**GOOGLE IT SUPPORT**

**TECHNICAL …**

**Physical Storage devices**

Before we get into computer storage, we need to fill in some gaps. I'm referring to things like gigabytes, bits, etc. But we actually haven't talked at all about what those metrics mean. Sorry, I got a gigabit ahead of myself. As you might have guessed, these terms refer to data sizes. The smallest unit of a data storage is a bit. A bit can store one binary digit, so it can store a one or a zero. The next largest unit of storage is called a byte, which is comprised of eight bits. A single byte can hold a letter, number or symbol. The next largest unit is referred to as a KB bite. But we typically use the term kilobyte. A kilobyte is made up of 1,024 bytes. Here's a quick data conversion chart. How much does 500 gigabyte even mean? Let's take a look at the size of an average music file, which is about three megabytes. On a 500 gigabyte machine, that's approximately 165,000 music files. That's a lot of music. We saw all of our computers data on our hard drive, which allows us to store our programs, music, pictures, etc. Have you ever had an issue with your computer and lost all the data that was on your hard drive? Yeah, me too. It was the worst. This actually happens a lot and you'll probably encounter it as an IT support specialist. Make sure you backup your data to be safe. This means you should copy or save your data somewhere else just in case something goes wrong and your hard drive crashes. That way, you won't lose all your data. There are two basic hard drive types used today. Hard disk drives or HDDs uses a spinning platter and a mechanical arm to read and write information. The speed that the platter rotate allows you to read and write data faster. This is commonly referred to as RPM or revolution per minute. A hard drive with a higher RPM is faster. So if you go out and buy a hard drive today, you might see something like a 500 gigabyte, with 5,400 rpm. HDDs are prone to a lot more damage because there are a lot of moving parts. This susceptibility to damage went away with a new type of storage called solid state drive or SSD. SSDs have no moving parts. Are you familiar with a USB stick? SSDs operate in a similar way. The information is stored on microchips and data travels a lot faster than HDDs. The form factor for SSDs is also slimmer compared to their HDD cousins. Sounds great, doesn't it? So why doesn't everyone use SSDs? Well, both have their pros and cons. HDDs are more affordable, but they're more prone to damage. SSDs are less risky when it comes to losing data, but they're also more expensive. So you may not buy as much memory storage in SSDs than what you can get in HDDs. Believe it or not, there are even hybrid SSD and HDD drives out there. They offer SSD performance where you need it for things like system performance, such as putting your computer along with hard disk drives, but less important stuff like basic file storage. There are a few interfaces that hard drives use to connect our system. ATA interfaces are the most common ones. The most popular ATA drive is a Serial ATA or SATA, which uses one cable for data transfers. SATA drives are hot swappable, great term, don't you think? It means you don't have to turn off your machine to plug in a SATA drive. SATA drives move data faster and use a more efficient cable like this one than its predecessors. SATA has been the de facto interface for HDDs today. But people quickly found that using the SATA cable wasn't good enough for some of the blazing fast SSDs that were coming on the market. The interface couldn't keep up with the speeds of the newest SSDs. So another interface standard was created called NVM express, or NVMe. Instead of using a cable to connect your drive to your machine, the drive was added as an expansion slot, which allows for greater throughput of data and increased efficiency.

* **Decimal nomenclature:** kilobyte, megabyte, gigabyte, terabyte, petabyte, exabyte, zettabyte, yottabyte

The decimal naming system for computer storage uses the metric system of prefixes from the International System of Units: kilo, mega, giga, tera, peta, exa, zetta, and yotta. These prefixes may also be referred to as the decimal system of prefixes. The metric/decimal nomenclature represent a base-10 approximation of the actual amount of data storage bytes. The metric system prefixes were selected to simplify the marketing of computer products.

* **Binary nomenclature:** kibibyte, mebibyte, gibibyte, tebibyte, pebibyte, exbibyte, zebibyte, yobibyte

The binary naming system is a standard set by the International Organization for Standardization (ISO) in partnership with the International Electrotechnical Commission (IEC). The ISO 80000 and IEC 80000 guides to units of measurement define the International System of Quantities (ISQ). The prefixes kibi-, mebi-, gibi, -tebi-. pebi-, exbi-, zebi-, and yobi- were created by the IEC organization. They are a blend of the first two letters of the metric prefix fused with the first two letters of the word “binary” (example: **me**gabyte + **bi**nary + **byte**= mebibyte).

Binary measurements of computer data are more accurate than decimal system measurements. While decimal nomenclature is commonly used to market computers and computer parts to the general public, binary nomenclature is often used in computer engineering for numerical accuracy.

* **One kilobyte (1 KB):**
  + **Kilobyte (KB) decimal format:** 103 = 1,000 bytes
  + **Kibibyte (KiB) binary format:** 210 = 1,024 bytes
  + **Decimal inaccuracy:** Off by -2.4% or -24 bytes
  + **Name origin:** “Kilo-” is a French derivation from the Ancient Greek word for “thousand” A kilobyte is one thousand bytes.
  + **1 KB can hold:** A short text file or a small icon as a 16x16 pixel .gif file.
* **One megabyte (1 MB):**
  + **Megabyte (MB) decimal format:** 106 = 1,000,000 bytes
  + **Mebibyte (MiB) binary format:** 220= 1,048,576 bytes
  + **Decimal inaccuracy:** Off by -4.9% or -48,576 bytes
  + **Name origin:** “Mega-” is derived from the Ancient Greek word for “large.” A megabyte is a large number of bytes.
  + **1 MB can hold:** Approximately one minute of music in a lossless .mp3 format or a short novel.
* **One gigabyte (1 GB):**
  + **Gigabyte (GB) decimal format:** 109  = 1,000,000,000 bytes
  + **Gibibyte (GiB) binary format:** 230 = 1,073,741,824 bytes
  + **Decimal inaccuracy:** Off by -7.4% or -73,741,824 bytes
  + **Name origin:** “Giga-” is derived from the Ancient Greek word for “giant.” A gigabyte is a giant number of bytes.
  + **1 GB can hold:** Between 2.5-3 hours of music in .mp3 format or 300 high-resolution images.
* **One terabyte (1 TB):**
  + **Terabyte (TB) decimal format:** 1012 = 1,000,000,000,000 bytes
  + **Tebibyte (TiB) binary format:** 240 = 1,099,511,627,776 bytes
  + **Decimal inaccuracy:** Off by -10.0%
  + **Name origin:** “Tera-” is a shortened form of “tetra-”, which was derived from the Ancient Greek word for the number four. The 1012 decimal format can also be written as 10004 (one-thousand to the 4th power). “Tera-” in Ancient Greek means “monster.” You might think of the word “terabyte” as a monstrously large number of bytes.
  + **1 TB can hold:** Approximately 200,000 songs in .mp3 format or 300 hours of video.
* **One petabyte (PB):**
  + **Petabyte (PB) decimal format:** 1015 = 1,000,000,000,000,000 bytes
  + **Pebibyte (PiB) binary format:** 250 = 1,125,899,906,842,624 bytes
  + **Decimal inaccuracy:** Off by -12.6%
  + **Name origin:** “Peta-” is derived from the Ancient Greek word “penta” meaning five. The 1015 decimal format can also be written as 10005 (one-thousand to the 5th power).
  + **1 PB can hold:** The content from 1.5 million CD-ROM discs or 500 billion pages of text.
* **One exabyte (EB):**
  + **Exabyte (EB) decimal format:** 1018 = 1,000,000,000,000,000,000 bytes
  + **Exbibyte (EiB) binary format:** 260 = 1,152,921,504,606,846,976 bytes
  + **Decimal inaccuracy:** Off by -15.3%
  + **Name origin:** “Exa-” was derived from the Ancient Greek word for six. The 1018 decimal format can also be written as 10006 (one-thousand to the 6th power).
  + **1 EB can hold:** Approximately 11 million movies in 4k video resolution or 3,000 copies of the entire United States Library of Congress.
* **One zettabyte (ZB):**
  + **Zettabyte (ZB) decimal format:** 1021 = 1,000,000,000,000,000,000,000 bytes
  + **Zebibyte (ZiB) binary format:** 270 = 1,180,591,620,717,411,303,424 bytes
  + **Decimal inaccuracy:** Off by -18.1%
  + **Name origin:** “Zetta” was derived from the Latin word “septem” which means seven. The 1021 decimal format can also be written as 10007 (one-thousand to the 7th power).
  + **1 ZB can hold:** Seagate reports one zettabyte can hold 30 billion movies in 4k video resolution.
* **One yottabyte (YB):**
  + **Yottabyte (YB) decimal format:** 1024 = 1,000,000,000,000,000,000,000,000 bytes
  + **Yobibyte (YiB) binary format:** 280 = 1,208,925,819,614,629,174,706,176 bytes
  + **Decimal inaccuracy:** Off by -20.9%
  + **Name origin:** “Yotta” is Ancient Greek for eight. The 1024 decimal format can also be written as 10008 (one-thousand to the 8th power).
  + **1 YB can hold:** In 2011, a cloud storage company estimated that one yottabyte could hold the data of one million data centers.

