Chapter 2: On the Motherboard

Complete CompTIA A+ Guide to PCs, 6e
Chapter Objectives

• To recognize and identify important motherboard parts
• To explain the basics of how a processor works
• What issues to consider when upgrading or replacing the motherboard or processor
• How to add cards to computers and mobile devices
• The differences between PCI, PCI-X, AGP, and PCIe adapters and slots
• About motherboard technologies such as HyperTransport, HyperThreading, and multi-core
• The benefits of active listening
801-1.2: Differentiate between motherboard components, their purposes, and properties.
801-1.6: Differentiate among various CPU types and features and select the appropriate cooling method.
801-3.1: Install and configure laptop hardware and components.
801-5.3: Given a scenario, demonstrate proper communication and professionalism.
802-1.9: Explain the basics of client-side virtualization.
802-4.2: Given a scenario, troubleshoot common problems related to motherboards, RAM, CPU, and power with appropriate tools.
Processor Basics: Central Processing Unit

- Basic components
  - Control Units
  - ALU: Arithmetic Logic Unit
  - I/O Unit
  - Registers
Bit - One 1 or 0
Byte - Eight bits
Kilobyte - 1,024 bytes
Megabyte - 1,048,576 bytes
Gigabyte - 1,073,741,824 bytes

- Why 1’s and 0’s?
- What is a kibibyte? See pg. 46!
Processor Basics: 32- and 64-Bit?

- Intel Processors
- AMD (Advanced Micro Devices, Inc.) Processors
- Register/Word size? (pg. 47)
- Buses (pipelines): Internal vs. External (pg. 47)
Processor Basics: Speed
(Hertz, gigahertz?)

- Clock Speed
- Cache Memory
- Bus Speed
- Threading

Clock cycle
Processor Basics: Cache Memory

- Very fast memory
- Increase processor speed
- Provides fast access to data/instructions
- L1 (Level one) Cache
  - Part of the processor
- L2 Cache (On-die cache)
  - In the processor package but not part of the processor
- L3
  - Can be in the package or on the motherboard
- Controller chip manages cache
Multi-Core Processors

- Dual Core
- Quad Core
- Hexa Core
- Octa Core
- Virtualization
If you buy a motherboard and processor separately, it is important to ensure that the motherboard CPU socket is the correct type for the processor.
Processor Cooling

- Heat Sinks
- Fans
- Liquid Cooling System
Motherboard Expansion Slots

- AGP (Accelerated Graphics Port)
- PCI (Peripheral Component Interconnect)
- PCIe (Peripheral Component Interconnect Express)
- ISA (Industry Standard Architecture)
Laptop Expansion

- Mini PCI
- Mini PCIe
- PC Card
- Express Card
Types of Motherboard Form Factors
Soft Skills - Active Listening

Have a positive, engaged professional attitude when talking and listening to customers.

Focus on what the customer is saying.

Participate in the conversation in a limited, but active, manner.

Briefly talk with the customer.
Review the latest processor slots the day of the exam. These are not ones that you might be dealing with on a daily basis.

Review the specifications for the expansion slots, including how some of the diagrams look. Use the Internet to view motherboards to see if you can determine the type of expansion slot. The exam has graphics that are unlabeled. Do the same for other motherboard components, including the processor.

Review the size and type of laptop PCI/PCIe adapters.

Know that AGP was used only for a video adapter.

Know the difference between the north bridge and the south bridge. Know the components that each bridge type connects to the CPU.
• Easily identify important motherboard parts: processor, RAM slots/RAM, expansion slots (PCI, PCI-X, PCIe, and AGP), and cooling devices.

• Processors can be multi-core and contain very fast cache memory: L1 cache inside the processor and L2 cache outside the processor but inside the chip. Processors can also support L3 cache.

• Processors use HyperThreading to make efficient use of processor time.

• Processors must be kept cool with fans and/or heat sinks. A thermal paste is applied between a heat sink and a processor.

• The clock speed refers to the processor’s internal clock. This is not the same as the FSB or bus speed.

• CPU throttling slows down the processor to prevent overheating.

• PCI/PCI-X is a 32- and 64-bit parallel bus. The AGP expansion slot has a dedicated path for video to the processor. PCI, PCI-X, and AGP have been replaced with the point-to-point serial PCIe bus.
• PCIe slots have a specific number of bidirectional lanes that are the maximum a card can use. A PCIe adapter can fit in a slot of the same number of lanes or a higher number of lanes.

• A chipset is one or more chips that coordinate communication between the processor and the rest of the motherboard. A chipset could have an MCH (north bridge) to coordinate between the CPU and some expansion slots as well as memory. The chipset could also have a ICH (south bridge) to coordinate between the CPU and the rest of the motherboard expansion slots and ports. The chipset dictates the maximum number and type of slots and ports on a motherboard. AMD and Intel have created technologies to address the slowness of the FSB: HyperTransport, QPI, and DMI.

• Laptops use mini PCI/PCIe slots for adapters and can use ExpressCards if the laptops have a slot in the side for these type of cards.
Chapter Summary

• When replacing a motherboard, ensure that the CPU socket and number/types of expansion slots are appropriate. When replacing a laptop motherboard, additional components may have to be removed.

• When replacing or upgrading the CPU, ensure that the motherboard supports the processor and that the heating device is attached before powering on the computer. When replacing a laptop CPU, a screw may have to be loosened before you can remove the old processor.

• When replacing a CPU, ensure that the heat sink or fan is attached before powering on the computer.

• Active listening is an important skill for a technician. Don't be distracted by people or technology, take notes, make good eye contact, and ask directed questions when appropriate.