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NSS-CONNECT : The Contributors Platform

S .P. Bendale[1], Aniruddha Sonawane[2], Samarth Giram[3], Mayur Pawar[4] , Soham Kale[5]
Professor , Computer Engineering[1]
Students, Computer Engineering[2-5]
NBN Sinhgad Technical Institutes Campus, Pune, India

Abstract: *This research paper presents the implementation of NSS-Connect, a Centralized Digital Platform for Streamlined Event Management and Real-Time Attendance Tracking using the frontend stack of React.js, Vite, and Tailwind CSS. Educational institutions often face challenges such as manual volunteer registrations, notice-board event scheduling, physical attendance registers, fragmented communication, and delayed hours reporting in National Service Scheme (NSS) operations. To address these issues, the proposed system provides a centralized web-based platform with secure role-based access for students, professors, and administrative coordinators. The system incorporates controlled user onboarding, admin-approved registrations, automated group and volunteer organization, event scheduling and resource allocation, attendance management, and automated report generation. Real-time notifications and alerts are enabled to keep volunteers informed of upcoming community service activities. The platform also includes analytics dashboards for monitoring volunteer attendance rates, total event participation, and NSS points accumulated. Experimental results demonstrate improved transparency, reduced administrative workload, enhanced communication, and more efficient event supervision. Future enhancements such as geofenced attendance verification, automated certificate generation, and native mobile applications for rural deployment are also discussed.*

Keywords: National Service Scheme (NSS), Digital Attendance Tracking, Event Management, Role-Based Access Control, React, Vite, Community Service Administration, Educational Technology.

I. INTRODUCTION

1.1 Background

The National Service Scheme (NSS) plays a crucial role in higher education by enabling students to engage in community service, develop leadership skills, and gain practical social awareness in their respective regions. However, NSS administration in many educational institutions is still carried out through manual processes involving spreadsheets, paperwork, physical attendance registers, and traditional notice boards. These manual methods often result in inefficiencies, delayed event scheduling, poor attendance tracking, and a lack of transparency throughout the volunteer lifecycle. The increasing number of student volunteers and the growing frequency of community service activities have placed significant administrative pressure on coordinators and faculty program officers. Without a centralized digital platform, institutions face challenges such as:

- Inefficient volunteer registration and profile management.
- Fragmented communication for scheduling and announcing upcoming social events.
- Difficulty in marking and verifying real-time student attendance on-site.
- Lack of automated hours compilation and volunteer progress tracking.
- Manual maintenance of volunteer attendance, service hours and event records.
- Increased administrative overhead and human errors in compiling semester -end performance summaries.

With the rapid adoption of digital technologies in education, there is a growing demand for centralized and automated systems that can streamline volunteer tracking, improve communication, and enhance transparency. The NSS-Connect Platform aims to address these challenges through automation, real-time attendance marking, and centralized operations monitoring.

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1.2 Problem Statement

Traditional National Service Scheme (NSS) administrative processes suffer from several limitations that affect student volunteers, faculty program officers, and institutional coordinators. Common challenges include:

- Manual student registration approvals and group assignment processes.
- Lack of centralized event scheduling and volunteer progress tracking.
- Delayed communication regarding upcoming service drives and announcements.
- Difficulty maintaining and verifying real-time site attendance and service hours.

A centralized NSS connect platform can provide an effective solution by automating registration workflows, enabling real-time event updates, improving volunteer visibility, and ensuring efficient attendance and points tracking throughout the NSS service lifecycle.

1.3 Objectives

The objectives of this research are:

To develop a centralized NSS-Connect Platform using React.js, Vite, Tailwind CSS, and modern web technologies. To provide secure role-based access for students (volunteers), professors (program officers), and administrators (program coordinators).

- To automate student registration approvals and group categorization for social activities.
- To facilitate event scheduling, professor guide assignments, and on-site volunteer attendance tracking.
- To implement real-time alerts and notifications to keep volunteers updated on upcoming community service events.
- To digitize the student attendance marking and evaluation workflows for NSS program events.
- To generate automated attendance reports and analytics for administrative reviews and hours validation.
- To build dynamic dashboards tracking volunteer statistics, attendance rates, and points accumulation.
- To improve transparency, accountability, and administrative efficiency in National Service Scheme (NSS) operations.

