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Energy Efficient Ethernet for Real-Time Industrial Networks

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Abstract:
To increase the energy efficiency of Ethernet networks, in 2010, the IEEE published the IEEE 802.3az amendment, known as Energy Efficient Ethernet (EEE). The amendment introduces a new operational mode, defined as Low Power Idle (LPI) that allows to considerably reducing the power consumption of inactive Ethernet links. In this paper, we address the application of EEE to Real-Time Ethernet (RTE) networks, the popular communication systems typically employed in factory automation, characterized by tight timing requirements.

We start with a description of the EEE basics and, subsequently, focus on the introduction of EEE in the industrial communication scenario. Then, we specifically address the implementation of effective EEE strategies for some popular RTE networks. The analysis is carried out on configurations commonly deployed at low levels of factory automation systems. The obtained results show that considerable power savings can be achieved with very limited impact on network performance.

Here in this project we are including WiFi module for communication purpose instead of Ethernet because in present generation all the communications and controlling is based on smart technology. This can used to control the man power and also power consumption. Using android mobile using one Application we can control. Here we are having hardware wifi module which is connected to the controller and by using the inputs given.

Introduction to Embedded Systems:

Embedded systems are electronic devices that incorporate microprocessors with in There implementations. The main purposes of the microprocessors are to simplify the system design and provide flexibility. Having a microprocessor in the device means that removing the bugs, making modifications, or adding new features are only matters of rewriting the software that controls the device. Or in other words embedded computer systems are electronic systems that include a microcomputer to perform a specific dedicated application. The computer is hidden inside these products. Embedded systems are ubiquitous. Every week millions of tiny computer chips come pouring out of factories finding their way into our everyday products.

Embedded systems are self-contained programs that are embedded within a piece of hardware. Whereas a regular computer has many different applications and software that can be applied to various tasks, embedded systems are usually set to a specific task that cannot be altered without physically manipulating the circuitry. Another way to think of an embedded system is as a computer system that is created with optimal efficiency, thereby allowing it to complete specific functions as quickly as possible.

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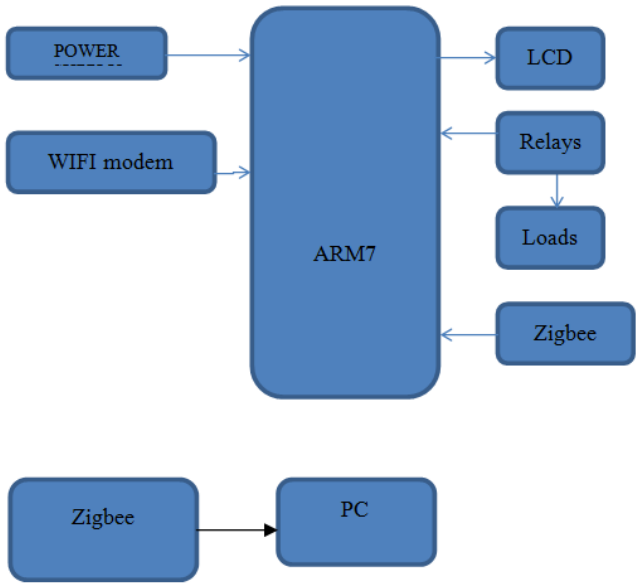
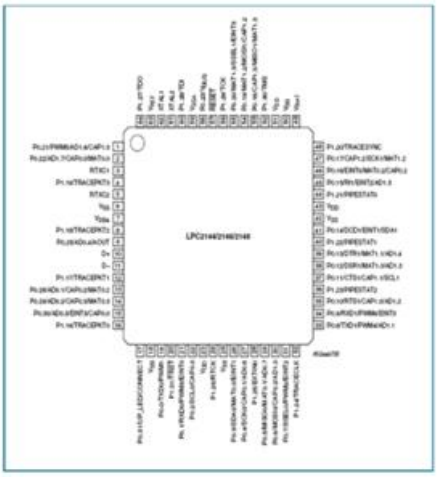
BLOCK DIAGRAM:



ARM Microcontroller: LPC2148:

The LPC2141/42/44/46/48 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, LPC2141/42/44/46/48 are 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 I2C-bus and on-chip SRAM of 8kB up to 40kB, 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.The application program may also erase and/or program the flash while the application is running, allowing a great degree of flexibility for data storage field firmware upgrades, etc.



