CompTIA®A+ Exam Notes : BIOS Tools On PC

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1. PC Hardware

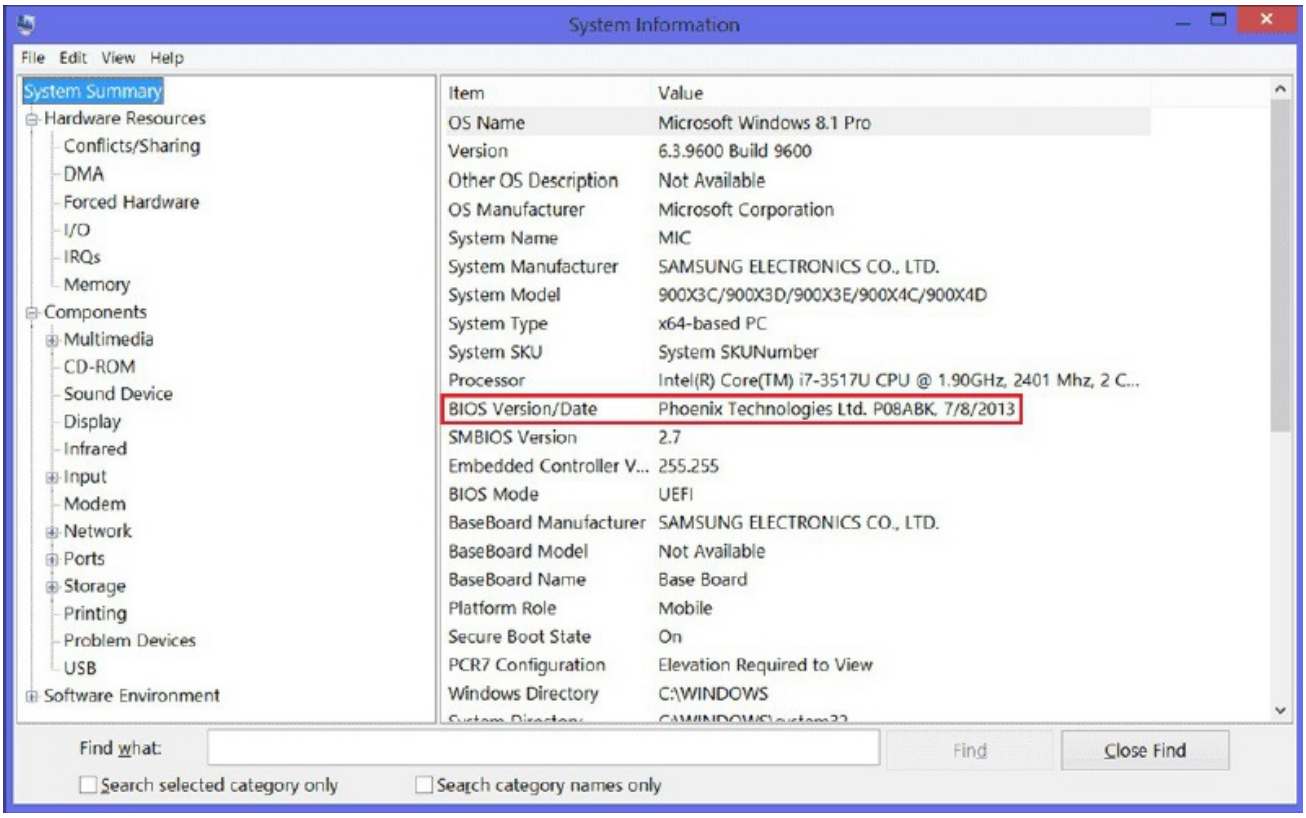
1.1 BIOS Tools on a PC

The BIOS is the Basic Input/Output System. This is a chip which resides on the Motherboard within ROM (Read Only Memory) on older systems, or within some Flash memory on a more modern system. The BIOS is usually referred to as 'firmware'. It contains instructions which allow the motherboard to initialize the hardware components and perform the POST (Power On Self Test), before moving forward to the boot process and loading the main operating system such as Windows or Linux.

Boot sequence is the order in which a computer searches for nonvolatile data storage devices containing program code to load the operating system (OS). Typically, a Macintosh system uses ROM and Windows uses BIOS to start the boot sequence. Once the instructions are found, the CPU takes control and loads the OS into system memory.

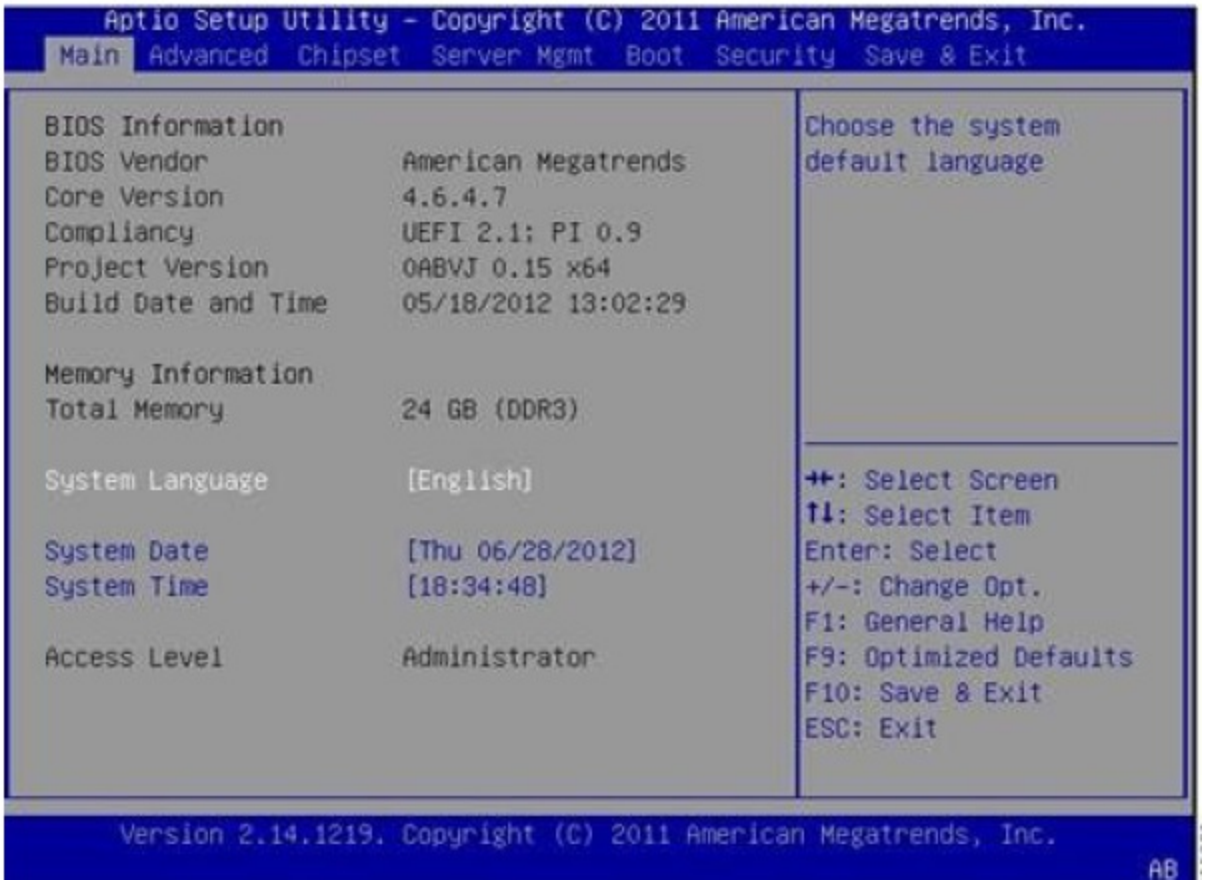
The devices that are usually listed as boot order options in the BIOS settings are hard disks, optical drives, flash drives, etc. The user is able to change the boot sequence via the CMOS setup. Boot sequence is also called as boot order or BIOS boot order.

You may find the BIOS version on a Windows computer by running msinfo32 command at the command prompt. It will bring up the following window:



As can be seen in the above screenshot, BIOS info is given under System Summary.

BIOS has a Setup utility stored in the BIOS flash memory. The configured data is provided with context-sensitive Help and is stored in the system's battery-backed CMOS RAM. To get into the BIOS on your Windows computer you need to press F2 just after you turn on the computer. A typical BIOS snap shot is shown below:



The following are some of the things that you can do with BIOS settings:

- Change the Boot Order
- Create a BIOS Password
- Change the Date and Time
- Change Floppy Drive Settings
- Change Hard Drive Settings
- Change CD/DVD/BD Drive Settings
- View Amount of Memory Installed
- Enable or Disable the Quick Power On Self Test (POST)
- Enable or Disable the CPU Internal Cache
- Enable or Disable the Caching of BIOS
- Change CPU Settings

- Change Memory Settings
- Change System Voltages
- Enable or Disable RAID
- Enable or Disable Onboard USB
- Enable or Disable Onboard IEEE1394
- Enable or Disable Onboard Audio
- Enable or Disable Onboard Floppy Controller
- Enable or Disable Onboard Serial/Parallel Ports
- Enable or Disable ACPI
- Change the Power Button Function
- Change Power-on Settings
- Change Fan Speed Settings

If the CMOS setup is not properly setup the computer may ignore or not look at the CD-ROM as a bootable option. Verify in the CMOS that your settings are properly set to boot from the CD-ROM drive.

Generally, these settings will be under the boot options. Setup your boot options similar to the below example.

- Floppy / LS120
- CD-ROM
- Network (if available)
- Hard Disk Drive

The best way to find the perfect resolution to suit you and your monitor is to experiment. To change the screen resolution, first right-click on the desktop and then left click on Screen resolution from the menu that appears. When using LCD/LED monitors, it is recommended to set for the native resolution of the monitor for best performance.

Usually, a sector contains 512 bytes. To find out the size of a hard disk, use the formula: (# of cylinders X # of sectors X # of heads) X 0.5 KB

To obtain BIOS string ID:

- Power off the system
- Either unplug your keyboard or hold down one of the keys on the keyboard
- Power-on the system and you should get a keyboard error
- The string in the lower left hand corner of your computer screen represents the BIOS String ID.

It is also possible to read the BIOS information by going to the BIOS set-up of the PC by pressing appropriate key (usually Del key) during boot up.

The general errors and the corresponding failures are shown below:

- 100-199: System board failures 200-299: Memory failures
- 300-399: Key board failures
- 400-499: Monochrome video problems 500-599: Color video problems
- 600-699: Floppy disk errors 1700-1799: Hard disk problems.

It is most likely that the USB is not enabled in the BIOS. This is the first thing to be checked while configuring USB port. If the keyboard is USB keyboard, and you are unable to enter BIOS configuration, it may need to be replaced with a conventional keyboard for the purpose of changing/ verifying the BIOS settings. Note that USB interface need to be enabled in the BIOS

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CompTIA®A+ Exam Notes : Motherboard Components And Their Purpose

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1. PC Hardware

1.2 Motherboard Components and their purpose

The motherboard is the computer's main circuit board. It's a thin plate that holds the CPU, memory, connectors for the hard drive and optical drives, expansion cards to control the video and audio, and connections to your computer's ports (such as USB ports). The motherboard connects directly or indirectly to every part of the computer.

This motherboard was developed by intel in 1995. ATX is the most common motherboard design. Several ATX-derived designs have been specified that use the same power supply.

ATX (Advanced Technology Extended): ATX is a full size board measuring 12" wide by 9.6" deep. ATX has 6-pin mini keyboard connector. Also, it has double row single power supply connector providing +/-5V, +/-12V, and +3.3V.

MicroATX: MicroATX is a small motherboard size of 9.6" x 9.6". Compared to full size ATX, microATX have smaller number of I/O slots. For example, full ATX can have 5 PCI slots, whereas MicroATX can have up to 3/4 PCI stots only. The chief advantages over ATX is reduced size, and power requirements. The microATX form factor was developed as a natural evolution of the ATX form factor to address new market trends and PC technologies. The microATX form factor improves upon the previous specification in several key areas.

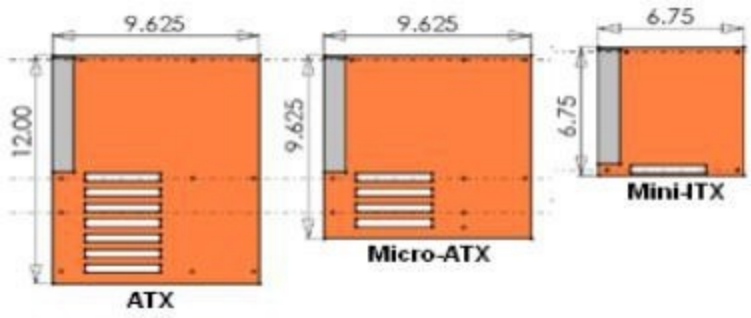
ITX: ITX is the smaller version of the motherboard. The user will find only a few expansion slots that are because of its small size. Also, one can find the ITX mini as well which have only one expansion slot. Since the space on this motherboard is less, so one might find very less features on this motherboard. The mounting points which would be found by the user are same as the ones he would find in Micro ATX or the ATX. So, one can fit them one by one in the same type of case. So, many manufactures actually build the case in the way that whatever motherboard is used, it can get fit into the case. SO basically, the Mini ITX gives an edge to the user if he wants to have the motherboard which covers only a small room.

Mini-ATX: Mini-ATX motherboards were designed with Mobile on Desktop Technology which adapt mobile CPUs for lower power requirements and less heat generation. Mini-ATX motherboards use surface-mount technology and solid state capacitors.

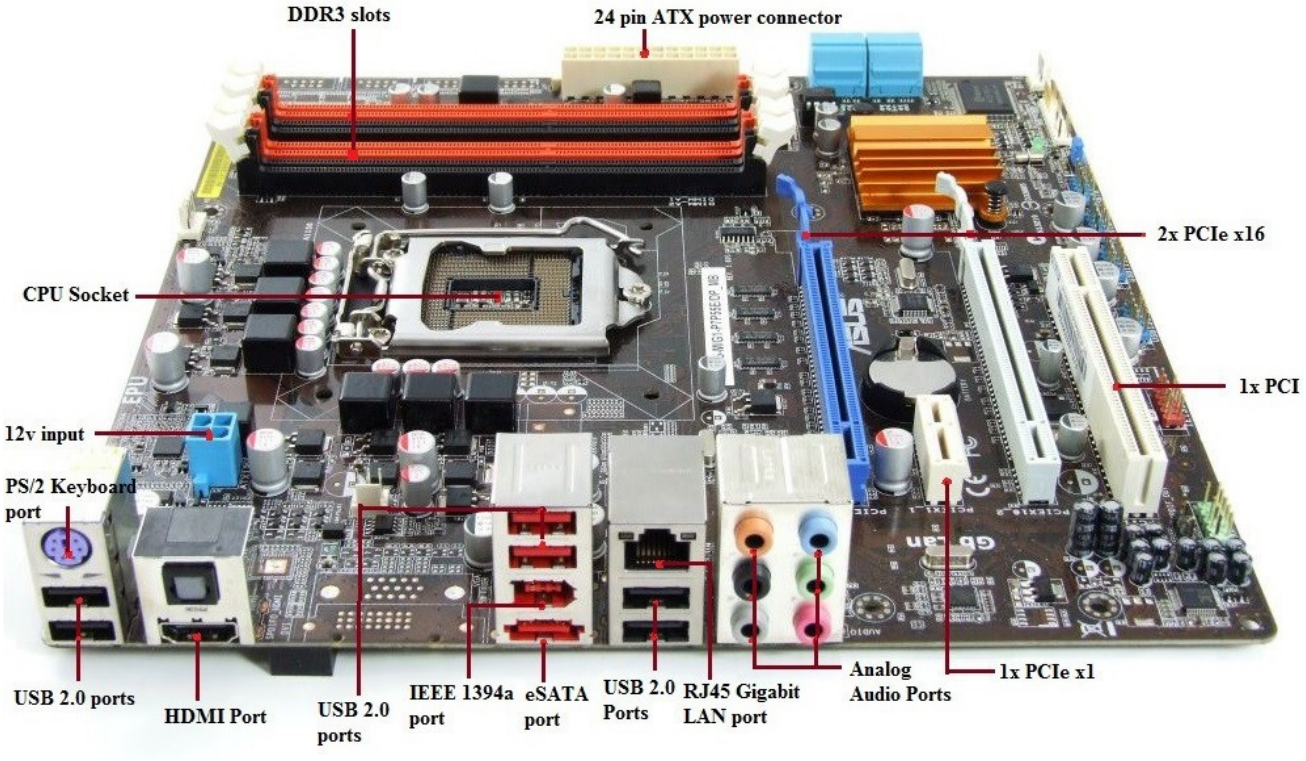
Given below are the main differences between ATX and Micro ATX boards:

- ATX is larger than Micro ATX
- ATX boards typically have more expansion slots than Micro ATX boards.
- A Micro ATX board can be installed in an ATX chassis but not the other way around.
- A Micro ATX chassis has fewer drive bays than an ATX chassis.
- AT style systems use two power connectors, P8 and P9 to connect to the motherboard. ATX systems use only one P1 connector to connect to the motherboard.
- ATX is a hardware (motherboard) specification of desktop computers introduced by the Intel Corporation in 1995 as advancement from the existing AT specification.
- MicroATX is a hardware specification introduced based on the ATX specification standard; therefore, it is compatible with the peripherals and add-on devices used for ATX computers. The power supply, I/O panel, and connectors are the same.
- MicroATX is smaller than the standard ATX configuration. It has less expansion slots and fan headers than a standard ATX.
- Chassis of a micro ATX is smaller, but microATX motherboard can be installed in a standard ATX board too.

The relative sizes of ATX, Micro ATX and Mini-ITX are shown below:



Further, Mini ITX is limited to one PCI-e slot, and up to 2 memory slots. For most PC applications, Mini-ITX is sufficient unless you want to go for more PCI-e slots or do heavy gaming (display-intensive).



Motherboard Components: A typical Micro ATX motherboard with constituent components is given below:

The ATX standard has two different versions of the main power cable: the original 20 pin cable, and the newer 24 pin cable. The main ATX connector is a 20-pin connector. The four pins carrying power are 3.3 V, 3.3 V, 5 V, and 5 V. This allows the motherboard to pull about 20 to 30 watts.

The 24-pin ATX connector is simply the 20-pin connector along with the extra 4-pin connector on the side. This provides the 4 pins carrying power as ATX 20-pin connector plus an additional 4 pins with 5 V standby, 12 V, 12 V, and 3.3 V.

- **ICH9:** ICH9 is Intel's own 'southbridge' chipset and it stands for I/O Controller Hub 9. The northbridge and southbridge are also known as MCH (Memory Controller Hub) and ICH, respectively.
- **SPDIF:** SPDIF also written as S/PDIF, stands for Sony/Phillips Digital Interface, and is an interface to transmit digital audio. Among the two consumer-level interfaces to transmit audio in digital format: SPDIF and HDMI (High-Definition Multimedia Interface) . SPDIF transmits only audio, but HMDI also carries digital video signal.
- **PCIe:** PCIe is an updated version of the PCI protocol. PCIe cards can always operate in PCIe slots with the same or more lanes than the card. For example, an x8 card can operate in a slot with x8, x16, or x32 lanes.

- **TPM:** The TPM would be mostly utilized by applications that require or are related to security, such as encryption/decryption, and authentication. Trusted Platform Module (TPM) is a microchip that is built into a computer. It is used to store cryptographic information, such as encryption keys. Information stored on the TPM can be more secure from external software attacks and physical theft.
    - BitLocker uses the TPM to help protect the Windows operating system and user data and helps to ensure that a computer is not tampered with, even if it is left unattended, lost, or stolen.
    - BitLocker can also be used without a TPM. To use BitLocker on a computer without a TPM, you must change the default behavior of the BitLocker setup wizard by using Group Policy, or configure BitLocker by using a script. When BitLocker is used without a TPM, the required encryption keys are stored on a USB flash drive that must be presented to unlock the data stored on a volume.
- **USB (Universal Serial Bus) Port:** There are usually a couple of these ports located on each motherboard used for connecting pen drives and external hard drives, like Ipods or Mp3 players.
- **RJ-45 (Registered Jack 45):** It is commonly used for an Ethernet or serial connection with an 8 position 8 conductor (8P8C) jack.
- **Audio ports:**
    - Line In port (light blue): This port connects a tape, CD, DVD player or other audio sources.
    - Line Out port (lime): This port connects a headphone or a speaker. In 4-channel, 6- channel, and 8- channel mode, the function of this port becomes Front Speaker Out.
    - Microphone port (pink): This port connects a microphone.
    - Side Speaker Out port (gray): This port connects to the side speakers in an 8-channel audio configuration.
    - Rear Speaker Out port (black): This port connects to the rear speakers on a 4-channel, 6- channel, or 8-channel audio configuration.
    - Center/Subwoofer port (yellow orange): This port connects the center/subwoofer speakers

- **PCI Express x16:** A graphics interface offers increased bandwidth and scalability over the previous AGP8X generation. PCI Express x16 allows up to 4 GB/s of peak bandwidth per direction, and up to 8 GB/s concurrent bandwidth.
- **PCI Express x4:** A graphics interface allows up to 800 MB/s of peak bandwidth per direction.
- **PCI (Peripheral Component Interconnect) Slot:** Supports peripherals like sound cards, DVD decoders, and graphic accelerators with 32 bits at 33Mhz capabilities. There are usually anywhere from 1 to 6 PCI slots available on the motherboard.
- **Printer Header:** It is parallel port used to connect scanners and printers.
- **COM(Communication) Port:** The port designed to connect your mouse and modem.
- I**DE Connector:** Responsible for connecting the IDE cord used for hard disks, CD drives, and DVD drives.
- **CPU slot:** To install the CPU, just slide it straight down into the slot. Special notches in the slot make it impossible to install them incorrectly. So remember if it does not go easily, it is probably not correct. Be sure to plug in the CPU fan's power.
- **SATA Controller:** Motherboard will typically have SATA controller for connecting SATA enabled devices such as Hard disks.
- **CMOS (Complementary Metal-Oxide-Semiconductor):** It is also called as non-volatile BIOS memory is the term usually used to describe the small amount of memory on a computer motherboard that stores the BIOS settings. The CMOS is usually powered by a CR2032 cell battery. Most CMOS batteries will last the lifetime of a motherboard (up to 10 years in most cases) but will sometimes need to be replaced. Incorrect or slow system date and time and loss of BIOS settings are major signs of a dead or dying CMOS battery. The Complementary Metal- Oxide Semiconductor(CMOS) allows the computer to store the Real Time Clock (RTC)and other device information even after the computer is switched off and on. This is achieved by using a battery just for CMOS. If you notice that the time is constantly incorrect, even after adjusting correctly, the most likely cause is that the CMOS battery has become weak and need to be replaced.

- **24 - pin ATX Power connector:** The ATX standard has two different versions of the main power cable, the original 20 pin cable, and the newer 24 pin cable. The main ATX connector is a 20-pin connector. The four pins carrying power are 3.3 V, 3.3 V, 5 V, and 5 V. This allows the motherboard to pull about 20 to 30 watts.The 24-pin ATX connector is simply the 20-pin connector along with the extra 4-pin connector on the side. This provides the 4 pins carrying power as ATX 20-pin connector plus an additional 4 pins with 5 V standby, 12 V, 12 V, and 3.3V. The below shows the 24-pin ATX power connector.

CPU Socket: The CPU socket is the array of hundreds of holes or metal plates to which a computer's central processing unit connects. The CPU socket supplies power to the processor and allows data to be sent to and from the processor from the computer's memory.

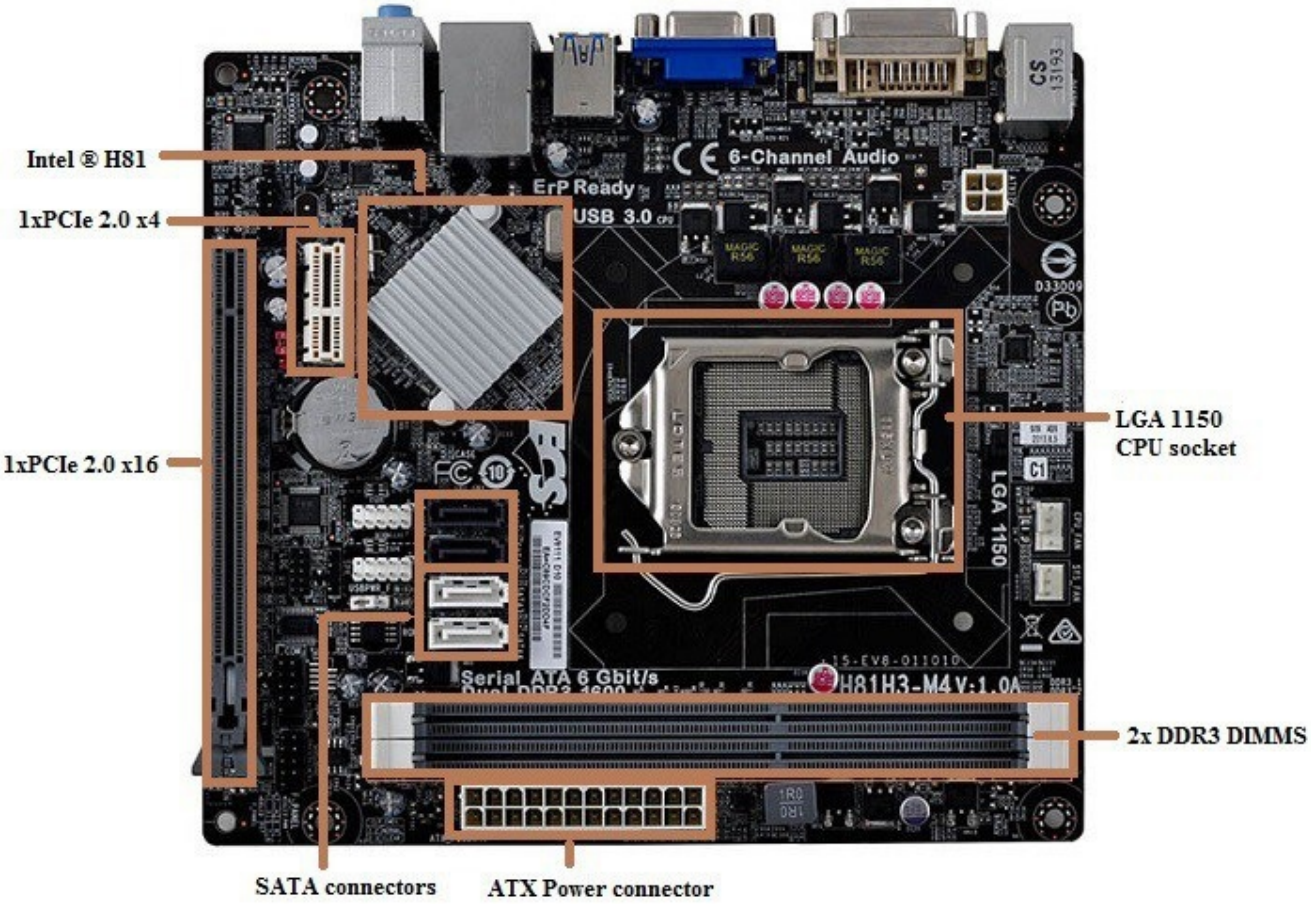
Add-on Card Connectors: Many motherboards have connectors for computer add-on cards. These connectors are long slots into which the cards are inserted. There are several types of add-on card connectors. Some of the most common include Peripheral Component Interconnect Express (PCIe) and Accelerated Graphics Port (AGP), used mainly for video cards, and conventional Peripheral Component Interconnect (PCI), used for other types of add-on cards such as sound cards and storage controllers.

RAM Slots: A memory slot, memory socket, or RAM slot is what allows computer memory (RAM) to be inserted into the computer. Depending on the motherboard, there may be two to four memory slots (sometimes more on high-end motherboards) and are what determine the type of RAM used with the computer. The most common types of RAM are SDRAM and DDR for desktop computers and SODIMM for laptop computers, each having various types and speeds.

Chipset: North Bridge connects directly to the CPU, whereas the South Bridge is connected to the North Bridge

- The northbridge typically handles communications among the CPU, in some cases RAM, and PCI Express (or AGP) video cards, and the southbridge.
- The southbridge is one of the two chips in the core logic chipset on a personal computer (PC) motherboard, the other being the northbridge. The southbridge typically implements the slower capabilities of the motherboard in a northbridge/southbridge chipset computer architecture.
- A southbridge chipset handles all of a computer's I/O functions, such as USB, audio, serial, the system BIOS, the ISA bus, the interrupt controller and the IDE channels.

Mini ITX: Various components of Mini-ITX motherboard are as shown in the below figure



Example: SanDisk Extreme SSD, which supports SATA 6Gb/s interface and when connected to SATA 6Gb/s port, can reach up to 550/520MB/s sequential read and sequential write speed rates respectively. However, when the drive is connected to SATA 3 Gb/s port, it can reach up to 285/275MB/s sequential read and sequential write speed rates respectively.

Express Card: Express card is an interface to allow peripheral devices to be connected to a computer, usually a laptop computer. Formerly called NEWCARD, the Express Card standard specifies the design of slots built into the computer and of cards which can be inserted into Express Card slots. The cards contain electronic circuitry and connectors to which external devices can be connected. The Express Card standard replaces the PC Card (also known as PCMCIA) standards.

