An Ethernet Based Approach for Automation and Controling Appliances

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Abstract—Advancement in the technology helps to increase the living standards of human life and building automation technology has a significant contribution to this advancements. The concept of automation binds the object around, to the Ethernet to promote the remote access and control. This paper presents controlling of electrical appliances over the Ethernet and enable interaction and control of the device from computer .A web server is developed using LM3S8962 stellaris family microcontroller with inbuilt Ethernet controller and Light weight Internet Protocol (LwIP) stack is ported, to promote the control of electrical appliance. Graphical User Interface (GUI) developed using web technologies provide an effective user interface. The functionality of the proposed system is checked and verified.

Keywords- Ethernet, LM3S8962, GUI, Interrupt mechanism, LwIP stack etc.

I. INTRODUCTION

Due to the fast growth in technology, automation based systems are playing importantrole in our day to day life. Introduction of intelligent system and smart devices helps to savetime, provides automatic control, reduce the human effort, eliminates the human error andreduce the energy wastage. Building automation system or intelligent building system inresidential and commercial complexes is popular due to safety, security and efficient energymanagement.

Due to human crave for sophistication and automation Industries with energymanagement and security system have become very popular and demanding. Solutionsinclude-building automation, video surveillance, efficient monitoring, fire protection andcontrol of heating, alarm systems and many more [12]. In order to obtain industry automationand energy management,Systems need to work as a single unit with cohesive nature. Thiswill provide increased performance with intelligent control.

Web-empowered or browser based systems are latest addition to building automationtechnology. These systems provides remote access for man-machine interface, adds moreflexibility, Controlling any numbers of devices are made possible with an infrastructure lesseffective GUI through web based building automations.

The rest of the paper is organized as section describes the related work in the field ofindustry automation followed by system architecture in section 3, Section 4 gives details thehardware description and in section 5 details about the software requirements. Finallysections 6 and 7 summarize the results and conclusions of the proposed.

II. LITERATURE SURVEY

With earlier times, the controls from the devices were done only through switches. But down the line wireless way of device handles were evolved from the development Wi-Fi technologies just like: Infrared, Bluetooth, and Worldwide System intended for Mobile, ZigBee and more. ZigBee protocol

is based on an IEEE802.15. ZigBee project supports different network topologies e.g. star, pine and fine mesh topologies. Home and building automation, professional controls are adopting the ZigBee intended for remote lights control program [11]. Wi-Fi network strategies are used in power automation system to manage appliances by way of ZigBee project. Wi-Fi network system has an outer as well as the inner ZigBee community for device controls [9]. But ZigBee centered home automation system provides the overhead associated with space limit. Wireless system has an outer as well as the inner ZigBee community for device controls [9]. But ZigBee centered home automation system provides the overhead associated with space limit. The flexibility of ZigBee control network can be expanded by means of modifying the communication community and with the addition of interface on the system. But it leads on the overload associated with limited assets. Mobile centered home automation program using Wireless Bluetooth technology furthermore had important role in Neuro-scientific personal region automation with graphical user interface [4]. Bluetooth is just like ZigBee centered home automation system which includes the operating space and in addition requires a lot more power burn in Wireless Bluetooth enabled device when compared with ZigBee. GSM community based home appliance control systems were also extremely popular in neuron-scientific automation devices for rural access associated with devices.

GSM community technology is utilized for sign of TXT from sender to receiver. Message is utilized for universal access associated with appliances along with allowing break control at home [10], [6]. Wireless home system determined by GSM along with ZigBee by which wireless ZigBee node is deployed with home. This node is interfaced with kitchen appliances and sensors in your own home and it will communicate while using the full practical device grasp control element. Master module is acting since hub with the data acquisition plus it send and have the data along with control commands from GSM community via control center [7], [13], [14]. GSM network provides flexibility with controlling room but causes increase with complexity to user with increase with appliance. This complexity is a result of poor graphical user interface and also as a result of more request-response mail messages as will increase in home appliances.

The proposed system aim is work to provide a flexible and cost effective solution for monitoring and control of electrical appliances through Ethernet using microcontroller. All the appliances are connected to the web server via I/O port and the inbuilt Ethernet controller. The embedded web server is designed with a user friendly GUI which facilitate the interactive control of appliance.

