White Papers

Today's mobile electronic devices demand ubiquitous interconnectivity

Imagine two notebook computers placed side by side, both have its own and the peer computer's icons appear on the desktops. Clicks away, one is able to explore the contents of both computers, copying a file from one to the other can be simply done by drag and drop the icon. Imagine this simple file transfers can be done not only between two computers, but PDAs, digital cameras, cellular phones and millions of other portable electronic devices. A salesperson on the road can exchange business cards by pointing his or her PDA to that of the client's. Pictures of product samples taken by a digital still camera can be printed or transferred to a computer by point the camera at a printer or at the computer. Imagine beyond simple file transfers, one is able to place a notebook computer next to a networked computer and be able to share all network resources and Internet access. The same salesperson can stay in touch with the home office by pointing his or her notebook at a computer with Internet access at a client's office, at his or her cellular phone, or even at a public phone. Imagine all these can be done without wires, without configuration and without re-starting the computer.

With over 50 million mobile devices in operation and growing exponentially, a low-cost, low-power, wireless connectivity solution is critically needed for the above scenarios to happen. The answer is IrDA.

IrDA - The wireless connectivity standard

IrDA is an infrared connectivity standard established by the Infrared Data Association, (www.irda.org) an international organization that creates and promotes the low-cost wireless connectivity standard based on a short-range point-to-point user model. A typical user who is familiar with the usage of a TV remote control, is able to point an IrDA-enabled device to a target within range to perform a desired task. Over the last several years, IrDA and its over 150 members are very successful in deploying large number of portable electronic devices equipped with IrDA ports. Many digital still cameras, cellular phones, PDAs, nearly all notebook computers and 100% of all Windows CE devices are equipped with IrDA, confirming the popularity and persuasiveness of IrDA as the wireless connectivity of choice.

As an emerging technology, IrDA is expected to gain universal acceptance in business and mobile environments in both homes and offices. Today, numerous consumer applications of IrDA are available including transferring files between PCs, direct printing from a notebook, exchanging business cards between PDAs, email or fax through cellular phones or public phones by making a simple walk-up point-to-point connection. Future applications of IrDA will extend to SoHo networking, home entertainment access and control systems. Beyond home and office, industrial and service applications are starting to utilize IrDA to improve data collection, documentation and sharing processes.

IrDA is made up of 3 layers of specifications to provide a low cost, low power, half-duplex wireless serial infrared link, a physical layer (IrDA-SIR), a data link protocol layer (IrLAP) and a link management protocol layer (IrLMP).

IrDA-SIR

The IrDA Serial IR specification is a low cost, low power, high noise-immune point-to-point connectivity implementation that is optimized for data transfers. The standard was developed to utilize low cost components, which minimizes the incremental costs of adding IrDA-enabled features for manufacturers. The power efficiency requirements specified minimize the battery drainage for power conscious mobile devices, comparatively requiring much less power than diffuse IR.

Data transfer rates are from 115.2 Kbps (SIR) to 4 Mbps (FIR) depending on encoding scheme. All data speeds are negotiated to the common supported speed prior to data transfer, but must support 9600 bps to be IrDA compliant. The standard 115.2 Kbps (SIR) speed uses 3/16 pulse encoding approach that can be designed from a standard UART, which is easily programmable to accommodate various data rates. The optional and faster 4 Mbps (FIR) speed uses Pulse Position Modulation (PPM) encoding that is

compatible to the slower SIR, but doesn't guarantee similar low power consumption because of additional controlling logic.

Bit Error Rate (BER) is specified to be better than 1 in 109 at ranges up to 1 meter, while still providing high level of noise immunity in normally illuminated environments.

IrLAP

IrLAP is the IrDA data link protocol layer that is responsible for link support initialization, device address discovery, data rate negotiation, information exchange, disconnection, link shutdown and address conflict resolution. IrLAP is based on HDLC, a widely implemented asynchronous data communication standard to provide simple and reliable communication link.