PCI Express (Peripheral Component Interconnect Express): Officially abbreviated as PCIe, is a high-speed serial computer expansion bus standard designed to replace the older PCI, PCI- X, and AGP bus standards.

NIC, Network Interface Card is the one that interfaces your PC to the LAN.NIC sits in your PC on one of the slot available on the motherboard.

- Advanced Configuration and Power Interface (ACPI) specification provides an open standard for device configuration and power management by the operating system.

- The specification is central to Operating System-directed configuration and Power Management (OSPM), a system implementing ACPI, which removes device management responsibilities from legacy firmware interfaces.
- The Advanced Host Controller Interface (AHCI) is a technical standard defined by Intel that specifies the operation of Serial ATA (SATA) host bus adapters in a non-implementation-specific manner.

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CompTIA®A+ Exam Notes : Identify Common PC Connector Types And Associated Cables

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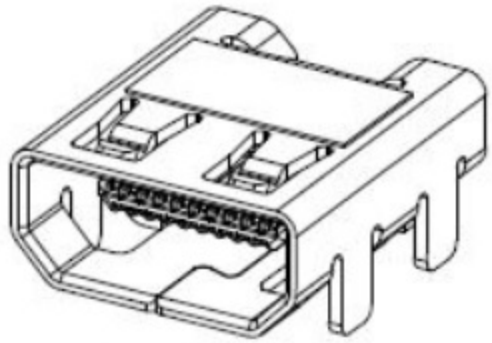
1. PC Hardware

1.3 Identify common PC connector types and associated cables

HDMI: HDMI stands for High-Definition Multimedia Interface, a standard for simultaneously transmitting digital video and audio from a source, such as a computer or TV cable box, to a computer monitor, TV or projector.

HDMI connector types



There are currently five standard connector types available for HDMI cables, namely:

Standard HDMI (HDMI Type A): Standard HDMI Connector Types use a 19 pin configuration, carrying video and audio signals. This connector type is commonly used for a variety of at-home devices like TV's, computers, and video game consoles.

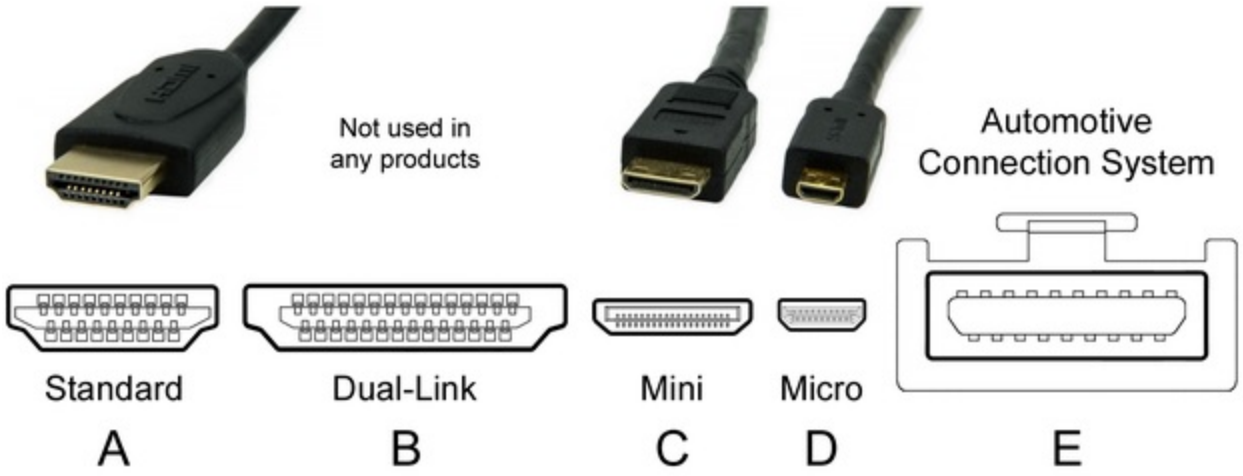
Extended Pin HDMI (HDMI Type B): Extended Pin HDMI Connector Types use an extended 29 pin configuration, carrying video and audio signals. This design is less commonly used.

Mini HDMI (HDMI Type C): Mini HDMI cables use a 19 pin configuration, carrying video and audio signals. This connector type is commonly used for recording devices, tablets, and other small devices.

Micro HDMI (HDMI Type D): Micro HDMI cables provide the same features at the Mini HDMI but uses a smaller 19 pin configuration. This connector type is commonly used for cell phones, small cameras, and other portable devices.

Type E (the Automotive Connection System, chiefly developed for in-vehicle use)

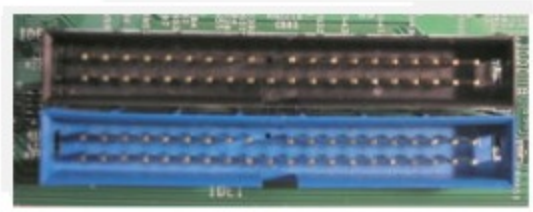
These various HDMI cable connector types are easy enough to identify physically, due to their noticeably different sizes. HDMI connector types A, C and D (standard, mini and micro) will be the only versions generally need.



HDMI Cable Types: In addition to the different types of connectors for HDMI, there are several different types of cables used, depending upon the application The HDMI interface allows a port to send high-resolution digital video, theatre-quality sound and device commands through an HDMI connector and down a single HDMI cord, each designed to support a video resolution and features in the HDMI specification.HDMI cables is that each wire pair is a twisted pair, making them balanced cables. This drastically reduces the signal to noise ratio, allowing for longer cable runs without signal loss.

DisplayPort: It is a digital interface standard produced by the Video Electronics Standards Association (VESA), used for audio and video.

PATA(IDE): Parallel Advanced Technology Attachment (originally called ATA and sometimes known as IDE or ATAPI) was the most dominant desktop computer storage interface from the late 1980s until recently, when the SATA interface took over. PATA hard drives are still being utilized today, especially in external hard drive boxes, but they're becoming rare. Some cheaper high-end server storage devices have also used PATA. Like SCSI, PATA has also gone through many revisions. The most recent version of PATA is UDMA/133 which supports a throughput of 133 MB/s.



IDE connector in Motherboard

Although PATA supports two devices per connector in a master/slave configuration, the performance penalty of sharing a PATA port is severe and not recommended if performance is important to the user. The 40-pin connector and cabling is also extremely wide, which is difficult to use in a high-density environment and tends to block proper airflow. The size of the connector also presents problems for smaller 2.5" hard drives, which require a special shrunken connector.

SATA and ESATA: SATA or Serial ATA, is the standard device for connecting storage media, like hard drives and optical drives, to the motherboard. It replaced the older PATA standard that existed for a considerable length of time. It offers much faster data transfer speeds, of which people can't seem to get enough. The eSATA, or External SATA, is a standard derivative of SATA, that is meant to be used with external hard drives. So far, there have been two basic versions of SATA, with SATA-150 and SATA-300. The numbers 150 and 300 represent the number of MB/s that the interfaces support. SATA doesn't have any performance problems due to cable/port sharing, but that's because it doesn't permit sharing at all. SATA hard disks may be used for building RAID arrays. Other options are not appropriate SATA cables are long, 7-pin cables. Both ends are flat and thin. One end plugs into a port on the motherboard, usually labeled SATA, and the other into the back of a storage device like a SATA hard drive.

SATA Data Pin out

Pin#	Signal Name	Signal Description
1	GND	Ground
2	A+	Transmit+

3	A-	Transmit-
4	GND	Ground
5	B-	Receive-
6	B+	Receive+
7	GND	Ground

eSATA is a variation of the SATA interface that supports external storage devices. It provides a slightly different, more rugged connector.

Because eSATA offers fast transfer rates, it has been a popular external hard drive interface used by video editors, audio producers, and other media professionals. eSATA is one of the fastest interfaces available, it is surpassed by both Thunderbolt (10 Gbps) and Thunderbolt 2.0 (20 Gbps), which are alternatives to eSATA. Unlike Firewire, USB, and Thunderbolt, the eSATA interface does not provide power to connected devices. Therefore, all drives connected through eSATA must include a separate power connector to provide electricity to the device.

SATA is the faster serial version of the original parallel ATA (PATA) interface. Both SATA and PATA are Integrated Drive Electronics (IDE) devices, which means the controller is in the drive, and only a simple circuit is required on the motherboard.

SATA data cable (7-pin):

Serial ATA (Advanced Technology Attachment) (SATA): SATA is a computer bus interface that connects host bus adapters to mass storage devices such as hard disk drives and optical drives

Serial ATA replaces the older PATA, offering several advantages over the older interface , reduced cable size and cost (seven conductors instead of 40), native hot swapping, faster data transfer through higher signaling rates, and more efficient transfer through an (optional) I/O queuing protocol. SATA host adapters and devices communicate

via a high-speed serial cable over two pairs of conductors. To ensure backward compatibility with legacy ATA software and applications, SATA uses the same basic ATA and ATAPI command-set as legacy ATA devices.

External Serial Advanced Technology Attachment or eSATA is an external interface for SATA technologies. It is faster compared to USB 2.0 or 3.0, and suitable for backing up large amounts of data using external hard drive. Even though eSATA is part of the SATA interface specifications, it uses a very different physical connector from the internal SATA connectors. The reason for this is to better shield the high speed serial lines used to transfer the signals from EMI protection. It also provides a 2m overall cable length compared to the 1m for internal cables. As a result the two cable types can not be used interchangeably.

Difference between SATA I, SATA II and SATA III

- SATA I (revision 1.x) interface, formally known as SATA 1.5Gb/s, is the first generation SATA interface running at 1.5 Gb/s. The bandwidth throughput, which is supported by the interface, is up to 150MB/s.
- SATA II (revision 2.x) interface, formally known as SATA 3Gb/s, is a second generation SATA interface running at 3.0 Gb/s. The bandwidth throughput, which is supported by the interface, is up to 300MB/s.
- SATA III (revision 3.x) interface, formally known as SATA 6Gb/s, is a third generation SATA interface running at 6.0Gb/s. The bandwidth throughput, which is supported by the interface, is up to 600MB/s. This interface is backwards compatible with SATA 3 Gb/s interface.
- SATA II specifications provide backward compatibility to function on SATA I ports. SATA III specifications provide backward compatibility to function on SATA I and SATA II ports. However, the maximum speed of the drive will be slower due to the lower speed limitations of the port.
- IEEE 1394 cabling uses two cable pairs to transmit and receive data. The additional two pair, if present, carries power to the device.
- Bluetooth can be used for personal area networking devices like keyboards and headphones.
- Philips screw driver uses "#" sign before the number, such as #1 to denote the size of the blade. Torx screw driver uses "T" sign before the number.
- PCIe is most likely to be used with a graphic expansion card because of its high bandwidth.

SATA Power connector (15-pin): The SATA 15-pin power supply connector is one of the standard peripheral power connectors in computers. It's the standard connector for all SATA-based hard drives, SSDs and optical drives. SATA power cables come from the power supply unit. The connector is keyed so that it's not possible to insert it in the wrong orientation without breaking something.

SATA Power Pin out

Pin#	Signal Name	Signal Description
1	V33	3.3v Power
2	V33	3.3v Power
3	V33	3.3v Power, Pre-charge, 2nd mate
4	Ground	1st Mate
5	Ground	2nd Mate
6	Ground	3rd Mate
7	V5	5v Power, pre-charge, 2nd mate
8	V5	5v Power
9	V5	5v Power
9	V5	5v Power
10	Ground	2nd Mate
11	Reserved	-
12	Ground	1st Mate
13	V12	12v Power, Pre-charge, 2nd mate
14	V12	12v Power
15	V12	12v Power

Molex: A Molex connector is used to provide power to drives of various types. It has four pins, two of which have power, one 12 V and the other 5 V. These are standard for IDE (PATA) or older SCSI drives. The total power demands are from 5 to 15 watts for IDE and 10 to 40 watts for SCSI.

4/8-pin 12 V: With the introduction of the Pentium 4, the motherboard required more power. Supplemental power connections were provided to the motherboard in 4-, 6- (discussed later in this section), or 8-pin formats. These were in addition to the 20-pin connector (discussed later in this section) that was already provided.

There is a 4-pin square mini version of the ATX connector, which supplies 2 pins with 12 V, and an 8-pin version (two rows) that has four 12 V leads. These connect to other items, like the processor, or other components, like a network card that may need power that exceeds what can be provided with the ATX connection to the board.

PCIe 6/8-pin: PCIe slots also draw more power and require power in addition to the main 20- pin connector (discussed next). These additional connectors can be 6 pins and may also contain an additional 2-pin connector on the side for cases where the connection required is 8-pin.

20-pin: The main ATX connector, referenced earlier, is a 20-pin connector. The four pins carrying power are 3.3 V, 3.3 V, 5 V, and 5 V. This allows the motherboard to pull about 20 to 30 watts.

24-pin: The 24-pin ATX connector is simply the 20-pin connector discussed earlier along with the extra 4-pin connector on the side. This provides the 4 pins carrying power as discussed earlier plus an additional 4 pins with 5 V standby, 12 V, 12 V, and 3.3 V.

SATA Data cable , Power cable and hard disk interface physical map

The figure shows the SATA hard drive with both the DATA and Power cables inserted into SATA connector slots.Typical connection of a hard drive using SATA cables. The red cable is SATA data, and the connector on the right is the power SATA cable. An older power supply might only have a ‘molex’ style power connector and not the SATA one shown above. Most hard drives will have the option for both Molex or SATA power connections, and you can use one or the other as you like. The two different types together look like this:

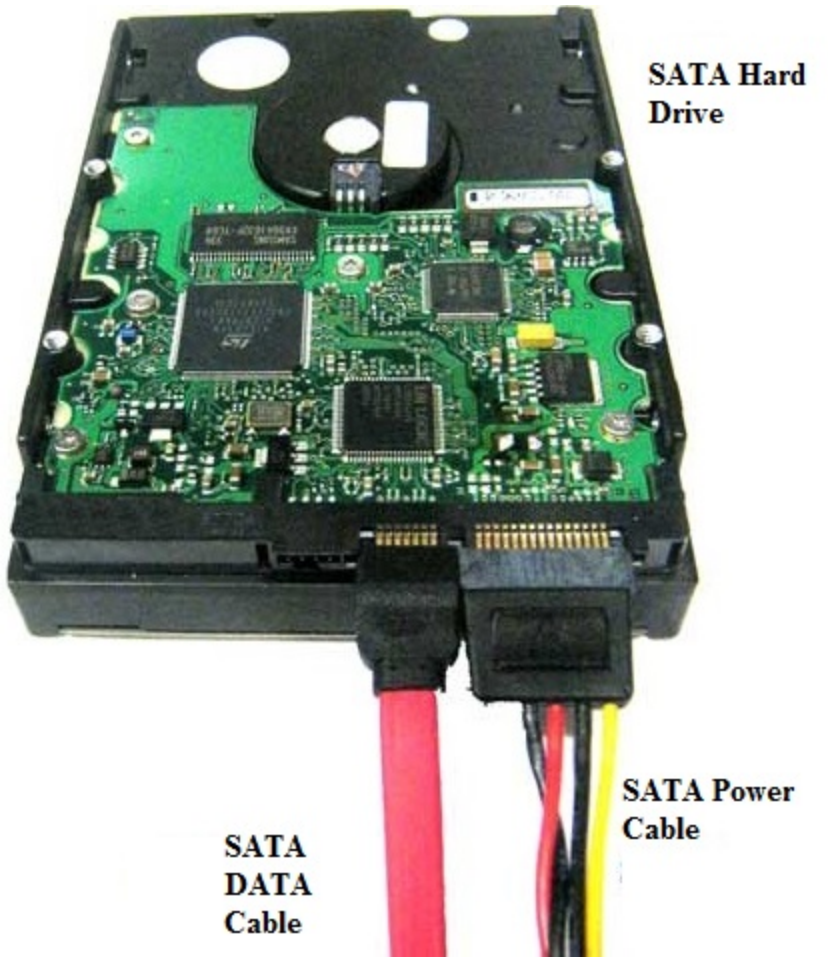


Fig: SATA Data cable , Power cable and hard disk interface physical map

When selecting a power supply, two issues become important. You need to supply the total wattage required by all the devices and the motherboard of the PC, and you must ensure that it has the connector types required by your devices.

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CompTIA®A+ Exam Notes : Various PC Connection Interfaces, Their Characteristics And Purpose

examguides.com/Aplus-Core1/aplus-core1-5.htm

1. PC Hardware

1.4 Various PC connection interfaces, their characteristics and purpose

There are various PC connection interfaces. In this category USB has the largest share of the market due to its ease of use and device compatibility.

- PCIe stands for PCI Express card bus and it is an internal bus.
- IEEE 1394,USB,eSATA are used for external hard disk connections.
- Most commonly used Video connectors include VGA, HDMI, and DVI.
- For connecting an LCD monitor, you need a digital signal connector such as DVI or HDMI. PGA, and VGA are analog standards.
- The different versions of USB cables, like USB 2.0 and USB 3.0, are concerned with the functionality and speed of the USB cable; whereas, the type of USB cable (like USB Type A, USB Type B) essentially refers to the physical design of the plugs and ports.
- USB is used for connecting USB-compliant peripheral devices, and eSATA is used for connecting external eSATA devices such as eSATA disk drives.

There are a variety of USB connectors as illustrated in the figure below:

Most prominent among these are Type A, Type B, Mini Type A, Mini Type B, Type Micro A, and Type Micro B

Firewire Cable Connector: The IEEE 1394 interface is a serial bus interface standard for high- speed communications, frequently used by personal computers as well as in digital audio and digital video. The interface is also known by the brand names of FireWire (Apple), LINK (Sony), and Lynx(Texas Instruments).

There are two prominent versions of this standard.

- IEEE1394a
- IEEE1394b

1**. IEEE 1394a:** IEEE1394a also called FireWire 400 is widely used for formats such as DV, DVCAM, DVCPRO, and HDV. FireWire provides an easy way to capture and output high-quality digital video using a variety of camcorders and decks and is capable of data rates as high as 400 Mbps. Standard FireWire cables can be up to 4.5 meters long. 16 cables can be daisy chained using active repeaters offering a total cable length of 72meters. There are two kinds of FireWire connectors: a 4-pin connector (typically found on video equipment such as camcorders or decks) and a 6-pin connector (used for computer equipment). However, some newer video equipment uses the 6-pin connector. The 6-conductor powered connector, adds power output to support external devices.

2. IEEE 1394b: IEEE1394a also called FireWire 800, offers higher-bandwidths capable of data transfer speeds of up to 800 Mbit/s. In fact, the FireWire roadmap outlined in the IEEE 1394b standard will eventually take the theoretical bit rate to 1600 Mbps and then up to a staggering 3200 Mbps. FireWire 800 is also capable of supporting cable distances of up to 100 meters. 9-pin-to-4-pin and 9-pin-to-6-pin FireWire 400 to FireWire 800 cables are available to connect older devices to a FireWire 800 interface.

Different types of FireWire cable connectors are shown below:

Display connectors:

VGA

HDMI

BNC Connector

Display Port

DVI

6-pin Mini Din

VGA: A Video Graphics Array (VGA) connector is a three-row 15-pin DE-15 connector. The 15-pin VGA connector was provided on many video cards, computer monitors, laptop computers, projectors, and high definition television sets. On laptop computers or other small devices, a mini-VGA port was sometimes used in place of the full-sized VGA connector.

HDMI(High-Definition Multimedia Interface): HDMI is a proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data from an Compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio device. HDMI is a digital replacement for analog video standards.

BNC Connector: The BNC connector is a miniature quick connect/disconnect radio frequency connector used for coaxial cable. BNC connectors are used with coaxial cable in radio, television, and other radio-frequency electronic equipment, test instruments, and video signals. The BNC was commonly used for early computer networks such as ARCnet, and the 10BASE2 variant of Ethernet. BNC connectors are made to match the characteristic impedance of cable at either 50 ohms or 75 ohms.

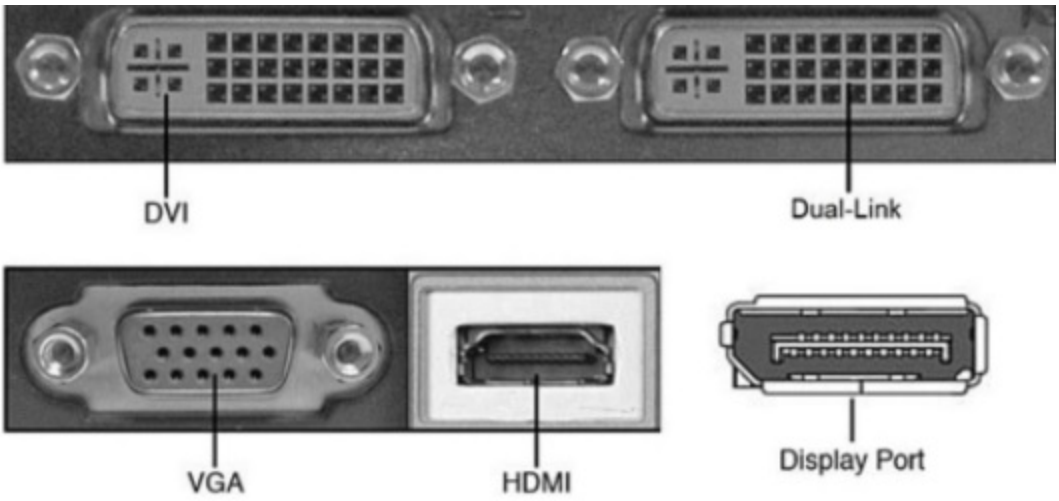
Display Port: DisplayPort is a digital display interface developed by the Video Electronics Standards Association (VESA). The interface is primarily used to connect a video source to a display device such as a computer monitor, though it can also be used to carry audio, USB, and other forms of data. Display Port is backwards compatible with VGA, DVI and HDMI through the use of passive and active adapters.

Digital Visual Interface (DVI): DVI is a video display interface developed by the Digital Display Working Group (DDWG). The interface is designed to transmit uncompressed digital video and can be configured to support multiple modes such as DVI-A (analog only), DVI-D (digital only) or DVI-I (digital and analog). The DVI specification is compatible with the VGA interface. Although DVI is predominantly associated with computers, it is sometimes used in other consumer electronics such as television sets and DVD

6- Pin Mini Din Connector: The mini-DIN connectors are a family of multi-pin electrical connectors used in a variety of applications. Mini-DIN is similar to the larger, older DIN connector. Mini-DIN connectors are 9.5 mm in diameter and come in seven patterns, with the number of pins from three to nine. Each pattern is keyed in such a way that a plug with one pattern cannot be mated with any socket of another pattern.

Table:Video card connectors

DVI	Digital Visual Interface	High quality connections used with LCD displays. Carries uncompressed digital video is partially compatible with HDMI. Types include: DVI-D:Digital only connection DVI-I:Digital and analog conections DVI-A:Analog-only conditions.
HDMI	High-Definition (HD) Multimedia Interface	Used mainly for high-definition television. Can carry video and audio signals. Type A: Supports all HD modes, compatible with DVI-D connectors. Type B:Double-video bandwidth, supports higher resolutions. Also known as dual-link uncommon. Type C: Mini -HDMI used in portable devices. Type D: Micro-HDMI smallest connector also used in portable devices. Type E: Used in automobiles has a locking tab.
DisplayPort	DisplayPort	Designed to be replacement for HDMI and DVI. Often has a locking tab. Uses packet transmission similar to Ethernet.
VGA	Video Graphics Array	15 pin known as DE15. Used for older monitors that display VGA,SVGA and XGA resolutions.



Typical video ports

The raw speeds (bits per sec) achievable by using different technologies is given below:

- USB 1.1 - 15 Mbps
- FireWire (1394a) - 400 Mbps
- USB 2.0 - 480 Mbps
- FireWire 800 (1394b) - 800 Mpbs
- SATA 1.5 - 1.5 Gbps
- SATA 3.0 - 3.0 Gbps
- USB 3.0 - 5Gbps
- eSATA – 6Gbps
- SATA 3.2 – 16Gbps

The following are usually hot pluggable devices:

- ESATA
- USB
- Express card/54

But you need to follow proper procedures if you want to remove a USB or eSATA device while the computer is on. The Personal Computer Memory Card International Association (PCMCIA) developed both the Express Card standard and the PC card standards. The host

device supports both PCI Express and USB 2.0 connectivity through the Express Card slot, cards can be designed to use either mode. The cards are hot-pluggable.

For connecting to an Ethernet LAN, you need an RJ-45 connector at the network end of the cable. The maximum allowed length of the cable for 1000BaseT Gigabit Ethernet is 100 meters (without repeater). Cat 5e or better cable type is used for Gigabit Ethernet network cabling. Cat5e cable contains four twisted pairs of wires for Gigabit Ethernet.

Note that RJ-11 connector has only two pairs of wires, and normally used for connecting telephones.

USB is used for connecting USB-compliant peripheral devices, and eSATA is used for connecting external eSATA devices such as eSATA disk drives.

NFC: NFC, short for Near Field Communication, is a short-range high frequency wireless communication technology that enables the exchange of data between devices over about a 10 cm distance. It allows users to seamlessly share content between digital devices, pay bills wirelessly or even use their cellphone as an electronic traveling ticket on existing contactless infrastructure already in use for public transportation. The significant advantage of NFC over Bluetooth is the shorter set-up time. Instead of performing manual configurations to identify Bluetooth devices, the connection between two NFC devices is established at once (under a 1/10 second).

There are two different types of NFC:

- Active
- Passive.

1. Active NFC: Active NFC which is currently used on many Android devices, as well as the new Apple devices, can send and receive data.

2. Passive NFC: Passive NFC on the other hand, can only send data. However, passive NFC provides an extra benefit. The passive devices can run without power. For example, a student ID card may use NFC technology. If you tap the card on the bus, your card is passively transferring information through NFC to the bus system's active card reader.

IR: Infrared transmissions use the invisible light spectrum to transmit low power signals to compatible devices. There are many applications that can utilize the technology, most notably remote control signaling for control of home theater devices, garage door openers and any dedicated device that has an unobstructed line-of-sight between the devices. Some smart phones incorporate this technology to let users control their multi-media components. It is one of the earliest types of optical communication and found in remote controls for televisions, DVD players and most other entertainment devices and uses Line Of Sight communication.

Note that Infra Red (IR) is one of the earliest types of optical communication and is still very much in use today. It is found in remote controls for televisions, DVD players and most other entertainment devices. It uses Line Of Sight communication and limited to a few meters.

Radio frequency(RF): RF is any of the electromagnetic wave frequencies that lie in the range extending from around 3 kHz to 300 GHz, which include those frequencies used for communications or radar signals.

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CompTIA® A+ Exam Notes : Various Memory (RAM) Types And Their Features

examguides.com/Aplus-Core1/aplus-core1-6.htm

1. PC Hardware

1.5 Various memory (RAM) types and their features

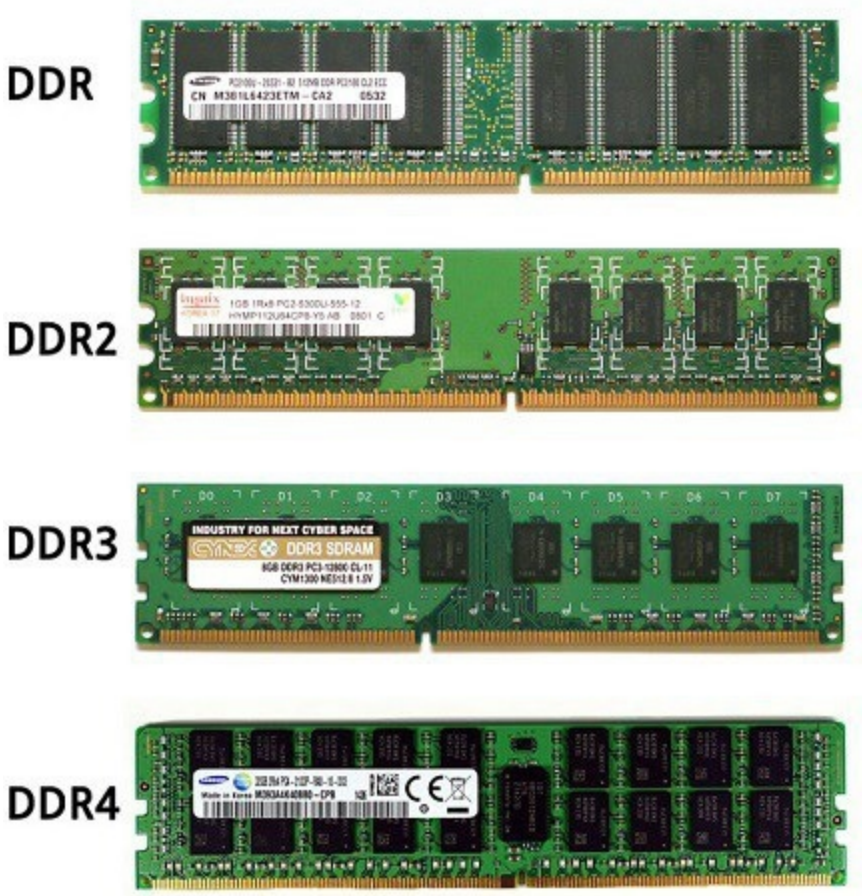
RAM system's short-term memory. Whenever computer performs calculations, it temporarily stores the data in the RAM until it is needed. This short-term memory disappears when the computer is turned off. If you're working on a document, spreadsheet, or other types of file, you'll need to save it to avoid losing it. When you save a file, the data is written to the hard drive, which acts as long-term storage. RAM is measured in megabytes (MB) or gigabytes (GB). The more RAM you have, the more things your computer can do at the same time. If you don't have enough RAM, you may notice that your computer is sluggish when you have several programs open. Because of this, many people add extra RAM to their computers to improve performance. RAM is much faster than ROM is, due to the nature of how it stores information. For this reason, RAM is often used to shadow the BIOS ROM to improve performance when executing BIOS code. PROM (Programmable ROM) is also a version of ROM and is slower compared to RAM. EEPROM, Electrically Erasable Programmable ROM is used to program dynamically.EPROM, Erasable Programmable ROM can be erased with ultra violet light.

