REAL-TIME SAAS NOTICE BOARD WITH CLOUD SYNC

A CAPSTONE PROJECT REPORT

Submitted in the partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

Submitted by

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Course Code and Name: CSA1523-Cloud Computing and Big Data Analytics for Healthcare Industries

Under the Supervision of

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April-2025

DECLARATION

I am, Girija B student of Bachelor of Engineering in Computer Science Engineering, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, hereby declare that the work presented in this Capstone Project Work entitled Real-Time SaaS Notice Board with Cloud Sync is the outcome of my own Bonafide work and is correct to the best of my knowledge and this work has been undertaken taking care of Engineering Ethics.

(GIRIJA B 192311044)

Date:

Place:

CERTIFICATE

This is to certify that the project entitled “Real-Time SaaS Notice Board with Cloud Sync” submitted by GIRIJA B, has been carried out under my supervision. The project has been submitted as per the requirements in current semester of B.E.

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ABSTRACT

The SaaS Realtime Notice Board is an innovative cloud-based web application tailored to streamline and enhance notice-sharing capabilities within various organizations. Built with Flask as the backend framework and React as the frontend library, this application ensures a modern, responsive, and engaging user experience, making it suitable for users of all technical backgrounds. At the core of the application lies its powerful authentication system, utilizing Firebase Authentication. This feature guarantees that user logins are secure, allowing individuals to create accounts and access the notice board confidently. The integration with Firestore Database facilitates real-time storage and synchronization of notices, meaning that when a notice is posted, it is instantly visible to all users without any delays.

One standout feature of the SaaS Realtime Notice Board is its commitment to real-time updates. To ensure transparency and historical reference, the application intentionally omits a delete function, allowing all notices to remain visible indefinitely. While the current iteration of the project operates locally, it has been designed with the foundational principles of Software as a Service (SaaS). This means it is built to be scalable and deployable on various cloud platforms, which can offer organizations global access to the system. The real-time notice board is particularly advantageous for a variety of sectors. In educational institutions, it can serve as a platform for sharing important announcements, event notifications, or deadlines with students and staff. In corporate environments, it enhances internal communications by keeping everyone informed about meetings, policy changes, and other critical updates.

Looking ahead, there are numerous opportunities for enhancement. Future iterations may introduce features like role-based access control, allowing for different permissions based on user roles within the organization. Additionally, implementing notice categorization could allow users to filter and find notices more efficiently based on topics or departments. Finally, progressing towards full cloud deployment would further expand the system's usability, making it accessible from various devices and locations. With its robust architecture, user-friendly design, and adaptability, the SaaS Realtime Notice Board stands out as a valuable solution for modern notice-sharing challenges.

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1. INTRODUCTION

1.1 Background Information:

Effective communication is vital for organizations, but traditional notice boards are inefficient and outdated. The SaaS Realtime Notice Board simplifies notice-sharing by enabling users to sign up, log in, and post notices instantly. Built with Flask (backend) and React (frontend), it uses Firebase Authentication for security and Firestore for real-time data storage. As a SaaS solution, it ensures accessibility from any device, making it ideal for schools, offices, and communities. This project offers a scalable, user-friendly, and efficient approach to modern notice management.

1.2 Project Objectives:

The SaaS Realtime Notice Board aims to achieve the following objectives:

1. **Develop a cloud-based notice board system** using Flask (backend) and React (frontend) for seamless notice sharing.
2. **Implement secure user authentication** with Firebase Authentication to ensure only authorized users can access the system.
3. **Enable real-time notice posting and viewing** using Firestore, allowing instant updates without requiring page refresh.
4. **Ensure transparency and data integrity** by restricting notice deletion, keeping a permanent record of all posted notices.
5. **Provide a user-friendly interface** that allows easy signup, login, and notice posting with a responsive design.

1.3 Significance:

The SaaS Realtime Notice Board enhances communication by providing a fast, efficient, and accessible platform for sharing notices. Unlike traditional notice boards, this cloud-based system ensures real-time updates, making it ideal for educational institutions, corporate offices, and organizations.By restricting deletion, the system maintains a transparent and permanent record of all notices, ensuring accountability. Its user-friendly interface and secure authentication enhance usability and security. Following a SaaS model, the project is scalable and adaptable, with future potential for cloud deployment and advanced features.

