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IoT-BASED AUTOMATED ATTENDANCE SYSTEM USING RASPBERRY Pi3

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ABSTRACT

Everything is possible in this new era with the Internet connection, which has made the entire world a tiny global village. Using the Internet and web services, people can access the information they need and connect with others through verbal conversation, instant messaging, email, etc. We propose an approach that can be implemented in various universities, schools, colleges, and organizations. With the support of Proposed Research, workers can be automatically tracked without any traditional approaches and at a fair price relative to systems already in place. The proposed research is focused on smart devices that are inclined to school representatives, organizations, where each smart device has a different MAC (physical) address. Students can be linked to the application via MAC address and results can finally be stored, and we can generate the report regularly or weekly or monthly. Our proposed system is divided into two parts; the first is a website that can be accessed via the program management main screen such as student data registration, adding the admin to the program, etc. The second component is a system work environment that is the Micro-controller (Raspberry Pi3) which runs the device 's main script. Finally, results can be automatically obtained based on the MAC address of the students. For some exceptional cases, we developed an Android application for the admin to update all information manually. The system can currently be operated on its own, and can also be part of other integrated systems.

KEYWORDS: ***IoT, Raspberry Pi, MAC address, Android Application.***

1. INTRODUCTION

For a long time, stakeholders in the computer networking industry have asked themselves the ever salient question, Will devices can communicate among them and execute everyday functions without human intervention?. The effort to answer this question and address this underlying need led to the development of the IoT framework. The term IoT in contrast to the internet as we know today which could be described as "The Internet of People" depicts a framework where devices are configured to communicate and execute functions whilst requiring little human effort [1]. The Internet as we know today can be mostly described as the "Internet of People" as most of the devices and gadgets on the internet are used to provide connections essentially between people. In this regard, network services such as social networking, email, etc, have humans at the back end and require human effort on at least one side in other to completely execute the service [2]. The IoT framework on the other connects devices such that information may be transferred between the devices. A simple example of an IoT system is the example of a garage door that automatically opens sensing the proximity of a connected car. In this system, the garage door and the car have communicated and executed the action of opening the garage door without requiring human effort [3]. Another example is the case of a home system when windows and blinds are closed when an installed sensor detects the presence of rain. Again in this system, the action of window closing has been performed without

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requiring human effort [4]. The term IoT was devised by British Scientist, Kevin Ashton in 1999 who used it to describe a system where objects could be connected to the internet whilst using sensors to receive information (Rose) [5].

Nowadays it's possible to link millions of devices to the Internet of Things infrastructure and make them interact with each other. Since almost all companies have this IoT infrastructure they can use the concept to automatically track employee attendance and other services. Compared to manual and semi-automated attendance, some of the advantages of automatic attendance include: reduces energy, money, better monitoring, and smaller rates of error. This paper suggests a program known as Automated Attendance System using IoT that can automatically monitor student attendance with less human interactions. This Automatic Attendance System work based on communications between machine and machine (M2 M). The proposed work automatically tracks the user by using MAC address (Media Access Control) of connected Wi-Fi devices such as a laptop network card, Mobile, video player, etc . Once the system is ready, the administrator can easily and quickly carry out manual user tests. This program will use each student's MAC address which is initially stored. The proposed system also allows a teacher to manually add attendance for the student who has no smartphone. The Automated Attendance System includes some other features such as printing the final attendance report directly from the website, monthly notification of each student's attendance, and the ability to notice the student as present in case of an emergency.

2. LITERATURE REVIEW

Studies so far show that the automated attendance system without human intervention is important and gaining more attention. **Mahesh Sutar et. al [6]** proposed Smart Attendance System Using RFID in IoT. With this work, an effort is made to solve the regular lecture attendance monitoring problem in developing countries using RFID technology. This system will ease is school/college to monitor the student as it reduces manpower, gives time-saving, easy control, and reliability.

Chethana Gosal S et. al [7] proposed a method of taking attendance using Bluetooth and Wi-Fi in Specific Region has been presented here which is automatic, paperless, quick, and accurate. A Bluetooth receiver along with a camera for face detection is used to overcome the disadvantage of proxy and biometric.

Mahesh P et. al [8] presented an automated attendance management system using Raspberry Pi and NFC which is a smarter and more efficient way .with the help of such a system the attendance management system in school/colleges/universities and hence reducing the time required for attendance in class. This system applies to not only students but also teachers, employees, workers.

