

A  
Project Report  
On

**Secure Digital Ticket Pass  
Using QR code Technology**



*The Project submitted to  
Sant Gadge Baba Amravati University, Amravati  
Towards partial fulfillment of the Degree of*

**Bachelor of Engineering  
in  
Computer Science & Engineering**

**Guided By:-**

**Dr. D.R. Dhotre**  
Asso. Prof. & Head, CSE Dept.

**Submitted By:-**

**Mr. Rohit Pardhi**  
**Mr. Rohit Tidke**  
**Mr. Shivam Shrivastava**

**Department of Computer Science & Engineering**  
Shri Sant Gajanan Maharaj College of Engineering, Shegaon,  
Dist- Buldhana – 444 203 (Maharashtra)  
**2018-19**

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING  
SHEGAON



2018-19

---

## CERTIFICATE

*This is to certify that **Mr. Rohit Pardhi, Mr. Rohit Tidke, Mr. Shivam Shrivastava** students of final year B.E (Computer Science and Engineering) in the year 2018-2019 of Computer Science and Engineering Department of this institute has completed the project work entitled “**Secure Digital Ticket Pass using QR code Technology**” based on syllabus and has submitted a satisfactory amount of his work in this report which is recommended for the partial fulfillment of the requirements for degree of **Bachelor of Engineering in Computer Science & Engineering of Sant Gadge Baba Amravati University, Amravati.***

**Dr. D.R. Dhotre**  
(Project Guide)  
Head  
Computer Sci. & Engg. Dept.  
S.S.G.M.College of Engg.  
Shegaon.

**Dr. S.B. Somani**  
Principal  
S.S.G.M. College of Engg.  
Shegaon.

SHRI SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING  
SHEGAON



2018-19

---

## CERTIFICATE

*This is to certify that the project work entitled “Secure Digital Ticket Pass using QR code Technology” Submitted by Mr. Rohit Pardhi, Mr. Rohit Tidke, Mr. Shivam Shrivastava-students of final year B.E (Computer Science and Engineering) in the year 2018-2019 of Computer Science and Engineering Department of this institute has submitted a satisfactory amount of his work based on syllabus in this report which is approved for the award of degree of **Bachelor of Engineering in Computer Science & Engineering of Sant Gadge Baba Amravati University, Amravati.***

**Internal Examiner**

Date:

**External Examiner**

Date:

## *ACKNOWLEDGEMENT*

---

*The real spirit of achieving a goal is through the way of excellence and lustrous discipline. We would have never succeeded in completing our task without the cooperation, encouragement and help provided to us by various personalities.*

*We would like to take this opportunity to express our heartfelt thanks to our project guide **Dr. D.R. Dhotre**, for his esteemed guidance and encouragement, especially through difficult times. His suggestions broaden our vision and guided us to succeed in this work. We are also very grateful for his guidance and comments while studying part of our project and we learnt many things under his leadership.*

*We extend our thanks to **Dr. D.R. Dhotre**, Head of Computer Science & Engineering Department, Shri Sant Gajanan Maharaj College of Engineering, Shegaon for his valuable support that made us consistent performer.*

*We also extend our thanks to **Dr. S. B. Somani**, Principal, Shri Sant Gajanan Maharaj College of Engineering, Shegaon for his valuable support.*

*Also we would like to thanks to all teaching and non-teaching staff of the department for their encouragement, cooperation and help. Our greatest thanks are to all who wished us success especially our parents, our friends whose support and care makes us stay on earth.*

*Mr. Rohit Pardhi  
Mr. Rohit Tidke  
Mr. Shivam Shrivastava*

*(Session 2018-19)*

## ABSTRACT

---

This real-time project provides an efficient and effective solution for the existing bus pass system. We have developed a mobile application to issue or renew a digital bus pass online. Digital Ticket Pass System is useful for people facing problems with the current manual work of bus pass registration and renewal. There will be no need to stand in long queues to obtain the bus passes. The proposed system will reduce the paperwork and save time for passengers and pass issuing authorities. Passengers don't have to remember the expiry date as it will send notifications to the Passenger to renew it. Therefore, passengers can renew the Pass through the app before expiring. This system provides a secured Digital Pass instead of a physical one that is prone to forging and could be lost or stolen.

In the presented system, passengers can apply for Digital Pass anytime. They need to upload the documents and make payments through the app. The system will generate a unique QR code for each Passenger. It also provides an effective solution for maintaining Bus pass information. The Conductor scans this QR code to fetch information about the Passenger. This system also supports generating a report of general stats like the number of scans in a specific route, etc. It will be helpful to the Administrator to make crucial decisions to improve the public transport services.

# CONTENTS

---

<b>1. INTRODUCTION</b>	<b>1</b>
1.1 Preface	1
1.2 Information about QR code	2
1.3 Statement of Problem	3
1.4 Objectives of Project	4
1.5 Scope and Limitations of the Project	4
1.5.1 Scope	4
1.5.2 Limitations	4
1.6 Organization of Project	4
<b>2. LITERATURE SURVEY</b>	<b>5</b>
<b>3. MATERIALS AND METHODS</b>	<b>7</b>
3.1 Materials can be used	7
3.1.1 Software Technology used	7
3.2 Methods can be used	8
<b>4. ANALYSIS</b>	<b>9</b>
4.1 Detailed Problem Statement	9
4.2 Requirement Specification	10
4.2.1 Hardware Requirement	10
4.3 Functional Requirement	11
4.4 Non-Functional Requirement	11
4.5 Feasibility Study	12
4.6 Proposed System	13
4.6.1 This system is for conductor, admin and passenger	14
4.7 Use Case Diagram	15
4.8 Use Case Specification	16
<b>5. DESIGN</b>	<b>17</b>
5.1 Design Goals	17
5.2 Design Strategy	18
5.2.1 Abstraction	18

5.2.2	Modularity	19
5.2.3	Verification	19
5.3	Class Diagram	22
5.4	Activity Diagram	23
5.5	Interaction Diagram	24
<b>6.</b>	<b>IMPLEMENTATION</b>	25
6.1	Implementation Strategy	25
6.2	Implementation Level Details	27
6.2.1	Home Page	27
6.2.2	Passenger Registration and Applying for Pass	28
6.2.3	Making Payments and Generating Pass	29
6.2.4	Dashboard and Scans from locations	30
6.3	Testing	31
<b>7.</b>	<b>RESULT AND DISCUSSION</b>	33
<b>8.</b>	<b>FUTURE SCOPE</b>	34
	<b>CONCLUSION</b>	35
	<b>REFERENCES</b>	36

## Table of Figures

Figure	Title of Figure	Page No.
1.	QR code	2
2.	Use Case Diagram	15
3.	Software Development Stages	17
4.	Class Diagram	22
5.	Activity Diagram	23
6.	Interaction Diagram	24
7.	Home Page	27
8.	Passenger Registration and Applying for Pass	28
9.	Dashboard and Scans from locations	30



## **1. INTRODUCTION**

---

### **1.1 PREFACE**

A Ticket Pass plays a vital role in the life of students and working professionals who need to commute daily for their studies or work. It allows them to commute using public service vehicles at a low cost. But this Pass is prone to forging and not secure. Also, for issuing or renewing passes, there are a lot of problems in the current system. Passengers need to submit an application form in person at the pass counter. Pass counters are not available 24\*7. There are long queues for issuing passes. Renewing the Pass can be done only during the last three days before the expiry date.

To resolve these issues, we came up with an effective solution. We have developed a mobile application - Secure Digital Ticket Pass using QR Code Technology. It is a secure paperless Pass that can't be stolen or lost. It could be issued and renewed easily through the app. It is easy to verify just by scanning a QR code. It is available 24\*7 since it is hosted on the cloud.

This application has three stakeholders - Passenger, Conductor, and Administrator. Passengers can apply for Digital Pass by filling required details and uploading documents. Then passengers can make cashless payments through the app. The Administrator will verify the documents and issue the Pass with a unique QR code. The Conductor can scan this QR code to verify the Pass. We have also created a dashboard where the Administrator can see general stats like the number of scans, location of the scans, etc. Based on this he can make important decisions to improve the public transport services.

