

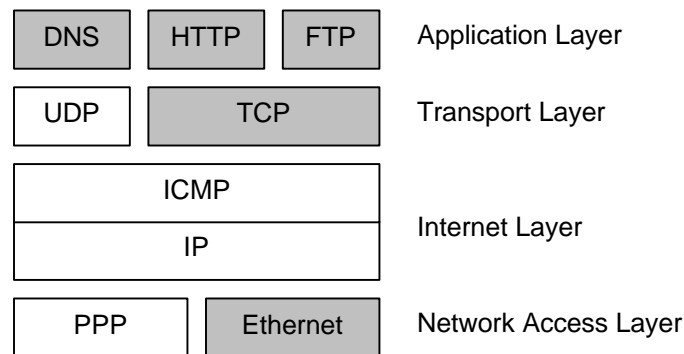
PPP-UDP Virtual Peripheral

The phenomenal growth in Internet usage has seen a corresponding increase in the number of hardware devices capable of communicating using TCP/IP. The ubiquity of TCP/IP in turn drives the desire for network stacks in smaller and cheaper devices. The applications of a TCP/IP capable micro-controller are vast, in effect any sensory or control device could be communicated with from any desktop in the world.

TCP/IP is usually implemented on 32-bit micro-processors with memory measured in megabytes and is almost unheard of for 8-bit micro-controllers. Carefully structuring of the code to avoid packet buffering makes Internetworking possible in smaller and cheaper devices than ever before.

A subset of a TCP/IP stack has been developed for the SX. This stack includes PPP, IP, ICMP and UDP. Together these protocols are enough to enable an SX to connect to TCP/IP router and by extension, to the rest of the Internet.

The following diagram shows (in white) the parts of a typical TCP/IP stack that have been implemented:



The Point-to-Point Protocol (PPP) provides communication over a serial connection such as RS-232 or telephone lines. The Internet Protocol (IP) and Internet Control Message Protocol (ICMP) provide addressing services. The User Datagram Protocol (UDP) provides point to point, connectionless, unreliable communication across the Internet. A commonly used application that is built on top of UDP is the Domain Name Service (DNS).

Features

- The network stack will inter-operate with any other RFC compliant stack.
- Responds to ICMP echo requests. This means the SX can be 'pinged' with the ping utility.
- Full UDP implementation. This allows delivery of packets to and from any Internet connected device. The SX can communicate with any existing UDP application without modification to that application.
- PPP option negotiation. For simplicity the SX will refuse any options the peer tries to negotiate.
- A simple API for receiving and transmitting IP and UDP packets.
- Built upon a full duplex UART with 7 byte transmit and receive FIFOs and RTS/CTS hardware flow control.
- Tested with Windows 95, Windows NT and Linux 2.0.30 (pppd 2.3.4).
- A simple demonstration application can read and write file registers on the SX from any computer connected to the Internet.

Possible Applications

- **Remote monitoring.** The SX could be connected to a modem. Instead of dialling into a central office which might be outside the free calling area, the SX dials a local ISP. Once a PPP connection has been negotiated with the ISP the SX can then communicate with the central office over the Internet. The central monitoring office could be in a different city, or even a different country, without incurring long distance charges.
- **Broadcast sensor.** An SX connected to a sensor takes periodic readings. Whenever it has a reading it negotiates a PPP connection and sends the reading to a designated computer. The destination computer will ignore any readings it receives unless the user specifies otherwise.
- **Legacy code.** If a legacy application using UDP needs to be integrated with a new product the SX could be used. The alternatives would be to use a PC to translate the legacy application's UDP packets into some other serial format or to embed a much more sophisticated (and expensive) network stack.