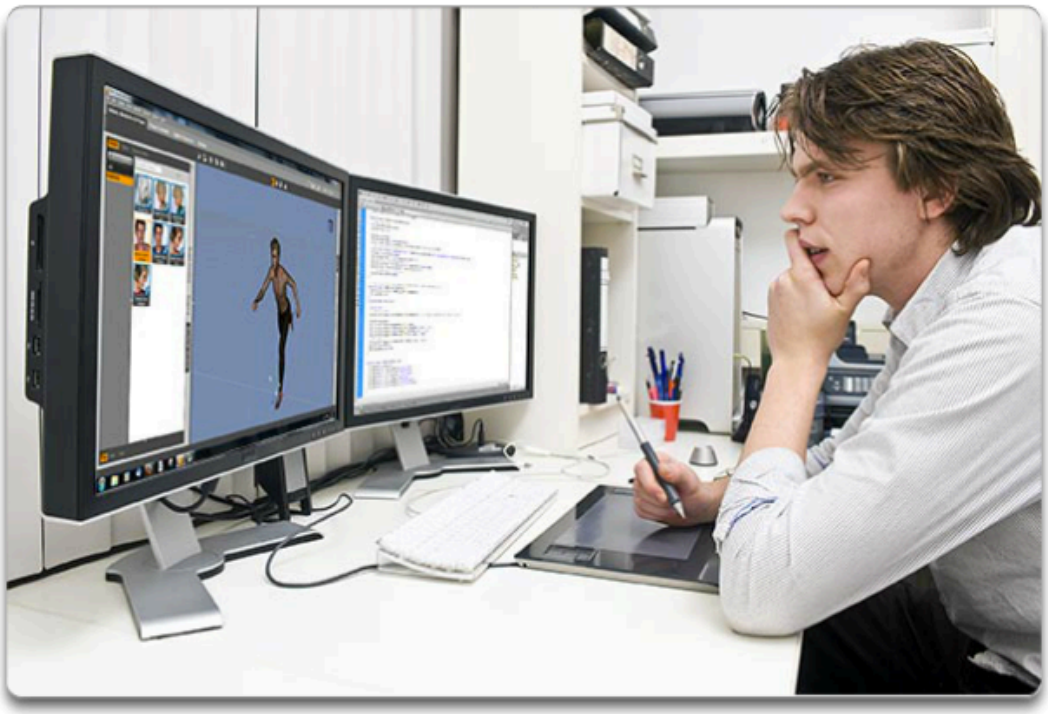
Specialized Computer System

CAx Workstation

CAD Workstation



You may need to design, build, and install computers for a customer that can accomplish a specific task. All computers can run programs, store data, and use I/O devices.

A standard thick client is a traditional desktop computer that meets the recommended requirements for Windows and runs desktop applications. In contrast, a specialized computer must support hardware and software that allows a user to perform tasks that a thick client cannot perform. One example of a specialized computer is a workstation used to run computer-aided design (CAD) or computer-aided manufacturing (CAM) software.

A CAD or CAM (CAx) workstation, as shown in the figure, is used to design products and control the manufacturing process. CAx workstations are used to create blueprints, design homes, cars, airplanes, and many of the parts in the products that you use every day. CAx is even used to develop the computer parts used in CAx workstations. A computer used to run CAx software must support the needs of the software and the I/O devices that the user needs to design and manufacture products. CAx software is often complex and requires robust hardware. Consider the following hardware when you need to run CAx software:

- Powerful processor - CAx software must make enormous amounts of calculations very quickly. You must meet the needs of the software when choosing a CPU.

- High-end video card - Some CAx software is used to create 3D models. Realistic shading and texturing add to the complexity of the models, and a video card that can handle high resolutions and high detail is needed. Often, multiple monitors are desired or even required so that the user can work with code, 2D renderings, and 3D models all at the same time. Choose a video card that supports multiple monitors.

RAM - Because of the high amount of data processed by a CAx workstation, RAM is very important. The more RAM that is installed, the more data the processor can calculate before needing to read from slower storage, such as hard drives. Install as much memory as is supported by the motherboard and the operating system. The quantity and speed of the memory should exceed the minimums recommended by the CAx application.

Audio and Video Editing: An audio and video editing workstation is used during many stages of development when creating audio and video material. An audio editing workstation is used to record music, create music CDs, and CD labels. A video editing workstation can be used to create television commercials, prime-time programming, and movies for the theater or home movies.

Audio Editing Workstation

Specialized hardware and software are combined to build a computer to perform audio and video editing. Audio software on an audio editing workstation, shown in the figure, is used to record audio, manipulate how the audio sounds through mixing and special effects, and finalize recordings for publication. Video software is used to cut, copy, combine, and change video clips. Special effects are also added to video using video software. Consider the following hardware when you need to run audio and video editing software:

- Specialized audio card - When recording music to a computer in a studio, multiple inputs from microphones and many outputs to effects equipment may be needed. An audio card capable of handling all these inputs and outputs is needed. Research different audio card manufacturers and understand the needs of your customer to install an audio card that will meet all the needs of a modern recording or mastering studio.

