What is computer hardware?

Now that's some serious hardware."

It's the kind of line you expect to hear in an action movie, when Arnold Schwarzenegger gets his hand on an arsenal of guns and explosives. Often, the same phrase is applied to the world of computers, though. Want to play the latest video games? You better be packing some serious hardware. That machine built for video editing? It's packing some serious hardware! But what is computer hardware, anyway?

Short answer: Computer hardware consists of the physical components that make a computer go. Software, on the other hand, is the programming that tells all those components what to do. Windows and Photoshop and Web browsers are software. Knowing how to operate software is a bit like knowing how to drive a car: It's what you use the computer for on a daily basis. But understanding hardware is like knowing how the car works. If you can differentiate between serious hardware and ho-hum hardware, you won't overspend on a mediocre computer (or buy one way more powerful and expensive than you need).

We all know hardware describes the physical pieces that make a computer hum with life. But what are those individual pieces? Well, you've probably heard of the processor, or central processing unit(CPU). That's the heart of the computer. It's a chip that takes instructions from programs (software), makes calculations and spits out the results. It may be the most important part, but it's certainly not the only one -- and like understanding the parts of a car, understanding computer hardware could help you repair one when things go wrong.

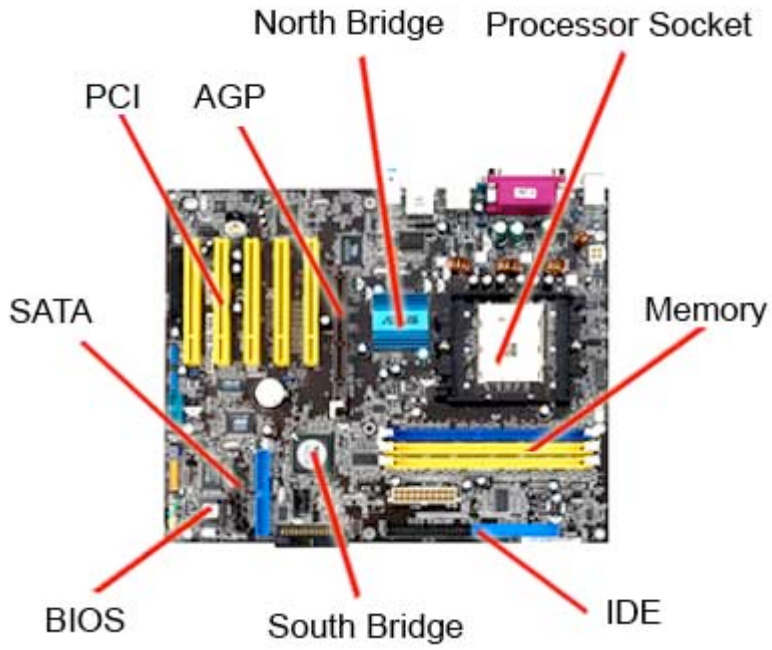
The Building Blocks of a Computer

By the 1980s, computers were small enough to fit into our homes, but still too expensive and specialized for the average person to put together. That really changed in the 1990s and 2000s, and now computers are shockingly easy to assemble with the right parts, a little patience and a screwdriver.

There are some basic pieces that go into every computer. A case, or tower, holds all the components, with a large open area that fits a motherboard. Think of the motherboard as the computer's nervous system: It's a big slab of fiberglass etched with circuitry that connects each component of a computer together. Every piece of computer hardware will connect to the motherboard.

Cases also include fans for keeping a computer cool, and room for a big power supply unit, or PSU, that handles power conversion for all the parts of a computer. Random access memory (RAM) is an integrated circuit that stores data in such a way that it's quickly accessible to the processor. Hard drives and solid state drives store gigabytes or terabytes of data using different technologies. A graphics card is its own little ecosystem, with a processor dedicated to different tasks than the CPU and high performance RAM. And that's just about all it takes to make a computer go. When the processor is plugged into the motherboard, a heat sink rests on top to keep it cool.

