

## **Radio Frequency Identification (RFID) Based Employee Management System (EMS)**

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**ABSTRACT :** *Radio Frequency Identification (RFID) is a new generation of Auto Identification and Data collection technology which helps to automate business processes and allows identification of large number of tagged objects using radio waves. RFID based Employee Management System (EMS) would allow complete hands-free access control, monitoring the whereabouts of employee and record the attendance of the employee as well. The access tag can be read up to 5 (~16 feet) meters from the RFID reader, which usually eliminates the need to handle the tag or to walk very close to the reader. This freedom is particularly important to handicapped workers, staff carrying packages. The proposed system is based on UHF RFID readers, supported with antennas at gate and transaction sections, and employee identification cards containing RFID-transponders which are able to electronically store information that can be read / written even without the physical contact with the help of radio medium. This paper presents the experiments conducted to set up RFID based EMS.*

**KEYWORDS**– API , GUI, RFID , Readers, Tags/Transponders, UHF

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### **I. INTRODUCTION**

The RFID-based equipment tracking system is an integrated system that offers an effective solution of managing items especially for large scale environment. It combines the RFID technology and security devices to ensure the items are always been monitored and secured. The system enable the organization to track and monitor selected individual to access locations, permit movement, record the important data and also enable the viewing of record via internet. This paper introduces the distinctive components of RFID technology and focuses on its core competencies, scalability and security. It will be then supplemented by a detailed synopsis of an investigation conducted to test the feasibility and practicality of RFID technology.

### **II. RFID COMPONENTS AND PRINCIPLE OF OPERATION**

RFID is a technology that uses radio waves to transfer data from an electronic tag – called an RFID tag or label, which is attached to an object through a reader for the purpose of identifying and tracking the object. An RFID system primarily comprises of RFID Tags, RFID Reader, Middleware and a Backend database. RFID Tags are uniquely and universally identified by an identification sequence, governed by the rubrics of EPC global generation2 tag data standard2. Some RFID tags can be read from several meters away and beyond the line of sight of the reader. RFID systems have been widely used in many different application areas, such as: product tracking through manufacturing and assembly ,control of inventory, parking lot access and control, container tracking, ID badges and access control, equipment tracking in hospitals, etc.

A conventional RFID system is made up of four components mainly,

1. RFID Reader
2. RFID Antenna
3. RFID transponder (or tag) electronically programmed with unique data
4. Host computer with appropriate application software

RFID systems consists of an antenna and a transceiver, which read the radio frequency and transfer the information to a processing device, and a transponder, or tag, which is an integrated circuit containing the RF circuitry and information to be transmitted .

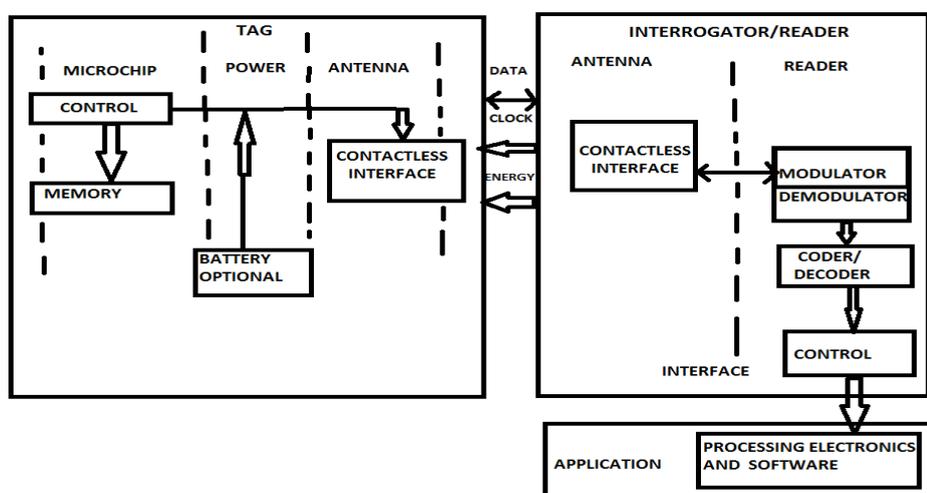


Fig.1 shows the Block Diagram Representation of RFID System Components

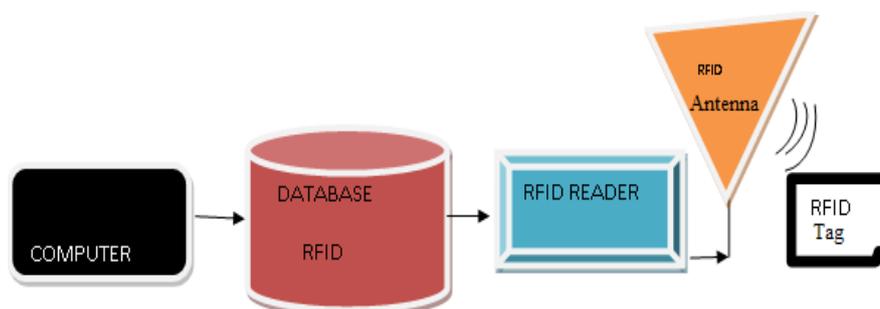


Fig.2. shows the Connectivity of RFID Components

### III. PROPOSED HARDWARE ARCHITECTURE

The system consists of UHF RFID Reader, Class1 Gen2 UHF Tags, application software and text/binary input and output files. The input files can be generated either by user interface or exporting form any type of data base in specified format. The out files can be imported to any type of database for further use like report generation etc. This makes the database independent. The readers are installed at the entrance or entry/exit gates and connected to the server via LAN. The server hosts Access Recorder application. The reader keeps on emitting radio signals and generates a radio circle of 5 meters approximately. The RFID inlet (chip) is inserted in the ID card of the employee. The employee/visitor wears the ID card attached with a lanyard. When the employee passes through the gate (radio active region), the tag is activated and it starts sending the information stored in it in the form of radio signals.

