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Real Time Attendance Logging With Multi Node Embedded System Connected Via Wifi

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ABSTRACT

In the present age, we are in need of fully automated attendance logging system. The design of Remote Attendance Logging System and its control is a challenging part. RFID reader reads the RFID tag, and the details of the tag is logged in the embedded system. The Web based distributed measurement and control is slowly replacing parallel architectures due to its non-crate architecture which reduces complexities. A new kind of expandable, distributed large attendance logging system based on ARM Cortex M3 boards has been investigated and developed in this paper, whose hardware boards use 32-bit RISC processor with wifi dongle attached to its USB port, and software platform use Keil MDK-ARM for firmware and HTML for man machine interface. [1] This system can display date and time of log in and log out of a person. The data can be displayed on web pages at different geographical locations, and at the same time can be transmitted to a Remote Data Acquisition System by using HTTP protocol. The embedded board can act as a central CPU to communicate between web servers automatically.

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1. INTRODUCTION

Attendance logging systems are necessary in all kind of establishments such as schools, colleges, factories, hospitals, construction sites and so on. In many cases it is difficult to manage the login data from remote sites. The system proposed in this paper can store attendance details and update it to the web server. Embedded Web based acquisition and control system can adapt to the strict requirements of the data acquisition system, such as the function, reliability, cost, size, power consumption, and so on. RFID tags are issued to Personnel, the tag details are pre-stored in the server [1]. In this paper, a new kind of remote distributed attendance logging system based on embedded Web server has been investigated and developed, which can log the attendance and can be displayed through web pages from the server, and at the same time can be acquired at different geographical locations through internet. The system has the dual redundant network and global communication function, which can ensure the disturb rejection capability and reliability of the communication network. The attendance is updated in a remote server, by the embedded system. The wifi access to the embedded system enables the embedded system to update it on the server.

This paper is structured as follows: We design the system in section 2. In Section 3 we discuss about the hardware design of the system, and in section 4 we elaborate upon wifi communication in multimode. Section 5 elaborates on the simulation environment and the experimental results. In Section 6, we present our conclusion.

2. SYSTEM DESIGN

Having a clear definition of the properties and characteristics of the embedded system prior to starting hardware and software development is essential to achieve final result that matches its target specifications. In this system we are using the 802.11g standard. It utilizes existing elements from the original CCK-ODFM and PBCC-22 proposals. Each of these proposals called for true 802.11a OFDM operation in the 2.4 GHz band as an optional mode to the primary proposed modulation, either CCK-OFDM or PBCC-22. The 802.11g draft standard makes OFDM the mandatory technology, offering 802.11a data rates in the 2.4 GHz band, requires mandatory implementation of 802.11b modes and offers optional modes of CCK-OFDM and PBCC-22. This balanced compromise offers a much clearer bridge between 802.11a and 802.11b, plus is a straightforward means to develop true multi-mode WLAN Embedded Nodes. 802.11g achieves the high 54 Mbps data rates of 802.11a in the 2.4 GHz band, thereby maintaining compatibility with installed 802.11b equipment. Demonstrates that the performance of 802.11g, in terms of both data transfer speeds and range, is better than any of the alternatives that had been considered earlier in the selection process [2].

Data transmission requires a brief discussion of the OSI Model, which consists of seven layers in order from the top layer to the bottom layer: computer's network protocol stack consists of the modules involved with networking. Fig.1 shows a Network Protocol Stack for a computer that connects to a WIFI network and supports common Internet protocols. At the bottom of the stack is the hardware interface to the wifi module. Here, LPC1768 board with a wifi module connected through SPI is present. At the top a module or modules that provide data to send on the network and use the data received from the network. In the middle there may be one or more modules involved with addressing, error-checking, and providing and using status and control information. In transmitting, a message travels down the stack from the application layer that initiates the message to the network interface that places the message on the network. In receiving, the message travels up the stack from the network interface to the application layer that uses the data in the received message. The number of layers a message passes through can vary. For some messages that travel only within a local network, the application layer can communicate directly with the wifi driver [2].