## **1.2 INFORMATION ABOUT QR-CODE**

QR code stands for Quick Response code. The QR code consists of a white surface having black and white squares on it which are arranged in a square grid. QR codes can store phone numbers, URLs, plain text, email addresses, and many alphanumeric data. QR codes can be digitally scanned. The small black and white squares are read by an image sensor and then processed by the system processor.



Figure 1: QR code

### **Features:**

- Greater data storage capacity
- Support for multiple data
- Dirt and damage resistant
- Readable from any direction in 360 degrees
- Fast and reliable scanning for camera-based devices

### **1.3 STATEMENT OF PROBLEM**

Passengers can avail of the facility of passes to commute using public service vehicles. These passes are prone to forging and may be used by someone else. Also, the current process of issuing a new Pass or renewing an existing Pass is slow and tedious. An innovative solution may be developed to transform it into a Paperless Pass and secure it through an ICT solution so no other person can use the same Pass.

### **1.4 OBJECTIVES OF PROJECT**

The main purpose of this project is to produce an application that can help ease solve all the problems of the current bus pass system. Therefore, the objectives to reach the goal are as follows:

- To overcome the problem of theft and misuse of Bus Pass
- To make paperless bus pass
- Secure and less vulnerable pass
- To reduce the complexity of the current system
- To reduce the workload of both the government and the passengers who are accessing the service

## **1.5 SCOPE AND LIMITATIONS OF THE PROJECT**

### **1.5.1 SCOPE**

This project serves as a Passenger Digital Pass. To get a Digital Pass, the passenger should upload all the documents online and make the payment. The administrator will verify all the documents and approve the request. After successful verification, a unique QR code will get generated. The conductor verifies the user by scanning this QR code and getting details of the passenger with his photo. The user can also use the facilities available on the application like seasonal passes, pass expiry reminders, and many more.

### **1.5.2 LIMITATIONS**

- Only the Conductor Scanner can scan that QR code.
- Passengers should have Android or iOS mobile phones.
- Need internet to operate this application.
- Passenger who does not sign up in this app cannot buy a bus pass.

## **1.6 ORGANIZATION OF PROJECT**

The project is organized as follows: -

1. Chapter 1 gives Introduction to the project
2. Chapter 2 gives Literature survey of the project.
3. Chapter 3 provides analysis of project.
4. Chapter 4 provides design phase of project.
5. Chapter 5 provides how project is implemented
6. Chapter 6 gives conclusion and discuss future work.

## 2. LITERATURE SURVEY

---

Sr. No	Title	Author Name	Publisher	Journal	Conclusion
01.	Secure QR code system.	Raed M. Bani-Hani, Yarub A. Wahsheh, Mohammad B. Al-Sarhan	IEEE-2014	2014 10th International Conference on Innovations in Information Technology (IIT)	QR code security is essential and QR codes are increasingly used in all life fields, this system can protect users' privacy and identity in addition to their smart phone devices.
02.	Exploring Ticketing Approaches Using Mobile Technologies: QR Codes, NFC and BLE	Rui Couto, João Leal, Pedro Maurício Costa, Teresa Galvão	IEEE-2015	2015 IEEE 18th International Conference on Intelligent Transportation Systems	QR Codes carry more restraining factors than NFC tags due to the conditions present in transportation stations

Sr. No	Title	Author Name	Publisher	Journal	Conclusion
03.	A Privacy Enhancing Service Architecture for Ticket-based Mobile Applications.	Oliver Jorns, Oliver Jung, Gerald Quirchmayr	IEEE-2007	The Second International Conference on Availability, Reliability and Security (ARES'07)	A transport ticketing application that allows users to buy different kinds of tickets that are similar to real world tickets but also tickets with encoded routes that are configured by incorporating the user.
04.	DIGITAL BUS PASS USING QR-CODE	Prof. Sneha Jagtap, Prajakta Dudhade, RajshreePal, SayaliPatil	IJSETR-2017	International Journal of Science, Engineering and Technology Research(IJSETR) Volume06, Issue05, May2017, ISSN:2278-7798	A real time project system which is useful for user who is facing current system of bus pass registration and renewal provided smart card using QR code whatever information related to user is stored in QR code.
05.	TRAVEL BUDDY - BUS PASS AND TICKET APPLICATION	Prof. Swapnil Gholap, Shivaji Salvi, Subodh Salvi, Vinit Shikhar	IRJET-2018	International Research Journal of Engineering and Technology (IRJET), Volume: 05 Issue: 04   Apr-2018	It eliminates the paper process present in the today's system. Verification of the pass or ticket ensures that any fraud will not be possible.

### 3. MATERIALS AND METHODS

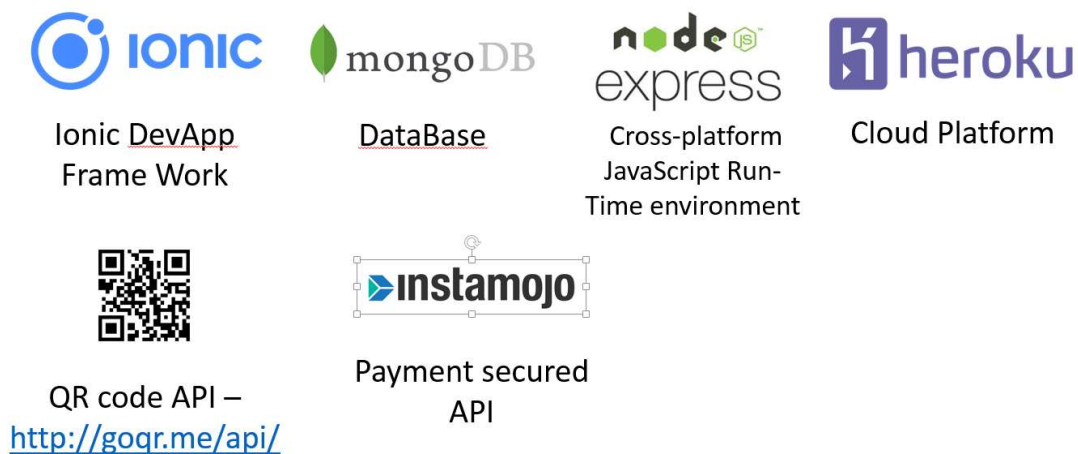
---

#### 3.1 MATERIALS CAN BE USED

##### 3.1.1 Software Technology used

- Operating System : Windows, Mac
- IDE : VS Code
- Frontend : Ionic Framework.
- Backend : Node.js Express
- Database : MongoDB.
- Cloud Platform : Heroku.
- Payment Mode : Instamojo API.
- QR Code : QR code API.

#### Technology Stack



### **3.2 METHODS CAN BE USED:**

A project management methodology is a set of principles and practices that guide you in organizing your projects to ensure their optimum performance:

1. Waterfall Methodology
  - a. Tasks and phases are completed in a linear, sequential manner, and each stage of the project must be completed before the next begins.
  - b. The stages of Waterfall project management generally follow this sequence:
    - i. Requirements
    - ii. Analysis
    - iii. Design
    - iv. Construction
    - v. Testing
    - vi. Deployment & maintenance
2. Agile Methodology
  - a. Involve short phases of work with frequent testing, reassessment, and adaptation throughout.
  - b. The key principles of agile project management methodologies are:
    - i. It's collaborative.
    - ii. It's quick.
    - iii. It's open to data-driven change.



## **4. ANALYSIS**

---

### **4.1 DETAILED STATEMENT OF THE PROBLEM**

As technology is growing fast, we need to update ourselves to be in touch with new technology. The current process of bus ticketing is a slow and tedious process. Customer needs to stand in a long queue to get bus pass in the bus Depot which is time-consuming, and this process is also hectic for employees in the Depot.

The existing bus pass system has some drawbacks. Passengers need to submit an application form in person at the pass counter. Pass counters are not available 24\*7. There are long queues for issuing passes. Renewing the Pass can be done only during the last three days before the expiry date.

This system provides effective software for maintaining bus passes. A digital bus pass generating system is helpful for people to get their bus pass online instead of standing in long queues. This system reduces paperwork, and efforts, and makes the process of issuing passes simple and faster. Users can use the Pass for a long time. They need to recharge their Digital Pass and extend the validity of the Pass every time when a pass is going to expire. No need to print the Pass every time.

This system performs functionalities like accessing basic information of the user. The admin and the conductor of the bus would be able to verify the authenticity of the bus pass by scanning the QR code. It will show all the details of the passenger along with the photo.