**Selecting a power supply**

**Local input voltage**

A main consideration when selecting a computer power supply is the voltage delivered to common wall sockets in your country. Power standards for input voltages can vary from country to country. The most common voltage inputs are 110-120 VAC and 220-240 VAC. VAC stands for volts of alternating current.

* **Voltages in the Americas**

North, Central, and parts of South America use the 110-127 VAC standard for common wall sockets. Computers and power supplies sold in these regions are designed to use this level of power.

* **Voltages for most of the world**

Most countries use the 220-240 VAC standard for common wall sockets. Computers and power supplies sold in these areas are designed to use this higher voltage.

Please visit [WorldStandards “Plug, socket & voltage by country”](https://www.worldstandards.eu/electricity/plug-voltage-by-country/) to find your country’s voltage standards.

## Key takeaways

When selecting a power supply for a computer, the following items should be taken into consideration:

1. Wall socket input voltage standard for the country where the computer will be used;
2. The number and power consumption needs of the computer’s internal components;
3. The motherboard model and form factor engineering specifications and requirements.

## Resources for more information

For more information on these topics, please visit:

* [Plug, socket & voltage by country](https://www.worldstandards.eu/electricity/plug-voltage-by-country/) - List of countries around the world and their voltage standards for common wall sockets and plug types.
* [How to Diagnose and Replace a Failed PC Power Supply](https://www.wikihow.com/Diagnose-and-Replace-a-Failed-PC-Power-Supply) - Step-by-step illustrated instructions on how to diagnose a power supply failure and replace it on a desktop PC.

# **Supplemental Readings for Batteries and Charging Systems**

Check out these links for more information:

You can learn about [Inductive Charging](https://en.wikipedia.org/wiki/Inductive_charging).

Read more about batteries and charge cycles for [Windows](https://docs.microsoft.com/windows-hardware/design/device-experiences/powercfg-command-line-options#option_batteryreport) or [Macs.](https://support.apple.com/HT201585) You can also check out: [Safe handling of lithium-ion batteries](https://www.osha.gov/sites/default/files/publications/shib011819.pdf).

Finally, learn how to maximize your batteries for [iOS](https://www.apple.com/batteries/maximizing-performance/) or [Android.](https://support.google.com/android/answer/7664358)

# Communication Connectors

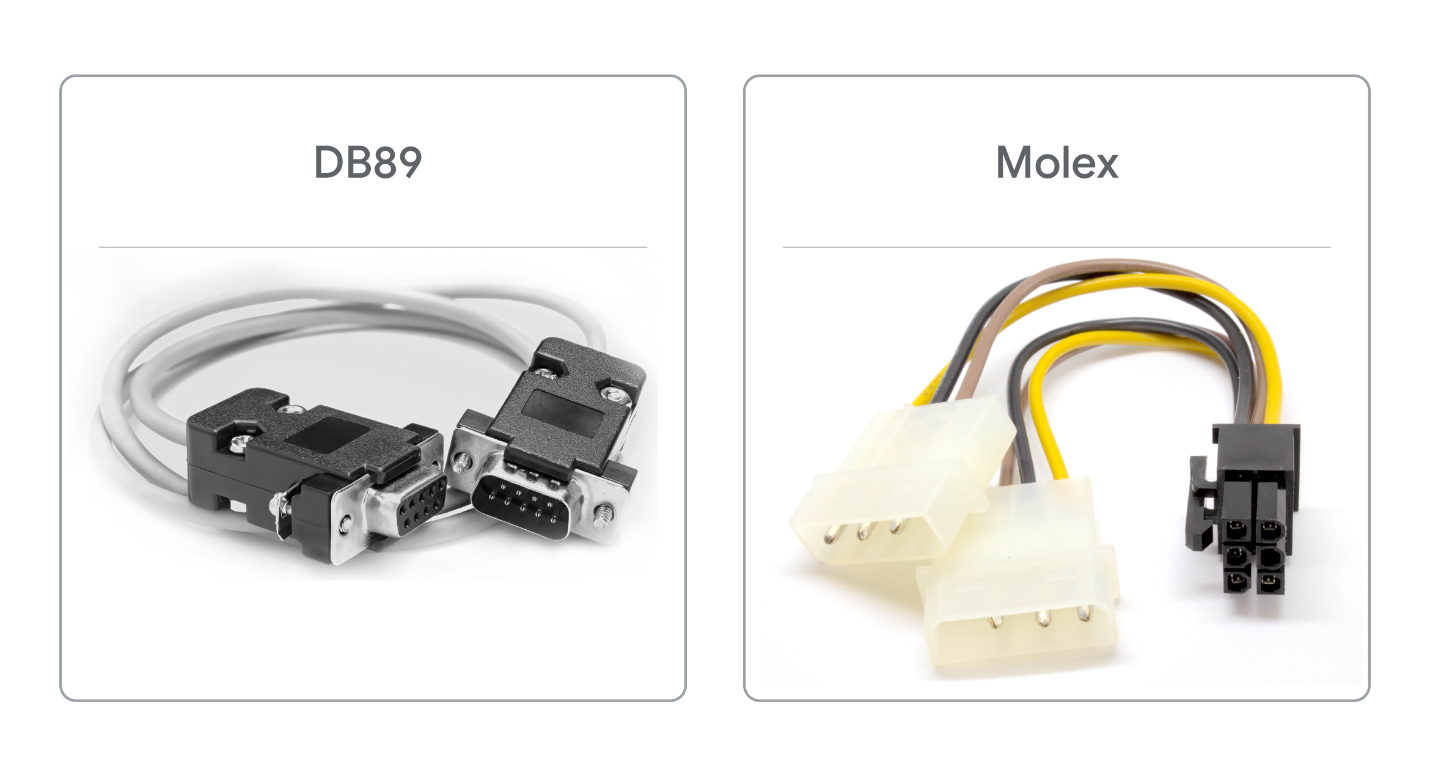
Different cable connectors are used to share information between devices and connect to the internet. IT professionals maintain network systems that use different types of communication connectors.



* **Plain Old Telephone Service (POTS)** refers to cables transmitting voice through twisted copper pair wires. Landline telephones, dial-up internet, and alarm systems use POTS. The RJ-11 (Register Jack 11) connector is used for POTS.
* **Digital Subscriber Line (DSL)** provides access to high-speed networks or the internet through telephone lines and a modem. The RJ-45 connects a computer to network elements and is mostly used with ethernet cables.
* **Cable Internet** uses a cable TV infrastructure and a modem to provide high-speed internet access to users. An F type connector is commonly used with cable modems..
* **Fiber-optic cables** contain strands of glass fibers inside an insulated casing that send data long-distance and allow for higher-bandwidth communication. The major internet providers use fiber-optic cables for high-speed internet service.

# Device Connectors

IT professionals will encounter legacy devices that still use older connectors such as DB89 and Molex.

