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External Device Server
Plug & Play Gateway Module
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Product Focus

EXTERNAL DEVICE SERVER

The easy way to provide Internet connectivity for your device!

External Device Server (Serial-to-Ethernet Gateway)
The WIZ1000 external device server makes it easy to connect and control any serial devices through Ethernet. It supports the standard baud rates from 1,200 to 230,400bps, and is fully compatible with 10/100Base-T Ethernet. This device server allows for Customization through our Customizing Service according to customer's needs.

Easy to Install and Setting
A powerful configuration tool is also provided. Users can use this configuration tool to set the parameters of WIZ1000 and remotely upgrade its firmware via Ethernet. Moreover, the Telnet COM port option (RFC2217) is included in the WIZ1000.

Main features:
- Easy to Connect with Serial Device
  - Adding Network Function Simply and Quickly
  - Providing Firmware Customization
- System Stability and Reliability by using the WS100 Hardware Chip
- Supports PPPoE Connection
- Supports Serial Configuration — with Simple and Easy command
- Supports Password to ensure Security
- Configuration Tool Program
- Telnet Com Port Option (RFC2217) Compliant
- 10/100 Base-T Ethernet Interface and Serial Interface with speed up to 230Kbps
- RoHS Compliant
- CE, FCC and KCC certificated
Serial-to-Ethernet Gateway Module

Besides our hardwired TCP/IP chips, the Serial-to-Ethernet Gateway (SEG) module is also one of our main products. For last 10 years, WIZnet has developed 4 different types of SEG to serve different customers and applications. WIZ100SR, WIZ1055R and WIZ1105R are controlled by a W5100 and an 8051 compatible microcontroller with various external interfaces. WIZ1205R is a high performance ARM based module that supports two serial ports. The main features are listed as follows.

- Easy to connect with existing serial device
- Adding Network Function Simply and Quickly
- Providing Firmware Customization
- System Stability and Reliability by using W5100 Hardware Chip
- Supports PPPoE Connection
- Supports Serial Configuration - with Simple and Easy command
- Supports Password to ensure Security
- Configuration Tool Program
- 10/100 Base-T Ethernet Interface and Serial Interface with speed up to 230Kbps
- RoHS Compliant

The main function is all the same for these modules, but their interfaces are a little different. For example, WIZ100SR and WIZ120SR have a pin header type interface; as a result, they can be easily embedded into an existing system. While WIZ1055R and WIZ1105R have external connectors, so they are more suitable for systems without the connectors. The main differences are summarized in the following table.

<table>
<thead>
<tr>
<th>Feature</th>
<th>WIZ100SR</th>
<th>WIZ1055R</th>
<th>WIZ1105R</th>
<th>WIZ1205R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main MCU</td>
<td>8051</td>
<td>8051</td>
<td>ARM Cortex-M3</td>
<td></td>
</tr>
<tr>
<td>Ethernet Controller</td>
<td>W5100</td>
<td>W5100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Serial Port</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Ethernet</td>
<td>10/100 Base-T</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RJ-45 Connector</td>
<td>Without</td>
<td>Has</td>
<td>Has</td>
<td>Without</td>
</tr>
<tr>
<td>DB9 Connector</td>
<td>Without</td>
<td>Without</td>
<td>Has</td>
<td>Without</td>
</tr>
</tbody>
</table>

WIZnet even takes the customizing service into Connectors. For the SEG product line, WIZnet provides not only the firmware customizing services, but also the hardware customizing services to meet the requirements of different customers. In the near future, WIZnet will provide more abundant customizing services in all product lines.
The WIZ610wi is a 802.11b/g WLAN pin header type module in a compact package (39mm X 32mm X 4.7mm). This module can be configured as an access point, a client-bridge or a pure client. The function of Serial-to-WLAN is embedded in WIZ610wi, so that serial-to-WLAN can be easily implemented with any system that has an UART interface. With the WIZ610wi, the development time is shortened because WLAN driver porting is not required. Our module guarantees excellent stability as a result of independent operation.

This module also provides Ethernet-to-WLAN bridging function which enables a wired network device to have a wireless communication interface. WIZ610wi offers a 54Mbps data rate and a maximum of 20Mbps effective data transmission rate. The module includes a fully featured network protocol stack and a built-in web server for configuration via a standard web browser. Moreover, WIZ610wi also supports serial command configuration. The main features of WIZ610wi are listed as follows.

