Implementation Of Web Server By Using Arm9 For Industrial Applications

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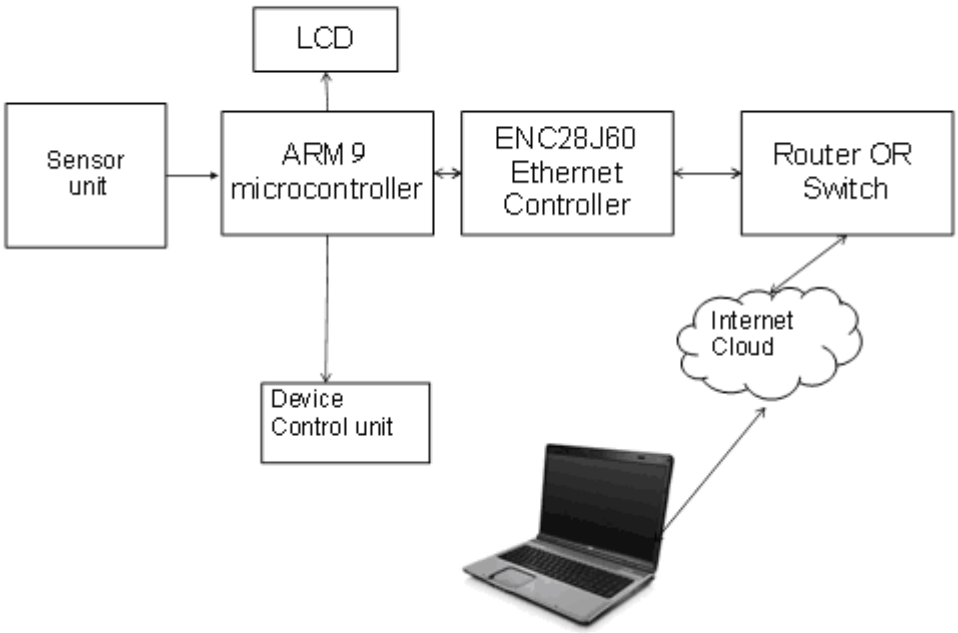
ABSTRACT:

As computer networks and embedded Internet technology rapid development of embedded systems in industrial production and daily life have been widely used. Embedded real-time operating system and dedicated hardware structure of Internet users around as long as you can at any time, any place using the system remote monitoring and control of embedded devices. Embedded system is an intelligent system that has the capability of processing,

monitoring and controlling. It may comprise of Sensors, Microcontrollers, etc. The TCP/IP protocol is a widely used standard for modern digital communication. Increasing amounts of integration of microcon trollers in electrical goods in today's world and the ever growing adoption of cheap 'smart home' solutions. Consider if we can remotely monitor the status of our embedded system using a web browser, or if send an alert when it needs a service or is sold out of specific items.

These things are all made possible with Embedded Ethernet. The key benefits of Embedded Ethernet Connectivity are described in the following paragraphs. Embedded connectivity stands at the forefront of today's embedded systems. So a solution need be found to realize the communication between industrial control devices and Ethernet. As the embedded system itself has the performance of network and human-computer interaction, it is possible that the embedded system replaces the previous control method based on microcontroller.

Block diagram



INTRODUCTION:

In this project we are implementing an embedded web sever using ARM Microcontroller and Ethernet device. ENC28J60 is a Microchip Technology has introduced a 28-pin stand-alone Ethernet controller and also greatly simplifies the related design, reducing the space. ARM microcontroller can communicate with serial data acquisition equipments at the terminal through SPI interface and can transmit data to remote host computer through Ethernet ENC28J60 interface. ARM acting as a standalone web server, with controls for various input and output transducers. The web page(s) will allow monitoring of traducers and status of the different devices.

The implementation of embedded Internet technology is achieved by means of the embedded web server. It runs on embedded system with limiting computing resources to serve web documents including static and dynamic information about embedded system to web browser. We can connect any electronic device/ equipment to web server andcan obtain the real-time status information and control remote equipments without time and space restriction through web page released by embedded web server.

