

Office Network Monitoring System

¹Sanal Vincent, ²Kiran Ouseph, ³Plavin Paul

Students
Computer Science,
Sahrdaya College of Engg & Technology, Kodakara, India

Abstract— This project offers a complete package of office automation tools which altogether can be really useful for the different users in an office premise. The project proposes an efficient management of various issues in office automation system which will smoothens the process of employee management. Our main idea is to secure the office network through proper authentication and be energy efficient by controlling the appliances by the technology called IoT. Most of the office network system contains data that must be confidential, so for proper authentication is essential, so we are using RFID tags. These tags will replace the conventional password login setup and offers more confidentiality. Each employee will be given these RFID tags and they must need that for entering to the office and also to use the network inside the office. This project also does an efficient implementation for IoT(Internet of Things) used for monitoring and controlling the office appliances via a world wide web. This system uses the portable devices as a user interface. They can communicate with home automation network through an Internet gateway, by means of low power communication protocols like Zigbee, Wi-Fi etc. This project aims at controlling appliances via internet using Wi-Fi as communication protocol and raspberry pi as server system. There will be two users for this system a admin part , and an employee part. the admin user will be given the provision for controlling these appliances in office. besides these there will be a portal for employee-admin conversation, leave application through web portal , remote download and such modules which help in employee's comfort and moreover satisfaction.

Index Terms— RFID, Readers, Tags/Transponders, UHF, Personal Computer , Internet of Things.

I. INTRODUCTION

This project is a complete package for an office automation system. The most important aspects in office automation is proper security to the important data as well as maintaining good comfort levels for it's employees. Smart office management system combines the solutions for those problem while saving energy doing so. Smart RFID cards for the employees will enable authentication and thus adding more security. These RFID's are more simpler than the other identification modules such as barcode module and other biometric methods in such a way that it does not rely on line of sight, meaning that the RF Tag can be invisible to the reader and from a range of several meters.

Energy saving is considered as another important issue affects the consumers, power system quality and the global environment. The high energy demanded by office appliances makes office to be considered as one of the most critical area for the impact of energy consumption. Smart home technology started for more than a decade to introduce the concept of device and equipment networking in house. The technology which made possible is the renowned IoT(Internet of Things), which gives grant to people and things to be connected Any-time, anyplace, with anyone, ideally using any network and any service. Replanting this Smart home technology to office might give more result than in home because of the large scale usage of energy. It minimizes the energy waste and can be adapted according to the user habits.

This project also performs some utilities which helps the users in the usual office environment considerably. As above mentioned the employee and admin gets separate web pages after their login procedures. In this the employee will be given the features like applying for leave with a simple click, can see the reminders set by himself, posting his opinions/ideas about the office and a remote download function. Remote download is the option given to the employee for downloading some work related contents by just sending it's download link to the server. This is really helpful for some employees which will be assigned some data limit. The downloading process is done in the admin system, which will be more faster and data is not used from the employee desk. For admin too this sytem provides certain functionalities to check the data browsed by the employee. this will be shown in the admin page with the help of graphical interfaces for the better analysing and understanding for the admin of what is actually the employee browsing in the internet. For this monitoring purpose we are providing the admin a special function to monitor a particular employee 's computer screen. This function can be utilized for better proof for what the employee doing in his pc during work time.

Also the usage of internet in office is too high in these days. this is mainly due to the usage of data not only for the work but also using for other kinds of activities. So to reduce this,a data quota method is introduced . based on RFID login the server gets to know who is log on to the system. Based on his usage, the data is reduced from the data quota and is stored in the database. The employee will be alerted when the data limit is nearly over and for the exceeding data usage money will be deduced from the employee salary.

II. MODULAR DESCRIPTION

Presently automation techniques are implemented either using microcontroller or computer. Microcontroller cannot run multiple programs at a time. With the use of Microcontroller it is difficult to control both the appliances and surveillance at a time i.e., it is very complex to perform the multiple functions simultaneously. We can achieve this with the computer, but using the computer is very expensive for this purpose and consumes more power. The Raspberry Pi is a single board computer and it can be used to overcome these problems. Simply, the Raspberry Pi system functions like a computer with small setup. It contains GPIO and USB ports. Using these ports we can control the appliances with the sensors as well as interface the camera for surveillance. Raspberry Pi can be used for multiple purposes based on our requirement.

