Applications of Information and Communications technology

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Lecture 09

Output Device

- **Display devices** Tip poster-sized digital signs are sometimes called e-posters; large, wall-sized digital signage systems are referred to as video walls. A display device—the most common form of output device—presents output visually on some type of screen. Because the output appears temporarily on a display device, it is some times referred to as soft copy. The display device for a desktop computer is more formally called a monitor; the display device for a notebook, tablet, smartphone, smart watch, or other device for which the screen is built into the device is typically called a display screen. In addition to being used with computers and mobile devices, display screens are also built into handheld gaming devices, home entertainment devices (like remote controls, televisions, and portable DVD players), kitchen appliances, e-book readers or e-readers (which display e-books), and other products

Source: Apple, Inc.

PORTABLE COMPUTERS

Source: Barnesandnoble.com llc

E-READERS

Source: General Electric Company

HOME APPLIANCE CONTROL PANELS

Source: LG

Source: HTC

Source: Planar Systems, Inc.

HW

Display Device Characteristics.

- Several characteristics and features differentiate one type of display device from another.

Color Vs. Monochrome Displays

Display devices form images by lighting up the proper configurations of pixels (the smallest colorable areas on a display device—essentially tiny dots on a display screen). A variety of technologies can be used to light up the appropriate pixels needed to display a particular image, as discussed shortly. Display devices can be monochrome displays (in which each pixel can only be one of two colors, such as black or white) or color displays (in which each pixel can display a combination of three colors—red, green, and blue—in order to display a large range of colors). Most monitors and display devices today are color displays.

- **Crt Monitors Vs. Flat-panel Displays** The CRT monitor used to be the norm for desktop computers. CRT monitors use the same cathode-ray tube technology used in conventional televisions in which an electron gun sealed inside a large glass tube projects an electron beam at a screen coated with red, green, and blue phosphor dots; the beam lights up the appropriate colors in each pixel to display the necessary image. As a result, CRTs are large, bulky, and heavy. While CRT monitors are still in use, most computers today (as well as most television sets, smartphones, and other consumer devices containing a display screen) use the thinner and lighter flat-panel displays.

cobalt88/Shutterstock.com

MULTIPLE MONITOR SETUPS
Can be used with a single computer to extend a desktop, which can increase productivity.

Source: Hewlett-Packard Development Company, L.P.

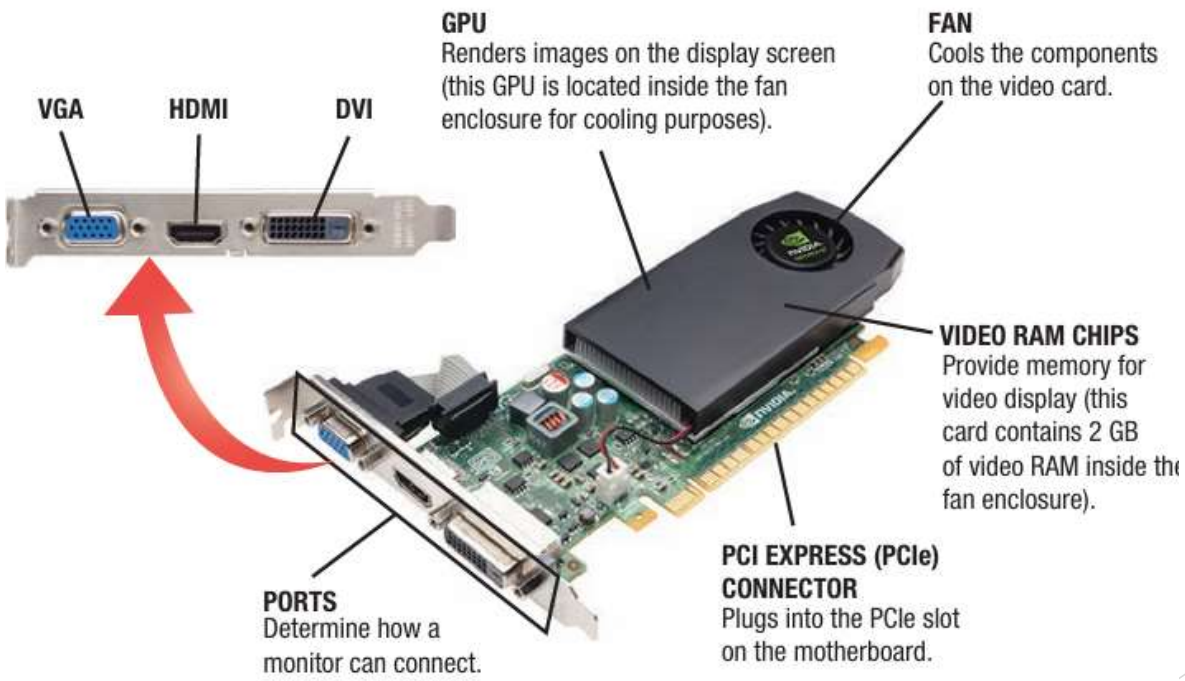
SECOND DISPLAY FOR PORTABLE COMPUTERS
Can be used to extend the desktop when needed; this curved screen has a wider viewing angle than a traditional display.

