EMBEDDED WEB SERVER FOR WEB-BASED NETWORK ELEMENT MANAGEMENT USING ARM TECHNOLOGY

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***Abstract*— The emergence of the world wide web (WWW) is likely to have a lasting impact on organizational IT in the years to come. The popularity of the WWW is due in no small part to the simple and adaptable user interface. It provides and its capability to integrate many disparate services.Web browsers have become the de facto standard user interface for a variety of applications including embedded real time applications such as Remote Data Acquisition System. This brings in a need for web services being deployed on various embedded processors such as Advanced RISC Machine (ARM) in real time context.An Embedded Web Server (EWS) is a Web server which runs on an embedded system with limited computing resources to serve embedded Web documents to a Web browser. By embedding a Web server into a network device, it is possible to provide a Web-based management user interface, which are user-friendly, inexpensive, cross-platform, and network ready.In this paper ARM9 Processor, with a dedicated Web-Server System with simple user-interface is developed. It is used for the network element management.**

***Keywords*— Web server, embedded os, Arm-9 processor.**

I.INTRODUCTION

World-Wide Web (WWW) is one of the most widely used Internet applications. Web-based Network Management is the use of this technology to manage networks and systems. Key technologies include HTML, HTTP, Web Browser & Servers, Java, CGI, XML, etc. Industry Standards for Web-based Network Management include Web-Based Enterprise Management (WBEM from DMTF) and Java Management eXtension (JMX from Sun). An Embedded Web Server (EWS) is a Web server which runs on an embedded system with limited computing resources to serve embedded Web documents to a Web browser. Figure 1.1 shows how Embedded Web Servers (EWSs) are used for Web-based Management User Interface (WebMUI). By embedding a Web An **embedded web server** can also be defined as a microcontroller that contains an Internet software suite as well as application code for monitoring and controlling systems.Embedded web servers are integral part of an embedded network and paves way for faster time to market products.

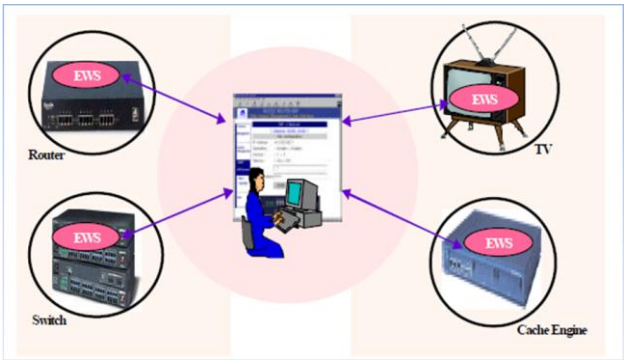

Fig .1.Block diagram

General web servers, which were developed for general-purpose computers such as NT servers or UNIX and Linux workstations, typically require megabytes of memory, a fast processor, a pre-emptive multitasking operating system, and other resources. A web server can be embedded in a device to provide remote access to the device from a web browser. The embedded system can be utilized to serve the embedded web documents, including static and dynamic information about embedded systems, to web browsers. This type of web server is called an web-based network element management gives an administrator the ability to configure and monitor network devices over the Internet using a Web browser. The most direct way to accomplish this is to embed a Web server into a network device and use that server to provide a Web based management user interface constructed using HTML, graphics and other features common to Web browsers. Information is provided to the user by simply retrieving pages, and information is sent back to the device using forms that the user completes. Web-based Network Management provides reduced development costs by using open technology,

unification for separated management platforms and simplification by ubiquitous and standard user interface. Embedded web servers have different requirements, such as low resource usage, high reliability, security and portability, for which general web server technologies are unsuitable.

II.RELATED WORK

There is a growing set of literature on Embedded Web server development: Mi-Joung Choi et al, 2000 [1] discuss on 'an efficient and lightweight embedded Web server for Web based network element management' with focus on integration mechanisms of embedded management information. Sanket-Dessai et al, 2009 [2] have reported on 'Web server development' and the need for a powerful user interface for the administrator. Design and development of embedded webserver[3] and embedded Ethernet monitoring and controlling using web browser by NVL Prasad et al[4].

III. ARCHITECTURE OF A EMBEDDED WEB SERVER

A web server is a system which hosts a web site and provides services for any requesting clients. Fig. 3.1 shows the design architecture of a typical EWS.

