Cutting the Cord:

Advantages of Network-enabling RS-232 Serial Devices

Remotely monitoring RS-232 serial devices via serial device servers provides real-time data and reduces service calls.

Executive Summary

RS-232 serial connectivity is a reliable, robust, and time-tested solution for a wide range of applications for a variety of industries from banking to retail POS to manufacturing to industrial monitoring and control. However, one traditional limitation of serial communication is that RS-232 devices must be directly connected to the computer controlling them. Serial device servers can "cut the cord" between device and computer, thereby allowing remote access via any computer. This provides tremendous savings by both eliminating the need for on-site data acquisition, and enabling remote monitoring and servicing of equipment.

Background

Information Technology and Customer Support managers are usually under pressure to reduce operating costs and keep head-counts to a minimum, yet provide better service to meet ever-increasing customer expectations. Most would agree that on-site data collection and service calls are very expensive tasks; but relatively few have investigated the savings that could be realized by remotely accessing and servicing equipment instead.

A large percentage of the equipment accessed and maintained by customer support organizations around the world is equipped with an RS-232 serial communications port. In fact, the RS-232 protocol has existed since the 1960s and is included in millions of devices that contain an electronic communications interface. It is estimated that only 10% of the serial ports available worldwide are connected to a network. However, the potential exists for a wide variety of serial-based equipment (for example, kiosks, CNC machines, and security access points) to be monitored over a LAN, WAN, VPN, the Internet, or even wirelessly - using a Serial Device Server.

Two-Port RS-232/422/485 Serial Device Server

What is a Serial Device Server?

A Serial Device Server (SDS) is a computer in a very robust and compact package (approximately the size of a deck of playing cards) that contains a built-in operating system and TCP/IP stack. State-of-the-art SDS models also contain a built-in Web server that allows configuration and monitoring through a client PC's Web browser.

An SDS serves a very specialized purpose: sending data to and from a serial device and a client PC over an Ethernet network. The application software on the client PC, whether in the same room or across the country, communicates with the SDS as if connected locally to a "virtual" COM port and cable.

The fact that the data is moving around the network and not a short serial cable is invisible to the client PC and the serial device. Practically any serial device having a software application to monitor it locally on a PC can be accessed remotely using an SDS -- without changing a single line of code. Imagine if all those on-site visits made to transfer a data stream from a serial device to a handheld computer or laptop could be performed from a PC right from the home office!

Improved Customer Service and Organizational Efficiency

TV and radio companies, clinical laboratory equipment manufacturers, factory automation vendors, ATM suppliers, POS integrators and many others can significantly improve service and support operations by installing Serial Device Servers in the field. All of these mission-critical industries can benefit from remote diagnostics and the savings resulting from dispatching support engineers more efficiently.

When network-enabled with an SDS, the severity of product malfunction, and possibly even the replacement parts needed, are established before the technician leaves the office. Equipment that is completely inoperable can be serviced ahead of those with minor problems, and service engineers can often arrive on-site with the correct replacement part in hand. When resources are limited, this type of efficiency is important in managing to meet service goals.

Proven Applications

In addition to the industries mentioned above, several applications have proven to benefit greatly from the networking of serial devices. DNC software companies write applications that create and download control codes to CNC-operated machine tools. Rather than storing the codes on a floppy disk or tape and walking it out to the machine tool, many machine shops are implement-ing wired and wireless SDS networks to drip-feed these instructions to the CNC. A typical DNC/ CNC system is shown in the diagram below.

Intelligent traffic systems are also using SDS solutions. Controlling cameras, monitoring traffic sensors and receiving radar data are all tasks accomplished remotely from a central site using Ethernet networks instead of dial-up connections or trips out to the freeway stations.

