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IOT BASED REAL TIME PERSONNEL MONITORING SYSTEM

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Abstract **-** Now day's very challenges about the remote data acquisition and monitoring for personnel operations are very complex task. Traditional data acquisition system using sensors with complex circuit and wired communication cannot satisfy these requirements due to its heavy cost. Embedded processor with IOT operation which makes easier and it have monitor and control remote personnel operations. ARM embedded processor with IOT reader and Wi-Fi module are used as hardware platform. The IOT reader to read the data and process the arm embedded system.an which data transfer over the wireless network is based on Wi-Fi module. The proposed design of the system using a user can monitor the personnel in the organization over a web page from anyplace that is geographically far. This system is based on the conversion of serial to wireless data which could be transferred over the cloud server and also over the internet. At the completion of the design, the result shows that data is transferred between the ARM embedded system and the host system using the wireless network**.**

Keywords: ARM processor, IOT Reader, GSM, Wi-Fi module.

1. INTRODUCTION

As the internet usage is increasing day by day and it is to reduce the time and effort for various tasks, it is advisable to give direct access to what they need to monitor and control. Transmission of data over network is economical, efficient and faster now than in olden times. An embedded system is implementing with program on a single microprocessor and to control the many of them and it is highly reliable with small size and very low power consumption. It is widely used in Consumer market, Communication, Industrial fields, biomedical applications. Earlier Ethernet, which is a networking technology which is used to share and communicate resources with embedded systems as most difficult task. The development of technology has enabled us to do remote monitoring and controlling using an embedded system connected to Ethernet. A many research work was done in the area of embedded ethernet interface in the past of years. In this design data is collected automatically by IOT Reader and is transferred over the wireless network using the Wi-Fi technology.
The wireless data transmission between embedded system and wireless monitoring system can be resolved easily and therefore the cost of networking and maintenance is minimized. In this ARM-based system the data is collected using IOT Reader and it will be kept in the database of the host system and cloud server. Thus we can avoid the wastage of memory of the embedded device. IOT Reader which is a short range device is indirectly converted into a long range device by connecting to the embedded device with Wi-Fi connectivity.

A user at a remote place can access the data using a web browser. Only a valid user can access the system which is verify by the system.

2. HARDWARES AND METHODS

A modular design approach is used in the system design. The main modules of the system are IOT Reader, Processor module, GSM module and Wi-Fi module. Wireless networking is used because of easy installation charges and reconfiguration is less complicated than a wired network. The system will process the data from the reader and will send a message to the person-in charge in case of absence. The basic system architecture is shown in Fig. 1.

In this system the data read by the wireless terminal is processed and send to the server where it is stored in the database. According to the requirement of the client it is displayed on the client monitor. In case of absence of the personnel who is under scrutiny message is sent to the person-in-charge.

The Wireless terminal shown in Fig. 2 consists of Processor, IOT Reader, an LCD display and the wireless
Module.

