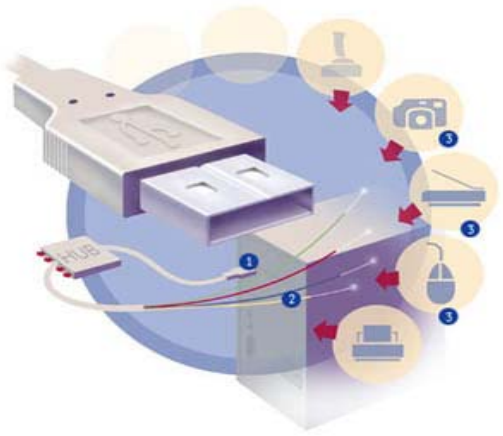

Universal Serial Bus

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Abstract

The Universal Serial Bus (USB) has been the most successful interface in the history of PCs. While the first generation USB standard was introduced in 1996, it first emerged after Microsoft included native support for it in Windows 98. This led to near universal support in the PC market, and a growing share of PC peripheral and consumer electronic device markets. USB is the solution for any PC user who has ever dreamed about an instant, no-hassle way to connect a new digital joystick, a scanner, a set of digital speakers, a digital camera, or a PC telephone to their computer. Adding an old-fashioned peripheral device can be a scary proposition, requiring a ton of computer savvy and a certain amount of luck! First you must figure out which port to use from a bewildering array of possibilities. Then in most cases, you have to pry open your PC to install an add-in card and set DIP switches. Then there are those touchy IRQ settings to configure, not to mention other alphabet soup. It is enough to deter most users from even thinking about adding a new peripheral. USB makes adding peripheral devices so easy, anyone can do it. With USB-compliant PCs and peripherals, you just plug them in and turn them on! USB makes the whole process automatic. It's like adding instant new capabilities to your PC.

Introduction

1) What is USB?

USB is a specification that allows computer peripherals to be attached to the outside of the computer. USB has greatly simplified the lives of PC users by combining multiple existing interfaces into a single, easy-to-use connector. USB's plug-and-play capability ends the formerly complex process of adding system peripherals. "Universal" means all peripherals share the same connector. "Serial" simply defines devices can daisy chain together.

2) Why do we need USB?

We need USB for the following reasons:

- **One standard connector type** - "one-size-fits-all."
- **Hot insertion and removal** - now you can attach and detach peripherals while your system stays up and running.
- **Chain devices together** - USB allows some peripherals to incorporate "hubs" that serve as connection points for other devices. This lets you use more than one USB-compatible device at a time.
- **Automatic installation** - when a USB-compatible peripheral is connected, PCs with USB automatically install and configure the necessary drivers and system resources.
- **Separate power cord not required** - most USB devices get their power through the USB bus (connection) itself, so only one cable is needed.
- **Faster** - USB transfers data 10 times faster than traditional serial ports.

3) USB's Story:

Connectivity specification was developed by computer and telecommunication industry members for attaching peripherals to computers. Listed are the following companies involved in the designing of USB:

- Compaq
- Intel Corporation
- Northern Telecom
- Microsoft Corporation
- NEC Corporation
- IBM
- Digital equipment Corporation

4) Versions of USB:

- USB **1.0**, the first edition, was released in January 1996. It supported 1.5 Mb/s (low speed) and 12 Mb/s (high speed) transfer rates. Note that this is Mega*bits* per second and not Mega*Bytes* per second -- a common misunderstanding. A percentage of this data rate is reserved for USB protocol overhead, so the actual data transfer is less than the indicated speed. How much less depends on the transfer type and the packet sizes.

- USB **1.1** was released in September 1998. This edition fixed many of the problems in release 1.0.

- USB **2.0** was released in early 2000 and has increased the maximum transfer speed by a factor of 14 up to 480 Mb/s! USB 2.0 is backwards compatible with USB 1.x. Although the USB 2.0 specification has been released, operating programs for personal computers are not expected to have USB 2.0 support until about the fourth quarter of 2001. A few peripherals supporting USB 2.0 have already begun to show up on the market in late 2000.

Behind the Scenes

1)How USB works?