- **Size And Aspect Ratio** Display device size is measured diagonally from corner to corner, in a manner similar to the way TV screens are measured. Most desktop computer monitors today are between 19 inches and 30 inches (though larger screens—up to 80 inches and more—are becoming increasingly common); notebook displays are usually between 14 inches and 17 inches; netbooks typically have 10- or 11-inch displays; and tablet displays are typically between 7 inches and 11 inches. To better view DVDs and other multimedia content, most monitors sold today are widescreen displays, which conform to the 16:9 aspect ratio of widescreen televisions, instead of the conventional 4:3 aspect ratio.

- **Screen Resolution** Regardless of the technology used, the screen of a display device is divided into a fine grid of tiny pixels, as previously discussed. The number of pixels used on a display screen determines the screen resolution, which affects the amount of information that can be displayed on the screen at one time. When a higher resolution is selected, such as 1,920 pixels horizontally by 1,080 pixels vertically for a widescreen computer monitor (written as 1,920 × 1,080 and read as 1920 by 1080), more information can fit on the screen, but everything will be displayed smaller than with a lower resolution, such as 1,024 × 768. The screen resolution on many computers today can be changed by users to match their preferences and the software being used.

- **Video Adapters, Interfaces, And Ports**

The video card or graphics card installed inside a computer or the integrated graphics component built directly into the motherboard or the CPU of the computer houses the graphics processing unit (GPU)—the chip devoted to rendering images on a display device. The video card or the integrated graphics component determines the graphics capabilities of the computer, including the screen resolutions available, the number of bits used to store color information about each pixel (called the bit depth), the total number of colors that can be used to display images, the number of monitors that can be connected to the computer via that video card or component, and the types of connectors that can be used to connect a monitor to the computer. Video cards typically contain a fan and other cooling components to cool the card. Most video cards also contain memory chips (typically called video RAM or VRAM) to support graphics display, although some are designed to use a portion of the computer's regular RAM as video RAM instead.


VGA
HDMI
DVI
GPU
Renders images on the display screen (this GPU is located inside the fan enclosure for cooling purposes).
FAN
Cools the components on the video card.
VIDEO RAM CHIPS
Provide memory for video display (this card contains 2 GB of video RAM inside the fan enclosure).
PCI EXPRESS (PCIe) CONNECTOR
Plugs into the PCIe slot on the motherboard.
PORTS
Determine how a monitor can connect.

- **Wired Vs. Wireless Displays** Traditionally, computer monitors are wired displays; that is, monitors that are physically connected to the system unit via a cable. However, an increasing number of display devices today— including digital photo frames, e-readers, computer monitors, and television sets—are designed to be wireless. Wireless displays connect to a computer or other device using a wire less networking connection such as Wi-Fi, Bluetooth, or a special wireless standard designed for transmitting multimedia

- **Wearable Displays** While most displays are designed to be looked at from at least several inches away, some displays are designed to be wear able. Wearable displays can project images from a smartphone or directly from the Internet. Typically, wearable displays have control buttons on the side for input, which allow the user to see images as if they are on a distant large screen display. Many wear able displays overlay the projected image on top of what the user is seeing in real time to provide augmented reality. One type of wearable display is smart glasses, such as Google Glass and the smart glasses

PRINTERS

Instead of the temporary, ever-changing soft copy output that a monitor produces, printers produce hard copy; that is, a permanent copy of the output on paper. Most desktop computer are connected to a printer; portable computers and some mobile devices can use printers as well.

