

## **AUTOMATED BLUETOOTH ATTENDANCE MANAGEMENT SYSTEM**

**SOURABH GAVADE, PINKEY ATWAL, ZUBIN KHAN, VISHNU RAJ PILLAI & BILKIS CHANDARGI**

Department of Information Technology, Savitribai Phule Pune University, KJ's Educational Institute,  
Trinity College of Engineering and Research, Haveli, Pune, Maharashtra, India

### **ABSTRACT**

This paper provides an idea for automated attendance management system using Bluetooth and Cloud. In the current scenario of companies and large organizations attendance is marked using RFID technologies, biometric systems and in some places, manually. Also payroll calculation is handled by employees themselves. The proposed system in this paper uses Bluetooth technology provided in cell-phones to mark attendance as well as payroll calculation and employee tracking in company premises. The system identifies the potential use of Bluetooth and Cloud computing platform to keep employee's records and to efficiently store and retrieve the same for evaluation.

**KEYWORDS:** RFID technologies, Bluetooth technology, payroll calculation, Cloud computing platform

### **INTRODUCTION**

Manually marking the attendance and analysing the working hours and productivity of employees can be tedious and time consuming. Automating the process will save a lot of human efforts and time as well as increasing productivity of the employees involved in the process. After implementation the system would automatically mark every employees attendance registering records with timestamps, calculate the pay for each employee depending on the time utilised for working in office and would also help managers in analysing the employees reports based on information provided by the system. Bluetooth Attendance Management System covers the requirements of a company in following area –

- Manpower analysis
- Day-to-Day attendance monitoring
- Maintaining Statutory Registers
- Monitoring of leave records
- Calculation of overtime
- Transfer of relevant information to payroll department.

### **RELATED WORK**

The data of heterogeneous form collected from various sources by sensors are used in various real-time applications. In this application we will be using it for attendance marking and tracking purposes. The only main pre-requisite would be that an employee should keep their Bluetooth on at all times while they are in company premises. We choose Bluetooth because the range of Bluetooth which is normally available in cell-phones is around 10 meters or approx. 32 feet and also has comparatively very less power consumption. The interaction between the phones and the

server will be through access points and will be Client-Server interaction and will be asynchronous and event driven with the access points scanning for Bluetooth devices constantly. Previous works done using RFID and biometric systems focus only on marking the attendance but this system uses Cloud to store the data in the form of records using which personal reports for each employee will be generated. Considering the scope of the project the proposed system will have limited data which is will use MySQL as the database management software. The storage will be done on Cloud to enable easy accessibility and scalability if and when needed.

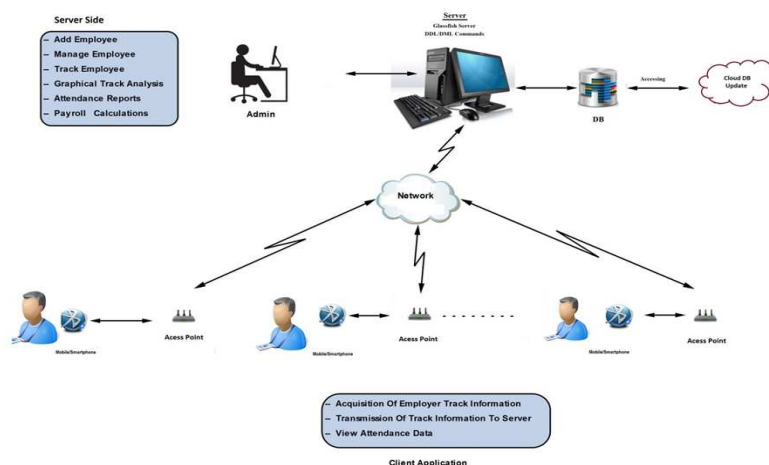
## PROPOSED SYSTEM

In Bluetooth Attendance Management System, Bluetooth provides connectivity between the end devices which will be the cell phones with the access points situated at various areas in the premises of the company. The use of Bluetooth makes sure that the device doesn't need to be connected to the access points to be able to provide its hardware address and also it reduces proxy attendance due to its limited range. For our proposed system we will be using Bluetooth 2.0 for our project. The access points will be connected to the server through internet network which in turn would be accessing the database stored on Cloud. Cloud would enable access to data in case there are different branches of a company located at separate physical locations as well as for storage of big data.

