

PUBLIC TRANSPORTATION SEATING SYSTEM USING IoT

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Abstract— A novel IoT Based Public Transport Seating System is proposed. Every seat in public transport (Bus or Train) will be attached with a switch (push button) or a load cell. The switches are connected to the IOT controller Node MCU. The entire system is monitored using a mobile app from a remote location. Whenever the person sits on a seat the system indicates that the seat is occupied and if there is no person sitting in the seat the system indicates that the seat is empty. Using this device, public transport and vehicle seat occupancy management can be done efficiently and consumers also can be aware of empty/ occupied seats. This will be of great assistance for elders, patients, females, and children to identify the empty seats and board the respective compartments.

Keywords—seating system, IoT controller, remote location, empty seats

I. INTRODUCTION

Nowadays, many people are suffering from seating problems during traveling. In Chennai, it is the third busiest suburban railway system in India after Mumbai and Kolkata. Based on the survey, in Chennai, 5.5 million people are traveling per day.

Out of 5.5 million people, 2.5 million passengers are traveling by local train and metro. A brainy transit method is part of the main thrust areas below the government's initiative for a brilliant town. India's urban population constitutes about 36% and needs exhaustive basic developments in all infrastructure.

Public transport still stays a blessing to individuals as they still prefer local trains and buses for their day-to-day transport. But standing for long hours inside the train even when the seats are available in other compartments on builds strain on more importantly individuals' life. Furthermore, trains stay crowded or with few passengers creating extremely disagreeable and unproductive management of resources.

In the local train, some of the compartment seats are fully occupied and some of the compartment seats are not occupied because of unawareness of available seats. So we proposed a system that solves the seating awareness problem. The system was integrated with the IOT (Internet of Things).

Designing an IoT-based seating availability check system

requires careful consideration of the devices being used, the network architecture, the data storage and processing requirements, and the user interface. A well-designed system can provide real-time information about seat availability and help maintain social distancing in public spaces. With the

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right hardware and software components, a reliable and scalable IoT system can be built to solve this problem.

II. OBJECTIVE

The IoT-based system provides real-time information regarding seat availability sensed by the mini switch and sends information to the app about the availability of seats on the local train. This. The IoT-based public transport seating system aims to allocate vacant seats on the train over the Internet. All the components that are connected to the IoT network can be controlled and secured through your smartphone.

Digitalization of seat availability checking in trains is also a kind of development in this fast-growing world. The Proposed system is designed to detect the seat availability in the train using the mini-switch mounted with some IoT device. In long-distance travel, IoT system helps to increase the efficiency and effective process on every need of the user. An IoT-based seat availability checking system is a smart system that uses IoT technology to monitor the availability of seats in a particular location, such as a public transportation system. The system uses miniswitches and wireless communication to provide real-time information about the availability of seats, allowing users to check the availability of seats remotely.

The system typically consists of a mini-switch placed on each seat, which detects whether the seat is occupied or vacant. These sensors are connected to a central hub, which collects and processes data from the sensors. The hub is connected to the internet, allowing users to access the seat availability data remotely.

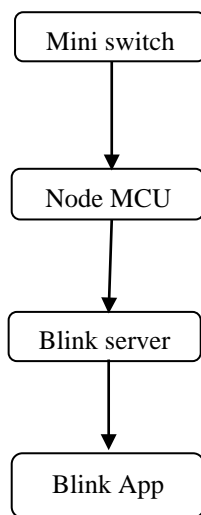
Users can access seat availability information through a mobile app, a website, or other user interfaces. The information is displayed in real time, and users can

easily check the availability of seats in a particular location, reserve seats, or even purchase tickets. The benefits of an IoT based seat availability checking system include improved customer experience, increased efficiency, and reduced waiting times. With real-time information about

resources more efficiently, resulting in cost savings and improved customer satisfaction.

III. SYSTEM DESIGN Architecture:

The architecture of the IoT-based seating availability check system includes multiple layers, including the device layer, the network layer, and the application layer.



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the actual implementation may include additional steps and processes such as:

- Authentication and authorization of the passengers
- Data collection and analysis of the seating

seat availability, users can plan their activities more effectively, reducing the risk of wasted time or missed opportunities. Additionally, the system can help businesses optimize their operations by allowing them to manage their

Device layer:

The device layer includes mini-switch that are placed on seats to detect whether they are occupied or vacant. There are several types of mini-switch available that can be used, such as pressure mini-switch, and load cells. Each node MCU should be battery-powered and connected to the network using wireless protocols like Wi-Fi, and Bluetooth.

Network layer:

The network layer is responsible for connecting the node MCU to the cloud. This layer needs to be reliable and secure to ensure that the data being transferred is accurate and confidential. MQTT or CoAP are popular network protocols used in IoT systems.