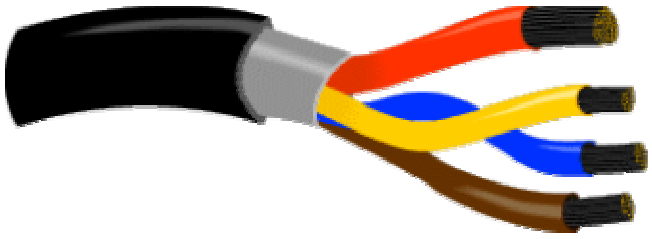
When the host powers up, it queries all of the devices connected to the bus and assigns each one an address. This process is called **enumeration** -- devices are also enumerated when they connect to the bus. The host also finds out from each device what type of data transfer it wishes to perform.Each device has its own ID so that the network will know how much bandwidth to assign to it. This ID also contains information about the device, such as vendor and purpose. When the device is unplugged from the socket, that's communicated to the applications, and the drivers are automatically unloaded. Besides plugging and unplugging, the end user doesn't have to do any configuration of the devices.

2) Do you need special software to run USB?

You do not need any special software to run USB. What you need is Windows Operating System or MacOS 8.5 (found in iMac and G3 systems). The operating systems pretty much cover the software side. If you got a USB device, either the operating systems have the necessary drivers or the manufacturers ship with the required software/drivers for the hardware.

3) USB cable:

Devices connected to a USB port rely on the USB cable to carry power and data.



Inside a USB cable: There are two wires for power -- +5 volts (red) and ground (brown) -- and a twisted pair (yellow and blue) of wires to carry the data. The cable is also shielded.

4) How fast is USB?

- High speed USB products have a design data rate of 480 Mb/s(megabitspersecond).
- Full speed USB devices signal at 12Mb/s
- Low speed devices use a 1.5Mb/s subchannel.

Applications of USB

USB is not designed for heavy multimedia usage; however, it is very capable handling low-end and mid-level devices.

USB is designed for simple installation and hot-swapping for external peripherals. USB-IF, the group that designed Universal Serial Bus, targets USB technology to benefit low-end and mid-level devices with PnP (Plug and Play). USB can apply to mouse, joysticks, keyboards, webcams, scanners, etc.

Developers saw the advantages of USB and jumped on the gun to push out USB devices, such as CD recorders, hard drives, speakers, even DVD drives, that are recommended to operate on high speed bus. USB have the beef for all this speed hungry stuff. Speakers can do simple MP3 playback and digital CD-audio.

If you are looking for awesome 3D quality surround sound, AC3 and environmental audio, EAX. You are knocking on the wrong door. You can use your Microsoft Encarta DVD-ROM version using your USB laptop on the road. USB is sufficient for CD-RW.

If burning CDs is part of your life, stay away from USB. The maximum CD writing speed of a USB drive is 4X. This number is more like marketing hype than the real deal. Performance of USB, compared to IDE and SCSI bus, is more like a four-wheeled bike and Skywalker's pod racer. USB is not designed for heavy multimedia usage.

For gamers, the possibility to connect lots of joysticks, joypads and wheels for all your games is a gift from heaven. Everyone would hate to swap game controllers for the game port for every other game.

USB is also a welcome change for video conferencing cameras, or webcams. The need for additional proprietary ISA/PCI cards is eliminated. Scanning family photos will be more enjoyable with a little help from USB bandwidth. The hassle of installing SCSI cards and the slowness of parallel connections will be gone.

Advantages of USB

Hot-Pluggable

USB peripherals deliver on the promise of plug and play convenience by eliminating the need to turn off or restart the computer when attaching a new peripheral. Users can connect USB peripherals whenever they need them. For example, a user engaged in producing a newsletter or illustrated report could easily swap out a digital camera for a printer—without any downtime.

Simple Installation

When a USB peripheral is first attached, the user installs a device driver by dragging its icon onto the System Folder or by running a simple installer application. This only needs to be done once and the device is then available, since USB supports dynamically loading drivers. Apple systems that feature USB, such as the Power Mac G4, PowerBook, iBook and the iMac, also feature pre-installed USB drivers for certain devices, so no installation is necessary.

Easy Connections

USB connections require no terminators, memory addresses or ID numbers. They also use a new kind of cable—small, simple, inexpensive, and easy to attach. There's only one style of cable (USB A-B), with different connectors at each end, so they can't be plugged in incorrectly.