### • Architecture

The above diagram represents the proposed architecture for our system. This system automates the attendance marking system of a company. But with our system we will also be able to automatically generate the payroll of the employees of a company as well as analyse how they are spending most of their time in the office premises. It will also help us in tracking employee location inside premises. Using these methods we would be able to make a report using which we can improve the productivity of the workers and hence the company. Automation of this whole process means saving a lot of employee's productive time and workload. Due to this employee can focus more on product related work.

In Figure 1 the main components are Bluetooth enabled phones/smartphones, access points, the network, the server which will be hosting DBMS software and server applications and cloud which will be used for storage purposes.



**Figure 1: Architecture of the Proposed System**

Bluetooth enabled phones will be used as the unique identity of each employee. Since the MAC Address of the hardware present in the phone is unique worldwide, we will use it for marking attendance. Every employee must keep their Bluetooth ON while entering the office/company premises. There will be access points enabled in all the various separate areas of the company. This factor helps us in employee tracking in the company. The access points have to be Bluetooth as well as internet enabled (WIFI or Cabled Network). For the scope of our system, we are using laptops as access points. Upon entrance of an employee the access point will detect the Bluetooth device (personal smartphones which will be already registered with the company) and retrieve the MAC address of the device. It will then send the addresses of the devices it has just scanned via internet network to the server. This process will keep repeating for the whole duration of office timings.

The Server will have a DBMS on it. When details from all the access points will be received by the server, it will access the database and will match the details received and the details stored in the database. If the details match then a new record will be created for marking the attendance of the employee, otherwise the received data is ignored. Administrator working on the server will have privileges for making certain changes in case of emergencies such as if an employee's device is not working etc. Also reports will be generated using application present on the server.

The server accesses the database present on cloud. The reason we are using cloud is mainly large storage capacity and accessibility. If a company has different branches at different physical locations and employee transfer takes place, then employee personal data should be accessible from any location if they have connectivity to the server.

The data coming from a single large company will be huge as there are thousands of employees are present and their everyday attendance and tracking information will use a lot of storage space. So during actual implementation of the system we will have to use Hadoop considering the big data and MongoDB/MySQL for database management. Also the hardware requirement to support this much data would also be higher than usual to support large amount of data flow.

### Multi-Tier Diagram

The proposed system can be divided into 3 tiers mainly Client, Business Logic and Database Tiers.

Figure 2 shows the structure of the multi-tier architecture.

- **Client Tier:** This layer represents the application which will be used by the user to access the information stored in the database. The main components are the UI, the Bluetooth Devices and the access points. The Bluetooth MAC address of the Bluetooth Devices (smartphones) will be scanned by the access points and will be sent to the business logic tier.

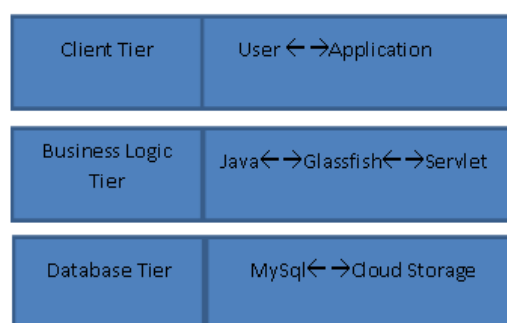


Figure 2: Multi-Tier Diagram Showing the Layers and the Services Working under them

- **Business Logic Tier:** The information scanned by the access points will be sent using java application to the backend services. In this process we use Client-Server logic by using web services. We are using Glassfish server for linking client and server. The servlet will then be responsible for retrieving and transferring information to and from the database.
- **Database Tier:** The database tier is mainly responsible for storage of database and retrieval of information from the stored data. All the DDL and DML commands for the database will be executed on the Server by the Administrator. The data will be stored on a cloud server, so that it can be accessed by all the branches of a particular company. We will be using MySQL for Database Management.