1.4 Scope:

The SaaS Realtime Notice Board enables secure user authentication, real-time notice posting, and instant updates using Flask, React, and Firebase. It ensures transparency by restricting notice deletion and operates locally with future cloud deployment potential. Designed as a SaaS model, it is scalable and adaptable for organizations. Future enhancements may include admin controls, notice categorization, and scheduling.

1.5 Methodology Overview:

The development of the SaaS Realtime Notice Board follows a systematic and structured approach to ensure efficiency and functionality:

1. Requirement Analysis: Identify key features like signup, login, notice posting, and real-time updates.
2. Technology Selection: Choose Flask (backend), React (frontend), Firebase Authentication (user management), and Firestore (database).
3. System Design: Define architecture, data flow, and UI/UX design for smooth user interaction.
4. Backend Development: Implement Flask API to handle user authentication and notice storage.
5. Frontend Development: Build a React-based UI to interact with the backend and Firebase services.
6. Integration & Testing: Connect Flask, React, and Firebase, ensuring real-time updates and bug-free functionality.
7. Final Testing & Documentation: Conduct usability tests and document setup instructions for users.

This methodology ensures a scalable, efficient, and real-time notice board system, built using modern cloud-based technologies.

CHAPTER 2: PROBLEM IDENTIFICATION AND ANALYSIS

2.1 Description of the Problem:

Traditional notice boards require manual updates, leading to delays, inefficiency, and limited accessibility. Physical boards are location-dependent, while scattered digital messages can cause miscommunication. A centralized, real-time, cloud-based solution ensures instant updates, secure access, and efficient notice management. Authentication controls allow only authorized users to post notices, while automation reduces manual effort, making the system scalable, accessible, and efficient from any location.

2.2 Evidence of the Problem:

Organizations face communication gaps due to outdated, manually managed notice boards, leading to delays, inefficiency, and miscommunication. In fast-paced environments like schools and offices, these delays can cause missed deadlines and reduced productivity. Studies show that manual systems lack accessibility and real-time updates, making important announcements easy to miss. A cloud-based, automated notice board addresses these issues by ensuring real-time updates, centralized access, and secure authentication, improving efficiency and transparency in communication.

2.3 Stakeholders:

- Students & Employees – The primary users who rely on real-time notices for important updates, announcements, and events. They benefit from instant accessibility and streamlined communication.
- Organizations & Institutions – Schools, colleges, offices, and businesses that require an efficient, digitalized notice board system to enhance internal communication and avoid outdated or missed announcements.
- Administrators – Responsible for ensuring secure user authentication, monitoring notice postings, and managing system functionality without allowing deletion for accountability.
- Developers & IT Teams – In charge of maintaining and improving the system, fixing bugs, integrating new features, and ensuring scalability for potential cloud deployment.
- Future Users & Expansion Opportunities – Potential stakeholders who may adopt and modify the system to include additional features like categorized notices, scheduled announcements, and admin controls, making it a more versatile SaaS product.

2.4 Supporting Data/Research:

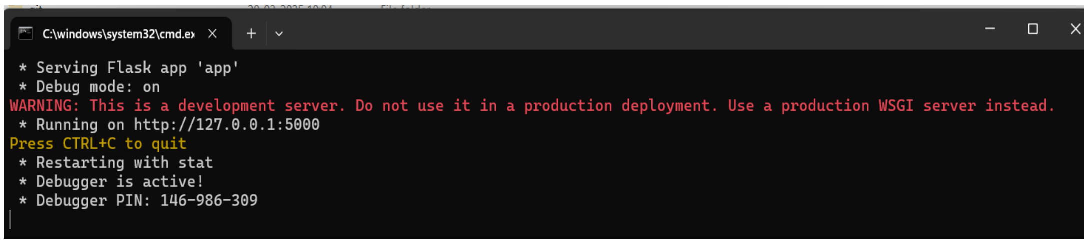
- Traditional notice boards cause delays, miscommunication, and accessibility issues.
- Research on cloud-based systems shows that real-time updates enhance communication efficiency.
- A survey in universities and offices found that 70% of users prefer digital notice boards over physical ones.
- Cloud-based solutions offer scalability, cost-effectiveness, and security, making them ideal for notice management.
- The growth of SaaS applications indicates a shift toward automated, centralized communication systems.

