

# What is this thing called a chipset?

The Khwarzimidic Science Society

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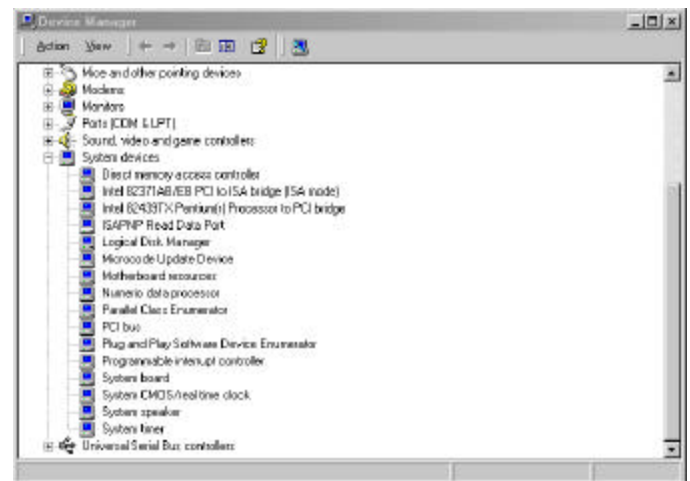
We all know that the most important thing inside the PC is the motherboard, not the hard disk, not the modem, not the CD-ROM drive. The motherboard is the physical reality that shapes the PC architecture. In the PC architecture, every component is connected to the same shared bus. But a motherboard today consists of a lot of components itself. So what is the most important component on the motherboard? Many of you would yell CPU. Wrong! The CPU is the brain of your computer, but if you live in your little house on your motherboard, you won't regard it your most important neighbor. It is the hard-working group of smaller-than-CPU chips around you that are the most important. This group of chips is called a *chipset*. Logically, a chipset would define the whole system for me because all the components, in one way or the other, rely on the capabilities of the chipset.

I am an Electrical engineer. I think about circuits. The Software people might talk about the major software components. Therefore they would say a lot of the CPU and the BIOS and such. But from my perspective, you can tell a lot more about the computer if you know the chipset it contains than its BIOS or CPU. Moreover, the chipset dictates the CPU and the BIOS. Plus you cannot replace your chipset. So the chipset is important.

A chipset is made around the specifications of the CPU. So the CPU comes out first and then leads the making of the chipset. So there should be a good working relationship between the chipset designers and the CPU makers so that a good exchange of technical information can take place between them. We shouldn't forget other components here. The BIOS makers are also key partners in the process. Intel makes CPUs, motherboards and chipsets. Acer sells OEM (Original Equipment Manufacturer) systems under the brand name Acer, also makes motherboards alone under the brand name of AcerOpen and they also design chipsets under the name Acer Laboratories Inc. (ALi). Advanced Micro Devices (AMD) started their business by making CPUs. Now they also make various chipsets. American Megatrends makes motherboards and writes BIOS. Anyway the largest and the favorite chipset manufacturer is Intel alone. They want to make sure there is always the soundest chipset available that can drive their CPUs to full potential.

Back in the 80486 days, the VLB (VESA Local Bus) standard was quite popular. But with the release of Pentium CPUs, Intel successfully tried to steer the chipset industry towards adoption of a better PCI (Peripheral Component Interconnect) chipset. My older P75 system was hybrid. It had an integrated graphics controller conforming to the VLB standard as well as the PCI 2.0 bus. VLB was extinct by the time PII CPUs were released. My current motherboard that runs my P200MMX CPU contains no VLB. It is PCI 2.1 (*concurrent PCI*) compliant. By no means it should be gathered that Intel's designs are the best in the performance market. You can find non-Intel chipsets performing better than all-Intel models.

Flip open the hood on your chassis. Blow the dust out and run your sight on the motherboard's surface. You would be able to spot the square chips lying, bigger than anything but the CPU. The CPU can be spotted very easily because apart from its size, it is always covered with a big heat sink on its top. You can read their tops. Generally, the model names are marked on the top. For those who fear the air inside, they can see the Device Manager page in the System property sheet. The System sheet can be invoked from within the Control Panel folder. Here is what I see for my computer.