Rajat Chaudhary et. al [9] developed a wireless automatic attendance system using a fingerprint identification technique which automates the whole process of taking attendance and maintaining it. The fingerprint identification technique was used for maintaining the attendance record.

K.Lakshmi et. al [10] Authors proposed system is to help the teachers in college to avoid maintaining the registry book. This project uses a barcode scanner. B.B.S.A.S uses a Barcode scanner to take the attendance of students entering the lab. Each student's ID card will have a barcode at the backside of it which contains unique data of the student such as roll number, branch, and year. Etc. It will reduce the teacher's efforts to manually mark attendance and their headache of maintaining the register since everything would be stored in the database. It will also help in generating the defaulter's list on its own and send email to those students whose attendance is below the required amount.

3. METHODOLOGY

3.1 SYSTEM REQUIREMENTS

3.1.1 FEASIBILITY STUDY

The proposed project is a development to promote student attendance in class and decrease the traditional method for attendance by making this process as automated when the student connects with the college wireless network. It also simplifies the job for people who are responsible for generating attendance reports through an online website and they can print it easily whenever it is required.

3.1.2 Operational Feasibility

The operational feasibility of this project is high since it is user friendly because the environment of college or company appropriate to apply system, nowadays all student or employ have a smartphone and the internet networks are available in everywhere, those factors will help in project implementation and apply the system in all environments.

3.1.3 Technical Feasibility

Technical feasibility analysis is the main reason that makes me think about this project, cause all techniques are available and nowadays it becomes important for our life such as smartphones, internet, and availability of electricity, all those components will create a very good connection environment that we call

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the Internet of Things (IoT).

3.1.4 Economic Feasibility

This is the most important part of the project because I tried to do an application that will help the administration to monitor students attendance with less cost and effort, and with the possibilities available, the project will not cost student anything cause we need only Mac address, as well as the organization, will not pay for many components to implement the project, they will use available Wifi with the application with Raspberry pi3 which does not cost much.

3.2 System Architecture

The system architecture shown in Figure consists of the students (MAC addresses), wireless router (getaway), Raspberry pi3 (system), Internet (webserver), and administrator for the web application.

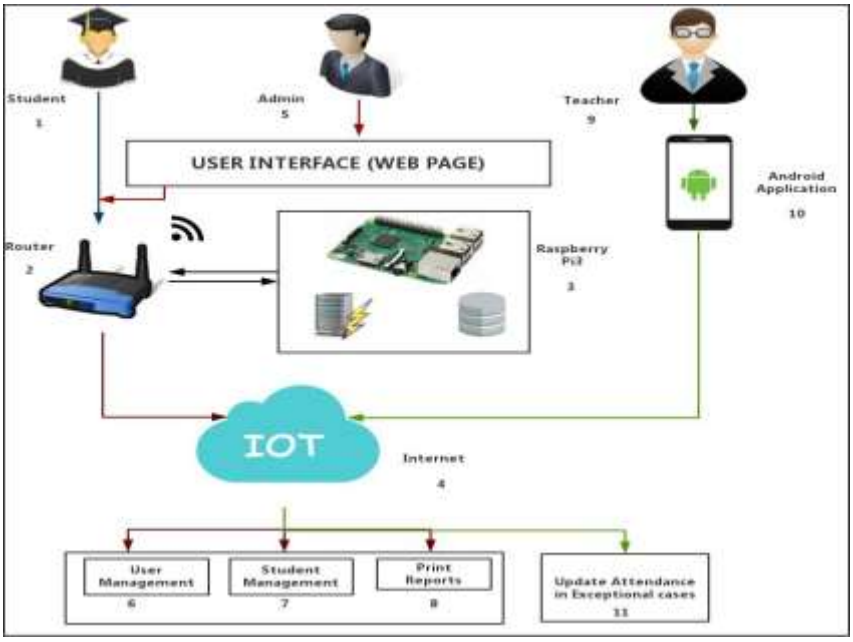

Figure1: System Architecture.

