

The Motherboard - Chapter #5

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Key Terms

Advanced Transfer Cache (ATC)— A type of L2 cache contained within the Pentium processor housing that is embedded on the same core processor die as the CPU itself.

Audio/modem riser (AMR) — A specification for a small slot on a motherboard to accommodate an audio or modem riser card. A controller on the motherboard contains some of the logic for the audio or modem functionality.

Back side bus — The bus between the CPU and the L2 cache inside the CPU housing.

Bus speed — The speed, or frequency, at which the data on the motherboard is moving.

Communication and networking riser (CNR) — A specification for a small expansion slot on a motherboard that accommodates a small audio, modem, or network riser card.

CISC (complex instruction set computing) — Earlier CPU type of instruction set.

Cooler — A combination cooling fan and heat sink mounted on the top or side of a processor to keep it cool.

Discrete L2 cache — A type of L2 cache contained within the Pentium processor housing, but on a different die, with a cache bus between the processor and the cache.

Dual-voltage CPU — A CPU that requires two different voltages, one for internal processing and the other for I/O processing.

Execution Trace Cache — A type of Level 1 cache used by some CPUs to hold decoded operations waiting to be executed.

Expansion bus — A bus that does not run in sync with the system clock.

EPIC (explicitly parallel instruction computing) — The CPU architecture used by the Intel Itanium chip that bundles programming instructions with instructions on how to use multiprocessing abilities to do two instructions in parallel.

External cache — Static cache memory, stored on the motherboard or inside the CPU housing, that is not part of the CPU (also called L2 or L3 cache).

Faceplate — A metal plate that comes with the motherboard and fits over the ports to create a well fitted enclosure around them.

Front-side bus — See system bus.

Heat sink — A piece of metal, with cooling fins, that can be attached to or mounted on an integrated chip (such as the CPU) to dissipate heat.

Host bus — See memory bus or system bus.

ISA (Industry Standard Architecture) slot — An older slot on the motherboard used for slower I/O devices, which can support an 8-bit or a 16-bit data path. ISA slots are mostly replaced by PCI slots.

Instruction set — The set of instructions, on the CPU chip, that the computer can perform directly (such as ADD and MOVE).

Internal bus — The bus inside the CPU that is used for communication between the CPU's internal components.

Internal cache — Memory cache that is faster than external cache, and is contained inside CPU chips (also referred to as primary, Level 1, or L1 cache).

Level 1 (L1) cache — See internal cache.

Level 2 (L2) cache — See external cache.

Level 3 (L3) cache — See external cache.

Local bus — A bus that operates at a speed synchronized with the CPU frequency. The system bus is a local bus.

Local I/O bus — A local bus that provides I/O devices with fast access to the CPU. The PCI bus is a local I/O bus.

Low insertion force (LIF) socket — A socket that requires the installer to manually apply an even force over the microchip when inserting the chip into the socket.

Memory bus — See system bus.

Memory cache — A small amount of faster RAM that stores recently retrieved data, in anticipation of what the CPU will request next, thus speeding up access. See also system bus.

Motherboard bus — See system bus.

Multiplier — The factor by which the bus speed or frequency is multiplied to get the CPU clock speed.

North Bridge — That portion of the chip set hub that connects faster I/O buses (for example, AGP bus) to the system bus. Compare to South Bridge.

On-board ports — Ports that are directly on the motherboard, such as a built-in keyboard port or on-board serial port.

On-Package L2 cache — Cache built directly onto the motherboard.

Pin grid array (PGA) — A feature of a CPU socket whereby the pins are aligned in uniform rows around the socket.

Power-on password — A password that a computer uses to control access during the boot process.

Primary cache — See internal cache.

Processor speed — The speed, or frequency, at which the CPU operates. Usually expressed in GHz.

RISC (Reduced Instruction Set Computing) chips — Chips that incorporate only the most frequently used instructions, so that the computer operates faster (for example, the PowerPC uses RISC chips).

Riser card — A card that plugs into a motherboard and allows for expansion cards to be mounted parallel to the motherboard. Expansion cards are plugged into slots on the riser card.

Single-voltage CPU — A CPU that requires one voltage for both internal and I/O operations.

South Bridge — That portion of the chip set hub that connects slower I/O buses (for example, an ISA bus) to the system bus. Compare to North Bridge.

Spacers — See standoffs.

Staggered pin grid array (SPGA) — A feature of a CPU socket whereby the pins are staggered over the socket in order to squeeze more pins into a small space.

Standoffs — Round plastic or metal pegs that separate the motherboard from the case, so that components on the back of the motherboard do not touch the case.

Startup password — See power-on password.