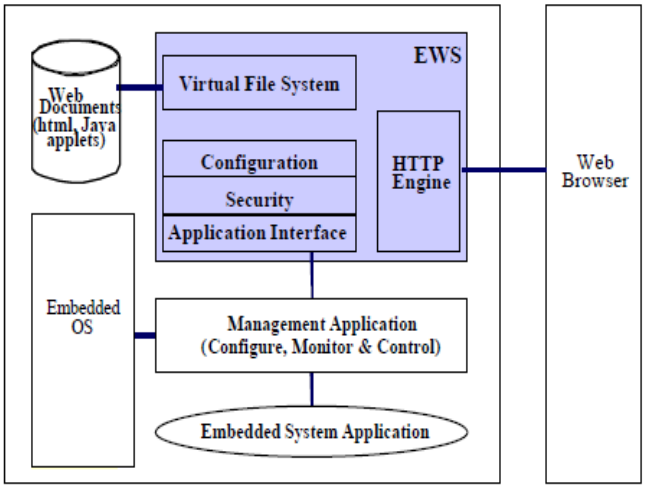

Fig 2.Architecture of a typical EWS

The hardware used for embedded web server is ARM9 based board. The board has the html pages saved on it.The application runs in the form of tasks. Each user connecting to the server is treated as a task. To manage the users, connections, an operating system is required, that performs the operations in real time. The embedded web server is implemented using µC/OS-II a powerful but small RTOS kernel. It is highly CPU independent and has been ported to numerous microprocessor platforms. To interact with the clients, the client has to send the data to them. In the embedded web server, web pages are selected as the media of interaction. The web pages are designed using HTML.

The present work is carried out in the following stages:

1.Embedded C language to be used for the software implementation of the embedded web server.

2.Web pages are to be developed for the web server using HTML in ARM9 Processor board. Web server application to be configured with the Keil Micro vision 3 MDKARM operating system.

3.Micro vision 3 MDKARM and web server application to be ported on ARM9 processor board.

4.Embedded web server to be tested for its working, using a data acquisition web application hosted over the network PC. Whenever a client request is received, the web server converts the analog input into digital. After processing the web page it gives the response to the client.

A. *Hardware Used :*

This project includes ARM processor[5] unit (ARM evaluation board ARM9 STR912FAZ42) and a debugging adapter. ARM-powered microcontrollers which combines a 16/32-bit ARM966E-S RISC processor core, dual-bank Flash memory, large SRAM for data or code, and a rich peripheral set to form an ideal embedded controller for a wide variety of applications such as point-of-sale terminals, industrial automation, security and surveillance, vending machines, communication gateways, serial protocol conversion, and medical equipment.

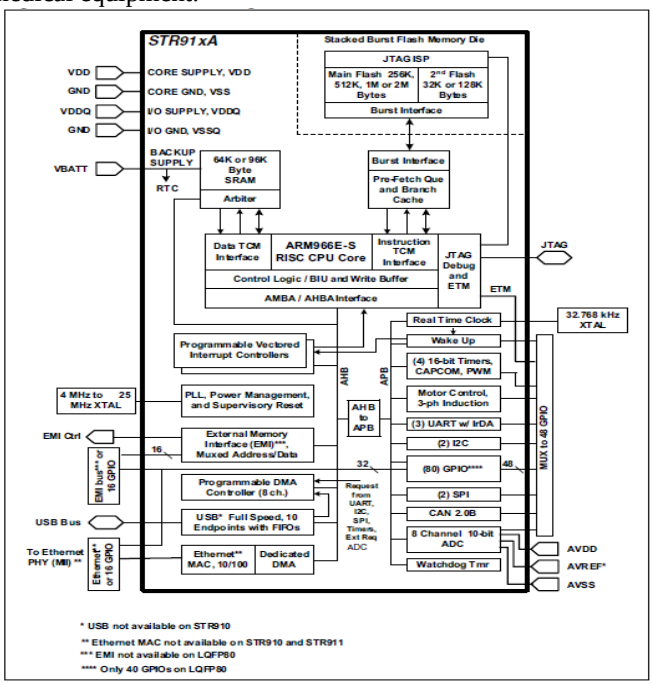

Fig. 3 STR91xFA block diagram
ARM9TDMI Pin description

The ARM966E-S core can perform single-cycle DSP instructions, good for speech processing, audio algorithms,

and low-end imaging. This datasheet provides STR91xFA ordering information, functional overview, mechanical information, and electrical device characteristics.

Arm Processor Unit :

The ARM architecture (Acron RISC machine) is a 32-bit RISC Processor architecture that is widely used in a number of embedded designs. Due to their power saving features, ARM CPUs are dominant in the mobile electronics market, where low power consumption is a critical design goal. ARM based embedded processors are widely used in embedded systems due to their low-cost, low-power consumption and high performance. An ARM based embedded processor is a highly integrated SOC including an ARM core with a variety of different system peripherals.