The following points we have considered for building this application:

- Paperless Pass.
- Can't be used by someone else.
- Can't be lost or destroyed.
- Secure and less vulnerable Pass.
- Can be renewed easily.
- Easy verification of digital passes by conductors.
- Don't need to remember due date.
- Cashless payment.

## **4.2 REQUIREMENT SPECIFICATION**

A Software Requirements Specification (SRS) is a detailed description of a software system to be developed with its functional and non-functional requirements. The SRS is developed based on the agreement between customers and contractors. It may include the use cases of how a user will interact with the software system. The software requirement specification document is consistent with all requirements required for project development. We should have a clear understanding of the requirements to develop the software system. To achieve it we need continuous communication with customers to gather all requirements.

Requirements gathered for any new system to be developed should exhibit the following three properties:

1. Unambiguity
2. Consistency
3. Completeness

Requirements can be specified in terms of Hardware requirements as below:

### **4.2.1 HARDWARE REQUIREMENTS**

The Hardware requirements may serve as the basis for a contract for the implementation of the system and should therefore be complete and consistent in the specification. The minimum hardware requirement of the system is mentioned below

- |             |                                     |
|-------------|-------------------------------------|
| ➤ SYSTEM    | : Microsoft Windows 7/8/10 (64-bit) |
| ➤ HARD DISK | : 1 TB                              |
| ➤ RAM       | : 4 GB                              |
| ➤ DEVICES   | : Laptop, Mobile, USB Cable         |

### **4.3 FUNCTIONAL REQUIREMENTS**

Functional requirement defines a function of a system or its component. A function is inscribed as a set of inputs, the behavior, and outputs. Basically, requirements are statements that indicate what a system needs to do in order to provide a capability.

- User Login
- User Signup
- Conductor Login
- Change User Login Password
- The user should upload the document online
- The user should make payment after uploading documents
- The Administrator should store the passenger data
- The Administrator should verify the user details
- The Administrator should provide the QR code
- The conductor scans the QR code by his device
- The conductor gets the detail of the passenger
- The User can renew the pass anytime he wants

### **4.4 NON-FUNCTIONAL REQUIREMENTS**

The Non-functional requirement elaborates a performance characteristic of the system.

Non-functional requirements of this project are:

1. Accessibility: The system is easily accessible.
2. Availability: The system is available 24\*7 and is accessible anytime.
3. Recoverability: The system can be easily recovered.
4. Maintainability: The system is easy to be understood and maintain.
5. Usability: Interactive User Interface.
6. Efficiency: The system is very efficient.
7. Robustness: The system is strong.

## **4.5 FEASIBILITY STUDY**

### **(a) Technical Feasibility:**

Technical feasibility is one of the first studies conducted after a project has been identified. The project requires certain limits with cloud subscriptions and resource allocation. Other required tools for the project to execute successfully are freely available. This project is feasible technically only for the windows-based operating system due to the limitation of WPF Application which also incurs that the system is not a web solution. So, it requires working windows operating system to work.

### **(b) Economic Feasibility:**

For any system, if the expected benefits equal or exceed the expected costs, the system can be judged to be economically feasible. This system does not incur any costs for its development. The software and hardware requirements are at affordable costs. Only the Cloud Execution may incur charges as its pay peruse. Rest all the resources are free of cost.

### **(c) Operational Feasibility:**

Operational feasibility is the measure of how well a proposed system solves the problems and takes advantage of the opportunities identified during scope definition and how it satisfies the requirements. This system solves the problem of the current hectic process of generating a new pass. It also saves time for users. It is secure. Therefore, this system can be considered operational and feasible.

### **(d) Behavioral Feasibility:**

Behavioral Feasibility refers to the system to see whether the data input is readily available or collectible. Collecting data from passengers sometimes depends on the type of city specified by the user. Also, it looks at whether the project is successfully started, or if no result is received. This system is robust and is accepted by the candidates involved in the system.

## **4.6 PROPOSED SYSTEM**

The proposed system is invented to overcome the drawback of the existing manual bus pass system. This system is a mobile-based application for the user to get a bus pass online.

In this system, we will generate digital and smart bus passes.

A Smart Bus Pass consists of

- Name of user
- Address of user
- DOB of user
- Photo of user
- Unique QR-code that contains all the basic information about the user

We will protect our system by giving the unique id and password to the user. Therefore only authorized users can access the system. In this system, all information about bus passes is maintained using a database. We are using the SQL ( Structured Query Language ) Database. SQL is a standard computer language for relational database management and data manipulation. The database will hold all of the information entered by the user while applying for a pass.

These databases include:

- Pass validity detail
- Passenger information
- Bus information
- Payment detail

This all can be updated by the end-user. The pass validity database will include the validity of the digital bus pass. The passenger information database will contain all the information about the passenger such as first name, last name, id number, gender, and phone number. The payment detail database will include all the payment information.

#### **4.6.1 This system is for admin, conductor and passenger**

**1) Passenger :** Using this system, Passenger can:

- Apply for a bus pass using the mobile application.
- Register for the pass, by submitting the basic details online initially.
- Log in to the system by entering the login id & password that is provided at the time of registration.
- Submit the required documents online.
- Extend the validity every time when the pass expired.
- Issue smart cards and recharge cards.
- Change their password.

**2) Admin:** Using this system admin can:

- View all user's details and balance system through its login.
- Generates reports and manages the whole system.
- Manage profiles of the users.
- Change or modify user rights.
- Manage the different pass schemes.
- Verification of online registration passes.
- Check the history of the pass of any user for verification.

**3) Conductor:** Using this system conductor can:

- Check the validity of the smart bus card by scanning QR-code that contains all the information about the passenger using an android phone camera.
- Check the information about the user.

## 4.7 USE CASE DIAGRAM

To model a system the most important aspect is to capture the dynamic behavior. To clarify a bit in detail, dynamic behavior means the behavior of the system when it is running/operating. So only static behavior is not sufficient to model a system rather dynamic behavior is more important than static behavior. In UML there are five diagrams available to model dynamic nature and the use case diagram is one of them. Now as we have to discuss that the use case diagram is dynamic in nature there should be some internal or external factors for making the interaction.