II. LITERATURE REVIEW

A review of existing National Service Scheme (NSS) administration methods shows that many institutions still rely on manual processes, spreadsheets, and paper registers. These approaches often lead to inefficient volunteer tracking, delayed hours compilation, and increased administrative workload.

Several institutional systems or general-purpose portals provide basic registration facilities. However, they offer limited support for dedicated volunteer group division, real-time on-site attendance marking, and centralized hours accumulation. Recent studies have highlighted the use of digital web technologies and real-time dashboard analytics in educational management to improve administrative coordination and event supervision. Despite these advancements, many existing solutions lack integrated attendance verification modules and complete volunteer lifecycle management.

The proposed NSS-Connect Platform addresses these limitations by integrating automated registration approvals, volunteer group organization, real-time event updates, digital attendance marking, and centralized hours tracking into a single centralized platform.

Table 1: Comparison of Existing Methods vs Proposed NSS-Connect

Feature	Traditional Manual Systems	Proposed NSS-Connect
Event Registration & Approvals	Manual / Paper-based	Automated / One-Click
Real-Time Communication	Limited (Notice Boards)	Yes (Dynamic Alerts)
Attendance Verification	Manual Signature Lists	Yes (Professor Mobile Portal)
Hours & Points Compilation	Handwritten Registers	Automated / Instant
Operations Monitoring	Fragmented / Delayed	Yes (Centralized Dashboard)

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III. SYSTEM DESIGN

3.1 System Architecture

The NSS-Connect Platform is designed using a three-tier architecture:

• Frontend: Developed using React.js, Vite, and Tailwind CSS to provide a responsive and user-friendly volunteer interface.

• Backend: Built using Node.js and Express.js to handle authentication, event scheduling, attendance tracking, and system operations.

• Database: MongoDB is used to store user data, event information, attendance records, approvals, and system notifications.

The system follows a modular architecture consisting of:

• User & Approval Module: Manages student (volunteer), professor (program officer), and admin accounts, including registration approvals.

• Group Management Module: Handles group division and volunteer organization.

• Event Management Module: Supports event scheduling, venue assignments, and professor guides allocation.

• Notification Module: Provides real-time event updates and announcements.

• Attendance Module: Manages on-site attendance marking, validation, and hours logging.

• Reporting Module: Generates reports and analytics for NSS coordinator monitoring.

