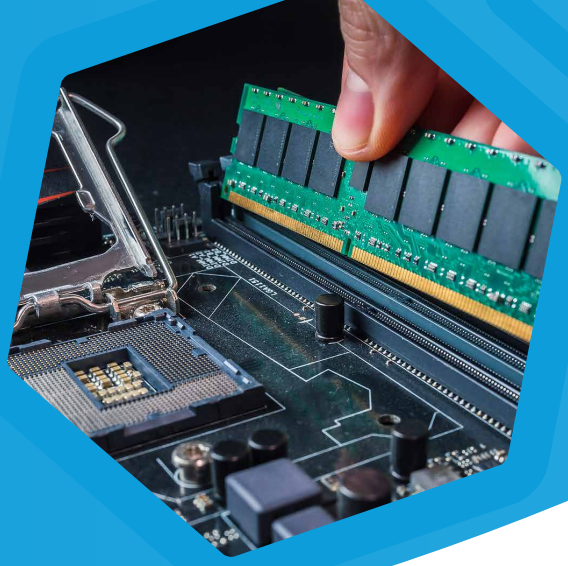

IT Fundamentals

Unit - Hardware

Lesson 2.1.1 - Input Output Interfaces

IT Fundamentals Objectives (FC0-U61)

Objective 2.1 - Classify common types of input/output device interfaces

- Networking
  - Wired
    - Telephone connector, Ethernet connector
  - Wireless
    - Bluetooth, NFC
- Peripheral device
  - USB, FireWire, Thunderbolt, Bluetooth, RF
- Graphic device
  - VGA, HDMI, DVI, DisplayPort, Mini-DisplayPort

Grade Level(s)

8, 9

Cyber Connections

- **Hardware & Software**

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Teacher Notes:

Input Output Interfaces

Networking

When we need to connect to a local area network, our computers must have some sort of network card. This network card can be wired, wireless, or both. Wired network cards have an *RJ-45* port (more commonly known as an ethernet port). If the card has wireless capabilities, it may have a small external antenna.

To connect to the broader Internet, a traditional modem is used or in more rural parts of the country, a regular telephone land line can be used for dial-up access. A modem expansion card can have two *RJ-11* (telephone) ports on it. The term modem is also used to refer to high-speed cable and DSL Internet connectivity.

Expanding upon wireless connectivity, we have *Bluetooth* and *NFC*. Bluetooth uses short-wavelength UHF radio waves ranging from 2.402 GHz to 2.48 GHz. Because of this, the range for Bluetooth devices is very limited. NFC (Near-field communication) is limited to an even shorter range of 4 cm for direct device to device contact (essentially cord connection without the cord). Common NFC devices in the real world are smartphones when they are used by credit card machines.

Peripheral Devices

Any computer device that is not essential for the computer, such as keyboards, mice, microphones, etc., are called peripheral devices. Peripheral devices have many different dongles/ways to connect to a computer. One of the most common is the *USB* (Universal Serial Bus). Most USB devices today use USB 2.0/Hi-speed (speeds up to 480 Mbps), USB 3.0/SuperSpeed (speeds up to 5 Gbps), or USB 3.1/SuperSpeed (speeds up to 10 Gbps).

At one time, there was a direct competitor to USB called *FireWire (IEEE 1394)*, but this has since faded. FireWire was developed by Apple and was capable of speeds up to 800 Mbps. As a replacement to FireWire and another competitor to USB (arguably), Apple and Intel created Thunderbolt. The current version of Thunderbolt (Thunderbolt 3) can transfer at a blazing speed (comparatively) of 40 Gbps.

Teacher Notes:

Just like with networking, Bluetooth can be used with peripheral devices. The communications work the same as with networking. A final type of peripheral connection involves the use of ***radio frequency (RF)***. Many of our wireless keyboards and mice require a wireless receiver to be plugged into a USB port which in turn communicates via RF with the wireless device.

Nvidia vs. AMD

As users, we know we need a keyboard, a mouse, and a monitor for a standard computer to be useful for us. A monitor can be connected in multiple ways, just like our keyboards and mice, but the connections are different and fairly unique. An "older" connector which is still in use today is called a ***Video Graphics Array (VGA)*** connector. Many Dell and HP monitors use the 15 pin VGA, having become universal on PCs.

A "newer" connector is HDMI ***(High-Definition Multimedia Interface).*** HDMI transmits uncompressed video data and uncompressed or compressed digital audio data. Two of the most common versions of HDMI are HDMI 1.3 with speeds up to 10.2 Gbps and HDMI 2.0 with speeds up to 18 Gbps. Although both VGA and HDMI are used for displays, it doesn't make sense to talk about the "speed" of VGA because it uses analogue signaling rather than digital signaling.

Another connector that is visually similar to VGA is DVI ***(Digital Visual Interface)***. The most standard DVI header uses 24 pins (29 if you include 5 analog pins). DVI has both digital and analog capabilities, but the analog specifications (direct from production) are short and vague, whereas the digital components are very detailed. A dual-link DVI can handle a bandwidth of up to 7.92 Gbps.

The last type of connector used for displays/monitors is ***DisplayPort*** (and mini-DisplayPort). Much like how VGA and DVI look relatively similar, so do HDMI and DisplayPort. The current version, DisplayPort 2.0, is capable of speeds up to 77.37 Gbps. Apple designed mini-DisplayPort (looking similar to a smaller, but fatter USB header) to work like DisplayPort 1.2 which is capable of 4K resolution with max speeds up to 21.6 Gbps.