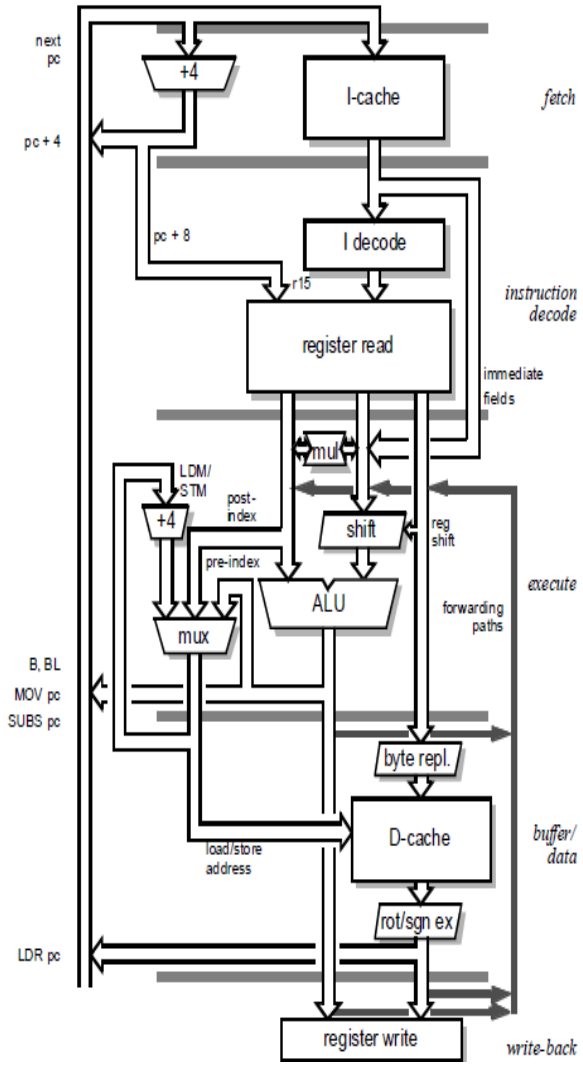

Fig. 4 ARM9TDMI Organisation

ARM9TDMI :

Harvard architecture, Increases available memory bandwidth, Instruction memory interface .Data memory interface, Simultaneous accesses to instruction and data memory can be achieved 5-stage pipeline Changes implemented to improve CPI to ~1.5 and improve maximum clock frequency. Fig 4 shows ARM9TDMI Organisation. In the above diagram shows the five stages of the pipeline and those detailed description the below fig 5.

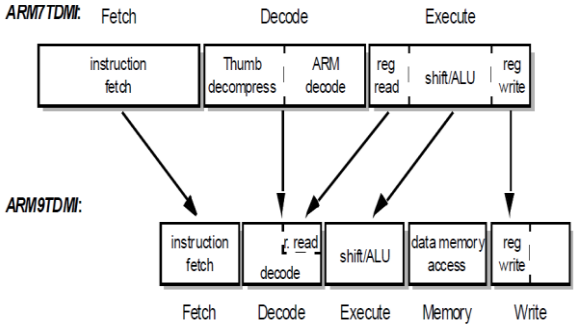

Fig 5. ARM pipeline operation

Not sufficient slack time to translate Thumb instruction into ARM instructions and then decode, instead the hardware decode both ARM and Thumb instructions directly.

Coprocessor support:

Coprocessors: floating-point, digital signal processing, special purpose hardware accelerator

On-chip debugger:
Additional features compared to ARM7TDMI
1.Hardware single stepping and break point can be set on exceptions
2.Graphics acceleration

Fig. 5 Items equipped with ARM processor

B. *Software:*

Keil Micro vision 3 MDKARM is a high performance, deterministic real-time kernel and can be embedded in commercial products and real-time applications. The target is powered via the PC, through its USB port. The Keil ULINK family of adapters connect the USB port of the PC to the JTAG port of your target board allowing to download and debug embedded programs running on the target hardware. The MCBSTR9 Evaluation Board is a USB-powered device.The MCBSTR9 Evaluation Board connects directly to the Keil µVision Debugger using the Keil ULINK USB-JTAG Adapter, so no additional software is required on the board. The MCBSTR9 Evaluation Board connects to a PC via a standard USB cable that provides power and emulates a COM interface for UART0. The STR91x device provide support for handling interrupts from external and internal (on-chip) peripherals with its **Vectored Interrupt Controller (VIC)**.

IV.EXPECTING RESULTS

Embedded C language is used for the software implementation of the embedded web server. Web pages are developed for the web server using HTML in ARM9 Processor board. Web server application is configured with the Keil Micro vision 3 MDKARM operating system. Micro vision 3 MDKARM and web server application is ported on ARM9 processor board. Embedded web server is testing for its working, using a data acquisition web application hosted over the network PC. Whenever a client request is received, the web server converts the analog input into digital. After processing the web page it gives the response to the client. Web server status can be visualized using status registers during interruption.

V.CONCLUSION

The methodology for the design and development of 'Embedded Web Server for Web-based Network Element Management using ARM Technology' is presented. In this paper, a dedicated Web-Server System based on ARM9 Processor having simple user-interface is developed which can be used for the network element management. Web server status can be visualized using current status registers. The performance of a Web server is dependent upon a number of variables: the server hardware and operating environment, the server application, the network protocol, and the network, hardware, band width and traffic load. Perception of that performance depend also on variables on the client side. Future work can involve 1) the study about the following four metrics which can be used to measure the capacity of web server: requests per second, throughput in bytes per second, round-trip time and error rate. 2) Investigate methods for network management of devices equipped with EWSs.

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