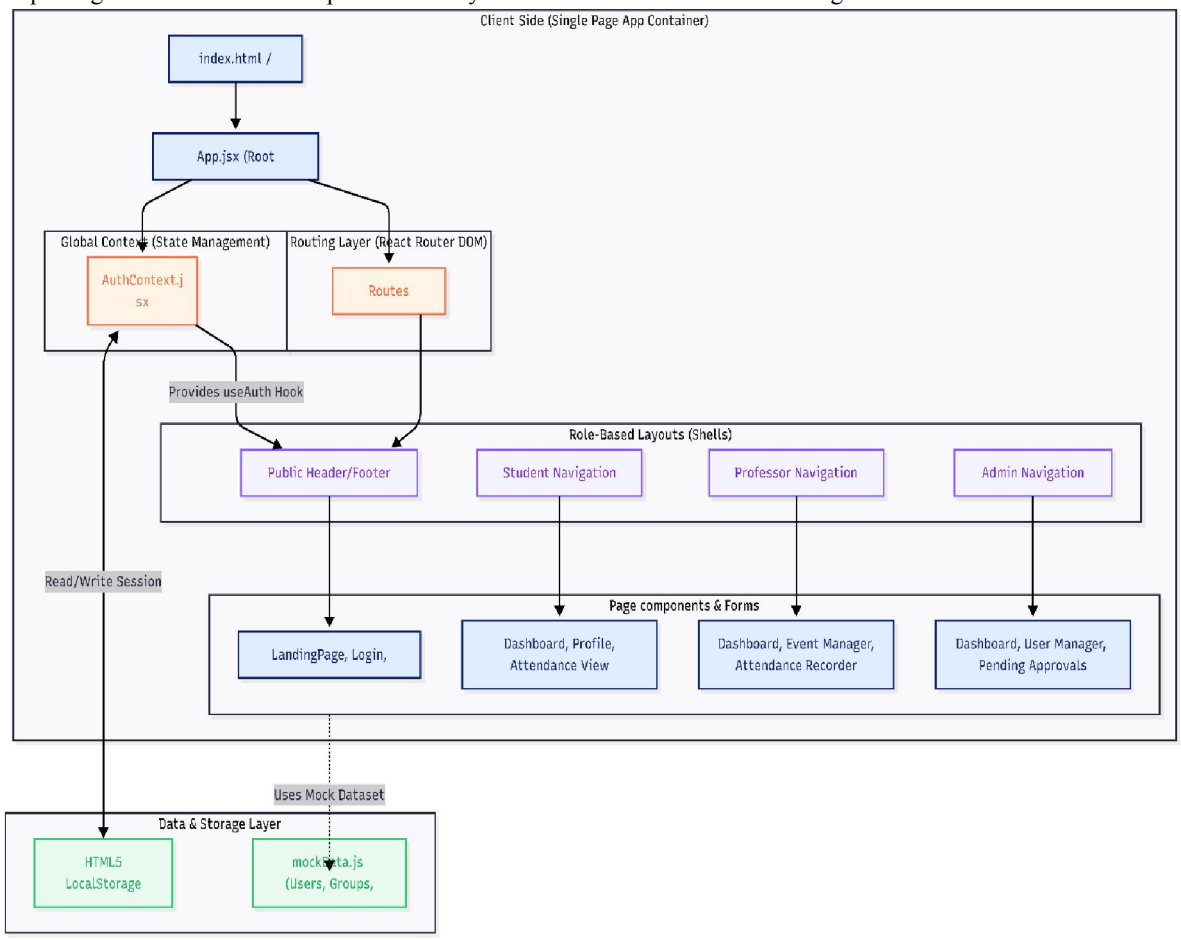

Figure 1: System Architecture Diagram

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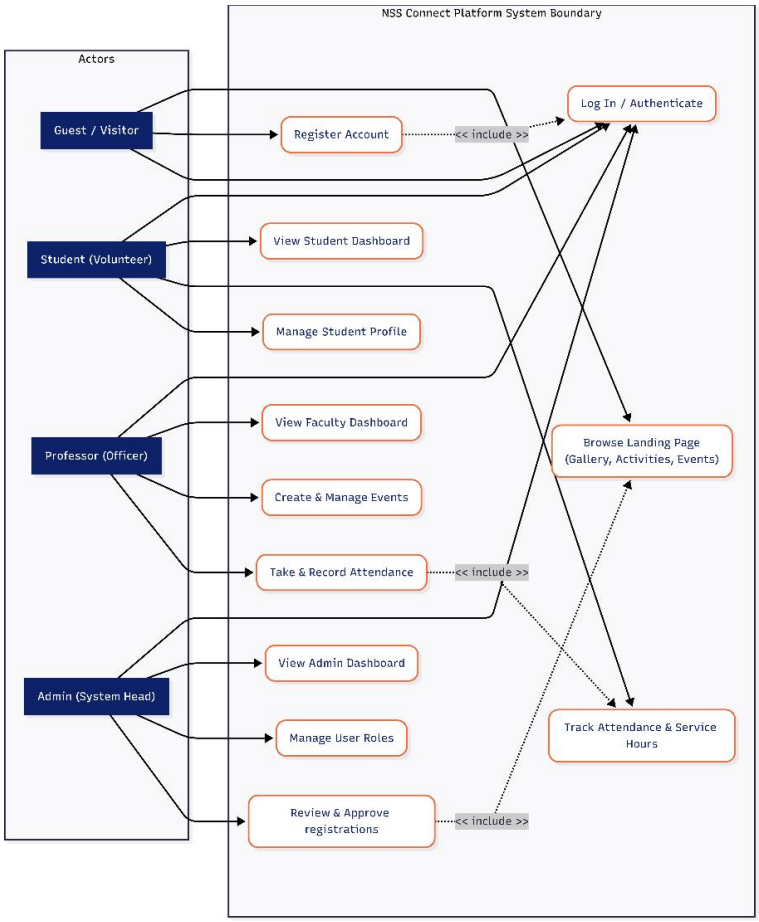

Figure 2: Usecase Diagram

3.2 Technologies Used

• React.js: Used for developing the frontend user interface and managing application components.
• Vite: Serves as the high-speed build tool and development server for rapid frontend compilation.
• Tailwind CSS: Provides responsive, custom utility-first styling for the web portal.
• Supabase: Used as the Backend-as-a-Service (BaaS) to manage database API routing, authentication, and backend functions.
• PostgreSQL: Relational database provided by Supabase to store user profiles, event logs, and attendance records.
• Supabase Auth: Handles secure user registration, token-based session management, and role-based access control.
• Supabase Realtime: Enables listening to database changes to instantly deliver event updates and notifications to volunteers.
• Row-Level Security (RLS): Database-level security policy to ensure volunteers and guides can only read/write authorized tables.

