

USB[®] Over IP: Turning Your Network Into an I/O Bus

White Paper

As Personal Computers (PCs) continue to decrease in size and become more streamlined, the input/output (I/O) slots have virtually disappeared, posing a challenge for applications like point-of-sale (POS) that require the connection of multiple peripheral devices. The I/O bus, or peripheral bus, is the pathway that joins peripheral devices to a PC. Industry Standard Architecture (ISA), Peripheral Component Interconnect (PCI) and Universal Serial Bus (USB) are the three busses commonly used in today's PC, thin client or server applications. In comparing ISA, PCI and USB, the key differentiator is ease of installation.

Traditionally, adding extra ports to connect serial interface devices like receipt printers, bar-code scanners, monitors, pole displays and magnetic stripe readers meant installing additional ISA or PCI cards. This involves a certain degree of technical savvy, because adding a card requires opening the computer's chassis, installing the card, reconfiguring the system and rebooting the PC.

Unlike internal card solutions, USB technology, basically a dual directional, high-speed serial connection that links peripheral devices, is simple to install and cost-effective. USB is commonly referred to as "Plug-and-Play," because upon connection, a computer can automatically recognize devices without any additional software or hardware, thus reducing costs. In addition, USB devices are "hot swappable," meaning they can be attached and removed without restarting a PC. Many everyday computer products are USB enabled, including scanners, mice, digital cameras and many other peripheral devices.

USB Becomes Industry Standard

Since 1998, the majority of new PCs have been "legacy-free," meaning they ship with at least one USB port, but without internal ISA bus cards. Some legacy-free PCs have one or two PCI bus slots, but others only have USB ports. With the proliferation of legacy-free PCs, many POS applications have abandoned internal I/O expansion in favor of external USB connectivity. For users who wish to continue using their serial peripheral devices like those mentioned above, USB-to-serial converters offer an easy way to instantly gain multiple serial ports from a single USB connection, without installing a PCI or ISA card. USB hubs, which may be "daisy chained," or interconnected to add as many as 127 USB ports to one PC, are commonly used in applications that opt to migrate to USB-attached peripheral devices.

Breaking the Distance Barrier

You may wonder why someone would not choose USB for I/O expansion, given its easy Plug-and-Play installation, hot-swappable device connectivity and lower total cost of ownership. While these are major benefits to both home and business users, one trait that can pose a challenge, particularly for POS applications, is the distance limitation of USB. Currently, the USB specification requires USB peripheral devices to be within five meters (16.4 feet) of the host PC. While this distance typically does not pose a challenge to the average home user who wants to connect a USB camera or printer, some POS applications require greater distances between peripheral devices and the host PC.

For example, a restaurant may wish to locate an order entry station in the front of the restaurant. This station consists of a PC or thin client attached to a Local Area Network (LAN), with a monitor, credit card scanner, receipt printer, cash drawer or other POS devices connected. When an order is entered into the system, an alpha-numeric monitor in the kitchen displays each line item, so that the kitchen staff knows what to prepare. Since the monitor receives its data from the order entry station, the monitor must either be connected to the order entry PC itself, or to a separate PC on the LAN. Unless the kitchen is within five meters of the order entry station, the first scenario is not an option because of the five-meter cabling limitation associated with the USB distance specification. Also, placing an expensive PC in a kitchen is not always a desirable option, since the environmental conditions are difficult to control.

One might come to the conclusion that the only option this restaurant has is to take a risk and put a PC in the kitchen. However, Digi International™ saw these limitations and as a result recently developed a new solution called AnywhereUSB®, which addresses not only this restaurant's challenge, but also the USB cabling challenge of similar POS applications.

Long Distance Relationships That Work

AnywhereUSB solves the five meter distance limit by connecting directly to a Transmission Control Protocol/Internet Protocol (TCP/IP) network. The product has five USB ports, and the box does not require a locally-attached host PC. Instead, its software drivers are loaded on a remote PC, making the USB ports appear to be locally attached with the same “Plug-and-Play” user experience as traditional USB expansion.

In the restaurant example, AnywhereUSB would plug directly into a network connection in the kitchen, the monitor would be connected to one of the USB ports on the AnywhereUSB box, and as a result the PC at the order entry station would “think” it was directly connected to the monitor. Digi refers to this technology as “USB Over IP™,” meaning that the USB data travels between the locally attached peripheral device and remotely attached host PC over a standard TCP/IP network. The relocation of the main PC to a remote location will offer even greater benefits to multiple user stations.

Yet another way to look at the value of USB Over IP technology would be to consider an application requiring multiple PCs, such as those found in department stores. For example, a department store might have scaled-down POS stations throughout the store, each with one AnywhereUSB connecting a bar-code scanner, receipt printer, credit card reader, credit card receipt printer and pole display. If a mix of serial and USB devices are required, a USB-to-serial converter may also be attached to the AnywhereUSB box. Each station’s transactions would be processed through a back office PC, eliminating the need for a PC or thin client at each station.

Securing Assets From All Angles

Two additional benefits may be seen as a result of moving the PC to a remote location. First, security is instantly increased, not only because the sensitive information would have fewer touch points, but also because the PC itself would be less accessible, lowering the chance of tampering or theft. Also, the relocation provides for system redundancy, one of the greatest values of USB Over IP. Simply put, if the back office PC goes down, another PC on the network can take over while an IT professional repairs the problem. To a retailer, loss of system uptime could result in a significant loss of sales.

Making Device Networking Easy

USB technology is a no-hassle, cost-effective alternative to PCI or ISA bus expansion for peripheral device connectivity. Implementing USB Over IP into a POS or other business application can turn a network into an I/O bus with virtually limitless expansion. Instead of placing multiple PCs throughout a location, each with additional PCI or ISA buses, one PC serves as the host for multiple AnywhereUSB devices. Multiple host PCs can access resources on the network, and can cover in the case of a system failure. Plug-and-Play installation and easy user diagnostics make USB connectivity a viable source of I/O expansion in both end user and business applications.

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