Application layer:

The application layer is where the end user interacts with the IoT system. This layer provides the user interface for controlling and monitoring the devices. The application layer can be a web-based or mobile application that displays the seating availability in real time. The application should allow users to view seat availability, book seats, and receive notifications when seats become available.

The system initializes and prepares to receive data from the IoT sensors.

The system retrieves the data from the IoT sensors to determine the seating availability and occupancy levels of the bus or train.

If there are vacant seats available, the system generates a notification for the passenger.

□ If there are no vacant seats available, the system generates a notification for the passenger regarding the expected waiting time for the next bus or train.

□ The system sends a notification to the passenger's smartphone with the available seat number and location, allowing them to locate and occupy the seat.

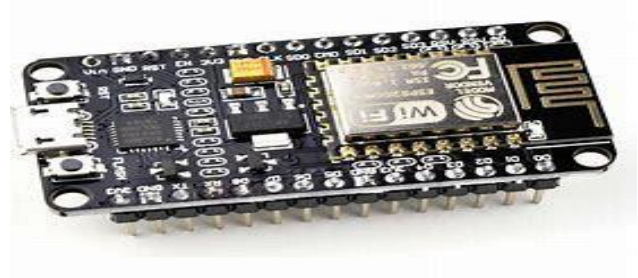
If there are no vacant seats available, the system sends a notification to the passenger's smartphone with the expected waiting time for the next bus or train, allowing them to plan their travel accordingly.

availability and passenger load

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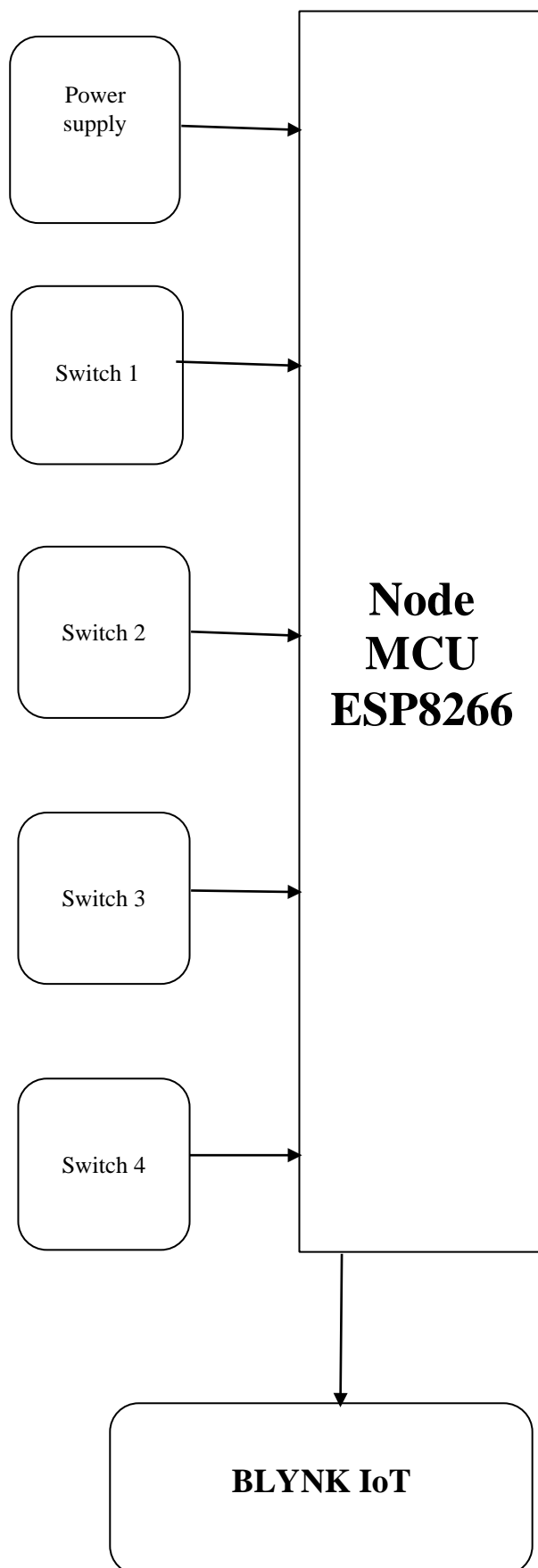
- Monitoring and management of the IoT devices and network
- Feedback collection and analysis from the passengers and operators.

This flow chart outlines the basic steps of an IoT-based public transport seating system, from detecting the seating availability to providing real-time information to the passengers. The implementation of such a system requires a robust infrastructure, reliable data transmission, and secure data management. Additionally, the system may include other features such as authentication, and feedback collection to enhance its functionality and usability.