ARM7TDMI-S processor has two instruction sets:

The standard 32-bit ARM set.

• A 16-bit Thumb set.

The Thumb set's 16-bit instruction length allows it to approach twice the density of standard ARM code while retaining most of the ARM's performance advantage over a traditional 16-bit processor using 16-bit registers. This is possible because Thumb code operates on the same 32-bit register set as ARM code.Thumb code is able to provide up to 65 % of the code size of ARM, and 160 % of the performance of an equivalent ARM processor connected to a 16-bit memory system. The particular flash implementation in the LPC2141/42/44/46/48 allows for full speed execution also in ARM mode. It is recommended to program performance critical and short code sections (such as interrupt service routines and DSP algorithms) in ARM mode. The impact on the overall code size will be minimal but the speed can be increased by 30% over Thumb mode.

POWEW SUPPLY

In this project we have power supplies with +5V & -5V option normally +5V is enough for total circuit.

ISSN No: 2348-4845
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Another (-5V) supply is used in case of OP amp circuit .Transformer primary side has 230/50HZ AC voltage whereas at the secondary winding the voltage is step downed to 12/50hz and this voltage is rectified using two full wave rectifiers .the rectified output is given to a filter circuit to fiter the unwanted ac in the signal After that the output is again applied to a regulator LM7805(to provide +5v) regulator. Whereas LM7905 is for providing –5V regulation (+12V circuit is used for stepper motors, Fan and Relay by using LM7812 regulator same process like above supplies.)Do not use the word "essentially" to mean "approximately" or "effectively".In your paper title, if the words "that uses" can accurately replace the word "using", capitalize the "u"; if not, keep using lower-cased.

Wireless Network Technology: Embedded Serial to Wi-Fi Modules

Introduction

Wi-Fi stands wireless fidelity Wireless technology has become common in modern society .It can be used in many application because the power consumption is very less expensive. It is very simple ,reduces wiring harness compare with the olden devices .Wi-Fi module efficiently transmit data up to 100 meters compare with the blue tooth the range of Wi-Fi is very high. This is the one of the standard protocol to transmit the data the IEEE 802.11.b.g/n and in the wireless application it can place special role by using this Wi-Fi we connect the network anywhere, if you know the encryption password you can access easily monitoring everything on the internet.

In the early 2007, embedded serial to Wi-Fi modules have become eagerly obtainable in public consumer markets. Each brand boasts similar features such as low power consumption and onboard wireless encryption or firewall security. The following section will investigate two embedded serial to Wi-Fi modules currently available on the market. Embedded serial to Wi-Fi modules function as device servers bridging serial devices to 802.11b/g wireless LANs. The Wireless-fidelity modules utilize RS232 serial ports in conjunction with UART to interact with serial machines. Some Wi-Fi modules such as the Wireless fidelity employ custom serial protocols .Additionally the modules are prepared with programmable processor chipsets with an OS that coordinates the data transfer between serial and Internet protocols. The Wi-Fi modules attach to wireless access points by utilize a built-in wireless adapter.The typical embedded serial to Wifi module is designed for somewhat simple installation. The attachments involve a Data bus 9 pass end to end serial cable that links the module to a serial port terminal. For most modules, power is supplied by a 4 -12v dc voltage un fettered , 3.3V regulated, or in some cases 2-3 V low down power battery sources. Initially, users must configure the module by connecting to a PC and utilizing the provided installation software prior to connecting the module to a serial module to controller device

16 * 2 Alphanumeric LCD

Liquid crystal display is very important device in embedded system. It offers high flexibility to user as he can display the required data on it. A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly. LCDs therefore need a light source and are classified as "passive" displays. Here the lcd has different memories to display data, those are discussed below.

Display data RAM (DDRAM) stores display data represented in 8-bit character codes. Its extended capacity is 80 X 8 bits, or 80 characters. The area in display data RAM (DDRAM) that is not used for display can be used as general data RAM. So whatever you send on the DDRAM is actually displayed on the LCD. For LCDs like 1x16, only 16 characters are visible, so whatever you write after 16 chars is written in DDRAM but is not visible to the user.

Figure below will show you the DDRAM addresses of 2 Line LCD.

