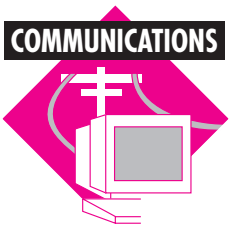

AIX Terminal Server

By Eddie Ho and Dave Phipps

As a multi-user system, AIX enables multiple users to connect to the system either locally via direct attachment, or remotely using a teleprocessing facility or a Local Area Network (LAN). The new Serial Communication Network Server can accelerate the use of AIX in multi-user distributed environments by enabling remote LAN-based workgroups to access system resources.

The classic definition of a terminal server is a device used to multiplex serial peripherals—ASCII terminals, printers, plotters, or modems—onto either a LAN cable or a host computer. Most UNIX systems have at least one built-in serial port. For additional users to be connected, systems must use multiport adapters, such as the RISC System/6000 (RS/6000) asynchronous adapters, which include the 8-Port Asynchronous Adapter and the 16-Port Asynchronous Adapter.

To use these adapters, each peripheral must be cabled to the host. Host computers have decreased their footprint size and can now support many more peripherals. However, because cabling is inherently bulky, connecting a large number of peripherals to a "small footprint" host can become a cabling nightmare.

The IBM 128-Port Asynchronous Controller Subsystem and the Serial Communication Network Server eliminate the difficulty and expense of hard-wiring these devices by packaging multiple serial ports in a single distribution box, rather than through point-to-point connections. The 128-port subsystem is used for wide area point-to-point connections between distribution boxes, while the Serial Communication Network Server is primarily Ethernet™ LAN-based.

Network resources are usually partitioned into server groups, in which the clients are connected to various network servers. These input/output devices can be located wherever they are needed, making it very convenient to relocate people and equipment on a network. Figure 1 summarizes the capabilities of the 7318 Serial Communication Network Server. In this scenario, all users connected to the 7318s can access the resources of all hosts.

Common methods of communication to a host system using TCP/IP are through the `telnet` and `rlogin` commands, which enable remote users to connect to hosts across a network. The communication layers of a host system dynamically create a pseudo-device that simulates a locally attached terminal for network communications. Therefore, users attached to a terminal server typically have the flexibility to connect to several hosts concurrently. In general, a terminal server can be classified as a *communication server* if it has a full set of network protocol layers and exhibits network attributes such as the following:

- Network management support
- Access to other communication nodes
- Advanced routing
- Security features
- Remote printing support

The 7318

There are two models of the 7318—the P10 and the S20. The P10 is a terminal server, while the S20 is a communication server. Both models include the following hardware features:

- 16 serial ports with RJ-45 connections; each port provides an RS-423 electrical interface that is compatible with RS-232, RS-423, and RS-422 devices
- Serial data rates up to 115.2 Kbps on all 16 ports
- Multiple session support for terminals, including one session for transparent printing and six display sessions (Each display session is selected via a user-definable hot-key based on the terminal type.)