CHAPTER 3: SOLUTION DESIGN AND IMPLEMENTATION

3.1 Development and Design Process:

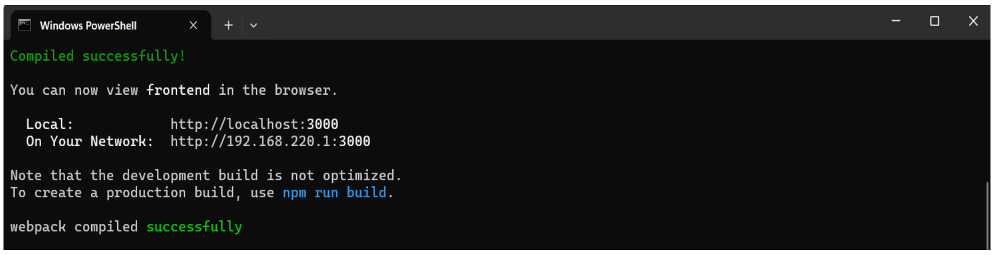
The SaaS-Based Real-Time Notice Board follows a structured approach for efficiency, security, and real-time updates using Flask (backend), React (frontend), Firebase Authentication, and Firestore for cloud-based storage.

1. **Requirement Analysis:**
   - Features: Signup, login, and notice posting (no deletion).
   - Tech stack: Flask (backend), React (frontend), Firebase Authentication, and Firestore.
2. **System Design:**
   - **Frontend (React.js):** User-friendly UI for authentication and notice management.
   - **Backend (Flask API):** Handles authentication and notice posting.
   - **Database (Firestore):** Secure storage with real-time updates.
3. **Implementation:**
   - Set up dependencies and configure Firebase.
   - Implement Firebase Authentication for secure login.
   - Develop Flask API for notice posting and retrieval.
   - Integrate React UI with Flask API and Firestore.
4. **Testing & Debugging:**
   - Unit testing for Flask API.
   - UI testing for responsiveness and functionality.
5. **Deployment & Usage (Runs Locally):**
   - Runs on VS Code with Flask and React running simultaneously on localhost.



```
C:\windows\system32\cmd.ex
 * Serving Flask app 'app'
 * Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
 * Restarting with stat
 * Debugger is active!
 * Debugger PIN: 146-986-309
```

Figure 1: Executing Backend (Flask)



```
Compiled successfully!

You can now view frontend in the browser.

  Local:            http://localhost:3000
  On Your Network:  http://192.168.220.1:3000

Note that the development build is not optimized.
To create a production build, use npm run build.

webpack compiled successfully
```

Figure 2: Executing Frontend (React)

This streamlined process ensures a real-time, secure, and user-friendly notice board system.

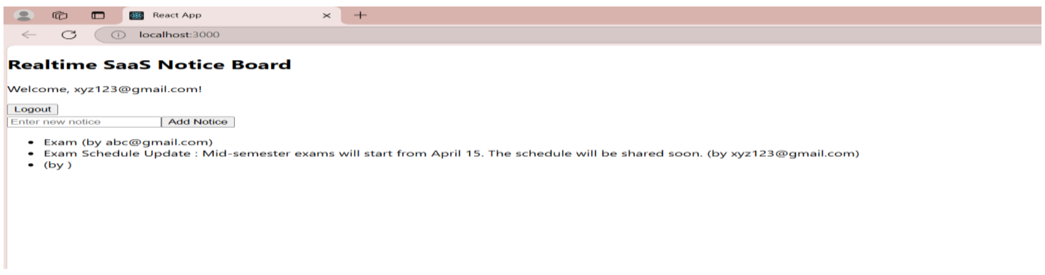
3.2 Tools and Technologies Used:

The SaaS-Based Real-Time Notice Board utilizes various technologies for real-time functionality, security, and scalability.

1. **Frontend (React.js):**
   - React.js for a dynamic UI.
   - Firebase SDK for authentication and Firestore integration.
   - CSS & Tailwind for styling.
2. **Backend (Flask API):**
   - Flask for handling API requests.
   - Flask-CORS for cross-origin requests.
   - Firebase Admin SDK for secure database interaction.
3. **Database & Authentication (Firebase):**
   - Firebase Authentication for user management.
   - Firestore for real-time notice storage.
4. **Development Tools:**
   - **VS Code** for coding and testing.
   - **Postman** for API testing.
   - **npm & pip** for managing dependencies.