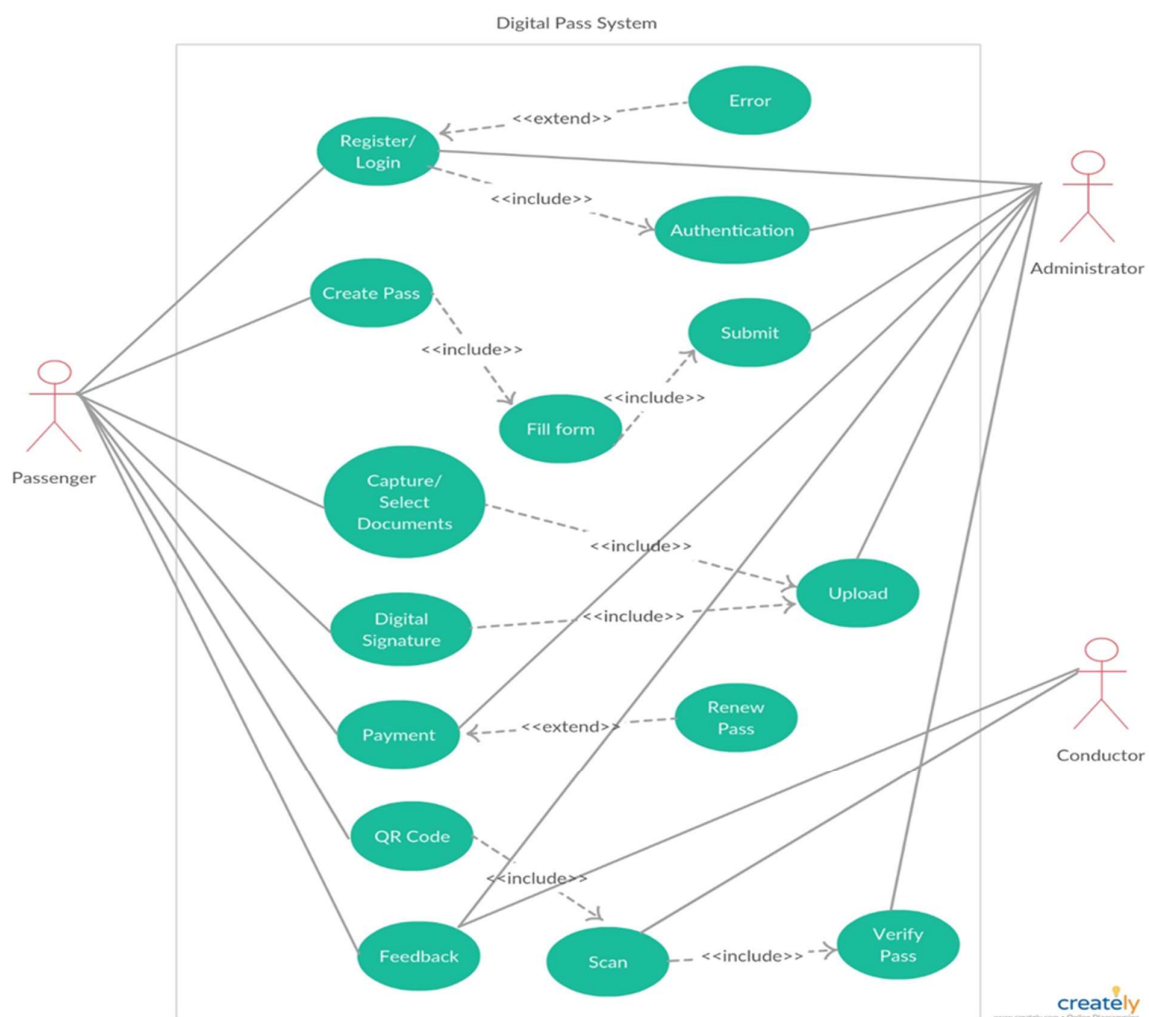


Figure 2: Use Case Diagram

## **4.8 USE CASE SPECIFICATION**

### **Use Case Specification**

#### **Actors:**

- **Passenger**
  - i. Passenger register himself.
  - ii. Apply for Pass
  - iii. Fill the form
  - iv. Make Payment
  - v. Give Feedback
  
- **Admin**
  - i. It authenticates the user
  - ii. It verifies the documents.
  - iii. It provides QR code for a particular user.
  
- **Conductor**
  - i. Scans QR code.
  - ii. Verifies the user.

#### **Use Cases:**

- Register/Login
- Create Pass
- Select documents
- Digital Signature
- QR code
- Feedback
- Renew Pass
- Submit
- Upload



## 5. DESIGN

---

### 5.1 DESIGN GOALS

Design is a meaningful engineering representation of something that is to be built. It can be traced to a customer's requirements and at the same time assessed for quality against a set of predefined criteria for good design. In the software engineering context, the design focuses on four major areas of concern: data, architecture, interfaces, and components. The design process translates requirements into a representation of software that can be assessed for quality before code generation. Design is the process through which requirements are translated into the blueprint for constructing the software. Initially, the blueprint depicts the holistic view of software. This is the design represented at a high level of abstraction. During various stages of system development and design following goals have been set up for a complete architecture

- Analysis
- Design
- Development
- Testing
- Implementation

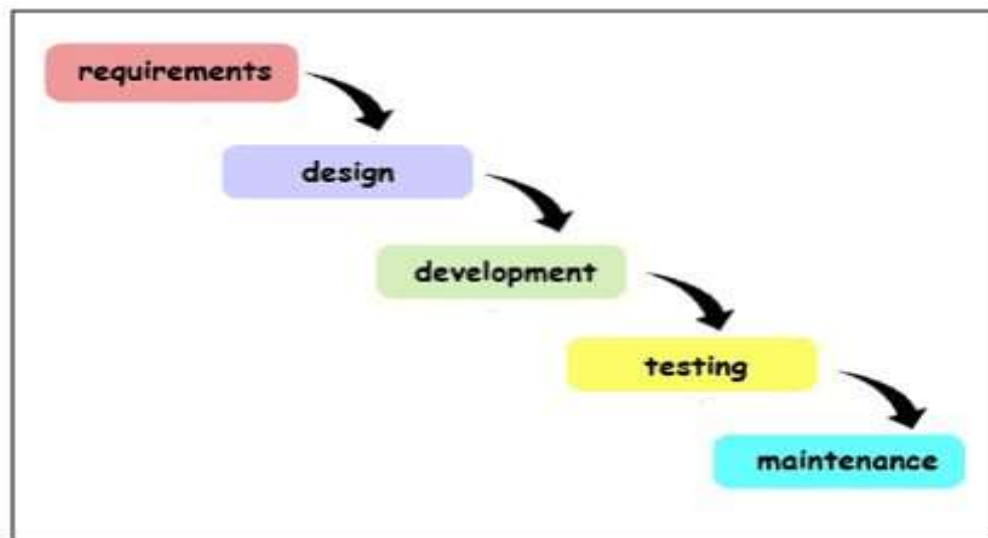


Figure 3: Software Development Stages

## **5.2 DESIGN STRATEGY**

Software design is a process to conceptualize the software requirements into software implementation. Software design takes the user requirements as a challenge and tries to find an optimum solution. While the software is being conceptualized, a plan is chalked out to find the best possible design for implementing the intended solution.

There are multiple variants of software design as follows:

### **1. Structured Design:**

Structured design is a conceptualization of a problem into several well-organized elements of the solution. It is concerned with the solution design. It gives a better understanding of how the problem is being solved.

### **2. Function Oriented Design :**

In function-oriented design, the system is comprised of many smaller sub-systems known as functions. These functions are capable of performing a significant task in the system.

### **3. Object Oriented Design :**

Object-oriented design works around the entities and their characteristics instead of functions involved in the software system. This design strategy focuses on entities and their characteristics.

There are two different software design approaches:

1. Top-Down design
2. Bottom-up design

### **5.2.1 ABSTRACTION**

Abstraction is used to construct solutions to the problem without having to take account of the intricate details of the various component sub-problems. Abstraction allows the system designer to make stepwise refinement, which at each stage of the design may hide unnecessary details associated with representation or implementation from the surrounding environment

### **5.2.2 MODULARITY**

Modularity is concerned with decomposing the main module into well-defined manageable units with well-defined interfaces among the units. This enhances design clarity, which in turn eases the implementation, Debugging, Testing, Documenting, and Maintenance of the software product. Modularity viewed in this sense is a vital tool in the construction of large software projects.

### **5.2.3 VERIFICATION**

Verification is a fundamental concept in software design. A design is verifiable if it can be demonstrated that the design will result in an implementation that satisfies the customer's requirements. Verification is of two types namely.

- Verification that the software requirements analysis satisfies the customer's needs.
- Verification that the design satisfies the requirement analysis.

Some of the important factors of quality that are being considered in the design of software:

#### **Reliability:**

The software should behave strictly according to the original specification and should function smoothly under normal conditions.

#### **Extensibility:**

The software should be capable of adapting easily to changes in the specification.

#### **Reusability:**

The software should be developed using a modular approach, which permits modules to be reused by other applications, if possible.

The System Design briefly describes the concept of system design, and it contains four sections. The first section briefly describes the features that the system is going to provide to the user and the outputs that the proposed system is going to offer.

The second section namely Logical Design describes the Data Flow Diagrams, which clearly show the data movements, the processes, and the data sources, and sinks, E-R diagrams which represent the overall logical design of the database, and the high-level process structure of the system. The process of design involves “conceiving and planning out in the mind” and making a drawing pattern, or sketch of the system. In software design, there are two types of major activities, Conceptual Design and Detailed Design.

The conceptual or logical or external design of software involves conceiving, planning out, and specifying the externally observable characteristics of a software product. These characteristics include user displays, external data sources, functional characteristics, and high-level process structure for the product.

Details or internal design involves conceiving, planning out, and specifying the internal structure and processing details of the software product. The goal of internal design is to specify the internal structure, processing details, blueprint of implementation, testing, and maintenance activities.

One of the important fundamental concepts of software design is modularity. A modularity system consists of interfaces among the units. Modularity enhances design clarity, which in turn eases implementation, debugging, testing, documentation, and maintenance of the software product.

The other fundamental concepts of software design include abstraction, structure, information hiding, concurrency, and verification. The use of structuring permits the decomposition of a large system into smaller, more manageable units with well-defined relationships to the other units. The system design is verifiable if it can be demonstrated that the design will result in an implementation that satisfies the customer’s requirements.