a) Raspberry Pi

It is using the Advanced Reduced Instruction Set Computing Machine (ARM) technology. ARM technology is used on the board which reduces cost, heat and power consumption. This board is available in three models named A, B, B+. The B+ Raspberry Pi board is the latest version among them, and it runs on ARM11 processor with 512MB RAM operating at 700 MHz frequency. It has SD card slot, which is used for booting the operating systems like Raspbian, Pidora, Raspbm. It has four USB2.0 ports to connect to the peripherals like mouse, keyboard and Wi-Fi adapter etc, making it as a full sized portable pocket computer. It also has an Ethernet port to connect to the network. GPIO ports are used to interface and control the LED's, switches, sensors and other devices. With the help of HDMI port, all kinds of monitors like LCD screens, projectors, TVs can be connected. In this board, some additional features like camera connector is available to interface camera and an audio jack. With all these features, Raspberry Pi is not just limited to single use, it can be used in many applications

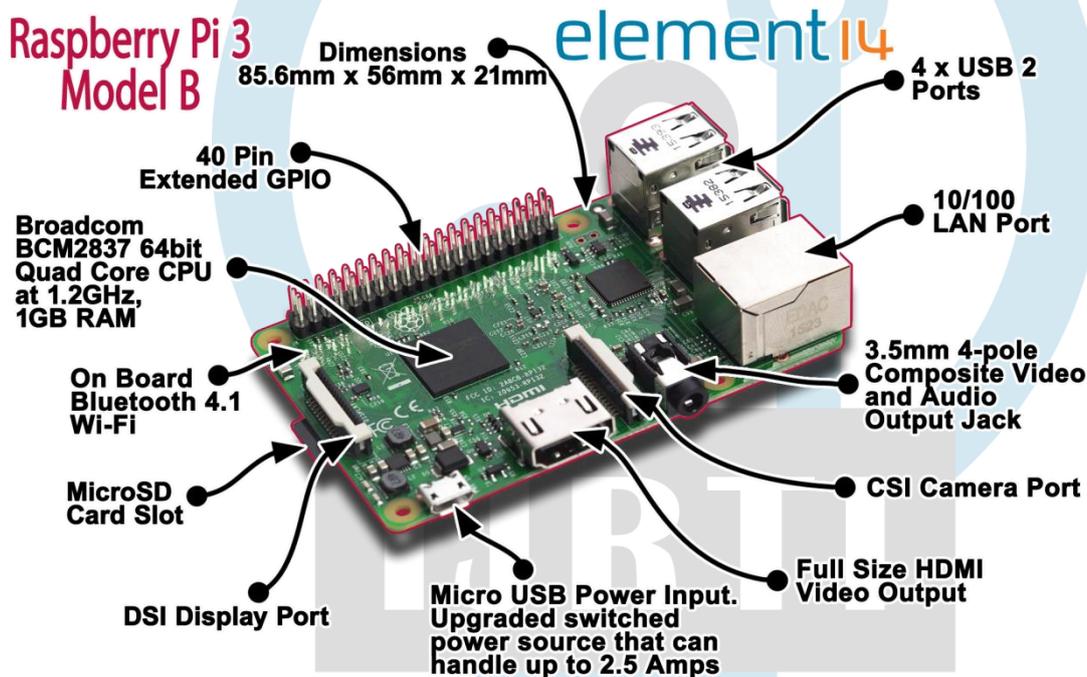


Fig 2.1 Raspberry-pi 3

b) Login module

RFID: Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source such as a battery and may operate at hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture. This project makes use of an onboard computer, which is commonly termed as micro controller. It acts as heart of the project. This onboard computer can efficiently communicate with the sensors being used. The controller is provided with some internal memory to hold the code. This memory is used to dump some set of assembly instructions into the controller. And the functioning of the controller is dependent on these assembly instructions.

c) Chating Section

Any industry communication is must for everything so the module of chat is must for the user. In our project we also add one module of chat each user in between while working time. while swiping RFID card through that time onwards we start to communicate any of your surrounded user.

d) Idea Sharing Module

In one industry each process make true through a single idea. The idea is share to every one is one of the good job and one encouragement for creator. May be somehow it should be a inspiration to create more than existed idea. Every new invention starts from a old invention so its properly recorded make more benefit for future process

e) Analyzing Browsing History Module

This section deal with the log out stage. While an employee logout from their position each data in browsing stage saved as file and send to admin server. Also the working screen of the employee can be monitore by the admin. While this module we plan to implement avoid the networking robbery and cheating issue we can properly analyzed them. The based on priority of browsing we make out a diagram and send admin server.