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IV. IMPLEMENTATION

4.1 Frontend Development

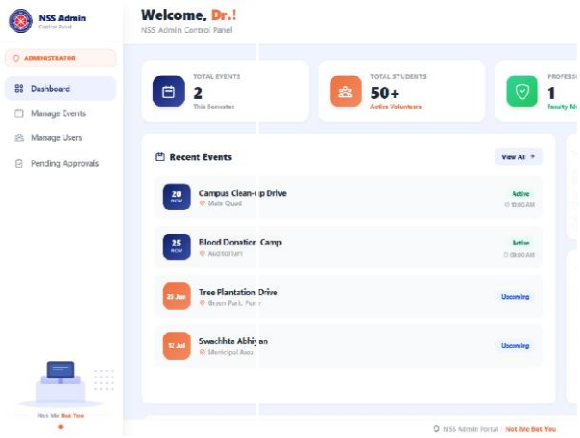
• User Interface: The frontend provides dedicated dashboards for Students (Volunteers), Professors (Program Officers), and Admins (Program Coordinators). Key features include user authentication, registration approval workflows, event scheduling, real-time attendance marking, and dynamic notifications.

• UI Framework: Tailwind CSS is used to create a responsive and user-friendly interface across different devices.

• Client-Side Validation: React.js validations ensure accurate and secure user input during volunteer registration, event scheduling, and attendance submission processes.

• Real-Time Features: The Supabase Realtime client enables instant notifications, event alerts, and real-time attendance

Screenshot 1: Landing Page



Screenshot 2: Admin Dashboard

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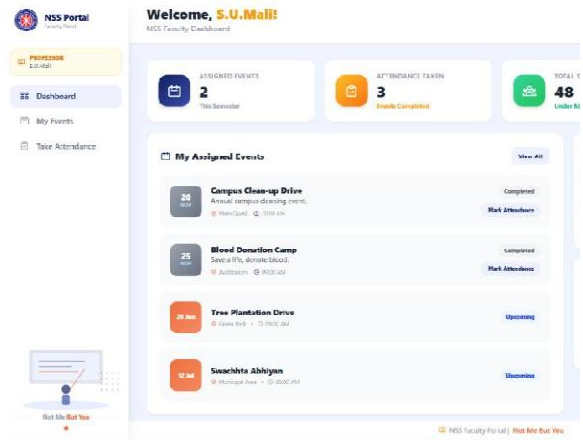
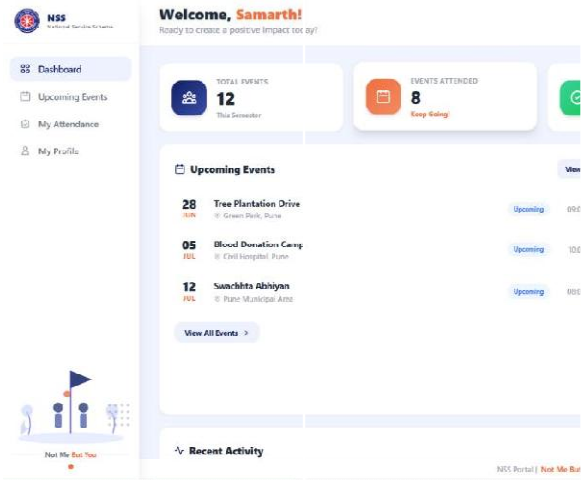


Screenshot 3: Professor Dashboard



Screenshot 4: Student Dashboard

4.2 Backend Development

• Backend BaaS: Supabase manages database operations, API requests, and serverless logic. Auto-generated RESTful APIs facilitate communication between the React client and the PostgreSQL database, handling registration approvals, event management, and attendance submissions.

• Authentication & Security: Supabase Auth handles JWT-based authentication, while PostgreSQL Row-Level Security (RLS) policies enforce role-based access control, ensuring secure access for Students (Volunteers), Professors (Program Officers), and Admins (Program Coordinators).

• Real-Time Communication: Supabase Realtime uses database replication channels to enable instant notifications, event alerts, and live dashboard statistics across the platform.