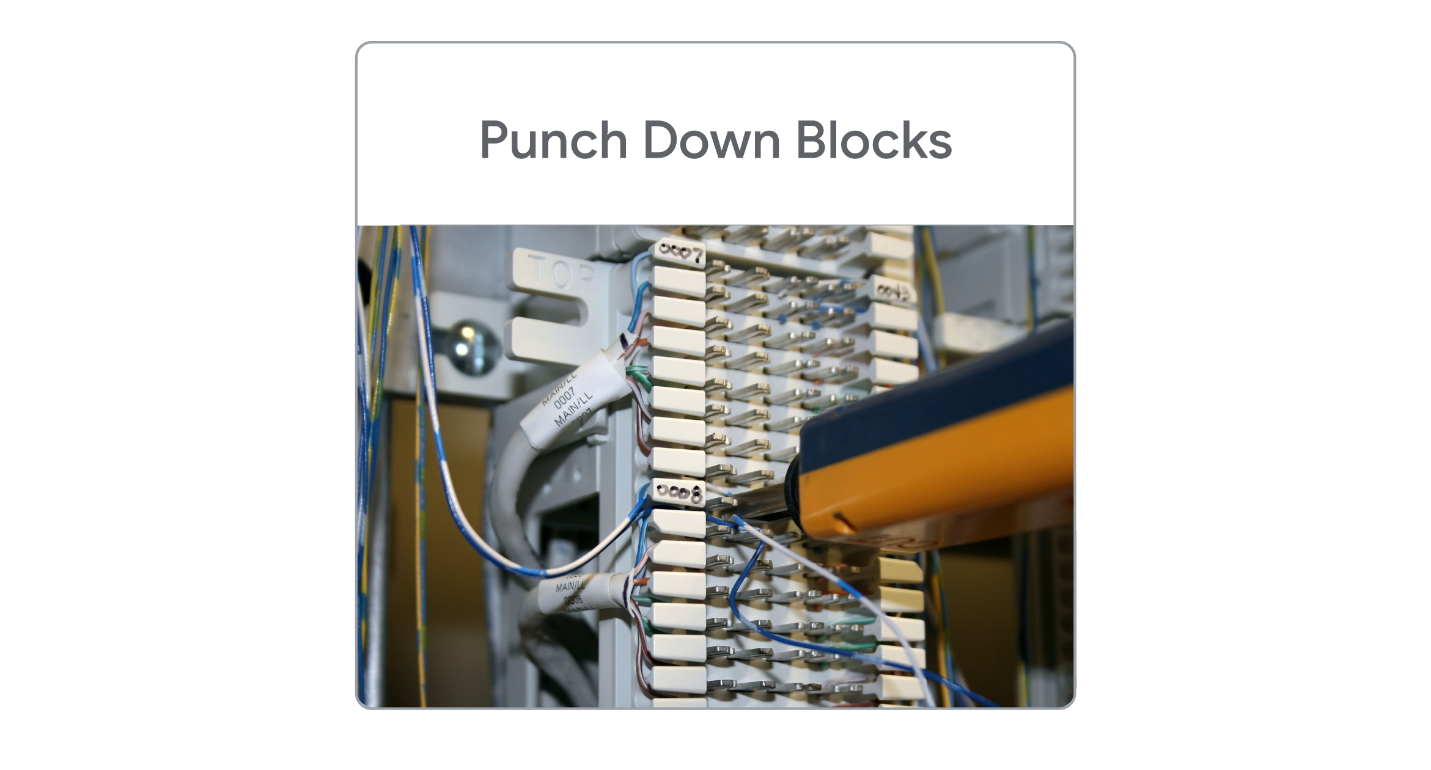


**DB89** connectors are used for older peripherals like keyboards, mice, and joysticks. An IT professional may still encounter a DB89 connector for external tools a computer uses and should recognize the cable to connect to the appropriate port.

**Molex** connectors provide power to drives or devices inside the computer. Molex connectors are used for connecting a hard drive, disc drive (CD-ROM, DVD, Blu-ray), or a video card.

# Punch Down Blocks

A punch down block is a terminal strip used to connect telephone or data lines. Punch down blocks are a quick and easy way to connect wiring. IT professionals use punch down blocks to change a wire or make a new connection for a telephone system or Local Area Network (LAN).



These are the most common cables and connectors. As technology advances, these cables and connectors will also change.

# Key Takeaways

IT professionals need to be familiar with cables and connectors used to attach peripheral devices to computers.

* USB connectors are the most common connector type and they transfer data and power to devices connected to a computer.
* Communication connectors, such as RJ-45 and fiber optic cables, connect devices to the internet and one another.
* IT professionals may encounter legacy devices that use older connectors such as DB89 and Molex.
* Punch down blocks are terminal strips used to connect telephone or data lines.

# Supplemental Reading for Projectors

## Projectors

Projectors are display devices for when you need to share information with people in the same location! Most projectors can be used just like any other display on a computer, and with a few differences, can be troubleshot just like any other display device. For example, projectors can have **dead** or **stuck** **pixels**, and can acquire **image burn-in**, just like other types of displays.

## Connectors and Cables

You will connect a computer to a projector using a display cable like [VGA](https://en.wikipedia.org/wiki/VGA_connector), [DVI](https://en.wikipedia.org/wiki/Digital_Visual_Interface#Connector), [HDMI](https://en.wikipedia.org/wiki/HDMI#Connectors), or [DisplayPort](https://en.wikipedia.org/wiki/DisplayPort#Full-size_DisplayPort_connector). When you do this, the computer's operating system will detect that a new display has been added. Depending on what your computer's video adapter supports, this new display can be **extended** or **mirrored** just like if you had added a second monitor!

* [Windows - How to connect to a projector or PC](https://support.microsoft.com/help/27911/windows-10-connect-to-a-projector-or-pc)
* [MacOS - How to connect a display, TV or projector to Mac](https://support.apple.com/guide/mac-help/mchl5fdd37ce/mac)
* [Ubuntu - How to connect another monitor to your computer](https://help.ubuntu.com/stable/ubuntu-help/display-dual-monitors.html)

A lot of times, display issues with projectors come down to the connectors and the cables that you are using. Because people frequently connect and disconnect from projectors, the cables and connectors can become worn out or damaged. Always consider this early in your troubleshooting if the projection display flickers or disappears.

## Device Drivers

Just like other display devices, if your computer does not correctly recognize the display resolution of the projector it may default to a very low-resolution **VGA mode** like 640x480 or 1024x768. If this happens, your computer may need a device driver for your projector. Take a look at the support website for your projector's manufacturer!

## Lighting

Projectors often rely on expensive, hot, very bright **incandescent** bulbs, or **lamps**. If a projector gets too hot for the lamp to safely operate, the projector will shut down. If the lamp burns out, the projector will either not work or will shut itself down. It is increasingly common for projectors to rely on LED lights, rather than incandescent lamps. These LED lights have far fewer issues with overheating, and have much longer lifespans than incandescent lamps.

## Calibration

Sometimes, like when a projector is first installed, reset, or moved, you will need to **calibrate** the projector image to account for the distance and angle that the projector is installed at. If the image is skewed or [keystoned](https://en.wikipedia.org/wiki/Keystone_effect), you might need to recalibrate the projector geometry. Calibrating the image involves focusing the image, and making adjustments to the image to make it square and aligned with the projection surface. Every projector is a little different, so refer to the vendor documentation to complete this task!

One last thing, we will discuss our BIOS settings. There's a special chip on our motherboard called the CMOS chip. It stores basic data about boosting your computer, like the date, time, and how you want it to start up. You can change these settings by booting into CMOS or BIOS settings menu. It varies on different computers, but usually when you boot the computer, there will be a quick screen that tells you what button to push to get into the settings. From there, you can change the basic BIOS settings of your machine. In an IT support role, you might interact with the BIOS more often than you think. BIOS settings control which devices to boot to. In an IT role, you might need to change the settings more often than not. A frequently performed IT task is the reimaging of a computer. The term refers to a disk image, which is a copy of an operating system. The process of reimaging involves wiping and installing an operating system. This procedure is typically performed using a program that stored on some external device, like a USB memory stick or a CD ROM, or even a server accessible through the network. To access these programs and perform the re-image, you will need to use the bios to tell the computer to boot up from that external device.

The one great constant in the technology industry is it's history of change and the speed of that change so no education is going to give anyone the skills they need for an entire career. You've got to have curiosity, you've got to have a lifetime of curiosity and a dedication to a lifetime of learning because the tools and technology that we use in this industry are always going to be changing.

PUTTING ALL TOGETHER

CPU and fan  
RAM locate the DIMM slot

Hard Drive

Rear fans

# Mobile Display Types

In this reading, you will learn about several types of displays used in modern mobile devices and monitors. As an IT Support professional, you may need to troubleshoot various types of displays. This might involve repairing damaged mobile device screens. You may even be responsible for selecting and ordering mobile devices for the employees of an organization. In your IT job role, you should have a basic understanding of the technology behind modern displays, as well as their common uses, positive features, and negative flaws. The top two technologies used in mobile system displays are Liquid Crystal Displays (LCD) and Light Emitting Diodes (LED).

## Liquid Crystal Display (LCD)

LCDs use liquid crystal technology. Liquid crystals have the properties of both a liquid and a solid. The crystals can be aligned in a variety of patterns and manipulated with electricity. How the liquid crystals are arranged and manipulated inside display panels affects refresh rates, image quality, and display performance. LCDs require backlighting, often provided by LEDs. Displays that need backlighting are also called non-emissive or passive displays. The backlighting unit (BLU) requires extra space, which makes LCD panels thicker and less flexible than other displays. Polarizers on either side of the liquid crystal layer control the path of the backlight to ensure the light is aimed toward the user.

The following are common LCD display types used for mobile devices:

### In-Plane Switching (IPS)

* **How it works:** In IPS displays, the liquid crystals are aligned horizontally to the screen. Electricity is passed between the ends of the crystals to control their behavior.
* **Uses:** IPS technology is used in touch screen displays and high-end monitors. They are often used for design, photography, video/film editing, animation, movies, and other media. They can also be used for games that rely on color accuracy and wide viewing angles, as opposed to speed.
* **Positives:** IPS displays provide vibrant colors, high quality graphics, and wide viewing areas. Additionally, they offer excellent color reproduction, accuracy, and contrast.
* **Negatives:** IPS displays are expensive. They have low refresh rates and slow response times. However, response times have been improving as the IPS technology evolves. IPS displays can be affected by “IPS Glow”, where the backlight is visible from side viewing angles.

### Twisted Nematic (TN)

Twisted Nematic (TN) is the earliest LCD technology that is still in use today. The term nematic, which means “threadlike,” is used to describe the appearance of the molecules inside the liquid.

* **How it works:** In TN displays, the liquid crystals are twisted. When voltage is applied, the crystals will untwist to change the angle of the light they transmit.
* **Uses:**  TN displays are appropriate for basic business use (e.g., email, document, and spreadsheet applications). They are also used for games that need rapid display response times.
* **Positives:** TN displays are low cost, easy to produce, have excellent refresh rates, response times, and resolutions. They are versatile and can be manufactured for any size and/or shape.
* **Negatives:** TN displays have narrow viewing angles, low image quality, color distortion, and poor color accuracy and contrast.