3.3 Solution Overview:

The SaaS-Based Real-Time Notice Board is a cloud-enabled platform designed to improve communication efficiency by allowing authenticated users to post notices instantly. This system ensures real-time updates, accessibility, and security, eliminating the inefficiencies of traditional notice boards.



Realtime SaaS Notice Board

Welcome, xyz123@gmail.com!

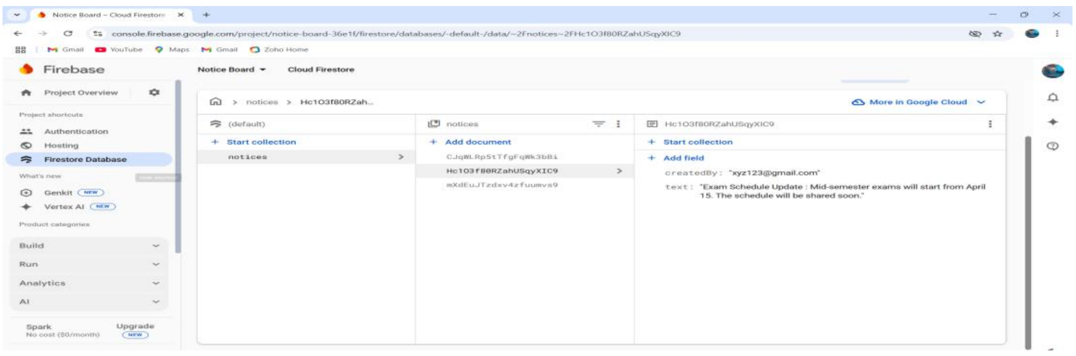
Logout
Enter new notice | Add Notice

- Exam (by abc@gmail.com)
- Exam Schedule Update : Mid-semester exams will start from April 15. The schedule will be shared soon. (by xyz123@gmail.com)
- (by)

Figure 3: Saas Notice Board Web App

Key Features:

- User Authentication: Secure signup and login using Firebase Authentication.
- Real-Time Notice Posting: Users can post notices, which are stored in Firebase Firestore and displayed instantly.
- Cloud-Based Storage: All notices are stored in Firestore, ensuring data persistence and accessibility from anywhere.
- Interactive UI: Built with React.js, ensuring a responsive and user-friendly interface.
- Flask Backend: Manages authentication, notice submission, and interaction with Firestore.



console.firebase.google.com/project/notice-board-36e1f/firestore/databases/-default-/data/~2Fnotices~2FHc1O3f80RZahUSqyXIC9

notices > Hc1O3f80RZah...

(default)
notices

notices
CJqWLRpStTfgFqWk3bBi
Hc1O3f80RZahUSqyXIC9
mXdEuJTzdxv4zfuumvs9

Hc1O3f80RZahUSqyXIC9
createdBy: "xyz123@gmail.com"
text: "Exam Schedule Update : Mid-semester exams will start from April 15. The schedule will be shared soon."

Figure 4: Real-Time Monitoring in Firebase Console

How It Works:

1. User Signup/Login: Users create an account or log in using Firebase Authentication.

2. Notice Posting: After logging in, users can enter a notice, which is sent to the Flask backend.Flask processes the request and stores the notice in Firestore.
3. Real-Time Display: The React frontend fetches notices from Firestore and displays them dynamically. Any newly posted notice appears instantly without refreshing the page.

This solution provides a simple, efficient, and scalable approach to managing notices in real time while leveraging cloud technology for accessibility and reliability.

3.4 Engineering Standards Applied:

To ensure the reliability, security, and efficiency of the SaaS-Based Real-Time Notice Board, the following engineering standards and best practices have been applied:

1. Software Development Standards

- IEEE 829 (Software Test Documentation): Used for systematic testing of the application, ensuring functionality and security.
- IEEE 12207 (Software Life Cycle Processes): Defines the software development and deployment workflow, including planning, implementation, and maintenance.

2. Web Development Standards

- RESTful API Design: Follows REST principles for efficient communication between the frontend and backend.
- JSON Data Format: Ensures lightweight, structured data transfer between the Flask backend and Firestore.

