

Internet Gameboy

An ExpressPCB/Nuts and Volts Design Contest Entry by Michael W. Johnson of iReady.

For a trade show last year, iReady was looking for a sexy demo that showed off the Seiko S7600 Internet protocol stack that iReady had developed. It was thought that a low cost handheld gaming device that could connect to the internet to play games, get information, chat, and email would be a killer demo. With the trade show only 3 weeks away a small engineering team went to work to crank-out the worlds first Internet connected Gameboy. This is a description of the design.

Design Overview

There were 3 major components of the Internet Gameboy Design, the 'Internet Dongle' that connected between the gameboy and an Internet service provider, the gameboy application, and the webserver support. Due to space constraints only the Internet Dongle design will be presented here, the rest of the design can be found online, please see the resource section of this document.

Internet Dongle Hardware

The Internet hardware design leverages off-the-shelf technologies to provide a simple and low-cost system. Shown in **Figure 1** is the hardware block diagram. A detailed circuit diagram is found at the end of this document. A description of the major blocks follows.

The Seiko iChip (S7600A) provides PPP and PAP authentication and the Internet protocols IP/UDP/TCP and ICMP.

An Atmel 90S2313 microcontroller implements the gameboy serial port, the modem serial port and controls the Seiko S7600.

An RS-232 level converter and DB9 DCE interface for connecting an off the shelf external modem.

The PCB for the Internet Dongle was designed with Express PCB software.

Internet Dongle Software

The software running on the Atmel 90S2313 microcontroller is shown as a block diagram in **Figure 2**. Its job is to take commands packets via the gameboy serial interface and process them. Based on those commands, dialup and connect to the Internet, establish an Internet connection to an ISP via PPP (authenticated with PAP), connect and retrieve content for a web server, and hang up.

The command packets are in the following format:
[0xa5][length][cmd][data][checksum]

The commands are shown in **Table 1**. The software will respond to each command using the same packet format with the command parameter being a return code.

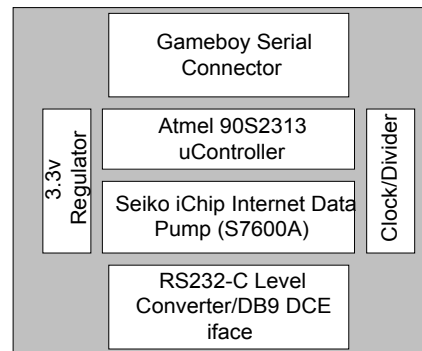


Figure 1 - Block diagram of the Gameboy Internet Dongle

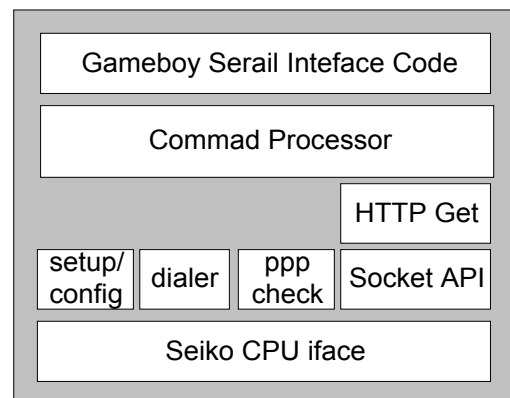


Figure 2 - Software block diagram of the Gameboy Internet Dongle.

Get State responds that the Internet Dongle is connected or in an idle state. When in an idle state the Internet Dongle can be instructed to initialize the modem, set the ISP account username and password and dialup and connect to an ISP.

When in the connected state the Internet Dongle can be instructed to hang-up the modem and to get a webpage.

Idle Commands:

GetState - Returns current state.
InitModem - Initializes modem.
SetPAP - Sets username/password
Connect - dialup & connect to ISP

Connected Commands:

GetState - Returns current state.
Get - get a webpage from a server.
Disconnect - hangup.

Table 1 - Serial Commands

Conclusion

Using the Internet Dongle, a custom gameboy cartridge and webserver pages, iReady was able to demo the worlds first Internet connected gameboy.

The Internet Gameboy shows one sample of the many possibilities of how the Internet Dongle hardware can be leveraged. With small hardware and software changes the Internet Dongle can Internet enable many other devices at a very low cost.

Resources

Atmel 90S2313 Data Sheet - <http://www.atmel.com/atmel/acrobat/doc0839.pdf>

Atmel AVR Instruction Set - <http://www.atmel.com/atmel/acrobat/doc0856.pdf>

Seiko iChip S7600A Technical Specification - <http://www.seiko-usa-ecd.com/intcir/pdf/techspecs/s7600a.pdf>

iReady.org – The iReady Developers Website, with project examples, forum, and documentation, including more details on the Internet gameboy project. – <http://www.iready.org>

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