### **Preliminary Design:**

Preliminary design is concerned with deriving an overall picture of the system into modules and sub-modules while keeping Cohesion and Coupling factors in mind. Tools, which assist in the preliminary design process, are Data Flow Diagrams.

**Code design:**

The purpose of code is to facilitate the identification and retrieval of items of information. A code is an ordered collection of symbols designed to provide unique identification of an entity or attribute. To achieve unique identification there must be only one place where the identified entity or the attribute can be entered in the code; conversely, there must be a place in the code for everything that is to be identified. This mutually exclusive feature must be built into any coding system.

The codes for this system are designed with two features in mind. Optimum human-oriented use and machine efficiency. Length of the code range from a length of one to a length of five characteristics:

- The code structure is unique; ensuring that only one value of the code with a single meaning may be correctly applied to a given entity or attributes.
- The code structure is expansible allowing for the growth of its set of entities and attributes.
- The code is concise and brief for recording, communication, and transmission and storage efficiencies.
- They have a uniform size and format.
- The codes are simple so that the user can easily understand them.
- The codes are also versatile i.e., it is easy to modify to reflect necessary changes in condition, characteristic, and relationships of the encoded entities.
- The codes are also easily storable for producing reports in a predetermined order of form.

## 5.3 CLASS DIAGRAM

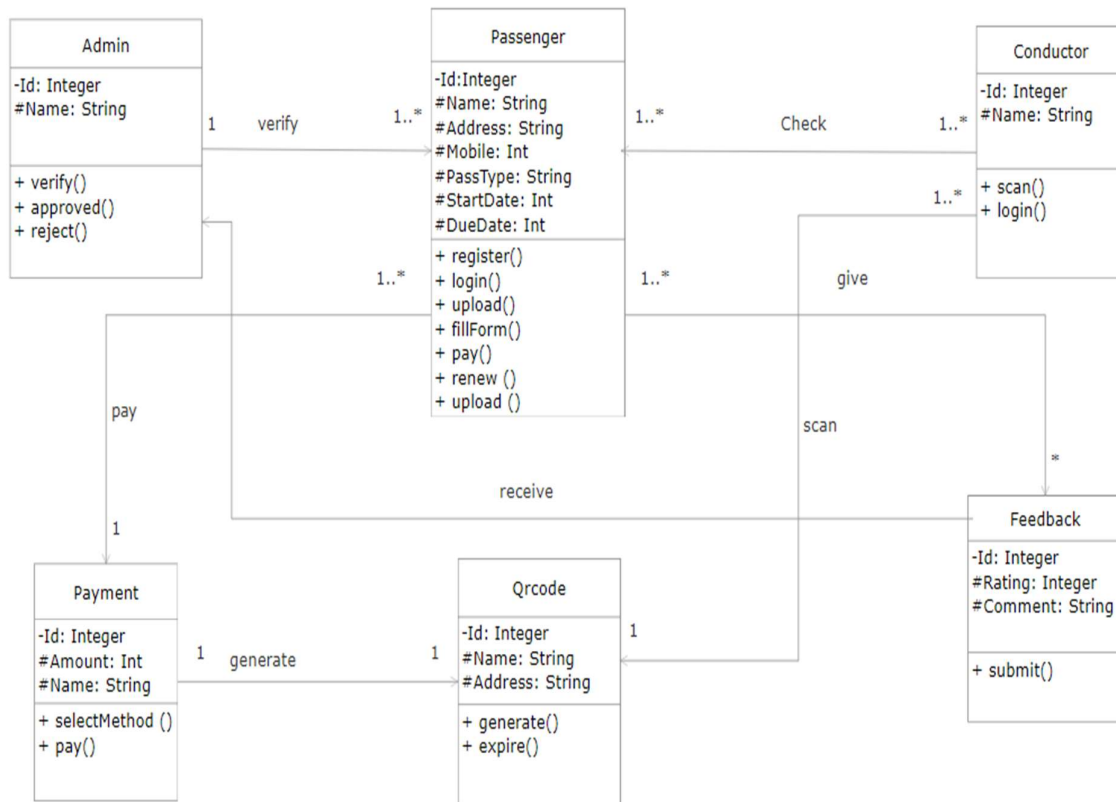


Figure 4: Class Diagram

**The Class Diagram consists of:**

1. **Admin:** The administrator is responsible for storing all the data of passengers and verifying the details.
2. **Passenger:** The user who registers as a new member fills the form, uploads documents, and makes payment to get the QR code.
3. **Conductor:** The person who scans the QR code for verifying the pass of a passenger.
4. **Payment:** The payment class has attributes of select method and pay.
5. **QR code:** QR code is for a particular user.
6. **Feedback:** Feedback must be given by the user about his experience.

## 5.4 ACTIVITY DIAGRAM

An activity diagram visually presents a series of actions or flow of control in a system similar to a flowchart or a data flow diagram. Activity diagrams are often used in business process modeling. They can also describe the steps in a use case diagram. Activities modeled can be sequential and concurrent.

Activity Diagram for Passenger (User):

