

Green House Control using Embedded Web-Server

¹ Ronak Gandhi, ² Y. S. Rao, ³ Anish Raut and ⁴ Ninad Sawe

Abstract—Idea pertaining to research of Embedded Web-Server are incorporated in various field of data computing and network but we propose to implement this practically in field of agriculture. A Embedded system is one that has computer hardware with software embedded in it as one of its most important component[6]. These are dedicated computer based systems for application. This is just an illustration that how an Embedded system can find its way out in different field except microprocessor, computation and commercial application.

Index Terms—Web-Server, Microcontroller, LAN, Ethernet controller, TCP IP protocols, Real time system (green house key words) .

I. INTRODUCTION

THE main objective of the paper is to provide remote access of devices via LAN network. Green house applications are connected to the Embedded Web-Server and are operated from remote location which are a part of LAN network. This LAN network communicates with the help of the Ethernet controller. The device will now access the system from a convenient node which are part of the same LAN network to control and monitor his appliances. For this we need to design and build an embedded HTTP server which is stored in the microcontroller. On accessing the system via LAN the microcontroller sends HTML pages to the user which acts as the application interface. The Embedded Web-Server provides the link to a webpage which is stored in Micro-Controller

The user wanting to control the device can enter the required commands for the respective appliances which are sent back to the microcontroller which decodes them and performs the controlling action. In this way the system can be controlled without the need to be present at the site where the device is situated. Section II of the paper will discuss different protocols used for building up an Embedded Web-Server. Section III illustrates on how embedded Web-Server be used in Greenhouse. Hardware details are discussed in Section IV.

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II. PROTOCOLS

The Embedded Web-Server is build on presently used internet protocol suite. Where each layers plays a very important role in data communication. The Internet protocol suite are set of protocols that implements protocol stack on which the Internet. It has also been referred to as the TCP/IP protocol suite, which is named after two of the most important protocols in it: the Transmission Control Protocol (TCP) and the Internet Protocol (IP), which were also the first two networking protocols. Today's IP networking represents a synthesis of two developments namely LANs (Local Area Networks) and the Internet.

The Internet Protocol suite—like many protocol suites—can be viewed as a set of layers. Each layer solves a set of problems involving the transmission of data, and provides a well-defined service to the upper layer protocols based on using services from some lower layers. Upper layers are logically closer to the user and deal with more abstract data, relying on lower layer protocols to translate data into forms that can eventually be physically transmitted. Embedded Web Server sysetm is build on this basis.The TCP/IP reference model consists of four layers:

A. Physical Layer

The physical layer is level one in the five-layer TCP/IP reference model. It performs services requested by the data link layer. The physical layer is the most basic network layer, providing only the means of transmitting raw bits rather than packets over a physical data link connecting network nodes. An analogy of this layer in a physical mail network would be the roads along which the vans carrying the mail drive.

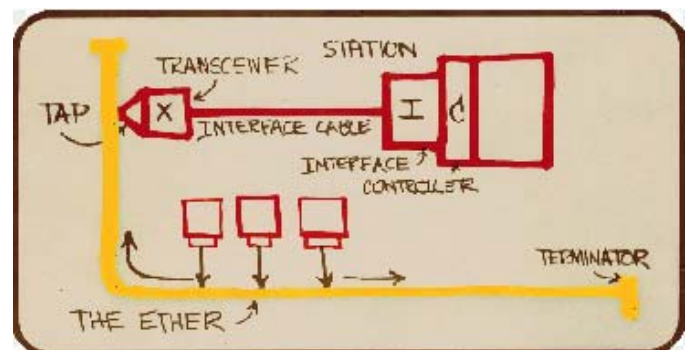


Fig.1. Drawn Robert M. Metcalfe and photographed by Dave R. Boggs in 1976 to produce a 35mm slide used to present Ethernet to the National Computer Conference

The Ethernet physical layer is the physical layer component of the Ethernet standard. The speed changes medium to medium where speed in physical medium ranges from bulky coaxial cable to twisted pair to optical fiber. In general, network protocol stack software will work identically.

Ethernet media types (section numbers from the IEEE 802.3-2002 standard are parenthesized). A 10/100 Ethernet port supports 100BASE-TX. is used in as basic building block of Embedded Web-Server. Fig.1. indicates an illustrative diagram for Ethernet physical layer.

B. Data link layer

The data link layer is layer two of five-layer TCP/IP reference model. It responds to service requests from the network layer and issues service requests to the physical layer.

This is the layer which transfers data nodes on the same local area network segment. The data link layer provides the functional and procedural means to transfer data between network entities and might provide the means to detect and possibly correct errors that may occur in the Physical layer.

