© 2025 ADYPJIET, Volume 1(1), Online ISSN: 3049-1517, September 2025, pp. 19-26

Ajeenkya DY Patil Journal of Innovation in Engineering & Technology

Journal Homepage: https://www.adypsoe.in/adypjiet

A Web Controlled IOT – Based Digital Notice Board

[1] **Prof. Meenakshi Annamalai,**
[2] **Muskan Shaikh**
[3]**Sakshi Kshirsagar**
[4] **Diksha Borhade**
[5] **Pruthviraj Chavan**

[1]Professor, Ajeenkya D Y Patil School of Engineering, Pune, INDIA
[2-5] UG students, Ajeenkya D Y Patil School of Engineering, Pune, INDIA

Article History:
Received: *19-08-2025*
Revised: *12-09-2025*
Accepted: *28-09-2025*

Abstract:

The launch of new dynamic information in a variety of industries, the conventional paper notice boards of the past and the earlier electronic display systems are seriously outdated. The available digital notice board solutions are based on hardware-intensive platforms or lack secure and scalable options for remote content management. In addition, taking mentioned gaps into consideration, we have a lightweight system architecture that supports authenticated web-based notice publishing and real-time wireless display on an LED matrix panel. Architecture and communication protocols of the current systems as well as existing features were surveyed widely. The paper introduces the realization of an ESP32-based, Wi-Fi-enabled IoT digital notice board system. It is more affordable and versatile than a regular digital notice board. There's room for improvements, especially in terms of broader control over information and bigger capacity as well as content management.

Keywords: *:* IOT, Digital Notice Board, Web Control Raspberry Pi, ESP32, Real-time communication, Content Management.

Introduction

Effective communication is a crucial prerequisite for ensuring the timely distribution of information in institutional settings like public spaces schools and workplaces. In these evolving environments

traditional manual notice boards have become increasingly less effective due to their high susceptibility to human error and labor - intensive updates. As the business expands, the static paper system becomes unfeasible, thereby emphasizing the need for improved communication. The concept of IoT-based notice boards, which display digital content through wired connections or GSM messages, was thus brought into play [1].

Even though these systems eliminated manual labor they had drawbacks like lengthy messages, reliance on mobile networks, increased operating expenses and a lack of centralized control, In addition, many early systems lacked functionality for multiple users and real-time updates. With the advent of the Internet of Things (IoT) intelligent networked display systems that can be operated from a distance via wireless networks have become possible. IoT-based digital notice boards enable administrators to quickly update announcements from any location by utilizing wireless communication internet technologies and small microcontrollers. This paper proposes a web-based digital board for IoT using ESP32 to provide a reliable wireless connection, control, and update, which overcomes the limitations of previous designs.

1. Literature Review

In recent years, developments in digital notice board technologies have mainly targeted transforming traditional paper-based notice boards to intelligent and IoT-based display technologies. AI-based intelligent notice boards utilizing chatbot technologies and web applications have also achieved better automation capabilities, as highlighted in literature [1]. Cloud-based real-time-based digital notice board technologies have also improved central data management and real-time synchronization, as addressed in literature [2]. Hardware-oriented technologies utilizing Raspberry Pi technologies have also achieved embedded display technologies via network-based communication protocols, as discussed in literature [3].

Further, for enhanced accessibility, some systems were found to include Android and multi-lingual interfaces for remote publishing and user interaction [4]. IoT-based smart notice boards integrating wireless microcontrollers, such as the ESP8266 model, allowed the system to send messages remotely using the internet [5]. The invention of voice-assisted notice boards also introduced intelligent interaction mechanisms for dynamic notice management [6]. A Raspberry Pi-based centralized system was also used for the management of a web structure and synchronization of the notice display [7].

Further research on the implementation of smart classroom environments emphasized the need to optimize the access control of the notice boards and their systematic development using IoT-enabled platforms [8]. The use of web-control mechanisms using Node MCU microcontrollers proved the need to publish electronic notices through the browsers and communicate between the microcontrollers using Wi-Fi infrastructure [9]. In the same way, wireless electronic notice boards implemented using IoT communication models have been used to verify the mechanisms of remotely updating and real-time display of the digital notice boards [10].
Despite these improvements, it has been noted that in various implementations, hardware execution and output visualization remain key priorities, while software validation, secure authentication, and

developmental strategies remain less emphasized. This formed the basis of how the proposed work is created, with a main focus on establishing a secure web-based cloud-assisted framework before any hardware rollover.