One major function of IrLAP is to establish primary and secondary stations. As the data link is being negotiated, the primary device takes a commanding position to establish the point-to-point or point-to-multipoint connection to the secondary or responding stations, then data is transferred between the primary and secondary stations under the complete control of the primary. A device wishes to be connected to another device by automatic discovery must come within the operational range, the initiator will send a connection request at 9600 bps indicating its device address, data rate and other capabilities. Upon receiving such request, the responding device will assume the secondary position returning its device address and capabilities. The primary and secondary devices will then change their data rate and operating parameters to a common set defined by the initial data exchange. The primary device then sends confirmation of the agreed parameters to the secondary. The two devices are now connected and ready to transfer data.

IrLMP

IrLMP, the IrDA Link Management Protocol is responsible for multiplexing and controlling of applications or transport protocols on same IrLAP connection at the same time. It operates in two modes, multiplexed and exclusive. In multiplexed mode, the multiplexer accepts data from any of its clients above, transport entities or directly bound applications. In exclusive mode, a single IrLMP connection occupies the IR medium; it can provide timing critical applications a way to meet their strict turn-around time requirements.

IrLMP is one of the required protocol stacks of IrDA; it uses services from the data link layer IrLAP and provides services to its own clients. In order to provide a generic flow control method, the optional IrDA Tiny Transport Protocol (Tiny TP) is defined to work within IrLMP to provide independent controlled streams between its clients and multiplex transport connections over one or more link service access points. One common client operated on top of IrLPM is IrDA Communications Services (IrCOMM), the serial/parallel port emulation that can support many print and communication applications using standard communications API, thus allowing many legacy applications running over IrDA without any change.

IrDA through USB - wireless convenience meets plug-and-play simplicity

Traditional IrDA support in the desktop PC platform has been through a IrDA-to-serial-port dongle, an implementation not only is inadequate in supporting the 4 Mbps FIR, it is relying on the ancient COM port that will soon face obsolesce opting for new and faster peripheral interface bus. One dilemma IrDA faces is its place in the desktop PC. As the market moving towards low-cost PCs, the option of keep the non-standard-feature IrDA as a premium becomes questionable. The required product qualification to meet IrDA interoperability and compliance is seemingly unjustified to insist on its availability. The ideal way to add IrDA accessibility to a PC is by a dongle, an interface that performs the IrDA function through PC's standard communication interface, and that interface is USB.

USB, the widely accepted and deployed Universal Serial Bus, is the peripheral interface that allows an instant, no-hassle connection to PC peripherals (www.usb.org). Adding an old-fashioned peripheral to a PC can be a challenging proposition for many, it requires a lot of computer savvy and some luck. Users are often required to plugging in additional boards, loading numerous custom drivers and setting IRQ and

DMA configurations. Instant success stories are rare and most end up in frustration from trial-and error.

USB changes all that. A device is plugged in, recognized, and ready to use in seconds without even re-starting the computer, thus bringing true plug-and-play consumer appliance-like user friendliness to the PC environment. With data transfer rate at 2 speeds, 1.5 Mbps and 12 Mbps, it meets the bandwidth requirements of most low to mid-speed applications including consumer audio and video conferencing. USB, as its name suggests, is now a universal feature on all new personal computers. PCs and Macs alike are fully exploiting the benefits of USB to enhance the end user experience.

The marriage of IrDA and USB is ideal. USB provides IrDA a plug-and-play interface to PC that is both low cost and practical. PC makers can rely on IrDA-to-USB dongles for IrDA accessibility, thus eliminating costly product qualification and model management. For millions of users of IrDA-enabled mobile appliances, IrDA-to USB dongles are easy to carry, and can instantly connect their portables to any PC with plug-and-play simplicity. As tens of millions of IrDA-enables looking for this simple link to the PC, where is the solution that can meet their needs?

KC technology offers such solution via the IRXpress line of IR-proliferating products. By leveraging the technologies offered by IrDA and our strength and proven compliance in USB, KC Technology is able to provide the wireless infrared connectivity solution with true plug-and-play simplicity that will enhance the networkability of today’s mobile computing devices and beyond.