

Wi-Fi Based College Attendance System

Aryan Aich¹, Sahil Buchade¹, Musafir Attar¹, Amita N. Dubey²

¹Student, Dept. of E&TC, JSPM's RSCOE Polytechnic, Maharashtra, India

²Professor & Head, Dept. of E&TC, JSPM's RSCOE Polytechnic, Maharashtra, India

Abstract – Traditional attendance systems, which consists of calling out roll numbers and maintaining physical records, is time-consuming and effortful. The records that are physical, need to be transferred to digital mediums at the end of semesters. From these records, multiple statistical data such as defaulters list is also obtained manually, thereby increasing burden. Thus, the project as titled, aims to digitize and shorten the attendance process in colleges, reducing it from 5 minutes to under 10 seconds. The system is a compact and portable model that utilizes pre-existing infrastructure such as Wi-Fi technology and smartphones to mark attendance. The project is a Wi-Fi Access Point, that allows students to connect their devices. Each device is assigned an IP address, which is linked with a student record to determine the owner of device present. Thus, present and absent students are marked, and records are generated easily. The project inculcates multiple functions in itself, such as One-Tap Scan, Register Mode, Manual Entry and Admin Access mode which each perform a procedure related to attendance marking and configuring smartphones to the project. The project is capable of hosting a webpage, allowing for easy download of attendance records. The system also incorporates a rechargeable battery, making it portable. Along with this, a drawer is provided for storing dusters and chalks, thus increasing the significance of carrying the project. In future, more complex features such as attendance statistics and defaulters list, can be integrated through its hosted webpage.

Key Words: Wi-Fi Access Point, smartphones, authenticated devices list, IP address, student record, One-tap Scan, webpage, upload record, register devices, 10-second marking

1. INTRODUCTION

Wi-Fi Based College Attendance System is a digital attendance marking system that makes use of pre-existing infrastructure such as Wi-Fi and smartphones. The project acts as a Wi-Fi Access Point (AP), which connects to all smartphones in a classroom through Wi-Fi. The project then obtains the IP address of all connected devices, to uniquely identify each device. Then, it determines the owner of each device to mark their attendance. This way, an attendance record will be prepared within 5-10 seconds and will be ready for a digital download for the teacher. With the ability to capture attendance within seconds, it saves a few minutes from a lecture, reduces burden of managing records and makes attendance recording convenient.

1.1 Problem Statement

Traditional attendance systems in educational institutions often involve manual methods such as roll calls and maintaining physical registers. These methods are not only time-consuming but also prone to errors and inaccuracies. Moreover, managing attendance records manually, requires a significant amount of paperwork, leading to the accumulation of large registers and numerous torn-pages (in case of small records). When attendance statistics are to be generated, such as defaulters list or monthly percentage, it needs to be all done manually. In the era of Artificial Intelligence, attendance systems are primitive and can be improved.

2. LITERATURE SURVEY

There are many projects that use the Wi-Fi technology in different ways to mark attendance of people through their devices. The project [1] focuses on hosting a Wi-Fi Hotspot and QR generation to send a special passkey to the Hotspot host through a custom application. Firstly, teacher hosts a Wi-Fi hotspot through their smartphone to which students connect. With the help of a custom smartphone application, a QR code is generated by teacher, which students scan for a "token" to the next screen. This screen accepts student details, which are compared with a locally stored database. If details match, the entry is stored to a XAMPP-based database. The absent / present records can easily be accessed by the smartphone app they developed.

Another approach, followed by projects [2][3], use a smartphone app in which people manually clock-in and clock-out as per their convenience. This approach implements a server-system in a pre-existing Wi-Fi network, to listen for requests of devices from the app, only which are connected to that particular Wi-Fi. Since the approach requires people to be connected to the particular Wi-Fi, this avoids false marking from homes, and requires people to be present in premises.

For the third approach found [4], it focuses on "fingerprinting" technique, wherein an Area of Interest (AOI), in which people whose attendance is to be taken are present, is divided into several blocks in a grid manner. Each grid block receives a particular amount of signal strength from multiple Wi-Fi Access Points. Based on the signal strengths received, the location of a particular device is estimated with the help of pre-decided coordinates of all Wi-Fi APs. If the

device is located within the Area of Interest, device is marked present.