Research Gap Analysis

- Many existing systems emphasize hardware execution and real-time visualization, while the software control part is not independently validated.
- Advanced functionalities such as AI, voice, or multilingual are often implemented without secure web-based authentication that would be suitable for institutional environments.
- The cloud-based solutions of digital boards allow remote access, but they inadequately handle structured notice management and access control.
- Few works present a step-by-step development approach whereby the web and cloud architecture is tested prior to hardware integration.

2. Methodology and system evaluation:

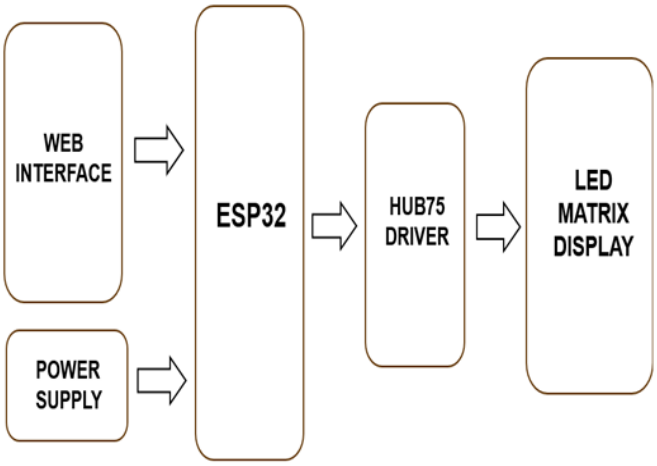

Fig. 1. Block Diagram of the Proposed Web-Controlled IOT Digital Notice Board System

As per the Fig.1, the web interface also enables users to input notice content remotely. ESP32 microcontroller receives and processes notice data via Wi-Fi. The HUB75 driver is a controller for signal timing and distribution for the LED Matrix. The LED matrix display will show real-time rendering of the content of the notice displayed on it.

The proposed system incorporates a web-centric and cloud-assisted approach for the dissemination of digital notices, which involves the use of a secure web application, cloud IoT platform, and embedded display interface.

A. System Framework

The architecture is composed of three layers: a web interaction layer, a cloud IoT layer, and a local display layer. In the proposed architecture, the web layer allows authorized users to publish a notice remotely, the cloud layer is responsible for the centralized storage and synchronization of the data related to the published notice, and the display layer is used to display the latest notice on the board.

B. Online Application and User Verification

The online platform is developed with the help of HTML, CSS, and JavaScript. The backend authentication system is handled with the help of a Node.js service along with a PostgreSQL database. User credential verification is done before allowing access to the interface to submit the notice.

C. Cloud Based Notice Management

Throughout the authentication procedure, it should be noted that the contents of the notice are made accessible to the cloud-based IoT platform, and the information is stored in a dedicated field and defined as the channel. This data is accessible in real-time, and the recent notices can be accessed through the cloud.

D. Integrated Controller and Display Interface

The microcontroller uses the ESP32 to retrieve the latest information from the cloud through a WiFi connection. This information is then processed. The processed information in the notified message is then retrieved by the LED matrix display through a HUB75 driver. This modified message is then displayed by the matrix, making it stable. The latest notification received is stored due to problems with the connection to the network.