There are basically two important types of RAM (Short for Random Access Memory):

1. **SRAM:** Static RAM being expensive, primarily used for Cache memory. DRAM, being cheaper, is used for main memory. SRAM is widely used for Level 1, Level 2 or Level 3 cache memory. Level 1 cache is internal to the processor, and level 2 and level 3 caches are external to the processor, it resides on the motherboard.

2. **DRAM:** Dynamic RAM holds its data if it is continuously accessed by special logic called a refresh circuit. If the memory is not refreshed regularly, then the DRAM will lose its contents. This refreshing action is why the memory is called dynamic. All PCs use DRAM for their main system memory, instead of SRAM, even though DRAMs are slower than SRAMs and require the overhead of the refresh circuitry. The reason that DRAMs are used is that they are much cheaper and take up much less space.

The computer main memory usually consists of some type of DRAM. Types of DRAM Packages and DRAM Memory are explained below:



PC ratings and corresponding DDR bandwidth are given below:

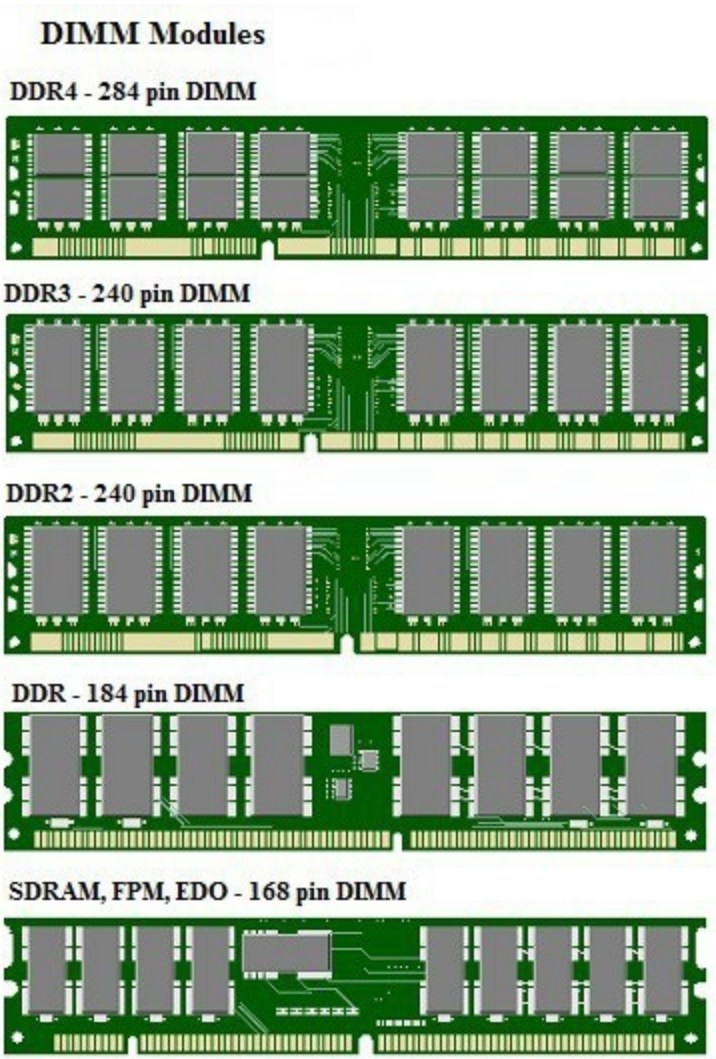
DDR266 = PC2100
DDR333 = PC2700
DDR400 = PC3200
DDR2-400 = PC2-3200
DDR2-533 = PC2-4200
DDR2-667 = PC2-5300
DDR2-800 = PC2-6400
DDR3-800 = PC3-6400
DDR3-1066 = PC3-8500
DDR3-1333 = PC3-10600 DDR3-1600 = PC3-12800
DR400 memory is also referred to as PC3200 memory. 400MHz
DDR2 memory would be listed as PC2-3200, and so on.

SDRAM DIMM (Dual In-line Memory Modules): SDRAM stands for Synchronous Dynamic Random Access Memory. DIMMs allow the ability to have two rows of DRAM chips. They are able to contain twice as much memory on the same size circuit board compared to SIMM (stands for Single Inline Memory Module, and not used now-a-days). In its basic form, DIMMs contain 168 pins and transfer data in 64 bit chunks. SDRAM DIMMs with 168 pins have two notches on the bottom of the PCB.

DDR DIMM: DDR DIMMs have 184 pins and may be identified by one notch at the bottom of the module. Note that DDR2 and DDR3 modules also have only one notch at the bottom of the board. However, they may be identified by the position of the notch. As may be observer, DDR (DDR1) modules have a notch to slightly to the right in comparison with DDR2 memory module, and DDR3 has a notch to far left of the bottom of the module as may be seen in the figure above.

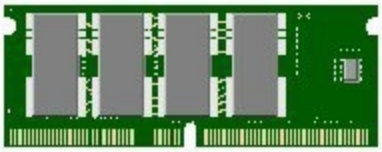
DDR3 DIMM Memory module: DDR3 memory modules are available in both DIMM and SO-DIMM form factors. DIMMs are commonly used for desktop PCs, while SO-DIMMs are typically used for laptops and all-in-one computers. While DDR3 DIMMs and SO-DIMM are the same size as their DDR2 counterparts, they are not compatible with DDR2 RAM slots. The connecting pins are arranged differently, so it is physically not possible to insert a DDR3 memory module into a DDR2 or DDR slot, and vice versa.

SO DIMM (Small Outline DIMM): SO DIMMs are commonly used in notebooks and are about half the size of normal DIMMs. 144-pin SO-DIMMs have a single notch near the center , 200-pin SO-DIMMs have a single notch nearer to one side. The exact location of this notch varies. 204-pin SO-DIMMs (DDR3) have a single notch closer to the center than on 200-pin SO-DIMMs. The 200-pin SO-DIMM may belong to types DDR or DDR2. The notch location is different in both the cases, and these two types of memory are not interchangeable.

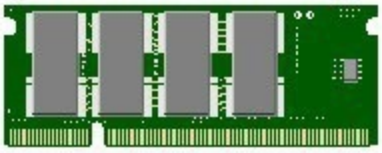


SODIMM Modules

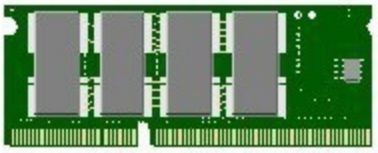
DDR4 - 256-pin SODIMM



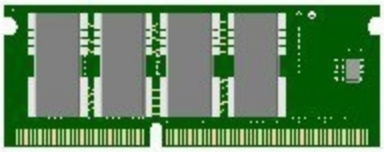
DDR and DDR2 - 200-pin SODIMM



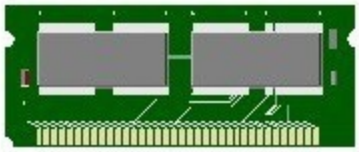
DDR3 - 204-pin SODIMM



SDRAM, FPM, EDO - 144-pin SODIMM



FPM, EDO - 72-pin SODIMM



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CompTIA®A+ Exam Notes : Install And Configure PC Expansion Cards

examguides.com/Aplus-Core1/aplus-core1-7.htm

1. PC Hardware

1.6 Install and configure PC expansion cards.

Sound Cards: A sound card is an expansion card or integrated circuit that provides a computer with the ability to produce sounds that can be heard from the computer speakers, external speakers, and headphones. Sound Cards can also be referred to as sound board or an audio cord. A sound card allows you to have a better quality of sound, so that the sound coming out of the computer is clear. the point of the sound card or its function is so that you are able to listen to music, watch movies, audio conferencing, using it for presentations and many other things that we use sound for. There are two main ypes of sound cards, PCI and ISA.

Graphic cards:A graphics card is a major component of a PC and it generally consumes more power compared to other components. Entry-level graphics cards draw their power from the PCI Express x16 slot only but high-end graphics cards require external power from the PSU for their working. The external power for these high-end graphics cards come from the 6-pin and 8-pin PCI-Express power connectors from the power supply.

Video cards: A video card is sometimes called a graphics card, graphics adapter, display card, or video controller. It is a piece of hardware responsible for processing any graphics generated by the motherboard and transmitting them to the display unit. It is like a circuit board that fits in a slot on a computer's motherboard. The monitor plugs into the socket on the video card and on the backside of the computer. The board consists of a special electronic circuit consisting of a graphics processing unit and a visual processing unit as well as a heat sink to spread out the heat produced. Other components of a video card are video BIOS, video memory, RAMDAC, video graphics array, digital visual

interface, HDMI and display port. The video card controls display factors such as resolution, colors displayed, and the speed of the images displayed. However, sometimes video cards are integrated directly into the motherboard or CPU, which are called integrated or on-board cards.

PCI Express x16 connector: Every modern-day graphics card comes with a PCI Express x16 connector that goes in the PCI Express x16 slot of your motherboard. PCI Express x16 connector connects your graphics to the motherboard and is the only interface through which communication happens.


PCI Express X16 connector

A PCI Express x16 slot can provide a maximum of 75 Watts to the graphics card which is enough for entry-level graphics cards. Even some mid-range graphics cards can also work on the power from the PCI Express x16 slot alone but higher mid-range graphics cards and high-

end graphics cards require external power from the PSU through 6-pin or 8-pin power connectors. You can see these connectors below:

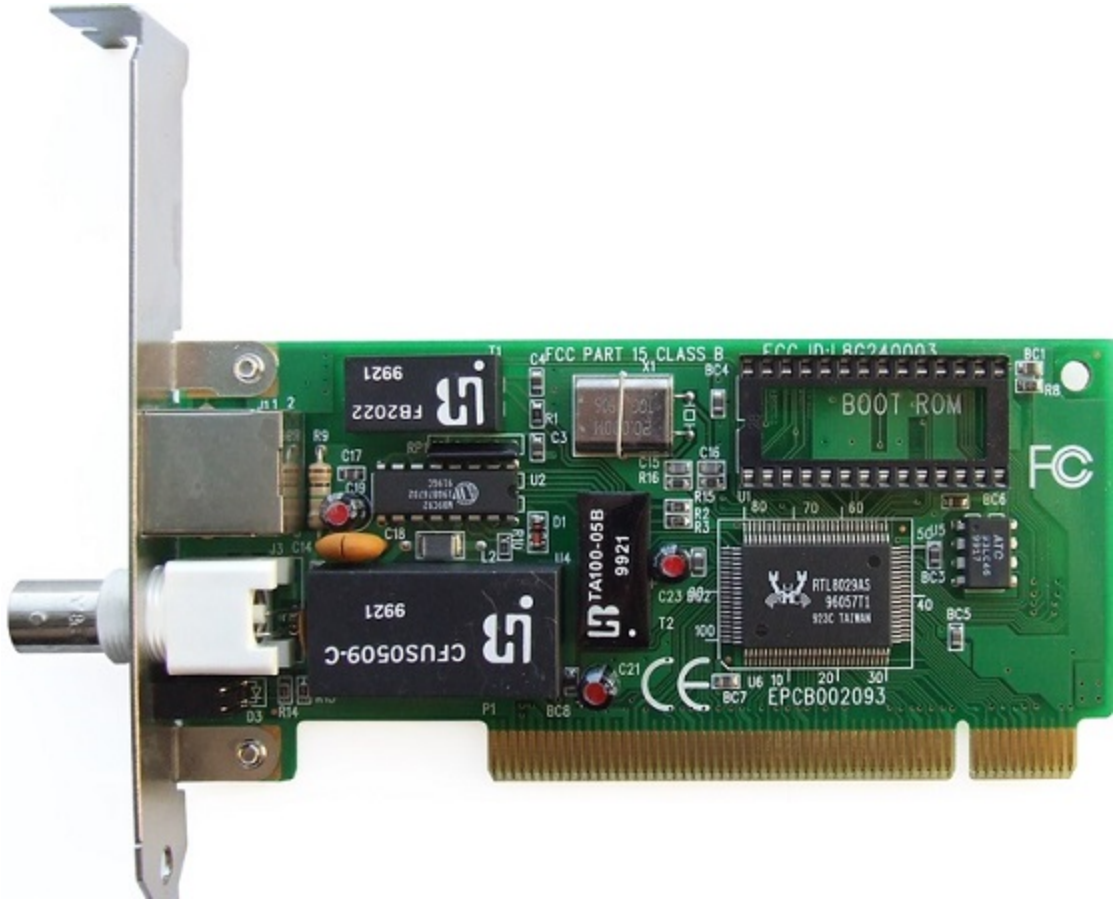
8-pin PCI-E connector 6-pin PCI-E connector

In fig b below you can see a typical PCI card, pointed out an alignment notch (A), this is used to align the card with the slot and take a look at the slot in fig a you can see how it is aligned with the card.

Network Cards: The figure shows a typical network card with RJ45 is a type of connector (not visible, though), commonly used for Ethernet networking. Network cards come in two main categories, 1) wired and 2) wireless.

fig a

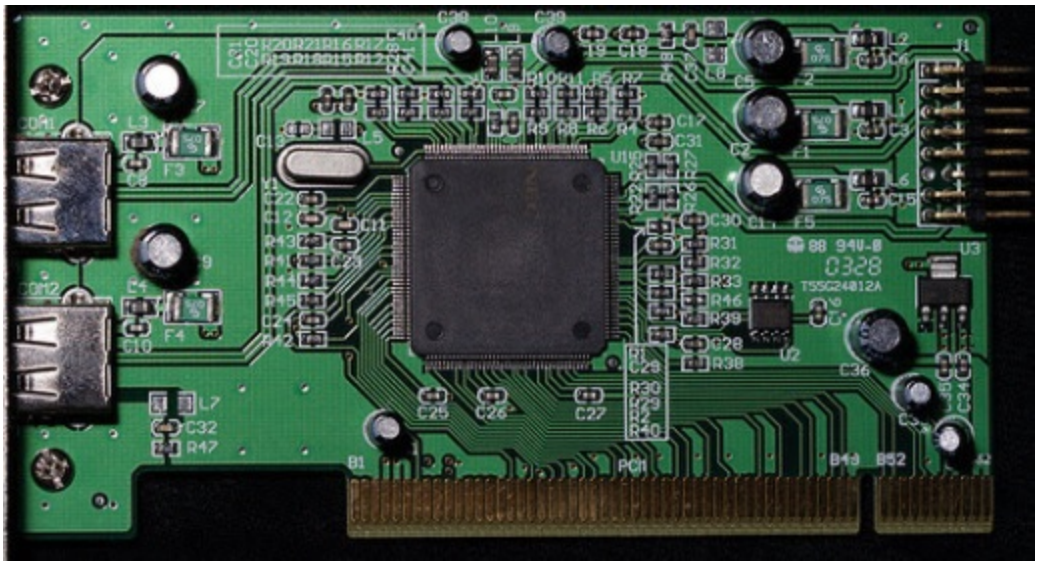
fig b



Wireless NICs need to use wireless technologies to access the network, so they have one or more antennas sticking out of the card. You can see an example of this with the TP-Link PCI Express network card.

USB cards: USB card actually is a pretty easy one. One simple has to open up the computer, making sure it's completely power off and the cord is unplugged. Then one can simply look for the manual guide to see where the USB cards can be attached. After it is done, restart and look for the drivers using the device manager or the windows update.

USB devices are Plug and Play devices, so there is little that you can do to control or configure them. Windows usually detects devices when they're plugged in and, if necessary, installs drivers. The most commonly used port for connecting digital camera to a desktop computer is USB port, though older cameras used serial port. Most PCs see a Camera as mass storage connected to USB port.



If your USB does not work after you plug it in, it's probably because of one of the following causes:

- Windows can't find a driver for the USB device. When hardware attached to a computer doesn't work properly, it's often because of a driver problem.
- When you plug in a USB device, Windows automatically identifies the device and searches for a driver.
- If Windows can't find the driver, it will prompt you to insert the disc containing the driver that came with your device.
- Windows doesn't recognize the USB device. Before Windows can find and install a driver for your USB device, it must be able to correctly identify the device.
- Occasionally you might have a USB device that Windows doesn't recognize and that did not come with a disc containing a driver. In this case, you can look for a driver on the device manufacturer's website.
- You can often download drivers from the support section of such sites.
- After you find a driver for a device that Windows cannot identify, you will have to install the driver manually.
- Look for an ejector button next to the PC Card slot. On some systems, the button is folded into the unit for storage. Unfold the button and remove any connected cables or dongles from the card.

Firewire Cards: The Firewire cards are connected to the PCI board. One would have to install and configure it all by himself. As it's understood, like all other hardware's, this hardware also has to be installed with screws and has to be planted in the motherboard. Also,

the devices can be searched for it using the windows update.

Storage cards: A flash memory card (sometimes called a storage card) is a small storage device that uses nonvolatile semiconductor memory to store data on portable or remote computing devices. Such data includes text, pictures, audio and video.That is often used to store photos, videos, or other data in electronic devices. Devices that commonly use a memory card include digital cameras, digital camcorders, handheld computers, MP3 players, PDAs, cell phones, game consoles, and printers. The picture is a MicroSD flash memory card, which is one of the types of memory cards available.

There are a different types of memory cards , each varying in size, compatibility, and storage capacity. The most commonly used types of memory cards are listed below.

- CF (CompactFlash)
- MicroSD
- Micro SDHC
- Mini SDHC
- MMC
- SD Card
- SDHC Card
- SmartMedia Card

CF (CompactFlash): Short for CompactFlash, CF is a 50-pin connection storage device. CompactFlash is a storage medium commonly found in PDAs, digital cameras, and other portable devices.

Micro SD: Alternatively referred to as T-Flash or TransFlash, MicroSD is a small removable flash memory card that was first developed by SanDisk

Mini SDHC: Short for Secure Digital High Capacity card, the SDHC card is an improved version of the standard SD card with a storage capacity up to 32 GB

MMC: Short for MultiMediaCard, MMC is a memory card available as flash memory and ROM used in car radios, cell phones, digital cameras, PDAs, MP3 players, and printers.

SD Card: Short for Secure Digital card, the SD card is one of the more common types of memory cards used with electronics. The SD technology is used by over 400 brands of electronic equipment and over 8000 different models, including digital cameras and cell phones. It is considered the industry standard due to the wide use.

SDHC card: Short for Secure Digital High Capacity card, the SDHC card is an improved version of the standard SD card with a storage capacity up to 32 GB.

SmartMedia card: The SM (SmartMedia) card is a type of flash memory card. It was one of the first memory cards to be produced and used in digital cameras, and other electronic devices.

Riser card: A riser board is a circuit board that gives a computer motherboard the option for additional expansion cards to be added to the computer.

AMR slot: AMR stands for Audio Modem Riser. AMR is a riser card that supports sound or modem function. With increasing CPU computational power, the digital processing job can be implemented in main chipset and share CPU power.

CNR slot: CNR stands for Communication Network Riser. CNR is a riser card specification that supports V.90 analog modem, multi-channel audio, phone-line based networking, and 10/100 Ethernet based networking. The digital processing is implemented in main chipset and share CPU power.

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CompTIA®A+ Exam Notes : Install And Configure Storage Devices And Use Appropriate Media

1. PC Hardware

1.7 Install and configure storage devices and use appropriate media.

CD-R: CD-R stands for CD- Recordable. You can only record data onto a CD-R only once.

CD-RW: CD-RW stands for CD-ReWritable, and as the name suggests, you can record data any number of times onto a CD-RW(subject to wear and tear). CD-R is represented by two speeds (AxB), the former is the write speed and the latter is the read speed. The write speed is always higher than the read speed.

CD-Rs are of two types:

1. **Single session :** A single session CD-R can be used for a single session of recording. The CD is closed after a single session of recording, and the remaining space on the CD becomes un-utilized.

2. **Multi-session :** Multi-session CD-R allows recording possible during multiple sessions resulting in efficient use of space. A multi-session CD-R can be closed after a single session if required.

Some typical CD-R speeds are given below:

- 4X24,
- 8X32,
- 16X32 etc.

The various CD speeds are given below:

For normal CD drives:

16X, 32X, 48X, 52X etc. Format: [read speed]X For CD-R drives:
4X24, 8X32, 16X32 etc. Format:[write speed]X[read speed] For CD-RW:
4X4X24,

8X4X32,
12X10X32 etc.

Format: [write speed]X[re-write speed]X[read speed].

- 1. DVD comes in single layer (SL) or dual layer (DL). They are also distinguished as single sided (SS) or double sided (DS). There are four possible combinations:
    - DVD-S (12 cm, SS/SL): 4.37 GB capacity
    - DVD-9 (12 cm, SS/DL): 7.95 GB capacity
    - DVD-10 (12 cm, DS/SL): 8.74GB capacity
    - DVD-18 (12 cm, DS/DL): 15.90GB capacity.
- Further, DVD-S stores about two hours of video, where as DVD-18 can store up to eight hours of video.
- Storage capacity of DVD: 4.7GB (single-layer) and 8.5GB (dual-layer)
- MS-DEFRAG utility is used to defragment the hard disk, you can run Microsoft defragment utility by issuing a command "DEFRAG".

The storage capacities of various CD/DVDs are as given below:

DVD Type	Side/Layer	Capacity
DVD-5	SS SL	4.7
DVD-9	SS DL	8.54
DVD-10	DS SL	9.4
DVD-14[22]	DS DL/SL	13.24
DVD-18	DS DL	17.08

DS DS (Double Sided Double Layer): DVD offers the highest capacity of 17.08GB. Note that the DVD extension is the value obtained by rounding the capacity to the next integer value.

RAID: RAID is short for Redundant Array of Independent Disks. It is a data storage solution that uses multiple physical hard drives to create a single data volume. The key benefits associated with using RAID are:

- Performance – faster disk read/write operations
- Capacity – enables large single-volume drive storage

- Fault Tolerance – data can be recovered if a disk fails

RAID actually is the way of making the group of all devices together to create bigger drive which is called RAID set. So, the small disks can be appeared as big ones. The RAID types are categorized from 0-5.

RAID (Redundant Array of Inexpensive Disks) details are given below:

- RAID 0: This has striping but no redundancy of data. It offers the best performance but no fault-tolerance.
- RAID 1: This is also known as disk mirroring. It consists of two or more drives that duplicate the storage of data. There is no striping. Read performance is better since either disk can be read at the same time.
- RAID 2: It uses disk striping across disks with some disks storing error checking and correcting (ECC) information. RAID 2 is hardly used because it is expensive and does not provide fault tolerance like other forms of RAID levels.
- RAID 3: It uses disk striping and dedicates one drive to storing parity information. The embedded error checking (ECC) information is used to detect errors.
- RAID 4: Block-level striping with dedicated parity.
- RAID 5: Uses block-level striping with distributed parity. Thus, all read and write operations can be overlapped. RAID-5 stores parity information but not redundant data (but parity information can be used to reconstruct data). RAID 5 requires at least three disks for the array. It's suitable for multi-user systems in which performance is not critical.
- RAID 10: Mirrored disk striping. RAID level 10 is also known as RAID 1+0 because it is a disk striping while mirroring the data written in the stripe. RAID 10 combines the advantages of RAID 1 and RAID 0. Requires a minimum of two disks but will usually have four or more. The system contains at least two mirrored disks that are then striped.

RAID Level 10 requires a minimum of 4 drives to implement. RAID 10 is implemented as a striped array whose segments are RAID 1 arrays. RAID 10 has the same fault tolerance as RAID level 1.
You need to replace the failed disk and see if the RAID builds up. For single disk failures, usually, RAID 10 will heal itself.

S**SD:** SSD, short for Solid-State Drive contains a controller with a firmware that provides more advanced features compared with SD cards. For example, the SSD controller spreads read and write operations over all the memory chips in the solid-state drive, so it's not limited by the speed of an individual chip as much. The controller is almost like a RAID configuration, it uses multiple chips in parallel to speed things up. When you write to a solid-state drive, the drive might actually be writing to twenty different NAND Flash chips at once, whereas writing to an SD card might take twenty times as long as the SD card might only contain a single chip.

A solid-state drive is also typically connected to the computer over a SATA 3, mSATA, or SATA Express interface, which will be faster than the interfaces available to a common flash drive or SD card.

eMMC: eMMC stands for embedded Multi Media Card. An eMMC drive isn't a sophisticated internal drive with speed and features on par with the SSDs you'd find in typical desktops and laptop computers. Instead, it's basically a MMC embedded onto the device's motherboard. Like SD cards, MMC cards and their interfaces are much slower than an SSD. The eMMC is relatively cheaper (compared with SSD) and used where cost is to be minimized. The eMMC device also has a controller that makes the eMMC bootable so it can be used as a system drive inside Android, Windows, and Chrome OS tablets and laptops. However, it doesn't have the firmware, multiple flash memory chips, high-quality hardware, and fast interface that makes a solid-state drive so fast. Just as SD cards are much slower than internal SSDs, eMMC storage is much slower than an SSD drive.

SSHDS(Solid State Hybrid Drives): Some laptops are equipped with hybrid hard disk drives (HHDD), also known as Solid State Hybrid Drives(SSHDs), combine hard drive and solid state storage in a single 2.5" device. They have all parts you can find in a classic HDD and include an SSD module on top of them. The SSHDs are convenient in that you only have one drive to manage and they offer some of the benefits of SSDs.

Software and files you most frequently use, including those required for booting up the operating system itself, are stored on the SSD portion for faster loading. Normal user content is that is less frequently used is stored on the HDD. The files to be stored on SSD and HDD is decided by a sophisticated algo that analyzes the usage pattern.

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CompTIA®A+ Exam Notes : Install Various Types Of CPU'S And Apply Appropriate Cooling Methods

1. PC Hardware

1.8 Install various types of CPUs and apply the appropriate cooling methods.

Socket 1150, also known as LGA1150 and H3, is a Land Grid Array socket with 1150 land contacts, compatible with forth and fifth generation Core desktop processors. Supports only DDR3 memory.

LGA 2011, also called Socket R, is a CPU socket by Intel. It has 2011 pins and supports DDR3 and DDR4 memory chips.

FM2, and FM2+ are used with AMD processors. Socket FM2+ APUs are not compatible with Socket FM2 motherboards.

Hyperthreading: Hyperthreading is an Intel invention for their processor cores that allows the CPU to present the Operating System with two "virtual" CPUs, each with its own set of resources. This new technology allows multiple processing threads to run in parallel on a single chip. The Operating System and associated hardware need to support hyper-threading for using this feature.

When designing a workstation that is used to host a virtual server, you need to consider the following:

- Memory capacity: It is very critical component of a virtual machine. The memory is required to support the host as well as the guest operating systems. More the number of guest OS's, more the memory you need.
- CPU cores: Again, you will need relatively larger CPU capacity for a virtual machine. The CPU cores are shared between the virtual machines, and if you need CPU intensive programs to run on the workstation, you may need multiple CPUs.
- Hard disk capacity: Here also, the hard disk is shared between the virtual machines. If reliability is a critical factor, you need to consider disk arrays like RAID 5.

Note that other factors such as High-end cooling, HDMI output, and specialized GPU may or may not be required, and primarily based on the host OS requirements.

CPU Cooling Types:

Passive CPU Cooling: This type of cooler solely consists of a heatsink. The heat spreader on the CPU makes contact with the heatsink, which draws the heat from the heat spreader to help it dissipate across a larger surface area. To assist the thermal conductivity from the heat spreader to the heatsink, a thermal compound is typically applied on the CPU to ensure proper contact.

Pure passive CPU Coolers (those requiring no airflow at all, like from a case fan) are not recommended for modern CPUs since they do not exchange heat at a high enough rate to keep current CPUs within acceptable operational temperatures.

Active CPU cooling: This type of cooler also consists of a heatsink and fan. Active CPU Coolers come in a variety of shapes, sizes and configurations. Most modern Active CPU Coolers offer heat pipes for faster heat exchange from the heat spreader to the heat sink. When the heat sink fins absorb the heat, the attached fan circulates air over the fins to facilitate faster cooling. A CPU Cooler can still be considered as using active cooling if case fans provide adequate airflow.

Heat Pipe Technology: Heat pipes typically act as a heat conductor throughout heat sinks. Heat pipes are filled with liquid that absorbs heat from the heat spreader, evaporating the liquid, which moves towards the heat sink fins on the other side of the heat pipe. When the heat sink cools the gas, it returns to the heat spreader side of the heat pipe as liquid to repeat the process.

Water Cooling: This type of cooler is an aggressive type of active cooling that uses coolant and a radiator setup. In water cooling configurations, a water block is attached to the CPU heat spreader in a similar fashion as passive or active cooling. The water block is specifically designed to allow coolant to pass through it via two openings. Tubes are attached to those openings to create a closed system with a pump and radiator. The coolant is then cycled

through the system, exchanging heat from the CPU to the radiator. A main advantage to water cooling is the ability to cool other components, like GPUs and hard disks, by adding appropriate water blocks and routing extra tubing to extend the system. Disadvantages include cost, labor and potential for leaks that could destroy the computer system.