The circuit diagram outlines the main components and functions of an IoT-based public transport seating system. It requires a reliable and secure network infrastructure, robust hardware components, and efficient data management and processing. The implementation of such a system requires a significant investment in technology and resources, but it can enhance the passenger experience and improve the operational efficiency of public transport services.

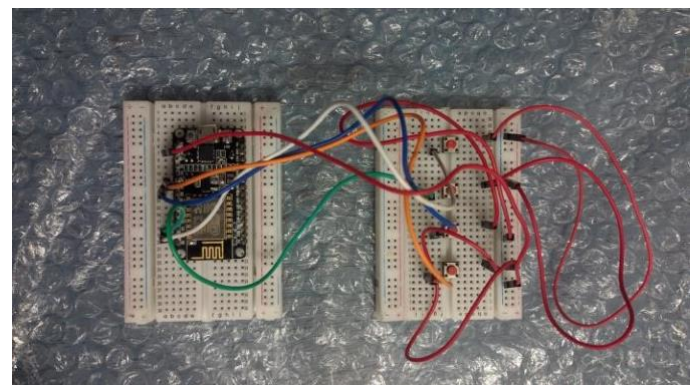
IV. CIRCUIT DIAGRAM



The microcontroller acts as the main processing unit of the system. It receives the seating data from the sensors and sends it to the Wi-Fi module for transmission. It can also perform basic data processing and analysis, such as calculating the occupancy levels and generating alerts.

The Wi-Fi module enables communication between the microcontroller and the cloud platform. It uses Wi-Fi protocols to transmit the seating data for processing.

Digital screens or mobile apps provide seating availability information to passengers. They can display the availability status of each seat and allow the passengers to select a seat or receive a seat assignment based on their preferences. They can also receive feedback from the passengers and transmit it to the cloud platform for analysis and improvement.



V. BENEFITS

There are several benefits of an IoT-based public transport seating system:

- Improved passenger experience: An IoT-based public transport seating system can provide realtime information to passengers about the seating availability and occupancy levels of the bus or train. This can help the passengers to plan their travel accordingly and choose the most convenient and comfortable seat available, thereby improving their overall experience.
 - Enhanced operational efficiency: An IoT-based public transport seating system can provide valuable data to the transport operators, such as the passenger load, route performance, and maintenance needs of the vehicles. This can help the operators to optimize their resources, improve service quality, and reduce operational costs.
 - Reduced environmental impact: An IoT-based public transport seating system can encourage more people to use public transport services, thereby reducing the number of cars on the road and the associated air pollution and carbon emissions.
 - Improved safety and security: An IoT-based public transport seating system can help to prevent overcrowding in the bus or train, which can lead to safety risks and accidents. It can also provide data for better security management and emergency response.
- Innovative and modern image: An IoT-based public transport seating system can enhance the image of public transport services as modern, innovative, and customer-centric. It can attract more customers and promote the sustainable development of urban mobility.

VI. RESULT/FINDINGS

Findings such a system can lead to improved passenger satisfaction and comfort, as passengers can easily access information on available seating options and choose the most convenient and comfortable seats. This can lead to increased ridership and revenue for the transport operators, as well as improved image and reputation for the public transport services.

Secondly, an IoT-based public transport seating system can optimize the seating occupancy levels and reduce the risk of overcrowding, which can enhance the safety and security of the passengers. It can also provide valuable data on passenger load, route performance, and maintenance needs of the vehicles, which can help transport operators improve their operational efficiency and reduce costs.

Additionally, an IoT-based public transport seating system can promote a more innovative and customer-centric image of public transport services, which can attract more customers and enhance the sustainable development of urban mobility.

VII. CONCLUSION

- In conclusion, an IoT-based public transport seating system can provide multiple benefits for passengers, transport operators, and society as a whole. By leveraging the power of IoT devices and data analytics, the system can optimize the seating occupancy levels, improve the travel experience, and enhance the operational efficiency of public transport services.
- The implementation of an IoT-based public transport seating system requires a significant investment in technology and resources, but it can lead to significant cost savings, environmental benefits, and safety improvements in the long run. It can also contribute to the sustainable development of urban mobility and the reduction of carbon emissions and air pollution.
- Moreover, an IoT-based public transport seating system can enhance the image of public transport services as modern, innovative, and customer-centric, and attract more customers to use public transport services. This can promote the sustainable development of urban mobility and improve the quality of life of urban residents.
- Therefore, an IoT-based public transport seating system is a promising solution for the challenges and opportunities of urban mobility in the 21st century, and can contribute to the creation of a smarter, greener, and more inclusive urban environment.