How Motherboards Work



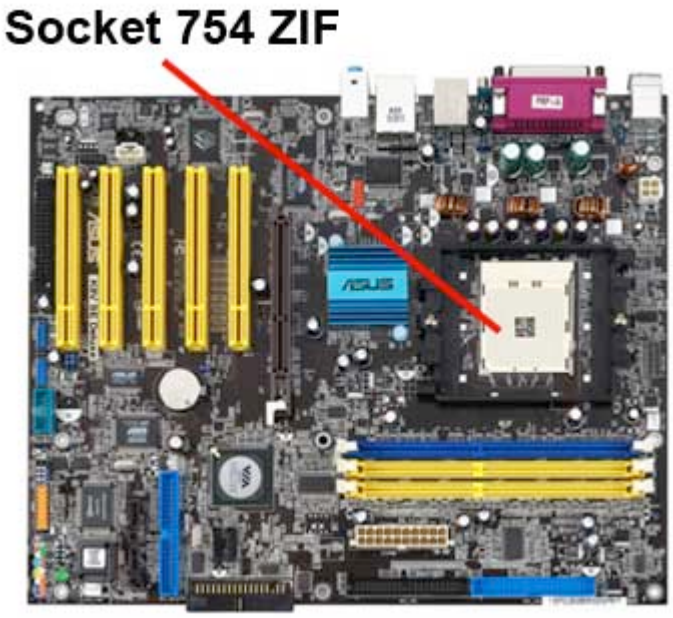
A motherboard by itself is useless, but a computer has to have one to operate. The motherboard's main job is to hold the computer's microprocessor chip and let everything else connect to it. Everything that runs the computer or enhances its performance is either part of the motherboard or plugs into it via a slot or port.

he form factor is just one of the many standards that apply to motherboards. Some of the other standards include:

- The **socket for the microprocessor** determines what kind of Central Processing Unit (CPU) the motherboard uses.
- The **chipset** is part of the motherboard's logic system and is usually made of two parts -- the northbridge and the southbridge. These two "bridges" connect the CPU to other parts of the computer.
- The Basic Input /Output System (BIOS) chip controls the most basic functions of the computer and performs a self-test every time you turn it on. Some systems feature dual BIOS, which provides a backup in case one fails or in case of error during updating.
- The **real time clock chip** is a battery-operated chip that maintains basic settings and the system time.

The slots and ports found on a motherboard include:

- Peripheral Component Interconnect (PCI)- connections for video, sound and video capture cards, as well as network cards
- Accelerated Graphics Port (AGP) - dedicated port for video cards.
- Integrated Drive Electronics (IDE) - interfaces for the hard drives
- Universal Serial Bus or FireWire - external peripherals
- Memory slots



A Socket 754 motherboard
PHOTO COURTESY **CONSUMER GUIDE PRODUCTS**

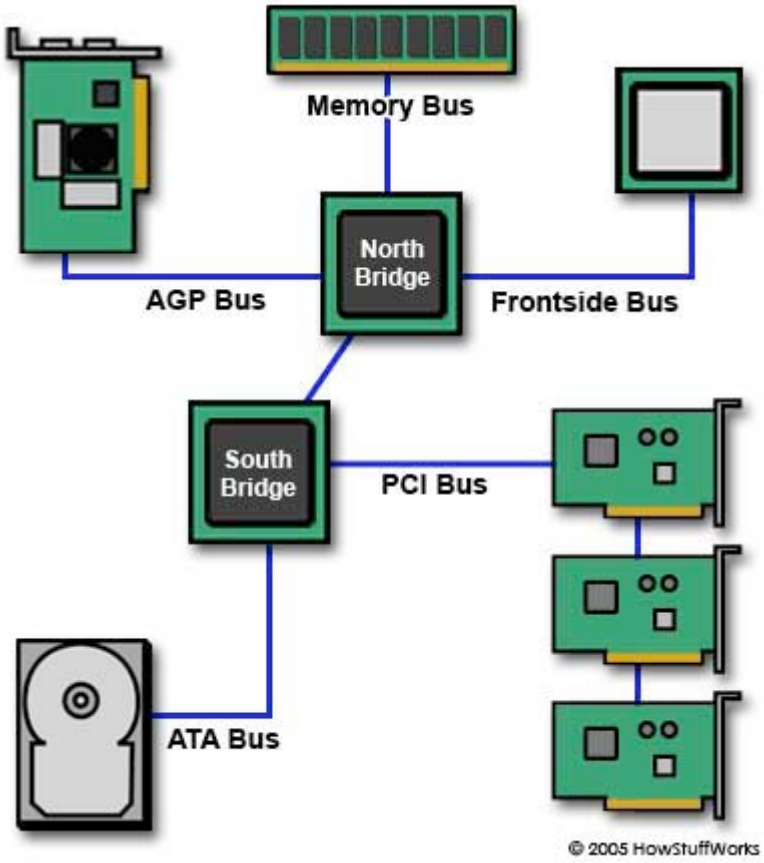
Some motherboards also incorporate newer technological advances:

- Redundant Array of Independent Discs (RAID) controllers allow the computer to recognize multiple drives as one drive.
- **PCI Express** is a newer protocol that acts more like a network than a bus. It can eliminate the need for other ports, including the AGP port.
- Rather than relying on plug-in cards, some motherboards have **on-board** sound, networking, video or other peripheral support.