Embedded server is a single chip implementation of the Ethernet networking standard. It consists of two primary elements communicating with each other: i) a server consisting of an ARM processor with an Ethernet controller and ii) a client computer which is connected to controller through this RJ45 interface. The client computer sends/receives data to/from the arm microcontroller using TCP packets. The client has to enter IP address to access this server. This request is taken by the operating system of the client and given to the LAN controller of the client system.

The LAN controller sends the request to the router that processes and checks for the system connected to the network with the particular IP address. If the IP address entered is correct and matches to that of the server, a request is sent to the LAN controller of the server and a session is established and a TCP/IP connection is establishes and the server starts sending the web pages to the client through which we can remotely monitor and control the sensor and device status respectively.

GNU ARM/Keil compiler will be used for building the applications. Friendly ARM 9 development board will be used to test the built application. Additional hardware nodes will be used to demonstrate the complete setup.

ARM PROCESSOR:

ARM9 ORGANIZATION AND IMPLEMENTATION:

Since 1995 several new ARM cores have been introduced which deliver significantly higher performance through the use of 5-stage pipelines and separate instruction and data memories (usually in the form of separate caches which are connected to a shared instruction and data main memory system). ARM920T implements 5-stage pipeline architecture.

5stage pipeline ARM organization:

All processors have to develop to meet the demand for higher performance. The 3-stage pipeline used in the ARM cores up to the ARM is very cost-effective, but higher performance requires the processor organization to be rethought. With a given compiler using a given set of optimizations, and so on) there are only two ways to increase performance:

- Increase the clock rate, Fclk. This requires the logic in each pipeline stage to be simplified and, therefore, the number of pipeline stages to be increased.

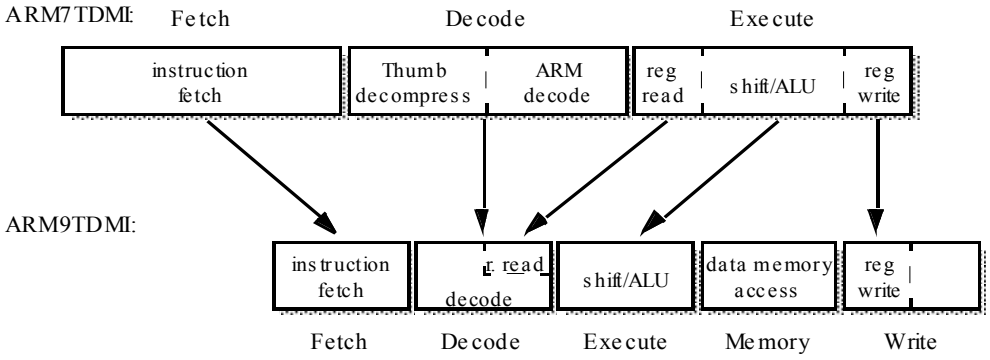
- Reduce the average number of clock cycles per instruction, CPI. This requires either that instructions which occupy more than one pipeline slot in a 3-stage pipeline ARM are re-implemented to occupy fewer slots, or that pipeline stalls caused by dependencies between instructions are reduced, or a combination of both.

The fundamental problem with reducing the CPI relative to a 3-stage core is related to the von Neumann bottleneck - and stored-program computer with a single instruction and data memory will have its performance limited by the available memory bandwidth. A 3-stage ARM core accesses memory on (almost) every clock cycle either to fetch an instruction or to transfer data.

Simply tightening up on the few cycles where the memory is not used will yield only a small performance gain. To get a significantly better CPI the memory system must deliver more than one value in each clock cycle either by delivering more than 32 bits per cycle from a single memory or by having separate memories for instruction and data accesses. and data memories (which may be separate caches connected to a unified instruction and data main memory) allow a significant reduction in the core's CPI.

A typical 5-stage ARM pipeline is that employed in the ARM9TDMI. The organization of the ARM9TDMI is illustrated in Figure.