Printer characteristics

Printers differ in a number of important respects, such as the technology used, size, print quality, speed, and type of connection used. Some general printer characteristics are dis cussed next, followed by a look at the most common types of printers.

TYPES OF PRINTERS

- Printers produce images through either impact or nonimpact technologies.

IMPACT PRINTERS

Impact printers, like old ribbon typewriters, have a print mechanism that actually strikes the paper to transfer ink to the paper. For example, a dot-matrix printer uses a printhead consisting of pins that strike an inked ribbon to transfer the ink to the paper—the appropriate pins are extended (and, consequently, strike the ribbon) as the printhead moves across the paper in order to form the appropriate words or images. Impact printers are used today primarily for producing multipart forms, such as invoices, packing slips, and credit card receipts.

NONIMPACT PRINTERS

They form images without the print mechanism actually touching the paper. Nonimpact printers usually produce higher quality images and are much quieter than impact printers are. The two most common types of printers today—laser printers and ink-jet printers—are both nonimpact printers.

Both impact and nonimpact printers form images with dots, in a manner similar to the way monitors display images with pixels. Because of this, printers are very versatile and can print text in virtually any size, as well as print photos and other graphical images. In addition to paper, both impact and nonimpact printers can print on transparencies, envelopes, mailing labels.

Printer characteristics

COLOR PRINTERS AND BLACK-AND-WHITE PRINTERS

Both color printers and black-and-white printers are avail able. Color printers work similarly to black-and-white printers, except that, instead of using just black ink or toner, they also use cyan (blue), magenta (red), and yellow ink or toner.Color printers either apply all of the colors in one pass or go through the entire printing process multiple times, applying one color during each pass. Color printers are often used in homes (to print photographs, greeting cards.

PRINT RESOLUTION

Most printing technologies today form images with dots of liquid ink or flecks of toner powder. The number of dots per inch (dpi)—called the print resolution—affects the quality of the printed output. Printers with a higher print resolution tend to produce sharper text and images than printers with a lower resolution tend to produce, although other factors (such as the technology and number of colors used) also affect the quality of a printout. Guidelines for acceptable print resolution are typically 300 dpi for general-purpose print outs, 600 dpi for higher-quality documents, and 2,400 dpi for professional applications.

PRINT SPEED

Print speed is typically measured in pages per minute (ppm). How long it takes a document to print depends on the actual printer being used, the selected print resolution, the amount of memory inside the printer, and the content being printed. For instance, pages containing photographs or other images typically take longer to print than pages containing only text, and full-color pages take longer to print than black-and-white pages. Because of these variations, the standard of images per minute (IPM) was developed as a more uniform measurement of print speed to allow consumers to more easily compare printers from different manufacturers

PERSONAL VS. NETWORK PRINTERS

Printers today can be designated as personal printers (printers designed to be connected directly to a single computer, typically via a USB cable) or network printers (printers designed to be connected directly to a home or an office network). Network printers can be used by anyone connected to the network via a wired or wireless connection and they are increasingly being used in homes as well as in businesses. Enterprise network printers are designed for high-volume office printing, typically support multiple paper trays to print various sized documents, and often include other capabilities, such as the ability to collate, staple, hole-punch, and print on both sides of the page

Audio Output

Audio output includes voice, music, and other audible sounds. Computer speakers, the most common type of audio output device, are either connected to or built into a computer in order to provide audio output for computer games, music, video clips and TV shows, Web conferencing, and other applications. Computer speaker systems resemble their stereo system counterparts and are available in a wide range of prices. Some speaker systems consist of only a pair of speakers. Others include additional speakers and a subwoofer to create better sound (such as surround sound) for multimedia content. Instead of being stand-alone units, the speakers for some desktop computers are built directly into, or permanently attached to, the monitor. Portable computers and mobile devices typically have speakers integrated into the device; these devices can also be connected to a home or car stereo sys tem, portable speakers, or a consumer device.

Source: Altec Lansing/AL Infinity, LLC

COMPUTER SPEAKERS
Used to output sound from a computer.

Source: Mova Systems SAS

PORTABLE SPEAKERS
Connect wirelessly to output sound from a smartphone or tablet.

Source: Altec Lansing/AL Infinity, LLC

EARBUDS
Used to deliver sound from a smartphone or other mobile device to one individual.