### Block Diagram

To understand the functionality of the proposed system [Figure 3], let's take an example of an Organization. Each organization consists of several departments and it consists of several workspaces each of which is mapped to Employee. Each department has an Access Point (AP), it scans for all the Bluetooth devices and it takes the hardware address and MAC address from the scanned devices. Then it fetches Employee Information from the already stored table and then store data into database. The transmission of the data from client side to the server side is done in the network.

In the proposed system, we are using Glassfish Server and JAVA (Servlets). Server searches the information from the database and matches employee record with that information. Servlets are used for the client server communication and objects are passed to and fro using object serialization concept. Performance of the system will depend on the Server as well as other hardware being used being used.

A company is a distributed system and might have branches at various physical locations. The Administrator has access to all the records of the employee which includes his/her working hours, break timings, payrolls, leave records etc. So if any employee wants to check his/her data records, they can directly contact the administrator for the same.

Employee personal information and attendance records are stored in the database. We are using MySQL for database management and JDBC, JAVA collection API to store the data records. MySQL is an open source relational database management system.

For the better accessibility and mass storage of all the data, we are using CLOUD. SOAP is the protocol specification we will be using to implement web services. SOAP and XML are used in the system for exchanging information in the client-server model. The server would keep updating new information in the cloud database periodically.

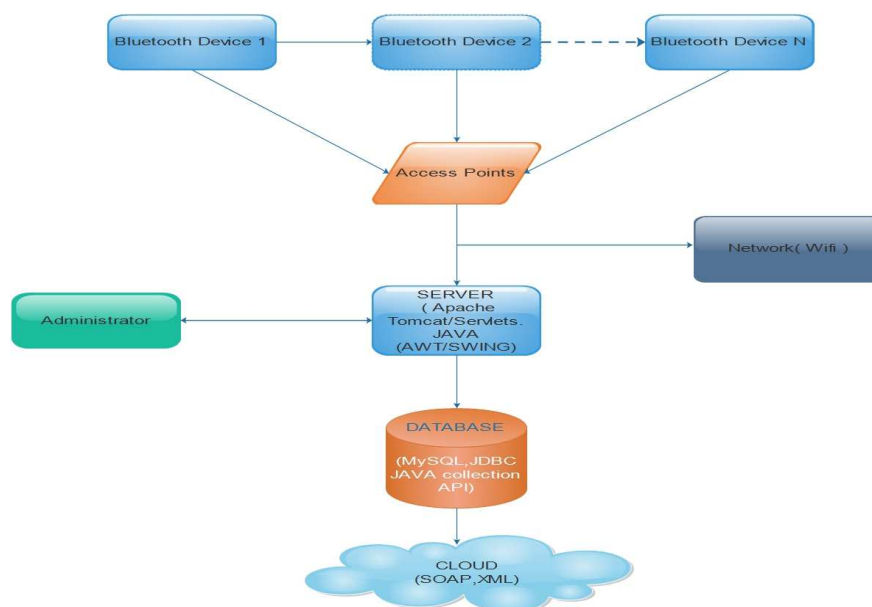
### Logical Structure

Figure 4 represents the scenario of a sample office branch on a single floor. This will give us an idea of the placement of the access points and enable us to efficiently track an employee around the office. Attendance will be marked when an employee enters through the entrance. As an employee moves around In the office area, the movement can be tracked. This will also enable the admin/manager to keep a track on their employees. Also for security purposes and preventing false attendance marking, a webcam will be installed at the entrance to take random screenshots which can be checked anytime.