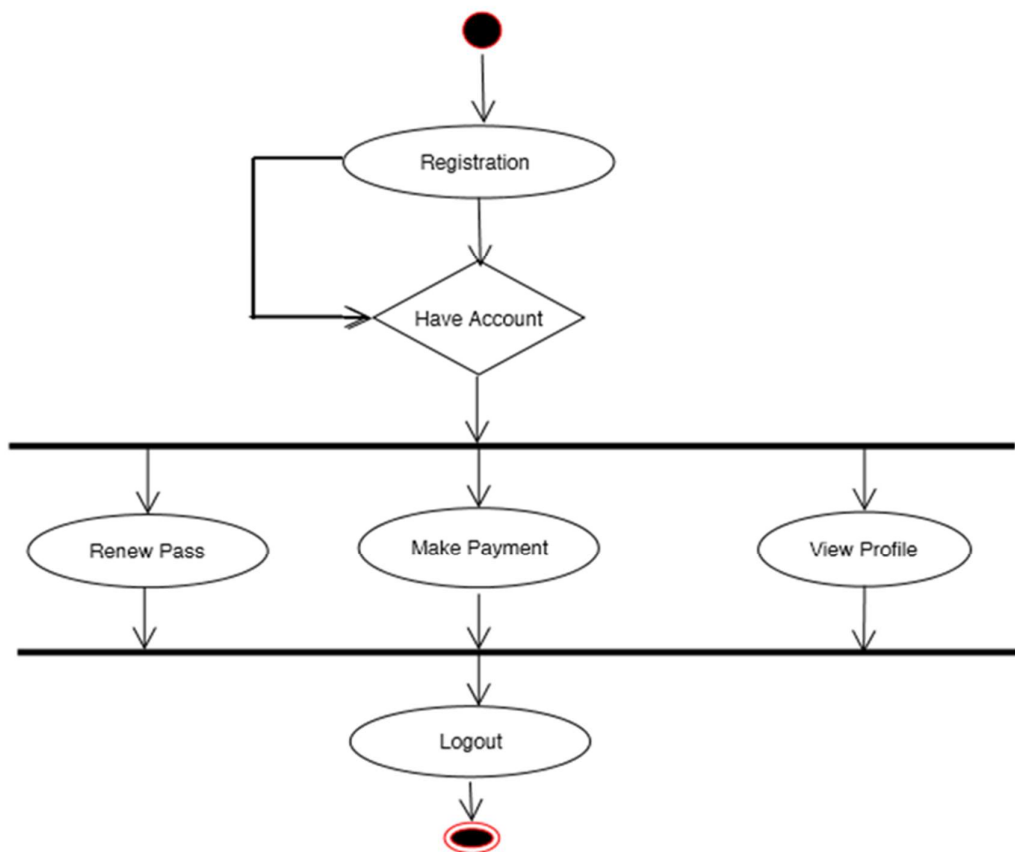


Figure 5: Activity Diagram

## 5.5 INTERACTION DIAGRAM

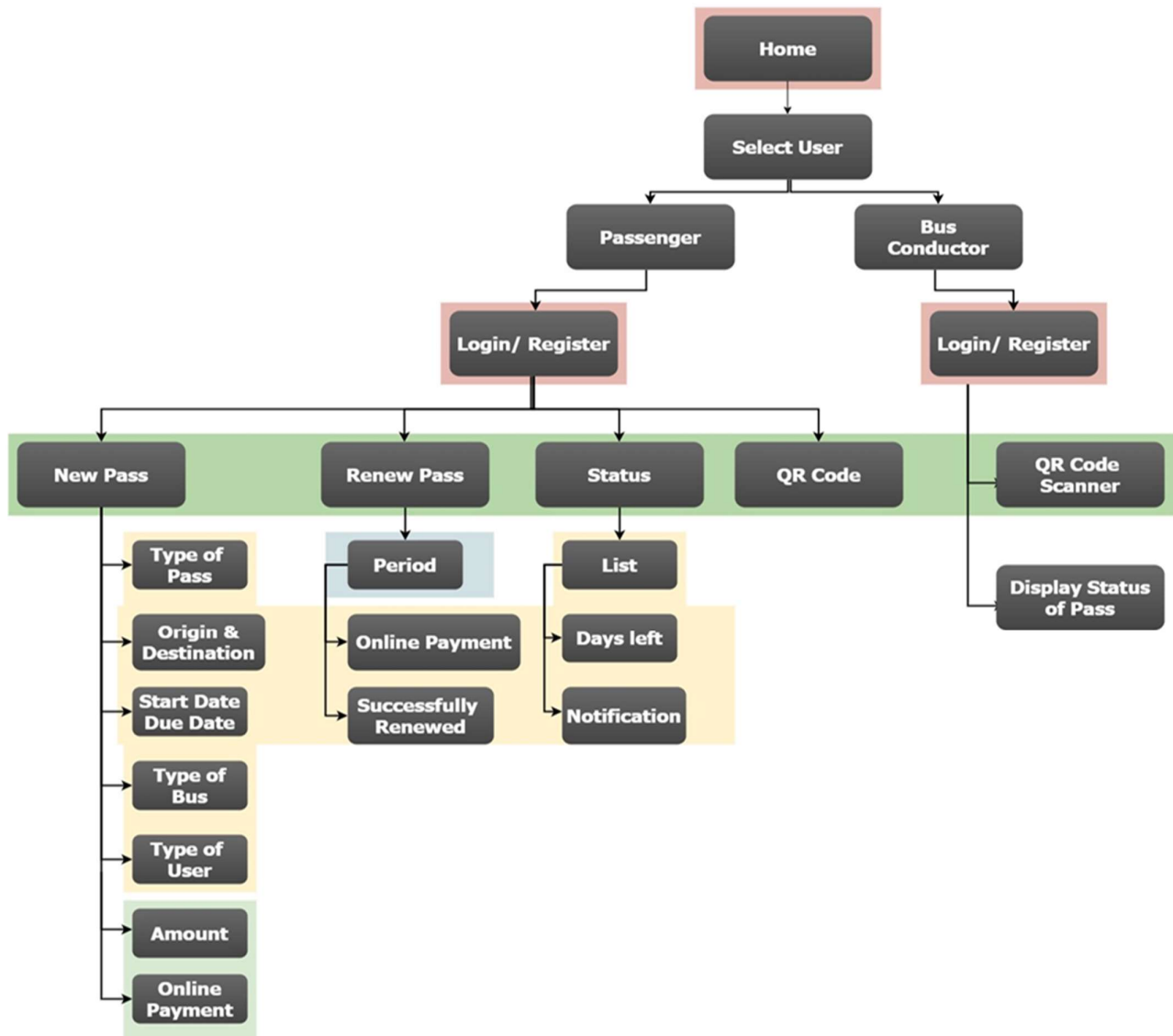


Figure 6: Interaction Diagram



## **6. IMPLEMENTATION**

---

### **6.1 IMPLEMENTATION STRATEGY**

During the software-testing phase, each module of software is thoroughly tested for bugs and accuracy of output. The system developed is very user-friendly and the detailed documentation is also given to the user as online help wherever necessary. The implementation phase normally ends with the formal test involving all the components. The entire system was developed using IONIC Framework, Node Js, Online Heroku Platform, and MongoDB for Database. The Ionic Framework is based on the Angular and HTML, CSS, and NPM packages.

#### **IONIC FRAMEWORK :**

Ionic Framework is an open-source UI toolkit for building performance, high-quality mobile and desktop apps using web technologies (HTML, CSS, and JavaScript).

Ionic Framework is focused on the frontend user experience, or UI interaction of an app (controls, interactions, gestures, animations). It's easy to learn and integrates nicely with library frameworks, such as Angular, or can be used standalone without a frontend framework using a simple script include.

Currently, Ionic Framework has official integration with Angular, but support for Vue and React is in development.

#### **MONGODB:**

MongoDB is a source-available cross-platform document-oriented database program. Classified as a NoSQL database program, MongoDB uses JSON-like documents with optional schemas. MongoDB is developed by MongoDB Inc. and licensed under the Server-Side Public License.

## **Document Database**

A record in MongoDB is a document, which is data structure composed of field and value pairs. MongoDB documents are similar to JSON objects. The values of fields may include other documents, arrays, and arrays of documents.

## **Node.js :**

The Node run-time environment includes everything you need to execute a program written in JavaScript. Node.js came into existence when the original developers of JavaScript extended it from something you could only run in the browser to something you could run on your machine as a standalone application. Now you can do much more with JavaScript than just making websites interactive.

JavaScript now has the capability to do things that other scripting languages like Python can do. Both your browser JavaScript and Node.js run on the V8 JavaScript runtime engine. This engine takes your JavaScript code and converts it into a faster machine code. Machine code is low-level code that the computer can run without needing to first interpret it.

Hence the design of the entire system is user-friendly and simple, the implementation has been quite easy.

## 6.2 IMPLEMENTATION LEVEL DETAILS

### 6.2.1 Home Page :

When the passenger opens the app following homepage will be shown. Customer will get the instructions for using the Secure Digital Ticket Pass Application. It is a Platform independent it can run on both IOS as well as Android.