### VA-Vertical Alignment

* **How it works:** In VA displays, the liquid crystal molecules are vertically aligned. They tilt when electricity passes through them.
* **Uses:** VA displays are intended for general purpose. Provides mid-range performance for graphic work, movies, and TV.
* **Positives:** VA displays offergreat contrast, deep black shades, and fast response times. They are mid-range quality for refresh rates, image quality, viewing angle, and color reproduction.
* **Negatives:** On VA displays, motion blur and ghosting occurs with fast-motion visuals.

## Organic Light Emitting Diodes (OLED)

OLEDs are diodes that emit light using organic (carbon-based) materials when electricity is passed through the diodes. Displays that are able to convert electricity into light are called emissive or active displays.

* **How it works:** The basic structure of an OLED display consists of an emissive layer placed between a cathode (which injects electrons) and an anode (which removes electrons). Electricity enters through the cathode layer, passes into the emissive layer and conductive layer to create light, then out through the anode layer.
* **Uses:**  OLED display technology can be used in foldable smartphones, rollable TVs, as backlighting in LCD TVs, for gaming, and inside VR headsets.
* **Positives:** OLED displays deliver excellent picture quality, wide viewing angles, infinite contrast, fast response rate, and brilliant colors with true blacks. They are energy efficient, simpler to make, and much thinner than LCDs. OLED panels can be built to be flexible and even rollable.
* **Negatives**: OLED displays are sensitive to light and moisture. Blue LEDs degrade faster than other LED colors causing color distortion over time. They are also prone to image retention and burn-in.

### Active Matrix Organic Light Emitting Diode (AMOLED)

Active Matrix Organic Light Emitting Diode (AMOLED) and Super AMOLED are recent technologies used in smartphone displays.

* **How it works:** AMOLED displays are a type of OLED panel that uses active matrix technology. Active-matrix displays have active capacitors arranged in a matrix with thin film transistors (TFTs). This technology enables the control of each individual pixel for rapid state changes, including changing brightness and color. AMOLEDs have touchscreen functions integrated into the screen.
* **Uses:** AMOLED and Super AMOLED panels are used in high-end mobile devices, flat screen monitors, curved screens, and touchscreens.
* **Positives:** AMOLED displays offer a high picture quality and fast response time. Color and brightness are consistent across the screen. Fast-moving images and motion are displayed clearly without blurring or ghosting. Super AMOLED panels can display a wider range of colors with enhanced contrast, which makes them easy to view in a wider variety of lighting conditions.
* **Negatives:** AMOLED displays have the same problems as OLED displays (listed above) plus AMOLED panels can be difficult and expensive to manufacture.

## Inorganic mini-LEDs (mLEDs)

Inorganic mini-LEDs (mLEDs) are a next-generation, emissive display technology.

* **How it works:** Mini-LED displays work the same way that OLED displays work, but the individual LED size is much smaller at approximately 50-60 micrometers.
* **Uses:** Mini-LED displays are used for LCD backlighting in smartphones, public information displays, signage, electronics, vehicle displays, and more. Mini-LEDs are also the tech behind “Liquid Retina XDR” screens.
* **Positives:** Mini-LED displays offer ultra high luminance, superior HDR fineness, long lifetimes, thin panels, and are readable in sunlight. They are also less expensive than micro-LED displays.
* **Negatives:** Mini-LED displays, when used as LCD backlighting, are limited by the properties of LCD technology. Mini-LED displays for mobile devices are more expensive than OLED displays.

## Inorganic micro-LEDs (μLEDs)

Micro-LEDs (μLEDs) are also emissive, next-generation displays.

* **How it works:** Micro-LED displays work the same way that OLED displays work, but the individual LED size is extremely small at 15 micrometers.
* **Uses:** Micro-LED displays can be used in smartphones, AR/VR headsets, wearables, public information displays, wall-sized TVs, vehicle displays, and more.
* **Positives:** Micro-LED displaysoffer superior performances across virtually all common display features, such as brightness, reaction speeds, power consumption, durability, color gamut, stability, viewing angles, HDR, contrast, refresh rates, transparency, seamless connectivity, and more. Micro-LED displays are readable in sunlight and have sensor integration capability.
* **Negatives:** Micro-LED displays are expensive to manufacture and are not yet ready for mass production.

## Key takeaways

The two main technologies used in mobile displays are Liquid Crystal Display (LCD) and Organic Light Emitting Diodes (OLED). Each technology has its own benefits and drawbacks when used in mobile device displays, among other consumer goods.

* Common LCDs include:
  + In-Plane Switching (IPS) displays
  + Twisted Nematic (TN) displays
  + VA-Vertical Alignment displays
* Common and upcoming OLED displays include:
  + Active Matrix Organic Light Emitting Diode (AMOLED) displays
  + Inorganic mini-LEDs (mLEDs) displays
  + Inorganic micro-LEDs (μLEDs) displays

# Module 2 Glossary

### ****New terms and their definitions: Course 1 Module 2****

**Address bus:** Connects the CPU to the MCC and sends over the location of the data, but not the data itself

**ATA:** The most common interface that hard drives use to connect to our system

**ATX (Advanced Technology eXtended):** The most common form factor for motherboards

**Backward compatible:** It means older hardware works with newer hardware

**Bios (Basic Input Output Services):** The BIOS is software that helps initialize the hardware in our computer and gets our operating system up and running

**BYOD (Bring Your Own Device):** Refers to the practice of allowing people to use their own personal devices for work

**Cache:** The assigned stored location for recently or frequently accessed data; on a mobile app it is where anything that was changed or created with that app is stored

**Charge cycle:** One full charge and discharge of a battery

**Chipset:** Itdecides how components talk to each other on our machine

**Clock cycle:** When you send a voltage to the clock wire

**Clock speed:** The maximum number of clock cycles that it can handle in a set in a certain time period

**Clock wire:** When you send or receive data, it sends a voltage to that clock wire to let the CPU know it can start doing calculations

**CPU:** Central processing unit

**CPU sockets:** A CPU socket is a series of pins that connect a CPU’s processor to the PC’s motherboard

**Data sizes:** Metrics that refer to data sizes including bit, byte, kilobyte, kibibyte, and megabyte

**DDR SDRAM (Double Data Rate SDRAM):** A type of RAM that is faster, takes up less power, and has a larger capacity than earlier SDRAM versions

**Desktop:** The main screen where we can navigate our files, folders, and applications

**DIMM:** Dual Inline Memory Module

**Display port:** Port which also outputs audio and video

**DRAM:** Dynamic Random Access Memory

**Drivers:** The drivers contain the instructions our CPU needs to understand external devices like keyboards, webcams, printers

**DVI:** DVI cables generally just output video

**Electrostatic discharge:** Electrostatic discharge is a sudden and momentary flow of electric current between two electrically charged objects caused by contact, an electrical short or dielectric breakdown

**External Data Bus (EDB):** It's a row of wires that interconnect the parts of our computer

**Factory reset:** Resetting a device to the settings it came with from the factory

**Form factor:** A mathematical way to compensate for irregularities in the shape of an object by using a ratio between its volume and height

**Hard drive:** It is a long term memory component that holds all of our data, which can include music, pictures, applications

**Hardware:** External or internal devices and equipment that help you perform major functions

**HDD (Hard disk drive):** Hard disk drives, or HDDs, use a spinning platter and a mechanical arm to read and write information

**HDMI:** A type of cable that outputs both video and audio

**Heatsink:** It is used to dissipate heat from our CPU

**Instruction set:** A list of instructions that our CPU is able to run

**ITX (Information Technology eXtended):** A form factor for motherboards that is much smaller than ATX boards

**Land Grid Array (LGA):** It is a type of CPU socket that stick out of the motherboard

**Lightning adaptor:** One of the standard power, data and display connector types used in mobile devices

**Mb/s:** megabit per second, which is a unit of data transfer rate

**Memory controller chip (MCC):** A bridge between the CPU and the RAM

**Micro display port:** One of the standard power, data and display connector types used in mobile devices

**Micro HDMI:** One of the standard power, data and display connector types used in mobile devices

**Micro USB:** One of the standard power, data and display connector types used in mobile devices

**Mini HDMI:** One of the standard power, data and display connector types used in mobile devices

**Mini USB:** One of the standard power, data and display connector types used in mobile devices

**Motherboard:** The body or circulatory system of the computer that connects all the pieces together

**Northbridge:** interconnects stuff like RAM and video cards

**NVMe (NVM Express):** interface standard which allows greater throughput of data and increased efficiency

**Overclocking:** it increases the rate of your CPU clock cycles in order to perform more tasks

**PCI Express:** Peripheral Component Interconnect Express

**Peripherals:** the external devices which we connect to our computer that add functionality, like: a mouse, a keyboard, and a monitor