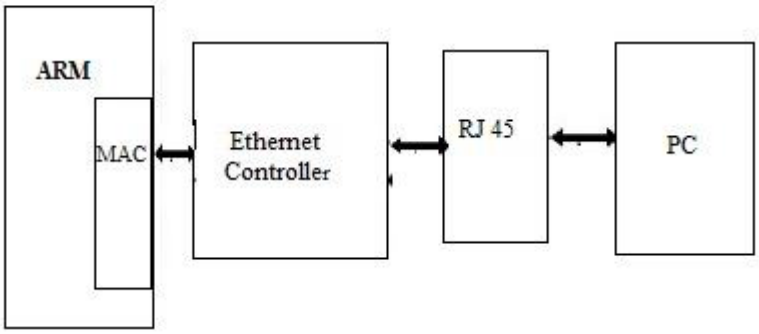
The ARM processors which use a 5-stage pipeline have the following pipeline stages:



ETHERNET MODULE:

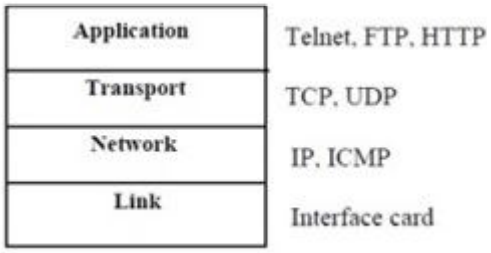
Ethernet provides services corresponding to Layers 1 and 2 of the OSI reference model. It is standardized as IEEE 802.3 It specifies bus topology with connecting cable with both station and the actual network medium. Ethernet interface consists of MAC controller and PHY interface.

MAC layer is responsible for data packaging, closing, sending and receiving. embedded with MAC but does not provide physical interface. Soit uses CS8900 chip to provide Ethernet access channels. CS8900A is a low-cost Ethernet LAN controller for embedded applications. Its highly integrated design eliminates the need for costly external components required by other Ethernet controllers.



TCP/IP PROTOCOL:

The software running on the embedded web server follows the same layered structure as used in the TCP/IP protocol suite. The TCP/IP protocol suiteallows computers of all sizes, running differentoperating systems, to communicate with each other.The TCP/IP protocol suite is a combination of different protocols at various layer.



Every layer acts independently from each other.The Link Layer normally includes the device driverin the operating system and the corresponding network interface (card) in the computer. An Ethernetcontroller driver controls the Ethernet interface. The network layer controls the communication between hosts on the Ethernet.

The Address Resolution Protocol (ARP) at network layer translates IP addresses to Ethernet MAC addresses. InternetProtocol (IP) delivers packets to Transmission Control Protocol (TCP), UDP, and Internet ControlMessage Protocol (ICMP), the ICMP answers toPING requests. TCP/UDP delivers data to the applications. HTTP runs on the top of TCP/IPprotocol. It is set of the rules for transferring files like text, image, sound and other multimedia file on the World Wide Web. When Web. The applications can communicate with the transport layer through buffer swith data and variables with control information. As soon as a Web user opens their Web browser, the useris indirectly making use of HTTP. When you are set up with direct access to the Internet, your computer isprovided with a copy of the TCP/IP program.

CONCLUSION:

Implementation of web server using ARM9 for intelligent monitoring is a new method to monitor a industrial appliances which designed here for the prototype.

By using ARM9 Processor, the embedded system becomes highly precise and gives better performance over traditional 8/16-bit Microcontrollers. The system can also communicate with PC through Serial Port. It supports online-supervision and control not only within Private Network (LAN) but also in Public Network (Internet).

The whole system has low-cost, good openness andportability, and is easy to maintain and upgrade. It is possible to interface different kind of sensors with these modules and make various applications. So it can monitor embedded system operation state through Internet, achieving network monitoring purposes. Hence for our future we make the system for domestic environment monitoring, for Ocean environment monitoring, Educational Institution petroleum etc.

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