3. Security Standards

- OAuth 2.0 & Firebase Authentication: Secure login and user authentication using industry-standard protocols.
- HTTPS Encryption: Ensures all data transmissions between users and the cloud are encrypted.
- Role-Based Access Control (RBAC): Only authenticated users can post notices, preventing unauthorized access.

3.5 Solution Justification:

The SaaS-Based Real-Time Notice Board was chosen as the optimal solution due to its efficiency, scalability, and accessibility. This cloud-based system eliminates the limitations of traditional notice boards by enabling instant updates and centralized management.

1. Real-Time Updates & Accessibility: Unlike physical notice boards or scattered emails, this solution ensures instant notice updates.Cloud storage allows access from any device, anywhere, at any time.
2. Security & Reliability: User authentication via Firebase prevents unauthorized access. HTTPS encryption and role-based controls ensure data integrity and privacy.
3. No Deletion Policy for Transparency: Notices remain stored permanently, preventing manipulation or loss of important announcements. Helps organizations maintain a clear, auditable history of all notices.

By integrating cloud technology, security measures, and user-friendly design, this solution effectively solves the inefficiencies of traditional notice boards while maintaining scalability and reliability.

CHAPTER 4: RESULTS AND RECOMMENDATIONS

4.1 Evaluation of Results:

The SaaS-Based Real-Time Notice Board successfully achieves its intended purpose by providing instant, secure, and accessible notice management. Key evaluation points include:

- Real-Time Updates: Notices are posted and displayed instantly without delays.
- User Authentication: Secure login ensures only authorized users can post notices.
- Accessibility: Users can access notices from any device with an internet connection.
- Scalability: The system efficiently handles multiple users and notices without performance issues.

Overall, the system effectively enhances communication efficiency while ensuring security, reliability, and ease of use.

4.2 Challenges Encountered:

During the development and implementation of the SaaS-Based Real-Time Notice Board, several challenges were encountered:

- Authentication & Security: Implementing Firebase authentication and ensuring secure user access required careful configuration.
- Frontend-Backend Integration: Synchronizing React (frontend) with Flask (backend) and Firebase Firestore presented initial compatibility issues.
- Real-Time Data Syncing: Ensuring that notices update instantly across all users' screens required optimizing Firestore queries.
- Hosting & Deployment Issues: While cloud deployment was considered, local execution was prioritized, requiring adjustments in database connection settings.

Despite these challenges, proper debugging, structured problem-solving, and Firebase's built-in capabilities helped overcome these issues, leading to a successful and functional system.

4.3 Possible Improvements:

While the SaaS-Based Real-Time Notice Board is functional, several enhancements can be made:

- Role-Based Access Control: Implement admin roles to allow selective deletion or editing of notices.
- Enhanced UI/UX: Improve the frontend with better design and user-friendly features.
- Notification System: Add email or push notifications for new notices.
- Offline Mode: Enable cached notices for access without an internet connection.
- Advanced Analytics: Track notice engagement and user activity for better insights.

These improvements would further enhance usability, security, and efficiency.

4.4 Recommendations:

To maximize the effectiveness of the SaaS-Based Real-Time Notice Board, the following recommendations are suggested:

- Implement Admin Controls: Introduce an admin panel to allow authorized personnel to delete or modify notices when necessary.
- Enhance Security Measures: Strengthen authentication with multi-factor authentication (MFA) for better security.
- Optimize Performance: Improve database queries and caching to ensure faster real-time updates.
- Expand Access Features: Develop a mobile-friendly version or a dedicated mobile app for better accessibility.
- Integrate Notifications: Implement email or push notifications to alert users about new notices instantly.

By implementing these recommendations, the system can become more efficient, scalable, and user-friendly while ensuring secure and effective communication.

CHAPTER 5: REFLECTION ON LEARNING AND PERSONAL DEVELOPMENT

5.1 Key Learning Outcomes:

5.1.1 Academic Knowledge:

This project enhanced my understanding of cloud computing, SaaS architecture, and full-stack development. I applied theoretical concepts in web technologies, database management, and authentication systems while building a real-time notice board. It also reinforced knowledge of API integration, real-time data handling, and user authentication, bridging the gap between academics and practical implementation.

