Petite Embedded Mesh Server

Kiran Jadhav
Electronics & Telecommunication Department of JSPM NTC, SPPU

Abstract

Sophisticating about realization of Petite Embedded system for particular Application with their results. Here, case of ware house is considered. The environmental conditions should be maintained for ware house plant like temperature & light from remote place. This system makes use of microcontroller ARM7 (LPC214X) as core device.

Keywords: ARM processor, ADC, Sensors

A. ENLIGHTENMENT

The Petite EWS kit consists of a microcontroller in which a web page is fed. This kit is then connected to a hub. Thus the web page can be accessed by machines or computers connected through the LAN. Hence users connected to LAN can now access the web page just by inserting the IP address. The EWS is basically very flexible, since it can be used for many applications. It is designed to be used with Ethernet through LAN.

The core of the EWS kit consists of a microcontroller, power supply and a network interface card**.** The microcontroller using here is a 32 bit microcontroller. The web page is stored in microcontroller. This web page is designed in HTML. By using TCP/IP and embedded C coding, I connect this web page with LAN.

Via a network interface card (NIC) to connect EWS with the LAN or hub. Thus web page gets connected in the local area network. The NIC is a connector or an interface between controller and the LAN. Embedded web server also consists of a power supply which is used to activate the microcontroller and different devices.

Petite web server system consists of a microprocessor containing all the relevant web pages and addresses. Since it is not a dedicated system it is responsible for carrying out various tasks which increases the cost and reduces the speed of the system.

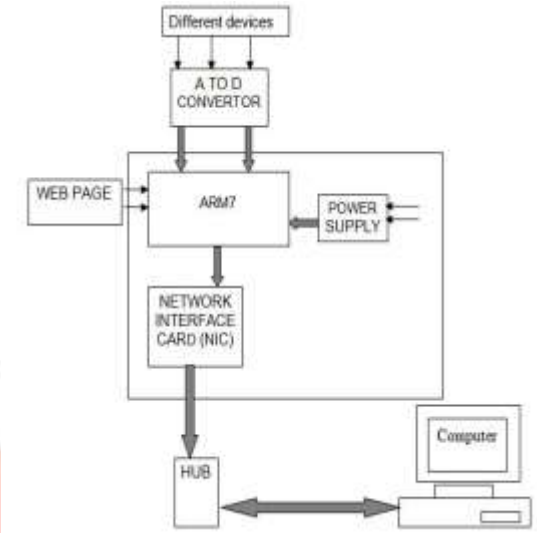

Fig.1 Block Diagram of Petite Embedded Mesh Server

B.HARDWARE DESIGNING

1. ARM Microcontroller:

The LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

Due to their tiny size and low power consumption, LPC2148 is ideal for applications where miniaturization is a key requirement, such as access control and point-of sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I^2C-bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems.

Applications:

- Industrial control
- Medical systems

- Access control
- Point-of-sale
- Communication gateway
- Embedded soft modem

2. Sensors

Sensors detect different parameters and communicate the changes in parameters through ARM. In this project three different sensors are used which are given below:

An LDR (Light dependent resistor), as its name suggests, offers resistance in response to the ambient light. The resistance decreases as the intensity of incident light increases, and vice versa. In the absence of light, LDR exhibits a resistance of the order of mega-ohms which decreases to few hundred ohms in the presence of light. It can act as a sensor, since a varying voltage drop can be obtained in accordance with the varying light. It is made up of cadmium sulphide (CdS). An LDR has a zigzag cadmium sulphide track. It is a bilateral device, i.e., conducts in both directions in same fashion.

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level.

3. NIC (Network Interface Card)

The ENC28J60 is a stand-alone Ethernet controller with an industry standard Serial Peripheral Interface (SPI™). It is designed to serve as an Ethernet network interface for any controller equipped with SPI. The ENC28J60 meets all of the IEEE 802.3 specifications.