LAN Environment

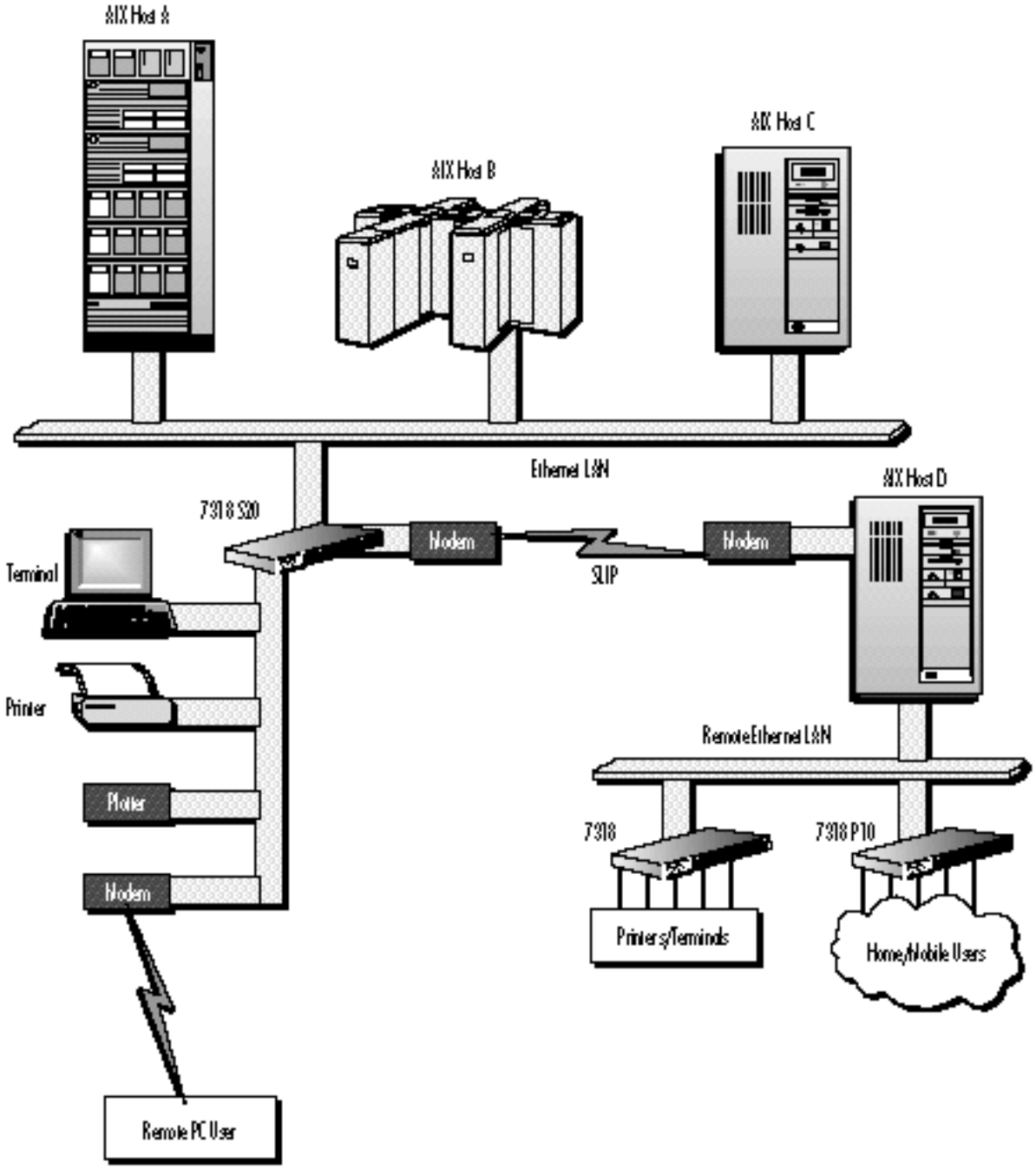

Figure 1. Serial communication network server in a LAN environment

- Two parallel ports, each with data rates up to 250 Kbps
- Capacity to daisy-chain up to four 7318s on one Ethernet connection
- Ethernet attachment using all existing RS/6000 Ethernet adapters (This is an efficient means for attaching serial devices because this attachment does not occupy a Micro Channel® slot in the RS/6000 system, as compared to the multiport attachment approach. Any of the following can serve as attachment media: 10BaseT, 10Base2, and 10Base5.)
- Desktop, rack, or wall-mounting