For the last approach found as per our scope of survey, source [5] proposes a unique idea of detecting if a particular Wi-Fi name is present in students' device's Wi-Fi list to determine if the student is actually present. The teacher first hosts a Wi-Fi with a randomized name. A dedicated smartphone app required to be installed in students' smartphones, will try to detect if that Wi-Fi name is available. If yes, the app generates a key using that name and sends it to an online database. All requests that are valid, have themselves marked present.

3. METHODOLOGY FOLLOWED

The above solutions deliver a promising working methodology. However, they all consume time. Our approach implements a system which requires no more than 10 seconds. It uses the feature of IP addresses, to uniquely identify a device and quickly mark their presence. Below process is followed:

- i. Linking each smartphone's IP address to a student so that the devices represent a student.
- ii. During attendance marking, hosting a Wi-Fi AP to which all students will connect their smartphones only using a few taps.
- iii. The Wi-Fi module used for hosting, will then retrieve list of all connected devices, i.e. IP addresses.
- iv. The project will check which student is represented by an IP address.
- v. The above is performed for all connected IP addresses.
- vi. The student which is represented by a connected IP address, is marked as present.
- vii. An attendance record is generated, which can be downloaded through a webpage hosted by the same Wi-Fi Module.

Thus, the process obtains an attendance record of students, by simply determining the presence of each student's smartphone in the hosted Wi-Fi AP; thus, achieving records under 10 seconds. The range of the Wi-Fi is around 20 meters, allowing coverage up to an auditorium. This is a novel technique which can be effective for colleges and educational institutes where smartphones are allowed.

4. WORKING

The project has a well-defined system of working, wherein a specific set of functions, called "modes", are followed in a logical order in order to setup the project and make it ready for daily use. Before discussing the main functionality of the project, the hardware system will be discussed.

4.1 Hardware Functionality

The project is divided into two functional units – the Main Control Board, and the Wi-Fi Module Board.

1. Main Control Board Unit:

This unit looks after the User Interface and communication with the Wi-Fi Module to perform Wi-Fi functions. Below is the systematic diagram, developed for achieving the discussed methodology.

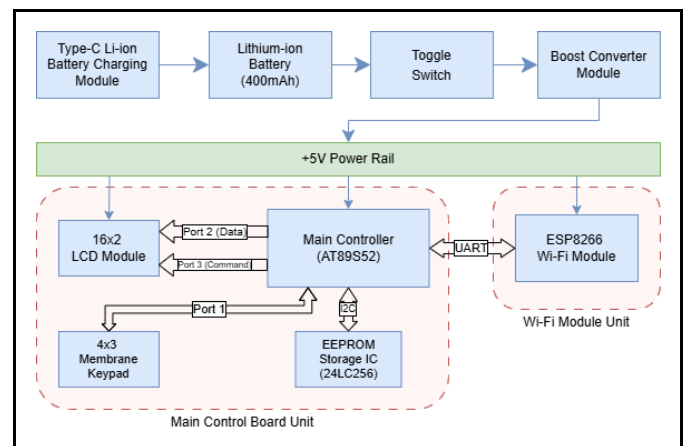


Fig 1: Hardware System Design - Block Diagram.

- i. **AT89S52 Microcontroller** – Used for controlling devices as below, and commanding the Wi-Fi module to perform Wi-Fi hosting, record generation and turning off the Wi-Fi AP.
- ii. **16x2 LCD Display** – For displaying functions, status of a selected mode and other information.
- iii. **4*3 Keypad** – For accepting inputs from user in order to select functions.
- iv. **4kB EEPROM** – Used for solving a hardware issue of low RAM of the controller.

2. Wi-Fi Module Unit:

The Wi-Fi module chosen, ESP8266, performs necessary functions of Wi-Fi hosting, listing connected devices, generating a record and storing it. The Wi-Fi module is also capable of hosting a webpage, to allow a special interaction of users with the module for registration, upload & download of records.

4.2 Software Functionality

The next page lists many functions, or "modes", which are developed for the working of the project. The working and logical order of the functions will be discussed in the sections that follow the list.