**Pin Grid Array (PGA):** CPU socket where the pins are located on the processor itself

**Ports:** Connection points that we can connect devices to that extend the functionality of our computer

**POST (Power On Self Test):** It figures out what hardware is on the computer

**Power supply:** Converts electricity from our wall outlet onto a format that our computer can use

**Programs:** Basic instructions that tell the computer what to do

**RAM:** Random Access Memory

**Registers:** An accessible location for storing the data that our CPU works with

**Reimaging:** The process of reimaging involves wiping and reinstalling an operating system using a disk image which is a copy of an operating system

**Return merchandise authorization (RMA):** The process of receiving returned merchandise and authorizing a refund

**ROM chip (Read Only Memory):** A read-only memory chip where the BIOS is stored

**RPM:** Revolutions per minute

**Safe operating temperature:** The temperature range in which rechargeable batteries must be kept in order to avoid demanage

**SATA:** The most popular serial ATA drive, which uses one cable for data transfers

**SDRAM:** It stands for Synchronous DRAM, this type of RAM is synchronized to our systems' clock speed allowing quicker processing of data

**SOC (System On a Chip):** Packs the CPU, Ram, and sometimes even the storage onto a single chip

**Southbridge:** It maintains our IO or input/output controllers, like hard drives and USB devices that input and output data

**SSD:** Solid State Drive

**Standoffs:** Used to raise and attach your motherboard to the case

**Thermal paste:** A substance used to better connect our CPU and heat sink, so the heat transfers from to the other better

**Type-C connector:** A type of USB connector meant to replace many peripheral connections

**UEFI:** Unified Extensible Firmware Interface

**USB (Universal Serial Bus):** A connection standard for connecting peripherals to devices such as computers

**USB-C adapter:** One of the standard power, data and display connector types used in mobile devices

A lot of us hear the term operating system and think of the interfaces of our desktops and phones, like the menus, buttons and backgrounds. Technically these are part of the operating system but it's a little more complex than that. An operating system is the whole package that manages our computers resources and lets us interact with it. There are two main parts to an operating system, the kernel and the user space. The kernel is the main core of an operating system. It talks directly to our hardware and manages our system's resources. As users we don't interact with the kernel directly. Instead, we interact with the second part of an operating system, the user space. The user space is basically made up of everything outside the kernel. These are things that we interact with directly like system programs, user interfaces, etcetera. When we say operating system, we're talking about both the kernel and the user space. There are hundreds of operating systems out there, but we'll focus on the major ones used in IT, Windows, Mac and Linux. Windows OS is developed by Microsoft and used widely in the business and consumer space. Most pcs you buy come with Windows as the default operating system. PC means personal computer, which technically means a computer that one person uses. But in today's world, PC is more commonly referred to as a Windows computer. So we'll just referred to a PC as a Windows computer from here. Mac OS by Apple is mainly used in the consumer space. If you buy an Apple computer, it'll come with Mac OS preloaded. The last operating system will dive into as the Linux operating system. Linux is an open source operating system which means its software is free to share, modify and distribute. Linux is used heavily in business infrastructure and in the consumer space. Linux itself is actually a kernel developed by Linus Torvalds. Because of the way it evolved, we call the kernel the Linux operating system. Today, Linux has become a huge community effort with developers all over the world contributing to its success. Because Linux is open source lots of different organizations package their own version of it. Operating systems like Windows or Macintosh, on the other hand, are solely developed by the respective companies. We call these different Linux OSs distributions. Some common Linux distributions are ubuntu, debian and red hat. Another operating system that has started to gain popularity is chrome OS but we won't go into detail on that one. Mobile phone usage around the world is more prevalent than desktop computers. One cool thing to call out is that chrome OS and android OS both run the Linux kernel underneath the hood. So there's a chance you've already worked with Linux and didn't even know it. There are lots of operating systems out there and they all share common characteristics. If you're able to understand the basic building blocks of one OS, you can apply that to any operating system and understand how it works. In IT support It's super common to work with many different operating systems, desktop OSs, to smartphone OSs and more. Before we get there let's do a rundown of the basics. The kernel does file storage and file management. You can compare it to a physical office file where we store data in paper form. A computer file is just data that we store and a file can be anything, a word document, a picture of song, literally anything. A file system is how we manage these files, just like in an office we use a system to store our files. We don't just put all our files in one cabinet that would be seriously messy. Instead we organize those files in folders or directories to make them easier to find. There are lots of different types of file systems which will cover more in depth in future videos. Another important function of the kernel is process management. We have many programs that we want to run on our system. To run them we manage the order they run in, how many resources they take up, how long they run etcetera. Our kernel helps us do this with its process management capabilities. For example, you've probably used your computer to do several tasks at once. Maybe you writing a text document while listening to music or playing a video. The process scheduler is part of the kernel that makes this multitasking possible. It switches the execution of each different process on the CPU faster than you can blink and it gives you the illusion that things are happening simultaneously. Next up is memory management. Our kernel optimizes memory usage and make sure our applications have enough memory to run. The last important function that a kernel performs is input, output or IO management. This is how our kernel talks to external devices, like disks, keyboards, networks, connections, audio devices and more. IO management is anything that can give us input or that we can use for output of data. If you've ever saved a file to disk, click the mouse button or used a microphone when video chatting with a friend, you've got the kernel's ability to manage IO to think. And that's the basic rundown of the main functions of the kernel file management, process management, memory management and IO management. Finally, we'll talk about the other component of an operating system, the user space. The user space is everything outside the kernel. These are the things that we interact with directly, like programs such as text editors, music players, system settings, user interfaces, etcetera. By the end of this module, you'll hopefully have a solid understanding of all these functions of an operating system. Let's start by taking a deeper dive into the kernel's file management

# Supplemental Reading for Chrome OS

## Another operating system that has started to gain popularity is Chrome OS, which you can read about in more detail [here](https://en.wikipedia.org/wiki/Chrome_OS).

**Heads up:** A big part of being successful in an IT role is the ability to be a self-led learner -- someone who finds key resources and reads up on the latest tech trends and solutions. The supplemental readings we’ve provided have been designed to show you just some of the support materials available to you online; they’re not meant to be considered a comprehensive list.

# Supplemental Reading for ReFS File System

## Microsoft is currently developing another filesystem called ReFS, it isn’t quite ready for consumer use, but if you’re interested in learning more you can read more about [here](https://en.wikipedia.org/wiki/ReFS).

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# Boot Methods

While the most common way to boot a computer is to simply push the power button and allow the normal process to run, there are many other boot options. This reading covers the various methods you can use to boot a computer.

# Internal method

You can create partitions on the computer’s drive so that only one part of the drive runs the boot process. A common reason to partition your drive is to have two separate operating systems on your computer, such as both Windows and Linux. When you have two operating systems on your drive, you must choose which one will run the boot process. Having two possible systems to boot into is called dual booting.

While having two operating systems can be helpful for various reasons, it is especially helpful when one system is failing or unable to boot. If this happens, you can still boot the computer using the other system and troubleshoot from there.

# External tools

External tools can be used to boot the computer. You can load the needed resources on an external tool to boot a system before any problems happen.

### External bootable devices include:

* **USB drive**: You use a USB drive loaded with resources needed to boot the computer. This drive is inserted into a USB port and chosen at startup.
* **Optical Media:** You use a disk loaded with booting resources. This disk can be a DVD, CD, or Blu-ray disk and is loaded through the computer's optical drive.
* **Solid State Boot Drive:** You use a solid state drive to boot. Solid state drives do not use spinning discs or moving parts. This solid state drive can be installed in your computer or can be a smaller device such as a flash drive.
* **External hot-swappable drive**: You boot from an external hard drive that can be moved between computers without turning it off.
* **Network boot:** You boot the operating system directly from a local area network (LAN) without using a storage device. Your computer must be connected to a LAN for this option.
* **Internet-based boot:** You boot the computer from an internet source, as long as it is a secure source. Your computer must be connected to the internet for this option.

## Window OS or Linux OS

In order to boot either Windows OS or Linux OS with an external tool, you’ll need to enter BIOS at startup by pressing F2/F12/Del keys. From there you can change the boot order so that the first option is the external tool you want to use.

## macOS

If booting macOS, press and hold the Option key at startup. This will open up the Startup Manager, which will scan your computer and identify bootable devices. Then you can choose the bootable device you want to use.

# Key Takeaways

There are multiple ways to boot a computer.

* A computer can be partitioned into different operating systems and you can select which OS to use when booting.
* You can boot from an external tool. External tools include USB drives, optical media, solid state boot drives, external hot-swappable drives, network booting, and internet-based booting.
* Choosing a boot method on startup varies depending on which operating system you use.

# Boot Methods Best Practices

The most common way to boot a computer is to simply push the power button and allow the normal startup process to run. But what happens if the normal startup process becomes corrupted and the computer will not boot? Or maybe you would like to run a computer on a different operating system than the one specified by your normal boot process. For situations like these, you have several options for booting your operating system. This reading covers the various methods you can use to boot a computer.

