V-Wall A Virtual Bulletin Board For Digital Communication In Educational Institutions

Malathi M[1], Menakha Priya N[2], Pavithra A[3], Manasadevi J[4]

[1] Assistant Professor, Department of Computer Science and Engineering,
Adhiyamaan College of Engineering (Autonomous), Hosur – 635130, Tamil Nadu, India
[2,3,4] Student, Department of Computer Science and Engineering,
Adhiyamaan College of Engineering (Autonomous), Hosur – 635130, Tamil Nadu, India

Abstract—The Virtual Bulletin Board (V-Wall) is a modern web-based platform designed to replace traditional physical notice boards with a centralized and digital communication system. It enables staff members to securely upload circulars, event posters, and announcements, which students can easily view, filter, share, and download in real time. Built using the MERN architecture (MongoDB, Express.js, React.js, Node.js), the system ensures seamless performance, scalability, and an intuitive user experience. Security and privacy are reinforced through JWT-based authentication and role-based access control (RBAC), ensuring that only authorized staff can create or manage posts. This paper discusses the architecture, implementation, and outcomes of the V-Wall project, highlighting its role in enhancing institutional communication and reducing paper dependency.

Index Terms—Digital Bulletin Board, MERN Stack, JWT Authentication, Web Application, Institutional Communication

I. INTRODUCTION

The Virtual Bulletin Board (V-Wall) is a comprehensive digital communication platform designed to transform the traditional method of information dissemination within educational institutions. Instead of relying on physical notice boards that require manual updates and often lead to information delays, V-Wall provides a centralized, real-time, and interactive digital solution accessible to both staff and students.

Developed using the MERN stack—MongoDB, Express.js, React.js, and Node.js—the platform supports modern full-stack web development principles. The frontend, built with React.js, delivers a smooth and responsive user experience, while the backend uses Express.js and Node.js to handle data requests and authentication. MongoDB Atlas serves as the database, ensuring reliable and scalable data storage.

The key purpose of V-Wall is to bridge communication gaps through efficient, secure, and eco-friendly interactions while eliminating physical constraints and delays associated with notice boards.

II. LITERATURE SURVEY

Traditional academic communication relies heavily on printed notices displayed on departmental boards. Systems such as mobile apps and web notices have been proposed to improve this [1], but many lack real-time updates or secured access control. For instance, web applications built for university-wide notifications [2] achieved ease of use but lacked integration with user roles and filtering capabilities. Studies on smart notice boards via IoT [3] introduced hardware dependencies.

This research highlights a need for a scalable, cloud-based solution that integrates secure authentication, categorized announcements, real-time updates, and student interaction features — all of which are addressed in the V-Wall system.

II. SYSTEM OVERVIEW

A. Existing System
Most institutions continue to use physical notice boards to display event updates, academic schedules, and exam announcements. This system:
- Relies on manual updates

- Requires printing and distribution
- Causes information delays
- Isn't accessible remotely

B. Proposed System

The V-Wall digital bulletin board system overcomes these limitations by:

- Allowing staff to upload posts anytime from any device
- Enabling students to access notices in real-time
- Integrating role-based authentication to restrict access
- Letting students save, pin, or download content directly

C. System Architecture

The architecture of V-Wall consists of:

- Frontend: Built with React.js to provide a responsive UI
- Backend: Express.js with Node.js to handle business logic and APIs
- Database: MongoDB Atlas cloud database for storing posts and user details
- Authentication: JSON Web Tokens (JWT) for secure login and role-based access
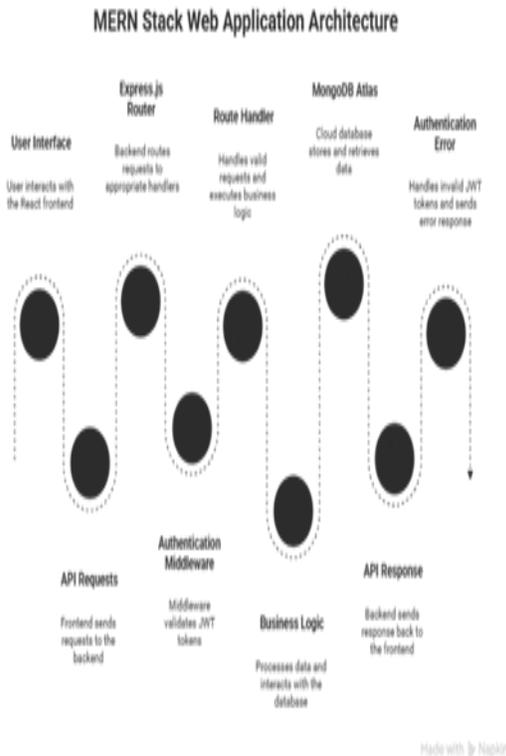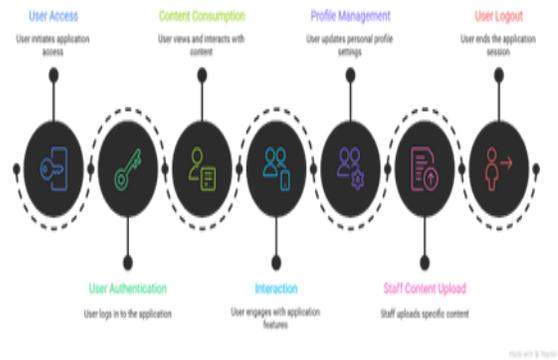