Chipsets

The chipset is the "glue" that connects the microprocessor to the rest of the motherboard and therefore to the rest of the computer. On a PC, it consists of two basic parts -- the **northbridge** and the **southbridge**. All of the various components of the computer communicate with the CPU through the chipset.The northbridge connects directly to the processor via the front side bus (FSB). A memory controller is located on the northbridge, which gives the CPU fast access to the memory. The northbridge also connects to the AGP or PCI Express bus and to the memory itself.The southbridge is slower than the northbridge, and information from the CPU has to go through the northbridge before reaching the southbridge. Other busses connect the southbridge to the PCI bus, the USBports and the IDE or SATA hard disk connections.

Bus Speed



Busses connect different parts of the motherboard to one another

A bus is simply a circuit that connects one part of the motherboard to another. The more data a bus can handle at one time, the faster it allows information to travel. The **speed** of the bus, measured in megahertz (MHz), refers to how much data can move across the bus simultaneously.

Bus speed usually refers to the speed of the **front side bus** (FSB), which connects the CPU to the northbridge. FSB speeds can range from 66 MHz to over 800 MHz. Since the CPU reaches the memory controller though the northbridge, FSB speed can dramatically affect a computer's performance.

Here are some of the other busses found on a motherboard:

- The **back side bus** connects the CPU with the level 2 (L2) cache, also known as secondary or external cache. The processor determines the speed of the back side bus.
- The **memory bus** connects the northbridge to the memory.
- The **IDE** or **ATA** bus connects the southbridge to the disk drives.
- The **AGP** bus connects the video card to the memory and the CPU. The speed of the AGP bus is usually 66 MHz.
- The **PCI** bus connects PCI slots to the southbridge. On most systems, the speed of the PCI bus is 33 MHz. Also compatible with PCI is **PCI Express**, which is much faster than PCI but is still compatible with current software and operating systems. PCI Express is likely to replace both PCI and AGP busses.

The faster a computer's bus speed, the faster it will operate -- to a point. A fast bus speed cannot make up for a slow processor or chipset.

How WiFi Works

A wireless network uses radio waves, just like cell phones, televisions and radios do. In fact, communication across a wireless network is a lot like two-way radio communication. Here's what happens:

1. A computer's wireless adapter translates data into a radio signal and transmits it using an antenna.
2. A wireless router receives the signal and decodes it. The router sends the information to the Internet using a physical, wired Ethernet connection.

The process also works in reverse, with the router receiving information from the Internet, translating it into a radio signal and sending it to the computer's wireless adapter.

A **WiFi hotspot** is simply an area with an accessible wireless network. The term is most often used to refer to wireless networks in public areas like airports and coffee shops. Some are free and some require fees for use, but in either case they can be handy when you are on the go. You can even create your own mobile hotspot using a cell phone or an external device that can connect to a cellular network. And you can always set up a WiFi network at home.

If you want to take advantage of public WiFi hotspots or your own home-based network, the first thing you'll need to do is make sure your computer has the right gear. Most new laptops and many new desktop computers come with built-in wireless transmitters, and just about all mobile devices are WiFi enabled. If your computer isn't already equipped, you can buy a **wireless adapter** that plugs into the PC card slot or USB port. Desktop computers can use USB adapters, or you can buy an adapter that plugs into the PCI slot inside the computer's case. Many of these adapters can use more than one 802.11 standard.

Local Area vs. Wide Area

We can classify network technologies as belonging to one of two basic groups. **Local area network** (LAN) technologies connect many devices that are relatively close to each other, usually in the same building. The library terminals that display book information would connect over a local area network. **Wide area network**(WAN) technologies connect a smaller number of devices that can be many kilometers apart. For example, if two libraries at the opposite ends of a city wanted to share their book catalog information, they would most likely make use of a wide area network technology, which could be a dedicated line leased from the local telephone company, intended solely to carry their data.

Ethernet мрежни

a system for connecting a number of computer systems to form a local area network, with protocols to control the passing of information and to avoid simultaneous transmission by two or more systems
Ethernet is a particular networking technology well adapted to the scale of one building, be it a single hours or a large office block. There are a number of versions of Ethernet which have developed over the years. And the fundamental thing that Ethernet does is transfer packets between computers.

The Internet is a worldwide packet switching network. Since it is based on packets, and Ethernet delivers packets, the carrier for the Internet that most people encounter is Ethernet. Within one building , the Internet is often carried by Ethernet. But over longer distances, others technologies are used. The broadband connections used to connect homes to the Internet are not Ethernet; they may be a number of other technology's such as ADSL. Likewise, the trans-ocean fibre optic links that deliver

Internet packets from one continent to another are not Ethernet. The Internet can be carried across many such links. But the one you encounter most often is Ethernet.

Ethernet is to Internet as roads are to the transportation of goods. Ethernet is one kind of technology used to carry packets of information that can also travel by other means. Ethernet uses wires of one kind or another; roads are flat-(ish). WiFi uses no wires, and goes through the air. Internet is the space you can reach by any technology that has compatible packets, addresses, and connected routes over any technology.