- Embedded 802.11b/g Wireless Networking
- Access Point, Client, Gateway, Serial to WLAN mode Supported
- Ethernet to Wireless Bridging
- Security with 64/128 bit WEP, WPA, WPA2 [AES]
- MII, UART, GPIO, U.Fl. (WLAN) Interface
- Ready to use serial to wireless application
- Max 20Mbps Data Streaming
- Compact Size: 39mm X 32mm X 4.7mm
- RoHS Compliant
WIZ200WEB - Embedded Web Server

With the wide spread of Internet, the browser has become an important tool while surfing the Internet. Nowadays, almost every computer has at least one browser installed. If every device has a web server, the dream of controlling these devices by using an Internet browser will soon come true. WIZ200WEB is a compact low cost web server that enables remote control for any embedded devices. This module features an 8-bit AVR microcontroller and the W5300 hardwired TCP/IP chip with high network performance. The webpage is saved in the flash memory of WIZ200WEB, and can be updated by the configuration tool.

WIZ850SW - Multi-port Switching Module

WIZ850SW is a multi-port switching network module that features a W3150A+ hardwired TCP/IP chip and a RTL8306SD switching PHY chip. This module can be used to easily develop multi-port applications. Since this module is a pin header type, it can be easily embedded in other systems.

The key features:
- Supports 10/100 Base TX
- Supports auto-negotiation and auto cross-over detection
- IEEE 802.3/802.3u Compliance
- Operates 3.3V with 5V I/O signal tolerance
- Supports network status indicator LEDs
- Supports MCU bus Interface and SPI Interface
- Supports Direct/Indirect mode bus access
- Supports Socket API for easy application programming
- Interfaces with two 2.00mm pitch 2 x 25 header pin
Drop-in network module

For fast and convenient evaluation of our hardwired TCP/IP chip, WIZnet provides a series of compact network modules for W5100 and W5300. We have 3 similar modules for our W5100 chipset: WIZ810MJ, WIZ811MJ and WIZ812MJ. The main functions of these modules are the same, but the physical dimension and pin assignments vary in order to meet our customer’s system requirements. Besides some differences in pin assignment, the hardware differences of our WIZ81xMJ series are shown in the following table.

<table>
<thead>
<tr>
<th></th>
<th>WIZ810MJ</th>
<th>WIZ811MJ</th>
<th>WIZ812MJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin header</td>
<td>2mm pitch 14x2x2 pins</td>
<td>2.54mm pitch 10x2x2 pins</td>
<td></td>
</tr>
<tr>
<td>Mount Hole</td>
<td>without</td>
<td>2 holes (Ø3.00mm)</td>
<td>4 holes (Ø3.00mm)</td>
</tr>
<tr>
<td>Size</td>
<td>52 x 25 x 21mm</td>
<td>55.5 x 25 x 23.6mm</td>
<td></td>
</tr>
</tbody>
</table>

For high performance applications, WIZnet also provides a new network module WIZ830MJ, which uses a W5300 to provide higher network performance than WIZ81xMJ series.

The main features of WIZ830MJ are listed as follows.

- Plug-in network module with W5300 & RJ45 Connector
- Supports 8 independent simultaneously connections
- Supports 8/16 bits data bus
- Supports DMA (Direct Memory Access) mode
Internet Weather Display

The Internet Weather Display is a weather station which fetches live weather information from the internet. After the data is received from the service provider, it is displayed on a LCD. This application uses a Propeller MCU and a WIZ810MJ module for network communication. Since the MCU "doesn't come with many peripherals at all", "The WIZnet W5100 Ethernet controller is the perfect companion chip for the Propeller microcontroller." WIZnet®'s hardware TCP/IP stack offloads the MCU from processing network packets; as a result, the MCU can utilize more memory and resources for the application. Although a software TCP/IP stack can be implemented in the MCU, "a TCP/IP stack would eat into the limited program memory".

"The W5100 does most of the 'heavy lifting.' It handles the entire Ethernet interface up to the TCP/IP level. It has a simple command interface to load data for sending outgoing data and for reading received data."

The WIZnet W5100 Ethernet Controller is the perfect companion chip for the Propeller microcontroller. Most other 32-bit microcontrollers have a version that includes integrated Ethernet. The Propeller does not; in fact, it doesn't come with many peripherals at all. An external MAC+PHY could be used, but a TCP/IP stack would eat into the limited program memory. A better solution is to use the W5100 to handle all the message passing on the Ethernet up to the TCP/IP level. The W5100 chip has both a SPI and a parallel interface. I chose the SPI to keep the design simple, and because I didn’t need the high throughput rate available in the parallel interface.