## The boot process

When your computer is powered on, the BIOS/UEFI (BIOS) runs a series of diagnostic tests to make sure that the computer is in proper working order. The BIOS is a low-level software that initializes a computer's hardware to make sure everything is good to go. A boot device is selected based on a boot order that is configured in the BIOS. Devices that are attached to your system, like hard drives, USB drives, and CD drives are checked in this configured boot order and the computer searches these devices for a small program called a “bootloader.” Once your computer finds a bootloader on a device, it executes this program. The bootloader program then initiates a process that loads the specific operating system setup that you want to use.

You can choose a computer’s boot method by telling the BIOS on which device to search for the bootloader. If you want to run an OS setup that’s stored on a USB drive, you can configure the boot order in your computer’s BIOS to search for a bootloader on a USB drive first.

## Configuring boot options

Boot order is the order in which a computer chooses which boot files to use to startup. The boot order determines your boot method. To set the boot order for a computer, you need to enter the BIOS and configure the boot options.

To enter your computer’s BIOS on a Windows or Linux computer, power on the system and look for an on-screen message that says which function key you should press to enter setup. The function keys used for entering the BIOS vary between computer manufacturers and the version of BIOS. Some of the more common function key messages are "Press DEL to enter SETUP," "F2=SETUP," or "Press F12 to enter SETUP." If booting macOS, press and hold the Option key at startup. This will open up the Startup Manager, which will scan your computer and identify bootable devices. Then you can choose the bootable device you want to use.

The BIOS screen will vary depending on your computer manufacturer and BIOS version, but all BIOS programs will feature a Boot Options menu. The Boot Options menu is where you can set your preferred boot method.

The boot options menu lists all the devices attached to your system where it may find a bootloader program. These include devices like internal hard drives, USB drives, CD drives, as well as other storage options, like network storage or cloud storage. In the BIOS boot options menu you can set the specific order you want to search these devices for the bootloader that will load your OS setup. The BIOS will run the first bootloader that it finds.

# Boot method options

You may find the following boot methods listed in your BIOS boot options:

## External options

* **USB drive:** You use a USB drive loaded with resources needed to boot the computer. This drive is inserted into a USB port and chosen at startup.
* **Optical Media:** You use an optical media disk loaded with booting resources. This disk can be a DVD, CD, or Blu-ray disk and is loaded through the computer's optical drive.

The USB drive and optical media methods are useful for recovering a computer with a corrupted OS. They can also be used to start up a computer with a different OS. For example, you might boot a Windows computer in a Linux environment by using a USB with Linux OS. You will need to prepare these media with a bootable OS in order to use them as a boot method (see resources linked below).

* **Solid State Boot Drive:** You can use a solid state drive to boot your computer. Solid state drives do not use spinning discs or moving parts. This solid state drive can be installed in the computer or can be a smaller device such as a flash drive.
* **External hot-swappable drive:** You may boot from an external hard drive that can be moved between computers without turning it off.
* **Network boot:** You can boot an operating system directly from a local area network (LAN) without using a storage device. Your computer must be connected to a LAN for this option. The network boot is used when the computer does not have an OS installed, among other things. To boot from a network, you will need to set up the Preboot Execution Environment (PXE) capability on the BIOS and have the network environment prepared for this type of request (see resources linked below).
* **Internet-based boot:** You boot the computer from an internet source, as long as it is a secure source. If you are in charge of a network and your server is down for any reason, you can use this boot method to remotely power on the server and restart network operations. Internet-based boot can be achieved in one of two ways:

1. Remote access. Remote Access Controller (IPMI or similar) has to be enabled on the BIOS and the computer needs to have a Remote access control device, such as IDRAC (see resources linked below).
2. Wake on LAN (WoL). This process requires the WoL option enabled on the BIOS  (see resources linked below). The WoL instruction should come from a device in the network or use a WoL gateway, and the network card should have WoL capability.

## Internal options

**Disk partitions:** You can create partitions on your computer’s drive so that only one part of the drive runs the boot process. A common reason to partition your drive is to have two separate operating systems on your computer. For example, you could have Windows on one partition of your drive and Linux on the other. When you have two operating systems on your drive, you must choose which one will run the boot process. Having two possible systems to boot into is called dual booting.

While having two operating systems can be helpful for various reasons, it is especially helpful when one system is failing or unable to boot. If this happens, you can still boot the computer using the other system and troubleshoot from there.

# Key Takeaways

There are multiple ways to boot a computer.

* A computer can be partitioned into different operating systems and you can select which OS to use when booting.
* You can boot from an external tool. External tools include USB drives, optical media, solid state boot drives, external hot-swappable drives, network booting, and internet-based booting.
* Choosing a boot method on startup varies depending on which operating system you use.

**Resource Links:**

* [How to make a bootable CD/DVD/USB to install windows](https://www.makeuseof.com/tag/make-bootable-usb-cd-dvd-install-windows-using-iso-file/)
* [How to build your own bootable Linux Live CD](https://www.makeuseof.com/tag/build-bootable-linux-live-cd/)
* [Create a bootable installer for macOS](https://support.apple.com/en-us/HT201372)
* [What is preboot execution environment (PXE)?](https://www.techtarget.com/searchnetworking/definition/Preboot-Execution-Environment)
* [How to set up PXE boot for UEFI hardware](https://www.redhat.com/sysadmin/pxe-boot-uefi)
* [Installing and configuring the RAC software](https://cs.uwaterloo.ca/~brecht/servers/docs/PowerEdge-2600/en/ERA/rac34c6.htm)
* [How to enable and use Wake on LAN (WoL) on Windows 10](https://www.windowscentral.com/how-enable-and-use-wake-lan-wol-windows-10)

# Supplemental Reading for Choosing an OS

## To find out more about which operating system is best for you and your organization, check out the link [here](http://www.makeuseof.com/tag/operating-system-choose-next-pc/).

# Windows 10 & 11 Feature Matrix

# Windows 10 and 11 Feature Matrix

Windows 10 and 11 are two operating systems IT Professionals work with. This reading describes the differences between them and highlights features that are important to IT. Windows 11 was released more recently and has higher system requirements than Windows 10. Professionals will still work with Windows 10 often, as many companies still use it.

The primary difference between the two operating systems is aesthetic. Windows 11’s design is more minimal, corners have been rounded, and colors are pastel. Another difference is in Windows 10, the start menu and taskbar are in the bottom left corner. In Windows 11, the start menu and taskbar are centered along the bottom.

## Features

* **Apps**: In Windows 10, apps can only be added from the Windows Store or installed manually. In Windows 11, Android apps can also be added natively.
* **Virtual desktop**: In Windows 10 it is possible to use Virtual Desktops, but it is unintuitive to set up. In Windows 11, the support for virtual desktops is more user-friendly making it easy to set up different desktops for work and personal use.
* **Teams**: In Windows 10, Teams is included in the operating system, but defaults to Skype for video conferencing. In Windows 11, Teams is featured prominently and incorporated into the taskbar and no longer defaults to Skype for video conferencing.
* **Widgets**: In Windows 10, there are desktop gadgets similar to widgets that can be added to the start menu. In Windows 11, widgets can be accessed from the taskbar directly.
* **Touch and pen**: Windows 11 has added more features for touch and pen use on supported devices, including vibration features for pens.
* **Random Access Memory (RAM) Support Limitations:** In Windows 10, the lowest RAM (Random Access Memory) requirements are 1GB for 32-bit versions and 2GB for 64-bit versions. In Windows 11, the base requirement is 4GB of RAM.

## Services and settings

* **Domain access:** Joining a domain, a centrally administered group of computers, functions the same in Windows 10 and 11. A user can quickly join a domain from the “System Properties” window.
* **Workgroup access:** Joining a workgroup, a group of computers on the same Local Area Network (LAN) with shared access and responsibilities, also functions the same in Windows 10 and 11. A user can quickly join a workgroup from the “System Properties” window.
* **Group Policy Settings (Gpedit.msc)**: Editing Group Policies (with Gpedit.msc) locally or using Active Directory is largely unchanged. Note that Gpedit.msc is not available in Home licenses of Windows.
* **Remote Desktop Protocol:** The Remote Desktop tool, used for connecting to the desktop of a different computer over a network connection, is largely unchanged between Windows versions. Note that to use a Remote Desktop Server, the server machine needs to be running at least the Pro edition of Windows.
* **Bitlocker:** Bitlocker, a drive encryption tool included with Windows, is largely unchanged. Note that Bitlocker is only available for Pro and Enterprise licenses of Windows.

# Key takeaways

Operating systems like Windows 10 and Windows 11 are constantly changing and evolving. As an IT professional, you may be required to maintain two or more versions of an operating system at the same time. IT professionals need to stay on top of changes and new development to ensure they can support their users.

* Windows 10 and Windows 11 primary difference is aesthetic.
* Windows 11 updated and added new features to make it simpler to access or use apps services, and settings.

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Go to next item

### Completed

# Supplemental Reading for Ubuntu

## To learn more about Ubuntu, click [here](https://www.ubuntu.com/).

## To help you load your installation image onto a USB drive, you may want to look at the tool, [etcher.io](https://etcher.io/).