System bus — The bus between the CPU and memory on the motherboard. The bus frequency in documentation is called the system speed, such as 400 MHz. Also called the memory bus, front-side bus, local bus, or host bus.

Voltage regulator module (VRM) — A device embedded or installed on the motherboard that regulates voltage to the processor.

Wait state — A clock tick in which nothing happens, used to ensure that the microprocessor isn't getting ahead of slower components. A 0-wait state is preferable to a 1-wait state. Too many wait states can slow down a system.

Zero insertion force (ZIF) socket — A socket that uses a small lever to apply even force when you install the microchip into the socket.

REVIEWING THE BASICS

1. What are the four most popular types of motherboards?

AT, ATX, Mini ATX, and BTX

2. How many power cords connect to a Baby AT motherboard?

2 – P8 and P9

3. Name 10 components that are contained on a motherboard.

- **Expansion Slots**
- **CPU**
- **RAM**
- **Connectors**
- **Chipset**
- **Heatsink**
- **Power Connector**
- **Buses**
- **ROM BIOS**
- **CMOS Configuration Chip**

4. If a motherboard has a slot 1, what CPU(s) is it designed to support?

Pentium II and Pentium III

5. Why should you want both ISA and PCI expansion slots on a motherboard?

ISA for slower devices and PCI for devices that need better bus performance.

6. When people speak of bus size, to what are they specifically referring?

The width of how much data can be transmitted at one time.

7. What characteristics of the motherboard architecture determine the amount of memory that a CPU can address?

How many Ram slots are available and the motherboard documentation.

8. What was the first Intel CPU to contain external cache?

Pentium Pro

9. When is it appropriate to use a Celeron rather than a Pentium 4 in a computer system?

10. Which is more powerful, the Celeron or the Xeon processor?

Xeon

11. Who is the major competitor of Intel in the CPU market?

AMD

12. Why did the competitors of the Intel Pentium II choose to stay with Socket 7 rather than use slot 1 for their competing processors?

Because it supports an AGP video and 100-MHz system bus, which is the same bus speed as the Pentium II.

13. What components inside a computer case keep a CPU cool?

Heatsink and fans.

14. Describe the difference between a PGA socket and an SPGA socket.

PGA – Pins are aligned in uniform rows around the socket.

SPGA – Pins are staggered over the socket to squeeze more pins into a small space.

15. Name a CPU that requires dual voltage. How are the two voltages used?

Pentium MMX, Cyrix M2, and AMD K6. One for external operations and another for internal operations.

16. Name a CPU that uses Socket A.

AMD Athlon XP

17. What are the three speeds of the most popular motherboards currently available on the market?

533 MHz, 800 MHz, and 1066 MHz

18. Name three manufacturers of motherboard chip sets.

Intel, AMD, Sis, and ATI

19. Name the three most popular manufacturers of system BIOS programs.

Dell, IBM, Hewlett-Packard

20. What is one reason to flash BIOS?

When the motherboard becomes unstable or some functions are lost.

21. What is the easiest way to obtain the latest software to upgrade BIOS?

By visiting the Web sit of your BIOS manufacturer or motherboard manufacturer. Also, most Flash ROM BIOS upgrades can be downloaded from www.unicore.com.

22. What is the name of the bus that connects L2 cache to the CPU inside the Pentium II processor housing?

ATC

23. Why is it best to install drives into a computer case before you install the motherboard?

Because there is a chance that you might drop one of the drives onto the motherboard damaging it.

24. What are the four categories of cargo that are carried over a bus?

Electrical power, control signals, memory addresses, and data

25. Describe how you can access the CMOS setup program.

By pressing a key or combination of keys during the boot process. The exact way to enter setup varies from one motherboard manufacturer to another.

THINKING CRITICALLY

1. Why does a motherboard sometimes support more than one system bus speed?

Because backward compatibility dictates that older buses be supported on a motherboard, even when faster, better busses exist. All this makes for a maze of buses on a motherboard widening the transportation for data. Each bus has different speeds, access methods, and protocols.

2. What must software developers do to take advantage of a 64-bit processor such as the Itanium?

3. Why don't all busses on a motherboard operate at the same speed?

Because traffic on a computer's CPU or bus is digital (on and off), rather than analog (continuous).

4. When you turn off a computer at night, it loses the date, and you must reenter it each morning. What is the problem and how do you solve it?

The time displayed in Windows does not match the current time. Either remove and reinstall realtime clock, replace the CMOS battery or Flash BIOS.

5. A computer freezes at odd times. At first you suspect the power supply or overheating, but you have eliminated overheating and replaced the power supply without solving the problem. What do you do next?

- a. Replace the CPU
- b. Replace the motherboard
- c. **Reinstall Windows**
- d. Replace the memory modules
- e. Flash BIOS