3. Simulation and experimental results:

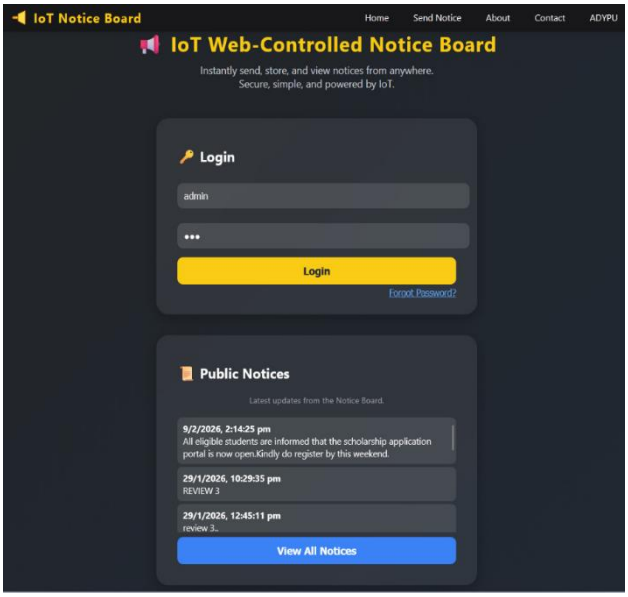

Fig. 2 Simulation

A. Software Experiment Setup:

Within the system, there is a web application to manage alerts, a server for processing logins, and cloud storage for IoT data. Developed the front end which operates on publicly available hosting services. Logging in operates via a system driven by Node.js (Express) - an API - that verifies account information against a PostgreSQL database. Central repository for saving and retrieving notification information in ThingSpeak addresses IoT simulation requirements. The web interface transmits alerts via validated API calls, mimicking how embedded sensors could connect in the future. On stable web applications, desktop tests flowed easily through known browsers. By the phone, tests transitioned smoothly across various screens with stable internet connection

B. Validation of Software Module Performance

Subsequently, once they were built separately, attention shifted to analysing how the elements interacted collectively. Their collaboration was subsequently challenged by assessing the authentication module using both correct and incorrect login credentials. Access to the notice submission dashboard was restricted to verified individuals, linking front-end validation to background data management. After the sample text alerts were sent through the web, it was clear how every notification was logged in the designated field.

C. Simulation of IOT Data Flow:

Although physical hardware was not deployed in Phase 1, an end-to-end IoT data flow was logically simulated using a cloud platform. The ThingSpeak channel acted as an intermediary between the web application and the future embedded device, and each notice uploaded through the web interface represented the exact data payload that would be retrieved by an ESP32-based display unit in the next phase. This simulation confirmed that the software stack could support real-time IoT communication without modification.

D. Analysis of findings:

The findings from the experiments validate that the software architecture effectively facilitates secure notification management and cloud data transfer. The authentication system successfully prevents unauthorized access, whereas the cloud platform ensures secure storage and retrieval of notification information.

4. Result Analysis:

The simulation succeeds in demonstrating the interfacing of the ESP32 microcontroller with the LED Matrix Display. In the demonstration, test text is correctly rendered to the display to confirm the correct implementation of the microcontroller display control logic. The correct functionality of the ESP32-based microcontroller for the LED Matrix Display project is therefore confirmed.

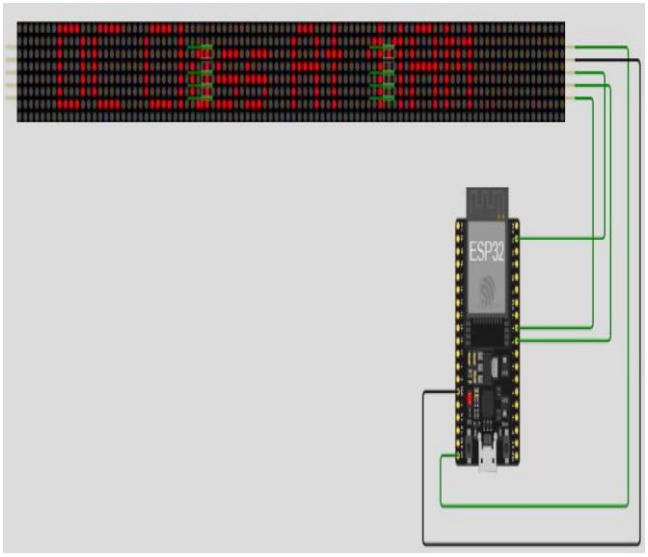

Fig. 3 Simulation of ESP32 interfacing with LED matrix display.