The reader captures the radio signals, decodes it to a byte stream, and sends the information for further processing to the server. The readers installed at gates are referred as access-points are assigned to each department. Information regarding department, gate number, reader IP and antenna port number of each access point is stored in Access Point file. The information can also be changed by editing, adding and deleting the desired access-point. Fig.2 shows placement of reader and antennas.

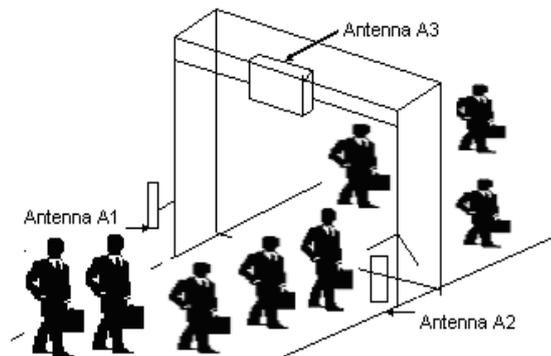


Fig 3. shows Reader and Antenna Placement

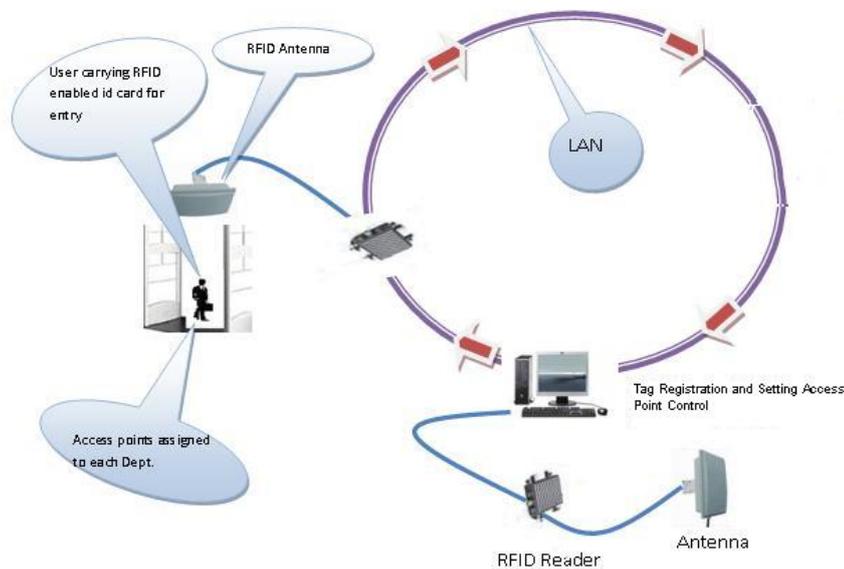


Fig.4 shows Complete System Architecture

#### IV. SOFTWARE ARCHITECTURE

The software architecture is designed as modules namely: communication module, Application Programming Interface (API), Graphical User Interface (GUI) for user visualization, and database module. The function of each module is summarized as follows:

##### i. Communication Module

Communication module that handles all the communication functions that are done at the Server side. It utilizes the wireless access point and it performs the following functions:

- Analyze the connection between the main server and the reader
- Prepare the server packets (command)
- Send the packets (command)
- Receive the reader packets (responds)
- Analyze the reader packets (responds)
- Update the database

The module functions at the reader side performs the following:

- Prepare the reader packet (commands)
- Send Packet (commands)
- Receive tags Packet (responds)

- Analyze tags Packets (responds)
- Receive server Packet (commands)
- Prepare the reader packets (responds)
- Send Packets (responds) to the server
- Send Packets (commands) to the tags
- Receive station Packets (commands)
- Receive tags Packets (responds)
- Analyze reader Packet (commands)
- Analyze tags Packets (responds)

#### ii. Application Programming Interface (API)

A software that handles data and analyzes the readings performing the following functions:

- Enable and disable tags
- Get the status of the tags

#### iii. User Visualization Software

Visualization software that communicates with the communication driver embedded with in and shows the data in a visual format in real-time every single click on any button.

- Show the information of the tags that the user gathered from the database.
- Plot the specific tags on the map as different colored points.
- Trace the route of specific tags on the map of the place as different colors lines with flags showing the information of the tag user.

#### iv. Database

SQL Server 2000 database, that saves all readings and information in tables and queries for fast access. Seven main tables to manage the system are:

- Tags Table, used to keep information about the tags themselves
- Tag User Table, used to keep information about the tag users
- Readers Table, used to keep information about the readers and their location
- Employee details Table, used to keep information about the employee tags, and the times when they will be detected
- Student details Table, used to keep track of location for each student tag
- Visitor details Table, used for entering visitors detail
- Password and Username Table, used to verification of tag

## V. CONCLUSION

RFID Based Employee Management System is systematically characterizes the reliability of RFID systems and its dependence on various practical factors. The results will provide important guidelines for real-world deployment of RFID-based tracking applications as well as simple yet effective solutions to guarantee reliability. Reading items and objects in motion can be done accurately using RFID. A system developed with a log in windows enables security and the overall cost of implementing the system may seem high but after a year of running the system, very high benefits will be realized. The whole system is very convenient and saves much on time.

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