III. SYSTEM ARCHITECTURE

The basic architecture of our system of an RFID system, a raspberry-pi and a client-server based web interface for both the admin and employee. The RFID system consists of a tag that includes an antenna and a chip, a reader equipped with antenna and workstation to host the Middleware and database. System architecture comprises of

- i. Hardware Architecture
- ii. Software Architecture

i Hardware Architecture

a) RFID login

To satisfy the system functional and non-functional requirements, the Electronic Product Code (EPC) Gen2 passive RFID tag and Ultra High Frequency (UHF) reader will be selected. The wireless access point that links the tag reader with the monitoring station and database server will also selected. Fig. 2 shows the arrangement of readers and antennas and the system hardware architecture. Multiple tag readers are added to enable the system track the employee while she/he is on the move.

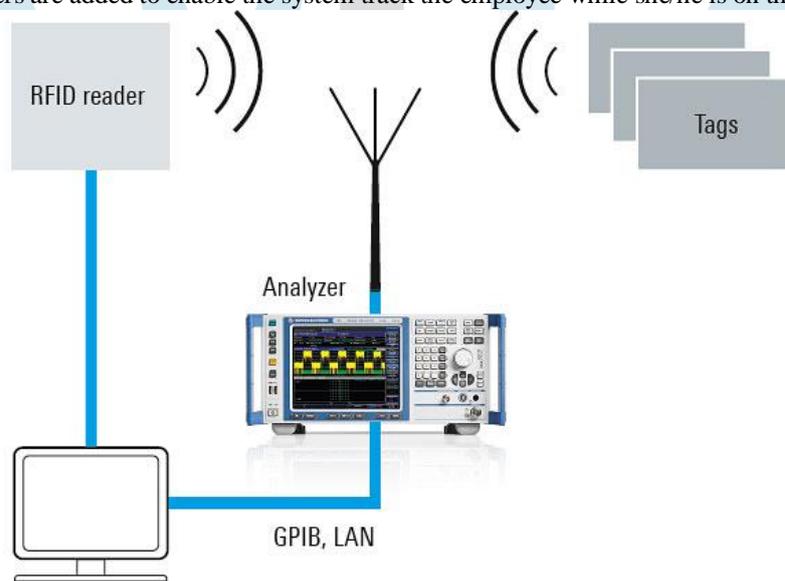


Fig .3.1 Analysis of reader/tag communications

b) Automation System

The backbone of this system is Raspberry –Pi. The implementation of this work starts with selecting the operating system that we prefer. In this project we have selected raspbian operating system . Now, we have to boot the operating system that we have selected with the necessary configurations. The various configurations which can be done are such as changing the password for default user, choosing whether to boot into a desktop environment, scratch, or the command line, enabling camera etc. The configuration settings are done according to the users need. After the configuration settings are done, the python program is to be typed in the leaf pad and it is executed by means of the LX terminal. LX terminal is used to view the status of various interfaces and results of all the inputs given to the raspberry pi.

After all the sensor being interfaced, by using the concept of IoT technology the various devices like Lights ON/OFF, Fan ON/OFF etc can be controlled. A web portal is being created where the devices can be controlled and monitored.