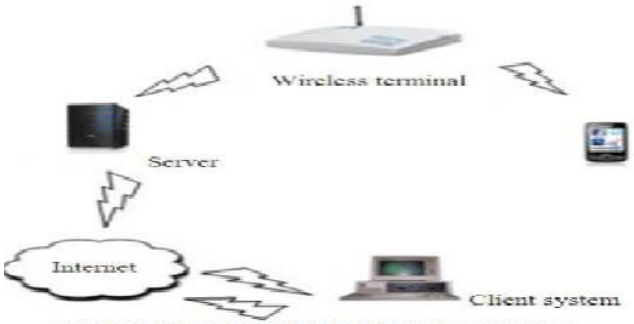

FIG 1.BASIC SYSTEM ARCHITECTURE

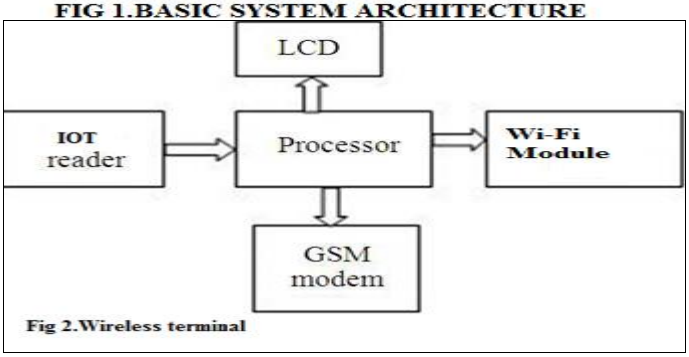

Fig 2.Wireless terminal

2.1. Processor Module

Phillips LPC2128 is an ARM7TDMI-S based high performance 32-bit RISC Microcontroller with 256 KB on-chip Flash ROM, 16KB RAM and low power consumption. High performance, low power, low cost, high throughput, excellent real-time interrupt response, small size and memory capacity are the main characteristics of ARM processor. ARM development Kits are available at low price and many Software Development Tools are available for this processor. The data read by IOT Reader is transferred to the processor through UART which can be displayed over LCD. The data that is to be send to the Wi-Fi module is packaged according to the frame format and Wi-Fi module will transform the data into wireless data sequence and send out automatically.

Development board with ARM microcontroller which is a powerful platform for embedded design is used in this project. It is normally used for the development of real time data monitoring and control, high speed wireless communication, USB based data logging.

2.2. GSM Module

GSM Global system for mobile communication is a standard set developed by the European Telecommunications Standards institute to describe protocols for second Generation (2G) digital cellular networks. The data is compressed and digitized by GSM and is send with two other streams of data down the channel with different time slot. In GSM, the account information of the user is stored in a Subscriber Identity Module (SIM) which is a smart card. Any GSM phone becomes immediately programmed after plugging in the SIM card. GSM networks operate in different carrier frequency ranges with most 2G GSM networks operating in the 900 to 1800 MHz bands. The GSM module is connected with the processor module using UART interface. The application software will send a message to the person-in charge as soon as identification code of the person he is monitoring is recognized by the reader.

2.3. IOT Reader Module

In this project we have using an **NFC** band as IOT module. It is tightly connected with personnel.
NFC-Near Field Communication is a set of communication protocol used for exchanging the data between two devices, here it is not needed to be paired for every time. **NFC** band are used to acquisition of data and store maximum of 12KB of data and is used to send the data to the processor for further processing. IOT Reader is better than QR codes reader because of its capability to read and write. The characteristics of reader are based on its range, frequency, memory, security and type of data. The IOT reader is fast, efficient and readily available. The IOT reader module is connected to the Processor using Wi-Fi interface.

2.4. Wi-Fi Module

The advantages of Wi-Fi are convenience, flexibility, mobility, practicality and portability. Wi-Fi also provides high transmission rate, convenient networking, and strong anti-interference capability.
Wi-Fi offers faster transfer speeds than, but it has a very limited range of 150-300 ft, depending on the type of equipment, Wireless-Local-Area-Network (WLAN) protocol being used and also depends on whether the solution is an indoor or outdoor deployment. Here, the data to be transferred over the wireless network is transferred to the Wi-Fi module using serial interface.

Wi-Fi networks have limited range and high power consumption. The coding technique used in Wi-Fi 802.11 g is orthogonal Frequency Division Multiplexing (OFDM).

Table 1 shows the characteristics of various other Wi-Fi technologies. 802.11 n is backward compatible with a, b and g standards and it can achieve speeds as high as 140Mbps.

Table 1. Characteristics of Wi-Fi technologies

Wi-Fi techology	Freq.	Max. Data rate	Modulation technique
802.11a	54	5.0	OFDM
802.11b	11	2.4	HR-DSSS
802.11g	54	2.4	OFDM
802.11n	248	2.4/5	OFDM

It can transmit up to four streams of data, each at a maximum of 150 Mbps. Wi-Fi is capable of splitting the radio bandwidth, which is available into dozens of channels so as to frequency hop rapidly between them and thus it will become immune to interference. A wireless range extender can be used to increase the distance covered by a WLAN signal. An extender overcomes the obstacles and the overall network signal quality is enhanced.
In this design the Wi-Fi module receives the data from the data reading equipment using its serial communication interface. Since we are using 802.11 n compliant Wi-Fi modules, maximum data rate is 248Mbps with less interference.
The Wi-Fi radio module is a complete standalone wireless LAN access device. The device has on board TCP/IP stack and applications Wi-FLY, 2011. Its wireless data rate is 54Mbps with high

throughput. It can not only be integrated into embedded devices because of its small size but also accomplish data transmission and network connectivity.