Table -1: List of Functions / Modes of Project

Modes of Wi-Fi Based Attendance System Project		
Sr. No.	Mode Name	Brief Description of Mode
1.	One-Tap Scan	Allows for attendance marking in a single tap of a button, by launching a Wi-Fi to which students will connect.
2.	Register Mode	Authenticates unknown devices to student records, to link IP addresses of the devices to a particular student.
3.	Manual Entry	Allows manual record-making by entering student identity numbers, and marking them as present to create a record.
4.	Admin Access	Hosts a webpage which allows teachers to upload student records, or download attendance records.

Before discussing the logical order of these modes, below is a description of each mode to understand their significance and working:

i. **One-tap Scan:** This mode is where the project hosts a regular Wi-Fi AP. The Wi-Fi is hosted with the name "Attendance", to which students connect using their smartphones. The Wi-Fi module then, when commanded by the main control board, stops the AP and obtains a list of connected devices. For each IP address in this list, its linked student is determined, and marked as present out of a pre-uploaded "student record template"; rest are marked absent.

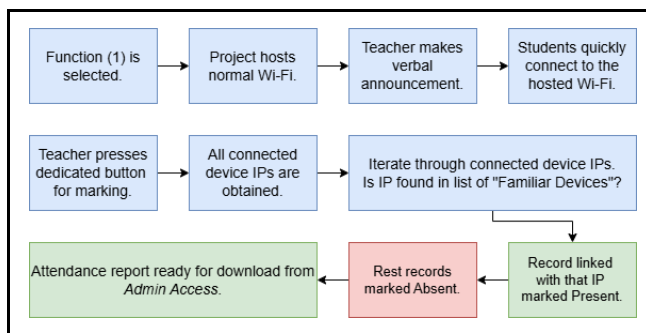


Fig 2: One-tap Scan - Sequence of Functions Performed.

ii. **Register Mode:** The mode allows devices that are unknown, to be linked with a student record for being considered during attendance marking. For this, the project hosts a special Captive Network Authentication (CNA) type Wi-Fi AP; a feature used for purpose of bulk "registering" of devices. Students get a webpage opened as soon as they connect to the Wi-Fi. The webpage is customized to provide fields for accepting personal student details. Students enter details, which are sent as a "request" to the Wi-Fi module. If details match exactly with a pre-uploaded "student record template", student

representing device is legitimate and its IP address is linked with the provided record. This step repeats for all the "requests" to generate a list of "Familiar devices". This list is important for functioning of One-tap Scan.

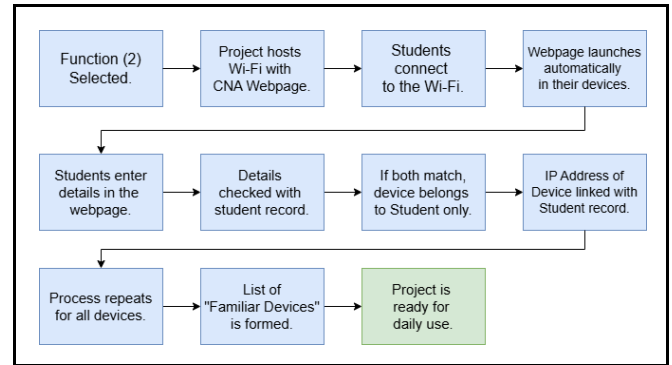


Fig 3: Register Mode - Sequence of Activities performed for registering students' devices.

iii. **Manual Entry:** In manual entry, short records of students can be made through manually entering student identity numbers, such as enrolment numbers or roll numbers. A prompt is displayed on the main board, which accepts student IDs through keypad. The numbers are sent to Wi-Fi module through UART protocol, for creating a record and marking respective students present to generate a record. This record will be accessible by a feature discussed below.

iv. **Admin Access:** This mode hosts a special Wi-Fi on which a webpage is hosted. The webpage allows for upload of a "student record template" and download of "attendance records". The student record is a mandatory pre-requisite which is necessary for the linking of device IP addresses with student records for determining present students through their devices. The record also provides a template over which present and absent students are marked to generate an attendance record. When a record is made, it is stored in the Wi-Fi module storage. The webpage lists a downloadable list of all attendance records.