The data link provides data transfer across the physical link. To make transfer more reliable we have loaded different HTML pages inside the microcontroller memory thus for acknowledgments of successful frame reception an HTML page is transferred to controlling computer within the LAN and if acceptance have occurred with an problem it will load default error page on screen and to make data link layer more reliable CRC codes are used to check for transmission errors

Ethernet controller RTL8089 is used as link between switch and controller board. Ethernet's are family of frame-based computer networking technologies for local area networks (LANs).

Ethernet is standardized as IEEE 802.3. The combination of the twisted pair versions of Ethernet for connecting end systems to the network wired LAN technology is used for implementation of Embedded Web-Server..

C. Network layer

The network layer is the third layer out of five in the TCP/IP model. In the TCP/IP reference model it is called the Internet layer. In all of the models, the network layer responds to service requests from the transport layer and issues service requests to the data link layer.

In essence, the network layer is responsible for end to end (source to destination) packet delivery, whereas the data link layer is responsible for node to node (hop to hop) packet delivery.

The network layer provides the functional and procedural means of transferring variable length data sequences from a source to a destination via one or more networks while maintaining the quality of service, and error control functions. The network layer deals with transmitting information all the way from its source to its destination - transmitting from anywhere, to anywhere.

For e.g. we have to reside the size of each frame and provide with CRC correction and detection coding technique and followed by source and destination address from where the data needs to be communicated.

Address Resolution Protocol (ARP) is the standard method for finding a host's hardware address when only its network layer address is known is also included while programming the controller the error messages are to be indicated and are done by Internet Control Message Protocol (ICMP) which are one of the core protocols of the Internet protocol suite. They chiefly used by networked computers' operating systems to send error messages—indicating, for instance, that a requested service is not available or that a host or router could not be reached.

D. Transport layer

The transport layer is the second highest layer in the four and five layer TCP/IP reference models, where it responds to service requests from the application layer and issues service requests to the Internet layer.

A transport protocol is a protocol on the transport layer. The two most widely used transport protocols on the Internet are the connection oriented TCP (Transmission Control Protocol), and UDP (User Datagram Protocol). A transport protocol is a protocol on the transport layer. The two most widely used transport protocols on the Internet are the connection oriented TCP (Transmission Control Protocol), and UDP (User Datagram Protocol). To provide end-to-end reliable communication, i.e. error recovery. This error recovery is performed by error detecting code (CRC) and automatic repeat request (ARQ) protocol. The ARQ protocol also provides flow control, which may be combined with congestion avoidance.

E. Application layer.

The application layer is the seventh level of the seven-layer OSI model. It interfaces directly to and performs common application services for the application processes; it also issues requests to the presentation layer. The application that are implemented are based on 'http' which is a communications protocol used to transfer or convey information on intranets and the World Wide Web. As 'http' is request and response protocol user puts a request on to web-browser. On the request and connection establishment user enters relevant address to communicate with controller but this communication take place through HTML pages preloaded in controller memory.

III. HARDWARE AND SOFTWARE USED

Fig.2. gives the pictorial view of hardware implementation of embedded web-Server. The PCB is designed using minimum hardware. On kit controller used is Philips 89V51RD2+ and Ethernet controller used is RTL8089. It has onboard clock of 12 Mhz crystal and LCD display. The board is supplied with USB based supply with Reset switch and LCD intensity

adjustment POT. The programming is done in keil-3 and ws loaded on the kit using FLASH MAGIC software.



Fig. 2. Printed Circuit Board for Embedded Web-Server.

IV. APPLICATION

An application was build on System control in Green house Fig.3. shows the HTML page that is used to communicate PC with onsite application. But mere typing of key words we are able to control the application like water controlling , temperature control, humidity control etc.on site.

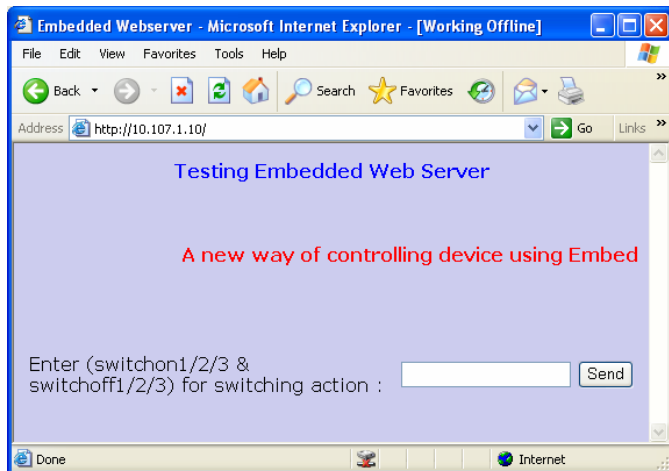


Fig. 3. Screen shot of HTML page for Embedded Web-Server.

V. ACKNOWLEDGMENT

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VII. BIOGRAPHIES



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Ronak recieved many awards for paper presentation and project at state level. He also lots of project under his credits and wish to work on research project and also wish to contribute his knowledge sharing skills but also wish to work for the betterment of humanity from technical skill set.



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