SERIALCOMMUNICATION

INTRODUCTION

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Computers transfer data in two ways: parallel and serial. In parallel data transfers, often 8 or more lines (wire conductors) are used to transfer data to a device that is only a few feet away. Examples of parallel transfers are printers and hard disks; each uses cables with many wire strips. Although in such cases a lot of data can be transferred in a short amount of time by using many wires in parallel, the distance cannot be great. To transfer to a device located many meters away, the serial method is used. In serial communication, the data is sent one bit at a time, in contrast to parallel communication, in which the data is sent a byte or more at a time. The 8051 has serial communication capability built into it, thereby making possible fast data transfer using only a few wires.

When a microprocessor communicates with the outside world, it provides the data in byte-sized chunks. In some cases, such as printers, the information is simply grabbed from the 8-bit data bus of the printer. This can work only if the cable is not too long, since long cables diminish and even distort signals. Furthermore, an 8-bit data path is expensive. For these reasons, serial communication is used for transferring data between two systems located at distances of hundreds of feet to millions of miles apart. The Figures shows serial versus parallel data transfers.

RELAY

A relay is used to isolate one electrical circuit from another. It allows a low current control circuit to make or break an electrically isolated high current circuit path. The basic relay consists of a coil and a set of contacts. The most common relay coil is a length of magnet wire wrapped around a metal core. When voltage is applied to the coil, current passes through the wire and creates a magnetic field. This magnetic field pulls the contacts together and holds them there until the current flow in the coil has stopped. The diagram below shows the parts of a simple relay.

Operation:

When a current flows through the coil, the resulting magnetic field attracts an armature that is mechanically linked to a moving contact.

The movement either makes or breaks a connection with a fixed contact. When the current is switched off, the armature is usually returned by a spring to its resting position shown in figure 6.6(b). Latching relays exist that require operation of a second coil to reset the contact position.

What's New in µVision4?

µVision3 adds many new features to the Editor like Text Templates, Quick Function Navigation, and Syntax Coloring with brace high lighting Configuration Wizard for dialog based startup and debugger setup. µVision3 is fully compatible to µVision4 and can be used in parallel with µVision4.

What is µVision4?

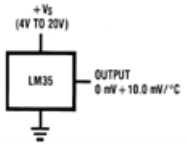
µVision3 is an IDE (Integrated Development Environment) that helps you write, compile, and debug embedded programs. It encapsulates the following components:

•A project manager.

•A make facility.

•Tool configuration.

•Editor.



•A powerful debugger.

To help you get started, several example programs (located in the \C51\Examples, \C251\Examples, \C166\Examples, and \ARM\...\Examples) are provided.

•HELLO is a simple program that prints the string "Hello World" using the Serial Interface.

•MEASURE is a data acquisition system for analog and digital systems.

•TRAFFIC is a traffic light controller with the RTX Tiny operating system.

•SIEVE is the SIEVE Benchmark.

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•DHRY is the Dhrystone Benchmark.

•WHETS is the Single-Precision Whetstone Benchmark.

Additional example programs not listed here are provided for each device architecture.

Building an Application in µVision4

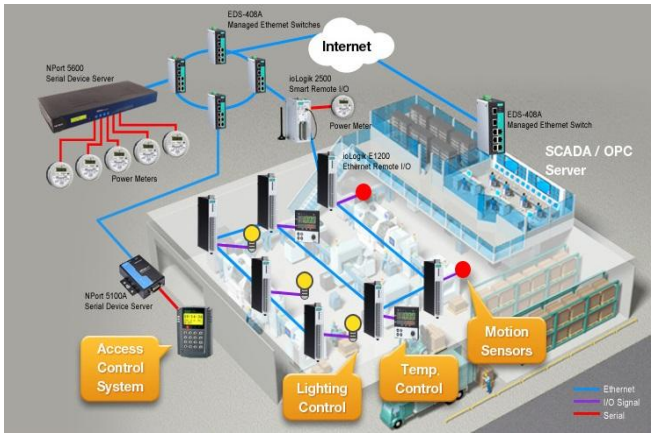
To build (compile, assemble, and link) an application in µVision4, you must:

1.Select Project –

(for xample,166\EXAMPLES\HELLO\HELLO.UV4).

2.Select Project - Rebuild all target files or Build target.

µVision4 compiles, assembles, and links the files in your project.



CONCLUSION

The project "Energy Efficient Ethernet for Real-Time Industrial Networks "has been successfully designed and tested Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

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Electronics For You, November 2012, Page 18

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