Fig.1 System Architecture of V-Wall

Fig 2.Data Flow Diagram

IV. SYSTEM IMPLEMENTATION

Use A. Frontend

The frontend uses React.js, providing:

- A modern and clean user interface
- Dynamic post rendering
- Search and filter features
- Category-based tabs (Circulars, Events, Announcements)

B. Backend

The backend is powered by Node.js and Express.js:

- Exposes REST APIs
- Implements role-based authentication
- Handles CRUD operations for posts
- Validates and stores uploaded files

C. Database
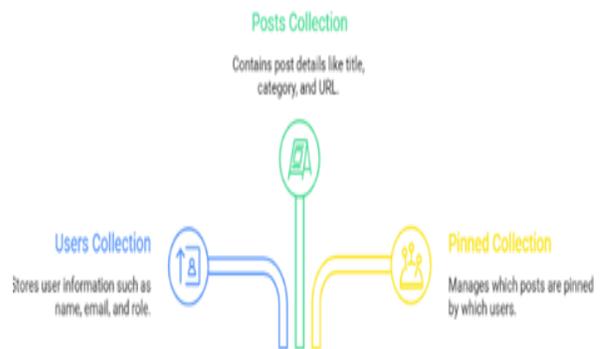
MongoDB Atlas stores:

Fig 3. Shows collections in MongoDB (Users, Posts, etc.)

- User details (name, role, email)
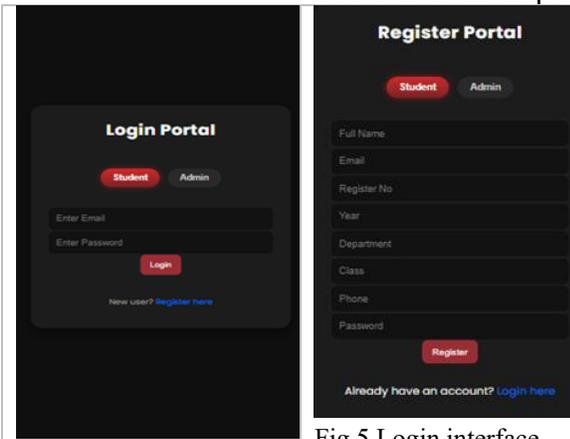- Posts (title, description, file URL, poster details)

Fig 4.Registration portal of V-Wall

Fig 5.Login interface for authorized access

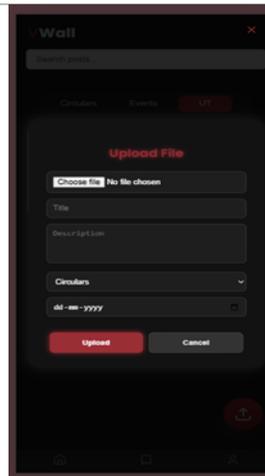Fig 6.Homepage view showing categorized announcements

Fig 7. Upload interface used by staff members to post informations

Fig 8.Post card layout in the student view

- Pinned data (user-post mapping)

Fig 3. Shows collections in MongoDB (Users, Posts, etc.)

V. RESULTS AND DISCUSSION

The V-Wall application was successfully deployed as a cloud-based web platform accessible to students and staff across devices. The platform's core features are shown in Fig. 5 through Fig. 9.24×7 Availability: As the platform is deployed on the cloud, users can access content at any time and from remote locations, enhancing accessibility.

Faster Access:Students and staff can access notices and circulars instantly after upload, without delays associated with manual posting.
Reduced Paper Usage:
Digitizing the notice circulation process significantly reduces paper wastage and associated manual work, leading to cost and effort savings.
Engaging Interface:
Features like pinning, searching, filtering, and downloading increase user engagement and interaction with notices (see Fig. 7 and Fig. 9).
Screenshot Walkthrough:

- Fig. 4 shows the Registration Page, where new users can create an account using institutional credentials.
- Fig. 5 presents the Secure Login Page, enabling role-based access for staff and students.
- Fig. 6 displays the Homepage, which provides categorized posts such as circulars and events for students.
- Fig. 7 shows the Upload Page, allowing staff to post notices and documents
- Fig. 8depicts an individual Post Card, which shows details like title, category, and action buttons like pinning and downloading.

VI. CONCLUSION

The V-Wall system effectively modernizes campus communication, eliminating dependencies on physical media. Future enhancements may include:
- Mobile application for iOS/Android
- Analytics dashboard for admin users
- Offline access support and AI-based tag suggestions

APPENDIX

A. JWT Authentication Code Sample (Backend – Node.js)

```
const jwt = require('jsonwebtoken');
const authenticate = (req, res, next) => {
 const token = req.header('auth-token');
 if (!token) return res.status(401).json({ msg: 'Access denied' });
 try {
 const verified = jwt.verify(token, process.env.TOKEN_SECRET);
 req.user = verified;
 next();
 } catch (err) {
 res.status(400).send('Invalid token');
 }
}
module.exports = authenticate;
```

B. MongoDB Schema (User Collection)

```
const mongoose = require('mongoose');
const userSchema = mongoose.Schema({
 name: {type: String, required: true},
 email:  type: String, required: true, unique: true},
 password: {type: String, required: true},
 role: {type: String, enum: ['staff', 'student'], default: 'student'}
});
module.exports = mongoose.model('User', userSchema);
```

ACKNOWLEDGMENT

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