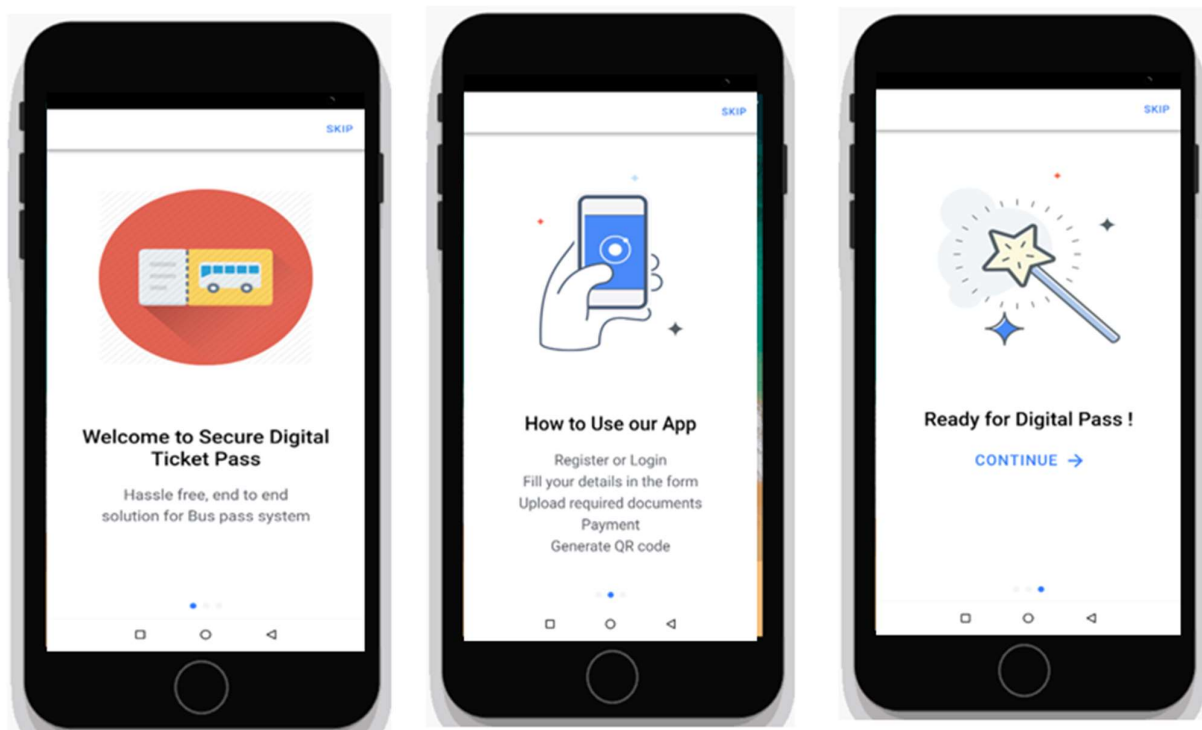


Figure 7: Home Page

### 1.2.2 Passenger Registration And Applying for Pass :

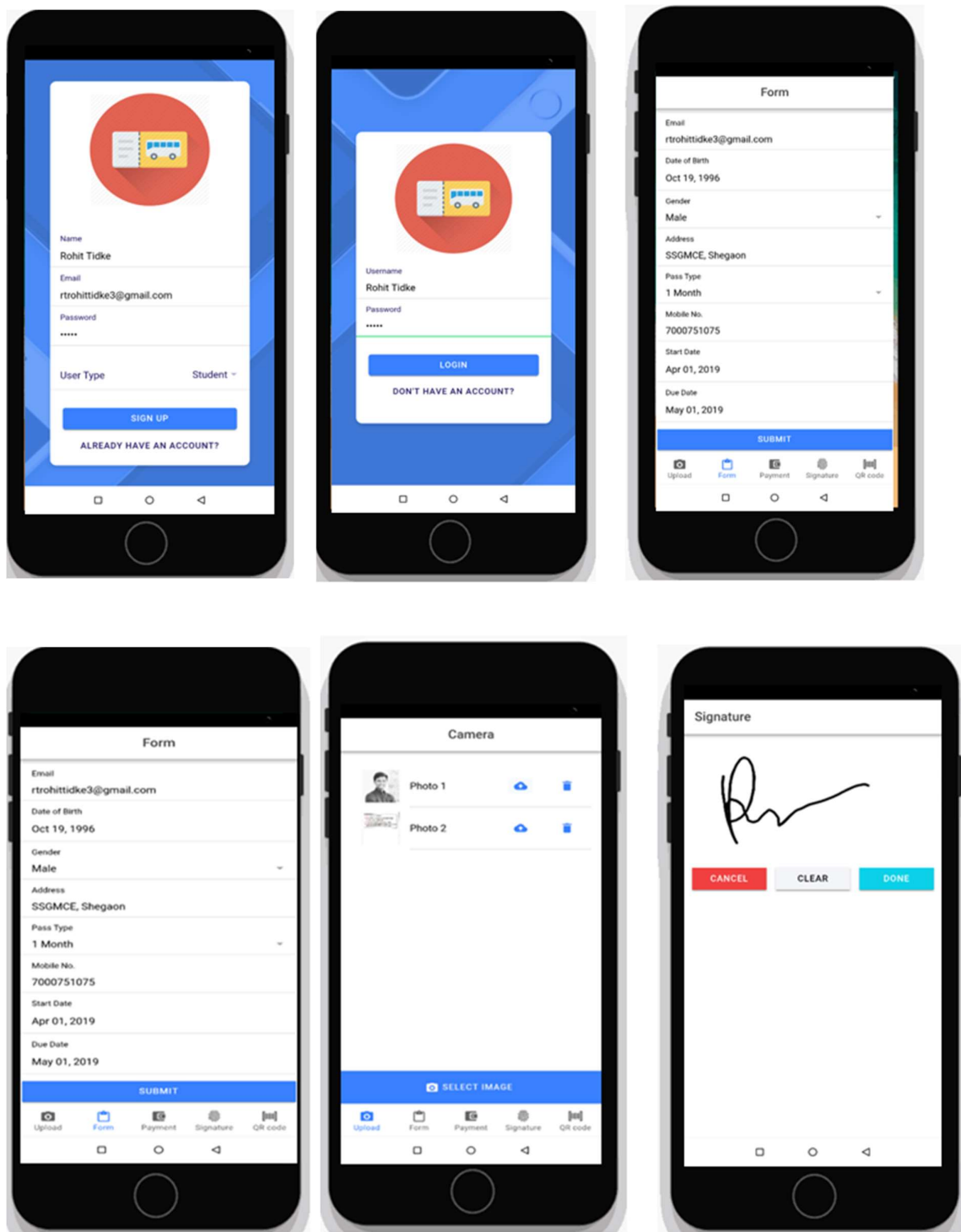
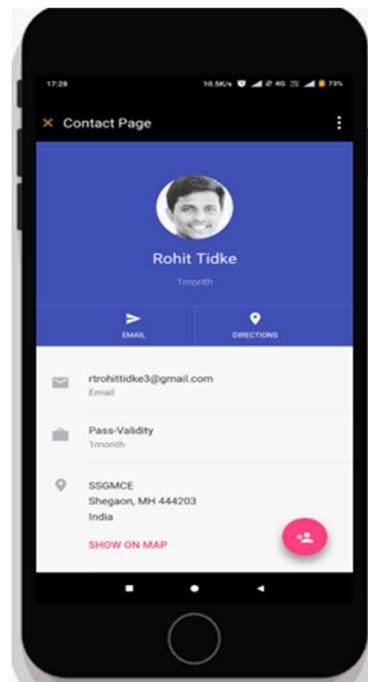
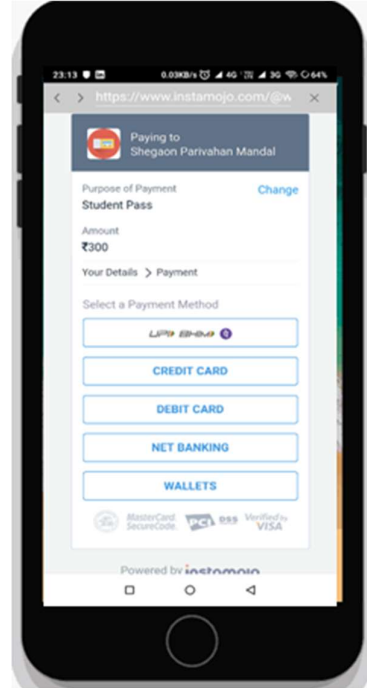
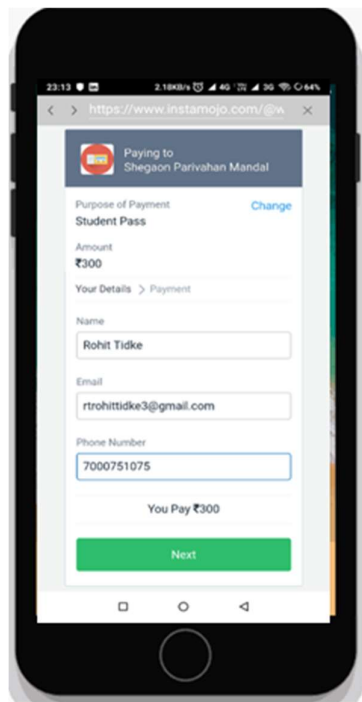