• File Management: Supabase Storage is used for the secure upload and hosting of volunteer activity reports, event images, and certificates.

4.3 Database Design

• User Table: Stores details of Students (Volunteers), Professors (Program Officers), and Admins (Program Coordinators), including roles, active statuses, and account details.

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• Group Table: Maintains NSS group information (e.g., Group A, Group B), member lists, and student leader details.
• Event Table: Stores event details (titles, descriptions, dates, venues, statuses) and the list of assigned professors.
• Attendance Table: Records volunteer attendance for each event, including event references, student references, attendance status (Present/Absent), and marking metadata.
• Pending Approval Table: Manages registration approval requests for new students and professors awaiting administrator review.
• Notification Table: Stores system announcements, upcoming event alerts, and status notifications

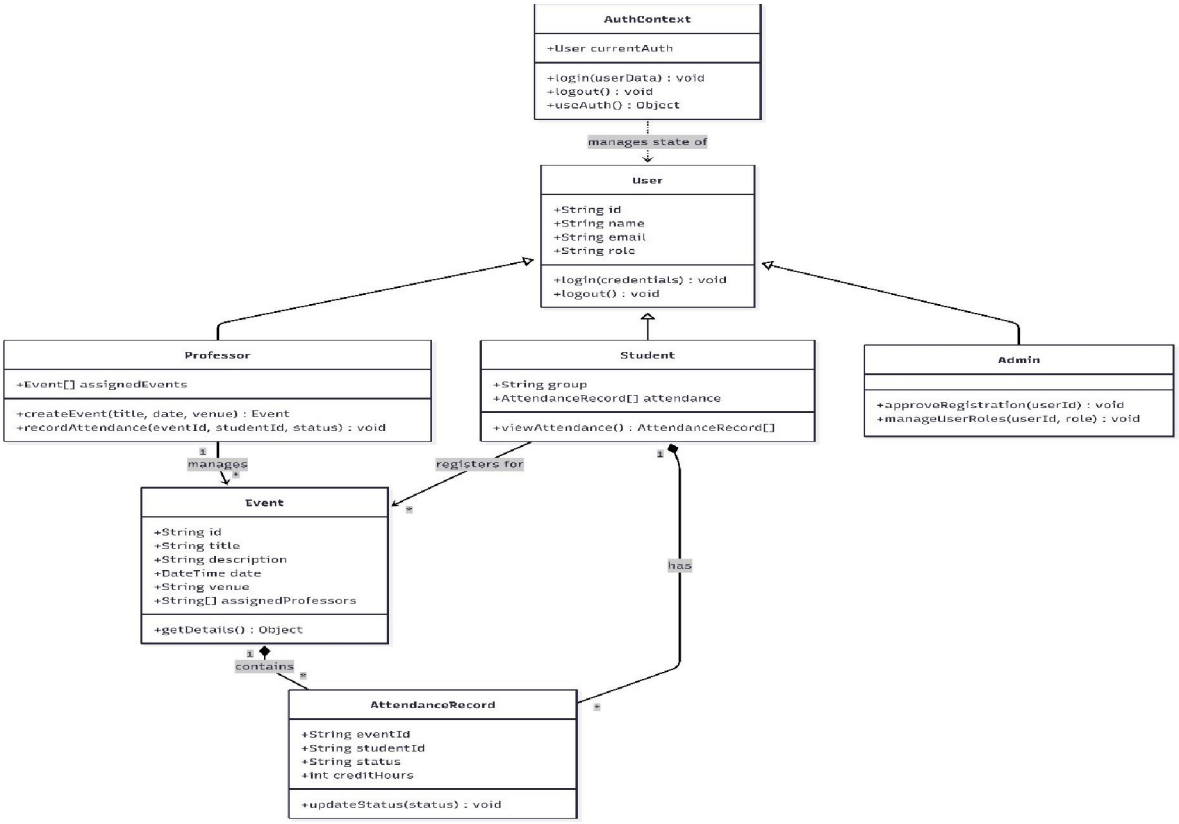

Figure 3: Class Diagram

V. RELATED WORK

Several activity management systems have been developed to support administrative operations in educational institutions. However, many existing solutions lack dedicated features such as volunteer group categorization, real-time mobile-friendly attendance tracking, and automatic service hours accumulation. As a result, National Service Scheme (NSS) management in many institutions still relies on manual paper registers, physical notices, and manual coordination.