Warehousing and distribution have many uses for this type of solution, too. Overhead scanners, printers, and now RFID readers are all serial devices that offer more information over a network than when attached to a single PC. Databases and inventory levels can be monitored "real-time" and this presents a more cost-effective and efficient way of doing business. The diagram below outlines some options for building maintenance and security systems.
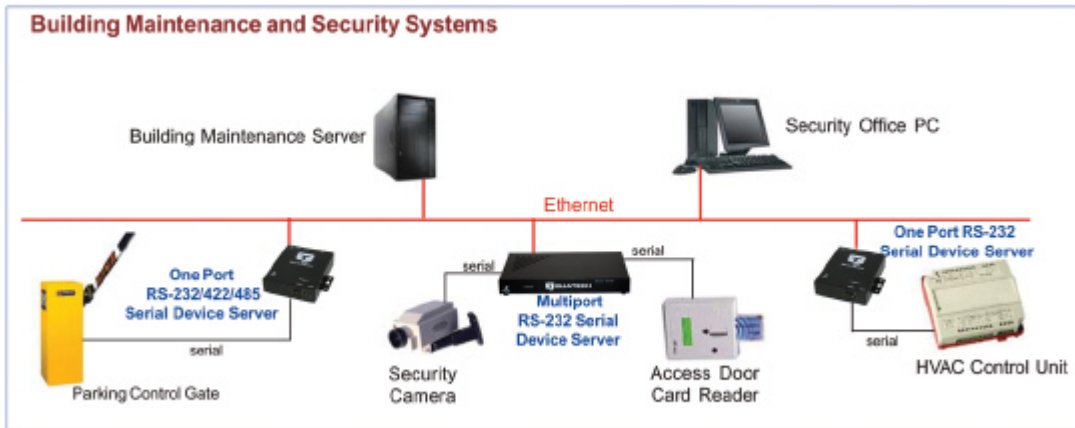
Sometimes serial devices simply need to be monitored, not diagnosed. The following diagram illustrates a security office monitoring the position of an elevator in an office building. Building access stations (including biometric analyzers and smart card readers) are also good candidates for SDS connectivity as networking these devices helps automate the task of logging entry and exit events.

Advanced Capabilities--Flexibility is Key

In addition to Web server technology and virtual COM port software, the best SDS models also have support for a number of applications right out of the box. An MEI interface is a key component, especially for multi-port models needed to network a number of serial devices using one SDS. MEI – or Multi-Electrical Interface – designates the SDS' ability to connect to different serial protocols, such as RS-232, RS-422 or 485. There are two types of selectable interfaces, switch-selectable and software selectable. Switch-selectable models require manually setting a small dipswitch selector on the SDS. Software selectable means that the interface desired can be programmed using a software utility or, better yet, remotely through a Web interface.

Another feature to consider when deploying an SDS is the new wireless mode now available from leading vendors. Almost all utilize the ubiquitous 802.11b standard, and for the majority of applications this is the best and most economical choice. The better models feature detachable antennas (for adding higher gain antennas when needed), good security protocols such as 128-bit WEP, EAP, or WPA, and an underlying serial-to-Ethernet technology that is very low in latency. Wireless access can be a great choice when running cables is an expensive proposition or handheld computers will be used to access the serial data.

Finally, keep in mind that while designed primarily to run as a virtual COM port in most popular operating systems, SDS units should support a variety of operating modes. Raw TCP, IP broadcasting / multicasting and Client modes are several methods that can be used to connect an SDS to a non-standard or specialized network.

Key Feature: Serial Tunneling (Paired Mode)

Barcode scanners, weight scales, printers, turnstiles, ticket machines and many other systems are often connected not to a PC, but to a serial port on an accompanying device. When two serial devices need to be separated beyond the short distances supported by the RS-232 protocol, serial tunneling can be the answer.

When serial tunneling is used, each serial device is connected to its own SDS, which allows them to communicate with each other over a network just as if connected by a short serial cable. That is, the SDS units work behind the scenes to add and then remove network routing packet information around the serial data to invisibly send and receive between the two serial devices. In effect, serial tunneling removes the distance limitation between serial devices as two SDS units can even tunnel around the world, over the Internet. Additionally, wireless SDS units eliminate the need to run an Ethernet cable between the two SDS units, making it even easier to install an "invisible" cable between the two serial devices.

Serial Device Servers Provide Quick Return on Investment

There are many ways to determine the value of serial device servers. A good rule of thumb when considering the value of implementing SDS units in the field is to calculate what it costs the service organization for each on-site call (labor, travel, food, lodging, phone calls, online time, shipping costs, etc.)

Another way of looking at it is to calculate what it would cost to place and maintain a dedicated PC to do many of the same tasks. As the average PC or service call can easily cost several hundred dollars on average, it can be said that if only one service call is avoided over the initial 12 months, the total investment will have paid for itself in just one year!

Plus, many SDS manufacturers offer a five-year warranty and with solid-state construction (unlike a remotely-placed dedicated PC), an SDS will offer years of reliable service and plenty of additional return on the initial investment

For more information about Quatech serial device servers see:

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