LANTRONIX®

Managing Serial Devices in a Networked Environment

Introduction

The proliferation of network management technology in both hardware and software has provided the network manager with an extensive tool kit. Still, many devices being used today support only serial management. Such devices provide a serial management port for attaching terminals or PCs to perform management functions. These serial-only devices may also require the network manager to implement costly and sometimes cumbersome workarounds to be included in the management scheme. This paper explores the technological advances in Device Server design that make it possible to manage serial-only devices over a network.

Management via Serial Communications: Non-networked Techniques

Networked communication seems like a birthright to current PC users. However, one should remember that for many years serial communication was the only way to transmit data from one device to another. Many industrial, medical and monitoring devices were designed long before the current advancements in integrated circuits made Ethernet technology so inexpensive. Some of these devices would even qualify as legacy equipment, built with internal processing capabilities far below that of current desktop PCs.

The only management option provided on many of these products is a serial port. Usually RS-232, this port is intended to connect directly to a PC or dumb terminal which displays device status information and/or grants access to device configuration information. In some cases, the PC is tasked with processing raw data sent over the serial port, due to the fact that the device itself does not have the bandwidth to do so. Typically, these devices can only be managed remotely by adding external devices allowing access to the dedicated management PC or attaching directly to the serial port itself.


In the past, remote management of devices with serial ports was accomplished by running a long serial connection using RS-232 cables. For greater distances, either RS-422 cables were used if the device itself supported this standard, or some type of external converter was installed.

Management via Serial Communications Over a Network

In the 1980's and 1990's, terminal servers became a popular way to connect serial devices to a network for accessing multi-user host systems. In a

terminal server design, serial devices were physically connected to terminal server ports. The terminal server itself governed protocol use, and the availability of added features such as multiple connection support from a single port or dedicated connections to a single system on powerup. TCP/IP was the protocol suite of choice for this type of configuration, for it allowed more efficient communications over both the local network (Intranet) and the Internet.
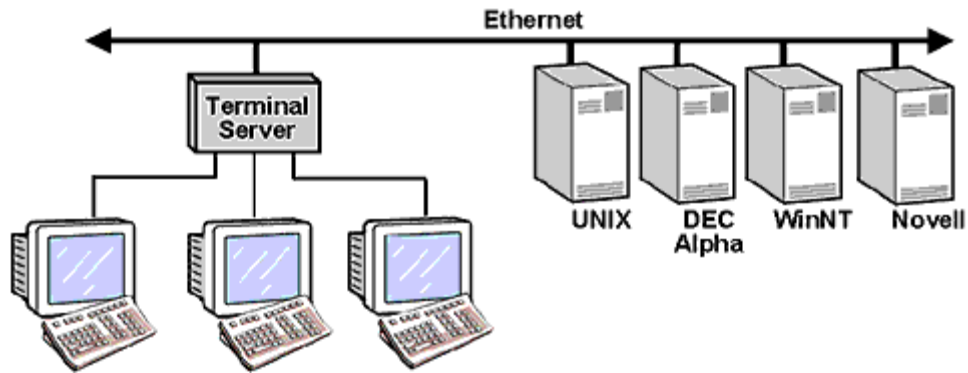

The primary function of terminal servers was to give terminal users access to network devices. Connecting network devices to remote serial ports became another popular use. Printers, modems, converters and other task-specific devices could be attached to server ports, and these ports could then be accessed from network hosts. In this configuration, monitoring devices could be polled at regular intervals, serial console ports on computers could be accessed from remote locations for important boot-time parameter configuration and the server itself could be accessed to examine performance data collected on the various ports themselves. While some users simply used IP's Telnet for management connections, other management-specific suites, such as SNMP, were developed to further enhance status and configuration management of these remote device ports.

Device Server™ Technology

Whereas earlier terminal server products were somewhat large, requiring substantial processing resources, newer integrated circuit designs have made it possible shrink the size of a terminal server. As we begin the new millennium, new single-port Device Servers can be built which are cost-effective and small in size. The availability of single-port Device Servers created the potential for isolated single-port serial devices to be networked in a cost-effective manner.