- **Students (MAC addresses):** Each student must open his WIFI network when he will reach the college morning and he must be pre-registered in the college network by Admission and Registration Department.
- **Wireless router (getaway):** A wireless router is an electronic device that works as a router meaning it sends data from the internet cable to a device and as a wireless access point. The student's devices will connect with this device via WiFi service, the wireless router is responsible to identify the MAC addresses of all phones which are connected and sent it to the system.
- **Raspberry pi3 (System):** The Pi is a tiny computer about the size of a credit card, the board features a processor, RAM and typical hardware ports you find with most computers. This means you're able to do most things a desktop computer can do such as document editing, playing HD video, playing games, coding, and much more. In this part we will install the system which will be responsible to make most of our project, such as send request to the router to ask about connected devices and bring them MAC addresses, store those MACs in a database to do some of the processes in the future, this card can be a web server, getaway also.

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Figure 2: Raspberry Pi

- **Internet (webserver):** The Internet is a worldwide system of computer networks - a network of networks in which users at any one computer can, if they have permission, get information from any other computer, to achieve the principle of Internet of things (IoT), the internet network is one of the fundamentals .we will build our server in the network and will make a simple website on it to do some tasks on our system such as generate reports and add students details to the system including the MAC addresses.
- **Administrator (admin):** is a person responsible for the systems which are behind our Web sites. He will be responsible of add student details and generate reports any time through the internet from anywhere. The Proposed system will start every day morning at 9:00 AM to scan the college network. When a student enters the college campus, he must connect with the college network; in turn, the Router is connected to Raspberry Pi which has a system. When a student enters a college campus, the system checks the database to ensure whether the student's MAC address is stored or not. If a particular student has been registered with his MAC address, then the system is going to monitor the student by his MAC address for a particular period (9:00 AM to 1:00 PM). The system can automatically record all traffic for each MAC address i.e. how many classes a student has attended and stored this information into a database. System Administrator can access the interface from anywhere, at any time via the website and he can generate daily reports, monthly reports. He can also add new students, admin, teachers into the system. An Admin can also add new Admin, teachers, students, and delete & update existing users in the system. There may be some exceptional cases like if a student does not have a Smartphone if a student loses his/her phone if a student has to leave the class in middle in an emergency. To handle these issues an Android Application has been developed, with the help this Android App teachers can mark the student's attendance manually.

3.3 Module Description

The proposed system consists of two modules:

Administrator Module

In this module Admin is responsible for adding a new Admin, Teachers, and Students; remove and display information about the people who are included in the system. Also, it is the responsibility of the Admin to maintain the Attendance report and if necessary, print the reports monthly.

Confirmation Module

This module is designed for the teacher to update the student's attendance in exceptional cases. If any student does not have a Smartphone like a phone without a WiFi facility if a student loses his phone then their attendance can be updated manually by the teacher.

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4. DATAFLOW DIAGRAM

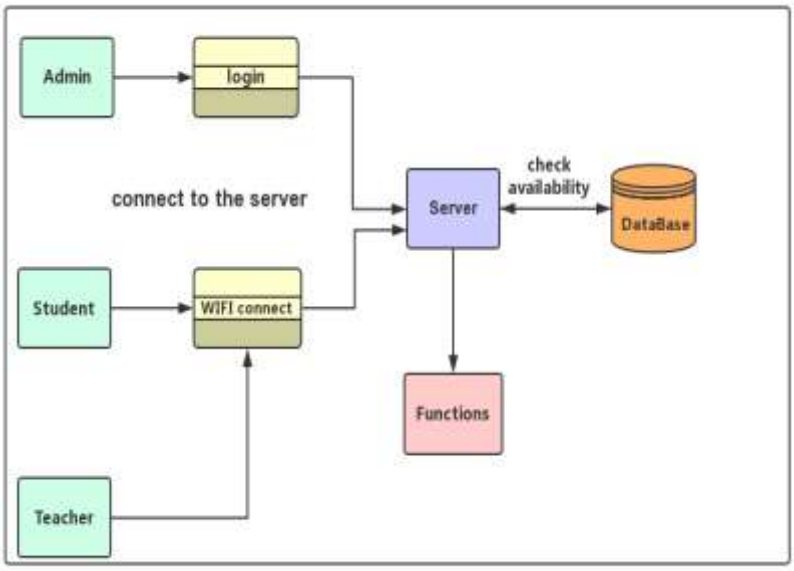

Figure 3: Dataflow Diagram

shows the Data flow diagram for the system. Admin can enter into the system via server and can monitor all management processes on the system. The student will connect with the wireless network and his information will send via server to the database to check availability. After checking the availability of Admin or user the functions will start.