Each Wi-Fi frame with frame format as shown in Fig.3 consists of a MAC header, Payload and a frame check sequence. The first two bytes of MAC header specifies the form and function of the frame. Each frame can have a maximum of four address fields which includes the MAC addresses of transmitter and receiver. The maximum size of the frame is 2346. When wireless encryption schemes like Wireless Encryption Protocol (WEP) or Wi-Fi protected Access (WPA) are applied to the frame, the Payload size will vary accordingly. The Wi-Fi-module connects the user terminal/processor with the wireless LAN network.UART interface is used to connect the terminal and the Wi-FlyGSX-UM2 module.

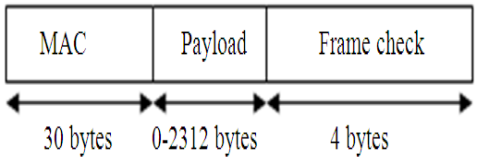

Fig. 3. Wi-Fi frame format

2.5. UART Interface

The serial communication interface UART is used for transferring data between processor module and
GSM Modem. It is one of the basic interfaces with advantages like less cost, simplicity and which is highly reliable for communication between controllers or a controller and a PC.UART is an abbreviation of universal asynchronous receiver and transmitter which is usually used in conjunction with communication standards like RS-232. UART takes bytes of data and transmits the individual bits in a sequential fashion. 8-bit shift register in UART is used for conversion between serial and parallel forms. Communication will be in simplex, half-duplex or duplex forms. All the operations of the UART are controlled by a clock signal which runs at a multiple of data rate. For fast processing, most UART chips have a built in buffer which is 16 to 64 kilobytes in size. This buffer is used for caching data that is coming in from the system bus while the data that is going out to the serial portis still being processed. The concept of Flow control is a very important aspect of serial communication. It is the capability of a device to tell another one to stop sending data for a certain time. The commands Request to Send (RTS), Clear To Send (CTS), Data Terminal Ready (DTR) and Data Set Ready (DSR) is used to enable flow control.

The data frame format of UART is shown in Fig. 4 and its interface with Microcontroller in Fig. 5.

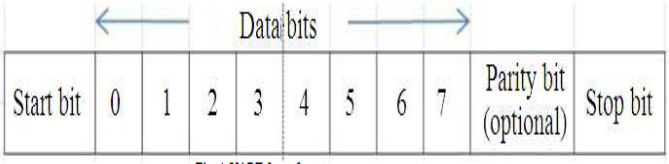

Fig. 4. UART frame format

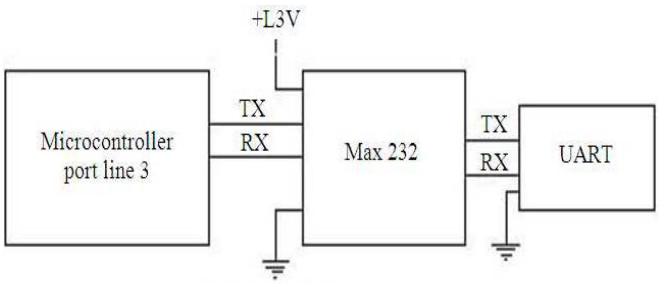

Fig. 5. UART interface

2.6. Software Design

The design of application software includes the data transfer from the data acquisition system to the ARM module using the embedded software, application software to read the data and storing in the database and the client side software which reads data from the database. The data transferred over the wireless network is protected using Wire-less Protected Access- Pre-Shared Key mode (WPA-PSK) protocol. This authentication mechanism uses some form of credentials of the users to verify that they should be allowed to use the network or not. The WPA-PSK encrypts the network data using a 256 bit key.

2.7. Embedded Software

The named embedded software mucos is used in this project. The functions of embedded software are reading the data from a valid user and transferring that to the wireless module. The data and time of entry/exit of a particular person will be based on the real time clock of the microcontroller. At the time of exit the data stored in the memory is transferred to the wireless module using serial interface with a set data rate.

2.8. Application Software-Server Side

Database is developed using MySQL database server which fast, reliable, scalable and easy to use relational
Database management system which runs as a server. The application software is written in JAVA. Java, which is robust, portable, with high performance and familiarity with write once run anywhere environment that made it the most apt embedded software developing language. The flowchart of application software is shown in **Fig. 6**.