Exotic CPU Cooling: Other cooling methods exist, such as thermoelectric cooling, liquid nitrogen/helium, liquid immersion and more. Depending on the solution, electric charges are introduced, special CPU housing must be constructed or specific, non-conductive liquid must be used. Due to the extra cost, labor and potential danger to computer systems, exotic cooling is not recommended for most computer builders.

A computer may reboot because the CPU is overheating. Ensure that you have sufficient ventilation for proper airflow, and that the CPU fan is working.

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CompTIA®A+ Exam Notes : Install A Power Supply Based On Given Specifications

examguides.com/Aplus-Core1/aplus-core1-10.htm

1. PC Hardware

1.9 Install a power supply based on given specifications.

Power Supplies :

1. DC voltages commonly found in a PC:

- +5, and +12 volts are the DC voltages commonly found on PCs. 80386 / 486 operate at +5v
- Pentium and above operate at +3.3v
- Power supply wires - yellow=+12v, blue=-12v, red=+5v, and white=-5v

2. One good way of determining a bad power supply is that the fan will not rotate. Also, the computer will not boot and the LED s indicating the power and disk activity will be OFF.

3. ATX12V 2.0 power supply provides four different voltages

- 3.3Volts, 5Volts, 12Volts and -12Volts. Previous versions of ATX12V used to provide
- -5V, and it has been discontinued in version 2.x.

4. ATX style systems use two power connectors, P8 and P9 to connect to the motherboard. ATX systems use only one P1 connector to connect to the motherboard.

5. Uninterrupted Power Supply (UPS)

An UPS is required for any critical and un-interrupted use of computers. It has the following benefits:

- Provide protection against small surges
- Filters noise from entering the computer
- Provide power to the computer during line power failure
- Give stable power to computer, even when the line power is unstable

Note that the UPS can give un-interrupted power only for a fixed amount of time under a given load, in the absence of line voltage.

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CompTIA®A+ Exam Notes : Compare And Contrast Types Of Display Devices And Their Features

examguides.com/Aplus-Core1/aplus-core1-11.htm

1. PC Hardware

1.10 Compare and contrast types of display devices and their features.

1. When you are installing a different SVGA monitor, it is unlikely that the new monitor has the same capabilities as the old one. As a result, the image on the screen may not be readable. In such instances, change the video resolution to Standard VGA before installing the new monitor. You can change the resolution appropriately after the image on the screen is readable with the new monitor. It may also be necessary to load appropriate device driver, if you are installing a different display adapter.

2. If the LCD screen changes colors, like turning green and then blue or red, it is likely that you have a cable problem. First check the monitor cable whether it is loose. Then try to twist the monitor and see if there is any problem. If the problem occurs, it may be necessary to replace the LCD monitor cable.

3. You need more brightness when a projector is used in environment where there is plenty of light in the room. Higher lumens provide more brightness, but more expensive.

4. TFT LCDs, also known as "active matrix", were developed as a variant of LCD. TFT LCDs improved the color, contrast and response times of passive matrix LCDs. FT LCD stands for "Thin Film Transistor" and "Liquid Crystal Display".

5. The two most common types of TFT LCDs are IPS TFT LCD and TN TFT LCD. TN generally has a faster response time, which provides better entertainment experiences for watching sports or gaming, but IPS was designed to solve TN display flaws, such as a poor viewing angle and low-quality color reproduction.

6. LCD display can't be viewed by itself. It requires back lighting, just like your digital watch requires a back light to view the time. At present, there are two main methods of backlighting in LCD flat-panels: Cold-Cathode Fluorescent Lamp (CCFL) and LED (light-emitting diode). LCD with CCFL back lighting were widely used in TVs and computer monitors. However, they are becoming obsolete these days. LCD with LED back lighting is widely used in TVs and computer monitors. Now a days. LED back lighting is most popular as it requires less power, and lasts longer. Note that the back lighting technologies should not be confused with LCD display technologies. The popular term LED TV is a bit misleading as it is actually an LCD TV, but with LED back lighting instead of CCFL.

7. Plasma display is entirely a different technology when compared with LCD. In plasma display each pixel on the screen is illuminated by a tiny bit of plasma or charged gas, somewhat like a tiny neon light. Plasma displays offer high refresh times, better viewing angles and color schemes when compared with LCD displays. However, they consume more power, and bulkier.

Some of the most widely known LCD panel types are:

1. TN (Twisted Nematic): The advantages of these panels are low manufacturing cost and a relatively high level of responsiveness; the pixels change their state quickly which helps make moving images appear smoother. Some Twisted Nematic displays have double the usual refresh rate (120Hz instead of 60Hz) allowing them to take advantage of 'active 3D shutter' technologies and allowing them to display twice as much information every second for a smoother gaming experience. Even 144Hz refresh rates have become possible using this technology.

2. VA panels (Vertical Alignment panels): These panels are more like TN panels, the main advantage is its efficiency at blocking light from the backlight when it's not wanted. This gives deeper blacks and higher contrast ratios of around 2000:1 - 5000:1 Another key advantage of VA is the improved viewing angles and colour reproduction compared to TN. The main disadvantage is its slow responsiveness.

3. IPS and PLS: IPS is short for In-Plane Switching is a technology developed chiefly by LG Display, PLS (Plane to Line Switching) technology by Samsung and AHVA by AUO. These are sometimes simply referred to collectively as 'IPS-type' panels. The main advantage is their superior colour accuracy, consistency and viewing angles when compared to the other LCD technologies. Usually, you can get contrast ratios of 1:1000 on these panels.

CompTIA®A+ Exam Notes : Install And Configure Common Computer Peripheral Devices

examguides.com/Aplus-Core1/aplus-core1-12.htm

1. PC Hardware

1.11 Install and configure common peripheral devices

A **KVM switch (short for Keyboard, Video or Visual Display Unit, Mouse)** is a hardware device that allows a user to control multiple computers from a single keyboard, video monitor and mouse. A KVM module typically consists of a video port (VGA), mouse and keyboard ports (USB). PS/2 ports for mouse/keyboard are rarely used these days, and hence not provided usually.

If you are getting a keyboard error, you need to do one of the following things:

1. Check if the keyboard needs to be cleaned

2. Check if the keyboard cable has become loose

3. Check if one or more of the keys are stuck

4. If required, replace the keyboard.

The 'native resolution' specification points out one of the big differences between LCD and CRT displays. If you run an LCD at any resolution other than its native resolution, the display will become blurry, especially with text. The reason this happens on LCDs is that they are made up of tiny cells in a matrix (called the native resolution). For instance, if the

native resolution is listed as 1280X1024, then there are 1280 cells across and 1024 cells down the screen. If you only display at 1024X768, then a large number of the pixels are being 'stretched' over multiple cells, which is what causes the image quality to degrade.

The SPDF - Sony/Phillips Digital Interface is designed to transfer digital signals between devices without degrading the signal by converting it to analog. This preserves the quality of the signal delivered to digital recording and playback devices.

TWAIN: A scanner driver is usually called TWAIN. The Twain driver will always have another name, for example, Microtek calls theirs ScanWizard, and HP calls it as DeskScan or Precision Scan. The TWAIN driver comes with the scanner, and knows how to operate this one brand of scanner hardware. Each scanner manufacturer provides their own TWAIN driver for their hardware.

Blu-ray drives are usually compatible with CD/DVD drives, but not the other way round.

There are two important varieties: These are

1. BD-R and
2. BD-RE

1. Blu-ray Disc Recordable(or BD-R): BD-R refers to two direct to disc optical disc recording technologies that can be recorded on to an optical disc with an optical disc recorder. BD-R discs can be written to once.

2. BD-RE (Blu-ray Disc Recordable Erasable): BD-RE can be erased and re-recorded multiple times.

Storage capacity of blu-ray: 25GB (single-layer) 50GB (dual-layer)

Storage capacity of DVD: 4.7GB (single-layer) 8.5GB (dual-layer)

Video Graphics Array(VGA): VGA is one of the oldest connection standards which can still be found in large areas of computing equipment. It was widely used for video cards, TV sets,computer monitors, and laptops.

HDMI: HDMI is often found on modern televisions, but is also on most newer PC monitors, and is swiftly becoming required hardware on most laptops. HDMI is a digital standard, meaning the connection is either on (1) or off (0). The quality of the cable, the distance from the machine to the monitor and the type of metal in the connector are all virtually irrelevant (so don't pay a whole lot for your HDMI cable!) . HDMI handles sound as well as video, so a monitor with a headphone jack and an HDMI cable can output sound from your laptop. HDMI looks like the middle graphic.

Barcode reader: Barcode reader used to read and input code to identify the product.

Scanner: Scanner is a device that scans images, printed text, and handwriting etc and converts it to digital form or image. It is so named because the data is converted one line at a time or scanned down the page as the scanning head moves down the page.

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CompTIA®A+ Exam Notes : Various Types Of Print Technologies And The Associated Imaging

1. PC Hardware

1.12 Compare and contrast differences between the various print technologies and the associated imaging

Printers are commonly used output devices that produce a hard copy of document stored in electronic form, i.e they put information from computer on to paper.

There are various kinds of printers available today like Impact printers, Bubble-jet printers, Laser printers, Thermal printers etc.

1. **Impact printers** are among the old printing technologies, which make use of inked ribbon to make an imprint on the paper. Impact printers are considered noisy when compared to other printers.

The most commonly known impact printers are Daisy-Wheel Printers and Dot-Matrix Printers

2. **InkJet** is the generic name given for contactless printing using ink. BubbleJet and DeskJet are the names of Cannon and HP InkJet printers respectively.

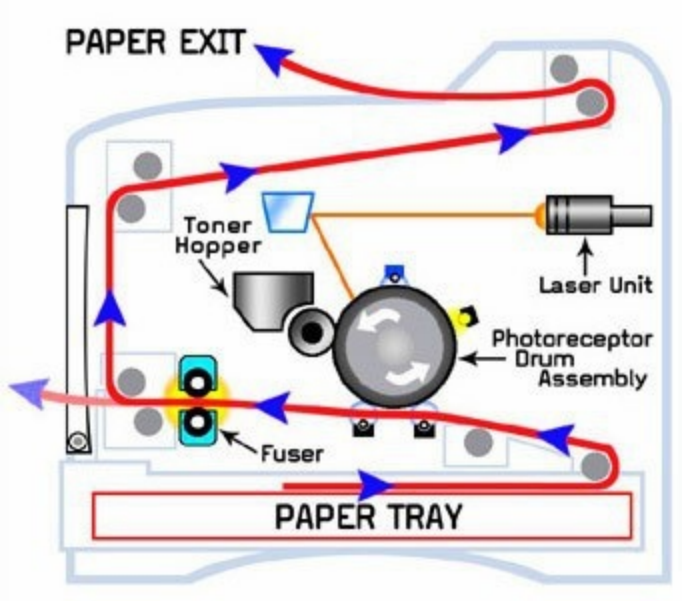
3. Laser printer : Laser printers are used for high volume work. They are available in black and colour. Toner (powdered ink) is used instead of liquid ink as in inkjet printers. These operate in a similar manner to a photocopier. Laser printers produce images using dots. The image is created using a laser beam and a mirror - lens arrangement on a drum which is coated with magnetically charged toner and then transferred from the drum to the paper. The paper is then fed through a heated fuser which fuses the toner to the paper as ink.

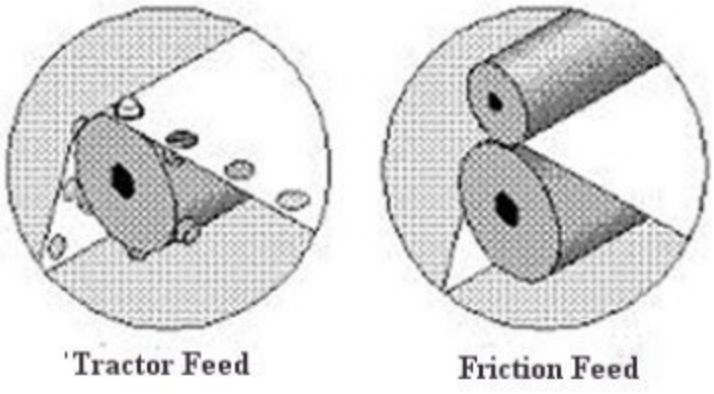
There are two important types of paper feed mechanisms. These are:

1. Tractor-feed printers have two sprocketed wheels on either side of the printer that fit into holes in the paper. As the wheels revolve, the paper is pulled through the printer. Tractor feed is also called pin feed. It is most commonly used with line printers that use paper with perforation on either end of the paper. Usually, the paper roll is continuously fed to the printer. Other names for tractor-feed stationery include fan-fold paper, sprocket feed paper, and pin feed paper.

2. Friction-feed printers use rollers to squeeze a sheet of paper and pull it through the printer. The rollers are usually made of plastic or hard rubber. It is most commonly used with laser and inkjet printers.

The figure below shows the two types of feeds, commonly used in printers.





2. Impact printers

- Impact printers are capable of printing multipart forms, since they can give necessary impact to print to multiple forms simultaneously.
- ECP (Extended Capability Port) has less control overhead and best suited for transferring large chunks of data, such as between the computer and laser printer.

3. InkJet Printers

InkJet Printers is the generic name given for contact less printing using ink. Friction feed is most commonly used with laser printers, and Inkjet printers. One needs to check the calibration for the inkject printer if it is not printing properly. If it doesn't help, then check the ink cartridge if it requires replacement.

4. Thermal printers

Thermal printers require a special kind of paper, called thermal paper. This paper is sensitive to heat, and the printing is produced by thermal heat applied on the paper by the print head.

1. Printer parallel ports come in the following varieties

- Unidirectional: Here, the data travels only from the computer to the peripheral (printer) device.

- Bi-directional: Here, the data travels both from the computer to the peripheral device and vice-versa.
- ECP (Extended Capability Port): ECP mode offers bi-directional data transfer, as well as DMA for data transfer.
- EPP (Enhanced Parallel Port): In addition to bi-directional features, it offers an extended control code set.
- The port that a printer is using can be found by going to Control Panel -> Printers and right click on appropriate printer. Choose Ports tab to view the port (like COM1, COM2, USB001, etc.) that the printer is using.

2. Cable lengths

- Serial cable maximum length is 50 feet.
- Parallel cable maximum length is 10 feet
- Longer cable lengths may lead to some errors & garbage characters.

3. RJ - cables

- 1. RJ-11: These connectors are used to link modem / phone to the phone line. They have only two pins that get into the modem.
- 2. RJ-14: RJ-14 connectors are dual-line phone jacks that can accommodate up to 2 telephone line.
- 3. RJ-45: RJ-45 cable is widely used for attaching UTP cable in LAN environment. These connectors have eight pins.
- 4. The widely used interface cables have the following pin count:
    - floppy-34 pin
    - IDE-40 pin
    - SCSI-50 pin
    - SCSI Ultra wide-68 pin

4. **Ultra IDE** cable has 80 wires, and handles better speeds compared to IDE cable with 40 wires. The additional wires are introduced to reduce noise and thereby improving speed.

5. T**hin co-axial and thick co-axial cables:** They have conductive grounding sheath surrounding the center conductor. Therefore, the electromagnetic interference (EMI) is significantly less.

6. **Cat 6 cabling** is recommended for Gigabit Ethernet networking.

7. **Centronics cable** used for parallel printing will have a male DB-25 connector at one end and a female 36 pin connector at the other end.

8. **The default spool folder** is located at: Systemroot\System32\spool\printers. For example, if the OS is residing on C drive, the default location will be: "C:\\Windows\System32\spool\printers".You can access this location through: Start -> Printers -> File -> Server Properties -> Advanced tab. Type in the new spool location over the default location.

Following are true about printers

- While connecting a printer using USB if Operating System is not recognizing the USB port you need to make sure that the USB interface is enabled in the BIOS.
- When a printer is installed on a network, default printer permissions are assigned that allow all users to print. Because the printer is available to all users on the network, you might want to limit access for some users by assigning specific printer permissions. For example, you could give all non-executive users in a department the Print permission and give all managers the Print and Manage Documents permissions. You can also deny print permission to all others. In this way, all non-executive users and managers can print documents, but managers can also change the print status of any document sent to the printer.
- If you share a printer with users running other versions of Windows (Windows 98, XP, Vista, etc), you can install additional printer drivers on your computer so those users can connect to your printer without being prompted to install the drivers missing from their systems. 13. Scanner installation process is much like a print device. Because so many of these now are USB, plugging them in will install the driver. In cases where that does not work (usually when it is a very new model and the operating system is older), use the installation disc to install the driver. Monitors, speakers, and projectors normally do not require a driver to perform.
- A scanner driver is usually called TWAIN. The Twain driver will always have another name, for example, Microtek calls theirs ScanWizard, and HP calls it as DeskScan or PrecisionScan. The TWAIN driver comes with the scanner, and knows how to operate this one brand of scanner hardware. Each scanner manufacturer provides their own TWAIN driver for their hardware.

- In Windows 7 Operating System, most printers and other peripheral devices are automatically detected and drivers are installed. Therefore, first you must see if the OS itself recognizes the device and installs the drivers. If you are prompted to locate the driver, the browse to the driver location and direct the installation.

Following are the best ways to reduce printer paper jam issues

- Loosen the sheets
- Sheets should not be overloaded
- Alignment of sliders and tray
- Keep the printer clean
- Keep the toner in good condition

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CompTIA®A+ Exam Notes : Select The Appropriate Components For A Custom PC

examguides.com/Aplus-Core1/aplus-core1-14.htm

1. PC Hardware

1.13 Given a scenario, select the appropriate components for a custom PC

1. 32-bit Operating systems (especially, workstation Operating Systems such as XP) usually support only up to 4GB of memory due to address bus limitation. It is recommended to go for 64-bit operating

2. system if you want to use more than 4 GB of memory. 2. SLI technology is designed for PCI Express and not AGP. This new bus has superior bandwidth (two to four times AGP 8X), support for isochronous data transport, and the capability to drive multiple highspeed graphics devices like running video games.

3. Computers used for graphic design, computer-aided design (CAD) applications, and computer-aided manufacturing (CAM) require much more horsepower than the standard PC. Specifically, they require multiple or more powerful processors, more robust video cards, and significantly more memory.

4. SATA hard disks may be used for building RAID arrays.

5. Dynamic disks are not supported in portable computers and on external USB devices. The primary reason being that dynamic disks are used for enabling RAID configuration or back configuration, which requires two or more disks to be present. Usually, portable computers

and USB hard disk drives come with single hard drive

6. RAID Level 10 requires a minimum of 4 drives to implement. RAID 10 is implemented as a striped array whose segments are RAID 1 arrays. RAID 10 has the same fault tolerance as RAID level 1. If a disk fails replace the failed disk and see if the RAID builds up. For single disk failures, usually, RAID 10 heals itself.

7. The hardware on the machine must have enough memory, hard drive space, and processor capability to support the virtualization. You also need the software to make virtualization possible.

8. Home Server: Important features of a Home Server are given below:

- Centralized backup: Backup individual computers at a central location.
- Health monitoring: Monitor health of individual computers
- File sharing: Enables file sharing over the home network
- Printer sharing: Enables printer sharing over the network
- Remote access gateway : Allows remote access to any connected PC on the network, including the server itself, over the Internet.
- Media streaming: Can stream media to an Xbox 360 or other devices supporting Windows Media Connect.
- Selective data redundancy: Guards against a single drive failure by duplicating selected data across multiple drives.
- Expandable storage: Provides a unified single and easily expandable storage space, removing the need for drive letters.
- Server backup: Backs up files which are stored within shared folders on the server to an external hard drive.

9. Sticky Keys is designed for people who have difficulty in holding down two or more keys at a time. When a shortcut requires a key combination such as Ctrl+P, StickyKeys allows you to press one key at a time instead of pressing them simultaneously.

10. Character Map: You can use Character Map to copy and paste special characters into your documents, such as the trademark symbol, special mathematical characters, or a character from the character set of another language.

11. Pointer trails can help people who struggle to track the movement of the pointer on both modern TFT screens and traditional 'tube' CRT screens.

12. A screen magnifier is software that interfaces with a computer's graphical output to present enlarged screen content.

13. When discussing thin and thick clients, you should understand that a thick client is a PC that has all the capabilities of a standard PC. It runs all applications locally from its own hard drive. A thin client is one that has minimal capabilities and runs the from a remote server

14. Wake-On-Lan requires a few settings as below:

- An ATX motherboard with an onboard, 3-pin "WOL" connector and ATX power supply.
- A network card that can support WOL with its cable to the motherboard properly installed.
- In the BIOS Power Management, you must enable the LAN Wakeup option.
- Then take a look at your network card settings, (right click mouse on "My Computer" icon on your desktop, select Manage -> "Device Manager") in "Device Manager" open properties of your "Network Card" and select "Power Management" tab. You need to check appropriate boxes enabling the Network Card to bring the computer out of standby.

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CompTIA®A+ Exam Notes : Identify The Various Types Of Network Cables And Connectors

examguides.com/Aplus-Core1/aplus-core1-15.htm

2. Networking

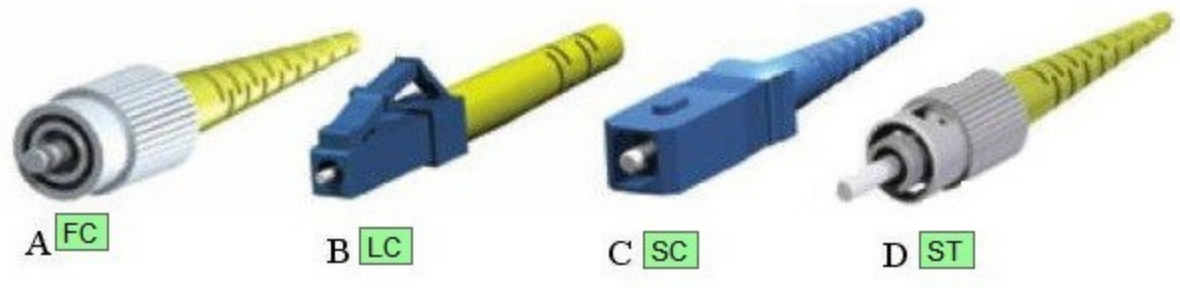
2.1 Identify the various types of network cables and connectors.

The connector types commonly used for Fiber Optic networking are SC,ST, or MIC connectors. IDC/UDC is used in Token Ring networks. RJ-45, BNC connectors are commonly used in Ethernet networking.

1. Straight Tip (ST) connectors are the most common type of commercial fiber optic connector. These connectors utilize an exposed plastic tube housing the optical fiber. This requires a connection to a matching cable on the other side, incorporating a connector that mates to the other. These combine in a spring-loaded twist, reminiscent of BNC connectors, and are noted for their reliability.

2. Subscriber Connector (SC): have the ferrule that houses the fiber mostly concealed. Probably the most similar commercial equivalent of To slink, SC connectors does not require a mating cable on the other side. Instead, these snap-on connectors simply push into their jacks with a click.

3. FC connector: is similar to ST connectors, these fiber optic connector's screws into their mating jacks. Additionally, the tube surrounding the optical fiber is typically shrouded in ceramic or metal, as opposed to being fully exposed. The inner ring of the connector is keyed to ensure positive mating to its corresponding jack.

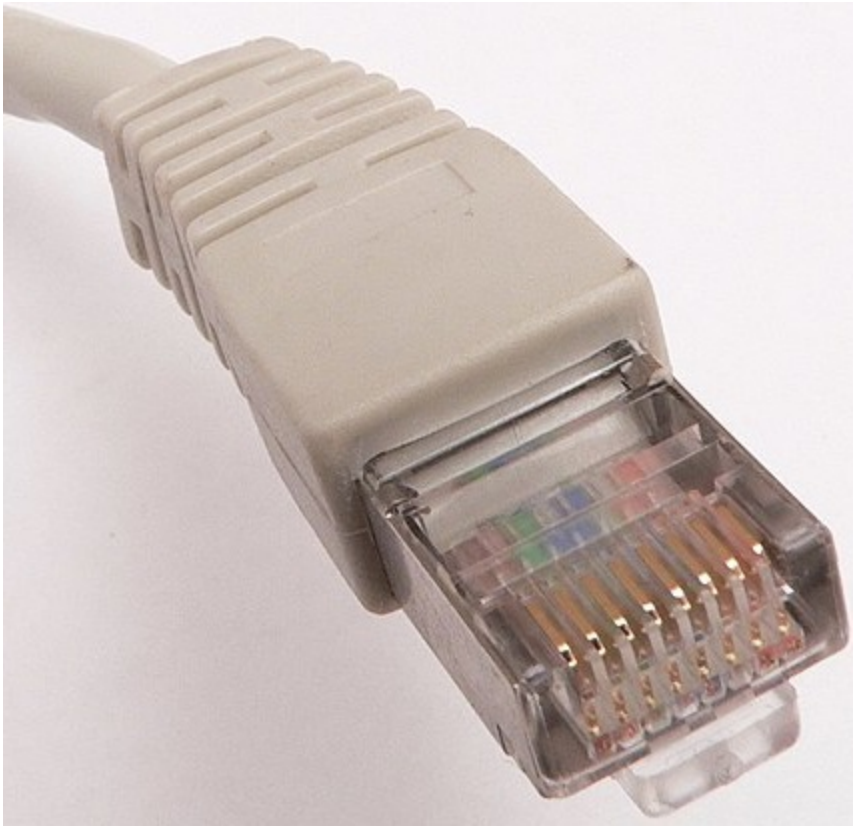


4. Lucent Connector(LC): LC cables latch release into their jacks in a manner similar to Ethernet connectors. Smaller in form than SC connectors, their durability is not compromised, nor is cost increased. Instead of snapping or thermo forming the connector to the cable, it is glued. This makes it a popular connector for field use.

1. RJ-11 (Registered Jack): Standard telephone cable connectors, RJ-11 has 4 wires (and RJ-12 has 6 wires). RJ-11 is the acronym for Registered Jack-11, a four- or six-wire connector primarily used to connect telephone equipment.

2. RJ -14: RJ-14 connectors are dual-line phone jacks that can accommodate up to two phone lines.

3. RJ -45: The "RJ" in RJ45 stands for "registered jack," since it is a standardized networking interface. The "45" simply refers to the number of the interface standard. RJ -45 cable is widely used for attaching UTP cable in LAN environment. RJ45 is a type of connector commonly used for Ethernet networking.



These connectors have eight pins. RJ45 cables can be wired in two different ways. One version is called T-568A and the other is T-568B. These wiring standards are listed below:

T568A and T568B: T568A and T568B are the two color codes used for wiring eight-position RJ45 modular plugs. Both are allowed under the ANSI/TIA/EIA wiring standards. The only difference between the two color codes is that the orange and green pairs are interchanged.

Color codes are provided on some motherboards to ensure that a technician identify LIKE memory slots to insert memory sticks.

The fig. below shows the color codes used in T568A and T568B

Coaxial cables: Coaxial cables are high-frequency transmission cables made up of a single solid-copper core. Data is transferred electrically over the inner conductor and has 80 times more transmission capacity than twisted pair cables. This type of cable is commonly used to deliver TV signals (its higher bandwidth makes it more suitable for video applications) and to connect computers in a network. Along with stable transmission of data, coaxial cables also have anti-jamming capabilities and can effectively protect signals from being interfered. The cost is slightly higher than twisted pair but still considered more economical than fiber.

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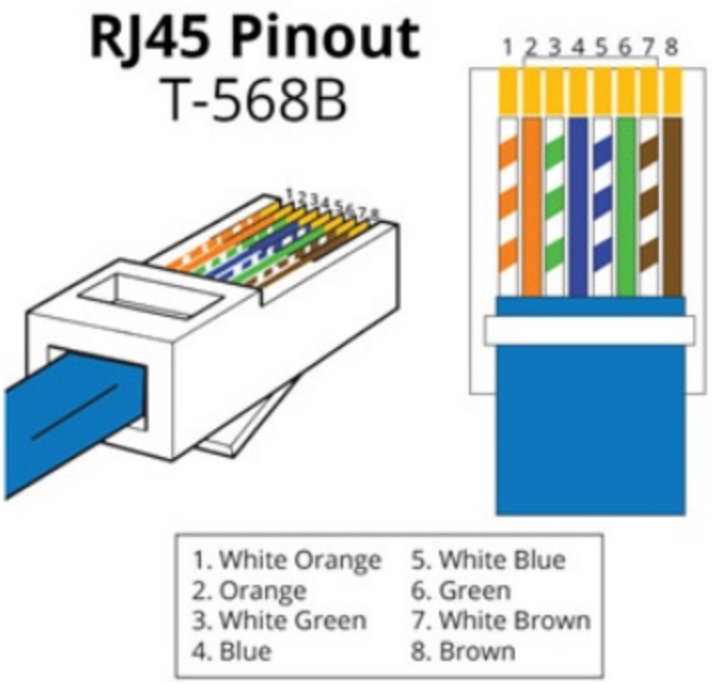


CompTIA®A+ Exam Notes : Compare And Contrast The Characteristics Of Connectors And Cabling

2. Networking

2.2 Compare and contrast the characteristics of connectors and cabling.

Thin co-axial and thick co-axial cables have conductive grounding sheath surrounding the center conductor. Therefore, the electromagnetic interference (EMI) is significantly less.

Fiber optic cabling is immune to crosstalk and other electrical interference because optical fiber does not conduct electricity and uses light signals in a glass fiber, rather than electrical signals along a metallic conductor to transmit data. So it cannot produce a magnetic field and thus is immune to EMI.