5. USE CASE DIAGRAM

Use case diagrams are used to gather the requirements of a system including internal and external influences. These requirements are mostly design requirements. So when a system is analyzed to gather its functionalities use cases are prepared and actors are identified.

The purposes of use case diagrams can be as follows:

- Used to gather the requirements of a system.
- Used to get an outside view of a system.
- Identify external and internal factors influencing the system.
- Show the interacting among the requirements are actors.

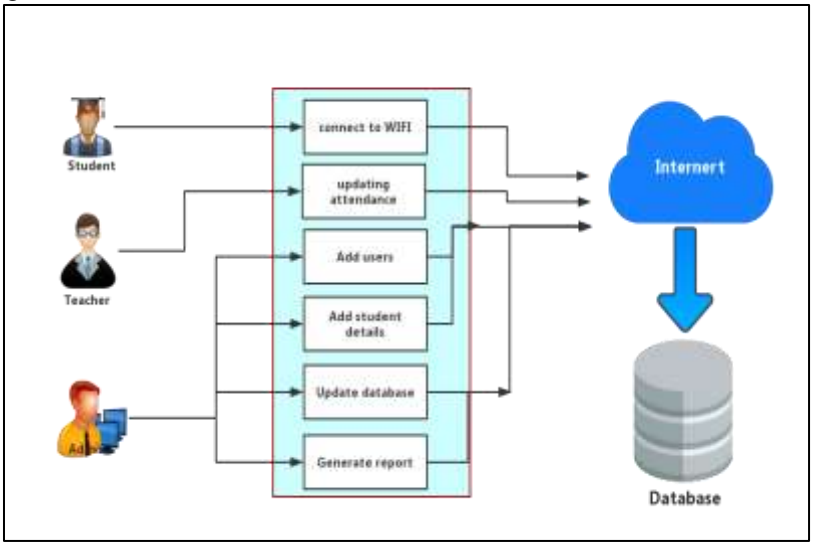

Figure 4: Use Case Diagram

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6. FUNCTIONAL TEST CASES AND RESULTS

Table 1: Test cases

Test No.	Test Case	Expected Result	Actual Result
1	Scan the network and get all MAC Addresses.	Successfully scanned and catch all MAC Addresses.	As Expected.
2	Create a database and store the results in the database	Successfully created and information is stored.	As Expected.
3	Create a student account and filling the signup form.	Successfully created and registered.	As Expected.
4	Create a new student account with an existing MAC Address.	Alert message i.e. MAC Address already registered is displayed.	As Expected.
5	Enter a valid id and password.	Pop screen to user home page.	As Expected.
6	Enter invalid id and password.	Alert message i.e. Please fill valid user id and password is displayed.	As Expected.
7	Generate daily reports.	Successfully generated in a special form.	As Expected.
8	Generate monthly reports.	Select the chosen month then Successfully generated in a special form.	As Expected.

7. CONCLUSION AND FUTURE WORK

The traditional attendance system must be taken by the instructor, this caused time waste, and more proxy attendance in the manual system can be registered. We can use the advantage of new technologies to create a computerized system. Most of the current program requires other strategies or other software that have to be built on student mobile.

In our proposed application we just need all students ' personal mobile phone MAC addresses that make the system at low cost. The web-based Automated attendance system is developed in this work using python object-oriented programming language, PHP server-side scripting language, and CSS, HTML, JavaScript for designing which fully meets the objectives of the system.

Our system program represents machine - to - machine (M2 M) interaction, which is the fundamental principle of the internet of things (IoT), taking advantage of these new technologies to simplify corporate management work. The program has solved numerous shortcomings implemented in attendance, saving substantial time, and reducing mistakes that can occur during attendance measurement.

The system is completely flexible and can be used flexibly in smartphones, tablets, and various operating systems.

As future work, it is possible to implement the evasion of attendance in organizations and colleges. For this reason, it is easier to use the IP camera to identify the face of the student and link it to the college database to increase the accuracy of the device.

As we get an enormous amount of data from the IoT platform concept of Big data is attend, we can Analyze, predict and make the decisions using Machine learning techniques based on historical data and ease the organization's management work. Managers in some companies ought to monitor the workers, For this purpose, we plan to develop a model with the help of the GPRS module to track the employee position at the organization.

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