



# **Stellaris Based Integrating Web Servers in Embedded Applications**

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**ABSTRACT:** As the World-Wide Web continues to evolve, it is clear that its underlying technologies are useful for much more than just browsing the web. After the “everybody-in-the-Internet-wave” “now obviously follows the “everything-in-the-Internet-wave”. However the embedded Internet integration for remote Maintenance and diagnostic as well as the so-called machine to machine communication is growing with a considerable speed. In this system, a microcontroller system acts like web servers that store the web pages in their memory. A client computer can access this web page using web browser to monitor and control the microcontroller where the microcontroller is used to control the various appliances like lamp. This embedded web server can be used for remote monitoring, control and data acquisition systems. Based on the ARM Cortex-M3 core, the award winning stellaris family provides exceptional processor horsepower, ample single cycle memory for efficient Ethernet traffic handling, high integration to connect to virtually any embedded interface, and optimization for low power.

**KEYWORDS:** Embedded web server, ARM, Ethernet

## **I. INTRODUCTION**

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

Due to human crave for sophistication and automation Industries with energy management and security system have become very popular and demanding. Solutions include-building automation, video surveillance, efficient monitoring, fire protection and control of heating, alarm systems and many more. In order to obtain industry automation and energy management, Systems need to work as a single unit with cohesive nature. This will provide increased performance with intelligent control. Web-empowered or browser based systems are latest addition to building automation technology. These systems provides remote access for man-machine interface, adds more flexibility, Controlling any numbers of devices are made possible with an infrastructure less effective GUI through web based building automations.

The rest of the paper is organized as section describes the related work in the field of industry automation followed by system architecture in section 3, Section 4 gives details the hardware description and in section 5 details about the software requirements. Finally sections 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. 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. 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



# International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

controls. 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 .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 .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. 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.SYSTEM IMPLEMENTATION

The system implementation includes proposed system and software implementation.

### A. PROPOSED SYSTEM

The Proposed System includes embedded system, light and server. The Embedded system consists of ARM LM3S8962, Ethernet and UART. Various appliances are attached to embedded system. The Server and Embedded system are connected by LAN as shown in fig 1.

### B. SOFTWARE IMPLEMENTATION

Ethernet: The LM3S8962 include Ethernet MAC and physical interface (PHY) on-chip. Two popular network stacks are  $\mu$ IP (micro Internet Protocol) and LwIP. LwIP is preferred because it is having more features than  $\mu$ IP like DHCP, PPP, ARP and Optional Berkeley-like socket API(Application Program Interface) etc. The controller confirms to IEEE 802.3 specifications and fully supports 10BASE-T and 100BASE-TX standards. The lwIP stack is an open- source implementation of the TCP/IP stack developed specifically to reduce resource usage while maintaining a full- scale TCP/IP stack. For embedded systems, with lwIP it is possible to connect the system to a local intranet or the Internet. The lwIP stack has been ported to the Stellar is family of microcontrollers. LwIP can run with or without an underlying operating system. The TCP/IP suites of protocols are defined in a layered fashion where each layer has a specific function. This layered protocol design has served as a guide for the implementation of the lwIP stack. Each protocol that is implemented has its own module with entry points into each protocol provided with function calls. The lwIP implementation uses a process model where all the protocols reside in a single process and are separated from the operating system kernel. Application programs can reside in the lwIP process, or be in separate processes .Having lwIP implemented outside of an operating system kernel allows the lwIP stack to be portable across operating systems or to be used without an operating system. The memory and buffer management system in a communication system must be prepared to handle buffers of varying sizes. LwIP uses packet buffers called pbufs.

The memory manager supporting the pbuf scheme handles allocations and deallocations of contiguous memory. The memory manager uses a dedicated portion of the total memory system, preventing the networking system from using all of the available memory. The lwIP stack provides a network interface data structure which allows the network interfaces to be saved in a linked list. The data structure provides a pointer to the next network interface structure, name of the interface, and the IP address information. There are also two function pointers provided in the

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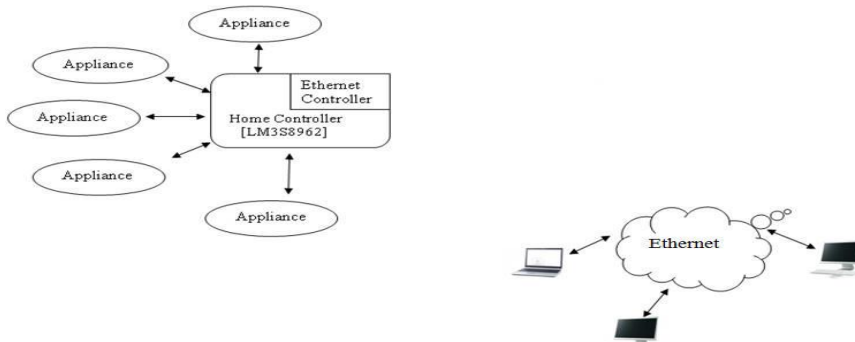