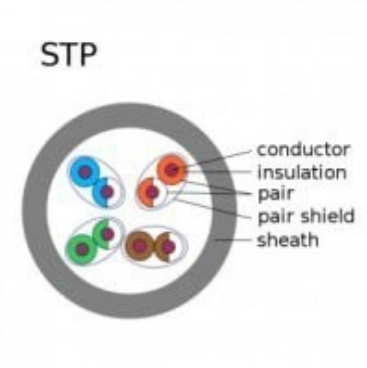
In twisted pair cable, the noise introduced into the twisted pair wire is canceled as the electrical signals pass through the wire. However, it is not possible to reduce the electrical interference totally in a TP wire .Instead of transferring data over copper wires, these cables contain optical fibers that transmit data via light, rather than pulses of electricity. Each optical fiber is individually coated with plastic layers and contained in a protective tube, making it extremely resistant to external interference.

Twisted Pair cable Types:

STP stands for Shielded Twisted Pair and UTP stands for Unshielded Twisted Pair.

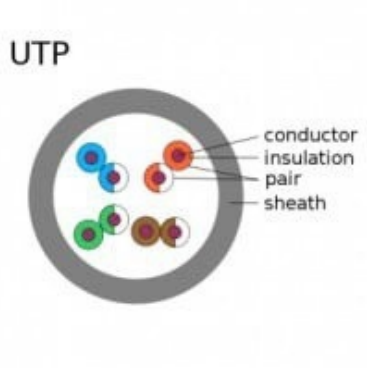
Shielded Twisted Pair (STP)cables reduce electrical noise and electromagnetic radiation. In other words, they help to keep the signal steady, and reduce interference with other devices. Given below is a diagram showing a typical shielded twisted pair cable

Unshielded Twisted Pair (UTP)cables do not have shielding to reduce interference. They are designed to cancel electromagnetic interference with the way the pairs are twisted inside the cable. Unshielded twisted cables are most widely used for office LANs, though recently wireless LANs are more widely used. Unshielded cables are lightweight, thin and flexible. They are also versatile and inexpensive. A typical UTP cable cross section is shown in the figure below:



Comparison between STP and UTP

1. Physical: The only difference between the STP and UTP cable is the additional shielding material used in STP cables. The shielding covers the full length of the cable and protects it from any external interference.



2. Cost: Due to the additional material used in a STP cable, it costs more than the UTP cable.

3. Considerations: While using STP cable will yield maximum bandwidth despite external conditions, the shielding makes the cable heavier and more difficult to bend.

4. Use: UTP cable typically is used in homes and offices. Some large businesses also use the cable because it is cheaper. Large companies that require maximum bandwidth typically use STP cable. STP cable is used outside to better deal with the elements and equipment that may degrade bandwidth quality.

The various wiring schemes for UTP

	CAT3	CAT5	CAT5e	CAT6	CAT6e	CAT7
Speed	16 Mbps	100 Mbps	1000 Mbps	10/100/1000Mbps and 10 Gbps	10/100/1000Mbps and 10 Gbps	10/100/1000Mbps and 10 Gbps
Limitation	Ineffective for Higher – speed networks often found in older 10BaseT networks	Range of 100 meters	Range of 100 meters	Range of 100 meters	Range of 100 meters	Range of 100 meters

For connecting to an Ethernet LAN, you need an RJ-45 connector at the network end of the cable. The maximum allowed length of the cable for 1000BaseT Gigabit Ethernet is 100 meters (without repeater)

Category 3: **Used in 10BASE-T networks. Can transmit data at speeds up to 10 Mbps.**

Category 5: Can transmit data at speeds up to 100 Mbps. Widely used in 100Base-T Ethernet networks.

Category 5e: Used in networks running at speeds up to 1000 Mbps (1 gigabit per second [Gbps]). The Cat-5e cable may be used in 1000BaseT Ethernet network. Both Cat -5 and 5e are almost same, except for better noise (cross talk, etc.) specs associated with 5e. Cat 5e or better cable type is used for Gigabit Ethernet network cabling. Cat5e cable contains four twisted pairs of wires for Gigabit Ethernet.

Category 6: Category 6 cable, commonly referred to as Cat-6, is a cable standard for Gigabit Ethernet and other network protocols that is backward compatible with the Category 5/5e and Category 3 cable standards. The cable contains four twisted copper wire pairs. This is same as CAT5 and CAT5e copper cable standards. The cable standard is suitable for 10BASE -T / 100BASE-TX and 1000BASE -T / 1000BASE-TX (Gigabit Ethernet).

Category 7: The Category 7 cable standard has been created to allow 10 Gigabit Ethernet over 100 m of copper cabling. CAT 7 is backwards compatible with traditional Cat5 and Cat6 Ethernet. Cat7 offers strict specifications for crosstalk and system noise than Cat6. Shielding has been added for individual wire pairs on the Category 7 cable. Cat7 has been designed as a standard for Gigabit Ethernet over 100m of copper cabling. The cable contains four twisted copper wire pairs, just like the earlier standards.

CAT5e is sufficient and can also handle gig Ethernet, but noise margin will be less.
CAT6 is rated for gigabit Ethernet while CAT6e is thicker and rated for 10 gig Ethernet. Typically

Note:

- RJ-11 connector has only two pairs of wires, and normally used for connecting telephones.
- IEEE 1394 cabling consists of shielded cable pairs. There are 4 and 6 wire versions of this cable type, known as STP, used in IEEE1394 connections.
- IEEE 1394, High Performance Serial Bus, is an electronics standard for connecting devices to personal computer. IEEE 1394 provides a single plug-and-socket connection on which up to 63 devices can be attached with data transfer speeds up to 400Mbps(megabits per second).
- FireWire is Apple's name for the IEEE 1394 High Speed Serial Bus.
- A standard FireWire connection will support 100,200 and 400 Mbps. The important features of IEEE1394 (also known as FireWire 400) are:

1. 100 Mbit/s, 200Mbit/s, and 400Mbit/s supported.

2. Works without control, devices communicate peer-to-peer.

3. Cable up to 4.5 m.

4. Up to 63 devices supported.

5. Power supply to external devices is 1.25A/12V (max.).

6. The only computer bus used in digital video cameras.

Power over Ethernet or PoE: PoE technology describes a system to pass electrical power safely, along with data, on Ethernet cabling. The IEEE standard for PoE requires category 5 cable or higher for high power levels, but can operate with category 3 cable if less power is required.

System Preparation(Sysprep): System Preparation tool prepares an installation of Windows for duplication, auditing, and customer delivery. Duplication, also called imaging, enables you to capture a customized Windows image that you can reuse throughout an organization. Audit mode enables you to add additional device drivers or applications to a Windows installation. After you install the additional drivers and applications, you can test the integrity of the Windows installation. Sysprep also enables you to prepare an image to be delivered to a customer. When the customer boots Windows, Windows Welcome starts.

RG-6 and RG-59: RG-6 may be used for both analog and digital television transmission.

RG-59 is a specific type of coaxial cable, often used for low-power video and RF signal connections

Comparison between RG-6 and RG-59

1. RG6 cable has a thicker conductor than the RG59

2. RG6 cable has better insulation than the RG59

3. RG6 can carry signals of much higher frequencies than the RG59

4. RG6 has much lower signal losses compared to the RG59

5. RG6 cable may not operate below 50Mhz while the RG59 can

6. RG6 is better for satellite signals while RG59 is better for video signals

7. RG6 cables cost more than RG59

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CompTIA®A+ Exam Notes : Explain The Properties And Characteristics Of Tcp/ip

2. Networking

2.3 Explain the properties and characteristics of TCP/IP.

Subnet Masking: Like IP addresses, a subnet mask contains four bytes (32 bits) and is often written using the same "dotted-decimal" notation.

A subnet mask is different from an IP address, and it doesn't exist independently from the IP address. Instead, subnet masks accompany an IP address and the two values work together. Applying the subnet mask to an IP address splits the address into two parts, an "extended network address" and a host address. If we don't specify a subnet along with an IP address, usually the default subnet mask is assumed.

The default subnet masks for various classes of IP addresses are given below:

Class A: 255.0.0.0

Class B: 255.255.0.0

Class C: 255.255.255.0

The IP address and default gateway on a computer should be in the same network (or subnet). By following this rule one of the two given addresses (200.122.21.1 or 200.122.21.255) is a default gateway. However, the address 200.122.21.255 is a broadcast address and could not qualify for a default gateway. That leaves us with only one option.

An IP address is considered private if the IP number falls within one of the IP address ranges reserved for private uses by Internet standards groups. These private IP address ranges exist:

10.0.0.0 through 10.255.255.255

172.16.0.0 through 172.31.255.255

192.168.0.0 through 192.168.255.255

Private IP addresses are typically used on local networks including home, school and business LANs including airports and hotels.

For accessing the Internet using static IP addressing, you need to configure the IP address, subnet mask, default gateway (if required by the ISP), and DNS server information.

APIPA: APIPA stands for Automatic Private IP Addressing. A feature of Microsoft Windows, APIPA is a DHCP failover mechanism. With APIPA, DHCP clients can obtain IP addresses when DHCP servers are nonfunctional. APIPA exists in all popular versions of Windows except Windows NT.

IPv4 vs IPv6: An IP address is binary numbers but can be stored as text for human readers. For example, a 32-bit numeric address (IPv4) is written in decimal as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address.

Pv6 addresses are 128-bit IP address written in hexadecimal and separated by colons. An example IPv6 address could be written like this: 3ffe:1900:4545:3:200:f8ff:fe21:67cf.

TCP and UDP ports, protocols and their purpose. Some important port numbers are as given below

21 - FTP (File Transfer Protocol)

22 - SSH (Secure Shell)

25 - SMTP (Simple Mail Transfer Protocol)

80 - HTTP (Hypertext Transfer Protocol)/WWW

143 - IMAP (Internet Message Access Protocol

443 - HTTPS (Hyper Text Transfer Protocol Secure)

137-139 NetBIOS/NetBT

445 - SMB/CIFS (Server Message Block /Common Internet File System) 427 - SLP (Service Location Protocol)

548 - AFP (Apple Filing Protocol)

Hyper Text Transfer Protocol Secure (HTTPS): HTTPS is the secure version of HTTP, the protocol over which data is sent between your browser and the website that you are connected to. The 'S' at the end of HTTPS stands for 'Secure'. It means all communications between your browser and the website are encrypted. HTTPS is often used to protect highly confidential online transactions like online banking and online shopping order forms.

Web browsers: Web browsers such as Internet Explorer, Firefox and Chrome also display a padlock icon in the address bar to visually indicate that a HTTPS connection is in effect.

SMTP: SMTP stands for Simple Mail Transfer Protocol. SMTP is used when email is delivered from an email client, such as Outlook Express, to an email server or when email is delivered from one email server to another. SMTP uses port 25.SMTP is used to upload mail to the mail server.

POP3: POP3 stands for Post Office Protocol. POP3 allows an email client to download an email from an email server. The POP3 protocol is simple and does not offer many features except for download. Its design assumes that the email client downloads all available email from the server, deletes them from the server and then disconnects. POP3 normally uses port 110. POP3 is used for downloading mail from a mail server to a client machine running POP3 client. SMTP can be used to upload mail over Internet to a Mail server. Note that POP3 is used to read email.

IMAP: IMAP stands for Internet Message Access Protocol. IMAP shares many similar features with POP3. It is a protocol that an email client can use to download email from an email server. However, IMAP includes many more features than POP3. The IMAP protocol is designed to let users keep their email on the server. IMAP requires more disk space on the server and more CPU resources than POP3, as all emails are stored on the server. IMAP normally uses port 143.

Domain Name System (DNS): DNS translates Internet domain and host names to IP addresses. On the Internet, DNS automatically converts between the names we type in our Web browser address bar to the IP addresses of Web servers hosting those sites. Larger corporations also use DNS to manage their own company intranet. Home networks use DNS when accessing the Internet.

FTP(File Transfer Protocol): FTP is used for uploading and downloading files from a server. You can use FTP to access your files which are hosted on your company server or Internet. Uses port 21. Filezilla is a well known FTP client software. Note that the server must be running FTP server daemon to transfer files to a client computer. It is used in a client/server configuration to transfer files. It can operate in active or passive mode and uses TCP to control the connection. In active mode, the connection is initiated by the client. It informs the server about which port it intends to use to receive data. In active mode (although port 21 is used for command and control) the data will be sent out on port 20 which serves as the FTP servers data port. FTP is a client-server protocol that is used for transfering files between a client and a remote host computer on a TCP/IP network. FTP (File Transfer Protocol) is used for uploading and downloading files from a server. You can use FTP to access your files which are hosted on your company server or Internet. Uses port 21. Filezilla is a well known FTP client software. Note that the server must be running FTP server daemon to transfer files to a client computer.

Telnet: Telnet is a protocol that allows you to connect to remote computers (called hosts) over a TCP/IP network (such as the Internet). Using telnet client software on your computer, you can make a connection to a telnet server (i.e., the remote host). Once your telnet client establishes a connection to the remote host, your client becomes a virtual terminal, allowing you to communicate with the remote host from your computer. Usually, telnet requires you to login to the remote system, which means that your system administrator had configured your login username and password on the remote host already.

Router: A router for Internet sharing is normally configured using web browser. High-end routers may provide option for terminal connectivity, where in you can connect a terminal, and issue commands for configuring the router.

MAC filtering(Media Access Control): Filtering refers to a security access control method where an address is assigned to each network card that's used to determine access to the network.

DHCP (Dynamic Host Configuration Protocol): A network protocol that enables a server to automatically assign an IP address to a computer from a defined range of numbers

SMTP (Simple Mail Transport Protocol): The SMTP uses TCP port 25 for internet mail transmission. It is an internet standard protocol.

Secure Shell(SSH): SSH is a cryptographic remote login protocol for secure data communication over an unsecured network. Designed as a replacement for telnet and rlogin, which send information in plaintext, SSH client and server programs provide strong host-to-host and user authentication as well as a number of securely encrypted methods of communication to provide confidentiality and integrity of data. SSH supports data stream compression between the client and the server.

LDAP (Lightweight Directory Access Protocol): LDAP is a directory service protocol that runs on a layer above the TCP/IP stack. It provides a mechanism used to connect to, search, and modify Internet directories. The LDAP directory service is based on a client-server model. The function of LDAP is to enable access to an existing directory.

SMB (Server Message Block Protocol): The Server Message Block Protocol is a client-server communication protocol used for sharing access to files, printers, serial ports and other resources on a network. SMB is the native Windows network file sharing protocol is the preferred protocol for Windows clients.

AFP(Apple File Protocol): The Apple Filing Protocol formerly AppleTalk Filing Protocol, is a proprietary network protocol that offers file services for Mac OS X and original Mac OS. AFP is the protocol for all Mac clients through OS X 10.8, SMB is the standard for Windows clients, and NFS is perfect between UNIX servers. With the release of OS X 10.9 "Mavericks", Apple fully supports both SMB2 and AFP. AFP is the native file and printer sharing protocol

for Macs and it supports many unique Mac attributes that are not supported by other protocols. Performance and reliability. The AFP version 3.0 and higher use TCP/IP ports 548 or 427 to support the proprietary Apple sharing protocol.

- AFP offers significantly faster read/write performance than SMB or NFS
- AFP supports server-based "fast find file" support - essential for today's large systems.

Remote Desktop Protocol (RDP): Remote Desktop in Windows 7 Professional uses Remote Desktop Protocol (RDP), which in turn uses port 3389. Therefore, you need to configure port forwarding on Port 3389 to access remote desktop. The port forwarding is usually configured on the router that communicates with the external network (Internet). Remote Desktop Protocol (RDP) is a proprietary protocol developed by Microsoft, which provides a user with a graphical interface to connect to another computer over a network connection. The user employs RDP client software for this purpose, while the other computer must run RDP server software.

RDP servers are built into Windows operating systems; an RDP server for Linux and OSX also exists. By default, the server listens on TCP port 3389.

NFS is good for UNIX server-to-server file sharing. However it is incompatible with Windows clients

S/MIME(Secure/Multipurpose Internet Mail Extensions): Secure/Multipurpose Internet Mail Extensions, is a technology that allows you to encrypt your emails. S/MIME is based on asymmetric cryptography to protect your emails from unwanted access. It also allows you to digitally sign your emails to verify you as the legitimate sender of the message, making it an effective weapon against many phishing attacks out there.

With respect to the S/MIME configuration, you need the following:

- A digital encryption certificate for yourself as the sender
- A copy of the digital public key from your intended recipient
- An email program capable of handling S/MIME email

WINS and DNS are both name resolution services for TCP/IP networks. While WINS resolves names in the NetBIOS name space, DNS resolves names in the DNS domain name space. WINS primarily supports clients that run older versions of Windows and applications that use NetBIOS. Windows 2000, Windows XP, and Windows Server 2003 use DNS names in addition to NetBIOS names. Environments that include some computers that use NetBIOS names and other computers that use domain names must include both WINS servers and DNS servers.

Network Types:

LAN (Local Area Network): LAN is a group of computers and network devices connected together, usually within the same building. By definition, the connections must be high speed and relatively inexpensive (e.g., token ring or Ethernet). A LAN connection is a high-speed connection to a LAN. For example, most of the buildings within a campus are connected using a LAN.

MAN (Metropolitan Area Network): MAN is a larger network that usually spans several buildings in the same city or town. For example, if your organization has several buildings spread across the city, then they may be connected via MAN.

WAN(Wide Area Network): WAN in comparison to a MAN, is not restricted to a geographical location, although it might be confined within the bounds of a state or country. A WAN connects several LANs, and may be limited to an enterprise (a corporation or an organization) or accessible to the public. The technology is high speed and relatively expensive. The Internet is an example of a worldwide public WAN.

PAN(Personal Area Network): PAN is a network which connects devices within small range typically on the order of 10 to 100 meters. Device in one PAN network can establish connection with another device in other PAN network when in the range.

All the short range wireless technologies fall under PAN viz. Bluetooth, Zigbee, Zwave, Infrared etc. It is mainly designed and developed for low data rate monitoring and control applications. PAN wireless technologies have become very popular in IoT (Internet of Things) networks.

Following are the characteristics of PAN:

- Short range
- Mainly used for low data rate applications in home automation, bluetooth is used for data transfer between devices.

- Widely adopted in IoT (Internet of Things)

Note that LAN technologies typically use Ethernet technologies where as PAN technologies use Bluetooth, Zigbee, etc.

Dial-up Internet and DSL: Dial-up Internet and DSL use copper wire for connecting to the Internet. In the case of DSL, there is a distance limitation between the Hub and the customer premises, beyond which the DSL may not work. Cable Internet uses co-axial cable that connects to your cable TV. Satellite Internet uses a satellite dish, and usually initial costs are more expensive. Satellite Internet is commonly used when broadband connectivity is required at remote locations that do not have traditional cable or DSL Internet. A DSL modem most commonly uses normal telephone line(Twisted Pair or TP) for connecting to the Internet. Dial- up offers the lowest speed among the other Internet access schemes. Cable Internet uses co- axial cable and a cable modem to connect to the Internet and offers highest download speeds up to a maximum of 3 Mbps (theoretically, download speeds are much higher than this). This is closely followed by Satellite Internet and DSL. The upload speed are typically limited to 128 Kbps.

Network architecture devices:

Hub: A hub is basically a multi-port repeater. When it receives a packet, it repeats that packet out each port. This means that all computers that are connected to the hub receive the packet whether it is intended for them or not. It's then up to the computer to ignore the packet if it's not addressed to it. This might not seem like a big deal, but imagine transferring a 50 MB file across a hub. Every computer connected to the hub gets sent that entire file (in essence) and has to ignore it.

Bridge: A bridge is a kind of repeater, but it has some intelligence. It learns the layer 2 (MAC) addresses of devices connected to it. This means that the bridge is smart enough to know when to forward packets across to the segments that it connects. Bridges can be used to reduce the size of a collision domain or to connect networks of differing media/topologies, such as connecting an Ethernet network to a Token Ring network.

Switch: A switch is essentially a multi-port bridge. The switch learns the MAC addresses of each computer connected to each of its ports. So, when a switch receives a packet, it only forwards the packet out the port that is connected to the destination MAC address. Remember that a hub sends the packet out every port, and you can see how much more efficient this it.

- Among the networking devices, Hub offers least network security. It is important to physically secure the networking devices to prevent security threats.

- Now a days, Hubs are rarely used and widely replaced by Switches. A Hub relays a packet on all the ports where as a Switch relays a packet only on intended port(s). A router uses an algorithm as specified for determining the next hop, and hence relatively more secure.

Networking tools:

Toner probe: A toner probe is an electronic test instrument to help trace wires. One part (the tone generator) induces a tone on a pair of wires, and with the other you part (the tone probe) you can detect the tone at the other end to trace where the wires go. You can trace wires through walls using a tone probe, and determine which pair is carrying the signal you induced at the other end. Toner probes are used to locate the correct cable coming into a patch panel from the wall outlet when connections have either not been labelled or the labels have been removed from the patch panel. They are two-piece units (sometimes called Fox and Hound) where one end sends a signal and the other end is used to locate the wires that contain the signal in the switch room.

Cable tester: Cable tester is used to verify that all of the intended connections exist and that there are no unintended connections in the cable being tested. When an intended connection is missing it is said to be "open". When an unintended connection exists it is said to be a "short" (as in short circuit). If a connection "goes to the wrong place" it is said to be "miswired" (the connection has two faults: it is open to the correct contact and shorted to an incorrect contact).

The main difference between a cable tester and a toner probe is that in the former, you have access to the both ends of the cable at the same time, and you normally to Open or Short testing (to determine right pins are connected), and in the latter, you don't have simultaneous physical access to both ends of the cable.

Punch-down tool: Punch-down tool is used when you are securing cables to the patch panel that have been run from the wall outlets into the switch room. A wire is pre-positioned into a slotted post, and then the punch-down tool is pressed down on top of the wire, over the post. Once the required pressure is reached, the internal spring is triggered, and the blade pushes the wire into the slot, cutting the insulation and securing the wire.

Crimper: Crimper is used to attach a connector to a cable by securing each wire (8 of them in a twisted-pair wire) to the proper connector in an RJ-45 connector. It usually also includes a stripper as well.

Loopback plugs: Loopback plugs are used to test the functionality of various types of ports, but their most common use is to test a network card. These plugs send a signal out of the card and then loop it back into the same card to test its operation. They look like an RJ-45 connector without the cable.

Parallel loop back tester: Parallel loop back tester will provide you with the ability to diagnose any problems with your DB25 parallel port or DB25 parallel cable. This loop back tester consists of a single DB25 male end for verifying accurate DB25 port functioning.

WI-FI networking standards:

- 802.11ac is called Gigabit Wi-Fi or 5G Wi-Fi. 802.11ac is a 5-GHz only technology that can use wider channels in the 5-GHz band, more spatial streams, and multi-user MIMO (MU-MIMO).
- Encryption types are used to provide security for wireless transmissions. The three widely used wireless encryption types are Wired Equivalent Privacy (WEP), Wi-Fi Protected Access (WPA), and WPA2.
- Attackers can easily discover the security key used for a WEP encrypted network.
- Because of this, WEP is not recommended for use.
- WPA was created as an interim replacement for WEP. Later, WPA2 was standardized and is now recommended for use whenever possible. WEP, WPA, and WPA2 commonly use a passphrase or a pre-shared key. When joining a network, you need to know the name of the network, the type of security used, and the passphrase.
- WPA and WPA2 both can use either Advanced Encryption Standard (AES) or Temporal Key Integrity Protocol (TKIP) to encrypt the data. AES is a widely used standard and recommended for use.
- WEP is the least secure wireless encryption type, and WPA2 is the most secure wireless encryption type. WPA2 with AES provides strong security for wireless networks.
- Wired Equivalent Privacy (WEP), Wi-Fi Protected Access (WPA), and Wi-Fi Protected Access II (WPA2) are the primary security algorithms. WEP is the oldest and has proven to be vulnerable as more and more security flaws have been discovered. WPA improved security, but is now also considered vulnerable to intrusion. WPA2, while not perfect, is currently the most secure choice. Temporal Key Integrity Protocol (TKIP) and Advanced Encryption Standard (AES) are the two different types of encryption used on networks secured with WPA2.
- TKIP and AES are two different types of encryption that can be used by a Wi-Fi network. TKIP is actually an older encryption protocol introduced with WPA to replace the very-insecure WEP encryption at the time. TKIP is no longer considered secure, and is now deprecated. AES is a more secure encryption protocol introduced with WPA2.

- An SSID is a 32-character (maximum) alphanumeric key identifying the name of the wireless local area network. Some vendors refer to the SSID as the network name. For the wireless devices in a network to communicate with each other, all devices must be configured with the same SSID.
- Disabling SSID broadcast is just one of many possible techniques for tightening security on a Wi-Fi network.
- WiFi is a local area wireless computer networking technology that allows electronic devices to connect to the network
- WiFi Analyzer can help you to identify Wi-Fi problems, find the best channel or the best place for your router/access-point.
- WEP, short for Wireless Equivalent Protection, is a security protocol designed to provide protection equivalent to wired LANs. WPA is an improved security protocol compared to WEP.
- WEP was introduced in the wireless networks to provide same level of protection as that of wired networks. However, it has been found to be easily broken, and later replaced by WPA and WPA2.
- The Wireless function key typically turns on/off the wireless radio. If you inadvertently press the function key, it is possible that you are not able to access the Internet, if using WiFi.
- A DMZ (De Militarized Zone) is an area on your network that allows public access while only allowing limited access to your internal network. Typically, you put your web server, gaming server, or mail server on DMZ to allow public access.

802.11 standards: 802.11a standard provides wireless LAN bandwidth of up to 54Mbps in the 5GHz frequency spectrum. The 802.11a standard also uses orthogonal frequency division multiplexing (OFDM) for encoding rather than FHSS or DSSS.802.11a is not compatible. Bluetooth is entirely a different protocol standard.

802.11b standard provides for bandwidths of up to 11 Mbps (with fallback rates of 5.5, 2, and 1 Mbps) in the 2.4G Hz frequency spectrum. This standard is also called Wi-Fi or 802.11 high rates. The 802.11b standard uses only DSSS for data encoding.802.11b is compatible with 802.11g.

802.11g standard provides for bandwidths of 20 Mbps+ in the 2.4 GHz frequency spectrum. This offers a maximum rate of 54 Mbps and is backward compatible with 802.11b.

802.11n the newest of the wireless standards you need to know for the exam is 802.11n. The goal of the 802.11n standard is to significantly increase throughput in both the 2.4 GHz and the 5 GHz frequency range. The baseline goal of the standard was to reach speeds of 100 Mbps, but given the right conditions, it is estimated that the 802.11n speeds might be able to reach 600 Mbps. In practical operation, 802.11n speeds will be much slower.

Bluetooth: Bluetooth is a wireless protocol for exchanging data over short distances from fixed and mobile devices, creating personal area networks. Most mobile devices are Class 2, providing a range of up to 10 m. Class 1 devices have a range of up to 100 feet. Bluetooth conforms to its own standards, and not compatible with 802.11 standards.

Bluetooth Class 3 supports speeds up to 1m at 2.4GHz (1mW power output max)
Bluetooth Class 2 supports speeds up to 10m at 2.4GHz (2.5mW power output max)
Bluetooth Class 1 supports speeds up to 100m at 2.4GHz (100mW power output max)

All the short range wireless technologies fall under PAN viz. Bluetooth, Zigbee, Zwave, Infrared etc. It is mainly designed and developed for low data rate monitoring and control applications. PAN wireless technologies have become very popular in IoT (Internet of things) networks.

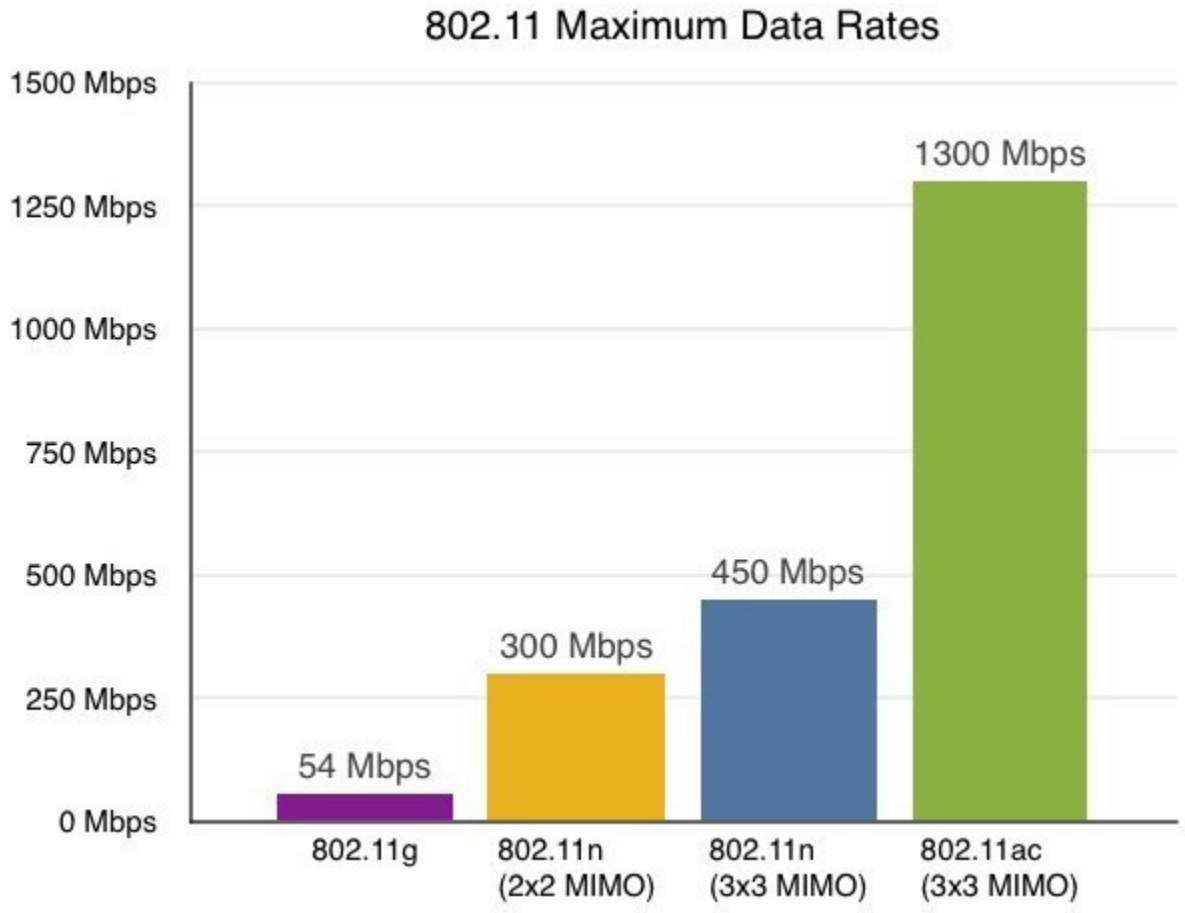
1. 802.11: applies to wireless LANs and provides 1 or 2 Mbps transmission in the 2.4 GHz band.