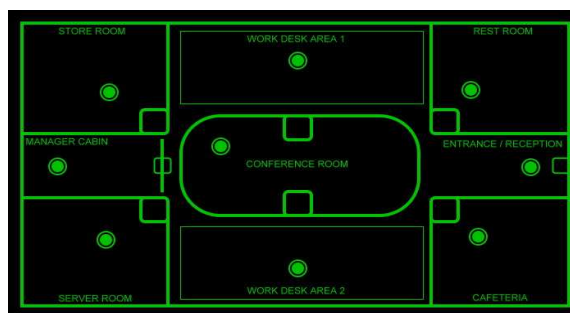
The logic behind keeping multiple access points and using Bluetooth is that we should be able to track an employee around the office and also analysis can be made on the time spent by employees in different areas. This would

also help us in increasing the productivity of the work force. The system automates the process of attendance marking, and based on each employee's attendance, their payroll will be calculated. Also monthly reports will be generated which will be handed over to respective department managers for assessment of people working under them. The report analysis will follow a hierarchical method, moving from juniors to senior posts in a company.

This will save a lot of time and human efforts in management area of a company. The only pre-requisite for this would be that every employee must keep their Bluetooth switched ON at all times inside the office premises.



**Figure 3: Block Diagram of the Components of the Proposed System**



**Figure 4: A Sample of the Logical View of Various Locations of the Office Area with the Dots Representing Access Points**

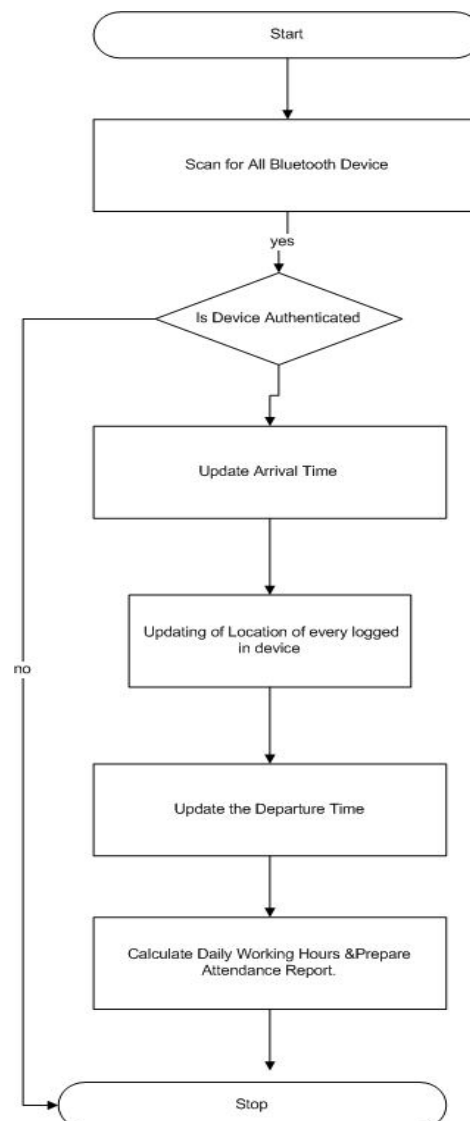
### Workflow Diagram

Bluetooth Attendance System is software which takes the attendance for Employee who all are available in office. [Figure 5] First it takes the attendance and then it saves data in to the MySQL database server. It also tracks the employee, its exact location through the access points. It scans for all the Bluetooth devices and then takes the hardware address (MAC) from the scanned devices. In server it fetches Employee information from the already stored table and check whether the information received from the mobile matches with the one stored in the server. If it matches then the data is stored in the server. We have also designed the module in which, payroll and attendance and tracking of the employee is done with the help of access point. The project also consists of module which will calculate the daily working

hours and attendance.

## CONCLUSIONS

We have learned that using Bluetooth, Java applications and database management systems connected with cloud we are able to record, manipulate, store and produce the data of the employee on demand to increase the productivity and reduce time spent in paper works. The system we are developing is a prototype of which can be implemented in companies where the system will automate the entire process to great extent and also provide security for proxy attendance on full implementation. We also learned that by using newer versions of Bluetooth (Bluetooth 4.0) we can further reduce the power consumption of the cell phone battery. Therefore our project "Automated Bluetooth Attendance Management System" is very user friendly and this system is easy to use. By using Cloud form of storage we can provide easy accessibility and on-demand storage capacity. It also proves to be much cost efficient compared to buying of physical storage. This system also reduces the paperwork required for attendance management, payroll calculation, report generation and employee analysis.



**Figure 5: Workflow Diagram**

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