Project Files
To download the code, go to ftp://ftp.circuitcellar.com/pub/Circuit_Cellular/2009/228

Source
W5100 Ethernet controller and WIZ810MJ network module
WIZnet Co., Inc. | www.wiznet.co.kr

Steven Nickels (ssea000@gamil.com) is a senior software engineer at Medtronic Navigation in Louisville, CO.

To see the full article, please visit the following link: http://www.circuitcellar.com
Web Camera Design

By Minas Kalarakis

The Web camera design is an IP camera system which can take pictures at a resolution of 640 x 480 or 320 x 240. Moreover, this application uses two axes servos to pan the camera horizontally and vertically. The WIZ810MJ is used in this project for controlling the camera and sending JPG images via UDP packets. Due to the simplicity and low I/O pin counts of SPI, it was used to interface the MCU (dsPIC30F4013) with the WIZ810MJ.

As you can see in Photo 2, the design consists of two single-layer boards. One holds the dsPIC30F4013 and the second is piggy-backed to WIZ810MJ module. The main board is simple. It features a dsPIC30F4013 with an 8-MHz crystal, power supply circuitry, and headers for connecting the board holding the WIZ810MJ.

Project Files

To download the code, go to ftp://ftp.circuitcellar.com/pub/Circuit_Cellar/2009/228

Source

W5100 Ethernet controller and WIZ810MJ network module
Wiznet Co. Inc. | www.wiznet.co.kr

Minas Kalarakis (info@kalarakis.gr) is a network administrator and computer technician for The Man Power Organization.

To see the full article, please visit the following link: http://www.circuitcellar.com
Network for the R8C/13

Web server with the W3150A+ from WIZnet
Joachim Wulbeck

In an automation system, the MCU does everything behind the scenes. Normally, these applications are configured via RS232 or a small keyboard and exchange data by using a display or LEDs. The collected data must be stored locally and are transported by a proprietary interface and a software solution. We as humans have switched this kind of communication to be handled by networks. We use e-mail and present our Art and services on web pages. This is all an open standard and can be accessed by free browsers. Why can’t our little MCUs do the same? The way of change is described here.

The Network interface
WIZnet Inc. from South Korea implemented the TCP/IP stack with MAC and PHY Layer into all in one hardware solution. The W3150A+ offloads the MCU from managing the TCP/IP Stack so that even a small 8051 can have network capabilities. Together with the W3150A+, any MCU can easily be a Web-Server or a client which can simultaneously send e-mail and data via FTP.

Also UDP can be used for audio- and video-streaming and all other layer 3 and 4 protocols (TCP, UDP, ICMP, IGMP, IPv4, ARP, PPPoE) are implemented in hardware. With the NM7010B+, WIZnet invented the network interface card (NIC) for microcontrollers. On this compact module, there is a 10x10mm small hardwired TCP/IP chip named “W3150A+”, a PHY chip (on the backside, not visible here), and a RJ45 Connector with a transformer and network status LEDs.

The R8C/13 application board becomes a Web server with many I/Os and have enough performance left for a lot of instrumentation and control applications. Picture 1 shows the Application board together with the NM7010B+. As you can see in the picture, you only need to have a 3.3V regulator and some wires to operate the NM7010B+.

WIZnet does not only provide W3150A+ chipset and Module but they also have a line up of EVBs based on Atmel AVR, 8051 and PIC12C MCU. All driver source code are opened source and available online. Porting the NM7010B+ into an existing project is very simple and easy. I have ported the necessary parts of the driver on to my R8C board.

The Internet Side
The RX- and TX- signals in the twisted pair wires are generated by the PHY chip (Realtek RTL812BL) and transmitted by the transformer in the RJ45 Jack. If you would like to implement W3150A+ yourself, you can find an alternative PHYs such as the DM9161AEP from Davicom for instance. As an extra function, this PHY chip has an automatic pair-change mechanism which cross the signal pairs if directed connected to a PC without switch. This function is called auto crossover or MDIX. The galvanic isolation is provided by transformers inside the RJ45 Jack. This transformer a small black box can normally be found in a standard NICs next to the RJ45 connector. The LEDs which

![Image](image1.jpg)

Picture 1. Network interface NM7010B+ on the R8C/13 Application Board

![Image](image2.jpg)

Picture 2. Block diagram R8C with NM7010B+ and LCD

indicates LINK and other status information are also integrated into the Jack. To use the auto crossover function, the transformer must be symmetrical. Here I would like to recommend the RJJLC-060T1 from Taimag with integrated LEDs a symmetrical transformer.