2. 802.11a: an extension to 802.11 that applies to wireless LANs and provides up to 54 Mbps in the 5GHz band.

3. 802.11b (initially referred to as 802.11 or Wi-Fi): an extension to 802.11 that applies to wireless LAN and provides up to 11 Mbps transmission in the 2.4 GHz band.

4. 802.11g: applies to wireless LANs and provides 20+ Mbps in the 2.4 GHz band.

Typical 802.11 data rates are shown in the figure below:



MIMO(Multi Input Multi Output): MIMO wireless technology is able to considerably increase the capacity of a given channel. By increasing the number of receive and transmit antennas it is possible to linearly increase the throughput of the channel with every pair of antennas added to the system. As spectral bandwidth is becoming very expensive, techniques are needed to use the available bandwidth more effectively. MIMO wireless technology is one of these techniques. Note that by using 4 antennas (4X4 MIMO), it is possible to increase the signal bandwidth, say in 802.11n by another 150Mbps to a total of 600Mbps.

NAT(Network Address Transaction): NAT is used to map internal IP addresses to external IP addresses. Typically, a router or a Firewall is used for this purpose. NAT is basically a translation from one network address, to another one.

Static NAT: Static NAT means that the address ALWAYS translates to the same address, every single time.

Dynamic NAT: Dynamic NAT means that the address may translate to one of several addresses, it doesn't necessarily have a one-to-one correspondence, like the static NAT. Dynamic NAT is used with a pool of addresses that addresses could be translated to.

PAT(Port Address Translation): PAT means that the translation is to a address/port combination, such that one address can "overload" the NAT. That is, one address can translate to 10.10.10.1:50000 and another address can translate to 10.10.10.1:40000

For example: The form of NAT most familiar to you would probably be PAT, as your home internet connection uses a PAT so that multiple devices inside your home network connect out through a single global address. Each of your internal devices translates to a different address/port combination.

Universal Plug and Play (UpnP): UpnP is a standard that uses Internet and Web protocols to enable devices such as PCs, peripherals, intelligent appliances, and wireless devices to be plugged into a network and automatically know about each other. With UPnP, when a user plugs a device into the network, the device will configure itself, acquire a TCP/IP address, and use a discovery protocol based on the Internet's Hypertext Transfer Protocol(HTTP) to announce its presence on the network to other devices. For instance, if you had a camera and a printer connected to the network and needed to print out a photograph, you could press a button on the camera and have the camera send a "discover" request asking if there were any printers on the network. The printer would identify itself and send its location in the form of a universal resource locator (URL).

The camera and printer would use Extensible Markup Language (XML) to establish a common language, or "protocol negotiation", to talk to each other and determine capabilities. Once a common language was established, the camera would control the printer and print the photograph you selected

Port forwarding: Port forwarding can be used to provide access to a system within a private network from the Internet. For example, all traffic coming in port 80 can be forwarded to a web server on an internal network. Port forwarding sends traffic coming in from the Internet on a specific port to an internal system with a specific IP address.

Port triggering: Port triggeringuses one outgoing port as a trigger to open a specific incoming port. For example, an application might send traffic out on port 3356 and receive traffic in on port 5668. A port trigger on the router or firewall will automatically open incoming port 5668 only when traffic is sensed going out of port 3356. Port triggering opens a specific incoming port only after traffic is sent out on a specific port.

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CompTIA®A+ Exam Notes : Laptop Hardware And Companents

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3. Mobile Devices

3.1 Laptop hardware and components

Hard drives: Laptop hard drives commonly have a $2^{1/2}$" form factor. The most common form factor for desktop hard drives is $3^{1/2}$". Laptop hard drives use the same drive technologies as their desktop counterparts, such as serial and parallel ATA. As with desktop hard drives, laptop hard drives are available in both solid-state and conventional varieties. Unlike desktop hard drives, laptop hard drives do not have separate power connectors. Some features are given below.

1. 2.5" drives are more readily available than the 1.8 and a whole lot less expensive. Plus the vast majority of laptops take 2.5 drives. The 1.8 drives are found in some of the 10 inch display laptops.

2. Ultraportable laptops use 1.8" drives because they weigh less and consume less power. However, they suffer from slow rotation speed and access time. 2.5" drives are much better performance wise because they have larger caches and higher rotation speeds.

Displays: LCD screens require a backlight system to operate, there are two backlight systems in use today:

a. CCFL - Cold Cathode Fluorescent Light, is an older backlight method, which utilizes a daylight specter fluorescent tube and an inverter which powers it.

b. LED - is a backlighting system which does not use an inverter, and instead of a fluorescent tube it uses a strip of LEDs (Light Emitting Diodes).

So in essence there are two types of laptop screens: LCD-CCFL and LCD-LED: these screens are not interchangeable.

LEDs do not require backlighting like LCDs. LCDs work by selectively blocking areas of the backlight to make the images that you see, while LEDs generate light themselves. Because LEDs do not require backlighting, they consume much less power than LCDs.

Plasma display panels consume most power because of the inherent architecture of the Plasma panels. On the other hand, LED displays consume least power relative to plasma and CCFL.

OLED(Organic Light Emitting Diode): OLED are thinner and lighter than other screen types, making them an excellent choice for handheld devices. OLEDs are designed with a layer of organic compounds sandwiched between two light-emitting electrodes. CRT monitors are big, bulky, and use a cathode ray tube. Plasma displays, popular in home big-screen TV systems are made of small cells of ionized gas and provide excellent contrast ratio. LCDs use liquid crystal displays and are frequently used in laptop computers.

WiFi antenna connector/placement: The wireless antenna is located in the display. While replacing a laptop screen you may encounter number of wires coming from the screen to the laptop body. One of these is the cable that connects the wireless antenna with the wireless card located in the body of the laptop. The antenna built into the display usually work quite well. In any specific situation improve the signal by moving the laptop around. This changes the polarization of the antenna and may cause it to line up better to the incoming signal.

Webcam: Many displays today, especially laptop displays, have a webcam built in. They come ready to go with all drivers preinstalled and nothing to configure or set up. To replace the webcam disconnect the laptop lid from the base,remove the screw covers ans screws holding the display bezel in place, and remove the bezel. After removing the screws holding the mounting rails to the hinges, remove the LED screen from the lid assembly.

Microphone: While many desktop systems lack a built-in microphone, almost all laptops have one. In some cases this microphone will be located on the laptop bottom, but in many cases it will be in the display next to the webcam or off to the side. If you need to replace it, you will need to take the same steps to get inside the display that you done for the webcam.

When you unhook the lid from the bottom, you will need to unplug several things from the board, nd one of those will be the microphone cable. If microphone is not working inspect the cable ,sometimes cable can be cut by the constant opening and closing of the case. You may be able to repair the cable without replacing the microphone.

Inverter: An inverter is a component that takes DC power and converts it to an AC form that can be used by the LCD screen. It is implemented as a circuit board that is located behind the LCD. If the inverter needs to be replaced,you should be aware that it may contain stored energy, so it may need to be discharged to be safe.

Digitizer/touchscreen: Digitizer read pressure applied to the surface of the display and are what make touch-screens work. In some cases, they work with a stylus or small pen-like device , in others you key to activate them. If these keys are not present, consult the documentation for the key to use in conjuction with Fn to increase and decrease brightness.

Common problems with laptop displays:

1. Display not working: If the external display is working properly and the problem is only with the internal laptop display, the most likely problem is with the inverter which powers the LCD display. Some times, an outline of an image can be viewed on a laptop screen, but it is very dim and the screen appears almost black. Such problems are almost always due to bad inverter and LCD.

2. Dead pixel: Dead pixel usually requires replacement of the LCD screen, and it is very expensive. If the laptop is new, check with your manufacturer for warranty replacement.

3. The inverter board is responsible for converting low voltage DC power to high voltage AC, necessary to light up the backlight bulb. If the inverter board is bad, the LCD screen (backlight bulb) will not light up when you turn on the laptop, but you still should be able to see a very dim image on the screen. Most commonly (say 80% of the time) it's the inverter, 10% it's the ccfl tube in the LCD panel, and 10% it's the motherboard or the VGA cable.

4. Digital displays offer best quality when operated at native resolution.

5. A dim screen can be caused by four things:

- The LCD inverter which causes the LCD panel to light up
- The CCFL fluro tube in the LCD panel
- The motherboard supplying signal & voltage to the inverter
- A damaged video cable between the laptop and the screen e. An LCD-LED display uses backlight and not a CCFL bulb. Therefore, the problem is most likey with backlight failure.

Internet connectivity problems: Laptops, being mobile, usually participate on more than one network, and often use a static IP address at one location and a dynamically assigned IP address at another. For example, your computer might use dynamic addressing (DHCP) at the office but need to use a static IP address when at home to connect to a broadband ISP. This often results in connectivity problems. Windows XP Professional solves this problem by allowing the user to configure the computer to first try DHCP, and then, if the attempt fails, to try alternate static IP address settings.

Bluetooth connectivity problem: Laptops with wireless networking capabilities usually provide a shortcut key to enable and disable the wireless radio. This feature is usually accessed by using a key combination of the function (Fn) key and one of the F keys at the top of the keyboard. Sometimes this key can also activate and deactivate the Bluetooth function of your computer.

How to replace the laptop battery

1. Turn off your laptop and disconnect the AC adapter.

2. Release the latch or other attachment devices that hold your battery in place.

3. Slide the old battery out of its compartment or storage bay.

4. Take the replacement battery out of the box.

5. Slide it into the notch or bay.

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CompTIA®A+ Exam Notes : Function Of Components Within The Display Of A Laptop

3. Mobile Devices

3.2 Function of components within the display of a laptop

Most laptop computers require a function key or software command to activate/deactivate the laptop video output signal. Usually, the activation/deactivation command acts as a toggle switch: repeat the command to display the image on the internal laptop display, the external display (projector) or both displays simultaneously.

Examples: Acer: Fn+F5, Dell: Fn+F8 will activate/deactivate laptop/external display.

Function key Function

1. Fn+F3 A panel for selecting a power scheme appears.

2. Fn+F4 Put the computer in standby mode

3. Fn+F5 Enable or disable the built-in wireless networking features and the bluetooth features.

4. Fn+F7 Switching the display output location

5. Fn+F8 Change the settings of the Ultra Navigation pointing device.

6. Fn+F9 Open the ThinkPad Easy Eject Utility screen. Buttons for the following choices are displayed:

7. Fn+F12 Put the computer into hibernation mode

8. Fn + PgUp Turn the Think Light on or off.

9. Fn+Home The computer display becomes brighter.

10. Fn+End The computer display becomes dimmer.

Special Function keys:

Bluetooth (on/off): In most cases, the same key that turns 802.11 wireless off and on also does the same for bluetooth.

Keyboard backlight: Some keyboards come with backlighting. These models will usually allow you to turn the backlighting on and off by using the Fn key in combination with another key, such as the Z key on ome models.

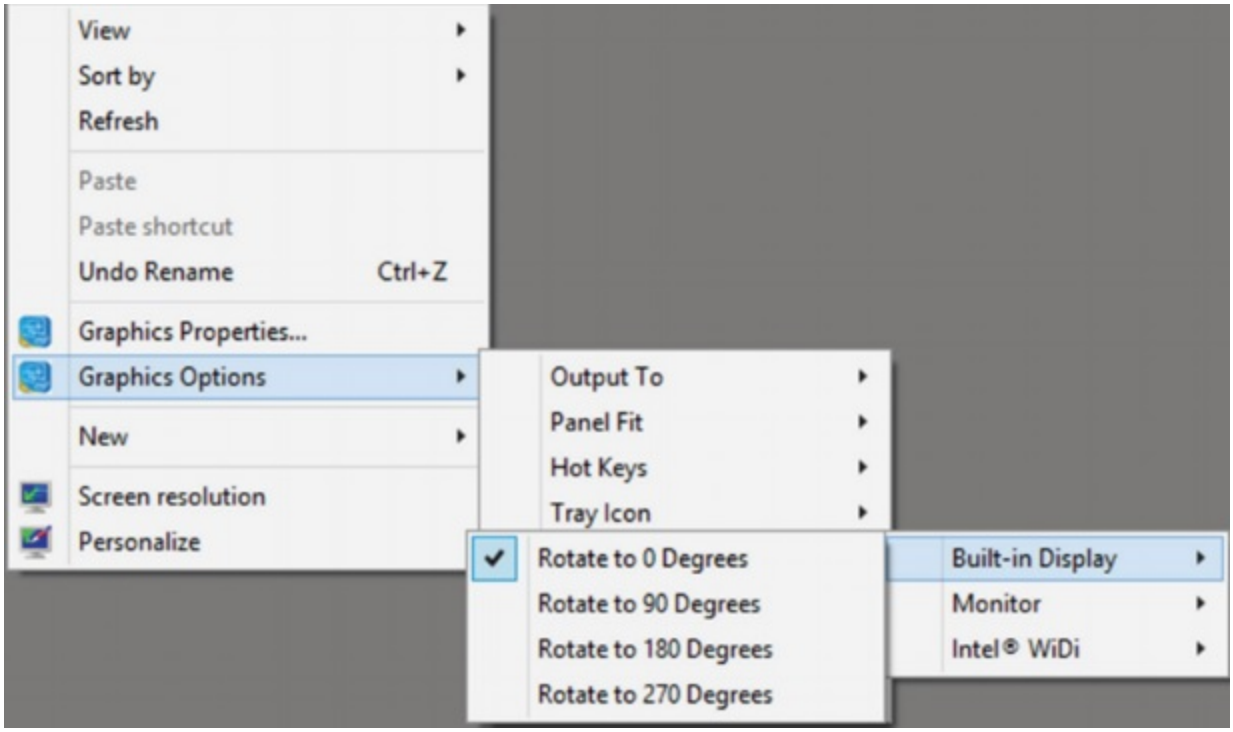
Touchpad (on/off): Touchpad provides a way to operate the laptop without a mouse, You can enable and disable the touchpad by using either software or hardware.

TouchPad Button: Many laptops have a button near the top of the touchpad that allows you to quickly enable and disable it. You can toggle the touchpad off and on by using that button.

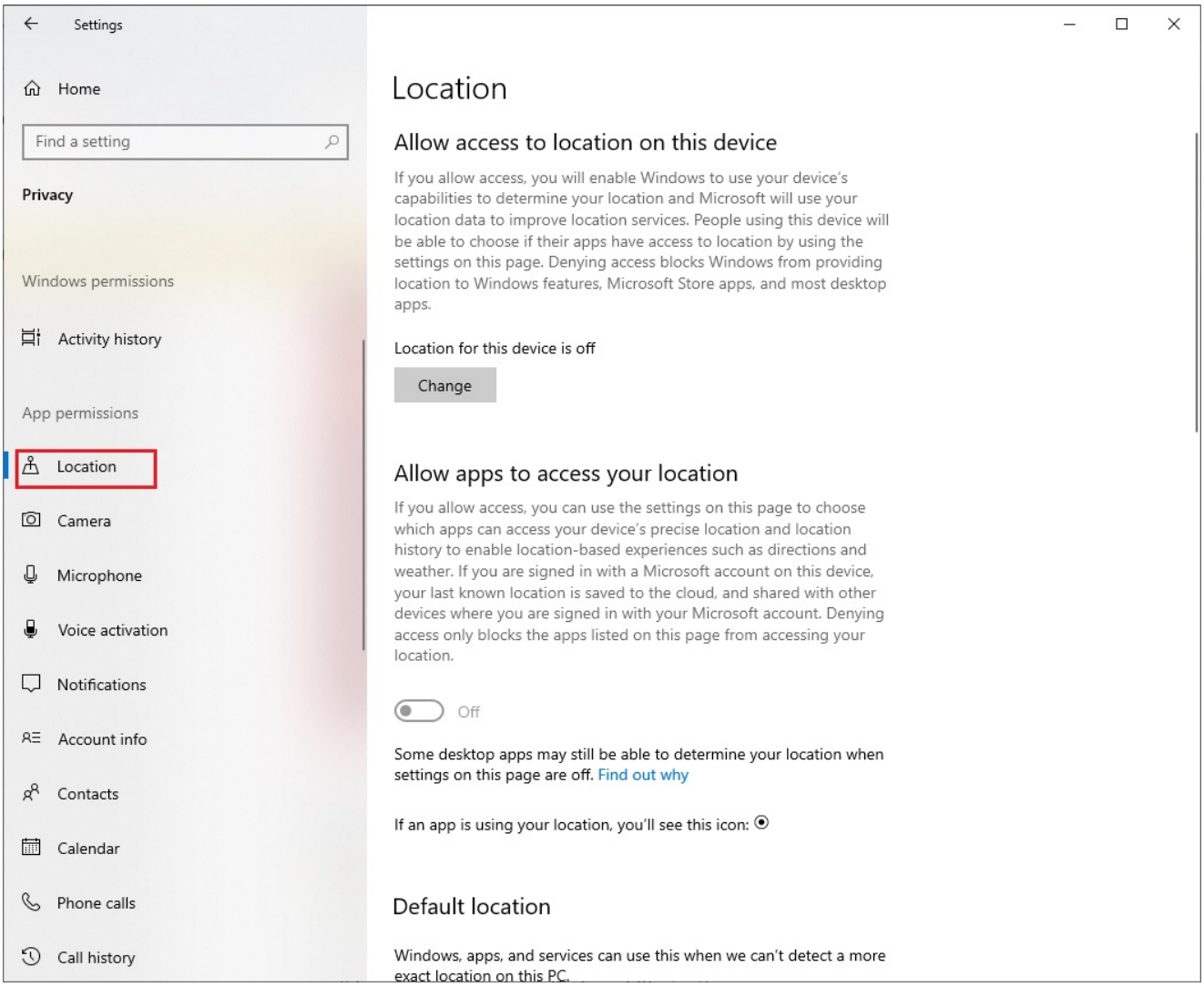
TouchPad Fn keys: Some laptops have an Fn key that can be used in combination with one of the F1 - F12 function keys to enable and disable the touchpad. To toggle the touchpad off and on, press both of these keys at the same time.

Screen Orientation: It refers to the position of the image on the screen. This is changed by “rotating” the screen. Rotating the screen can be done either by using the display settings or in some cases by using a special key combination.

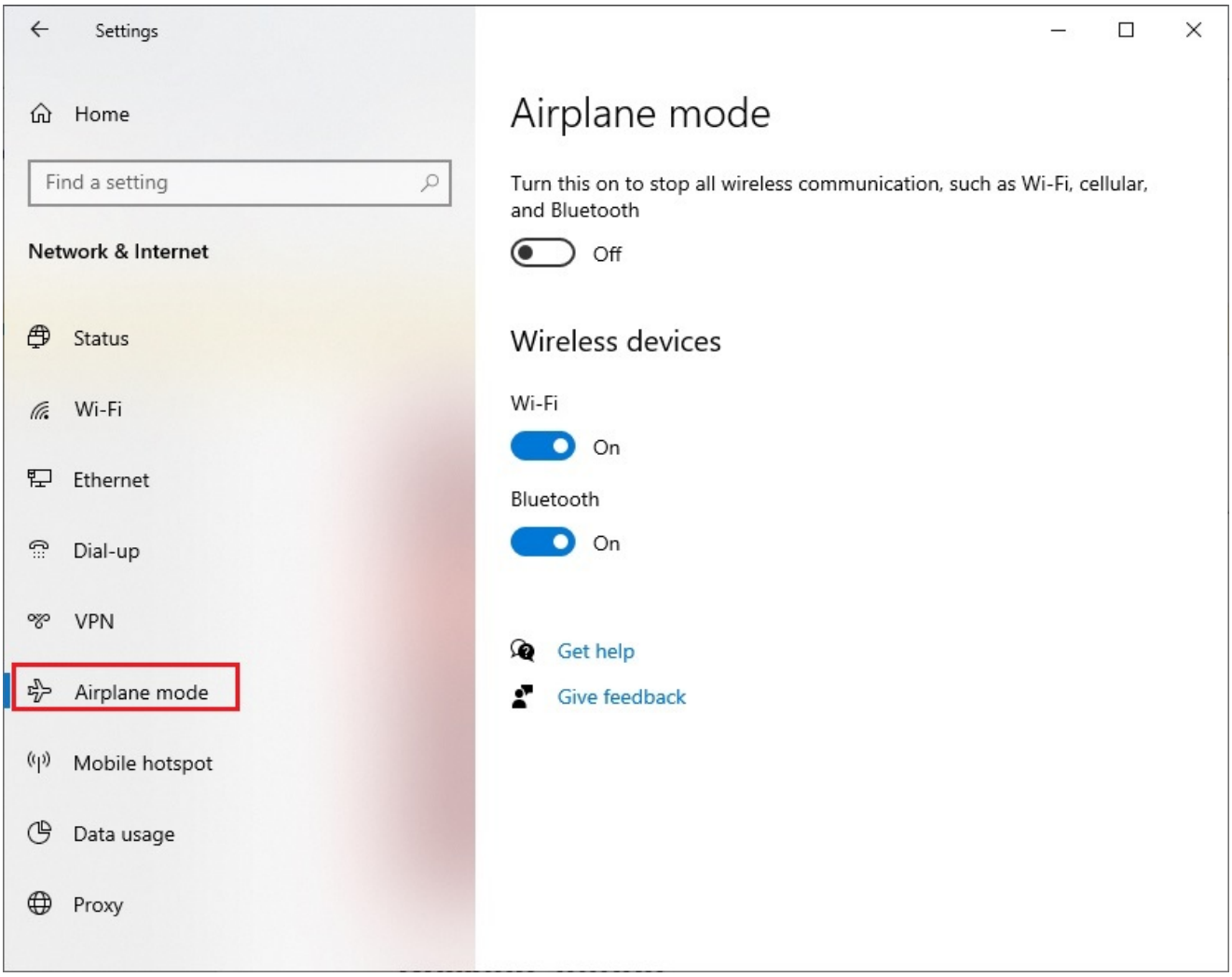
Media options (fast forward/rewind): Many laptops also offer keys that are used with media players. For Example, you can fast-forward and stop the player. These keys may have a special location, or they may be included as function keys at the top of the keyboard. Below fig it shows thay are located at the top of the keyboard.



GPS (on/off): Many dvices now come with a built-in GPS feature. You can enable and disable the GPS using the privacy settings in Windows. It is enabled by default.You can disable it in windows 10 by bringing up the Charms bar. At the bottom, choose the Settings charm. Tap or click the Change PC Settings link and then select Privacy on the left. Choose loction. On this page you can select to either turn it on completely or turn it off certain applications as shown below.



Airplane mode: It suspends many of the device's signal-transmitting functions. It's called airplane mode because it disables the transmission of signals that interfere with aircraft signaling. To enable /disable it in windows 10 go to PC settings, select Network. Then select Airlane Mode. On the right side there is button to toggle between on and off as shown in below fig.



Docking station and Port replicator: Some notebook Pcs have optional accessories called docking stations or port replicators. They let you quickly connect/disconnect with external peripherals and may also provide extra ports that the notebook PC doesn't normally have. It allows laptop computer to be converted to a desktop. When plugged into a docking station, the laptop has access to things it doesn't have stand-alone,the network, a workgroup printer, and so on. The cheapest form of docking station is a port replicator, and the laptop can then use a full-sized monitor, keyboard, mouse and so on.

Laptops can support plug and play at three levels, depending on how dynamically they are able to adapt to changes. Each docking station works a little differently, but there is usually a button you can press to undock the notebook from the unit.

Cold Docking: The laptop must be turned off and back on for the change to be recognizd.

Warm Docking: The laptop must be put in and out of suspended mode for the change to recognized.

Hot Docking: The change can be made and is recognized while running normal operations.

Laptop display adjustment:

Laptop computer screens are equipped with a "Function" key as well as numerous hot keys for fast adjustments of various features on the computer, such as increasing or decreasing the brightness of the laptop screen. Dimming the screen is desirable when working in direct sunlight or to create a more soothing display that's easier on the eyes. The precise key sequence varies on different laptop models, but involves a combination of the function and arrow keys.

- Press the Function ("Fn") key on the laptop keyboard and continue holding it down. This key is usually on the lower, left side of the keyboard.
- Press and release the left arrow key to dim the laptop screen one increment, or hold the key to dim the screen as low as it will go. The arrow key may also be printed with a sunburst icon. Alternatively, on some laptops press one of the numbered F keys on the top row to dim the screen. The correct key will usually be printed with a filled-in sunburst icon, while the F key to brighten the screen will have a hollow sunburst icon.
- Press the right arrow key to brighten the screen or use the numbered F key at the top of the screen

Disk enclosures: A disk enclosure is essentially a specialized chassis designed to hold and power disk drives while providing a mechanism to allow them to communicate to one or more separate computers. Drive enclosures provide power to the drives therein and convert the data sent across their native data bus into a format usable by an external connection on the computer to which it is connected. Note that a SCSI adapter will not solve the problem as it would not supply the power and other signals that may be necessary to proper functioning of the hard drive.

Please note the following important points with respect to laptop

1. Laptops, being mobile, usually participate on more than one network, and often use a static IP address at one location and a dynamically assigned IP address at another. For example, your computer might use dynamic addressing (DHCP) at the office but need to use a static IP address when at home to connect to a broadband ISP. Windows XP Professional solves this problem by allowing the user to configure the computer to first try DHCP, and then, if the attempt fails, to try alternate static IP address settings.

2. Laptops with wireless networking capabilities usually provide a shortcut key to enable and disable the wireless radio. This feature is usually accessed by using a key combination of the function(Fn) key and one of the F keys at the top of the keyboard. Sometimes this key can also activate and deactivate the Bluetooth function of your computer. If on a clean install Bluetooth is not working instead of reinstalling the OS, it is always better to install the correct driver for the device. Go to device manager, and update the Bluetooth driver.

3. Laptop antenna is almost always located in the display section of the laptop. This is because, the screen is lifted and provides better propagation of RF waves, which is a requirement for 802.11 specification. But the exact location within the laptop display bezel may change from one laptop manufacturer to another.

4. Problem with Hot Keys: If any Hot Key is not working as expected it is recommended to install the Hotkey drivers from the manufacturer's website.

5. Cellular Connectivity: If a notebook cellular card was activated by the cellular operator, but was not recognized by the Operating System then check if feature is supported in laptop BIOS.

6. It is most likely that the cellular card is disabled in the BIOS. Please check the BIOS and enable the card. Note that all notebook computers may not support this feature

7. The Laptop speakers usually work with any motherboard. If you encounter any problem with speakers, check if the cable is good and properly connected.

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CompTIA®A+ Exam Notes : Characteristics Of Various Types Of Other Mobile Devices

3. Mobile Devices

3.3 Characteristics of various types of other mobile devices

Smart phone: A smartphone is a mobile phone with an advanced mobile operating system which combines features of a personal computer operating system with other features useful for mobile or hand held use. Smartphones, which are usually pocket-sized, typically combine the features of a cell phone, such as the ability to receive and make phone calls, with those of other popular digital mobile devices. Other features typically include a personal digital assistant (PDA) for making appointments in a calendar, media player, video games, GPS navigation unit, digital camera and digital video camera. A typical smartphone has a high-resolution touch screen display, WiFi connectivity, Web browsing capabilities, and the ability to accept sophisticated applications. The majority of these devices run on any of these popular mobile operating systems: Android, Symbian, iOS, BlackBerry OS and Windows Mobile.

A typical smart phone will a more powerful CPU, more storage space, more RAM, greater connectivity options and larger screen resolutions than a regular cell phone.

High-end smart phones now run on processors with high processing speeds and allow you to play 3D games, video conferencing, and other processor/memory intensive tasks longer than you used to.

Features often found in smart phones

- Create and edit office documents using Open Office, Microsoft Office software
- Based on advanced operating systems such as Android, Windows Mobile, or Apple IOS.