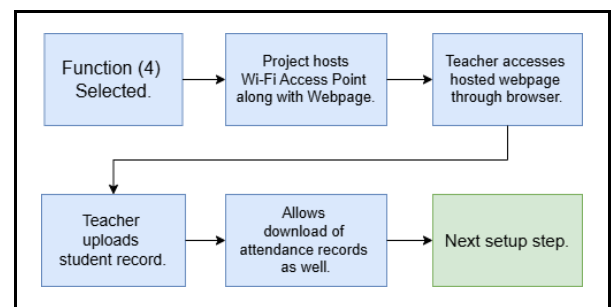


Fig 4: Admin Access - Activities Performed to Obtain Described Function.

In the descriptions provided, the project does not mention the use of an “app” for special functions of registration, upload and download of records. The system has been made with a policy of convenience; hence, webpages are used for providing anytime, anywhere usability for the project.

4.3 Logical Order of Modes for Project Working

First, Admin Access mode is used for uploading the list of students for whom attendance records are to be made. Next, the Register Mode function is used to register all unknown devices to a student record, for generating a list of “authenticated devices” or “Familiar Devices”. The list provides a reference to the project, to determine which student is present when a particular IP address is found. After this, the project setup is completed, and becomes ready for regular use. Then, whenever the teacher demands, the One-tap Scan function is selected to mark attendance.

Teacher verbally announces all students to be ready for connecting their smartphones to the upcoming Wi-Fi. Then, students connect to the Wi-Fi using a few taps only. During this process, the Wi-Fi module waits for a confirmation command serially. As soon as the teacher presses the button which sends this command from main board to Wi-Fi module, in one tap, the Wi-Fi module stops AP, retrieves list of connected devices, and iterates through all devices for determining present students. A record is generated, which is stored in the Wi-Fi module and ready to be downloaded. Thus, with a single-tap, attendance of the class is marked in only a few seconds.

Later, through Admin Access, records can be downloaded through a webpage that is hosted. This way, attendance is conveniently marked, using the least amount of time as compared the approaches available today.

3. CONCLUSIONS

This project successfully demonstrates the feasibility of developing a Wi-Fi-based attendance system for educational institutions using pre-existing infrastructure with a carefully thought system. The project provides a novel technique for marking attendance, in order to provide a “one-tap” attendance recording. The system developed, scans all connected devices and identifies students respectively to generate attendance record instantaneously. Thus, attendance marking is guaranteed to be done under 10 seconds, under ideal conditions. The brain of the project, the AT89S52 microcontroller, was used which provided a great set of challenges. Hence, in future if the project were to commercialize, modern-day processors would be opted such as ARM cortex capable of Wi-Fi signalling. Thus, the system can be made more compact in future, with more added functionality of attendance statistics generation to make attendance more convenient for the modern era.

REFERENCES

- [1] R. S. Kumar, B. Ganesh, U. H. Kiran and V. R. Rao, "WIFI BASED ATTENDANCE SYSTEM," 2020. [Online]. Available: https://ece.anits.edu.in/2019-20%20BE%20Project%20REPORTS/BCM_1920_PRC ECT_2.pdf. [Accessed 6 March 2025].
- [2] N. D. R, "Attendance 2.0: Revolutionizing Office Check-ins with Smartphones and Wi-Fi," 22 November 2023. [Online]. Available: https://tallysolutions.com/technology/revolutionizing-office-attendance-smartphones-wifi/?srsltid=AfmBOor8We3us5rwtXZp3I_ezIWdNxSogELCi1U1h6BpB52CM9KCGJ_. [Accessed 6 March 2025].
- [3] A. Randeriya, "WifiClassroomAttendance," Github, 4 February 2024. [Online]. Available: <https://github.com/aryanranderiya/WifiClassroomAttendance>. [Accessed 10 March 2025].
- [4] S. M. Khan, M. S. Haque, M. T. Mahila and A. Rahman, "WiFi Received Signal Strength (RSS) Based Automated," 19 December 2024. [Online]. Available: <https://dl.acm.org/doi/pdf/10.1145/3704522.370423>. [Accessed 6 March 2025].
- [5] M. Choi, J. H. Park and G. Yi, "Attendance Check System and Implementation for Wi-Fi Networks Supporting Unlimited Number of Concurrent Connections," 8 July 2015. [Online]. Available: <https://journals.sagepub.com/doi/10.1155/2015/58698>. [Accessed 6 March 2025].