Figure 8: Applying for Pass

### 6.2.3 Making Payment and Generating Pass:



## 6.2.4 Dashboard and Scans from locations:

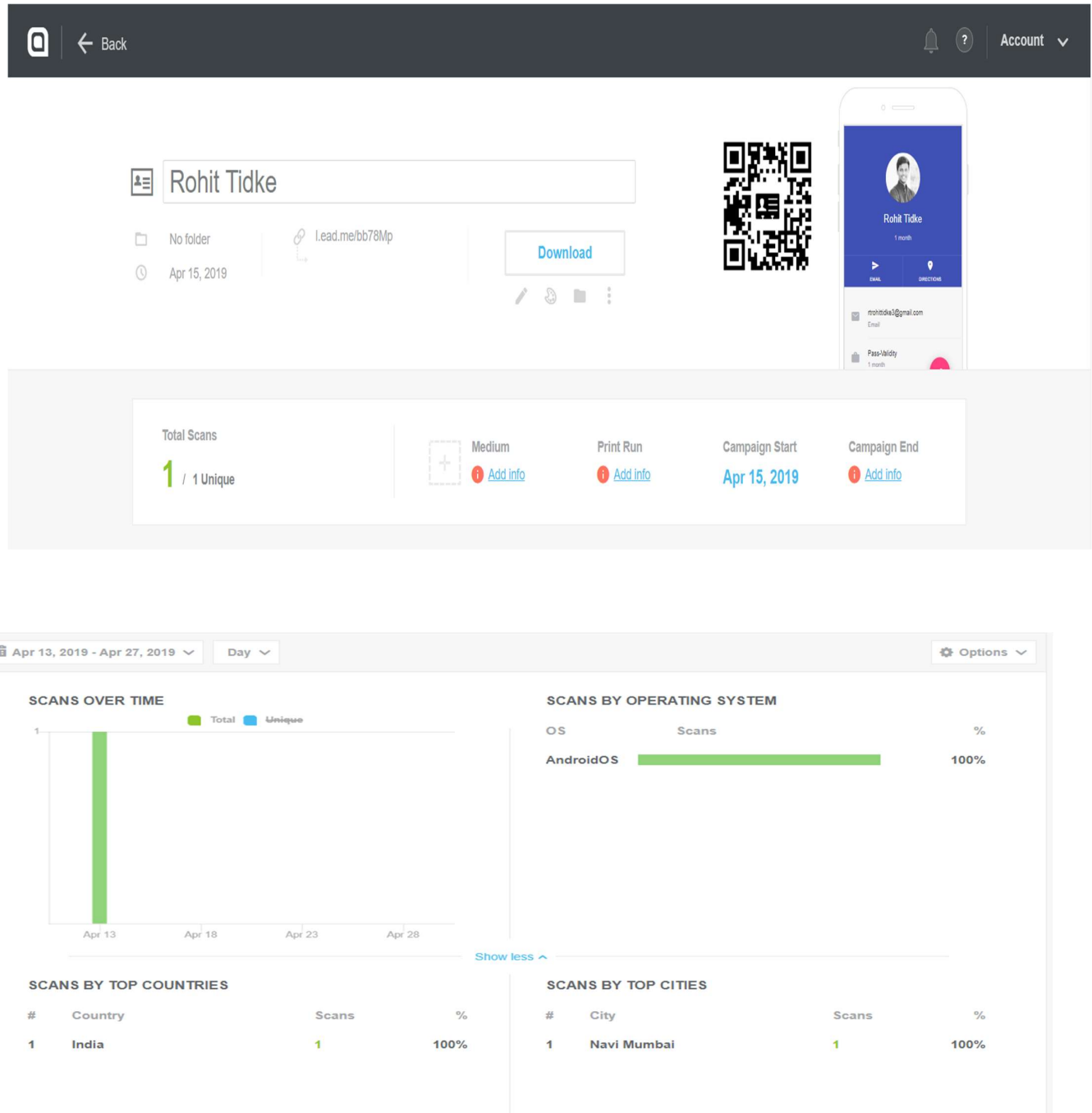


Figure 9: Dashboard and scans from locations

## **6.3 TESTING**

Software testing is an investigation conducted to provide stakeholders with formation about the quality of the software product or service under test. Software testing can also provide an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation. Test techniques include the process of executing a program or application with the intent of finding software bugs (errors or other defects) and verifying that the software product is fit for use.

It can also be stated as the process of validating and verifying that a software program or application or product:

- Meets the business and technical requirements that guided its design and development.
- Works as expected.

### **1.Functional Testing**

Functional testing is a software testing process used within software development in which software is tested to ensure that it conforms to all requirements. Functional testing is a way of checking software to ensure that it has all the required functionality that's specified within its functional requirements. All the modules of this project were tested and were functioning properly.

### **2.Performance Testing**

Performance testing is the process of determining the speed or effectiveness of a computer, network, software program, or device. This process can involve quantitative tests done in a lab, such as measuring the response or the number of MIPS times. For our project, internet connectivity plays a major role in determining performance. Any latency in the network may produce a delay in establishing the connection between the Client and the Database.

**Other Testing Strategies:**

**Alpha Testing:**

This was done at the developer's site by a customer. The software is used in a natural setting with the developer "looking over the shoulder" of the user and recording errors and usage problems. Alpha tests are conducted in a controlled environment.

**Beta Testing:**

This was conducted at one or more customer sites by the end-user of the software. Unlike alpha testing, the developer is generally not present. Therefore, the beta test is a "live" application of the software in an environment that cannot be controlled by the developer. The customer records all problems that are encountered during beta testing and reports these to the developer at regular intervals. As a result of problems reported during beta tests, software engineers make modifications and then prepare for the release of the software product to the entire customer base.

**Test deliverables:**

The following documents are required besides the test plan

- Unit test report for each unit
- Test case specification for system testing
- The report for system testing
- Error report



## **7. RESULT AND DISCUSSION**

---

So, with the help of the above-mentioned procedure, we have completed our project named Secure Digital Ticket Pass using QR code Technology. The technology used in this project is the namely Ionic framework, Node.js express, and MongoDB. Ionic is used for developing hybrid mobile applications it can run on any platform like Android & IOS. Node.js express is used for traditional websites and back-end API services but was designed with real-time, push-based architectures in mind. And finally, for the live Database of the user, MongoDB is used.

**FUTURE SCOPE:**

- Electronics Tickets Across routes – Pay per use. Across State Transports.
- Cloud based Application – can be used from Anywhere.
- Smart City – Smart Transport Cards – One Card Across integrated transport system in the city, Single Fare Card.
- Wallet for money to be used to buy tickets across routes.
- Automation for Conductor / Ticket Checker less travel.
- Aadhar based Biometric Payment Feature.
- Report / financials for the management to take decision like increasing the capacity etc.

**EXTRA FEATURES:**

- Due Date notification
- Fare Rates chart
- Help
- Contact Us

## **CONCLUSION**

---

In this real-time project, we have seen how this app is helpful for people who are facing problems with the current manual work of bus passes. It has resolved the issue of standing in long queue for registration and renewal. It is secure and can't be forged or lost. Digital bus pass is easily verifiable by using QR code. It could reduce the paperwork and save the time of passengers and pass issuing authorities. It also frequently warns the passenger before the expiration of the Pass by sending notifications to the user. This system allows users to renew their bus pass from any time to anywhere. Passenger can make online cashless payment through the app to get new Pass or renew the existing one.

## REFERENCES

---

- [1] Raed M. Bani-Hani, Yarub A. Wahsheh, Mohammad B. Al-Sarhan, "Secure QR Code System", 978-1-4799-7212-8/14/2014 IEEE.
- [2] Joo Leal, Rui Couto, Pedro Mauricio Costa, Teresa Galvo, "Exploring ticketing approaches using mobile technologies: QR Codes, NFC and BLE", 978-1-4673-6596-3/152015IEEE DOI 10.1109/ITSC.2015.9.
- [3] Oliver Jorns, Oliver Jung, Gerald Quirchmayr, "A Privacy Enhancing Service Architecture for Ticket-based Mobile Applications", The Second International Conference on Availability, Reliability and Security (ARES'07), pp. 223–233, 1997 IEEE.
- [4] Prof. Sneha Jagtap, Prajakta Dudhade, Rajshree Pal, Sayali Patil, "DIGITAL BUS PASS USING QR-CODE", International Journal of Science, Engineering and Technology Research (IJSETR) Volume 06, Issue 05, May 2017, ISSN: 2278-7798.
- [5] Prof. Swapnil Gholap, Shivaji Salvi, Subodh Salvi, Vinit Shikhar, "TRAVEL BUDDY - BUS PASS AND TICKET APPLICATION", International Research Journal of Engineering and Technology (IRJET), Volume: 05 Issue: 04 | Apr-2018.

## PROJECT GROUP MEMBERS

---

**Name : Rohit Pardhi**  
**Address : Ward No 19 Waraseoni. Dist.Balaghat 481331.**  
**Email : rohitpardhi90@gmail.com**  
**Mobile No. : 9834611551**



**Name : Rohit Tidke**  
**Address : Ayodhya Nagar Civil Colony**  
**Deulgaon Raja. Dist.Buldhana 443204.**  
**Email : rtrohittidke3@gmail.com**  
**Mobile No. : 9422250832**



**Name : Shivam Shrivastava**  
**Address : Ward No 03 Waraseoni. Dist.Balaghat 481331**  
**Email : sshrivastava711@gmail.com**  
**Mobile No. : 7000751075**