7318 P10 Topology

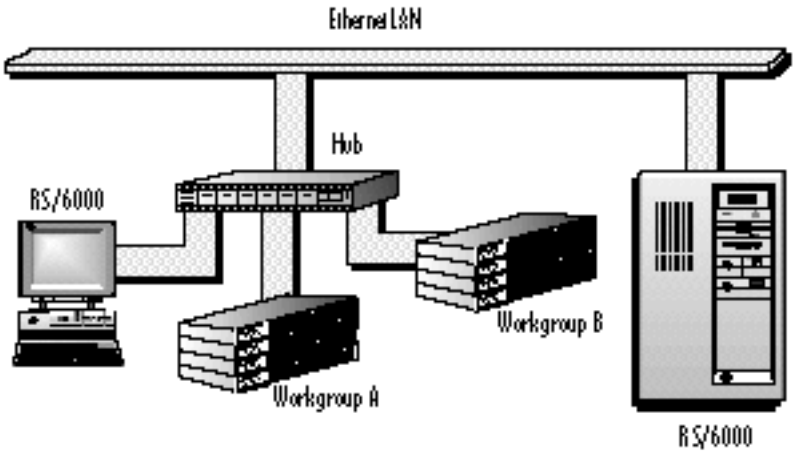

Figure 2. Model 7318 P10 topology in a hub environment

7318 P10 Protocol Structure

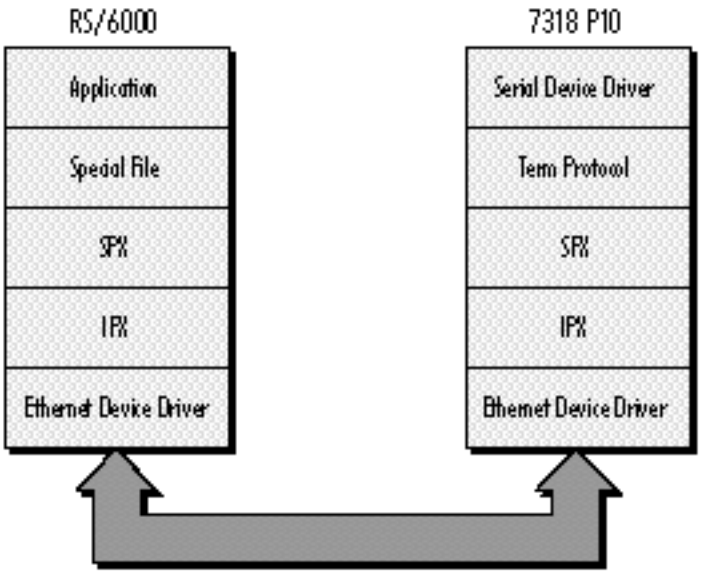

Figure 3. Model 7318 P10 protocol structure

Model 7318 P10

The Model 7318 P10 provides for the attachment of serial ports to the RS/6000. These ports operate much like the multiport adapter or the native ports. The network topology is similar to the Remote Asynchronous Node of the 128-port asynchronous controller; the 7318 connects to the RS/6000 through a coax cable running the standard Ethernet protocol. Figure 2 shows a simple Model P10 topology.

The RS/6000 LAN connection can use either a Micro Channel Ethernet adapter or an integrated Ethernet port. The LAN protocol uses SPX/IPX, selected for its simplicity and low overhead for the RS/6000. Figure 3 shows both protocol layers.

The device driver creates tty devices very similar to traditional tty devices such as `/dev/ttyxx`. When a login program such as `getty` is started on a tty device connected to a 7318, a login banner appears on the terminal. These static tty devices are created at system boot time. Application programs that use a `/dev/ttyxx` device as their interface can also use the ports without any programming changes.

Some tty terminal control processing occurs with the P10. During its power-on phase, these functions are downloaded from the RS/6000.

Model 7318 S20

The Model 7318 S20 is a communication server that uses TCP/IP as the transport protocol. It supports all the functions of the Model P10 plus additional communication protocols. It is a complete TCP/IP networking node with key node attributes such as security, network management, and other applications, including the following:

- Simple Network Management Protocol (SNMP)
- Security (Kerberos Version 5)
- Communication programs:
  - `telnet`, `rlogin`, `tn3270`
  - Serial Line Interface Protocol (SLIP)
  - Compressed SLIP (CSLIP)
  - Point-to-Point Protocol (PPP)

Since the S20 contains its own TCP/IP protocol stack and applications, it does not consume any RS/6000 CPU resources after receiving its program load from the RS/6000. It provides stand-alone support for attaching serial devices with a focus on asynchronous TCP/IP node-to-node communication. The common protocols used for this are SLIP, CSLIP, and PPP.