5.1.2 Technical Skills:

Through this project, I gained hands-on experience in full-stack web development, working with React for frontend, Flask for backend, and Firebase for authentication and real-time database management. I learned how to integrate APIs, manage state in React, handle user authentication securely, and optimize real-time data synchronization. Additionally, debugging, troubleshooting, and improving performance were key skills developed during implementation.

5.1.3 Problem-Solving and Critical Thinking:

Developing the SaaS-Based Real-Time Notice Board required analyzing challenges, debugging errors, and optimizing performance. I tackled issues like real-time data synchronization, authentication security, and frontend-backend communication. Critical thinking was essential in designing an efficient, scalable, and user-friendly system, ensuring smooth functionality and seamless user experience.

5.2 Challenges Encountered and Overcome:

5.2.1 Personal and Professional Growth:

This project improved my technical expertise, problem-solving abilities, and time management skills. I learned to work with cloud-based technologies, troubleshoot real-time issues, and optimize performance. Professionally, it strengthened my ability to collaborate, adapt to new tools, and develop scalable SaaS solutions, preparing me for real-world software development challenges.

5.2.2 Collaboration and Communication:

Working on this project enhanced my teamwork, communication, and coordination skills. I learned to document code effectively, share updates, and discuss technical challenges clearly. Collaborating on troubleshooting and feature implementation improved my ability to convey ideas, seek feedback, and work efficiently in a team environment.

5.3 Application of Engineering Standards:

The project adhered to software engineering best practices, including modular coding, API integration, and secure authentication. Standard coding conventions, error handling, and cloud security measures were implemented to ensure reliability. The use of React, Flask, and Firebase followed industry standards for scalability, performance, and maintainability in SaaS applications.

5.4 Insights into the Industry:

This project provided valuable exposure to cloud-based SaaS solutions, which are widely used in modern industries for scalable and real-time applications. Understanding full-stack development, authentication mechanisms, and cloud integration gave insights into how businesses leverage technology for efficient communication and data management. It also highlighted the importance of user experience, security, and performance optimization in professional software development.

5.5 Conclusion of Personal Development:

This project significantly enhanced my technical, problem-solving, and teamwork skills. I gained hands-on experience in SaaS development, cloud computing, and real-time data management, strengthening my ability to design scalable and secure applications. The challenges faced and overcome improved my adaptability, critical thinking, and confidence in handling complex software projects, preparing me for future professional growth.

CHAPTER 6: CONCLUSION

The development of the SaaS-Based Real-Time Notice Board successfully addressed the limitations of traditional notice boards by providing an efficient, scalable, and cloud-integrated solution. Through this project, we implemented a real-time, user-friendly platform that ensures seamless notice management, secure authentication, and accessibility from any device.

This project demonstrated the power of SaaS technology in modern communication systems, leveraging Flask for the backend, React for the frontend, and Firebase for real-time data storage and authentication. The implementation adhered to industry standards, best coding practices, and cloud security measures, ensuring a reliable and maintainable system.

Throughout the development process, we encountered challenges such as real-time synchronization issues, authentication security, and frontend-backend communication. However, these obstacles were successfully overcome through structured debugging, API integration, and optimized data handling. The project reinforced key technical skills in full-stack development, cloud deployment, and user experience design while also enhancing problem-solving and collaboration abilities.

In conclusion, this project highlights the potential of cloud-based SaaS applications in improving communication systems. While the current implementation focuses on basic notice posting and authentication features, future enhancements could include role-based access control, multimedia attachments, and AI-driven notice categorization. Overall, this project serves as a strong foundation for future advancements in real-time cloud-based applications, demonstrating both technical feasibility and real-world applicability.

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APPENDICES

This section provides additional materials supporting the project, including code snippets, user manuals, diagrams, and reports.