- Enabled with sensors such as GPS, Accelerometer, Gyroscope, and magnetometer. GPS can be used to locate places while traveling. Accelerometers handle axis-based motion sensing and can be found in fitness trackers as well as phones-they're the reason why your smartphone can track your steps even if you haven't bought a separate wearable. A gyroscope is a device used for measuring or maintaining orientation and angular velocity. The gyroscope helps the accelerometer out with understanding which way your phone is orientated. Magneto meter is an instrument for measuring the intensity of a magnetic field, especially the earth's magnetic field. A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact.
- When it comes to messaging, a smart phone will send messages and also emails. A smart phone can synchronize your email accounts with that of the mail server. Some smart phone can support multiple accounts depending on the operating system and the email client software.

Tablets: A tablet, or tablet PC, is a portable computer that uses a touchscreen as its primary input device. Most tablets are slightly smaller and weigh less than the average laptop. While some tablets include fold out keyboards, others, such as the Apple iPad and Motorola Xoom, only offer touchscreen input.

Components of a Tablet PC:

Besides the CPU and battery, other components you'll likely find in a typical tablet include:

1. Accelerometers

2. Gyroscopes

3. Graphics processors

4. Flash-based memory

5. WiFi and/or cellular chips and antennas

6. USB dock and power supply

7. Speakers

8. A touch-screen controller chip

9. Camera sensors, chips and lenses

Advantages

1. Tablet PCs feature more mobility than traditional notebooks, due to the absence of built-in keyboard. They are also often more lightweight than most notebooks, and consume much less power. Also, handwriting can be much slower than traditional keyboard input when writing lengthy documents and emails. Due to the amount of hand resting directly on the screen, Tablets are also more susceptible to smudges and dirt collection.

2. A tablet sits somewhere between the smart phone and laptop in most areas, and flexibility is no exception. In many ways, a tablet can fill the role of a laptop and perform most, if not all, of the same functions. But, the tablet is also more versatile. Most can take photos, or shoot videos in addition to allowing video chat and conferencing. They also work nicely as e-readers (or in some cases the e-reader has evolved into a tablet) for accessing an entire library of books on the go. Some of these things are technically possible, but ridiculous in a practical sense with a notebook.

Disadvantages

1. The 'handwriting-to-text' conversion does not always work the way we would like it to. Tablet PCs recognize a trained penmanship easier than the way you may write naturally. Just like speech-to-text systems it requires a trained style of speech to work properly.

2. The size may also be a disadvantage. As they are smaller than laptops this clearly means that the screen is smaller, possibly reducing the visibility function that laptops can provide. The keyboards are also smaller which could prove difficult for some people who already struggle with a laptop keyboard.

Docking station: A docking station is a platform into which you can install a portable computer. The docking station typically contains slots for expansion cards, bays for storage devices, and connectors for peripheral devices, such as printers and monitors. Once inserted in a docking station, the portable computer essentially becomes a desktop model computer.

Wearable technology (also called wearable gadgets) is a category of technology devices that can be worn by a consumer and often include tracking information related to health and fitness. Other wearable tech gadgets include devices that have small motion sensors to take photos and sync with your mobile devices.

GPS: A global positioning system is navigation system made of network of satellites allow people to find geographic locations in all weather conditions any where on the earth. It can be installed on mobile phone and cars.

Smart watches: Smart watches are smaller than smart phones but can have many of the same features depending on the level of communication built in.

Fitness Monitors: While many smart watches can also act as fitness monitors, there is a class of devices that specializes in tracking your movement.Fitness monitors read your body temperature, heart rate, and blood pressure. Some of the devices, called fitness trackers, are wrist bands that can track the information discussed and communicate wirelessly to an application located on a computer.

VR/AR headsets:

Virtual reality (VR) is a brand new user interface unlike the conventional one, immersing a person in a digital 3D environment, instead of watching on a display. Computer-generated imagery and content aim at simulating a real presence through senses (sight, hearing, touch). Virtual reality simulation requires two main components: a source of content and a user device. Software and hardware, in other words. Currently, such systems include headsets, all-directions treadmills, special gloves, goggles. VR tools should be providing realistic, natural, high-quality images and interaction possibilities. For this, devices rely on measurements like:

- image resolution,
- field of view,
- refresh rate,
- motion delay,

- pixel persistence,
- audio/video synchronization.

Augmented Reality: applies algorithms and sensors to detect the position of the camera, and then superimposes 3D graphics/objects into a user's view via smartphones/glasses/projections.

E-readers: While these devices typically have internet access and can be used for Internet browsing, the main job e-readers were created for is reading. These devices have proven to be more popular with older users because younger users seem to have grown up reading everything on a computer and see no reason for another device.

Mobile device Synchronization: Synchronization occurs when a mobile device communicates with applications on a personal computer or a server. You can do this by synchronizing the device's operating system and applications with either a desktop management program or individual applications on a personal computer

Mobile hotspot: As the name implies, Mobile hotspot connections can be used to provide Internet access for multiple users in a mobile environment. These days, normal smart phones are offering mobile hotspot capability via the carrier Internet access. A device with just wireless LAN access can connect to the mobile hotspot (it can be smart phone, tablet PC or a desktop computer with wireless LAN) and access the Internet. Mobile hotspot is also known as MiFi.

Note: MiFi is a brand name used to describe a wireless router that acts as mobile Wi-Fi hotspot

Hotspot/tethering: A smartphone and a compatible USB cable is all that you need to connect your cellular internet connection to your laptop or tablet in a process called tethering. You may also connect your desktop computer by tethering via your smart phone using WiFi connection. In this process the Internet connection is used to create a mobile hotspot, through which the other devices can access resources on the internet. Tethering, or phone-as-modem (PAM), is the sharing of a mobile device's internet connection with other wirelessly connected computers.

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CompTIA®A+ Exam Notes : Given a scenario, configure basic mobile device network connectivity and application support

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3. Mobile Devices

3.4 Given a scenario, configure basic mobile device network connectivity and application support

For mobile devices to deliver the functionality that most expect, they must be connected to a network. To use email the device must be set up properly.

Wireless/cellular data network (enable/disable): Mobile devices provide more robust functionality when connected to a network. Two types of networks can be used to gain access to the internet. Cell phone networks and Wi-Fi networks.

Corporate and ISP email configuration: Email is one of the most important functions that people access on their mobile devices. Following procedure explaains configuring email on the mobile device. Before you can access email on your mobile device, you must know the settings for the email server of your email provider. There are two protocols that can be used to access email acounts: POP3 and IMAP.

POP3: On an Android mobile devices, follow these steps.

1. In settings, select Clouds and Accounts and then Accounts.

2. In Accounts, select ad an account and select Email as the type.

3. Enter the email address and password and select Sign in.

4. After your account is recognized and set up , select Pop3 as the account type.

5. Enter the name of the incoming PoP3 servr, nd if desired, select to enable encryption.

6. Enter 110 as the incoming port, and if desired select Delete Email Off The Server.

7. Enter the name of the outgoing POP3 server and enter port number 25.

8. Finally, if desired, turn on SMTP authentication.

On an ios mobile device, follow these steps:

1. Select Settings>Accounts and Passwords >Add Account

2. Select other

3. Select Add Mail Account. Fill in your name, email address,password and escription and click Next.

4. Select POP. Verify that the name,address, and description carried over from the last page.

5. Under Incoming Email server, enter the FQDN of the POP3 server ,your email address, and your password.

6. Under Incoming Email server enter the FQDN of the SMTP server and your email address

7. Click Next. Click Save in the upper-right corner.

IMAP

On an Android mobile device, follow these steps:

1. In Settings, select Account then Add an account.

2. Click the appropriate account type.

3. If prompted for an account subtype, select the type.

4. After entering the email address, tap next.

5. After entering the password , tap Next

6. If prompted, enter either the username,password, or server

7. After configuring any account options desired. Click Next.

8. Complete any account options based on the account type chosen.

9. Enter the account name and if prompted the name for outgoing messages.

On an iOS mobile device, follow these steps:

1. Select Settings >Accounts and Password > Add Account.

2. Select Other.

3. Select Add Mail Account. Fill in your name, email address, password,description and click Next.

4. Select IMAP. Verify that the name,address, and description are carried over from the last page.

5. Under Incoming Email Server, enter the FQDN of the IMAP server, email address and password.

6. Under Outgoing email server , enter the FQDN of the SMTP server and your email address.

7. Click Next. Click Save in the upper-right corner.

Port and SSL Settings: Secure Sockets Layer (SSL) is the technology responsible for data authentication and encryption for internet connections. Because data can be sent with or without the use of SSL, one way to indicate a secure connection is by the port number. By default, HTTPS connections use TCP port 443.

S/MIME: With respect to the S/MIME configuration, You need the following:

1. A digital encryption certificate for yourself as the sender.

2. A copy of the digital public key from your intended recipient.

3. An email program capable of handling S/MIME email.

Exchange supports S/MIME, so that part is taken care of. Once you have obtained your certificate, you must import it into your device and make it available to the email program.

Integrated commercial provider email configuration: You may want to set up your personal email on a device from a commercial provider. Folowing section describes some of the email systems you may encounter.

iCloud: To set up iCloud email on an Android device,follow these instructions:

1. Swipe up or down in the Home screen to access the Apps screen.

2. In settings, select Accounts then Add an account.

3. Click the account type.

4. If prompted select the account subtype.

5. After entering the email address, select Next.

6. After entering the password, select Next.

7. If prompted for the username,password, or server name, enter them and select Next.

8. Enter the SMTP server, port number, and outgoing server and select Next.

9. After configuring any account options dsired click Next.

10. Address any additional options you encounter and select Next.

11. Enter an account name for outgoing messages.

Google/Inbox: On an Android mobile device follow these steps:

1. Select the Gmail icon.

2. Select Alread Have a Google account.

3. In the Sign In with your google account field, enter your username password and select Sign In.

On an ios mobile device follow these steps

1. Select Settings > Account & Passwords > Add Account.

2. Select Gmail

3. Fill in your name,address,password, and description if desired. Click Next.

4. Verify that the address carried over frm the last page. Click Next.

5. Select the items you want to sync automatically with the email server and click done.

Exchange Online: To set up Outlook on Android, first if required install Outlook for Android. Follow these steps.

1. On the Android device, select Email icon.

2. After entering the email address and password, select Manually Setting.

3. Complete the Domain\username field.

4. After entering the password for the exchange server, select User Secure Connection (SSL) and then Next.

5. In the Account Options interface, select a frequenc for checking email and click Next.

6. Finally, if desired, enter a name for the account in the Give This Account A Name field and selet done.

On ios, follow these steps:

1. Add your Exchange account by tapping Settings > Passwords & Accounts > Add Account > Exchange.

2. Enter your address.

3. Choose either Configure Manually or Sign In to connect to your Exchange Server.

PRI updates/PRL updates/Baseband updates:

The Primary Rate Interface (PRI): is the connection between the mobile device and the radio. From time to time this may need updating, and when done, it may add features or increase data speed.

The Preferred Roaming List (PRL): is a list of radio frequencies residing in the memory of some kinds of digital phones. It lists frequencies the phone can use in various geographic areas. Each area is ordered by the bands the phone should try to use first. Therefore, it's a priority list for which towers the phone should use.

The baseband is the chip that controls all the GSM and 3G phone RF waves. An update makes the code in the chip current.

When roaming, the PRL may instruct the phone to use the network with the best roaming rate for the carrier, rather than the one with the strongest signal at the moment.

I**MEI vs. IMSI:** International Mobile Equipment Identification (IMEI) is used to identify a phyical phone device, While International Mobile Subscribr Identification (IMSI) is used to identify a Subscriber Identification Module (SIM) card. An International mobile Subscriber Identity is a unique number, usually fifteen digits, associated with Global System for Mobile Communications(GSM) and Universal Mobile Telecommunications System (UMTS) network mobile phone users. The IMSI is a unique number identifying a GSM subscriber.

This number has two parts. The initial part is comprised of six digits in the North American standard and five digits in the European standard. It identifies the GSM network operator in a specific country with whom the subscriber holds an account. The second part is allocated by the network operator to uniquely identify the subscriber.

The IMSI is stored in the Subscriber Identity Module (SIM) inside the phone and is sent by the phone to the appropriate network. The IMSI is used to acquire the details of the mobile in the Home Location Register(HLR) or the Visitor Location Register (VLR).

VPN: Many users need to use th mobile devices to connect to the corporate network. This should be done using a VPN connection. To set up a VPN connection in Android, folow these steps.

1. Swipe up or down on the Home screen to select the App screen.

2. In Settings, select Connections and then More Connection Settings.

3. After tapping VPN, Select the plus icon.

4. If desired, set up a lock screen PIN.

5. In the Name field, enter the name, and in the type field, select the VPN type.

6. Complete the information in the fields provided for the selected VPN type and click Save.

7. Select any advanced options by selecting Show Advanced Options and complete the provided fields.

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CompTIA®A+ Exam Notes : Given a scenario, use methods to perform mobile device synchronization

examguides.com/Aplus-Core1/aplus-core1-29.htm

3. Mobile Devices

3.5 Given a scenario, use methods to perform mobile device synchronization

Keeping information in sync between your desktop or laptop and your mobile device is one of features that many users want to take advantage of.There are many types of information that can be synced applications that can be installed to perform the synchronization and connection methods that can be used to do this.

Synchronization methods: There are 3 basic ways to synchronize various data types, You can synchronize to the cloud, a desktop, or an automobile's computer system.

1. **Synchronize to the cloud:** This provides central location for user's data such as contacts,Email,Pictures,Musics,Videos,applications,calendar,bookmarks,documents etc.

2. **Synchronize to the desktop:** In this method sync process is set up between two devices such as a smartphone and a desktop computer. Here the two devices sync with one another at any time on same network such as home wireless network.

3. **Synchronize to the automobile:** Cars can be synced to the mobile device either by using Bluetooth or by using cables designed by the vendors to connect to the car system.

T**ypes of data to Syncronize:** Users may be interested in maintaining a consistency between the state of data that exists on the laptop or desktop and state of same data on a mobile device.Following describes the types of data.

Contacts: The most important part of using any calling device is the contacts. The contacts may be stored in the phone or device, in the email accounts or in the sim , provided by the service provided to the user. This contact list can be saved in the external memory cards easily and that can be transferred to the computer for keeping a backup of it. Once that is done then how to put the numbers added recently. There is the place where synchronization is required.

Applications: Typically, the applications used for the sync process are OS dependent, i.e. a Google Gmail account for Google Drive on Android, Apple's iCloud for syncs to and from the internet, and iTunes to/from the PC. Most mobile OSs include some type of sync or backup capability. Usually, these tools allow you to choose which content should be synced. Third party apps are also available should the built-in options not suit your needs.

Email: Email is an example of one of the earliest applications of synced and easily accessible data, email contact lists.Your email client may sync contacts or address books, reminders, and the emails themselves. You can choose to sync any or all of these.

Pictures: Pictures can be synced between devices and the internet. While technically a backup, using a shared internet location such as iCloud Drive or Google Drive allows you to sync your content easily. The online presence of your data is the key to unifying the content across all of your devices.

Music – Videos – Documents – Bookmarks: These can also be synced and shared using the same tools described above. Simply select or deselect the content as desired. It is important that you set how you want the sync to handle duplicate content. You don't want to lose anything, but you also do not want multiple copies of the same content.

Calendar: The calendar is a critical application for both work and play. All mobil devices support syncing the calndar between devices.

Bookmarks: Bookmarks of frequently visited websites make everyone's day easier, and when the same ones are available in the browser of all your devices, including your mobile devices, it doubles the benefit. Bookmarks are another item that can be configured to sync automatically.

Documents: Technology to sync documents located in multiple locations has been around for some time. It is present in moderm mobile devices , users want to able to work any where on any device. Location data:In some cases, users may decide to allow an application to track

their location for the purpose of tailoring search results. When this is done, it can be a onetime thing or the users can give the application ongoing permission to do so.

Social media data: When users have multiple accounts many mobile platforms such as Google and Apple offer applications that can allow them to track and post to multiple accounts at once, reducing the time requird to check and update the accounts.

E-books: Many users have accounts that give them access to books in digital format, or e-books. Naturally, they want to have access to thes books on all their devices.The sync process can keep their various devices up-to-date with the latest position of a bookmark in the book or of new items that have been highlighted or notes that have been made.

Passwords: Passwords can also be synchronized across devices.For ex, if you change Gmail password on one device it automatically updates it on all other devices.

Mutual Authentication for Multiple Services (SSO): Apple, Microsoft and Google allow mutual authentication for multiple services. For x single Microsoft account login provides access to Outlook email., Microsoft store, and OneDrive. A single Apple login provides access to iTunes, iCloud and other services. A single Google login provides access to Gmail, Android services and other services.

Software requirements to install the application on the PC: As with any software minimum hardware and disk-space requirements exist for installing the software that allows synchronization of mobile devices. Any computer on which a user would install these software applications should have USB and Wi-Fi for connectivity.

Connection Types to enable synchronization: The synchronization process can be carried out over several methods of connection between the devices. In some cases, you can connect the mobile device to the laptop or desktop using a USB connector. In other cases you can establish a Bluetooth connection from the mobile device and the desktop. Finally, an 802.11 WLAN can also be usd to establish this connection. In some instances the synchronization application will allow you to introduce a shared folder into the scenario., which then allows you to use the internet to syncfrom the laptop to the dropbox and then from the Dropbox to the mobile device.

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CompTIA®A+ Exam Notes : Troubleshoot common problems related to motherboards, RAM, CPU,And Others

4. Hardware and Network Troubleshooting

4.1 Troubleshoot common problems related to motherboards, RAM, CPU and power with appropriate tools

1. On a personal computer, the general errors and the corresponding failures are shown below:
100-199 : System board failures
200-299 : Memory failures
300-399 : Key board failures
400-499 : Monochrome video problems
500-599 : Color video problems
600-699 : Floppy disk errors
1700-1799: Hard disk problems.

2. Some of the frequently encountered error codes and their corresponding error messages on a PC are given below.

Error Code	Error Message
161	CMOS battery failure: Replace the CMOS battery
164	Memory size error : If the error occurs after memory upgrade, run SETUP program.
201	Memory test failed : RAM chips failed, one or more may need to be replace.
301	Keyboard error: You may have to check the key board

3. **A toner probe** is an electronic test instrument to help trace wires. One part (the tone generator) induces a tone on a pair of wires, and with the other you part (the tone probe) you can detect the tone at the other end to trace where the wires go. You can trace wires through walls using a tone probe, and determine which pair is carrying the signal you induced at the other end.

4. A **cable tester** is used to verify that all of the intended connections exist and that there are no unintended connections in the cable being tested. When an intended connection is missing it is said to be "open". When an unintended connection exists it is said to be a "short" (as in short circuit). If a connection "goes to the wrong place" it is said to be "miswired" (the connection has two faults: it is open to the correct contact and shorted to an incorrect contact).

5. **Difference between a Toner Probe and Cable Tester:** The main difference between a cable tester and a toner probe is that in the former, you have access to the both ends of the cable at the same time, and you normally to Open or Short testing (to determine right pins are connected), and in the latter, you dont have simultaneous physical access to both ends of the cable. An AT computer will have two interrupt controllers. The second interrupt controller needs to deliver the interrupts through the primary interrupt controller. IRQ2 had been identified for this purpose on the primary and IRQ9 on the secondary interrupt controllers. In other words, IRQ2 and IRQ9 are cascaded.

6. **AT style systems:** AT style systems use two power connectors, P8 and P9 to connect to the motherboard. ATX systems use only one P1 connector to connect to the motherboard.

7. **Keyboard Error**: If you are getting a keyboard error, you need to do one of the following things:

1. Check if the keyboard needs to be cleaned

2. Check if the keyboard cable has become loose

3. Check if one or more of the keys are stuck

4. If required, replace the keyboard.

8. **Battery backup:** The battery is supposed to provide backup in the event of any power failure, typically up to 2 hours or more

9. **Hardware Compatibility List:** The best ways to find whether a new hardware is supported by your Windows OS is to check the manufacturer's documentation first, and then the Hardware Compatibility List (HCL).

10. **Inverter board:** The inverter board is responsible for converting low voltage DC power to high voltage AC, necessary to light up the back-light bulb. If the inverter board is bad, the LCD screen (back-light bulb) will not light up when you turn on the laptop, but you still should be able to see a very dim image on the screen.

11. **Pagination Error:** If your error is typical, it will result in random BSOD (Blue Screen of Death) crashes but between crashes, the computer will be usable. Recommended sequence of steps to troubleshoot in a Windows 10 computer:

1. First check the hard drive for errors:

- Open a CMD window as an administrator.
- Type or paste 'chkdsk /f /r' and hit Enter.
- Allow the process to complete.

2. Then perform a system file check.

- Open a CMD window as an administrator.
- Type or paste 'sfc /scannow' and hit Enter.
- Allow the process to complete.

If problem persists, check Windows updates and drivers as they are often the cause of Page Fault in Non paged Area errors.

1. Navigate to Settings, Update & security.

2. Click 'Check for updates' in the Windows update tab.

3. Allow the process to complete.

4. Navigate to Control Panel, Hardware and Sound, Device Manager.

5. Select hardware, right click and 'Update Driver Software'. Make sure you check graphics and audio drivers as well as any third party webcam, printer and other drivers.

6. Reboot and retest.

If the BSOD still occurs, check the Windows page file.

1. Right click 'This PC' in Windows Explorer and select Properties.

2. Click 'Advanced system settings'.

3. In the Advanced tab click Settings in the Performance box.

4. Click Change in the Virtual memory box and uncheck ‘Automatically manage paging files for all drives’.

5. Set a custom size for the page file.

6. Click Ok.

7. Reboot.

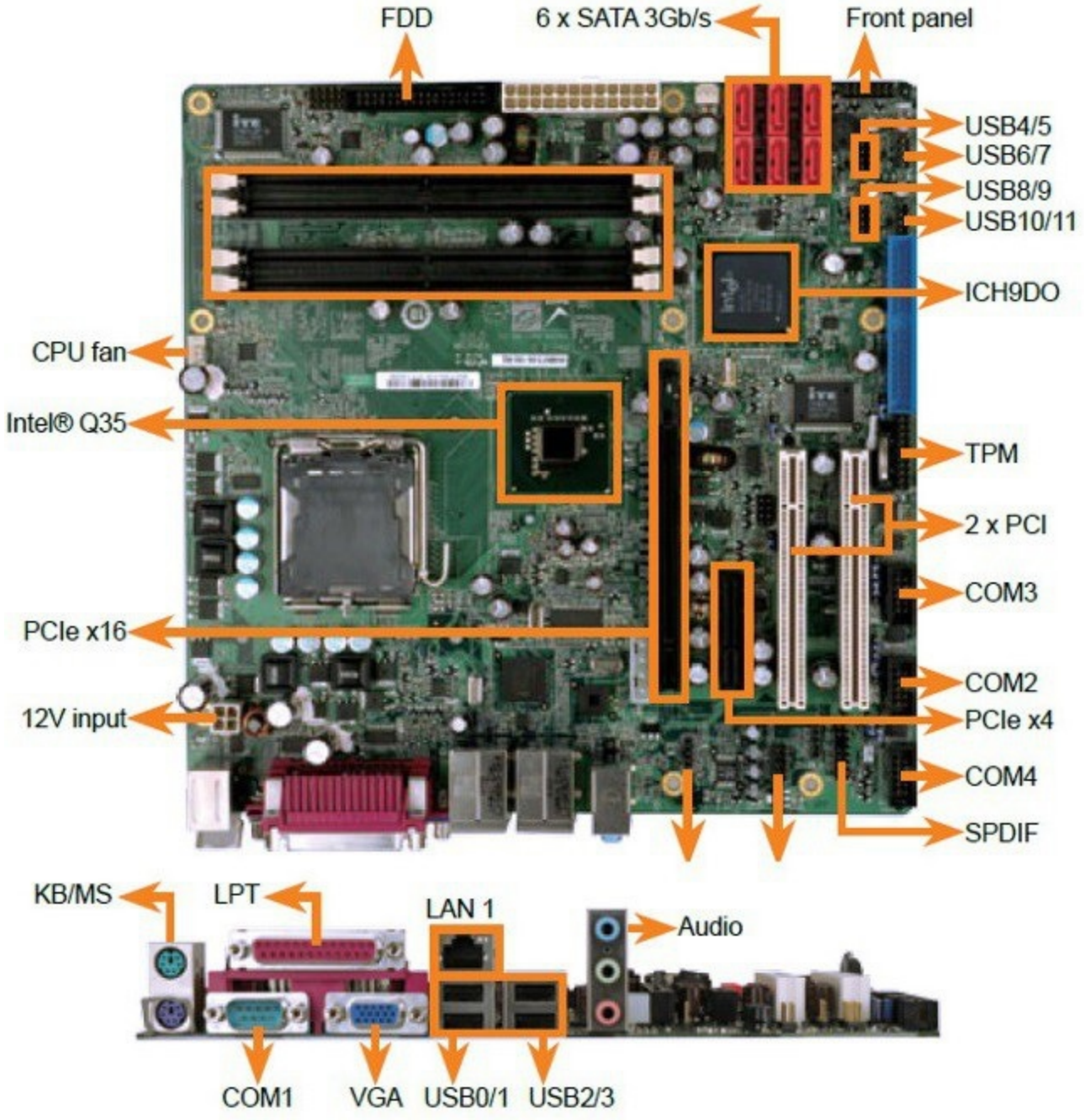
Finally, if none of those software methods work, check your RAM (physical memory). If your computer has multiple sticks of RAM, remove one and retest. If the fault persists, change the memory slot and retest. If the error keeps occurring, consider replacing your RAM.

12. **Date and Time Not Set error:** Date and Time Not Set is the most common error that occurs when the BIOS battery is drained. You need to replace the CMOS battery.

13. **Sporadic Movement of Mouse:** The most likely cause for sporadic movement of mouse is dirt. If dirt has entered the mouse, clean the dirt with IPA, or cotton wetted in soap water.

14. **Conflicting IRQs:** The most likely problem is conflicting IRQs(Interrupt Request Line). Since the mouse is working until the modem is used, the IRQ/IO address of modem may be conflicting with that of the mouse.

15. The motherboard displayed has the following expansion slots:



1. **PCI slots:** 5 (distinguished by white color, usually the number of PCI slots available on a motherboard varies from 3 to 6)

2. **ISA slots:** 2 (distinguished by black color, longer than PCI slots, placed next to PCI slots.)

3. **AGP slot:** 1 (The single slot, next to 5 white PCI slots is AGP slot in brown color. Note that there will be only one AGP slot)

16. **To obtain BIOS string ID:**

1. Power off the system

2. Either unplug your keyboard or hold down one of the keys on the keyboard

3. Power-on the system and you should get a keyboard error

4. The string in the lower left hand corner of your computer screen represents the BIOS String ID.

17. It is also possible to read the BIOS information by going to the BIOS set-up of the PC by pressing appropriate key (usually Del key) during boot up.

18. **Various POST (Power On Self Test)** error codes and their description is as below: Code 01: Undetermined problem

Code 02: Power Supply error Code 1xx: System board errors Code 2xx: Memory (RAM) errors Code 3xx: Keyboard errors

Code 6xx: Diskette Drive errors x is any single digit integer.

19. **The following are true about backup:**

1. **Full backup:** Here all files that have been chosen for backup are backed up, irrespective of whether the archive bit is set or not set. Archive bit is set (ON) after backup.

2. **Incremental backup:** Here only the files that have been created or have changed since the previous full or incremental backup will be backed up. The archive bit is set after a file is backed up. Incremental backup will backup files that have changed since previous full or incremental backup.

3. **Differential backup:** Here, the files that have changed or created since the last full backup will be backed up. Note that, unlike Incremental backup, the archive bit is not set on a differential backup. The result of this is that the next differential backup will include files that were backed up during earlier Differential backups.

20. UPS usually contains a filter to smooth the noise, and this filter is called noise filter.

21. x86 (32-bit) operating systems have a memory limit of 4GB. If you intend to use greater than 4GB of memory, you need to upgrade to x64 bit operating system.

22. Startup Repair can prevent a time-consuming re-installation by diagnosing and repairing problems that prevent Windows from starting.

Startup Repair: Startup Repair is designed to start automatically if Windows detects a startup problem. The Startup Repair tool in Windows 7 can help fix problems that prevent Windows from starting up.

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CompTIA®A+ Exam Notes : Troubleshoot Wired And Wireless Networks With Appropriate Tools

4. Hardware and Network Troubleshooting

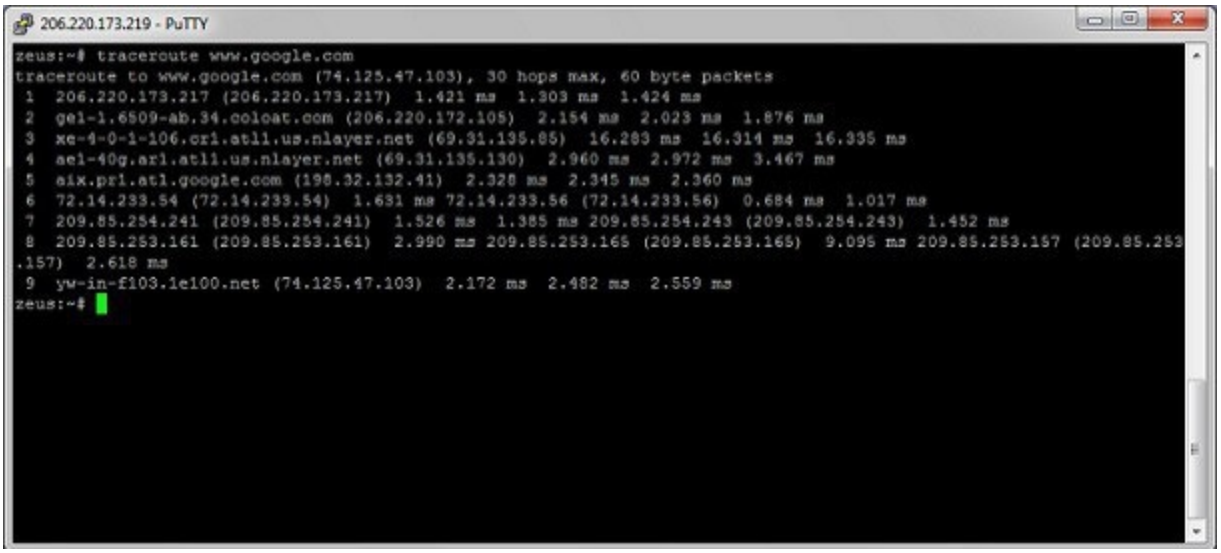
4.2 Troubleshoot wired and wireless networks with appropriate tools.