The common terminal emulation protocols used with TCP/IP are `telnet` and `rlogin`. The 7318 S20 can communicate with any system that supports the same protocol.

The 3270 data stream is a commonly used terminal protocol in the IBM mainframe area. It is a blocked data stream in EBCDIC form. The 7318

S20 can process this data stream and translate it into ASCII format for terminal presentation.

The S20 supports the SNMP management protocol and can participate in a network management system as a full agent. Using an SNMP manager such as NetView/6000™, network administrators can retrieve event statistics and error logs as well as set event traps.

Network security is also supported by the S20 system with password and data encryption during runtime. The Kerberos security protocol is used with the `rlogin` protocol for better security control. The S20 uses Kerberos Version 5, which is compatible with the Distributed Computing Environment (DCE) standard. This provides a secure environment for workgroup users while accessing data.

Historically, running SLIP on a point-to-point link was seriously limited by the modem bandwidth. This limitation has been significantly reduced by the availability of V.32bis modems providing 14400 bps connections over dial-up lines. The 7318 supports SLIP as well as the compressed format (CSLIP) for better performance. Since SLIP was formed in the early 1980s, it lacks many useful link-level functions; most known deficiencies have been documented by RFC 1055 of IETF.

Point-to-Point Protocol evolved from earlier work on SLIP. PPP is a more robust, full-featured protocol that is quickly becoming a standard, as defined by RFC 1331.

Conclusions

Terminal servers provide the most cost-effective way to add users to a network. By offering a better wiring scheme, they enable terminal connections to be located wherever they are needed, instead of being confined to the back of an RS/6000. In addition, communication servers are next-generation devices designed to meet the ever-evolving connectivity needs of today's networks. These servers enable remote access, a more mobile workforce, and modem access from PCs or X terminals.

Eddie Ho, *IBM Corporation, 11400 Burnet Road, Austin, TX 78758. Internet: eddieho@chang.austin.ibm.com. Mr. Ho is a senior programmer in the AIX Communications area. He has a BS in Computer Science from the University of Wisconsin and an MS in Computer Science from North Dakota State University.*

Dave Phipps, *IBM Corporation, 11400 Burnet Road, Austin, TX 78758. Internet: dlphipps@bach.austin.ibm.com. Mr. Phipps is a staff programmer in the AIX Communications area. He has a BS in Applied Mathematics, Engineering, and Physics, and an MS in Computer Science from the University of Wisconsin.*

Terminal servers provide the most cost-effective way to add users to a network.

PowerPC 604 Development Completed

IBM and Motorola™ have completed development and fabrication of the PowerPC 604 microprocessor, the most powerful high-volume microprocessor in the industry. The PowerPC 604 will provide close to twice the performance of competing microprocessors, with the power to support new classes of advanced multimedia, graphics, and other applications. It is designed to deliver exceptional performance for high-end desktop systems, midrange servers, and high-performance graphics workstations.

The PowerPC 604 at 100 MHz achieved an estimated SPECint92 rating of 160 and an estimated SPECfp92 rating of 165. It is designed in a 0.5-micron, 3.3-volt Complementary Metal Oxide Semiconductor (CMOS) technology, and incorporates 3.6 million transistors. This superscalar, multiprocessor-enabled chip issues up to four instructions in parallel every clock cycle to six execution units. Its three-stage, double-precision floating-point unit enables users to take advantage of graphical and multimedia applications, providing tremendous performance capabilities that were previously available only through expensive add-on hardware. n