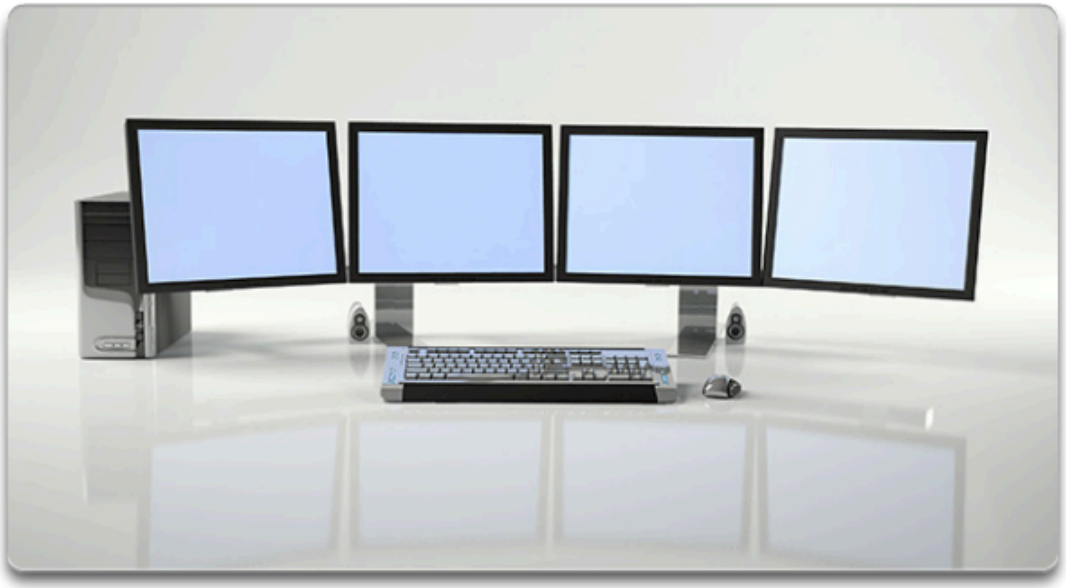
- Specialized video card - A video card that can handle high resolutions and multiple displays is necessary to combine and edit different video feeds and special effects in real time. You must understand the needs of the customer and research video cards to install a card that can handle the high amounts of information that comes from modern cameras and effects equipment.

- Large, fast hard drive - Modern video cameras record in high resolution at fast frame rates. This translates into a high amount of data. Small hard drives will fill up very quickly, and slow hard drives will not be able to keep up with demands, even dropping frames at times. A large, fast hard drive is necessary to record high-end video without errors or missed frames. RAID levels such as 0 or 5, where striping is used, can help to increase storage speed.

Dual monitors - When working with audio and video, two, three, or even more monitors can be very helpful to keep track of everything that is going on with multiple tracks, scenes, equipment, and software. Find out how your customer likes to work to decide how many monitors is most beneficial. If multiple monitors are required, specialized video cards are necessary when building an audio or video workstation.

Virtualization Workstations: You may need to build a computer for a client that uses virtualization technologies. Simultaneously running two or more operating systems on one computer is called virtualization. Often, an operating system is installed, and virtualization software is used to install and manage additional installations of other operating systems. Different operating systems from multiple software companies may be used.
There is another type of virtualization called Virtual Desktop Infrastructure (VDI). VDI allows users to log in to a server to access

Virtualization Workstation



their own virtual computers. Input from the mouse and keyboard is sent to the server to manipulate the virtual computer. Output such as sound and video is sent back to the speakers and display of the computer accessing the virtual computer.
Low-powered devices, known as thin clients, use a server that is much more powerful to perform difficult calculations. A thin client meets the minimum requirements for running windows and runs basic applications from the server.
Laptops, smart phones, and tablets can also access the VDI to use virtual computers.
These are some other functions of virtual computing:

- Test software or software upgrades in an environment that does not hurt your current operating system environment

- Use other operating systems on one computer, such as Linux or Mac OS X

- Browse the Internet without harmful software hurting your main installation

- Run old applications that are not compatible with modern operating systems

Virtual computing requires more powerful hardware configurations because each installation needs its own resources. One or two virtual environments can be run on a modern computer with modest hardware, but a complete VDI installation may require fast, expensive hardware to support multiple users in many different environments. This is some of the hardware required to run virtual computers:

- Maximum RAM - You need enough RAM to meet the requirements of each virtual environment and the host computer. A standard installation using only a few virtual machines might require as little as 64 MB of RAM to support a modern operating system such as Windows XP. With multiple users, supporting many virtual computers for each user, you might need to install as much as 64 GB of RAM or more.

CPU cores - Although a single core CPU can perform virtual computing, a CPU with additional cores increases speed and responsiveness when hosting multiple users and virtual machines. Some VDI installations use computers that have multiple CPUs that have multiple cores.

Gaming PCs: Many people enjoy playing computer games. Each year, games become more advanced and require more powerful hardware, new hardware types, and additional resources to ensure a smooth and enjoyable gaming experience.