Interface to the R8C/13
On the other side, the interface to the MCU is provided by SPI or 8 Bit Memory-Bus. There is a special mode called indirect mode without using the whole 16 bit address bus. The address is pushed by the data bus and then automatically incremented inside W3150A+. This saves a lot of I/O pins and does not greatly effect the data throughput. The schematic overview in picture 2 shows all the parts of the Application Board and how they are connected. To provide the other functions also the 8 Bit data bus is separated into two nibbles on two different ports. This makes the driver a little bit more complex but the LCD and all other components are still accessible. The LCD and NM7010B+ share a 4 Bit of that data bus and the RD signal. All LEDs, analog inputs and the RS232 are still available. The splitted data bus affects the data throughput but not very much. Because W3150A+ and LCD are sharing the same data bus, you have to avoid enabling both the E (LCD enable) and CS (Chip Select) at the same time.
Network for the R8C/13 (continued)

Hardwired Stack and Driver
Picture 3 shows the internal block diagram of the W3150A+. The functions are between the Application and driver on top and the PHY layer below. The W3150A+ is processes the protocols in Layer 2, 3 and 4 (MAC + TCP/IP). The external PHY is providing Layer 1 services. The driver and Application on top are operating in Layer 5 and above to control the W3150A+. With the offloading system operating, the MCU can concentrate on the application and is only controlling the communication process. The driver defines the IP-Address and the TCP/IP protocols (client/server). To configured these parameters, there are 'Common' register to configured inside the W3150A+. These registers are in the address range 0x0000 to 0x0030 and contain all network information like IP, Gateway, MAC Address, Net Mask, RX & TX memory and control information. These registers are stored in a nonvolatile EEPROM (here inside R8C/13), as a result, they are resistant against reset or power loss. The 'Socket'-registers address from 0x0400 to 0x0800 stores all the configurations and status of the Socket. This is runtime information and is not needed to be stored permanently. The main program can poll or react on interrupt to check this status-register to react on automatically build connections or requests. The internal 16k memory (from 0x4000 to 0x8000) can be assigned to one socket completely or divided up to 4 Sockets as a send and receive buffer.

Requests are automatically acknowledged. Then, the connection establishes. After the incoming data is processed, the data is stored in the RX/TX memory. Sending data is as easy as receiving data. After configuring the network parameters such as destination IP, the data in the RX buffer transmit once the 'Send' command is called. The connection is automatically established, along with all handshaking and acknowledgment. Once the connection is established, data is sent out. For start and end-address of received or to be send data there are also dedicated socket registers.

MCU does not have to take care about that communication and only monitors the status of the used Socket.

Connection Establishment
Picture 4 show the state machine of the Socket. To use the board as a web server, a socket must be initialized from 'Closed' to 'listen'. The Socket Status changes to "Established" after a client successfully establishes a connection. All communications are handled with a double handshake from both sides. Now data will be exchanged also with a lot of handshaking and after that a "FIN"-packet will command the Socket in close again. To accept another client’s request, the socket must return to 'Listen mode'. The W3150A+ can handle 4 independent Sockets at the same time. Therefore, a server is nearly always reachable also if one Socket is busy (established). But different Sockets can also handle different services like one is server while another Socket is client and connects to an external server himself. For every service there are port numbers that define the kind of service that is provided by a Socket. At the same time one Socket can do DHCP and other Sockets do FTP or e-mail via SMTP. The next Socket can act as web server at the same time.

Picture 4. Socket status diagram

Software
At the end we have the Internet to do data exchange between human like on
In my website www.elektor.de you can find source code, datasheets and circuits. On the R8C/13 board, there is a driver which controls the W3150A+, LEDs, ADC input and LCD output. The web server application is a status monitoring system which sends out data when request is received. The Network parameters are configured in static but you can also automatically fetch the network parameters by using DHCP. This is very easy and is already available for Atmel AVR on the website of Wiznet.

Links

The Author
Joachim Wulbecker specializes in electronic engineering and information technologies. His main focus is analog and digital metering and automation control. As a student, he was active as free design and development engineer and today application-engineer at Dacom West GmbH.
WIZWIKI E-Forum  http://www.wizwiki.net/forum/
In the global market, there are plenty of specialized experts in a local market. To allow those experts to craft application-specific and value-added designs to our platform in order to realize its full potential. That is our strategy for a global standard.

Only when we are self-motivated can we do our job best. Use that motivation to fuel your imagination to its fullest. WIZnet will provide the stage where your imagination can freely roam. Come together! Communicate and collaborate with each other on the platform that WIZnet presents. We will play in perfect harmony so we can all have the best of fun and achieve our dreams.

We will together build a wiki community, WIZwiki.net, based on the standardized platform and the brand of WIZnet to share our spirits.

Y. B. Lee / CEO