Greater Expandability

USB supports simultaneous connection of up to **127** devices by attaching peripherals through interconnected external hubs. When a computer's ports fill up, users simply attach a device called a hub, which provides additional ports (usually four or seven), and keep on plugging in more peripherals—and hubs—as needed.

Products

Almost all new PC designs from major vendors shipping today have USB connections on the motherboard and the correct Win OS to make them work. There are also many products used to design and build USB systems, such as connectors, chipsets and board-level computers. USB peripherals, including keyboards, monitors, mice and joysticks. Listed are some of the USB products:

Bali USB PVR (Personal Video Recorder)

Bali USB PVR is a very high quality, low cost external, MPEG-1 / MPEG-2 encoder, with an integrated onboard TV tuner and optional FM tuner, for the PC. The unit connects to the PC via a USB cable. This product consists of an external box and a software application. Additional accessories such as cables and a power supply are required for operation. The application allows the user to capture full motion D-1 quality video clips in MPEG-1 or MPEG-2 format on the PC.

USB Pendrive Pocketable, Reliable Plug-'n'-Play USB Memory

The Pen Drive is a USB FLASH MEMORY DRIVE and can support up to 2GB disk space, which is 1400 times more than a 1.44MB floppy disk. The Pen Drive USB flash disk is a plug and play device, just simply plug into any USB port and the computer will automatically detect it as another removable drive. Now you can read, write, copy, delete and move data from your hard disk drive to the Pen Drive or from the Pen Drive to your hard disk drive. You can even play MP3 files, run applications or view videos directly from the Pen Drive and a lot more.....

USB Bluetooth Adapter

The D-Link Personal*Air*™ DBT-120 USB Bluetooth Adapter is a very compact, low-profile solution based on the Bluetooth 1.1 specification, making it compatible with other Bluetooth enabled devices. The DBT-120 was designed and engineered from the ground up to be compact and portable, making it the perfect solution for notebook computers, but also just as easy to use with a desktop computer.

The DBT-120 features standard 128-bit encryption that provides you with a higher level of security for your data and communication.

The D-Link Personal*Air*™ DBT-120 includes Bluetooth management and connectivity software by WidComm, which enables you to configure and access Bluetooth enabled devices quickly and easily. The Bluetooth software enables your computer to discover and access available Bluetooth services ranging from Internet access to wireless synchronization with your PDA or cellular phone.

Compatible with USB 1.1, the DBT-120 supports Windows XP/2000/Me/98SE and Macintosh OS X 10.2 and installs quickly and easily to a desktop or notebook computer with an available USB port.

USB On-The-Go (OTG)

Consumers and Corporate users need to connect their mobile devices to each other and to various peripherals. This is confirmed by dozens of connectivity methods used by different mobile product manufacturers including proprietary docks, dongles, slots, connectors and 7 different memory card technologies. To move past this state of chaos, several mobile phone, PDA, and mobile product manufacturers have collaborated to develop a standard technology using a version of the popular USB specification tailored for mobile applications. The result is USB On-The-Go (OTG). USB OTG is a new supplement to the USB 2.0 specification that augments the capability of existing mobile devices and USB peripherals by adding host functionality for connection to USB peripherals. Since USB has traditionally consisted of a host-peripheral topology where the PC was the host and the peripheral was a relatively dumb device, these new features were needed to upgrade standard USB technology for mobile devices.

New features include:

- A new standard for small form factor USB connectors and cables.
- The addition of host capability to products that have traditionally been peripherals only, to enable point to point connections.
- The ability to be either host or peripheral (dual-role devices) and to dynamically switch between the two.
- Lower power requirements to facilitate USB on battery powered devices.

Point to Point Communication:

USB On-the-Go is a point-to-point communication standard. It still maintains master/slave at any point of time. The point-to-point capability lies on a defined mechanism allow swap of master and slave roles. The point-to-point connection is not limited to the same kind of products. Different product can connect to each other. The two figures below illustrate the point-to-point communication.

Where USB OTG is Heading?

There's not much USB, originally designed to converge phones and computers, hasn’t accomplished, including simplifying the ways of which people work with computers and inspiring new ideas for business opportunities. Following the success of USB 2.0 and with the compatibility of 500 million devices, the new On-The-Go is ready to push mobile computing to the next level.

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