## For a list of all Ubuntu's updates, check out the link [here](https://www.ubuntuupdates.org/).

## For more information on why Ubuntu will be switching its default user interface over to GNOME, click [here](https://arstechnica.com/information-technology/2017/04/ubuntu-unity-is-dead-desktop-will-switch-back-to-gnome-next-year/).

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there are two protocols that you need to know. The Transmission Control Protocol and the Internet Protocol, or TCPIP for short, which had become the predominant protocols of the Internet. The Internet Protocol, or IP, is responsible for delivering our packets to the right computers. Remember those addresses that computers use to find something on a network? They're called IP addresses or Internet Protocol Addresses. The Internet Protocol helps us route information. The Transmission Control Protocol, or TCP, is a protocol that handles reliable delivery of information from one network to another. This protocol was an important part of the creation of the internet since it led us share information with other computers. For now, you've got a high level understanding of how the Internet works with TCP, IP.

# Supplemental Reading for Internet of Things

## To learn more about the "Internet of Things," click [here](http://www.wired.co.uk/article/internet-of-things-what-is-explained-iot).

# Common Scripting Solutions

In this reading, you will learn about a variety of scripting languages, their uses, and their risks. As an IT Support professional, you may need to automate routine tasks. For example, you might want to automate a backup of company data that runs every night. You might also need to automate high volume tasks, like changing security access settings on thousands of files. Scripting is a common tool used for automation. This tool can help IT Support staff save time and resources in a busy enterprise work environment.

## Scripting languages

There are many scripting languages available to use for a variety of tasks in different operating system environments. Most scripts are written in command line environments.

**Scripting languages for Windows environments:**

* **PowerShell (.ps1)** - Windows PowerShell is among the most common command line scripting tools used in Windows environments. PowerShell is built on the .NET platform and employs many of the same elements that programming languages do. PowerShell scripts are used for building, testing, and deploying solutions, in addition to automating system management.
* **Batch scripts (.bat)** - Batch scripts, also called batch files, have been around since the early days of MS DOS and OS/2. Batch files can execute simple tasks, like calling a set of programs to run when a computer boots up. This type of script could be useful in setting up employees’ workspaces when they power on their computers.
* **Visual Basic Script (.vbs)** - Visual Basic Script is an older scripting language. It has reached its end of life for Microsoft support and has been replaced by PowerShell scripts. However, as an IT professional, you may encounter .vbs scripts on some legacy systems.

**Scripting languages for Linux and Unix environments:**

* **Shell script (.sh)** - Shell scripting languages, like Bash, are used in Unix or Linux environments. The scripts are often used to manipulate files, including changing file security settings, creating, copying, editing, renaming and deleting files. They can also be used to execute programs, print, navigate the operating system, and much more. The scripts run in command-line interpreter (CLI) shells, such as the Bourne shell, Bourne Again SHell (Bash), C shell, and Korn (KSH) shell.

**Programming languages that can be used for scripting:**

* **JavaScript (.js)** - JavaScript the most used programming language in the world. It is a lightweight language that is used for scripting in web development, mobile and web apps, games, and more. It can also be used to develop software and automate web server functions.
* **Python (.py)** - Python is a user-friendly programming language that can perform advanced tasks and import modules from libraries specially designed for automation scripts.

## Scripting uses - finding the right tool for the job

* **Basic automation:** Python is an excellent script for automation. It’s one of the most commonly used, with many available automation libraries.
* **Restarting machines:** Many power users use PowerShell (.ps1) scripts to restart machines (Windows). For Linux machines, they can use .sh (shell) scripts.
* **Mapping network drives:** In the past, mapping network drives was accomplished with .bat or .vbs scripts. However, PowerShell scripts are most commonly used to map drives in Windows environments today. For Linux users, shell scripts can be used for this purpose.
* **Installing applications:** Batch files and shell scripts are often used for automated software installation.
* **Automated Backups:** Windows PowerShell and Linux/Unix shell scripts can automate backups.
* **Gathering of information and data:** Python is a popular choice for gathering data. Python has many available libraries to help with this task.
* **Initiating Updates:** Powershell and shell scripts can be used for initiating updates in Windows and Linux, respectively.

## Security risks of using scripts

IT Support professionals need to be very careful when using scripts, especially with prewritten scripts copied or downloaded from the internet. Some of the security risks of using scripts could include:

* **Unintentionally introducing malware:** As an IT Support professional  that is new to scripting, you may try to search the internet for assistance in writing scripts. In your search, you might find a script online for a task that you want to automate. It’s tempting to save time and effort by downloading the script and deploying it in your network environment. However, this is dangerous because scripts authored by an unverified source could potentially contain malware. Malicious scripts could have the power to delete files, corrupt data and software, steal confidential information, disable systems, and even bring down an entire network. Malicious scripts can create security weaknesses for the purpose of creating entry points for cybercriminals to penetrate networks. Scripts could also introduce ransomware attacks, which often works by encrypting file systems and then selling the decryption keys for ransom.
* **Inadvertently changing system settings:** Scripts are powerful tools for changing system settings. Using the wrong script can cause the user to inadvertently configure harmful settings. For example, one minor typo in a shell script that sets file permission security in Linux could make confidential files accessible to the world.
* **Browser or system crashes due to mishandling of resources:** Mishandling resources can lead to program crashes in the browser or cause the entire computer to crash. For example, directing too much memory to the browser can overload the computer system.

## Key takeaways

A basic knowledge of scripting is an important tool for IT professionals. You may need to improve workflow efficiency by automating basic functions with a scripting language. Some common scripting languages include:

* Windows environments: batch scripts (.bat), Powershell (.ps1), Visual Basic Script (.vbs)
* Linux/Unix environments: shell scripts (.sh)
* Most OS environments: javascript (.js), Python (.py)

Scripts have multiple helpful uses, such as:

* Basic Automation
* Restarting Machines
* Remapping Network Drives
* Installing Applications
* Automating Backups
* Gathering of information/ data
* Initiating Updates

There are risks in using scripts, including:

* Unintentionally introducing malware
* Inadvertently changing system settings
* Browser or system crashes due to mishandling of resources

## Resources for more information

For more information about scripting languages, please visit:

* [14 Top Scripting Languages You Can Learn](https://www.indeed.com/career-advice/career-development/top-scripting-languages)

# Supplemental Reading for Software Versioning

## For more information about software versioning, click [here](https://en.wikipedia.org/wiki/Software_versioning).

**Heads up:** A big part of being successful in an IT role is the ability to be a self-led learner -- someone who finds key resources and reads up on the latest tech trends and solutions. The supplemental readings we’ve provided have been designed to show you just some of the support materials available to you online; they’re not meant to be considered a comprehensive list. Feel free to add to the conversation by posting other useful resources for learners to [this forum thread](https://www.coursera.org/learn/technical-support-fundamentals/discussions/weeks/5/threads/3Ud6so60Ee2-ahKXxFFB4w).

Phelan

In high school, I wasn't really sure what I wanted to do yet, but when I joined the US Navy, one of the options for job was an information systems technician. Information technology and the Navy can be pretty exciting. You get to be very resourceful if you're out on a deployment in the desert. Perhaps, you have to use the tools that you have at hand to get the job done. So I remember being in a server room in a tent with the sand blowing in and we'd occasionally have to take out the servers and then reverse the vacuum and blow the dust and sand out of the server to make sure that they kept working. So obviously I can't go into too much specifics and details but in the Navy, one of my favorite technology moments was when the command came down that we needed to do this thing and I had to write a program to actually do it. And I've never written a program before. And I was like, okay, I mean, I'll try. And so I did the research, I did the learning, I figured it out, I wrote the program it ran, and it did the thing that I wanted it to do. And I was so satisfied. That was an amazing experience. I made this thing from nothing and it actually performed the action that I wanted it to, which was pretty cool.

**1.**

Question 1

You're doing desktop support, and the company policy is that you can assess and work on company equipment. A user walks in:

Tech: Hi there, how can I help you?

User: My computer is really slow, and I can barely use it. Can you help me figure out what's wrong?

Tech: It looks like this is a personal computer. Are you talking about your work computer?

User: Uh, no, this is the one that I need help with. I figured you’re good with computers, and you could help. My daughter needs it for a school assignment that’s due tomorrow, but it's too slow for her to get anything done.

What would you do?

1 / 1 point

Explain why you can’t assess or work on the issue, per the company policy. But give them some tips on what common issues could be slowing down his computer, and how they might go about fixing them.

Politely tell them that it's against the company policy, and you can’t help them.

Tell them you can’t help them and suggest they go to a local tech store for help.

Forget about the policy and help them!

Correct

This response sets expectations and then gives some helpful suggestions. Here, you're showing the user that you care about their issue, even if you can’t help them.

**2.**

Question 2

Situation: You work for a company that requires a visual verification when resetting passwords. The verification doesn't have to be done through your company account. However, you must see the person "live" (not through a picture), so that you can match them to their photo before resetting their account.

Scenario: Phone call

Anastasia: Thanks for calling. My name is Anastasia. How can I help you?

Ling: Hi, Anastasia. This is Ling. I need to reset my account password.