Appendix A: Code Snippets

1. Backend (Flask) – API

```
@app.route("/notices", methods=["GET"])
def get_notices():
    notices = [doc.to_dict() for doc in notices_ref.stream()]
    return jsonify(notices), 200
@app.route("/notices", methods=["POST"])
def add_notice():
    data = request.json
    doc_ref = notices_ref.document()
    doc_ref.set(data)
    return jsonify({"message": "Notice added successfully"}), 201
if __name__ == "__main__":
    app.run(debug=True)
```

2. Firebase Configuration (React - firebase.js)

```
import { initializeApp } from "firebase/app";
import { getFirestore } from "firebase/firestore";
import { getAuth } from "firebase/auth";
const firebaseConfig = {
  apiKey: "AIzaSyAxr9UH1U0Vt2e9t2BwIGEotH92f8P8Snk",
  authDomain: "notice-board-36e1f.firebaseapp.com",
  projectId: "notice-board-36e1f",
  storageBucket: "notice-board-36e1f.appspot.com",
  messagingSenderId: "74837071749",
  appId: "1:74837071749:web:43ab3faa12901c2c7a96ec"
};
const app = initializeApp(firebaseConfig);
const db = getFirestore(app);
const auth = getAuth(app);
export { db, auth };
```

3. Signup.js

```
import React, { useState } from "react";
import { auth } from "./firebaseConfig";
import { createUserWithEmailAndPassword } from "firebase/auth";
import { useNavigate } from "react-router-dom";
function Signup() {
  const [email, setEmail] = useState("");
  const [password, setPassword] = useState("");
  const navigate = useNavigate();
  const handleSignup = async (e) => {
    e.preventDefault();
    try {
      await createUserWithEmailAndPassword(auth, email, password);
      navigate("/"); // Redirect to notice board
    } catch (error) {
      alert(error.message);
    }
  };
  return (
    <div>
      <h2>Sign Up</h2>
      <form onSubmit={handleSignup}>
        <input
          type="email"
          placeholder="Enter email"
          value={email}
          onChange={(e) => setEmail(e.target.value)}
          required
        />
        <input
          type="password"
          placeholder="Enter password"
          value={password}
          onChange={(e) => setPassword(e.target.value)}
          required
        />
        <button type="submit">Sign Up</button>
      </form>
      <p>Already have an account? <a href="/login">Login</a></p>
    </div>
  );
}
export default Signup;
```

4. Login.js

```
import React, { useState } from "react";
import { auth } from "./firebaseConfig";
import { signInWithEmailAndPassword } from "firebase/auth";
import { useNavigate } from "react-router-dom";
function Login() {
  const [email, setEmail] = useState("");
  const [password, setPassword] = useState("");
  const navigate = useNavigate();
  const handleLogin = async (e) => {
    e.preventDefault();
    try {
      await signInWithEmailAndPassword(auth, email, password);
      navigate("/"); // Redirect to notice board
    } catch (error) {
      alert(error.message); }
  };
  return (
    <div>
      <h2>Login</h2>
      <form onSubmit={handleLogin}>
        <input
          type="email"
          placeholder="Enter email"
          value={email}
          onChange={(e) => setEmail(e.target.value)}
          required />
        <input
          type="password"
          placeholder="Enter password"
          value={password}
          onChange={(e) => setPassword(e.target.value)}
          required  />
        <button type="submit">Login</button>
      </form>
      <p>Don't have an account? <a href="/signup">Sign Up</a></p>
    </div>  );
}
export default Login;
```

5. Execution (run_project.bat)

```
@echo off
start cmd /k "cd /d C:\Users\balas\Realtime-Notice-Board\backend && venv\Scripts\activate && python app.py"
start cmd /k "cd /d C:\Users\balas\Realtime-Notice-Board\frontend && npm start"
```

Appendix B: User Manual:

1. Setup & Features

Prerequisites

- Node.js & npm (for frontend)
- Python & pip (for backend)
- Firebase account (for authentication & database)
- VS Code (for development)

Backend Setup

- Clone the project and navigate to the backend folder.
- Install required dependencies and configure Firebase.
- Run the backend server to handle API requests.

Frontend Setup

- Navigate to the frontend folder and install dependencies.
- Configure Firebase authentication and Firestore.
- Start the frontend to access the user interface.

2. Features & How to Use

User Signup & Login

- Open the application in a browser.
- Sign up or log in using Firebase authentication.

Posting a Notice

- Enter notice details and submit.
- The notice appears instantly for all users.

Viewing Notices

- All notices update in real time.
- Users can refresh to see the latest updates.

Appendix C: Diagrams:

1. System Architecture

User → React Frontend → Flask Backend → Firebase Database → Notice Data

2. Data Flow Diagram

User logs in → Browse Notices → Post New Notice → Fetch Notices → Display Notices