One can see very quickly how a network manager can now attach the serial port of a device to a single-port server and immediately have network access to that device. No long cable runs, dedicated modem or multiplexor ports are now required - simply install the Device Server on the nearby network, attach it to the serial port of the device and manage the device from anywhere within the corporate or campus network (Intranet) or from the Internet.
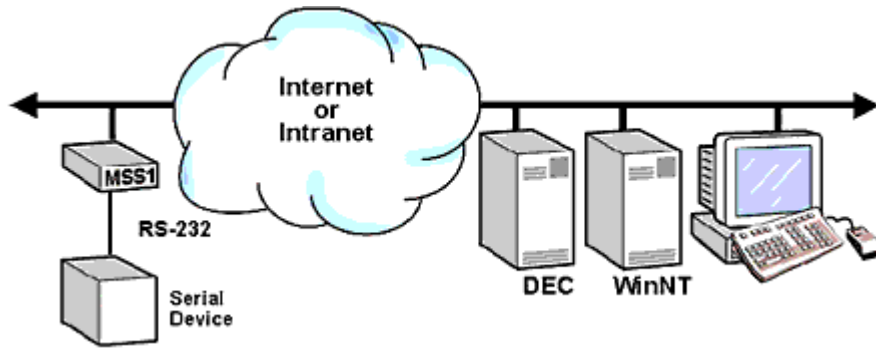
Some devices require a dedicated PC to not only present the management and configuration information, but also to process it before the user views it. Can this type of device also benefit from the availability of a Device Server? The answer is yes.

Using a redirector software package, a PC running software specifically to process information from a serial device can become a networked PC. The redirector software takes the PC's output destined for it's communications port and redirects it to a network port--specifically, the network port on the Device Server. Thus, the PC "believes" it is talking to a local device on the COM port, when it is really talking to a device located remotely on the network.
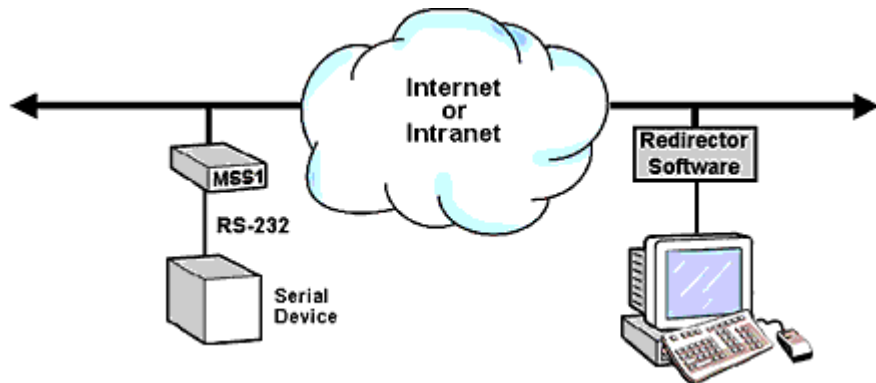
Even without redirector software, a remote PC can be connected via a process called "tunneling." Here, each Device Server passes the serial data from one end of the connection to the other. This configuration can be utilized if the data between the serial device and the PC is encoded or proprietary.

Internet
or
Intranet

MSS1

RS-232

Serial
Device

MSS1

RS-232
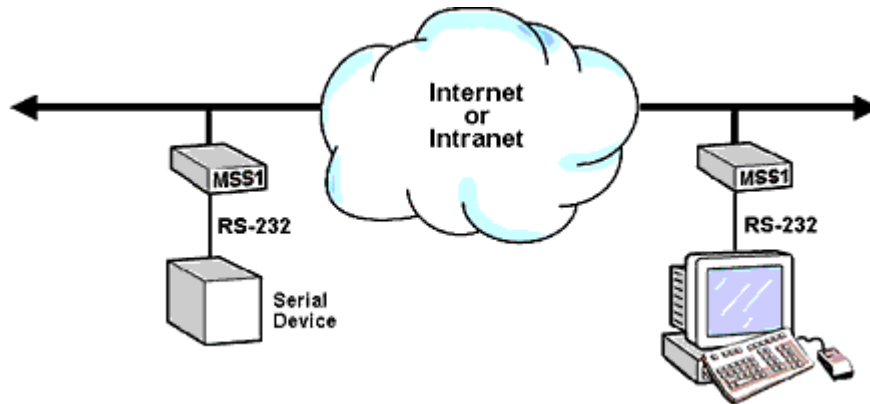
The Benefits of Networked Management

