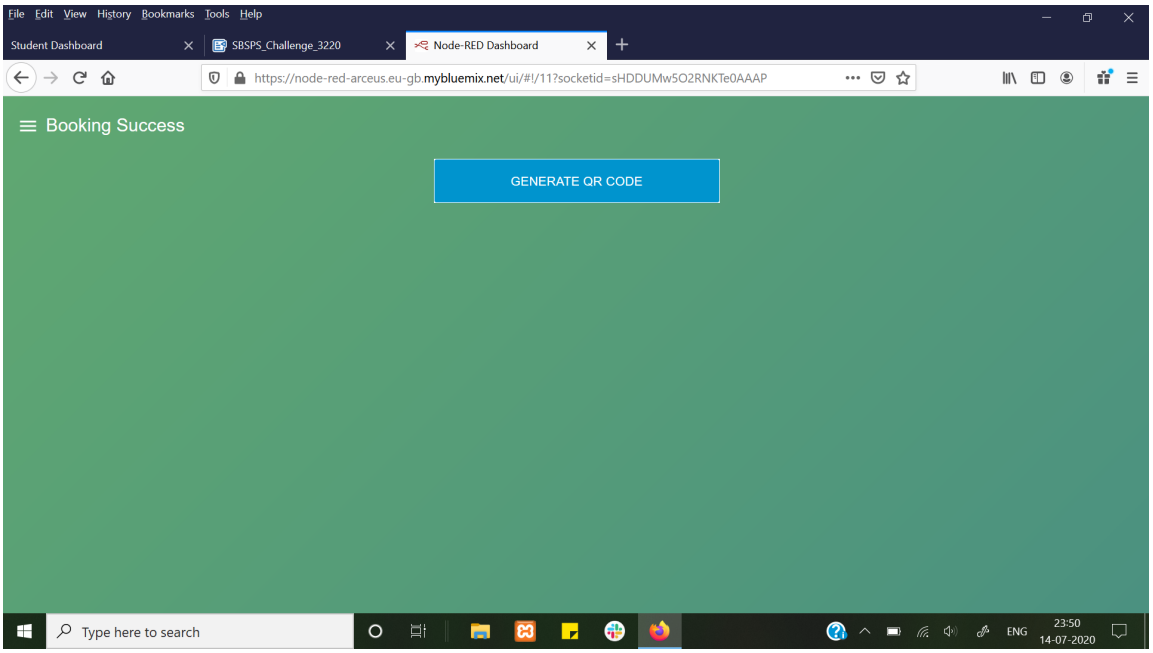


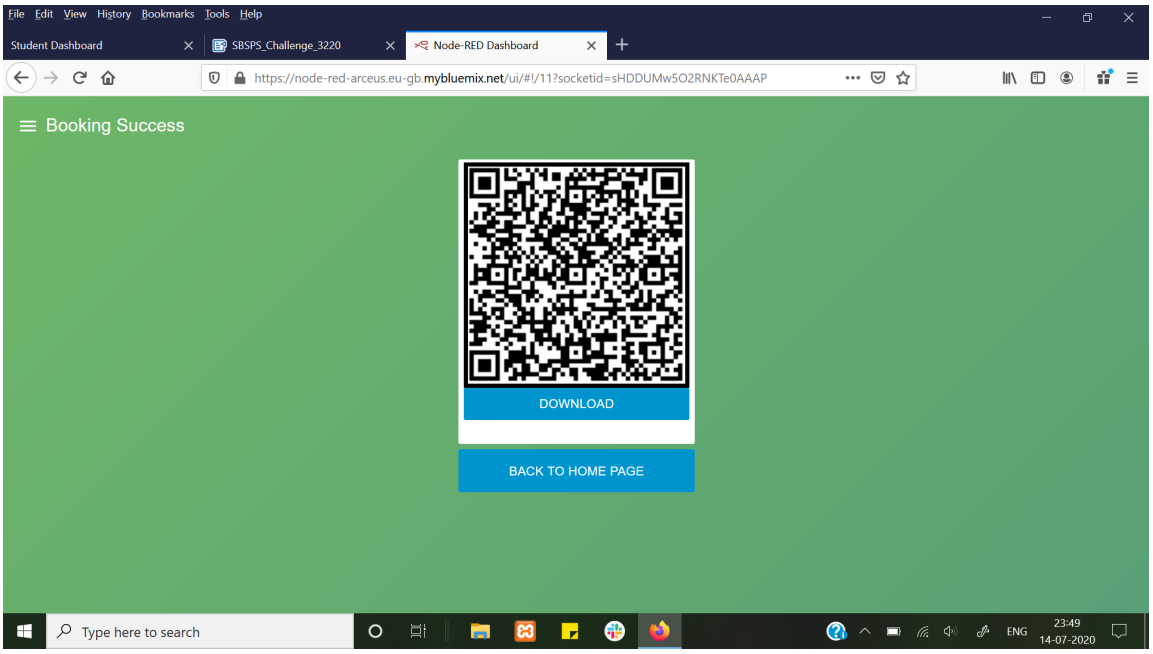


Payment:



QR Code Generation:

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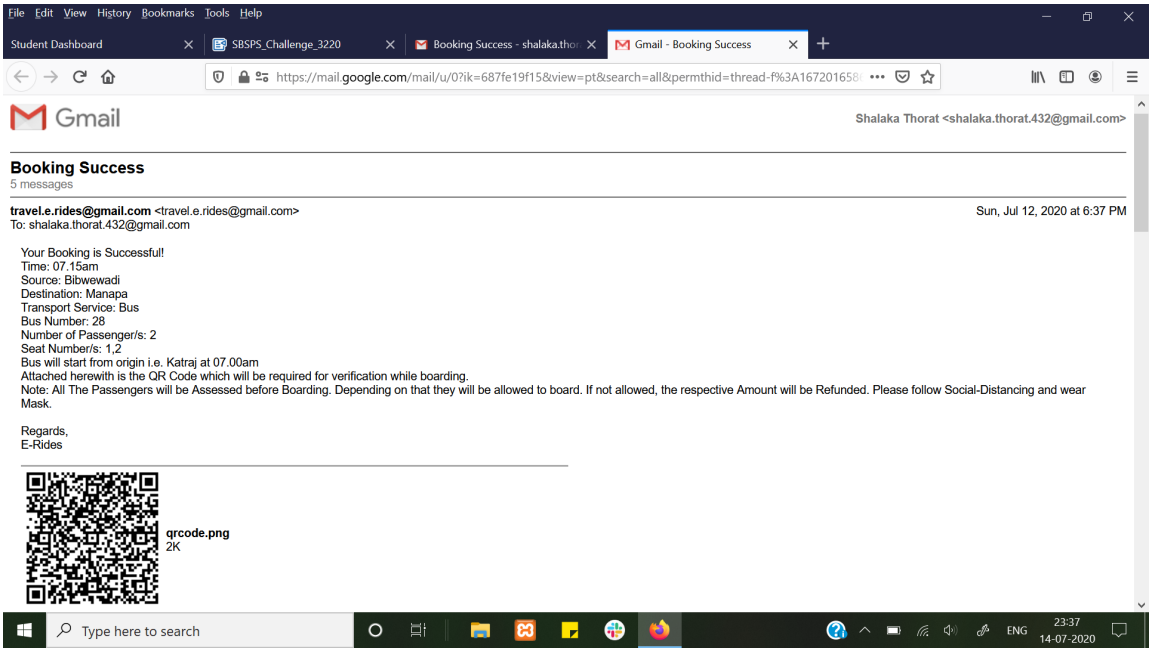
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Your Booking is Successful!
Time: 07.15am
Source: Bibwewadi
Destination: Manapa
Transport Service: Bus
Bus Number: 28
Number of Passenger/s: 2
Seat Number/s: 1,2
Bus will start from origin i.e. Katraj at 07.00am
Attached herewith is the QR Code which 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
qrcode.png
2K
Type here to search
ENG
23:37
14-07-2020

Registration, Verification:

User has to fill the registration form that includes Name, Phone Number, Email and Password. After submitting it, the email address is compared with the user_login database whether it already exists. If already registered, user is redirected to Login. Else, a random 4-digit verification code is generated consisting of digits 0-9. This is sent through mail and user is required to enter that code, the code is checked and if correct, user is registered and directed to Login.

Login, Mode of Transport:

User has to enter the registered email and password, tick the captcha, the email entered is checked with user_login database whether it exists and if yes, password is checked. Depending on that, user is directed to Choose Transport Service if login is successful. User needs to select Transport service i.e. Bus, Metro or Train and he then has to choose Source, Destination.

Choose Location, Time-slot Booking:

User needs to enter Source, Destination, Passenger Count, then by retrieving the relevant records from bus_schedule/metro_schedule/train_schedule database, the amount and time from the source are calculated. If no route exists, user is redirected to choose source, destination. Route Number, Source, Destination, Time and Seats Available/Not are shown in tabular format depending on number of routes. For metro and train, coach number is also mentioned. After selecting seats, user is directed for Assessment.

Symptom Checker Bot, Payment:

If passenger count is 1, user interacts with Symptom-Checker bot. User should enter hello and then continue to start assessment. Gender, Age, Whether passenger has any symptoms/diseases, all these questions are asked and depending on the answers, risk is calculated and user is directed to Payment. User has to choose payment option: Debit/Credit Card, NetBanking, Pass, then he is provided with QR Code.

Symptom Checker Form, Result of Assessment:

For more than 1 passenger, user has to fill the form containing same questions that were asked by the bot, number of rows depends on passenger count. All this information is gathered, analyzed and risk of passengers is evaluated. User is then directed to payment.

QR Code Generation, Booking Confirmation:

After clicking 'Generate QR Code' button, a unique QR code generated with email and timestamp is created and shown to the user. User can download the QR Code. The available seats count is updated in bus_schedule/metro_schedule/train_schedule database. Exact seat number and coach number incase of metro and train, is calculated. All the information: source, destination, transport type, amount, passenger count, time, route number, seat and coach number, timestamp and risk is stored in booking database. Also, this information with the attached QR Code is mailed to the user.