2.9. Client-Side Software

Using the client side software a new user can be added in the list of valid users and then on he/she can retrieve the monitoring details of the personnel by entering an IP address. The client side software will be listening to the
server port using a TCP connection and as soon as a valid user enters the related data will be transferred to the client side. The flow chart of this is **Fig. 7**.

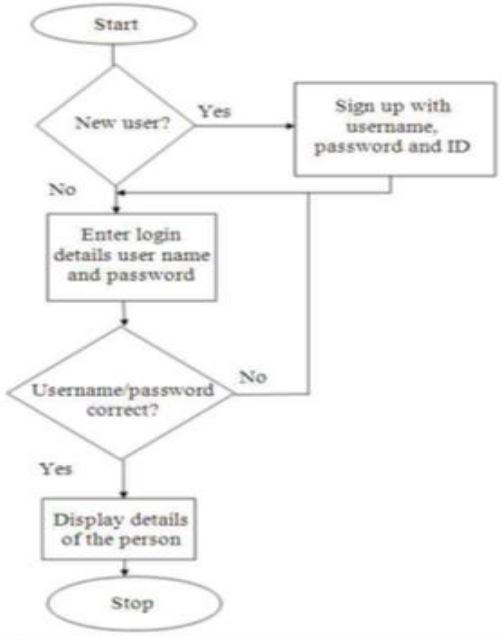

Fig. 7. Flow chart of client side program

3. RESULTS

The result shows that the data is transferred to the server over the Wi-Fi network, stores it in the database and is accessed by the client whenever needed. The user interface for a new user to sign up is shown in **Fig. 8**.The details of the people under client's scrutiny for a particular day as per his request. The wireless data transfer rate is 54Mbps and the advantages of the system are low power consumption, convenient, low cost and high data rate.

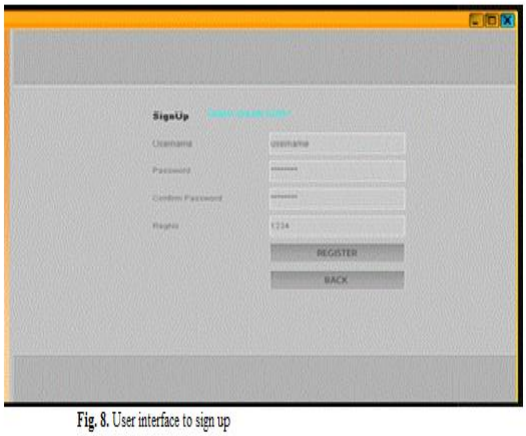

Fig. 8. User interface to sign up

5. CONCLUSION

Data acquisition and monitoring from a distanced place, we have needed more number of human interventions for functioning organization.it can be made faster, reliable and less costly using the designed system. The system is compatible with IEEE 802.11n which is more throughputs. Bluetooth and Zigbee consume less power than Wi-Fi. In order to avoid the transferring and usage of IOT Reader card by a wrong user, we can use social secure IOT devices.

6. REFERENCES

[1] Babu, T.R., K.V.V.S. Murthy and G. Sunil, 2011.AES Algorithm Implementation using ARM Processor. Proceedings of the 2nd International Conference and
[2] Workshop on Emerging Trends in Technology, (ETT' 11), pp: 24-29.
[3] Sudipta Dhar, Aniruddha Dasgupta,2015, NFC technology: Current and future trends in India. International Conference on Contemporary Computing and Informatics.
[4] Lu, X.C., J. Huang, M.C. Wu, X.F. Liu and Y. Ding, 2010. IP-based connectivity with IEEE 802.11embedded networks. Proceedings of the 2nd International Conference on Information Science and Engineering, IEEE Xplore Press,
[5] Hangzhou, China, pp: 2147-2150.
[6] Ruimei, Z. and W. Mei, 2010.Design of ARM-based embedded ethernet interface. Proceedings of the 2nd International Conference on Computer Engineering and Technology, IEEE Xplore Press,
[7] Chengdu, pp: V4-268-V4-270.
[8] Yang, R., H. Cai and M. Zhang, 2009.Research and Implement of Ethernet interface Based on embedded system. Proceedings of the 2nd International
[9] Symposium on Computational Intelligence and Design, IEEE Xplore Press, Changsha, pp: 288-291.