Anastasia: Hi, Ling. I’d be happy to help you with that, but first I need to verify your identity. Can you do a video call with me through Skype?

Ling: I can’t get into my work account. That's why I’m calling.

What would you do in this situation? Check all that apply.

1 / 1 point

Suggest the user make a video call with you through their phone.

Correct

You're all about thinking outside the box to figure out what else the user can do to set up that call. You could potentially suggest they go to an internet cafe or local library with wifi, too.

Offer to set up a video call through Skype, Facetime, or Hangouts.

Correct

You're all about thinking outside the box to figure out what else the user can do to set up that call. You could potentially suggest they go to an internet cafe or local library with wifi, too.

Kindly tell them they will have to wait until the next day to meet with someone live.

Ask the user if they have a personal account to use for Skype.

Correct

You're all about thinking outside the box to figure out what else the user can do to set up that call. You could potentially suggest they go to an internet cafe or local library with wifi, too.

**3.**

Question 3

A user needs their password reset. The IT Support Specialist is pulling up the necessary information while the user starts asking a bunch of questions: Why does the password have to have a capital and a symbol? Why can’t I write it down? Why does it change so often? Isn’t this a waste of time?

How would you respond to the user?

1 / 1 point

Stop what you're doing and explain to the user that passwords should have numbers and symbols for security purposes, and this is more important than productivity.

Kindly ask the user to stop asking questions, since you're trying to solve their problem.

Ignore the user and keep working on resetting the password, so you don’t lose your place.

Let the user know that you're working on their issue and will be sure to answer all of their questions once you're done.

Correct

You're acknowledging the user’s questions, but setting a clear agenda of what you want to accomplish. This allows them to understand what they should anticipate and helps you keep control of the conversation.

**4.**

Question 4

You receive the following ticket from a user:

My machine is saying I have to reboot, but this is silly. I have a ton of processes running, I don’t want to have to reload everything. This is a waste of time. I’ve included a screenshot of the message. Please advise.

-Aditya

Choose the best response

1 / 1 point

When installing programs, you need to reboot your machine.

Thanks for contacting support. I see that you’re concerned about rebooting your machine.

Based on the screenshot you provided, it looks like you received the reboot prompt because a new program was installed. In order for the program to start working, you’ll need to reboot your machine. Is it possible to save your commands beforehand, so that you can get to them again?

Please let me know if there is anything further that I can help you with.

Regards,

Amelia

I see that you’re concerned about rebooting your machine.

I looked into the screenshot you provided, and it appears the reboot is due to a new program you installed. In order for the program to run, a reboot has to be done.

It was a pleasure working with you.

Regards,

Amelia

Hi Aditya,

Thanks for contacting support.

Please restart the computer, there are no other options in this case.

Regards,

Amelia

Correct

You’re letting the user know that you’ve looked at the information they provided, explained why the reboot is needed, suggested a possible workaround to their concern, and left the door open in case there are more questions.

**5.**

Question 5

Situation: You are working as an IT support specialist and receive the following request through chat:

Name: Yuki Saitō

Customer number: 674213

Issue: I need more bandwidth

Chat log:

Mia: Hi Yuki, how are you today? I see that you are concerned about needing more bandwidth. I’d be happy to help.

Yuki: Thanks, I really need it!

Mia: Can I ask what you mean by “needing more bandwidth?”

Yuki: I mean that everytime I try to use my computer after lunch, it’s incredibly slow. I think I’m using all the bandwidth in the morning.

What do you do next?

1 / 1 point

Suggest the user reboot his machine when this happens.

Ask more questions about what programs they’re using.

Give the user what they want. Increase their bandwidth and move on to the next user.

Tell the user that you have no control over their bandwidth and politely close the chat.

Correct

This response shows that you were paying attention to the little clues that people leave. The user mentions that this always happens after lunch. Pinpointing the programs used will help you better diagnose the issue faster.

# Crafting Your Resume

Your resume is usually the first impression that companies have of you, so you want to make sure that you include relevant information in it. If you’d like to build your resume from scratch, make sure to scroll down to the bottom of this page to download PDFs of resume templates to help you get started. Keep in mind, these are just sample resumes, and you should customize them as you see fit!

**What you want to include**

* Who you are: name, address, phone number, email
* Education history: where and what you’ve studied (or are studying)
* Employment history: where and in what roles you’ve worked (or are working)
* Relevant Skills

When listing out your education, include colleges attended, certificates obtained, and any additional education programs you’ve completed. You can include a GPA or grade average for degrees if you wish. It is not necessary to include dates for your education section.

If you are a new graduate, or are still studying, you’ll want to include a few additional details, like interesting projects that you did during your studying or highlight an elective subject that you took.  After a few years of professional experience, though, you may simply include the degree, year and location.

A “Functional” or “Skills based” resume format works well for new graduates or candidates with limited work experience. The focus of this format is more around your skillset, rather than your work experience. You can include a brief summary of qualifications, followed by a list of skills with examples for each. This format works well for candidates with less employment history, but lots of applicable skills.

For your employment history, you’ll want to highlight the skills that are most relevant for the position that you are aiming for. Use a chronological or reverse-chronological format for your employment history. List the month and year for each role accurately. List out achievements, not just tasks performed, and make them quantifiable. Use the sentence format of Action Verb + Specific Task + Quantifiable Point”. For example: “Automated imaging process for new computers, reducing 90% of manual work for the IT team.” Include responsibilities of your role, but don’t fill your resume with lots of bullets about every small task. Summarize and tailor your bullet points around the job description you’re applying to. For example, instead of saying “Created new user accounts, deleted old accounts, set passwords….”, say “Administered and maintained all user accounts”.

Similarly for relevant skills.  You want to include the general topics that you are knowledgeable about, as in customer support, networking, system administration, programming, etc. You may list the operating systems that you’ve worked with and the programming languages that you are skilled in, but don’t try to list every networking protocol you’ve heard about or every IT tool that you’ve ever used.  The noise distracts from the relevant information.

Regardless of the format you decide to use (chronological, functional, etc.), make sure you keep the format and structure consistent throughout. For example, if you use full sentences for your bullets, be sure to use that format for all of them and include proper punctuation and grammar. Check your font sizes and styles to ensure those are consistent as well.

**Tailoring the resume**

Before sending a resume to a certain job position, it’s a good practice to check that the contents of your resume match what’s in the job description. You should be tailoring your resume to each job you’re applying to. Sending generic resumes to as many roles as possible, is not a good strategy. A targeted approach is always better.

If you are applying for an IT support role, you may want to highlight your customer support experience, even if it only comes from a volunteer organization at your university.  Whereas, if you are applying for a programming job, you’ll want to highlight your software development experience, regardless of whether it was acquired in university or on the job.

**Your online presence**

Many companies nowadays contact candidates through online sites like LinkedIn, so it’s important to keep your online profile complete and up to date.  Start by writing a summary that describes both your current role (if applicable) and your career aspirations. Include a professional photo and up to date contact info (although recruiters may also contact you directly via LinkedIn).

LinkedIn profiles are much more in depth than resumes. You can include specific accomplishments from as many roles as you like, but use the same format as your resume (Action Verb + specific task + quantifiable point).

Adding in personal projects can also be helpful, especially if you have something tangible to show from it. For example, if you’ve created an application, a website, or similar type of product as part of a hobby or school project, include it and provide a link to it.

Just like a resume, list your skills, your experience and what you are looking for as your next step. Make sure that you include all the relevant background information that a recruiter looking at your profile might be interested in. Make sure you are descriptive, don’t assume the reader will have context.

# Creating Your Elevator Pitch

An elevator pitch is a short description of yourself.  The name comes from the fact that you want it to be so short that you can deliver it to someone that you are meeting in an elevator ride.

The goal of the elevator pitch is to explain who you are, what you do and why the other person should be interested in you.

For example, this is my elevator pitch for this program:

My name is Rob Clifton, and I’m a Program Manager at Google. I manage all of our hiring efforts for our junior IT support roles. I’ve interviewed hundreds of candidates, and I help train our interviewers on how to find the best talent in the industry.

I’m telling you who I am, what I do, and why you might be interested in what I have to say.

In an interviewing context, you want to be able to quickly define who you are, what your current role is and what your future goals are.

For example, if you are a student, you’ll want to include what and where you are studying, and what you are looking to do once you have graduated.

Hi! I’m Jamie, I’m in my senior year at Springfield University, studying Computer Science.  I enjoy being able to help people and solve problems, so I’m looking forward to putting my tech skills into practice by working as an IT Support Specialist after I graduate.

If, instead, you already have a job and you are looking for a change, you will want to include what you do and what difference you are looking for.

Hi! I’m Ellis, I’ve been working at X Company as an IT Support Specialist for the past two years. During those years, I’ve learned a lot about operating systems and networking and I’m looking to switch to a system administrator position, where I can focus on large scale deployments.

Remember that you want to keep it personal, you want to get the attention of the other person and let them know why they are interested in you. Even if you don’t meet them in an elevator, you want to be ready to give people you meet a quick impression of yourself.