Device Server technology allows an isolated device to be networked into the campus or corporate network. Why network these devices? Several reasons come to mind:

1. **Easy Installation and Maintenance**
    Network connections tend to populate every location of a campus or corporate site. Wherever one goes, a network access port is usually nearby. This means a device in any location can be put onto the network and accessed from anywhere else on the local network or even over the Internet. As networks are extended to great lengths using switches, hubs and converters, connectivity becomes available to areas that previously required long dedicated serial cable runs.

2. **Management From Anywhere**
    Network managers now have a great many tools at their disposal for ensuring that the network performs efficiently. SNMP (including MIBs) is a standardized management protocol providing pro-active management information arising from continuous process monitoring. Many vendors, such as HP (HPOpenview) and SUN (SunNetmanager), have well-developed software packages for network management, while most vendors support simple telnet or menu-based management interfaces. These protocols are supported over the Internet, allowing a network manager to roam at will, literally around the world, and still have access to a device.

3. **Reliable Management Access**
    Corporate and campus networks have become very highly scrutinized. In most larger networks, 24-hour-a-day maintenance and monitoring takes place to ensure the network is running properly. Networking protocols designed for data delivery ensure that information arrives from node to node. Routed networks provide multiple pathways for data deliver. New software capable of measuring quality of service helps the network manager to tune the network topology to allow data to flow freely between devices virtually all the time. All of these reasons combine to make management over the network one of the most reliable ways to manage a remote device.

4. **Lower Management Costs**

   With a reliable remote management tool available, network managers can streamline their staffing and troubleshooting requirements to a centralized or even automated system. Standards-based management features such as SNMP maximize the investment in software and analysis devices based upon that protocol. Even a simple management technique such as a ping or a telnet login to validate that a node is alive can be run from a script. With a management scheme based upon established standards, network managers can train internal staff better and more easily hire new staff with known levels of skill regarding the management suite. Better management technology and better staff results in lower costs for the network manager.

The availability of smaller, more tightly integrated circuits makes it possible to build a single-port Device Server on a circuit board no larger than a matchbook. As a board-level product, a Device Server can be integrated into a device's design to allow a number of options: (1) for devices able to preprocess in full the status and configuration information, the Device Server can be used to allow that device to be offered with a network port which can accept or generate connections to any network node; (2) for those devices requiring processing elsewhere, a Device Server can allow that device to be located anywhere on the network with the serial data being "piped" from the sending device to the processing device.
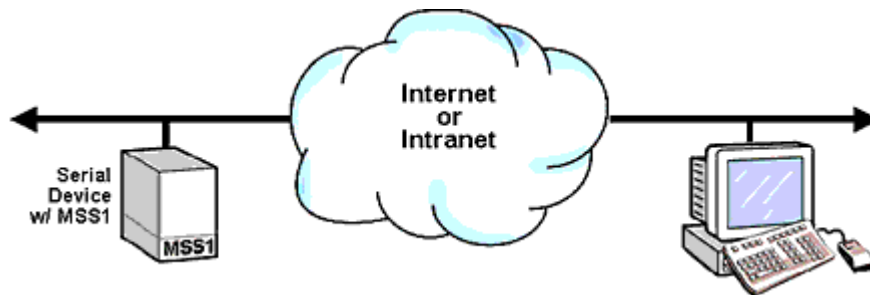
Lantronix MSS and UDS/CoBox® Device Server Product Families

The MSS and CoBox/UDS Device Server product families have paved the way for remote serial-only devices to be managed over a network. These products provide serial-to-Ethernet connectivity in a compact and cost-effective design. Both families provide external and embedded solutions, and support a variety of serial and Ethernet interfaces.