Recent studies highlight the importance of centralized digital platforms for tracking voluntary community services and improving program coordinator supervision. The proposed NSS-Connect Platform addresses these limitations by integrating registration approvals, event scheduling, mobile-friendly attendance tracking, and real-time alerts within a single platform, thereby improving administrative efficiency and transparency in National Service Scheme (NSS) operations.

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VI. RESULT & DISCUSSION

The proposed NSS-Connect Platform was tested using simulated community service workflows involving student volunteers, professors, and administrative coordinators. The results indicate significant improvements in event coordination, volunteer tracking, communication efficiency, and administrative management.

Key observations include:

- Reduced time required for volunteer registration approvals and group assignments.
- Improved communication through centralized notifications and real-time event updates.
- Faster on-site attendance marking and submission compared to traditional manual paper registers.
- Enhanced transparency in volunteer service hours tracking, event participation, and points accumulation.

Table 2: Impact of SOAPMS on Academic Project Management

Metric	Before System Implementation	After System Implementation
Communication Method	Multiple Channels (Notice boards, WhatsApp)	Centralized
Report Generation	Time Consuming	Automated
User Satisfaction	Moderate	High

6.1 System Testing Observations

The developed system was tested using multiple NSS administrative scenarios involving student registration, registration approval, group assignment, event scheduling, and real-time attendance marking workflows. Testing confirmed that the system successfully automated several manual processes and provided centralized volunteer and event monitoring capabilities.

The implementation demonstrated:

- Successful role-based access for Students (Volunteers), Professors (Program Officers), and Admins (Program Coordinators).
- Accurate volunteer registration and approval workflow.
- Effective real-time updates through event alerts and notifications.
- Streamlined on-site attendance logging and verification by assigned professors.
- Reliable report generation and volunteer service hours tracking functionalities.

VII. CONCLUSION & FUTURE SCOPE

7.1 Conclusion

The proposed NSS-Connect Platform provides a centralized digital environment for managing the complete National Service Scheme (NSS) administrative lifecycle. The system successfully automates student registration approvals, volunteer group organization, event scheduling, real-time attendance marking, and hours accumulation. By integrating dynamic event boards, mobile-friendly on-site marking, and automated hours aggregation, the platform improves transparency, reduces administrative workload, and enhances coordination among students (volunteers), professors (program officers), and administrators (program coordinators)..

7.2 Future Enhancements

- Integration of geofencing or GPS location tracking for verified on-site student attendance marking.
- Automated, verified certificate generation for volunteers completing the required community service hours.
- Native mobile application support (Android and iOS) using React Native for offline attendance logging during rural service camps.
- Advanced dashboard analytics for tracking volunteer engagement trends and predicting event participation rates.
- Integration with college academic portals and institutional ERP systems for direct credit transfer of NSS performance.
- Multi-institution deployment to enable university-wide event coordination and centralized district-level reports aggregation.