You may be required to build a computer for a customer designed specifically for playing games. This is some of the hardware required when building a gaming computer:

- Powerful processor - Games require all the components in the computer to work together seamlessly. A powerful processor helps ensure that all the software and hardware data can be addressed in a timely fashion. Multiple core processors can help increase the responsiveness of hardware and software.

Gaming PC

- High-end video card - Modern games use high resolutions and intricate detail. A video card that has a fast, specialized GPU and high amounts of fast video memory is necessary to ensure that the images displayed on the monitor are high quality, clear, and smooth. Some gaming machines use multiple video cards to produce high frame rates or use multiple monitors.

- High-end sound card - Video games use multiple channels of high-quality sound to immerse the player in games. A high-quality sound card increases the quality of sound above that of built-in sound on a computer. A dedicated sound card also helps improve overall performance by taking some of the demand off of the processor.

- High-end cooling - High-end components often produce more heat than standard components. More robust cooling hardware is often needed to make sure that the computer stays cool under heavy loads while playing advanced games. Oversized fans, heat sinks, and water cooling devices are often used to keep CPUs, GPUs, and RAM cool.

- Large amounts of fast RAM - Computer games require large amounts of memory to function. Video data, sound data, and all the information needed to play the game are constantly being accessed. The more RAM that the computer has, the less often the computer needs to read from slower storage, such as hard drives or SSDs. Faster RAM helps the processor keep all the data in sync, because the data that it needs to calculate can be retrieved when it is needed.

- Fast storage - 7200 RPM and 10000 RPM drives can retrieve data at a much faster rate than 5400 RPM hard drives. SSD drives are more expensive, but they improve the performance of games dramatically.

Gaming-specific hardware - Some games involve communicating with other players. A microphone is required to talk to them, and speakers or headphones are required to hear them. Find out what type of games your customer plays to determine if a microphone or headset is needed. Some games can be played in 3D. Special glasses and specific video cards may be required to use this feature. Also, some games might benefit from the use of more than one monitor. Flight simulators, for example, can be configured to display cockpit images across two, three, or even more monitors at the same time.

Home Theater PCs: Building a Home Theater Personal Computer (HTPC) requires specialized hardware to deliver a high-quality viewing experience for the customer. Each piece of equipment must connect and properly provide the necessary services and resources to support the different demands required from an HTPC system.

Home Theater PC

A useful feature of an HTPC is the ability to record a video program to watch at a later time. HTPC systems can be designed to display live television, stream movies and Internet content, display family photos and videos, and even surf the

Internet on a television. Consider the following hardware when building an HTPC:

- Specialized cases and power supplies - Smaller motherboards can be used when building an HTPC so that the components can fit into a more compact form factor case. This small form factor looks like a component usually found in a home theater. Usually an HTPC case contains large fans that move more slowly and create less noise than those found in an average workstation. Power supplies that do not have fans can be used (depending on power requirements) to further reduce the amount of noise created by the HTPC. Some HTPC designs contain high-efficient components and require no fans for cooling.

- Surround sound audio - Surround sound helps to bring the viewer into the video program. An HTPC can use surround sound from the motherboard when the chipset supports it, or a dedicated sound card can be installed to output high-quality surround sound to speakers or an additional amplifier for even better sound.

- HDMI output - The HDMI standard allows for transmission of high-definition video, surround sound, and data to televisions, media receivers, and projectors.

- TV tuners and cable cards - A tuner must be used for the HTPC to display television signals. A TV tuner converts analog and digital television signals into audio and video signals that the computer can use and store. Cable cards can be used to receive television signals from a cable company. A cable card is required for access to premium cable channels. Some cable cards can receive as many as six channels simultaneously.

- Specialized hard drive - Hard drives, that have low noise levels and have reduced power consumption are commonly known as audio/video drives (A/V).

Instead of building an HTPC, some clients may opt to build a Home Server PC instead. The home server PC can be placed anywhere in the home and be accessed by multiple devices at the same time. The home server shares files and streams audio, video, and photos to computers, laptops, tablets, televisions, and other media devices over the network. A home server may have a RAID array to protect valuable data from a hard drive failure. To stream data to multiple devices without delays, install a gigabit NIC.

Chapter Summary

This chapter introduced the components that comprise a personal computer system and how to consider upgrade components. Much of the content in this chapter will help you throughout this course.

- Information technology encompasses the use of computers, network hardware, and software to process, store, transmit, and retrieve information.

- A personal computer system consists of hardware components and software applications.

- The computer case and power supply must be chosen carefully to support the hardware inside the case and allow for the addition of components.

- The internal components of a computer are selected for specific features and functions. All internal components must be compatible with the motherboard.

- Use the correct type of ports and cables when connecting devices.

- Typical input devices include the keyboard, mouse, touch screen, and digital cameras.

- Typical output devices include monitors, printers, and speakers.

- Cases, power supplies, the CPU and cooling system, RAM, hard drives, and adapter cards, must be upgraded when devices fail or no longer meet customer needs.

Specialized computers require hardware specific to their function. The type of hardware used in specialized computers is determined by how a customer works and what a customer wants to accomplish.