The Intel 82371AB/EB PCI to ISA bridge and the Intel 82439TX Pentium(r) Processor to PCI bridge are showing that I have the Intel 430TX PCIsset, also commonly known as the Triton chipset. Looking at the motherboard of course can have a more exact picture. There is no fixed number of chips that the chipset must have. Although 2, 3 or 4 are common.

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A chipset is an integrated set of VLSI chips that perform all the functions of the computer system, including the ones that once required separate chips. The chipset today replaces the following types of devices.

- Memory controller
- EIDE (Extended Integrated Device Electronics) controller
- PCI (Peripheral Component Interconnect) bridge
- RTC (Real Time Clock)
- DMA (Direct Memory Access) controller
- IrDA controller
- Keyboard controller
- PS/2 mouse controller
- L2 (second level) cache controller
- Low-power CMOS (complementary metal-oxide semi-conductor) SRAM (Static Random Access Memory)

The list is not complete. As the time passes, there is more added to it. Some things become extinct in favor of others. Notice also that some devices are not integrated with every chipset.

You can imagine that data moving between peripherals or the memory and the CPU has to go through the chipset. The CPU can be considered as the node or the terminal and the chipset becomes the hub. Peripherals can contact other peripherals via the chipset. You must have thought how data from the memory bypasses the CPU on its way to the hard disk. The DMA controller built into the chipset does that. Why doesn't the data pouring into the CPU from the hard disk collide with the data coming from the modem? The bus controllers (memory, PCI, ISA, EISA) inside the chipset are responsible.

The chipset run the show. Proved. As new chipsets are designed, motherboards are re-designed to accommodate them. The CPU can be changed. The memory can be upgraded. The hard disk can be swapped. But nothing can be done about the chipset. If there is a new chipset in the market that you want to avail, your motherboard goes out of your chassis. *Vice versa*. Since the motherboard is designed around the capabilities of the chipset, unless there is an upgrade of motherboard, the overall performance of your PC would not show greater improvement. I am ready to back this argument in the face of the modern motherboard designs, which can accommodate quite a large range of CPUs and other peripherals. The chipset shall always be the stem of the tree, the backbone of the giant.

Here are a few examples of the properties of a computer system the chipset dictates.

- Memory type – FPM (Fast Page Mode), EDO (Extended Data Out), SDRAM (Synchronous Dynamic RAM), ECC, parity-checking
- L2 cache type – burst, pipelined burst, synchronous, asynchronous
- CPU type – Pentium P54C, Pentium 55C, Pentium II, Pentium III, Pentium II Xeon, Pentium III Xeon, Pentium Pro, Pentium II Celeron
- Maximum memory bandwidth – 33, 40, 50, 60, 66, 75, 83, 100, 133 MHz
- PCI bus type – 32-bits or 64-bits
- SMP capability – single, dual, trio or quad CPU support
- Other features like AGP (Advanced Graphics Port), IrDA, USB (Universal Serial Bus), PS/2 (Personal System/2) mouse
- Built-in PCI EIDE controller with all possible EIDE features such as PIO mode, ATA/33 mode, ATA/66 mode, DMA mode, UDMA mode, UDMA-2 mode
- Built-in PS/2 mouse support, BIOS, keyboard controller and the RTC circuitry

So we finally come to an understandable conclusion. What makes the chipset lovely is its ability to integrate the functions of a large number of chips into an integrated set of 2 or 4 chips. This cuts the test time by more than half because previously it could take a lot more time handling the compatibility issues of all the chips. But there are trade-offs. Chipset upgrades are delayed. The end-user is confined to a limited set of choices because the diversity of chips falls within a singularity. But there are hard-working zealots who flood the performance-market with their designs and therefore successfully challenge one another.