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APPENDICES

Appendix A: Data flow Diagrams

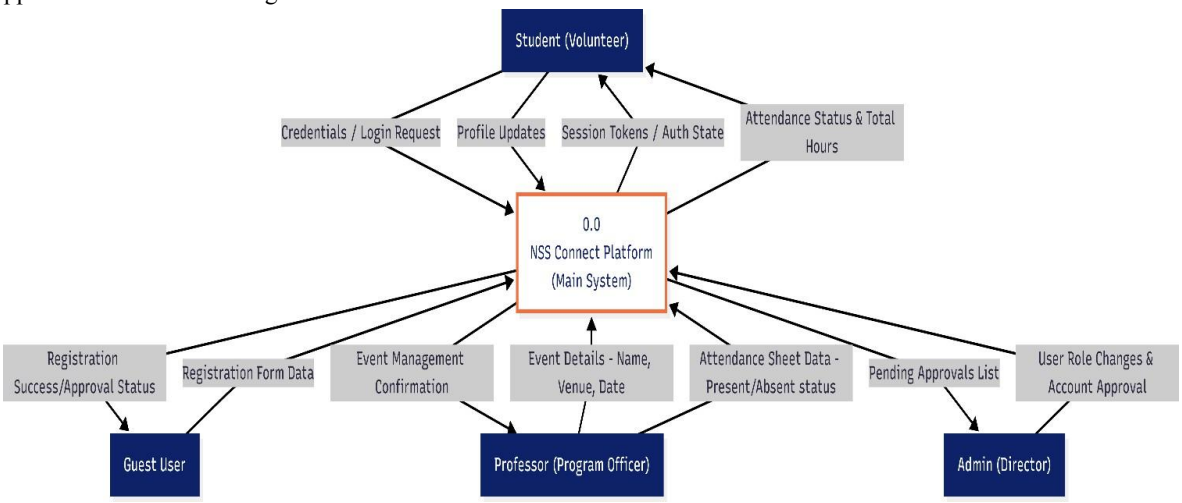

Figure 4: Data Flow diagram DFD0

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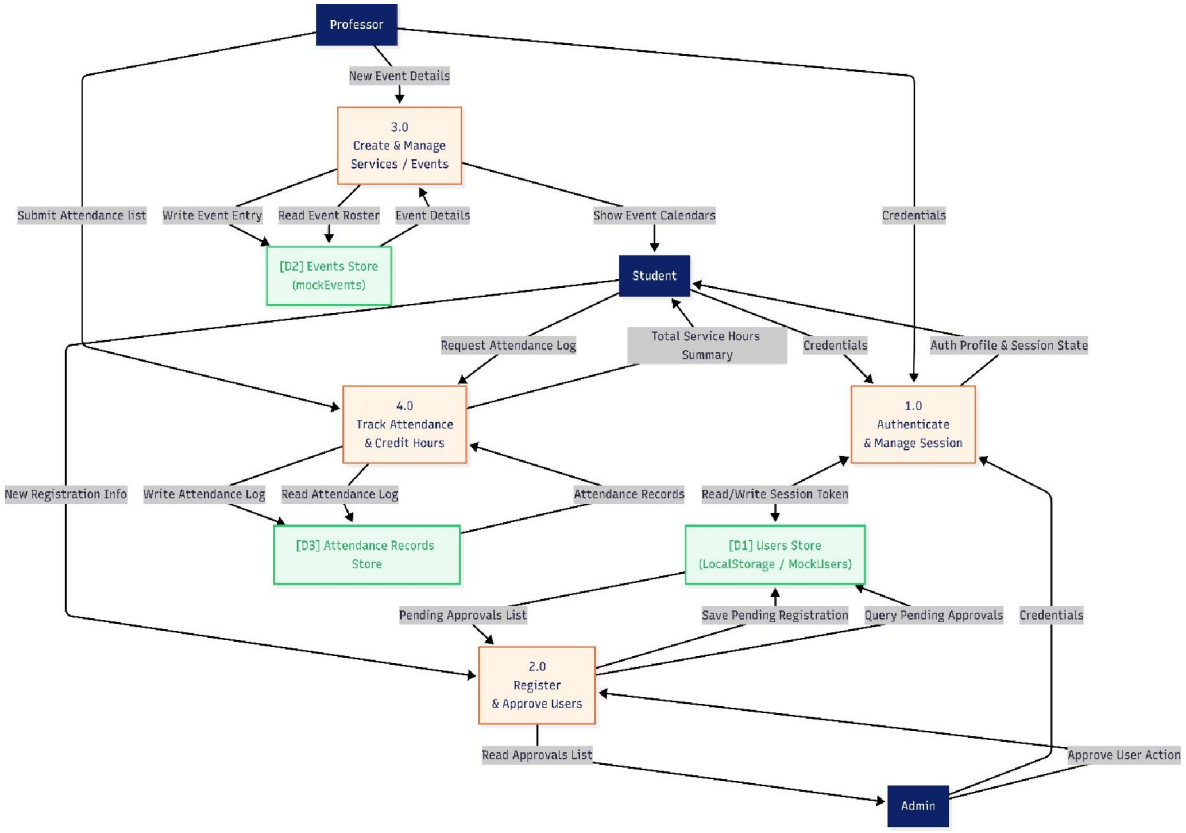

Figure 5: Data Flow diagram DFD1

APPENDIX B: TABLE DEFINITIONS

User Table	Group Table	Project Table
user_id (PK)	group_id (PK)	event_id (PK)
name	group_name	title
email	leader_id (FK)	description
password	join_key	date
role	member_ids	venue

Proposal Table	FTR Review Table	Notification Table
proposal_id (PK)	attendance_id (PK)	notification_id (PK)
project_id (FK)	event_id (FK)	user_id (FK)
role	student_id (FK)	title
group	status	message
status	marked_by (FK)	created_at