Chapter 5

Custom Configurations

Need for custom Configurations

You might be given a list of requirements from a client and need to translate that into the optimal system for their needs

A+ Exam

On the A+ exam, you may be given a scenario and asked to choose the right PC configuration to meet customer needs. Each of the next eight sections on different configurations gives you the information needed to choose the right configuration based on a given scenario. For example, if given a scenario where the user will be designing magazines, he or she will need a graphic or CAD/CAM workstation. Or, if the user wants to store all of the family's important files in a central location, they might consider a home server PC.

Specialized Systems

1) Standard thick clients
2) Graphic and CAD/CAM design workstations
3) Audio/video editing workstations
4) Virtualization workstations
5) Gaming PCs
6) Home theater PCs
7) Thin clients
8) Home server PCs

1. Standard Thick Clients

- A thick client is a standard client computer system
- It's the standard configuration on which custom configurations are based.
- This is the type of client that users need unless they are performing specialized duties requiring extra hardware or software.
- Minimum OS requirements, standard applications such as MS Office
- Minimum RAM, HDD space, Network capabilities can't be assumed

2. Graphic and CAD/CAM Workstations

- Designers of graphical content, such as posters, advertisements, magazines, product packaging, and other graphic media
- Engineers or architects
- Need:

i. CPU enhancements
ii. Video Enhancements
iii. Maximized RAM…..

i. CPU Enhancements

- Graphic design workstations are used by desktop publishers in the creation of high-quality copy consisting of professional text and graphical images. This output is used in advertising, marketing, and other forms of specialized documentation.
- CAD/CAM workstations are used in the design of engineering and architectural documentation, including blueprints in both two and three dimensions.

- The best type of CPU for these types of systems will often be a multicore processor
- Each core can execute instructions independently, which greatly speeds up the system's performance
- Quad Core processor at minimum

ii. Video Enhancements

- Best technology within budget is required by Graphic design and CAD/CAM Workstations
- Video adapters with better graphics processing units (GPUs) and additional RAM on board have the capability to keep up with the demand of graphic design applications.

iii. Maximized RAM

- Maximizing the amount of RAM that can be accessed by the CPU and operating system will result in better overall performance by graphic design workstations.
- PS - Before upgrading your RAM, always check to see what type of RAM is compatible with the motherboard, how many slots are available, and how the slots work together.

2. Audio/Video Editing Workstations

Require:

- Video enhancements
- Specialized audio
- Specialized hard drives

i. Video Enhancements

- *Audio/video editing workstations* benefit most from a graphics adapter with multiple video interfaces that can be used simultaneously
- Dual Monitor is a must – for multiple viewing of same or similar files
- Also required is a high resolution monitor

ii. Specialized Audio

- Editors of audio information who are expected to perform quality work often require six to eight channels of audio and not the standard 2 channels in standard cards
- In addition to audio output, many A/V editors will require the ability to input custom music from an electronic musical keyboard or other device. A term you will hear in relation to this is the *musical instrument digital interface (MIDI)* standard

iii. Specialized Hard Drives

- Use separate drives for System and Data files
- Use large and fast Data drives for faster encoding and processing
- SATA 6Gbps spinning at 7200RPM or faster are recommended
- SSD cards can be considered but have a size, cost limitation

3. Virtualization Workstations

- Virtualization in detail is discussed in Ch. 20
- It allows for multiple guest OSs to run on the same computer at the same time, along with a host OS.
- Each virtual machine (VM) running on a host system appears to come along with its own resources

Virtualization workstations

The following components are shared by the host and all guest OSs:

- CPU Cycles
- System Memory
- Drive Storage
- System-wide Network Bandwidth

Therefore *CPU Enhancements* (multicore) and *Maximized RAM* must exceed standard workstations

Virtualization Workstation

- The following 3 constraints determine how much RAM can be installed:

1. CPU address-bus width
2. Operating System Maximum supported RAM
3. Motherboard's Maximum supported RAM

4. Gaming PC's

- Today's advanced PC-based gaming software cannot be expected to run on an average system.
- Specialized *gaming* computers are optimized for running modern video games
- PC Gaming is a growing segment of the personal-computer market.

Gaming PC enhancement areas

4 areas of enhancement must be considered:

- CPU enhancements
- Video enhancements
- Specialized audio
- Enhanced cooling

i.CPU Enhancements

- CPU must be able to create the action
- Mid-level to high end multicore will suffice
- Gamers overclock the CPU to reach clock speeds greater than the manufacturer by making changes in the bios to the clocking frequency to dominate competitors
- Overclocked CPUs don't last long though

ii.Video Enhancements

- Technologies like NVIDIA's SLI and ATI's Crossfire are extremely beneficial for such graphics-intensive applications.
- Video cards for gaming systems essentially require their own dedicated graphics processing unit (GPU)
- The choice of monitor must keep up with the speed of the adapter, its resolution or 3D capabilities

iii. Specialized Audio

- High definition digital audio from technologies such as S/PDIF and HDMI are required
- Headsets with Microphones

iv. Enhanced Cooling

- As mentioned overclocked CPUs used by some gamers don't last long due to heat output
- High end graphics cards come with their own cooling fans
- Gaming-PC builder's decision to include two or more ganged adapters (video cards that are two expansion slots wide and take up two expansion slots but attached together as one unit) in one system (SLI or Crossfire) challenges the engineered cooling circuit.