III. PROPOSED SYSTEM ARCHITECTURE

The Electronic Control Unit (ECU) is sophisticated vehicle control in the automotive. Each of the ECU acting as a small centralized unit and has the important role of monitoring the output of a system to the corresponding control input to the system. In the architecture microcontroller is having similar behavior as ECU. The stellaris family microcontroller is acting as an embedded web server as well as Home Controller Unit (HCU). The role of embedded web server is to connect the home appliances to the Ethernet with the feature of interactive control of appliance from the remote location. The role of HCU enables the centralized control architecture of the home appliance. All the appliances in the electrical are integrated with HCU. It has to control the appliances corresponding to the user input and the user inputs are given to HCU is through the push button switch (physical switch) inside the home or the user inputs from the web page. Figure3.1 shows the system architecture of the proposed work.

The electrical appliance can be controlled using the physical switches inside the industries and also can be controlled over the Ethernet. Physical switch control of appliance is programmed using General Purpose Input Output interrupt mechanism. The controlling of signal from the web server to the AC appliance is driven by relay circuit. Web page is converted to hex format, which is executed by server and control code with LwIP stack are compiled using code composer studio.
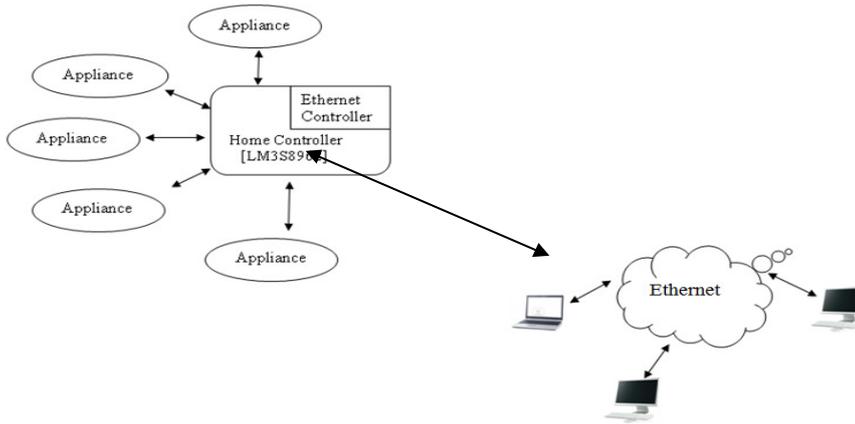
Figure 3.1 System Architecture

Figure 2. Flow chart describes the processing flow architecture of embedded web server.
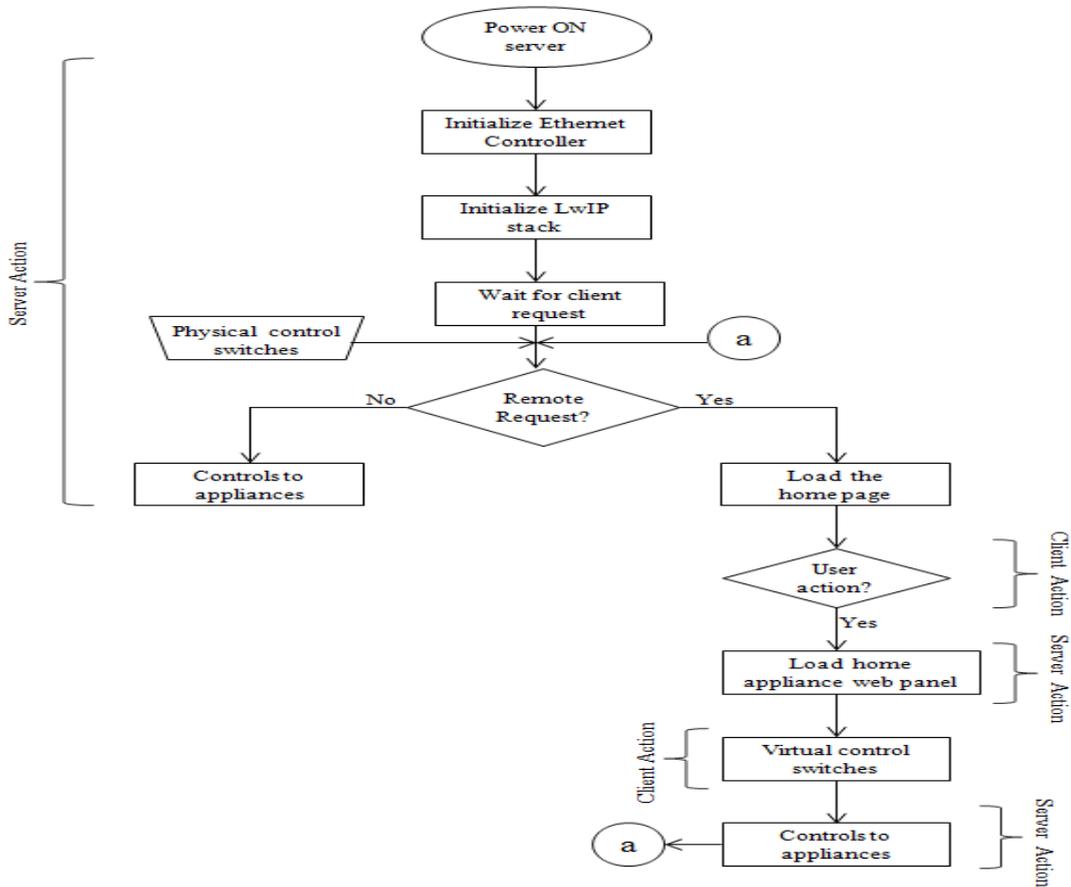