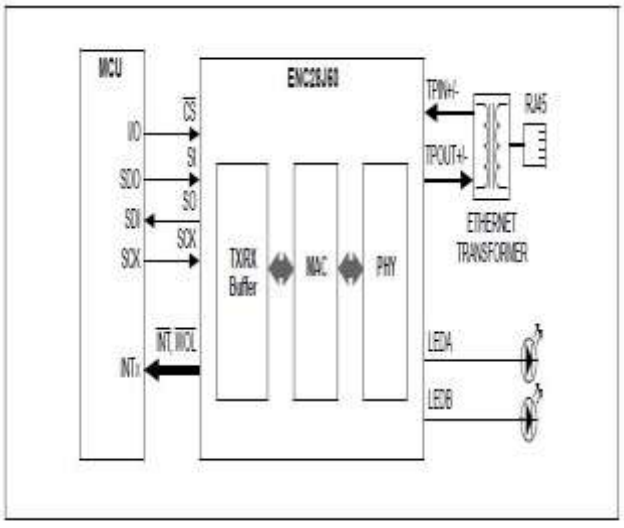

Fig.2 Block diagram of the ENC28J60

A simple block diagram of the ENC28J60 is shown in Figure 1-1. A typical application circuit using the device is shown in Figure 1-2. With the ENC28J60, two pulse transformers and a few passive components are all that is required to connect a microcontroller to a 10 Mbps Ethernet network. The ENC28J60 consists of seven major functional blocks:

1. An SPI interface that serves as a communication channel between the host controller and the ENC28J60.
2. Control registers which are used to control and monitor the ENC28J60.
3. A dual port RAM buffer for received and transmitted data packets.
4. An arbiter to control the access to the RAM buffer when requests are made from DMA, transmit and receive blocks.
5. The bus interface that interprets data and commands received via the SPI interface.
6. The MAC (Medium Access Control) module that implements IEEE 802.3 compliant MAC logic.
7. The PHY (Physical Layer) module that encodes and decodes the analog data that is present on the twisted pair interface.

This device also contains other support blocks, such as the oscillator, on-chip voltage regulator, level translators to provide 5V tolerant I/Os and system control logic. It also provides an internal DMA module for fast data throughput and hardware assisted IP checksum calculations. Communication with the host controller is implemented via two interrupt pins and the SPI, with data rates of up to 10 Mb/s. Two dedicated pins are used for LED link and network activity indication

C. SOFTWARE CONSTRAINT

1. Keil C51 Cross Compiler:

The Keil Cross Compiler is an ANSI C Compiler that is written specifically to generate fast, compact code for the microcontroller family. The Keil Compiler generates object code that matches the efficiency and speed of assembly programming. The Keil Compiler for the microcontroller is the most popular compiler in the world. It provides more features than any other compiler available today. This Compiler allows you to write microcontroller applications in C that, once compiled, have the efficiency and speed of assembly language. Language extensions in the Compiler give you full access to all resources of the microcontroller. The Compiler translates C source files into re-locatable object modules which contain full symbolic information for debugging with the µVision Debugger or an in-circuit emulator. In addition to the object file, the compiler generates a listing file which may optionally include symbol table and cross reference information.

2. Embedded C:

We have decided to use an ARM microcontroller as the basis of the embedded system, the next key decision that needs to be made is the choice of programming language. I require a language that is efficient, high-level, gives low-level

access to hardware, and is well defined. In addition – of course the language must be available for the platforms I wish to use. Against all of these points, C scores well.

D. RESULT

Summary:

We have designed Petite Embedded Web Server, which sustain task necessities and the following conclusions according the obtained results, are:

- Our Petite Embedded Web Server provides Web page containing temperature, light intensity and humidity presence in the environment. All this information accessible for clients from Internet. To realize the same task without embedded system we need personal computer and huge operational system. Comparing electrical circuits we can say, that Embedded Web Server is small and inexpensive system.
- Client access the Petite Embedded Web Server's page using Internet Browser. For this reason, no additional programs or drivers are needed.
- Power consumption is low. Thus, exploitation of device is inexpensive. Using planar electrical components this power consumption can be further reduced.

The fig.3 shows result on web page.

Fig.3 Result for Petite Embedded server

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