Some of the important commands useful in trouble shooting TCP/IP networks are:

NBTSTAT : This utility displays current NetBIOS over TCP/IP connections, and display NetBIOS name cache. Netstat displays active TCP connections, ports on which the computer is listening, Ethernet statistics, the IP routing table, IPv4 statistics, and IPv6 statistics. Used without parameters, netstat displays active TCP connections. NETSTAT is used to review all inbound / outbound TCP/IP connection. Nbtstat is designed to help troubleshoot NetBIOS name resolution problems. When a network is functioning normally, NetBIOS over TCP/IP (NetBT) resolves NetBIOS names to IP addresses. The nbtstat command removes and corrects preloaded entries using a number of case-sensitive switches.

NETSTAT: netstat stands for network statistics. This command displays incoming and outgoing network connections as well as other network information. Displays protocol statistics and current TCP/IP connections since the server was last booted.

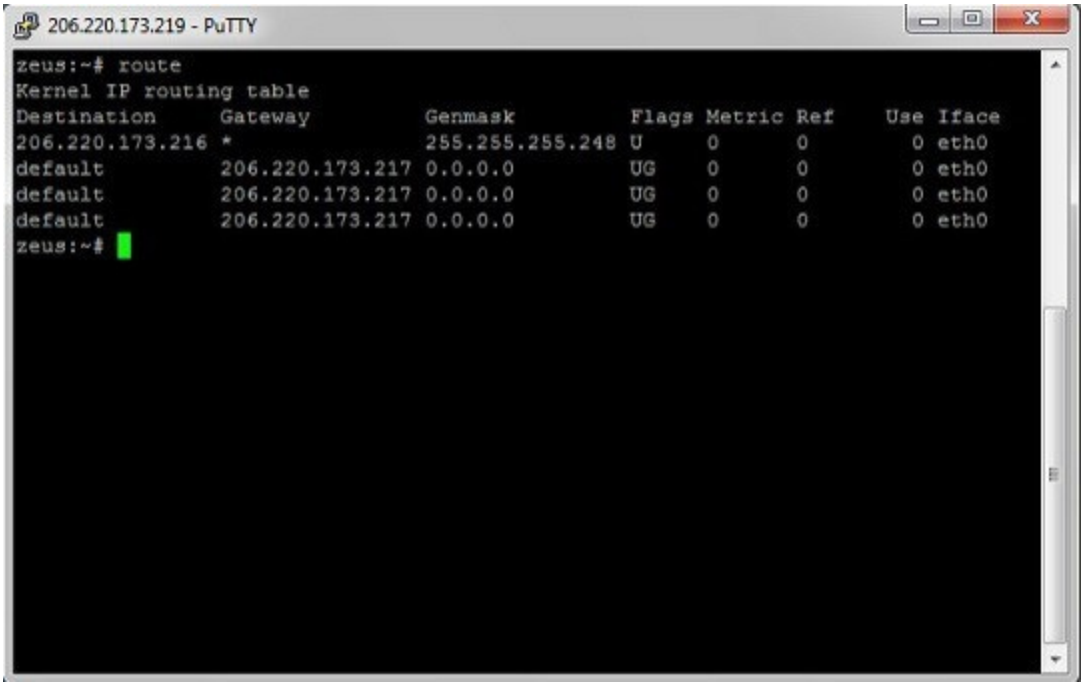
TRACERT: Used to determine which route a packet takes to reach its destination from source. IPCONFIG Used to display Windows IP configuration information. TRACERT command can be used to determine the path that a packet takes while traversing on the network before reaching the destination.



NSLOOKUP: This utility enables users to interact with a DNS server and display resource records. The nslookup command will look up the IP addresses associated with a domain name.

nslookup also allows you to perform a reverse lookup to find the domain name associated with an IP address. Displays information that you can use to diagnose Domain Name System (DNS) infrastructure. The Nslookup command-line tool is available only if you have installed the TCP/IP protocol.

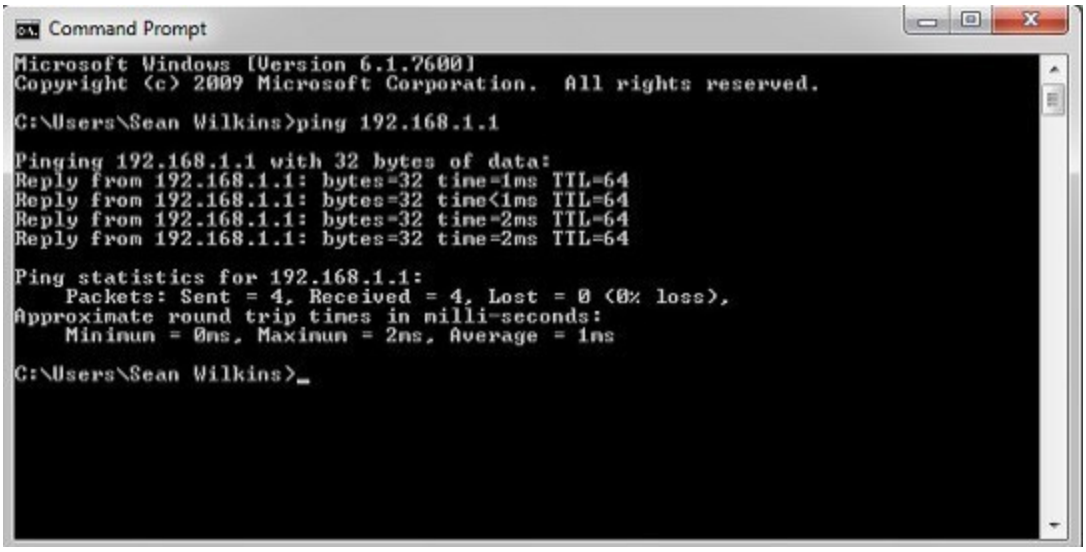
ROUTE: Used to display and edit static routing tables. Displays and manipulates route information.



Ping: This command can be used to verify whether the target ip address or host name is present. You need to specify the target IP address or host name.

You can ping the loop back address at 127.0.0.1. A response ensures that the TCP/IP stack is installed properly on your computer.

Running a command like "ping" or "ipconfig" will open the command screen. However, the command screen closes soon after the execution of the command. If you intend to observe the results of any such command, you need to open the DOS screen by going to Program Files | Accessories | Command Prompt.



IPCONFIG: IPCONFIG gives the current IP address assigned to the Windows 8 computer. Winipconfig command is not available in Windows XP, 7 and later versions. Displays TCP/IP configuration values, including IP address, subnet mask, and default gateway. It is used to find out your current TCP/IP settings. With IPCONFIG you can find out your IP Address, find your Default Gateway and find your Subnet Mask. This is a very handy network tool for finding your local IP address. Ipconfig (sometimes written as IPCONFIG) is a command line tool used to control the network connections on Windows NT/2000/XP machines. There are three main commands: "all", "release", and "renew". Ipconfig displays all current TCP/IP network configuration values and refreshes Dynamic Host Configuration Protocol (DHCP) and Domain Name System (DNS) settings. Used without parameters, ipconfig displays the IP address, subnet mask, and default gateway for all adapters.

ipconfig/all: To display all your IP information for all adapters. With ipconfig/all you can also find out your DNS Server and MAC Address of your network card. This will show your full TCP/IP configuration for all adapters on your Windows machine. You can find out your own IP Address as well as your default gateway.

Related commands that are often used:

ipconfig /release: To release your current IP information and obtain a new IP Address from the DHCP server.

ipconfig /renew: Used to renew your IP Address if you have it set to obtain IP Address automatically.

ipconfig /displaydns: This shows your current DNS Resolver Cache Logs.

ipconfig /flushdns: This flushes or clears your current DNS Resolver Cache Logs.

Peer-to-peer model is best suited when you need to share files and folders among others in your office. If the number of networked computers become very large or if the security of data is very important, Client-Server model is recommended.

Available options with ipconfig command are given below:

/?	Display this help message
/all	Display full configuration information.
/release	Release the IPv4 address for the specified adapter.
/release6	Release the IPv6 address for the specified adapter.
/renew	Renew the IPv4 address for the specified adapter.
/renew6	Renew the IPv6 address for the specified adapter.
/flushdns	Purges the DNS Resolver cache.
/registerdns	Refreshes all DHCP leases and re-registers DNS names
displaydns	Display the contents of the DNS Resolver Cache.
/showclassid	Displays all the dhcp class IDs allowed for adapter.
/setclassid	Modifies the dhcp class id.
/showclassid6	Displays all the IPv6 DHCP class IDs allowed for adapter
/setclassid6	Modifies the IPv6 DHCP class id.

Given below are the basic commands that are used with FTP:

get: to copy one file from the remote machine to the local machine

mget: to copy multiple files from the remote machine to the local machine;

put: to copy one file from the local machine to the remote machine

mput: to copy multiple files from the local machine to the remote machine;

p: is used to request help or information about the FTP commands, and ls is used to list directory contents.

Diskpart command line function can be used to manage disk drives in Vista, Win 7/8. Use the command with caution.

System File Checker (sfc) Scans and verifies the versions of all protected system files after you restart your computer.

Wi-Fi Troubleshooting:

If your smartphone Wi-Fi does not remain connected, the problem may be that it is configured to drop the connection during sleep or lock mode. Just go to Wi-Fi > Settings > Menu > Advanced and choose to stay connected to Wi-Fi during sleep.

If you sign up with a mobile carrier network, you might need to configure your phone's APN settings.

The first thing you'll need to do is find the right APN settings for the network you want to use. You'll be able to find these at the support pages at the carrier website.

For example, the settings may look like:

NAME: straight talk APN: tfdata
PORT: 80
MMSC: http://mms-tf.net
MMS PROXY: mms3.tracfone.com

Once you have this information at hand, take your phone.

Configuring APN settings:

To get started configuring APN settings, go to Settings -> Wireless & Networks -> More -> Mobile Networks -> Access Point Names.

Once you've found your mobile network settings, the rest will be the same on all devices. You're looking for the "Access Point Names" section. Tap to open it.

If you don't see the APN of your carrier, make a new APN, and have the settings entered as is. Don't have to worry about blank entries as these entries, most probably, not required by the carrier.

Once you have the settings provided by your carrier entered, you need to save the APN. You do that by pressing the three dots in the upper right (or the menu key if your phone has one) and selecting the "Save" option.

Once your APN information is saved, go back one screen to the list of APNs and tap the new APN settings you just entered to make them active.

Note that the menu options may change slightly from one version of Android to another.

Setting passcodes on mobile devices is the most basic security requirement for any mobile device to be allowed into a work environment. Passcodes require the user to enter a passphrase to unlock the device. Devices can also be configured to lock automatically after a configurable timeout period. (Typically, five minutes is ideal)

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CompTIA®A+ Exam Notes : Troubleshoot Hard Drives And Raid Arrays With Appropriate Tools

4. Hardware and Network Troubleshooting

4.3 Troubleshoot hard drives and RAID arrays with appropriate tools.

1. If the CMOS setup is not properly setup the computer may ignore or not look at the CD-ROM as a bootable option. Verify in the CMOS that your settings are properly set to boot from the CD-ROM drive.

2. The Complementary Metal-Oxide Semiconductor (CMOS) allows the computer to store the Real Time Clock (RTC)and other device information even after the computer is switched off and on. This is achieved by using a battery just for CMOS.

3. Generally, these settings will be under the boot options. Setup your boot options similar to the below example.

- Floppy / LS120
- CD-ROM
- Network (if available)
- Hard Disk Drive

4. If CD-ROM is listed after a device that is bootable it will boot from the other device before the CDROM. Verify that the devices before CD-ROM, such as floppy, do not have bootable media in them.

5. If the SCSI bus termination is not done, SCSI devices on the bus will not function properly. This is due to reflection of the signals at the end of the bus. To prevent this, both ends of the SCSI bus needs to be terminated. If one end of the SCSI bus is terminated, you may find intermittent problems. Never terminate the bus at a device connected in between.

6. If you are creating a Striped volume on a new Windows 2000 machine, it can only be created on dynamic disks. However, if you are upgrading a Windows NT computer to Windows 2000, any existing stripe set will be supported.

7. If you are finding that the Logical Disk > %Free Space counter is less than 10%, you might need to make additional free space available. This can first be done cleaning up the disk of any unwanted files, duplicate files etc. If required, additional physical disk may be provided.

8. If you have a standard desktop PC that uses integrated drive electronics (IDE) disk drives, then these will be detected during setup. If, however, you use SCSI disks or have Redundant Array of Independent Disk (RAID) storage systems, you will see, shortly after the reboot, the following line of text displayed at the bottom of the screen

9. “Press F6 if you need to install a third party SCSI or RAID driver…” Pressing F6 will start a dialog that allows you to configure and install the drivers for your SCSI or other disk subsystem controllers. This option is usually used on server platforms that use large-capacity, high-speed, fault-tolerant disk subsystems. For most PCs, however, you won't need to use this option.

10. If you want to format a drive and also make it bootable, you need to format with /s switch. By issuing this command, the boot files IO.SYS, MSDOS.SYS, COMMAND.COM get copied to the disk

11. It is obvious that you can get shock is due to sudden discharge of static electricity. Since the operator is touching the memory module when the discharge happened, it is most likely that the memory module may have internally damaged. This damage may or may not show up immediately. In any case, it always recommended to replace the statically damaged module with a good one. Follow anti-static precautions before touching any electronic components inside a PC.

12. It is recommended that the backup tape is stored at a location away from the building where the backup was taken. For most companies, backups contain important data and loosing backups may affect the continuity of one’s business. If a backup is stored in the same building, it may get damaged in fire or any other natural calamities along with the computers. As a result, both the server, as well as back fail at the same time. Therefore, it is recommended to store the backup at a different location.

13. If the hard-disk is making sound, the most likely problem is that the hard disk read/write head is scratching the disk surface. It often results in the total failure of the disk. If you find that you can still read/write to the disk, backup the hard disk and replace immediately.

14. Low level formatting will erase the data on a hard drive permanently.

15. A hard disk should never be low level formatted at the customer premises. It is highly recommended that it is done at the manufacturer's or at any authorized center. It is very cumbersome to change the partition sizes, once the hard disk is partitioned and used. It may require backing up all the data and restoring after re partitioning.

Dynamic disks are not supported in portable computers and on external USB devices. The primary reason being that dynamic disks are used for enabling RAID configuration or back configuration, which requires two or more disks to be present. Usually, portable computers and USB hard disk drives come with single hard drive.

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CompTIA®A+ Exam Notes : Troubleshoot Common Video And Display Issues

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4. Hardware and Network Troubleshooting

4.4 Troubleshoot common video and display issues

1. Monitors accumulate very high static charges and need to be handled very carefully. Before attempting any repair, it is imperative to discharge any accumulated charges on the monitor. You can use a jumper, one end of which is grounded, and touch the other end of the jumper wire to the anode of the monitor. While doing so, ensure that you are not in direct contact with the jumper wire or the anode. You can use a screw driver or a nose pliers with rubber handle for this purpose. A "POP" sound can be heard when the static charges accumulated on the anode lead getting grounded through the jumper wire

2. Never wear a wrist strap when working on monitors. Monitors contain very high voltages, sometimes fatal to human, even when the power is turned off. If you are wearing wrist strap, the human body work as a conduit to discharge the electric charge

3. When you are installing a different SVGA monitor, it is unlikely that the new monitor has the same capabilities as the old one. As a result, the image on the screen may not be readable. In such instances, change the video resolution to Standard VGA before installing the new monitor. You can change the resolution appropriately after the image on the screen is readable with the new monitor. It may also be necessary to load appropriate device driver, if you are installing a different display adapter.

4. The most probable cause that the screen is dumping garbled characters is that the communication settings are not correct. Check the speed, parity, start/stop bits etc. If the serial port parameters are correct, then you need to check the cable, such as straight/cross cable and the pin connections.

5. The problems such as video card, network card, and modem card can be resolved by booting to Safe Mode. While in Safe Mode, troubleshoot the problem.

CompTIA®A+ Exam Notes : Troubleshoot Printers With Appropriate Tools

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4. Hardware and Network Troubleshooting

4.5 Troubleshoot printers with appropriate tools

Problems associated with laser printers and probable causes:

1. Speckled pages: The causes for this may be

- The failure to clean the drum after printing properly, or
- The drum might have developed scratches.

2. Blank pages: The causes for white pages may be

- The toner would have dried out, replace the toner.
- The transfer corona, that is responsible for transferring the toner to the drum might have failed.
- The High Voltage Power Supply (HVPS) failure will also result in white pages.

3. Ghosted Images: Ghosting occurs when previously printed pages are printed again, though much lighter than the present image. The most likely cause is that the erasure lamp might not be working properly, thus leaving some charges representing the earlier image left on the photosensitive drum before new image is written. Also check the cleaning blade, which is responsible for scraping the residual toner.

4. Smudged images: If the fusing fails, the toner will not bond with the paper. Check the halogen lamp responsible for heating.

- The toner is negatively charged, so that it gets attracted towards the positively charged paper surface (due to positively charged transfer corona).
- The manufacturer specifies the field replaceable parts, and usually, the print heads and toner catridges are the only FRUs (Field Replaceable Parts).
- Nickel Cadmium battery is not environmentally friendly and not as efficient as Nickel/Metalhydride or Lithium Ion. Nickel/Metal hydride, though environmentally friendly, not as efficient as Lithium Ion. Lithium Ion battery is environmentally friendly and very efficient.
- Typically, a laser printer maintenance kit consists of fuser fixing assembly, pickup rollers, transfer roller, gloves, and instruction manual.

The following are the 6 steps in the ElectroPhotographic (EP) print process of Laser Printer:

1. Cleaning: Cleaning the photosensitive drum includes residual toner left on the drum and removing the electrical charges left out on the drum. The physical cleaning is done with a rubber blade and the electrical charge cleaning is done with erasure lamps.

2. Charging: The next step in printing, is to charge the photo sensitive drum with high negative charge, this is done with the help of a corona wire.

3. Writing: A laser (type 3) sweeps the entire length of the drum, creating the static image of the matter to be printed. The places where the laser travel, the highly charges are neutralized. Other places of the drum, it remains highly negatively charged

4. Developing: Now drum gets in close proximity to the toner. Because the toner is negatively charged, it gets attracted to the areas where the drum is neutral. It will not be attracted to the places where the drum is highly negatively charged. Thus the image of the page to be printed formed on the photosensitive drum

5. Transferring: Now, the toner on the drum gets attracted toward the paper, by using highly positive charges developed on the surface of the paper. The "transfer corona" is used to generate highly positive charge on the paper surface and to attract the toner from the drum. Thus the image of the page to be printed formed on the paper. But still, the toner is loose and can get easily smeared.

6. Fusing: In order to permanently bond the toner particles to the paper, the paper is passed through rollers. One of the rollers, the non stick roller is heated by a high intensity lamp, generating the heat necessary to bond the toner to the surface of the paper.

Lightning Connector: The Lightning connector is proprietary to Apple, and is solely used on Apple devices, such as iPhones and iPads It is able to output a larger amount of power than traditional chargers for faster charging, and it does not have to be turned a specific way to connect it to the charge port on your phone. The following are some of the advantages of lightning connector

- It can supply more power
- It can be inserted either way
- It is physically more durable than USB
- It can detect and adapt to connected devices.

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CompTIA®A+ Exam Notes : Compare and contrast cloud computing concepts

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5. Virtualization and Cloud Computing

5.1 Compare and contrast cloud computing concepts

Virtualization: Virtualization is an emerging IT paradigm that separates computing functions and technology implementations from physical hardware. It enables single computer controlling multiple machines, or one operating system utilizing multiple computers to analyze a database.

Virtualization may also be used for running multiple applications on each server rather than just one; this in turn reduces the number of servers, companies need to purchase and manage. It enables you to consolidate your servers and do more with less hardware. It also lets you support more users per piece of hardware, deliver applications, and run applications faster.

Using the virtualization, the software can reduce the cost of hardware and it increases utilization, accessibility, and efficiency of the infrastructure. Virtualization works on the top of the hardware of the physical server and divides its hardware into multiple segments (Virtually only) where virtual machines are then installed.

What is Cloud?

The term Cloud refers to a Network or Internet. In other words, we can say that Cloud is something, which is present at remote location. Cloud can provide services over network, i.e., on public networks or on private networks, i.e., WAN, LAN or VPN. Applications such as e-mail, web conferencing, customer relationship management (CRM), all run in cloud.

What is Cloud Computing?

Cloud Computing refers to a set of principles and approaches to deliver the application and services that run on a distributed network and accessed by general internet protocol on demand. It can provide limitless virtual computing, network, storage and infrastructure resources, services, platforms and applications.

Benefits of Cloud computing

1. It is accessible to all the users (proper credentials) without any restriction.

2. Using the cloud for applications is cost-efficient.

3. Least the possibility of access failure due to non-dependency on a single machine.

4. Cloud provides independence from machine access. URL gives access to infrastructure all the time.

5. Real time user access. Multiple users can access the same application and can work on it (Example – Google Doc)

6. Cloud is reliable for Backup and recovery since data storage is not server-specific.

7. Cloud computing is the best platform to showcase your applications/software worldwide. Users can access your application & work on it using a single link.

8. Flexibility to access it from anywhere makes it popular among users and service-providing industries.

Common Cloud Models: There are many different service models available for the cloud, with more being defined all the time. The three most common models are Software as a Service, Platform as a Service, and Infrastructure as a Service. Each provides a different level of manageability and customization for your solution.

1. SaaS: SaaS, or software as a service, is a cloud service that revolves around, easily the largest and most well known cloud-based service, SaaS uses the cloud to deliver software to users, which is then usually accessed via your Web browser. Unlike physical software that you install on your computer, SaaS solutions are hosted on a provider's servers. SaaS helps

deliver an application that can be widely distributed and accessed. An example of this would be Google's Gmail. This email-based application is fully managed and accessed over the internet.

2. PaaS: PaaS, or Platform as a Service providers offer you a higher level of management and control by providing access to a framework from the operating system, up. The underlying architecture of the host hardware network components and OS are typically managed by the vendor, who also take care of maintenance and support. This aspect makes it a great deployment service for developers who are free to concentrate on developing and not on maintenance.

3. IaaS: IaaS, or infrastructure as a service, is essentially cloud-based computers and resources. The most popular and well known type of IaaS is the virtual machine which is a digital version of a computer or server that is accessed over an Internet connection. The infrastructure is physically kept off site, and usually managed by a provider, but you access and interact with it as if it is located on your computer or in your office.

Public vs. Private vs. Hybrid vs. Community:

Cloud computing offers notable advantages for businesses of all sizes. Moving all or part of a company's computer resources to the cloud involves deciding which cloud services and which type of cloud best suits the company's needs. There are two fundamentally different types of clouds, public and private. Each has its own advantages and disadvantages. However, cloud computing is continually evolving and cloud-service providers (CSPs) may offer hybrid clouds that combine features of both the public and private models. Community clouds are a recent variant of hybrid clouds that are built to serve the specific needs of different business communities.

Public Clouds: In a public cloud, individual businesses share on premise and access to basic computer infrastructure (servers, storage, networks, development platforms etc.) provided by a CSP. Each company shares the CSP's infrastructure with the other companies that have subscribed to the cloud. Payment is usually pay-as-you-go with no minimum time requirements. Some CSPs derive revenue from advertising and offer free public clouds.

Public clouds are usually based on massive hardware installations distributed in locations throughout the country or across the globe. Their size enables economies of scale that permit maximum scalability to meet requirements as a company's needs expand or contract, maximum flexibility to meet surges in demand in real time, and maximum reliability in case of hardware failures. Public clouds are highly cost effective because the business only pays for the computer resources it uses.

The main disadvantage of public clouds is that advanced security and privacy provisions are beyond their capabilities. For example, public clouds cannot meet many regulatory compliance requirements because their tenants share the same computer infrastructure. In

addition, large CSP's often implement their public clouds on hardware installations located outside the United States which may be a concern for some businesses.

Public clouds are well suited for hosting development platforms or web browsers, for big data processing that places heavy demands on computer resources, and for companies that do not have advanced security concerns.

Private Clouds: In a private cloud, a business has access to infrastructure in the cloud that is not shared with anyone else. The business typically deploys its own platforms and software applications on the cloud infrastructure. The business's infrastructure usually lies behind a firewall that is accessed through the company intranet over encrypted connections.

Private clouds have the significant advantage of being able to provide enhanced levels of security and privacy because computer infrastructure is dedicated to a single client. In addition, private cloud CSPs are more likely to customize the cloud to meet a company's needs.

An important disadvantage of private clouds for some companies is that the company is responsible for managing their own development platforms and software applications on the CSP's infrastructure. While this gives the business substantial control on the software side, it comes at the cost of having to employ IT staff that can handle the company's cloud deployment. Recognizing this disadvantage, some CSPs provide software applications and a virtual desktop within a company's private cloud.

Private clouds have the additional disadvantages that they tend to be more expensive and the company is limited to using the infrastructure specified in their contract with the CSP.

Hybrid Cloud: In a hybrid cloud, a company's cloud deployment is split between public and private cloud infrastructure. Sensitive data remains within the private cloud where high security standards can be maintained. Operations that do not make use of sensitive data are carried out in the public cloud where infrastructure can scale to meet demands and costs are reduced.

Hybrid clouds are well suited to carrying out big data operations on non-sensitive data in the public cloud while keeping sensitive data protected in the private cloud. Hybrid clouds also give companies the option of running their public-facing applications or their capacity intensive development platforms in the public portion of the cloud while their sensitive data remains protected.

Community Clouds: Community clouds are a recent variation on the private cloud model that provide a complete cloud solution for specific business communities. Businesses share infrastructure provided by the CSP for software and development tools that are designed to meet community needs. In addition, each business has its own private cloud space that is built to meet the security, privacy and compliance needs that are common in the community.

Community clouds are an attractive option for companies in the health, financial or legal spheres that are subject to strict regulatory compliance. They are also well-suited to managing joint projects that benefit from sharing community-specific software applications or development platforms.

The recent development of community clouds illustrates how cloud computing is evolving. CSPs can combine different types of clouds with different service models to provide businesses with attractive cloud solutions that meet a company's needs.

Shared resources: Devices in a cloud data center are virtual machines (Vms) that share the resources of the underlying host. Virtual machines represent virtual instances of an operating system that exist as files on the physical host. One of the benefits of hypervisor-driven virtualization is the ability of the hypervisor to recognize momentary needs for more resources by one of the Vms and react by shifting some percentage of the resource in contention to the overloaded VM.

Internal vs. External: Regardless of whether the solution is public or private, the shared resources might be located either externally or internally. In an internal solution, all the resources are located in an organization's data center and are owned by the organization. In an external solution, all the resources are located at the service provider's data center and are owned by the service provider.

Virtual desktop: Virtual desktop infrastructures (VDIs) host desktop operating systems within a virtual environment in a centralized server. Users access the desktops and run from the server. There are three models for implementing VDI.

Centralized: All desktop instances are stored in a single server, requiring significant processing power on the server.

Hosted: Desktops are maintained by a service provider. This model eliminates capital cost and is instead subject to operation cost.

Remote Virtual Desktops: An image is copied to the local machine, making a constant network connection unnecessary.

Virtual NIC: Virtual network interface cards (VNICs) are software packages that act in the place of a physical network interface card (NIC) for a VM. Virtual NICs and virtual switches alone can form a virtual network for only virtual machines and the host physical machine, but if any communicating required between the virtual network and the physical network , the virtual NIC must be configured to communicate with the physical NIC of the underlying host.

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Security requirements: Many security problems that can occur with attackers jumping out of one VM and accessing another, most software solutions include sufficient protection to reduce the possibility to a small one.

Keep in mind that in any virtual environment, each virtual server that is hosted on the physical server must be configured with its own security mechanisms. These mechanisms include antivirus and anti-malware software and all the latest service packs and security updates for all the software hosted on the virtual machine.

Network requirements: Network access is not a requirement in every virtual environment but is often needed in most. During implementation of the virtualization, you can configure the network functionality for the machine or combine elements of the network together to provide network virtualization.

Hypervisor: A hypervisor, also known as a virtual machine monitor, is a process that creates and runs virtual machines (VMs). A hypervisor allows one host computer to support multiple guest VMs by virtually sharing its resources, like memory and processing. Generally, there are two types of hypervisors. Type 1 hypervisors, called “bare metal,” run directly on the host’s hardware. Type 2 hypervisors, called “hosted,” run as a software layer on an operating system, like other computer programs.

Hypervisor make it possible to use more of a system’s available resources and provide greater IT mobility since the guest VMs are independent of the host hardware. This means they can be easily moved between different servers.