Figure 3.2 Embedded Web Servers and Remote Client Control Flow Architecture

IV. HARDWARE DESCRIPTION

4.1 Microcontroller

The controller used for the proposed application development is an ARM Cortex-M3 based Stellaris LM3S8962 microcontroller. It is having high performance 32-bit computing with operating frequency of 50MHz. The controller has 256KB internal flash file system and 64KB of SRAM. The Stellaris family offers efficient performance and extensive integration, with a 10BASE-T/100 BASE-TX Ethernet Media Access Control (MAC) and Physical (PHY) layer. The Stellaris microcontroller is targeted for industrial applications, including, electronic point of network appliances, sale machines and switches, factory automation, remote monitoring, gaming equipment, motion control, HVAC and building control, and fire and security.

4.2 Ethernet Controller

This Stellaris Ethernet Controller fulfills IEEE-802.3 technical specs and fully supports 10 BASE-T and 100 BASE-TX standards. This Ethernet Controller is made up of fully built-in Media Access Controller and network real user interface system. On board Ethernet Controller can be hugely configurable, supports many functional processes and supplies intelligent MDI/MDI-X cross-over modification.

V. SOFTWARE DESCRIPTION

5.1 LwIP Stack

LwIP standard protocol is a set of open source TCP/IP standard protocol stack for that inserted methods. LwIP stack is often a handful of traces of signal to help put into practice the actual TCP/IP standard protocol stack put together by Adam Dunkels in the Computer system as well as Communities Architectures (CNA) laboratory in the Swedish Start of Computer system Scientific discipline (SICS). The objective of the actual LwIP stack would be to decrease ram need as well as dimensions of signal as well as making it acceptable to make use of in smaller ft. Images [4]. It will take 10's KB of RAM MEMORY as well as 40KB of RANGE OF MOTION. The item works by using Request Plan Program (API) so as to decrease running as well as ram require [15]. LwIP contains a number of adventures to help utilizing the actual TCP/IP methodologies (IP, ICMP, UDP as well as TCP) as well as a number of added support adventures. The support module incorporate the actual operating system (OS) emulation coating, system screen functions, stream as well as ram managing subsystems as well as functions pertaining to processing the World Wide Web checksum [15].

5.2 WEB PAGE DESIGN

The web page supplies a user helpful graphical program. It connects anyone virtually to the electrical appliances and security system. Web site design could be made good user requirement and could contain information to facilitate anyone interaction [8]. HTML will be the markup terminology for creating websites. HTML factors forms the building blocks of websites when anyone request server to see the appliances status, a dynamically website is made on server-side according to the user request and web site is served to the user.

VI. RESULTS

On this section, the final results of the proposed technique to overpower the particular equipment in excess of Ethernet connectivity using LM3S8962 controller can be shown. Number 3 indicates your home webpage of the Kitchen appliances Handle as a result of Ethernet Applying TI Board, immediately after coming into the particular stuck web server IP target. This equipment is usually governed sometimes by strong or perhaps handy remote control. In this

execution regarding project two equipment are believed some sort of lamp fixture along with an Enthusiast.

Figure 6.1 Home Page

VII. CONCLUSIONS

The paper presents a web based control of electrical appliances through the Ethernet connectivity. Rapid technology development in silicon devices led to improvements in flexibility of interactive control of device with an effective user interface. In future the embedded web server can be designed with Wi-Fi and Internet, which is co-existence technology on a single-chip. So the electrical appliances can also control from Wi-Fi enabled smart device with high graphical interface. This feature will enhance the control mechanisms with multiple technologies

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