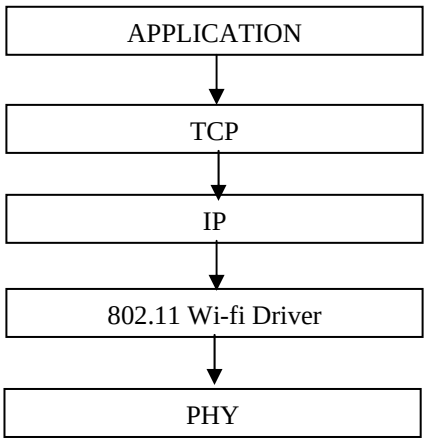

Figure 1. A Network Protocol Stack for a computer

In wifi networks, a unique hardware address identifies each interface on the network. IP addresses are more flexible because they aren't specific to a network type. A message that uses IP can travel through different types of networks, including Ethernet, token-ring, and wireless networks, as long as all of the networks support IP. A communication in a local network that doesn't use TCP or UDP may not require IP. Messages that travel on the Internet must use the Internet Protocol. Messages that use the Internet Protocol can also use the User Datagram Protocol or the Transmission Control Protocol to add error checking or flow-control capabilities. The LPC1768 microcontroller board uses TCP protocol packet to transmit data to a remote computer, through a Wi-fi module connect to SPI of the ARM Processor. TCP protocol is one of protocols in the TCP/IP protocol suite that is used in the place of UDP when a reliable delivery is required. There is more processing of TCP packets than the one of UDP. An application often has a user interface that enables users to request data from a computer on the network

or provide data to send on the network. An application may use a standard protocol such as the hypertext transfer protocol (HTTP) for requesting and sending Web pages, the file transfer protocol (FTP) for transferring files, or the simple mail transfer protocol (SMTP) or Post Office Protocol (POP3) for e-mail messages. Here FTPis chosen.

3. HARDWARE STRUCTURE OF REMOTE EMBEDDED NODE

The system mainly composed of Processor module is the core part of the design, in which the ARM chip LPC1768 used. LPC1768 is an ARM-based microcontroller for applications requiring serial communications for a variety of purposes. This microcontroller incorporate a 10/100 Ethernet MAC (DP83848H), USB 2.0 Full Speed interface, four UARTs, two CAN channels, an SPI interface, two Synchronous Serial Ports (SSP), three I2C interfaces, an I2S interface, On-chip crystal oscillator run with an operating range of 1 MHz to 24 MHz. A Wi-fi module is connected to the LPC 1768 connected to the WLAN or internet. The ARM processors flash memory is preloaded with the table consisting of RFID Tag ID and the personnel information. The RFID tag reader, stores the data which is received into a flash memory, along with the time and date which is generated with the help of Real Time Clock [5].