Fig 1 System Architecture

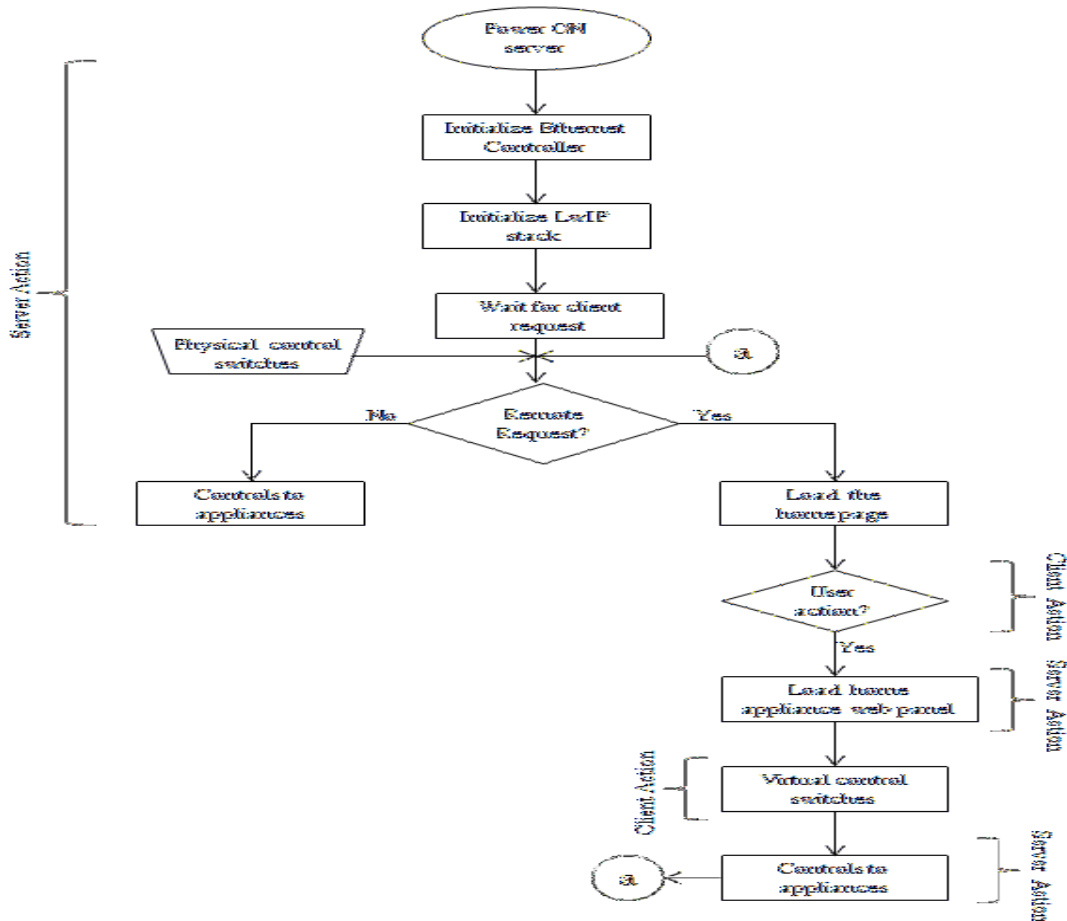


Fig 2. Embedded Web Servers and Remote Client Control Flow Architecture

data structure: one point to a function to process incoming data, and the other points to the device driver which is used to transmit data on to the physical network. Due to the process model of the lwIP stack, the implementation of the API is divided into two parts. The first part is a library linked into the application program, and the second part is implemented in the TCP/IP process. Interprocess communication (IPC) mechanisms are provided by the operating system emulation layer

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Vol. 4, Issue 4, April 2015

## IV. HARDWARE DESCRIPTION

**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.

## V. SOFTWARE DESCRIPTION

**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. 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. 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

**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. 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. 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 as shown in Fig 3. In this the lamp is connected with the microcontroller and in turn controlled by the web server.

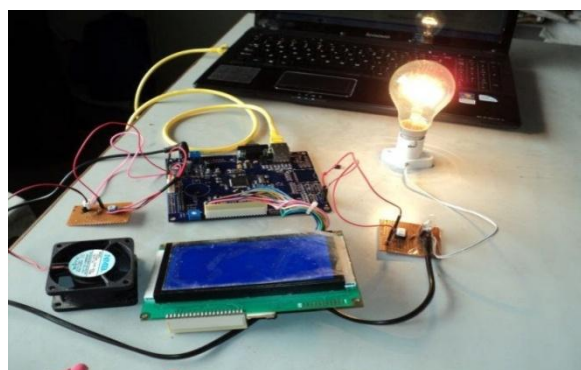


Fig 3. When Lamp is ON



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(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2015

## 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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