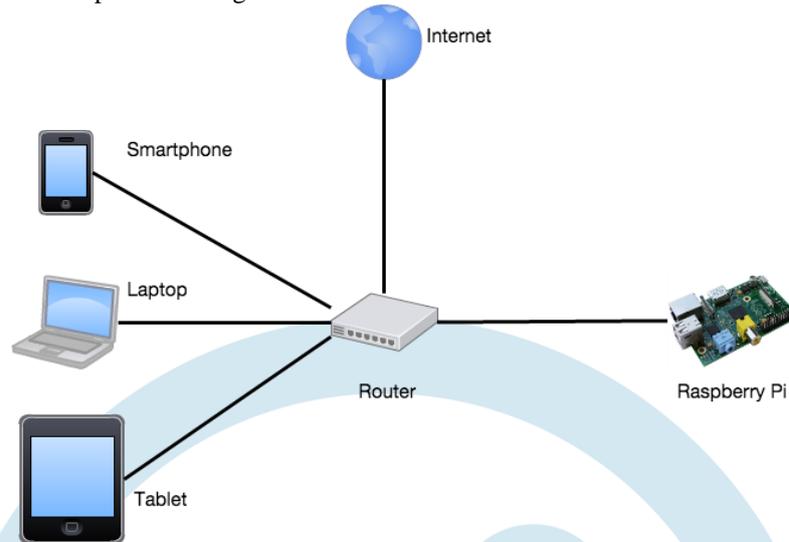


Fig 3.2 Network Diagram RPi

ii Software Architecture

a) RFID login

The software architecture is designed as modules namely: communication module and database module. The function of each module is summarized as follows:

Communication Module:

This 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

Database:

mySQL Server database, that saves all readings and information in tables and queries for fast access. 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
- Employee details Table, used to keep information about the employee tags, and the times when they will be detected
- Password and Username Table, used for verification of tag

b) Automation System

Software (Programming languages and OS involved):

1. PHP.
2. HTML/CSS.
3. Python.
4. Linux/Raspbian.

You can consider the whole system to be composed of two parts: Server and Client. Here, the server is the web interface consisting of buttons and UI (User Interface) that will allow you to turn ON/OFF a device. It consists of PHP files, Html files and a .txt file (to store data). The server usually stores information regarding the button press on the page (ON/OFF) on a .txt file. This is a simple Html file, consisting of two buttons. The clicking of the buttons will trigger the execution of a PHP file. This program serves as an API (Application Programming Interface) to store data on to a text file. The data is a string : "ON", if ON button is clicked and "OFF", if OFF button is clicked. Thus the current button press state is recorded in the text file.

The client side consists of a Raspberry Pi with a LED connected to its GPIO pin. The pi runs a python program which is used to 'Post' a url link using urllib2. That is, the pi constantly reads the contents of a url link. Here, the url link is another PHP file. This PHP file serves as an API to read the contents of the txt file. After reading the data, the python program checks if the string obtained is "ON" / "OFF" based on which it switches ON/OFF the relay respectively via its GPIO pin.

If you are having your own domain, you can use the file manager service to drop these files into your server and can be used to control your IoT systems from anywhere around the world. However, if you don't have a domain, you can simulate a domain in your local network or wifi using a service called xampp. We are using xampp since we don't own a domain. XAMPP is a free and open source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages. XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). It is a simple, lightweight Apache distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes. Everything needed to set up a web server – server application (Apache), database (MariaDB), and scripting language (PHP) – is included in an extractable file.

c) Employee Monitoring

The admin can monitor what the employee is browsing in his system through this module. the software specification includes these programming languages

1. Java
2. Netbeans integrated development kit

NetBeans is a software development platform written in Java. The NetBeans Platform allows applications to be developed from a set of modular software components called modules. Applications based on the NetBeans Platform, including the NetBeans integrated development environment (IDE), can be extended by third party developers.

using the source code the admin can view what all sites the the employee browsed until he log out of his account. This is because the browsing history in his system is converted into a text file and being send to the admin. For communication between the admin and employee we are using the TCP connection. Once the connection is set up, both the parties can chat with each other. These history is shown in graphical form using charts and other styles which helps the admin to analyze better. this is done through a special library module in java that is JFreeChart. JFreeChart is an open-source framework for the programming language Java, which allows the creation of a wide variety of both interactive and non-interactive charts.

IV. CONCLUSION AND FUTURE WORKS

In this paper, we are designing an complete office automation system which has employee management system and automation system which in turn reduces most of the human interactions. the employee management system consists of features like applying for leave with a simple click, can see the reminders set by himself, posting his opinions/ideas about the office, a remote download function, monitor a particular employee computer screen, warns the user about the excess usage of energy. Finally, it is absolutely an affordable system. It can be associated with various other options like energy monitoring systems etc., soon, as an extension to this project a system may be developed which track the employee location and movements inside the office. also using various sensors to collect data of stress levels, voice tone of the employee which will help in understanding the employee well and managing them properly. The various future applications may be used by controlling various household devices of house with internet, Industrial automation and management through internet, machine-driven fireplace exit systems and improvement of security problems in extremely restricted areas

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