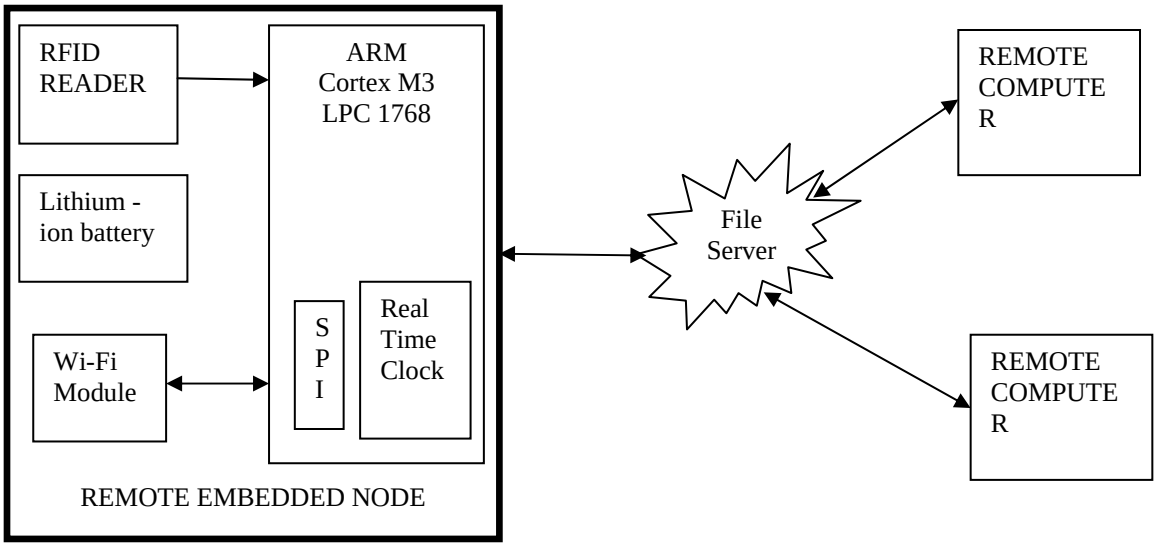

Figure 2. Structure of Remote Attendance Logging System

Once in Every hour the embedded system, logs into the file server making use of FTP protocol, and updates the attendance log into the remote server. These details can be accessed from the PC remotely.

Care has been taken to ensure that in case of internet disconnectivity, the attendance log is stored in the SD card or Flash memory available to the ARM processor. When internet is available, the remote database update takes place. The attendance log is stored in CSV format which is similar to that of SQL database present in the file server [6]. The embedded system makes use the FTP link stored in it, to connected to the File Server and the file is pasted in the server [3].

4. WIFI COMMUNICATION

In the design of network communication, we should handle TCP frame accepting and TCP frame transmitting. According to the received packet type, choose a different approach. Data transmission over the WIFI medium can be segmented into three main steps [3].

1. Initialization of the SPI, PHY and the CPU:
   (a) Initialize SPI Control Registers.
   (b) Initialize PHY registers.
   (c) Enable interrupts after setting interrupt handlers for the SPI interrupts.
   (d) Initialize RFID Tag table from the memory [6]

2. RFID Tag Read:
   (a) Create a Table in CSV format
   (b) Store the RFID Tag details along with Time and date in the flash memory.

3. Update of database in the server:
   (a) The data in the flash memory is checked and compared with existing file if there is change in file size.
   (b) If there is a change in file size, connect to internet and access the fileserver using FTP.
   (c) Paste the updated file in the fileserver.
   (d) If attendance is logged when updating the remote server, then terminate the update, log the attendance and reconnect after random delay.

5. RESULT

Figure 3 indicates the result which is achieved. The Node E3 and F1 are the nodes where personnel can swipe the RFID tag. When the details are captured by the tag reader, it is stored in the memory and uploaded to a fileserver. The fileserver details can be seen from any web browser

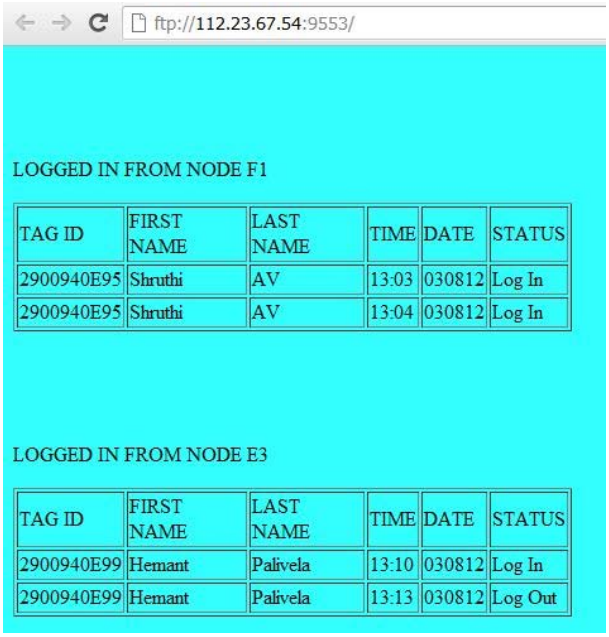

Figure 3. Result of the Real Time Attendance Logging

6. CONCLUSION

The system developed will be very useful to increase the accuracy and make the attendance logging automated. Wi-fi is most mature and widely used technology for Internet, the scheme proposed in this paper not only can be used in connecting the embedded device to WLAN, but also supports embedded web system. This system can be used widely in the domain of data-acquisition and remote data transportation, security, attendance system and industrial on-site product invoicing etc.

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He did his Bachelors Of Engineering in Electronics And Communication from Visvesvaraya Techonological University. Currently he is pursuing his Masters VLSI Design And Embedded System from Visvervaraya Technological University He has presented various research papers in the field of DDOS prevention, and on remote data acquisition and monitoring.