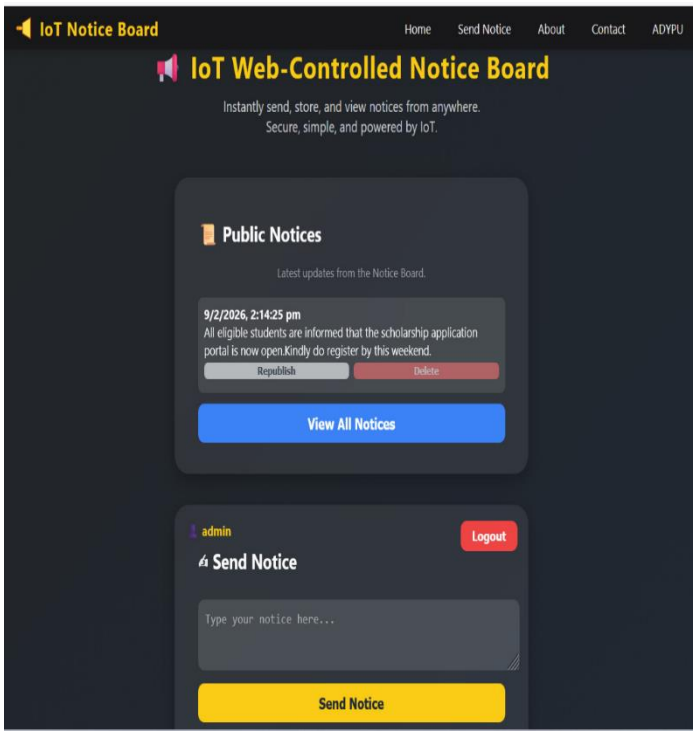

Fig.4 Real-Time Web Portal for Notice Publishing and Management

The developed web application enables an authenticated interface for authorized users to create remote notices with all notices being stored through a cloud platform. The system recognizes secure

login, real-time notice submission, and thus validating the software framework for subsequent hardware integration in later phases.

5. Discussion

In this present study, the application of the suggested idea of a web-controlled IoT-based digital notice board system with a major focus on the software framework, has been addressed. A cloud IoT-based secure web application for generating, storing, and accessing data has been created. Additionally, the experimental results confirm the reliability of the proposed software architecture and its appropriateness for implementation with embedded display devices. Unlike many existing implementations, the proposed system incorporates a secure authorized login mechanism that restricts notice publishing access to verified users only.

References:

1. Dr. C. V. Subhaskara Reddy, K. S. Harsha; V. N. Charan, P. Sai Teja., AI-Powered Smart Notice Board with Chatbot Integration Using Raspberry Pi, Django, and Rasa, International Journal of Creative Research Thoughts (IJCRT), Vol. 13, Issue 4, Apr. 2025.

2. Arpan Wanve, Alka Shrivastava, Abhijeet Deshpande, Pritam Landage, Shweta Ratnaparkhi, Arpith Malke, Real-Time Cloud Based Smart Digital Notice Board, International Journal of Innovative Research in Technology (IJIRT), Vol. 11, No. 11, Apr. 2025 .

3. Sumit Bhamre, Yash Gala, Mandar Kolhe, Rohit Kshirsagar, Dr. Viplav Soliv, Digital Notice Board Using Raspberry Pi, International Journal of Innovative Research in Technology (IJIRT), Volume 6, Issue 12, April 2025.

4. Dr. K. Rasadurai, IoT Based Multi Language (ML) Smart Notice Board Using Android App, International Innovation & Practices (IIP) Series, 2024 .

5. Pratik Barge, Omkar Pawar, Pranav Deshmukh, Nikhil Patil., IoT Based Smart Notice Board, Research Inventy: International Journal of Engineering and Science, Vol. 14, Issue 3, Mar. 2024.

6. T. V. Ananda Babu, K. Suresh, M. Haritha, P. Divya, K. Anusha., Smart Notice Board using Voice Chat, International Journal of Advanced Technology and Engineering Methods (IJATEM), Vol. 5, Issue 5, May 2024.

7. Ajay B., Sneha R., Varsha K., Manoj S., Empowering Communication: A Raspberry Pi- Based Smart Noticeboard System, International Journal for Multidisciplinary Research (IJFMR), Vol. 6, Issue 3, May– June 2024.

8. Anushree Das PT, Megna Raj M, Rahila M, Fathima Shafna P N, Haseena M, Karishma, A Digital Notice Board for Smart Classroom Using IoT, International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET), 2023.

9. R. Mathan Abishek, S. Keerthana, P. S. Keerthivasan, P. Shalini., Web Controlled Smart Notice Board using NodeMCU, International Journal of Progressive Research in Engineering Management and Science (IJPREMS), Vol. 03, Issue 08, Aug. 2023.

10. Khadar Basha N., Jonnalagadda Padma Priya, Inamadugu Harika, Oguri Vanaja; Komatineni Mounika, Design of Wireless Electronic Notice Board Using IOT, International Journal of Research Publication and Reviews (IJRPR),2022.

.