5. Home Theater PCs

- Today though, *home theater PCs (HTPCs)* are becoming more popular as specialized computing appliances used to control the entire home entertainment experience.
- They store large amounts of video media streamed out to display devices, stream from the internet or act as A/V tuners and receivers
- HTPCs give users more control over their set-top boxes

HTPCs continued

- The following list comprises the specializations inherent in true HTPCs:
- Video enhancements
- Specialized audio
- Special chassis
- TV tuner requirement

i. Video enhancements

- High Definition Multimedia Interface (HDMI) offer high def. audio and high def. video and therefore a logical choice
- Graphic adapters with one of more HDMI interfaces
- Monitor should be state of the art too

ii. Specialized audio

- HDMI is capable of 8-channel 7.1 surround sound ideal for home theater
- High end digital audio should be near the top end of the wish list
- Minimum should be 7.1 *analog* surround sound (six 3.5mm stereo mini jacks)

PS: stereo mini jacks are the ones you find on a standard headphone set

iii. Special chassis / iv. TV Tuner

- HTPCs have their own specialized computer case form factor (case design)
- These should blend well with other home appliances such as DVRs, DVD players etc
- Typically black, sit horizontal like desktop computers and have touch screen interfaces

HTPC features..

- Typical dimension 17”x17”x7
- Motherboard typically mini-ITX with integrated HDMI
- Blu-ray drive, PCIe or USB TV Tuner card, HDD or SSD (large storage)
- RAM for mini-ITX, SODIMMs for prebuilt models

FIGURE 5.2 HTPC case

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6. Thin Clients

- A *thin client* is any machine that divests itself of all or most local storage and varying levels of RAM and processing power without necessarily giving up all ability to process instructions and data.
- It resembles but is not a *dumb terminal* (which only displays output to the monitor and relays input from keyboard and mouse to the server)
- Thin clients feature a true network connection but have low processing power and storage, meaning the server must have increased capacities. This unfortunately leads to one central point of failure

Thin Clients continued..

- Their Operating Systems can be simple and designed specifically for thin clients
- For example Thinstation, Windows Embedded Standard (WE7) and Lenovo Terminal Operating System (LeTOS)
- Thin clients can feature flash-based storage and small form factor RAM which distinguish them from Thick clients

7. Home Server PCs

- *Home server PCs* are essentially powerful client systems with a standard, non-server OS.
- These have many features of a server but don't necessarily have server Operating System and are thus capable of allowing other clients to have limited access, but not enough access to accommodate a large number of users.

Home Server PCs continued..

- Fault tolerance should be considered.
- PS: Fault tolerance seeks to retain accessibility during the failure while redundancy simply ensures recoverability after the failure.
- For example having run-flat tires allows you to continue to drive even when a puncture occurs (Fault Tolerance). Redundancy means having more of what you need for example a spare tire in case you get a flat

Home Server PC enhancement features:

- Media streaming capabilities
- File sharing services
- Print sharing services
- Gigabit NIC
- RAID array

i. Media streaming capabilities

- Home server PCs stream music, photos, and videos to other devices including those that are not PCs.
- Windows 7 and newer allow media streaming services
- In Windows 7, Microsoft introduced HomeGroups (password protected) similar to WorkGroups but with a smaller scope and security requirements
- HomeGroups can share files and devices such as printers
- Exercise 5.1 shows how to enable media streaming

ii. File and Print sharing

- Streaming occurs in one direction from the server and does not affect the client's file system.
- But file sharing can go in both directions, and it adds to the client's file system during downloads.
- The server acts as a repository for uploaded files that can then be downloaded from any other machine in the home network.
- Difference between Enterprise servers and Home servers is that all systems in the home have equal access to files and printers while enterprise servers have permission level access to the data store that allow or restrict access to users

iii. Gigabit NIC

- Home server should be hard wired to a switch or wireless access point
- The NIC (Network Interface Card) should be capable of Gigabit speeds
- Running client NICs at gigabit speeds should be avoided, even though the capability is ubiquitous.
- Running all devices on the network at gigabit speeds guarantees that each device that is attached will attempt to saturate the server's gigabit interface with its own traffic.

iv. RAID Array

- Because some of the data stored on a home server represents the only copy, it must be protected from accidental loss
- Large storage capacity is desirable
- Fault tolerance is advised
- Hardware RAID relieves the server from managing the array
- It should include hot-swappable drives so that it can be rebuilt on the fly while still servicing client requests during the loss of a single drive.

Custom Configuration Enhancements Summary

Graphics, CAD/CAM	A/V editing	Virtualization	Gaming PCs	Home Theater PCs	Thin Clients	Home Server PCs
CPU enhancements	Specialized Audio	CPU enhancements	CPU enhancements	Specialized Audio	**	Media Streaming Capabilities
Video Enhancements	Video Enhancements	Maximized RAM	Video Enhancements	Video Enhancements		File and Print sharing services
Maximized RAM	Specialized HDD		Specialized Audio	Special Chasis		Gigabit NIC
			Enhanced Cooling	TV Tuner		RAID Array